NASA/TM-2003-212429/VOL2

Compendium of NASA Data Base for the Global Tropospheric Experiment's Transport and Chemical Evolution Over the Pacific (TRACE-P)

Volume 2: P-3B

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October 2003

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COMPENDIUM OF NASA DATA BASE FOR THE GLOBAL TROPOSPHERIC EXPERIMENT'S TRANSPORT AND CHEMICAL EVOLUTION OVER THE PACIFIC (TRACE-P), VOLUME 2: P-3B

By Mary M. Kleb and A. Donald Scott, Jr.
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SUMMARY

This report provides a compendium of NASA aircraft data that are available from NASA's Global Tropospheric Experiment's (GTE) Transport and Chemical Evolution over the Pacific (TRACE-P) Mission conducted from late February through early April 2001 in the western Pacific. The broad goal of TRACE-P was to characterize the transit and evolution of the Asian outflow over the western Pacific. It provided the scientific community an opportunity to investigate the impact of the rapid industrialization in Asia and compare the current conditions with those observed during the Pacific Exploratory Missions in the western Pacific (PEM-West missions), A in 1991 and B in 1994. Conducted from February 24 through April 10, 2001, TRACE-P integrated airborne, satellite- and ground-based observations, as well as forecasts from aerosol and chemistry models. PEM-West A (fall 1991) and PEM-West B (early spring 1994) examined the impact of natural and human activities on the chemistry of the troposphere over the northwestern Pacific from 10°N to 50°N. TRACE-P was conducted in early spring when there was strong continental outflow, as was the case with PEM-West B. The two main operational bases were Hong Kong and Yokota Air Force Base in Fussa, Japan. Additional operational sites included Okinawa; Kona, Hawaii; and Guam. The transit sites were Palmdale, California; Wake Island; and Midway Island.

TRACE-P was conducted as part of the National Aeronautics and Space Administration's (NASA) Global Tropospheric Experiment (GTE). The GTE has been an ongoing

element of the Tropospheric Chemistry Program, a Research and Analysis (R&A) program within the Science Division of NASA's Office for Earth Science Enterprise. The major thrust of GTE has been to utilize NASA's DC-8 and P-3B aircraft to carry multi-instrument payloads into regions of the global troposphere where natural and/or human impacts are believed to be particularly significant in effecting chemical composition changes and/or where the troposphere is still relatively unaffected. This was the case with TRACE-P as well, however in addition, data from satellites, ground–based stations, and chemistry and aerosol models were integrated and comprised an important aspect of the mission in the planning, execution and analysis of results.

The format of this compendium utilizes data plots (time series and altitude profiles) of selected data acquired aboard the NASA/Dryden DC-8 (vol. 1) and NASA/Wallops P-3B (vol. 2) aircraft during TRACE-P. The purpose of this document is to provide a representation of aircraft data that are available in archived format via NASA Langley's Atmospheric Sciences Data Center (ASDC) and through the GTE Project Office archive. The data format is not intended to support original research/analyses, but to assist the reader in identifying data that are of interest. This compendium is for only the NASA aircraft data. The ASDC archived databases includes numerous supporting data including meteorological observations/products, results from surface studies, satellite observations, and data from ozonesonde and FTIR stations.

INTRODUCTION

The goal of the NASA Tropospheric Chemistry Program is to develop an understanding of the chemical cycles that control the composition of the troposphere and to assess the susceptibility of the global atmosphere to chemical change. A major component of the NASA program has been the **G**lobal **T**ropospheric **E**xperiment (GTE). GTE has consisted of a series of field experiments designed to (1) evaluate the capability of instrument techniques to measure, under field conditions, the minute concentrations of key chemical species in the troposphere; and (2) systematically address tropospheric chemistry issues relevant to global change, through airborne sampling expeditions, coupled with modeling and laboratory studies. GTE has been primarily an aircraft-based program supplemented by ground-based measurements. Satellite data also played important roles (however TRACE-P was a more integrative mission). Space Shuttle observations of tropospheric carbon monoxide distributions have been used to plan and direct the course of expeditions, for example, over tropical rain forests and for continental outflow into the tropical Atlantic Ocean. LANDSAT land-surface images have facilitated the extrapolation of regional Arctic-tundra measurements into global-scale conclusions. **T**otal **O**zone **M**easurements from **S**atellites (TOMS) has helped place GTE observed ozone distributions/budgets into a global perspective (temporal and spatial) and has been used to guide intensive aircraft studies over the tropical Atlantic Ocean. Weather data returned by environmental satellites have guided flight planning for research flights. During TRACE-P chemical and aerosol models participated in flight planning and execution. The **A**tmospheric **S**ciences **D**ata **C**enter (ASDC) data include many of the satellite, surface, and meteorological products used to support GTE missions or analyses.

The GTE airborne expeditions have focused on studies of the remote global atmosphere in order to provide well-documented baseline measurements of the unperturbed environment and to fully understand the chemical cycles underlying the natural environment. Table 1 and Figure 1 summarize GTE missions conducted through 2001. The GTE expeditions have been conducted in a diverse range of environments and with

different scientific goals. The **C**hemical **I**nstrument **T**est and **E**valuation (CITE) series was designed to study the ability to measure key tropospheric gaseous species by exposing selected instrumentation to a wide range of measurement conditions. The **A**tmospheric **B**oundary **L**ayer **E**xperiments (ABLE) were designed to study the emission, chemical processes, and dynamics of the boundary layer, and have been conducted over ecosystems known to have significant influence on the global troposphere. The importance of long-range transport of natural and anthropogenic emissions on the global troposphere has been investigated in the **P**acific **E**xploratory **M**issions (PEM) and the **Tr**ansport and **A**tmospheric **C**hemistry near the **E**quator – **A**tlantic (TRACE-A). The Pacific Exploratory Missions in the Western Pacific Ocean (PEM-West) Phases A and B focused on the impact of emissions from the Asian continent over the northwest Pacific Ocean during contrasting meteorological conditions. The Pacific Exploratory Missions over the Tropical Pacific (PEM-Tropics) Phases A and B studied the oxidizing power of the atmosphere and sulfur chemistry over the Pacific basin also during contrasting seasons. The **Tra**nsport and **C**hemical **E**volution over the **P**acific (TRACE-P) mission focused on the composition and evolution of Asian outflow.

The GTE, managed as part of the Tropospheric Chemistry Program in the Mission to Planet Earth Office, NASA Headquarters, was initiated in the early 1980s. Implementation of the GTE Project is via a Project Office at the NASA Langley Research Center, Atmospheric Sciences Competency.

SYMBOLS AND UNITS

ABLE	Atmospheric and Boundary Layer Experiment
ASDC	Atmospheric Sciences Data Center
CITE	Chemical Instrument Test and Evaluation
FTIR	Fourier Transform Infrared Spectrometer
GTE	Global Tropospheric Experiment
ITCZ	Inter-Tropical Convergence Zone

LaRC	Langley Research Center
NASA	National Aeronautics and Space Administration
PEM	Pacific Exploratory Mission
ppbv	parts per billion, by volume
ppmv	parts per million, by volume
pptv	parts per trillion, by volume
SPCZ	South Pacific Convergence Zone
TOMS	Total Ozone Measurements from Satellites
TRACE-A	Transport and Atmospheric Chemistry near the Equator – Atlantic
TRACE-P	Transport and Chemical Evolution over the Pacific

PROGRAM AND DATA DESCRIPTION

The National Aeronautics and Space Administration's TRACE-P mission, conducted from late February through early April 2001, was a major component of the Global Tropospheric Experiment, a project within the Earth Sciences Enterprise program. The long-range goal of the GTE has been to contribute substantially to scientific understanding of human impacts on the chemistry of the global troposphere. Changes in chemical composition of the troposphere on a global scale have been well documented during these last two decades. This has given rise to considerable concern that these chemical changes in the troposphere, which are expected to increase as population increases and economic activity expands, will lead to changes in the earth's climate. The TRACE-P campaign had two main objectives, (1) to determine the chemical composition of the Asian outflow over the western Pacific in spring in order to understand and quantify the export of chemically and radiatively important gases and aerosols, and their precursors, from the Asian continent, and (2) to determine the chemical evolution of the Asian outflow over the western Pacific in the spring and to understand the ensemble of processes that control this evolution. Within this framework, 5 specific tasks were identified: (1) to identify and quantify the contributions to Asian outflow from industrial

sources in Asia, Europe, and North America, as well as from biomass burning sources in Southeast Asia and northern Africa, (2) to demonstrate the potential for synergistic integration of aircraft and satellite observations, together with three-dimensional models, to quantify the chemical outflow from a major continental source, (3) to determine the importance of natural processes (lightning, stratospheric down welling) contributing to the Asian outflow, (4) to understand the long-range transport and chemical aging of Asian pollution over the North Pacific, and to assess the implications for global influence and for intercontinental transport of pollutants, and (5) to determine the role of heterogeneous chemistry in controlling the chemical evolution of the Asian outflow over the Pacific.

The broad design of the TRACE-P campaign employed a series of flights utilizing the NASA Dryden DC-8 and NASA Wallops P-3B aircraft from two main operational sites in the western Pacific (Hong Kong and Yokota Air Force Base in Fussa, Japan). Additional operational and/or transit sites for the DC-8 included Kona, Hawaii; Guam; and Kadena Air Force Base, Okinawa. The P-3B's additional operational/transit sites were Kona, Hawaii; Wake Island; Guam; Kadena Air Force Base, Okinawa; and Midway Island. Geographic coverage of flights originating from the intensive bases ranged from 110E to 150E in longitude approximately 10N to 45N in latitude. Tables 2a and 2b summarize the DC-8 and P-3B flights, respectively as well as briefly describe the science objectives of each flight. Figure 2a shows the TRACE-P transit flights for both aircraft while Figure 2b shows the intensive flights during the mission. Flights 1 through 3 for the DC-8 and P-3B, all test flights, are not included in Figure 2a or 2b.

The overall objective in using two aircraft was to maximize geographical coverage of Asian outflow. The DC-8 had a higher ceiling, greater payload capacity, and longer range than the P-3B. Instrumentation on the DC-8 measured ozone, and aerosol structure above and below flight altitude, ozone photochemical precursors, and airmass characterization. The P-3B however, could fly for longer periods of time at low altitude (below 3km) than the DC-8 so it focused more on hydroxyl radicals, aerosol microphysics, sulfur chemistry, and eddy flux measurements. Table 3 summarizes the

measurement characteristics for the parameters measured aboard both aircraft. Figures 3a and 3b show the mission payloads for the DC-8 and P-3B, respectively. Additional measured quantities (e.g., Project measurements) and some calculated quantities (liquid water content) not listed in Table 3 are available from the ASDC and GTE archives.

The TRACE-P data available on the Langley ASDC and GTE archive include (1) data taken aboard the DC-8 aircraft; (2) data taken aboard the P-3B aircraft; (3) ozonesonde data; (4) FTIR data; (5) merged data; (6) satellite data products; and (7) meteorological data products. The ozonesonde data include releases from the following locations: Trinidad Head, CA (40.8N, 124.2W); Hilo, HI (19.4N, 155.0W); Sapporo (43.1N, 141.3E), Tsukuba (Tateno) (36.1N, 140.1E), Naha (26.2N, 127.7E), and Kagoshima (31.6N, 130.6E), Japan; Hong Kong (22.3N, 114.2E); Taipei, Taiwan (25.0N, 121.4E); and Cheju Island, Korea (33.5N, 126.5E). FTIR measurements were made at Moshiri (44.4N, 142.3E) and Rikubetsu (43.5N, 143.8E) Observatories and Tsukuba (36.1N, 140.1E), Japan.

The data plots for TRACE-P are given in Appendix A. For each DC-8 flight, 19 pages of time series plots followed by altitude profiles of dewpoint, temperature, ozone, and carbon monoxide are provided. The order of the species in the time series plots is given in Table 4. Table 5 lists the parameters plotted and their chemical formulas. The species were selected to provide the reader with information on both the source characteristics and photochemical history of air. There are no plots prior to flight 4 for the DC-8 or the P-3B, as these were test flights and data archival was not required. Data plots are in standardized format as discussed in Appendix A.

CONCLUDING REMARKS

This compendium of data from NASA's Global Tropospheric Transport and Chemical Evolution over the Pacific (TRACE-P) provides only a graphical representation of aircraft data that are available in archived format from NASA Langley's Atmospheric Sciences Data Center (ASDC) and from the GTE Project Office archive. The plots are not intended to support original research/analysis, but serve as an overview of the TRACE-P aircraft data and provide some assistance to the reader in identifying data that are of interest and which may be obtained from Langley's ASDC archive or GTE's Project Office archive. This compendium volume covers only selected NASA P-3B aircraft data. The DC-8 aircraft data is contained in volume 1 of the compendium. The GTE archived database includes other data measured on board the aircraft as well as numerous supporting data including meteorological observations/products, photochemical modeling products, surface station observations, satellite observations, and ozonesonde and FTIR measurements. GTE-sponsored analyses/results from the TRACE-P expedition have been accepted for publication to a Special Issue of the *Journal of Geophysical Research – Atmospheres* and will be published in two parts, October 27, 2003 and November 16, 2003.

Questions or information regarding the Langley ASDC archive should be directed to Langley ASDC User and Data Services, Mail Stop 157D, NASA Langley Research Center, Hampton, Virginia, 23681-2199. A brief description of the ASDC, log on procedures, and databases is given in Appendix B.

Table 1. GTE Field Expeditions Through 2001

Expedition	**Date**	**General Geographic Region**	**Time of Year**
CITE-1	1983	Hawaii	November
CITE-1	1984	Eastern North Pacific – off the California coast	April
ABLE-1	1984	Barbados, French Guyana	June
ABLE-2A	1985	Amazon Basin	August
CITE-2	1986	Western USA	August
ABLE-2B	1987	Amazon Basin	May
ABLE-3A	1988	Alaska – Barrow, Bethel, Cold Bay	July/August
CITE-3	1989	Western North Atlantic – Virginia coast and Western South Atlantic – Brazil coast	August/September
ABLE-3B	1990	Canada – Hudson Bay, Schefferville	July/August
PEM-West A	1991	Western Pacific Rim	October
TRACE-A	1992	Brazil, South Atlantic, Southwest Africa	September
PEM-West B	1994	Western Pacific Rim	February/March
PEM-Tropics A	1996	South Pacific Basin	August/September
PEM-Tropics B	1999	South Pacific Basin	March/April
TRACE-P	2001	Western Pacific	February-April

Table 2(a). Summary of DC-8 Aircraft Flights For TRACE-P Mission

Flight Number	Start Date, GMT	Julian Day, GMT	Start Time, GMT	Stop Time, GMT	Lat. Min, degree	Lat. Max, degree	Lon. Min, degree	Lon. Max, degree	Flight Location and Description
1D*	2/14/01	45	18:20:10	22:16:16	26.7700	35.2800	-121.6717	-117.8633	DFRC Test Flight 1
2D*	2/16/01	47	18:10:00	22:25:36	27.0217	35.2817	-124.5117	-117.3283	DFRC Test Flight 2
3D*	2/21/01	52	23:02:50	04:13:34	25.0483	35.2983	-124.1117	-116.9850	DFRC Test Flight 3
4D	2/26/01	57	17:36:52	01:50:43	19.5133	40.3950	-156.7900	-117.8183	DFRC to Kona, Hawaii – Aged Asian Pollution and MOPITT mid-latitude validation
5D	2/27/01	58	20:02:16	04:53:06	13.5633	19.7533	-156.0417	144.8650	Kona, Hawaii to Guam – Asian Pollution Subsidence and MOPITT tropical validation
6D	3/03/01	62	23:52:36	08:48:43	13.5717	27.7600	-113.9117	145.0450	Guam to Hong Kong – Asian Outflow: Frontal, Convective, S. China Sea
7D	3/07/01	66	01:10:04	10:52:39	20.0067	30.5367	113.7817	140.2000	Hong Kong Local 1 – China Outflow and Frontal Crossing
8D	3/09/01	68	01:01:17	10:21:26	20.0000	26.3600	113.8983	149.9233	Hong Kong Local 2 (to Okinawa) – Chemical Evolution of Frontal Outflow
9D	3/10/01	69	01:49:18	09:08:21	19.9983	37.2033	113.7267	129.0150	Hong Kong Local 3 (from Okinawa) – China Outflow to Yellow Sea
10D	3/13/01	72	02:15:28	10:25:14	18.4183	25.9467	113.7633	135.8950	Hong Kong Local 4 – Aged Asian Outflow
11D	3/17/01	76	00:55:07	08:36:20	19.2150	30.1983	113.8983	138.9167	Hong Kong to Kadena AFB, Okinawa – MOPITT Validation and China Outflow
12D	3/18/01	77	00:50:58	08:17:47	22.5050	35.7533	117.6833	139.4567	Kadena AFB, Okinawa to Yokota AFB, Japan – Formosa Strait and China Outflow
13D	3/20/01	79	22:54:37	08:22:26	21.8100	35.9683	124.5133	139.5167	Yokota Local 1 – Frontal Lifting and Dust Outflow
14D	3/23/01	82	23:21:34	08:19:19	21.2900	35.9750	134.8083	150.1850	Yokota Local 2 – Convective Outflow
15D	3/26/01	85	23:36:04	08:55:26	23.4850	37.3050	124.3550	139.5233	Yokota Local 3 – Convective Outflow and Stratospheric Influence
16D	3/29/01	88	18:15:05	03:37:24	27.7517	35.8817	124.1433	139.4367	Yokota Local 4 – Sunrise Photochemistry of Asian Outflow
17D	3/31/01	90	00:12:09	07:37:10	34.2367	45.5350	131.6683	149.8783	Yokota Local 5 – Warm Conveyor Belt and Cyclonic Recirculation
18D	4/03/01	93	22:38:47	07:46:36	19.5350	36.1567	-156.0150	139.3250	Yokota AFB, Japan to Kona, Hawaii – High Altitude Asian Outflow and Sunset MBL Chemistry
19D	4/06/01	96	17:56:26	04:12:33	18.8617	37.1850	-156.1333	136.0100	Kona, Hawaii Local 1 – Subsidence over E. Pacific and MOPITT Transect
20D	4/09/01	99	17:14:56	00:03:13	19.7233	35.1717	-156,0467	-117.5067	Kona, Hawaii to DFRC – A/C Intercomparison , Stratus Chemistry and Jet Stream Transport

* optional data archival; required for other flights

Table 2(b). Summary of P-3B Aircraft Flights For TRACE-P Mission

Flight Number	Start Date, GMT	Julian Day, GMT	Start Time, GMT	Stop Time, GMT	Lat. Min, degree	Lat. Max, degree	Lon. Min, degree	Lon. Max, degree	Flight Location and Description
1P*	2/09/01	40	16:34:50	19:35:46	34.8738	37.9827	- 75.8625	72.8816	WFF Test Flight 1
2P*	2/13/01	44	20:29:36	22:59:46	34.7859	37.9724	- 75.8612	73.2178	WFF Test Flight 2
3P*	2/17/01	48	19:52:25	00:37:38	37.1159	38.5590	- 75.6416	73.0761	WFF Test Flight 3
4P	2/24/01	55	14:36:15	22:15:18	33.5966	37.6096	-118.0862	- 75.9491	WFF to Palmdale, California – Stratospheric Intrusion
5P	2/26/01	57	17:34:21	00:51:59	19.7055	34.6774	-156.0717	-118.0731	Palmdale, California to Kona, Hawaii – Aged Asian Pollution
6P	2/27/01	58	19:52:12	02:41:40	19.2236	21.2348	-156.1263	166.5762	Kona, Hawaii to Wake Island – Asian Pollution Subsidence
7P	3/01/01	60	21:56:23	04:19:33	9.9016	19.2866	144.8860	166.7067	Wake Island to Guam – Tropical/Subtropical Gradient
8P	3/04/01	63	00:34:00	08:25:00	13.5731	22.4097	113.9184	145.0026	Guam to Hong Kong – A/C Intercomparison; Asian Outflow to S. China Sea
9P	3/07/01	66	02:17:02	10:07:56	20.0490	28.5091	113.7464	124.2517	Hong Kong Local 1 – Post-Frontal Asian Outflow
10P	3/09/01	68	01:07:16	08:39:50	19.9987	22.3419	113.7484	131.2688	Hong Kong Local 2 – Aged Post-Frontal Outflow
11P	3/10/01	69	00:55:45	09:00:53	6.8956	22.3185	111.9539	116.4651	Hong Kong Local 3 – S. China Sea Quiescent Period
12P	3/13/01	72	00:53:42	09:05:30	17.0386	27.6039	113.7251	124.9838	Hong Kong Local 4 – Stratospheric Intrusion; Biomass Burning Outflow
13P	3/17/01	76	00:58:41	09:07:37	20.0514	37.2261	113.8976	127.9529	Hong Kong to Kadena AFB, Okinawa – Low Level Outflow to Yellow Sea
14P	3/18/01	77	01:58:04	09:17:05	26.3539	37.0393	124.3366	139.4325	Kadena AFB, Okinawa to Yokota AFB, Japan – Surface Outflow to Yellow Sea; Volcanic Plume
15P	3/21/01	80	00:21:00	07:56:40	32.9998	40.9278	139.3278	155.0006	Yokota Local 1 – Frontal Boundary Profile
16P	3/23/01	82	23:06:58	07:23:48	30.9409	39.9699	132.9872	140.0680	Yokota Local 2 – A/ C Intercomparison; Japan North-South
17P	3/27/01	86	00:27:51	08:41:41	32.1353	35.9329	139.3172	146.4258	Yokota Local 3 – Air-Sea Exchange; Volcanic Plume; TERRA Underpass
18P	3/30/01	89	23:13:30	06:25:35	28.9584	37.9434	127.9982	139.6035	Yokota Local 4 – ACE Asia; Asian Outflow to Sea of Japan; TERRA Underpass
19P	4/02/01	92	00:23:07	08:31:21	35.6250	40.9494	131.7143	139.3511	Yokota Local 5 – ACE Asia;Moist Conveyor Belt; TERRA Underpass
20P	4/03/01	93	23:23:05	07:12:34	28.1442	36.1534	-177.3796	139.3075	Yokota AFB, Japan to Midway Island – High Altitude Asian Outflow
21P	4/06/01	96	06:53:24	14:21:21	20.0282	28.2473	-177.2093	164.9640	Midway Island Local 1 – Aged Asian Pollution; Stratospheric Influence
22P	4/07/01	97	16:18:40	23:06:02	16.0089	28.2231	-177.5010	-155.5967	Midway Island to Kona, Hawaii – Sunrise Photochemistry; Stratospheric Influence
23P	4/09/01	99	16:57:44	01:03:30	19.7240	34.9655	-156.0468	-117.7267	Kona, Hawaii to NASA- DFRC – A/C Intercomparison
24P	4/10/01	100	15:33:28	22:05:41	30.4674	37.9393	-118.0146	- 75.4597	DFRC to WFF – Transport of Clean Tropical Air

* optional data archival; required for other flights

Table 3. TRACE-P Aircraft Measurement Characteristics

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
B. Anderson[1]	X		Aerosol absorption at 565nm	PSAP	30 to 180 s	20%	20%	5×10^{-7} m^{-1}
	X		Single scatter albedo	Nephelometer	30 to 180 s	NA	NA	NA
	X		Equivalent BC mass	PSAP	30 to 180 s	30%	20%	0.1 µg m^{-3}
	X		CN>4nm Unheated CN>14nm Heated CN>14nm	Condensation nuclei counter	1 s	10%	10%	1 cm^{-3}
	X		Ratio Heated/Unheated	Condensation nuclei counter	1 s	20%	20%	NA
	X		Scatter at 450nm Scatter at 550nm Scatter at 700nm	Nephelometer	1 s	10%	10%	$1 \times 10^{-7} m^{-1}$
	X		Angstrom exponent: 450-550nm 450-700nm 550-700nm	Nephelometer	1 s	NA	NA	NA
	X		Number: .1-.75, .75-2, 2-5, 5-20, 20-50, 50-1550	PCASP aerosol probe, FSSP-300, Cloud, aerosol, and precipitation spectrometer (CAPS)	1 s	20%	20%	0 cm^{-3}
	X		Surface: .1-.75, .75-2, 2-5, 5-20, 20-50, 50-1550 Volume dry: .1-.75, .75-2, 2-5, 5-20, 20-50, 50-1550	PCASP aerosol probe, FSSP-300, CAPS	1 s	50%	50%	0 $\mu m^{-2} m^{-3}$
E. Apel[2]	X		CH_3CHO	GC/MS	10-60 s	±4%	±7%	40 pptv
	X		Methanol	GC/MS	10-60 s	±3%	±7%	50 pptv
	X		Acetone	GC/MS	10-60 s	±3%	±2%	50 pptv
	X		Ethanol	GC/MS	10-60 s	±3%	±19%	5 pptv
	X		Butanal	GC/MS	10-60 s	±3%	±5%	5 pptv
	X		Methyl ethyl ketone	GC/MS	10-60 s	±3%	±3%	5 pptv
	X		Propanal	GC/MS	10-60 s	±3%	±6%	15 pptv

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
E. Browell[1]	X		Aerosol wavelength dependence profiles (1064nm/587nm)	Derived from IR and VIS lidar backscatter data	Horizontal: 1 min; Vertical: 30 m[a]			
	X		IR aerosol scattering ratio profiles (1064nm)	Normalized IR lidar backscattering	Horizontal: 1 min; Vertical: 30 m[a]	10% or ±0.05[b]	0.05	0.01
	X		Ozone profiles	UV DIAL	Horizontal: 5 min; Vertical: 300m[c]	10% or ±2 ppbv[b]	5% or 1 ppbv	NA
	X		Trop. heights and ozone columns	Derived from UV DIAL ozone data	5 min[d]	Derived	Derived	NA
	X		Visible aerosol scattering ratio profiles (587 nm)	Normalized VIS lidar backscattering	Horizontal: 1 min; Vertical: 30 m[a]	10% or ±0.03[b]	0.03	.01
	X		Visible aerosol depolarization profiles	VIS lidar backscatter depolarization	Horizontal: 1 min; Vertical: 150 m[a]	10% relative or ±0.2% absolute[b]	0.2%	NA
W. Brune[3]	X		OH	LIF	20 s	±40% at 2 sigma	1 km 10 ppq, > 5 km 4 ppq	10 ppq
	X		HO_2	LIF	20 s	±40% at 2 sigma	1 km 100 ppq, > 5 km 40 ppq	100 ppq
A. Fried[2]	X		CH_2O	Tunable diode laser absorption spectrometer	60 s	12 to 15%[e]	66 pptv	66 pptv[f]
B. Heikes[4]	X		H_2O_2	HPLC	30 s	±15 ppt or ±0.15 x value	±15 ppt or ±0.15 x value	15 pptv
	X		CH_3OOH	HPLC	30 s	±25 ppt or ±0.25 x value	±25 ppt or ±0.25 x value	25 pptv
	X		CH_2O	Flow Injection Analysis (FIA)	60 s	±50 ppt ±0.15 x value	±50 ppt ±0.15 x value	50 pptv
G. Sachse[1]	X		N_2O	DACOM IR Laser Spectrometer	5 s	1%	0.15% (1σ)	NA[g]
	X		H_2O	D LH NIR Laser Spectrometer	50 ms	1 ppmv or 10% conc. [b]	0.1 ppmv or 1% conc. [b] (1σ)	NA[g]

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
S. Sandholm[5]	X		NO	TP-LIF	60 s	±20%	>10%	2 pptv
	X		NO_2	TP-LIF	60 s	±40%	>20%	5 pptv or 10%[h]
H. Singh[6]	X		PAN	GC	120 s	±20%	±10%	1 pptv
	X		Acetone	GC	180 s	±20%	±10%	5 pptv
	X		Acetaldehyde	GC	180 s	±25%	±10%	10 pptv
	X		Propionaldehyde	GC	180 s	±25%	±15%	10 pptv
	X		Methyl Ethyl Ketone	GC	180 s	±20%	±10%	10 pptv
	X		Methanol	GC	180 s	±25%	±15%	15 pptv
	X		Ethanol	GC	180 s	±25%	±20%	20 pptv
	X		Acetonitrile	GC	180 s	±25%	±15%	30 pptv
	X		HCN	GC	180 s	±25%	±15%	30 pptv
	X		PPN	GC	120 s	±30%	±20%	1 pptv
	X		Methyl nitrate	GC	120 s	±15%	±10%	1 pptv
	X		i-propyl + ethyl nitrate	GC	120 s	±15%	±10%	1 pptv
B. Talbot[7]	X		Chloride	Filter collection	2.7-42.5 min	20%	15% + 23 pptv	25 pptv
	X		Nitrate	Filter collection	2.7-42.5 min	20%	15% + 2.5 pptv	3 pptv
	X		Sulfate	Filter collection	2.7-42.5 min	20%	15% + 2.1 pptv	3 pptv
	X		Oxalate	Filter collection	2.7-42.5 min	20%	15% + 4.4 pptv	5 pptv
	X		Sodium	Filter collection	2.7-42.5 min	20%	15% + 18.4 pptv	20 pptv
	X		Ammonium	Filter collection	2.7-42.5 min	20%	15% + 5.7 pptv	6 pptv
	X		Potassium	Filter collection	2.7-42.5 min	20%	15% + 8.6 pptv	9 pptv
	X		Magnesium	Filter collection	2.7-42.5 min	20%	15% + 3.8 pptv	4 pptv
	X		Calcium	Filter collection	2.7-42.5 min	20%	15% + 3.2 pptv	4 pptv
	X		Beryllium-7	Filter collection	2.7-42.5 min	10%	50%/25%/15%[i]	30 fCi scm^{-1}[i]
	X		HNO_3	Mist Chamber-Ion Chromatography	130-140 s	15%	15%	3 pptv
	X		SO_2	Mist Chamber-Ion Chromatography	130-140 s	20%	20%	3 pptv
	X		Fine aerosol NSS	Mist Chamber-Ion Chromatography	130-140 s	20%	20%	4 pptv
	X		SO_4	Mist Chamber-Ion Chromatography	130-140 s	20%	20%	4 pptv

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
E. Atlas[2]	X	X	CH_3ONO_2 n-$C_3H_7ONO_2$ 2-$C_4H_9ONO_2$	GC/MS	40-150 s	10-20%	5-10%	0.10 pptv
	X	X	$C_2H_5ONO_2$ i-$C_3H_7ONO_2$	GC/MS	40-150 s	10-20%	5-10%	0.14 pptv
	X	X	3-$C_5H_{11}ONO_2$ 2- $C_5H_{11}ONO_2$ 3-CH_3-2-$C_4H_8ONO_2$	GC/MS	40-150 s	10-20%	5-10%	0.30 pptv
	X	X	HFC-134a	GC/MS	40-150 s	5-10%	5-10%	0.30 pptv
	X	X	HCFC-141b HCFC-142b $CHCl_3$	GC/MS	40-150 s	5-10%	5-10%	0.10 pptv
	X	X	HCFC-22	GC/MS	40-150 s	5-10%	5-10%	0.20 pptv
	X	X	HCFC-21 HCFC-123	GC/MS	40-150 s	10-20%	10-20%	0.10 pptv
	X	X	HCFC-124	GC/MS	40-150 s	10-20%	10-20%	0.20 pptv
	X	X	Halon-1211	GC/MS	40-150 s	10-20%	10-20%	0.07 pptv
	X	X	Halon-2402 Halon-1301	GC/MS	40-150 s	5-10%	5-10%	0.15 pptv
	X	X	Halon-1202	GC/MS	40-150 s	5-10%	20% or 0.02 pptv	0.02 pptv
	X	X	CH_3Br	GC/MS	40-150 s	10-20%	5-10%	0.20 pptv
	X	X	C_3H_7Br	GC/MS	40-150 s	10-20%	10-20%	0.54 pptv
	X	X	CH_3Cl OCS	GC/MS	40-150 s	5%	5-10%	1.00 pptv
	X	X	C_2H_5Cl	GC/MS	40-150 s	10-20%	5-10%	0.50 pptv
	X	X	C_2H_3Cl	GC/MS	40-150 s	10-20%	5-10%	0.18 pptv
	X	X	CH_2Cl_2	GC/MS	40-150 s	5%	5-10%	0.40 pptv
	X	X	1_2-$C_2H_4Cl_2$	GC/MS	40-150 s	10-20%	5-10%	0.40 pptv
	X	X	C_2HCl_3	GC/MS	40-150 s	10-20%	5-10%	0.05 pptv
	X	X	C_2Cl_4	GC/MS	40-150 s	5-10%	5-10%	0.16 pptv
	X	X	CH_2Br_2	GC/MS	40-150 s	10-20%	5-10%	0.08 pptv
	X	X	$CHClBr_2$	GC/MS	40-150 s	10-20%	10% or 0.02 pptv	0.02 pptv
	X	X	$CHBr_3$	GC/MS	40-150 s	10-20%	5-10%	0.14 pptv
M. Avery[1]	X	X	Ozone	Nitric oxide chemiluminescense	1 s	5% or 2 ppbv	2% or 0.8 ppbv	0.8 ppbv

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
D. Blake[8]	X	X	Ethane Propane	GC	40-150 s	5%	1% or 2 pptv[b]	3 pptv
	X	X	trans-2-Butene	GC	40-150 s	10%	2% or 3 pptv[b]	3 pptv
	X	X	Benzene Toluene o-Xylene m-Xylene p-Xylene Ethylbenzene	GC	40-150 s	5%	2% or 3 pptv[b]	3 pptv
	X	X	$CHClBr_2$	GC	40-150 s	10-20%	5-10%	0.005 pptv
	X	X	Ethyne n-Butane i-Butane n-Pentane i-Pentane	GC	40-150 s	5%	1% or 2 pptv[b]	2 pptv
	X	X	H-1211	GC	40-150 s	5%	2%	0.1 pptv
	X	X	CH_3I	GC	40-150 s	10-20%	5-10%	0.05 pptv
	X	X	Methyl nitrate Ethyl nitrate 2-Butyl nitrate	GC	40-150 s	10-20%	1-5%	0.05 pptv
	X	X	CH_3CCl_3	GC	40-150 s	5%	1%	3 pptv
	X	X	CCl_4	GC	40-150 s	2%	1%	3 pptv
	X	X	Ethene	GC	40-150 s	10%	2% or 3 pptv[b]	3 pptv
	X	X	Propene	GC	40-150 s	10%	2% or 3 pptv[b]	2 pptv
	X	X	CFC-12	GC	40-150 s	2%	0.7%	1 pptv
	X	X	CFC-11	GC	40-150 s	2%	0.8%	3 pptv
	X	X	CFC-113	GC	40-150 s	2%	1.4%	3 pptv
	X	X	CFC-114	GC	40-150 s	5%	1.5%	1 pptv
	X	X	HCFC-22	GC	40-150 s	5%	1.5%	10 pptv
	X	X	H-2402	GC	40-150 s	5%	5%	0.1 pptv
	X	X	C_2Cl_4	GC	40-150 s	10%	1-5%	0.05 pptv
	X	X	CH_2Cl_2	GC	40-150 s	10%	5%	2 pptv
	X	X	$CHBrCl_2$	GC	40-150 s	10-20%	5-10%	0.05 pptv
	X	X	CH_3Cl	GC	40-150 s	5%	5-10%	100 pptv
	X	X	$CHCl_3$	GC	40-150 s	5%	5-10%	2 pptv
	X	X	$CHBr_3$	GC	40-150 s	10%	5-10%	0.1 pptv

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
D. Blake (cont.)	X	X	CH_3Br	GC	40-150 s	5%	4%	1 pptv
	X	X	CH_2Br_2	GC	40-150 s	10-20%	5-10%	0.4 pptv
	X	X	CH_4	GC	40-150 s	1%	0.1%	NA
	X	X	OCS H-134a	GC	40-150 s	10%	5%	NA
	X	X	DMS	GC	40-150 s	10%	5% or 2pptv[(b)]	1 pptv
	X	X	HCFC-141b HCFC-142b	GC	40-150 s	10%	3%	NA
	X	X	C_2HCl_3	GC	40-150 s	20%	5%	0.02 pptv
	X	X	CH_2BrCl	GC	40-150 s	20%	5%	NA
	X	X	C_2H_5Cl	GC	40-150 s	20%	5%	0.3 pptv
	X	X	C_2H_5I	GC	40-150 s	20%	10%	0.01 pptv
	X	X	2-$C_5H_{11}ONO_2$ 3-$C_5H_{11}ONO_2$ n-$C_3H_7ONO_2$	GC	40-150 s	10-20%	1-5%	0.01 pptv
	X	X	i-$C_3H_7ONO_2$	GC	40-150 s	10-20%	10%	0.02 pptv
	X	X	CS_2	GC	40-150 s	20%	5%	0.5%
	X	X	1,2-Dichloroethane	GC	40-150 s	20%	10%	0.05 pptv
	X	X	n-Hexane	GC	40-150 s	5%	5%	3 pptv
Project (J. Barrick[(1)])	X	X	$J(NO_2)$ zenith $J(NO_2)$ nadir	Filter radiometer (PMT)	1 s	10%	4%	1.5×10^{-6} mv^{-1}
	X	X	Dew/Frost point	Chilled mirror hygrometer	1-10 s	±0.5°C	±0.2°C	±75° C
G. Sachse[(1)]	X	X	CO	DACOM IR Laser Spectrometer	1 s	2%	1 ppbv or 1% conc. [(b)] (1σ)	NA[(g)]
	X	X	CH_4	DACOM IR Laser Spectrometer	1 s (DC-8) 5 s (P-3B)	1%	0.15% (1σ)	NA[(g)]
R. Shetter[(2)]	X	X	J[O3->O2+O(1D)] J[CH2O->H+HCO] J[CH2O->H2+CO]	SAFS	10 s	~10%	~3%	<0.05mW $cm^{-2}nm^{-1}$
	X	X	J[NO2->NO+O(3P)] J[H2O2->2OH] J[HNO2->OH+NO] J[HNO3->OH+NO2] J[HNO4->HO2+NO2]	SAFS	10 s	~8%	~3%	<0.05mW $cm^{-2}nm^{-1}$

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
R. Shetter (cont.)	X	X	J[CH3CHO-> CH3+ HCO] J[CH3CHO->CH4+CO] J[C2H5CHO-> C2H5+ HCO] J[CHOCHO] J[CH3COCHO] J[CH3COCH3] J[CH3OOH-> CH3O+ OH] J[CH3ONO2-> CH3O+ NO2] J[PAN+hv->products] J[CH3CH2CH2CHO-> C3H7+HCO] J[CH3CH2CH2CHO-> C2H4+CH2CHOH] J[CH3COCH2CH3] J[CH3CH2ONO2+hv-> Products	SAFS	10 s	~8%	~3%	<0.05mW $cm^{-2}nm^{-1}$
S. Vay[1]	X	X	CO_2	Non-dispersive IR Spectrometer	1 s	0.25 ppmv	0.07 ppmv (1 Hz)	0.5 ppmv
A. Bandy[9]		X	SO_2	Atmospheric Pressure Ionization Mass Spectrometry	1 s	2-5%[j]	2 pptv or 2%[k]	1 pptv
C. Cantrell[2]		X	HO_2 HO_2+RO_2	Chemical ionization mass spectrometry	60 s	±35%	±10%	$3x10^{7}$ molec cm^{-3}
A. Clarke[10]		X	Condensation Nuclei cold	CN counter	5 s	5-10%	5%	1 particle cm^{-3}
		X	Condensation Nuclei hot	CN with 300C heater	5 s	5-10%	5%	1 particle cm^{-3}
		X	Cloud liquid water content	PVM optical probe	5 s	5-10%	5%	0.002g-m^{-3}
		X	APS integral number, area, volume[l]	Aerodynamic particle sizing	60 s	20%	5%	NA[m]
		X	FSSP integral number, area, volume[n]	FSSP probe	15 s	20%	5%	NA[m]

Table 3. Continued

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
A. Clarke (cont.)		X	Scatter (all part) at 450nm, 550nm, 700nm Backscatter (all part) at 450nm, 550nm, 700nm	3 Wavelength integrating nephelometer	25 s	±0.2 Mm^{-1}	±0.1 Mm^{-1}	±0.2 Mm^{-1}
		X	Scatter (submicron) at 450nm, 550nm, 700nm Backscatter (submicron) at 450nm, 550nm, 700nm	< 1µm Dp aerodynamic	25 s	±0.2 Mm^{-1}	±0.1 Mm^{-1}	±0.2 Mm^{-1}
		X	Light Absorption (all part) 565nm Absorption (submicron) 565nm	PSAP- light transmission through filter[o]	65 s	15%[p]	<6%	±0.5 Mm^{-1}[q]
		X	DMA number, surface area and volume at 50C[r]	Differential Mobility Analyzer	20 s grab samples	20%	5%	NA[m]
		X	OPC number, surface area and volume at 50C[s]	Optical Particle Counter effective optical particle size	60 s	15%	5%	NA[m]
F. Eisele[5]		X	OH	CIMS	30 s	60%	20%	$1x10^{5}$ OH cm^{-3}
		X X	H_2SO_4 MSA	CIMS	30 s	60%	20%	$2x10^{5}$ cm^{-3}
		X	HNO_3	CIMS	20 s	±25%[t]	20%	5 pptv
W. Flocke[2]		X	PAN PPN	GC	2.5 min[u]	-10% to +5%	1% or 1 pptv[v]	5 pptv
		X X	MPAN PiBN	GC	2.5 min[u]	-10% to +10%	±15% or ±2.5 pptv[b]	5 pptv
Y. Kondo[11]		X	NO NO_Y	Chemiluminescence	1 s 1s	16% 35%	6 pptv 16pptv	12 pptv 28pptv
		X	NO_2	Chemiluminescence	10 s	32%/60%[w]	4 pptv/3 pptv[w]	13 pptv[x]
Project (J. Barrick[1])		X	Air Temp	RTD sensor	1 s	±0.3°C	±0.2°C	±100° C[y]
		X	Surface temp	IR Pyroelectrics (chopped radiation)	1 s	±0.7°C	±0.5°C	-50° to 70° C[y]
Project (L. Thornhill[1])		X	Latitude, longitude	TAMMS	20 s^{-1}	0.4 nm hr^{-1}	NA	0.1 min
		X	Pressure altitude	TAMMS	20 s^{-1}	0.4%	7 ft	0.5 ft
		X	Static pressure	TAMMS	20 s^{-1}	0.2 hPa	0.05 hPa	0.008 hPa

Table 3. Concluded

Investigator	Aircraft		Species/ Parameter	Technique	Averaging Time	Accuracy	Precision	LOD
	DC-8	P-3B						
Project (cont.) (L. Thornhill)		X	Impact pressure	TAMMS	20 s^{-1}	0.4 hPa	0.05 hPa	0.008 hPa
		X	Pitch, roll	TAMMS	20 s^{-1}	0.2 deg	0.1 deg	0.04 deg
		X	True heading	TAMMS	20 s^{-1}	0.1 deg	0.1 deg	0.04 deg
		X	U, V	TAMMS	20 s^{-1}	0.5 m s^{-1}	0.1 m s^{-1}	0.01 m s^{-1}
		X	W	TAMMS	20 s^{-1}	0.1 m s^{-1}	0.05 m s^{-1}	0.01 m s^{-1}
		X	MR[z]	TAMMS	20 s^{-1}	0.6 deg C	0.2 deg C	-50° C
		X	MR (LymanAlpha)	TAMMS	20 s^{-1}	5%	2%	1%
		X	Virtual potential temperature (theta v)	TAMMS	20 s^{-1}	0.5 deg K	0.1 deg K	173° to 373° K[y]
R. Weber[5]		X	Sodium	PILS-Ion Chromatography	3 min	±10%	±5%	21 pptv
		X	Ammonium	PILS-Ion Chromatography	3 min	±10%	±5%	27 pptv
		X	Calcium	PILS-Ion Chromatography	3 min	±10%	±5%	12 pptv
		X	Potassium	PILS-Ion Chromatography	3 min	±10%	±5%	13 pptv
		X	Magnesium	PILS-Ion Chromatography	3 min	±10%	±5%	15 pptv
		X	Chloride Sulfate	PILS-Ion Chromatography	3 min	±10%	±5%	3 pptv
		X	Nitrate	PILS-Ion Chromatography	3 min	±10%	±5%	4 pptv
		X	Total UCN (> 3 nm)	Condensation particle counter and Pulse Height Analysis (PHA)	1 s	±10%	±2%	NA
		X	Total UCN UCN 3-8nm UCN 3-4nm	Condensation particle counter and Pulse Height Analysis (PHA)	60 s	±10%	±10%	NA

Notes:

a. Horizontal sample interval: 10 seconds; Vertical sample interval: 30 meters.
b. Whichever is greater.
c. Horizontal sample interval: 1 minute; Vertical sample interval 60 meters.
d. Horizontal sample interval: 1 minute.
e. Percentage of the ambient concentration. However, as the ambient levels decrease, the accuracy estimate can be somewhat higher.
f. Replicate measurements during constant air mass periods provides realistic assessment of how LOD improves with averaging time. These measurements indicate that LOD does in fact improve by roughly the square root of averaging time out to time periods as long as 10 minutes. For 5 minutes of averaging, based on median 1 min LOD of 66 pptv, 5 min LOD is around 30 pptv.
g. Concentration in the troposphere or lower stratosphere never reaches the LOD.
h. Of the NO value, whichever is greater.

i. For Be-7 there is still some uncertainty due to measured air flow (on the order of 5% max) but this is generally dwarfed by the statistical uncertainty inherent in the counting of radioactive decays. Precision increases notably with higher activity. For samples less than 200 fCi scm^{-1} the mean and median uncertainty was 50%, this improves to 25% for samples between 200 and 600 fCi scm^{-1} and to 15% for samples more active than 600 fCi scm^{-1}. (Note that 52% of all samples with reported Be-7 were in this last group and only 24% were less than 200 fCi scm^{-1}). It is estimated an LOD of 30 fCi scm^{-1} (though this also depends on the volume of air sampled).
j. Below 3 ppbv is 2-3%, and above 3 ppbv is about 5%.
k. Below 200 pptv is 2 pptv, and above 200 pptv is about 2%.
l. 0.7 um <= Dp <= 20.0 um.
m. The overall performance (accuracy, precision & LOD) of the size distribution measurements (DMA, OPC, APD & FSSP) are size dependent and are difficult to generalize. The 3 latter instruments are single particle counters making them sensitive to low concentrations limited primarily by count statistics at a given size. Particle losses in sample inlet become significant for sizes larger than about 4 µm.
n. 0.3 µm <= Dp <= 1.0 µm, 1.0 µm <= Dp <= 20.0 µm, 0.3 µm <= Dp <= 20.0 µm.
o. Longer averaging times are generally required for low absorption environments.
p. At typical atmospheric absorption levels and 60 s averages.
q. For 60 s average but lower with larger averaging time.
r. 0.007 <=Dp<=0.1µm.
s. 0.1<=Dp<=20.0µm, 0.1<=Dp<=0.75µm, 0.75<=Dp<=20.0µm.
t. The overall accuracy is estimated to be ±25% for < 100 pptv, ±20% for 100-200 pptv, and ±15% > 200 pptv.
u. One discreet sample (which is an average of 2.5 seconds) is taken every 2-2.5 minutes.
v. Short term (duration of flight), whichever is greater. Long term (over the entire mission), larger of 5% or 1 pptv.
w. Altitude < 2 km / Altitude > 2 km; (NO_2 median 70 pptv for altitude < 2 km / NO_2 median 30 pptv for altitude > 2 km) .
x. Precision and LOD of NO and NO_y were estimated for a 1 s integration time, while for NO_2, a 10 s integration time was used.
y. Lower number is minimum LOD, higher number is maximum LOD.
z. Derived from dew point (GE 1011).

1. NASA Langley Research Center
2. National Center for Atmospheric Research (NCAR)
3. Pennsylvania State University
4. University of Rhode Island
5. Georgia Institute of Technology
6. NASA Ames Research Center
7. University of New Hampshire
8. University of California-Irvine
9. Drexel University
10. University of Hawaii
11. University of Tokyo

Table 4. P-3B Time Series Plot Order

Plate	Panel	Parameter	Plate	Panel	Parameter
1	1	Lat, Lon	9	1	Flag
	2	AltP		2	Cl
	3	TS, ProjDP		3	NO3
	4	WNS		4	Na
	5	WND		5	NH4
2	1	Ozone	10	1	K
	2	CO		2	Ca
	3	Methane		3	Mg
	4	CO2		4	SO4
	5	NOy		5	MSA
3	1	NO	11	1	SO2
	2	NO2		2	OCS
	3	HNO3		3	H2SO4
	4	PAN, PPN		4	DMS
	5	PiBN		5	Methyl Iodide
4	1	OH	12	1	Total UCN
	2	HO2		2	3<UCN<8 nm
	3	HO2 + RO2		3	3<UCN<4 nm
	4	Methyl Chloride		4	CN at 300C
	5	Chloroform		5	CN at 30C
5	1	Ethane	13	1	Scattering at 450nm
	2	Propane		2	Absorption at 565 nm
	3	i-Butane, n-Butane		3	DMA+OPC number
	4	i-Pentane, n-Pentane		4	FSSP number
	5	Ethyne		5	DMA+OPC surface
6	1	Ethene	14	1	FSSP surface
	2	C3H8/C2H6		2	DMA+OPC volume
	3	C2H4/C2H6		3	FSSP volume
	4	C2H2/CO		4	PVMLWC
	5	C2H6/CO		5	Left blank
7	1	Methyl Nitrate	15	1	O3 Col
	2	Ethyl Nitrate		2	SZA
	3	i-Propyl Nitrate		3	J(O3)
	4	n-Propyl Nitrate		4	J(H2O2)
	5	2-Butyl Nitrate		5	J(NO2)
8	1	CFC-12	16	1	J(NO2)N + J(NO2)Z
	2	H-1211		2	J(NO2)N/J(NO2)Z
	3	HCFC-142b		3	Roll
	4	HCFC-22		4	AltCab
	5	CH3CCl3			

Table 5. Plotted Chemical Names and Formulas: P-3B

Variable Name	**Other Names**
Lat	Latitude
Lon	Longitude
AltP	Pressure altitude
TS	Static temperature
ProjDP	Project dew point
WNS	Wind speed
WND	Wind direction
Ozone	O3
CO	Carbon monoxide
Methane	CH4
CO2	Carbon dioxide
NOy	Reactive Nitrogen
NO	Nitric oxide
NO2	Nitrogen dioxide
HNO3	Nitric acid
PAN	CH3C(O)OONO2
PPN	C2H5C(O)OONO2
PiBN	2(CH3)CHC(O)OONO2
OH	Hydroxyl radical
HO2	Hydroperoxy radical
HO2+RO2	Total peroxy radicals
Methyl Chloride	CH3Cl
Chloroform	CHCl3
Ethane	C2H6
Propane	C3H8
i-Butane	i-C4H10
n-Butane	n-C4H10
i-Pentane	i-C5H12
n-Pentane	n-C5H12
Ethyne	C2H2
Ethene	C2H4
C3H8/C2H6	Propane-ethane ratio
C2H4/C2H6	Ethene-ethane ratio
C2H2/CO	Ethyne-carbon monoxide ratio
C2H6/CO	Ethane-carbon monoxide ratio
Methyl Nitrate	CH3ONO2
Ethyl Nitrate	C2H5ONO2
i-Propyl Nitrate	i-C3H7ONO2
n-Propyl Nitrate	n-C3H7ONO2
2-Butyl Nitrate	2-C4H9NO3
CFC-12	CCl2F2
H-1211	CBrClF2

Table 5. Continued

Variable Name	**Other Names**
HCFC-142b	CH3CF3Cl- Freon 142b
HCFC-22	CHF2Cl- Freon 22
CH3CCl3	Trichloroethane
Flag	
Cl	Chloride
NO3	Nitrate
Na	Sodium
NH4	Ammonium
K	Potassium
Ca	Calcium
Mg	Magnesium
SO4	Sulfate
MSA	Methanesulfonic acid
SO2	Sulfur dioxide
OCS	Carbonyl sulfide
H2SO4	Sulfuric acid
DMS	Dimethyl sulfide
Methyl Iodide	CH3I
Total UCN	Condensation nuclei
3<UCN<8 nm	Condensation nuclei
3<UCN<4 nm	Condensation nuclei
CN at 300C	Condensation nuclei heated
CN at 30C	Condensation nuclei unheated
Scattering at 450 nm all part	Scattering
Absorption at 565nm all part	Absorption
DMA+OPC number (.007<=Dp<=20 um @ 50C)	Optical particles
FSSP number (.3<=Dp<=20)	Aerosol density
DMA+OPC surface (.007<=Dp<=20 um @ 50C)	Optical particles
FSSP surface (.3<=Dp<=20)	Aerosol properties
DMA+OPC volume (.007<=Dp<=20 um @ 50C)	Optical particles
FSSP volume (.3<=Dp<=20)	Aerosol properties
PVMLWC	Liquid water content
O3 Col	Ozone column
SZA	Solar zenith angle
J[O3->O2+O(1D)]	Photolysis frequency
J[H2O2->2OH]	Photolysis frequency

Table 5. Concluded

Variable Name	**Other Names**
J[NO2->NO+O(3P)]	Photolysis frequency
J(NO2)Nadir + J(NO2)Zenith	Photolysis frequency
J(NO2)Nadir/J(NO2)Zenith	Photolysis frequency
Roll	Roll angle
AltCab	Cabin altitude

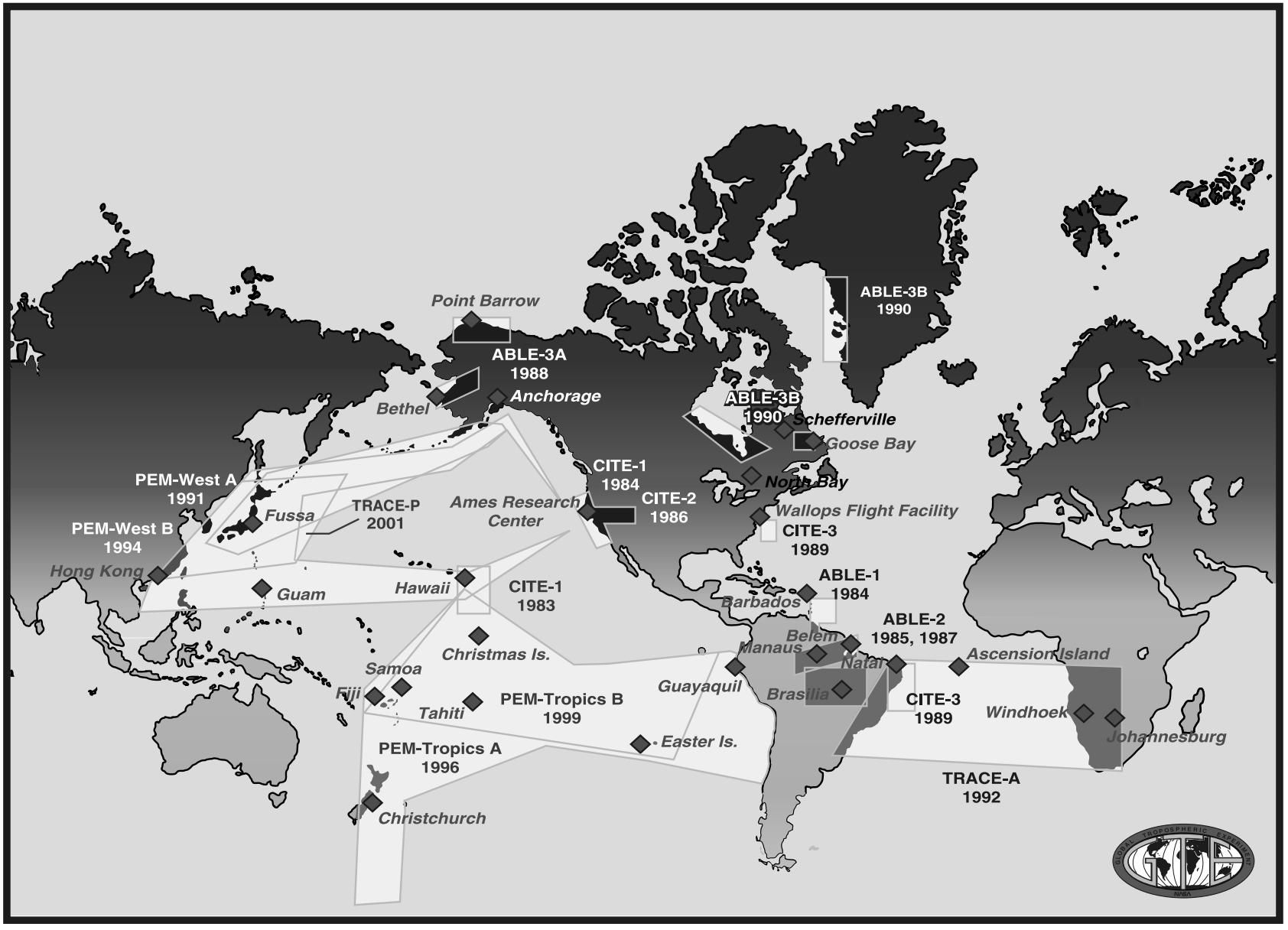


Figure 1. GTE missions through 2001.

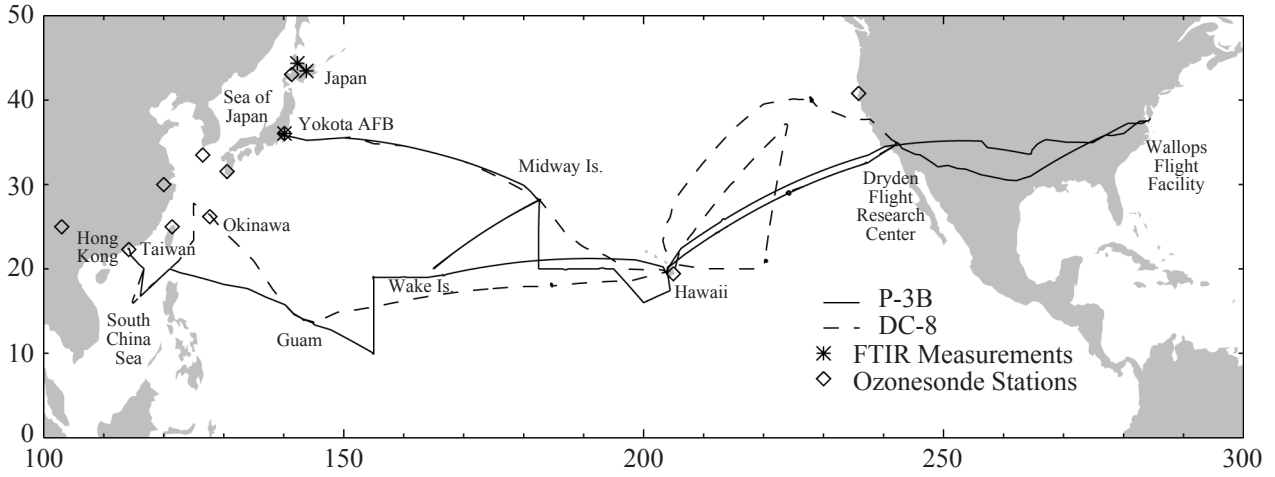


Figure 2(a). TRACE-P transit flight tracks.

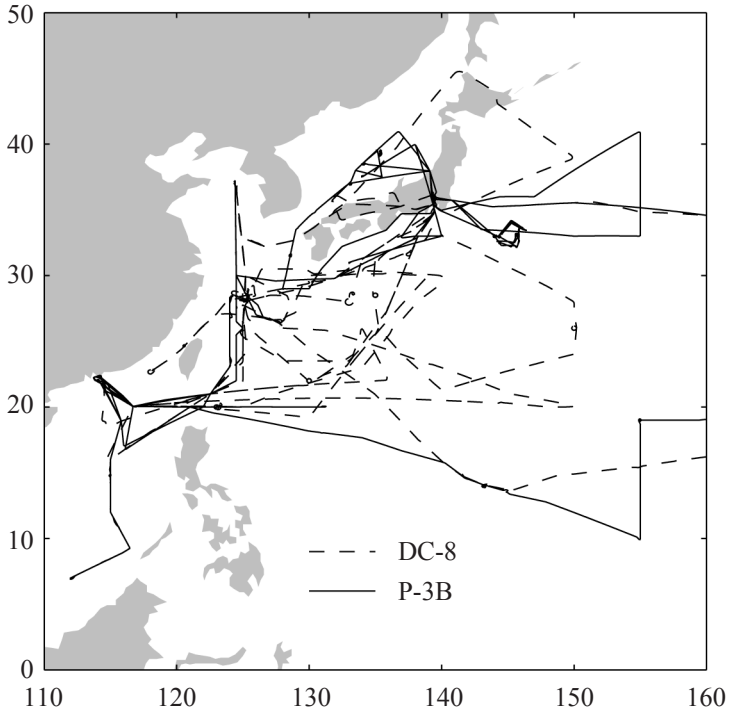


Figure 2(b). TRACE-P intensive flight tracks.

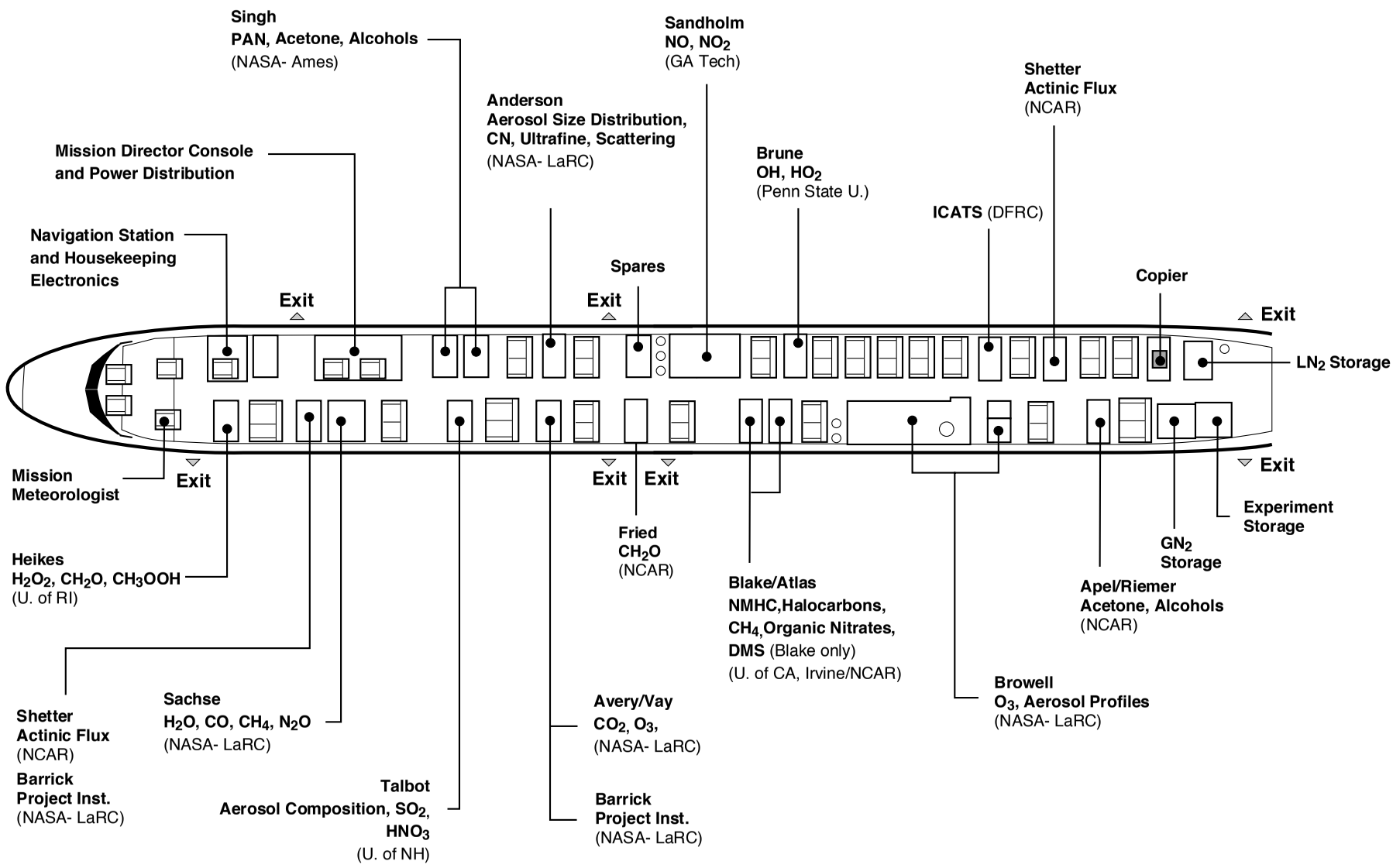
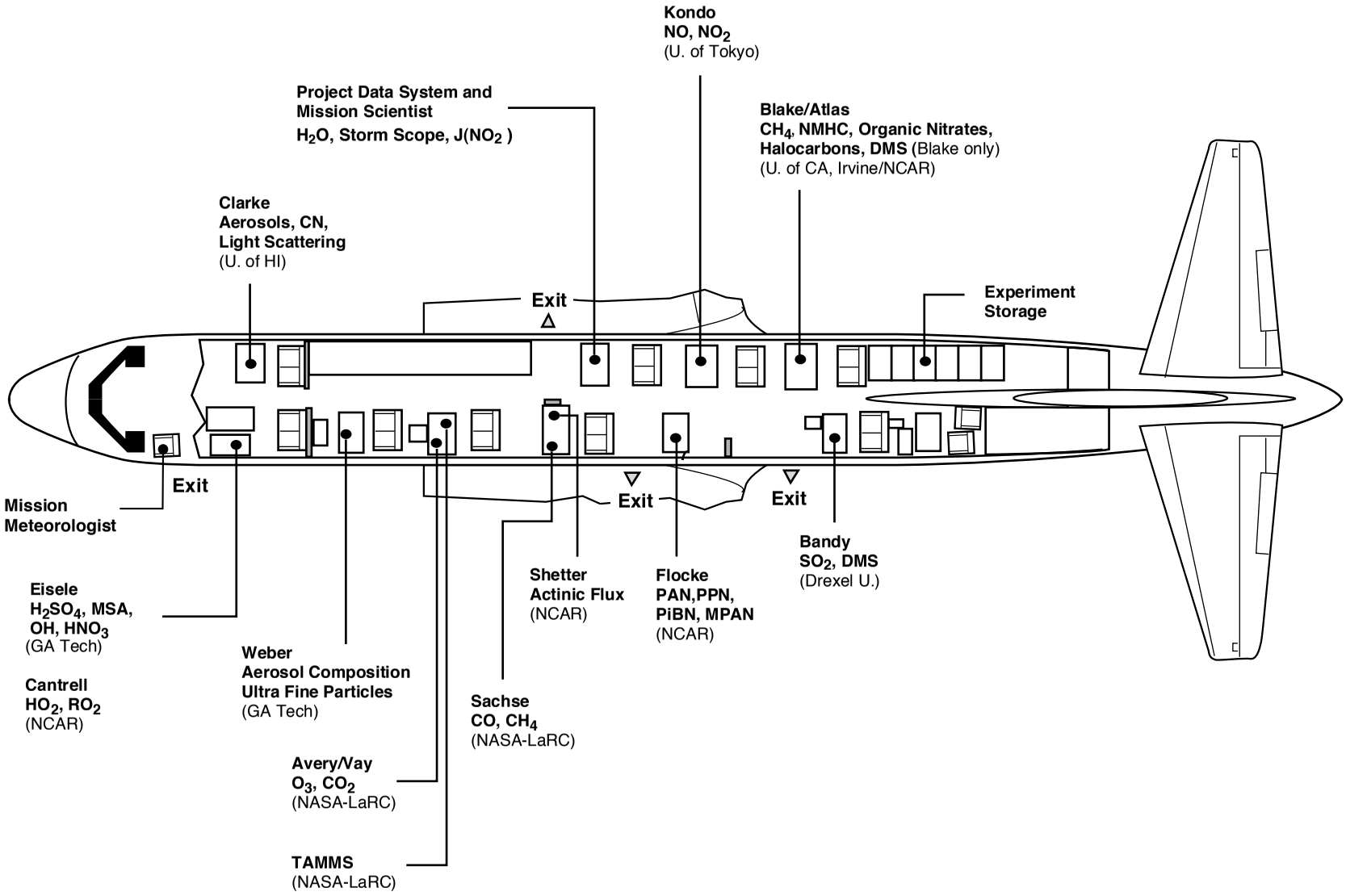


Figure 3(a). TRACE-P DC-8 mission payload.

12.06.02JC


Kondo
NO, NO_2
(U. of Tokyo)
Project Data System and
Mission Scientist
H_2O, Storm Scope, $J(NO_2)$
Blake/Atlas
CH_4, NMHC, Organic Nitrates,
Halocarbons, DMS (Blake only)
(U. of CA, Irvine/NCAR)
Clarke
Aerosols, CN,
Light Scattering
(U. of HI)
Exit
Experiment
Storage
Exit
Mission
Meteorologist
Exit
Exit
Bandy
SO_2, DMS
(Drexel U.)
Shetter
Actinic Flux
(NCAR)
Flocke
PAN,PPN,
PiBN, MPAN
(NCAR)
Eisele
H_2SO_4, MSA,
OH, HNO_3
(GA Tech)
Weber
Aerosol Composition
Ultra Fine Particles
(GA Tech)
Cantrell
HO_2, RO_2
(NCAR)
Sachse
CO, CH_4
(NASA-LaRC)
Avery/Vay
O_3, CO_2
(NASA-LaRC)
TAMMS
(NASA-LaRC)

08.07.02JC

APPENDIX A

Transport and Chemical Evolution over the Pacific (TRACE-P)

Plots are presented in a standardized format, and the data (unedited) are from the Langley GTE archive. Relative humidity is calculated from measurements made on the aircraft. In some cases (mostly for moist, boundary layer conditions) relative humidity may exceed 100% (not plotted) as dew point temperature exceeded air temperature by a few degrees (assumed to be the result of instrument measurement/calibration uncertainty). For time series plots, abscissa time scales for given flights are identical. Ordinate scales were selected to best represent all the data for specie measured during the flight. In order to maintain the standardized format, plots for flights in which a specie data were not reported are plotted with the axes and a "NO DATA" entry. On a panel with multiple curves, if a particular curve is missing, it may be assumed that the data for that particular specie for that particular flight is not available ("NO DATA" will not appear on a multi-curve panel). The time series plots are followed by altitude profiles of temperature, dew point, ozone, and carbon monoxide. In general altitude profiles are shown for ascent/descent portions of the flights. As a result the number of altitude profiles shown varies on a flight by flight basis.

Given below are the beginning page numbers for each flight's sequence of plots:

Flight 4P – page 33

Flight 5P – page 53

Flight 6P – page 77

Flight 7P – page 101

Flight 8P – page 123

Flight 9P – page 147

Flight 10P – page 173

Flight 11P – page 199

Flight 12P – page 227

Flight 13P – page 253

Flight 14P – page 281
Flight 15P – page 307
Flight 16P – page 333
Flight 17P – page 361
Flight 18P – page 385
Flight 19P – page 411
Flight 20P – page 439
Flight 21P – page 465
Flight 22P – page 491
Flight 23P – page 517
Flight 24P – page 539

CHEMICAL and METEOROLOGICAL DATA

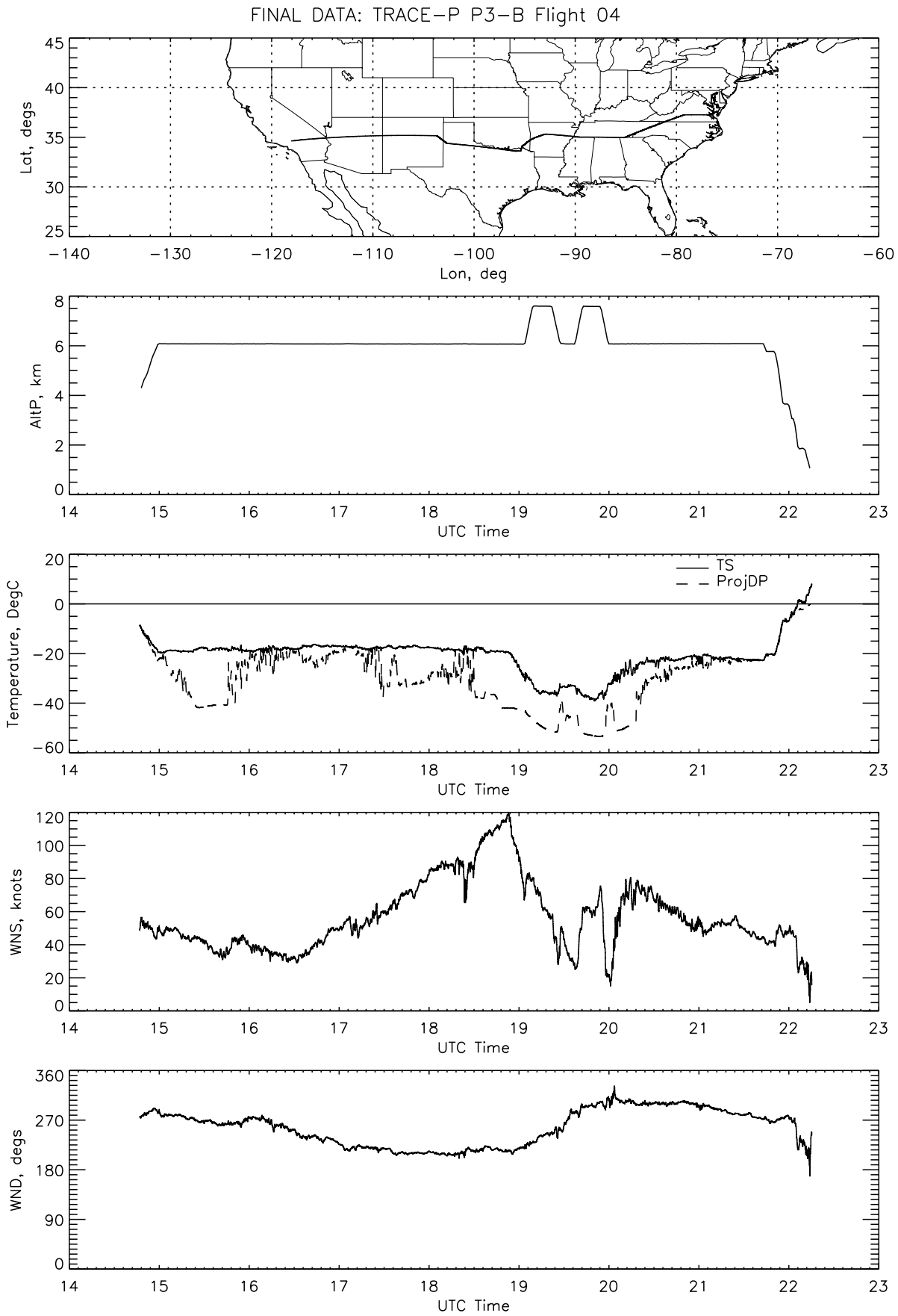
TRACE-P

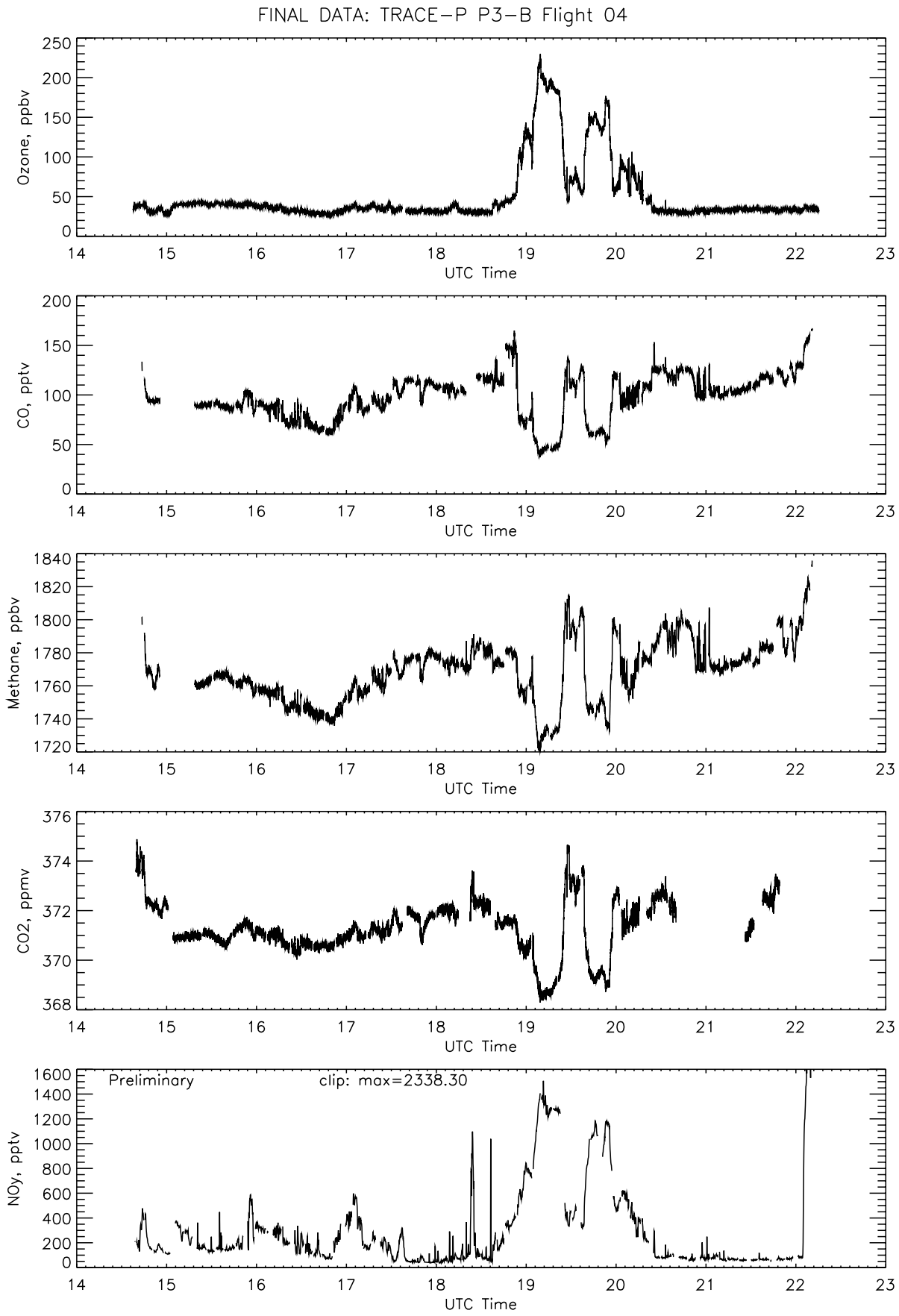
Flight 4P

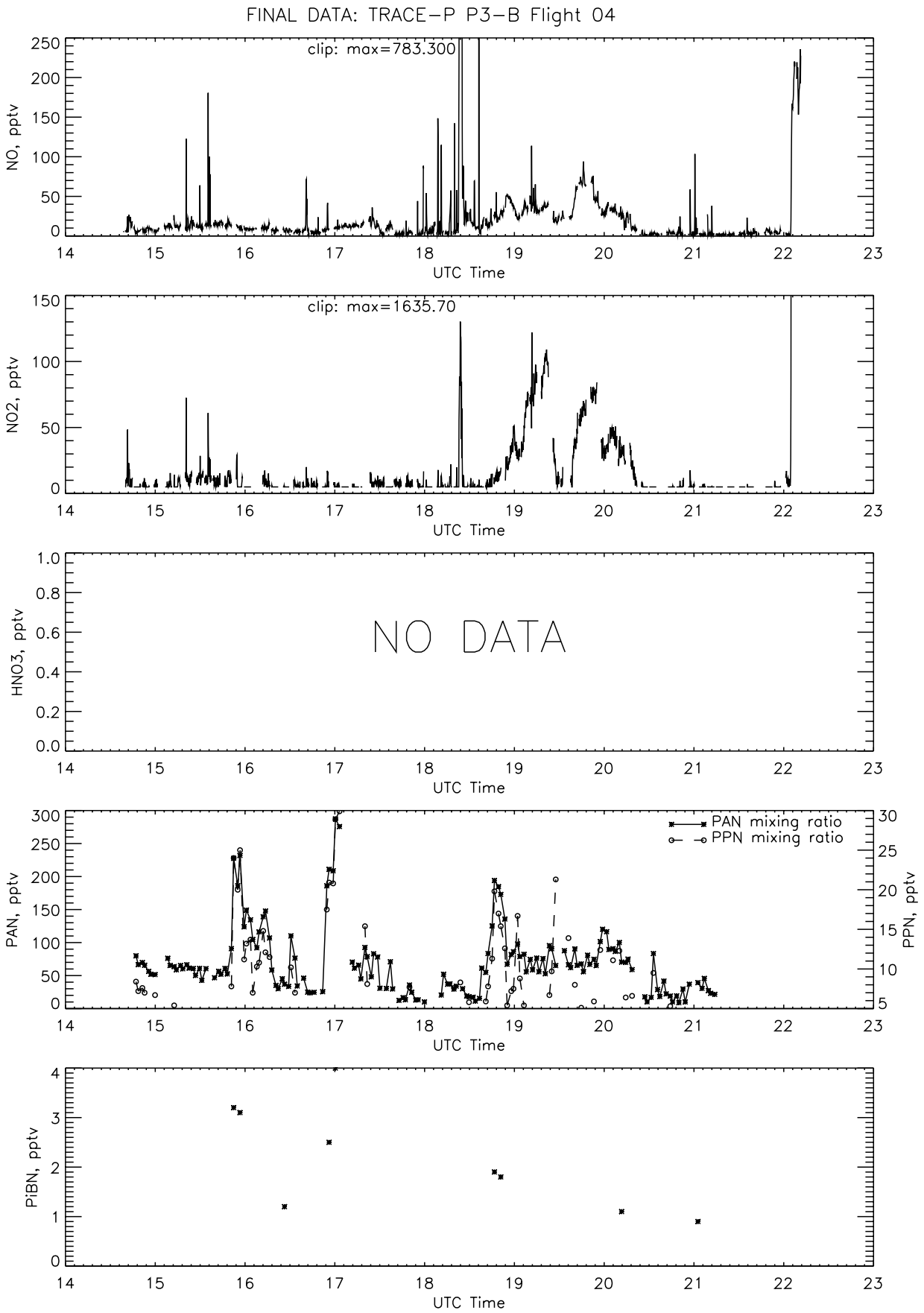
Transit: NASA-Wallops to Palmdale, CA

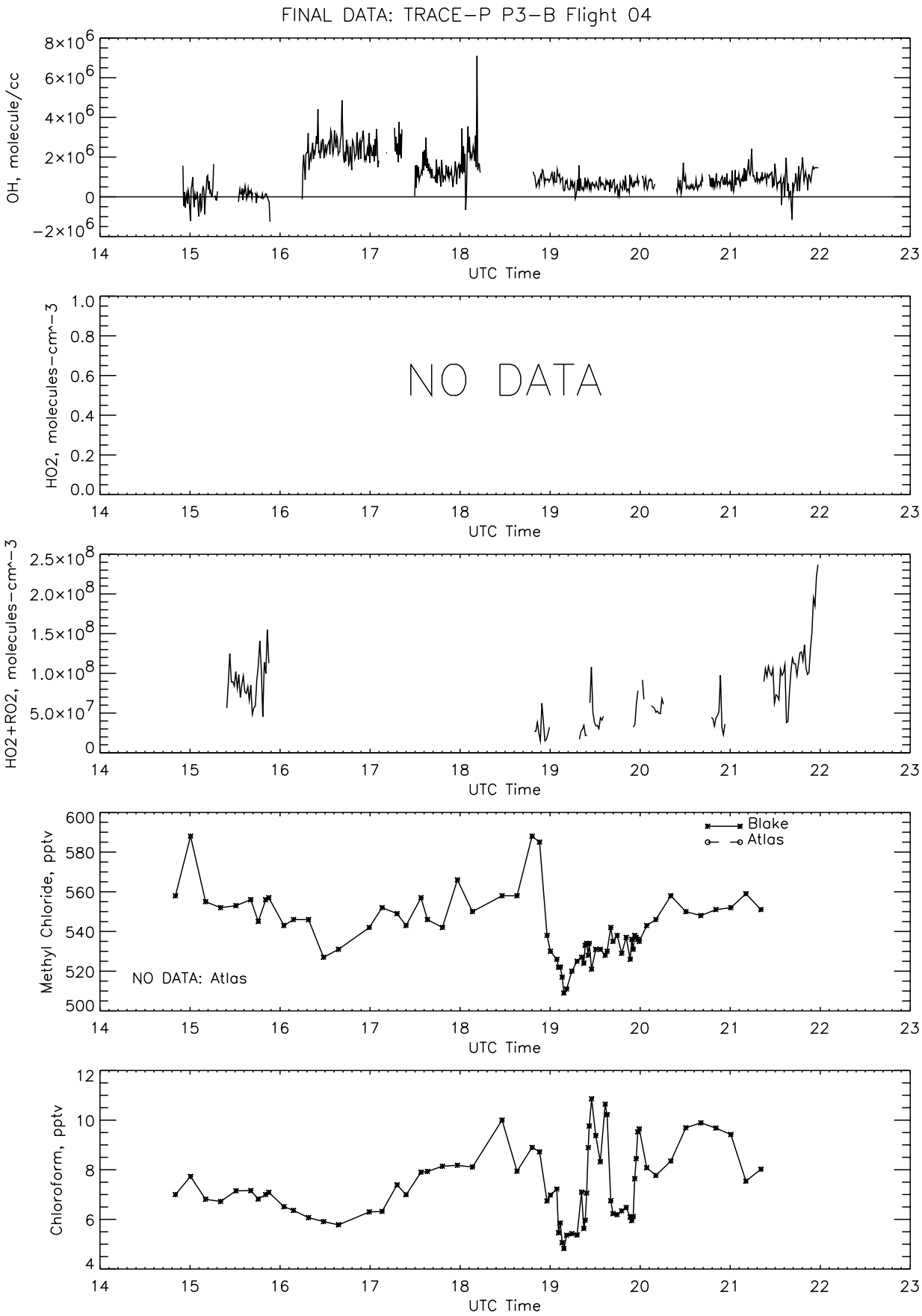
Stratospheric Intrusion

February 24, 2001


FINAL DATA: TRACE-P P3-B Flight 04
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 04
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=2338.30


FINAL DATA: TRACE-P P3-B Flight 04
clip: max=783.300
NO, pptv
UTC Time
clip: max=1635.70
NO2, pptv
UTC Time
HNO3, pptv
NO DATA
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time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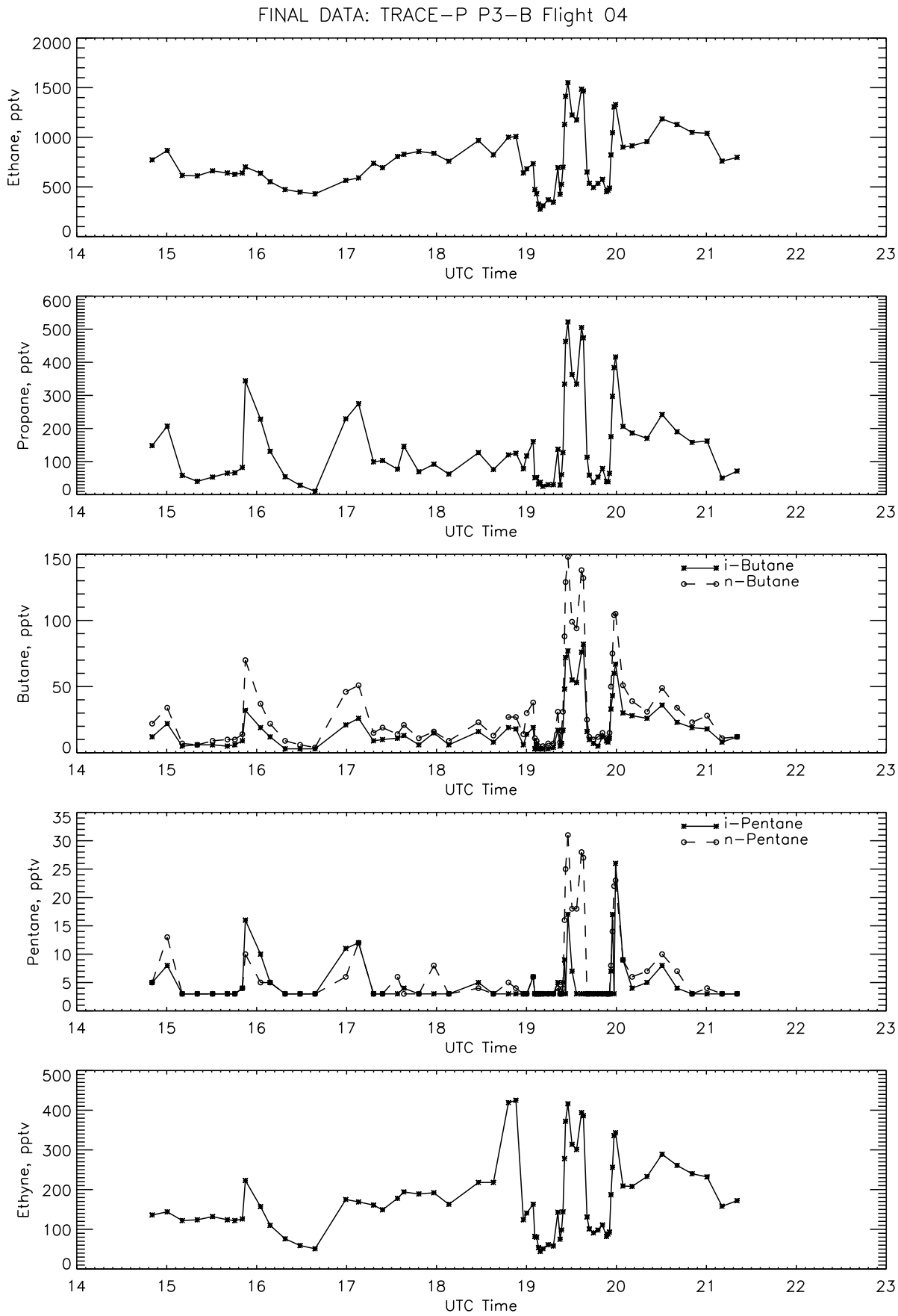
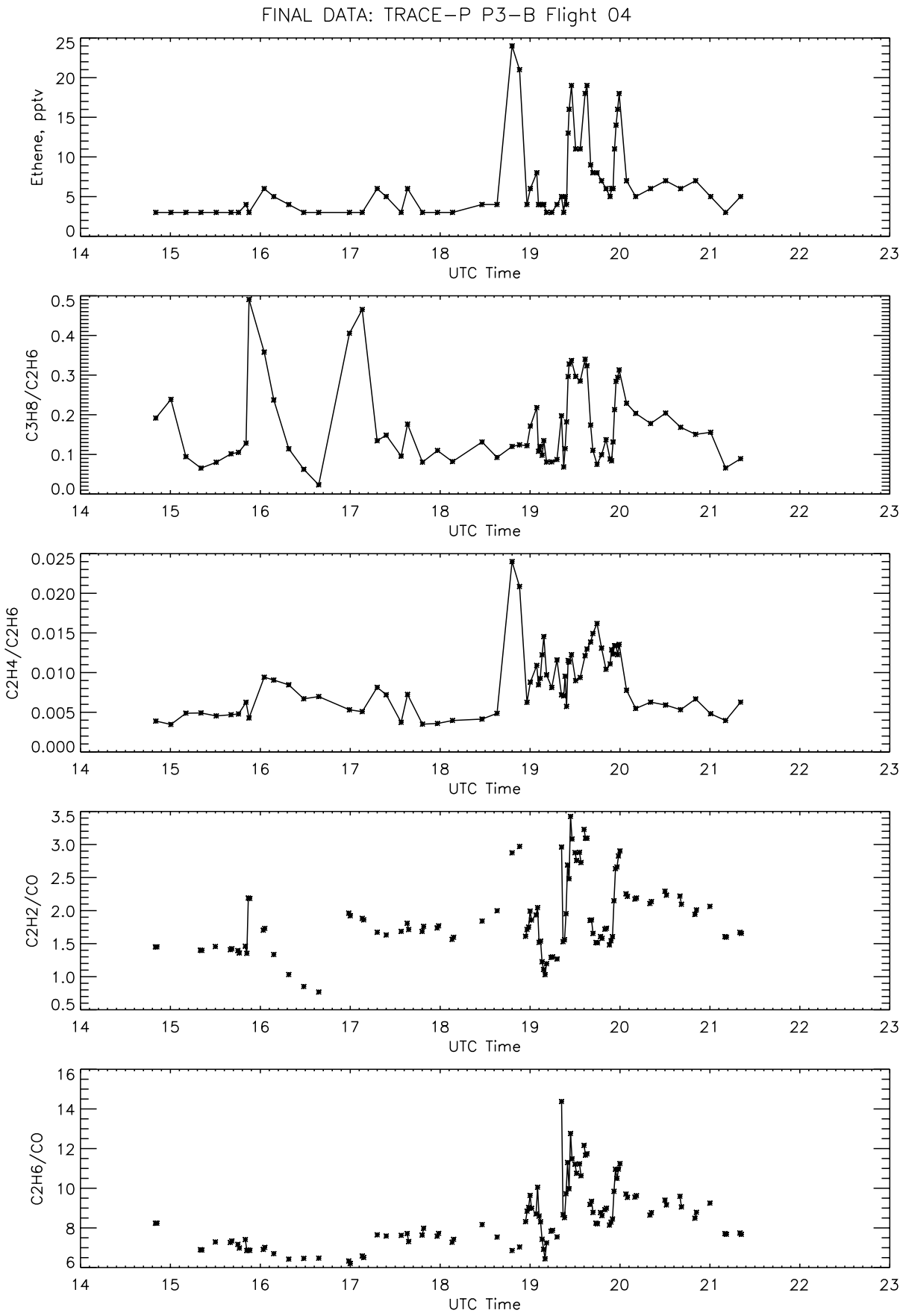
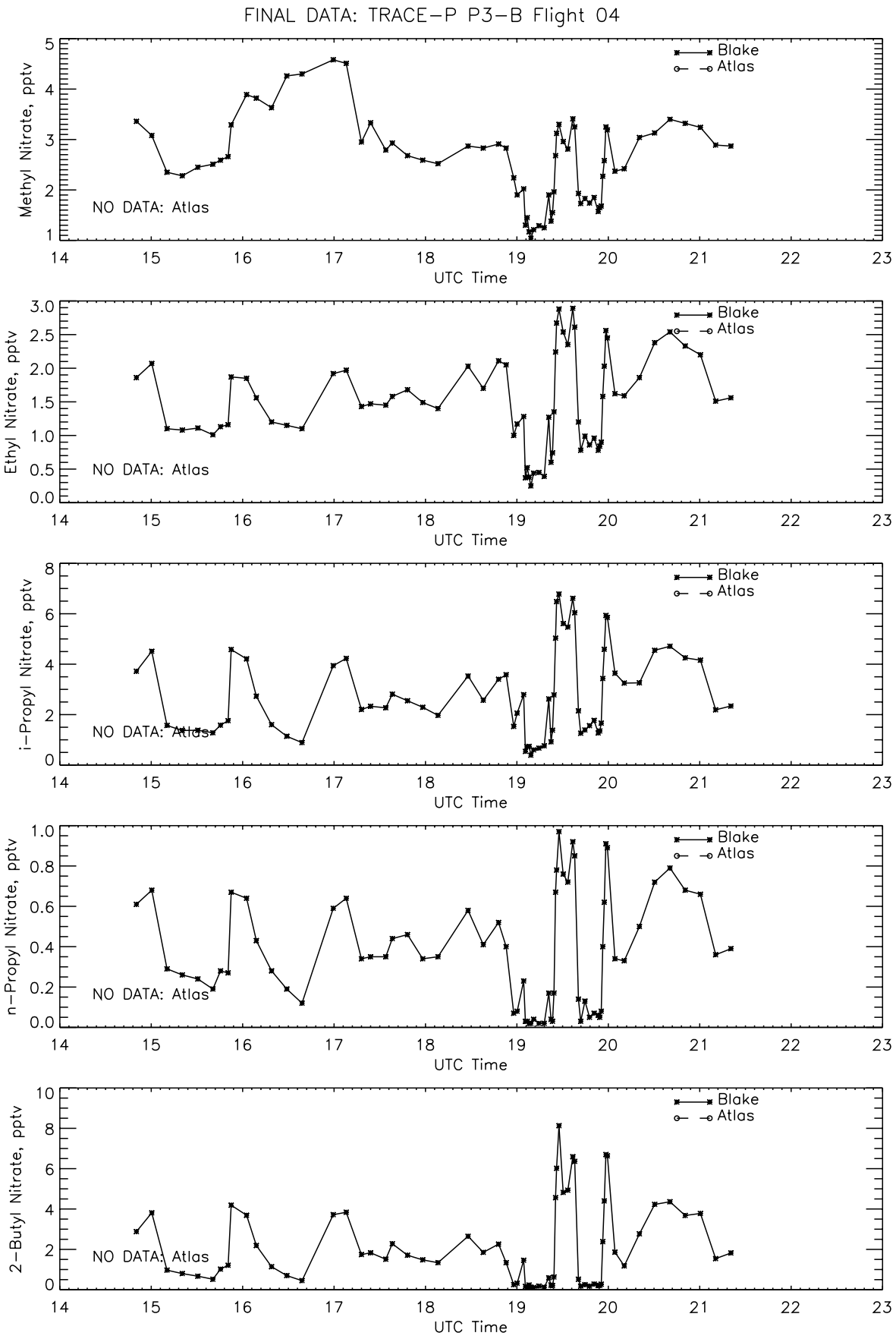
OH, molecule/cc
8×10^6
6×10^6
4×10^6
2×10^6
0
−2×10^6
UTC Time
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
2.5×10^8
2.0×10^8
1.5×10^8
1.0×10^8
5.0×10^7
Methyl Chloride, pptv
Blake
Atlas
NO DATA: Atlas
Chloroform, pptv
14
15
16
17
18
19
20
21
22
23


FINAL DATA: TRACE-P P3-B Flight 04
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time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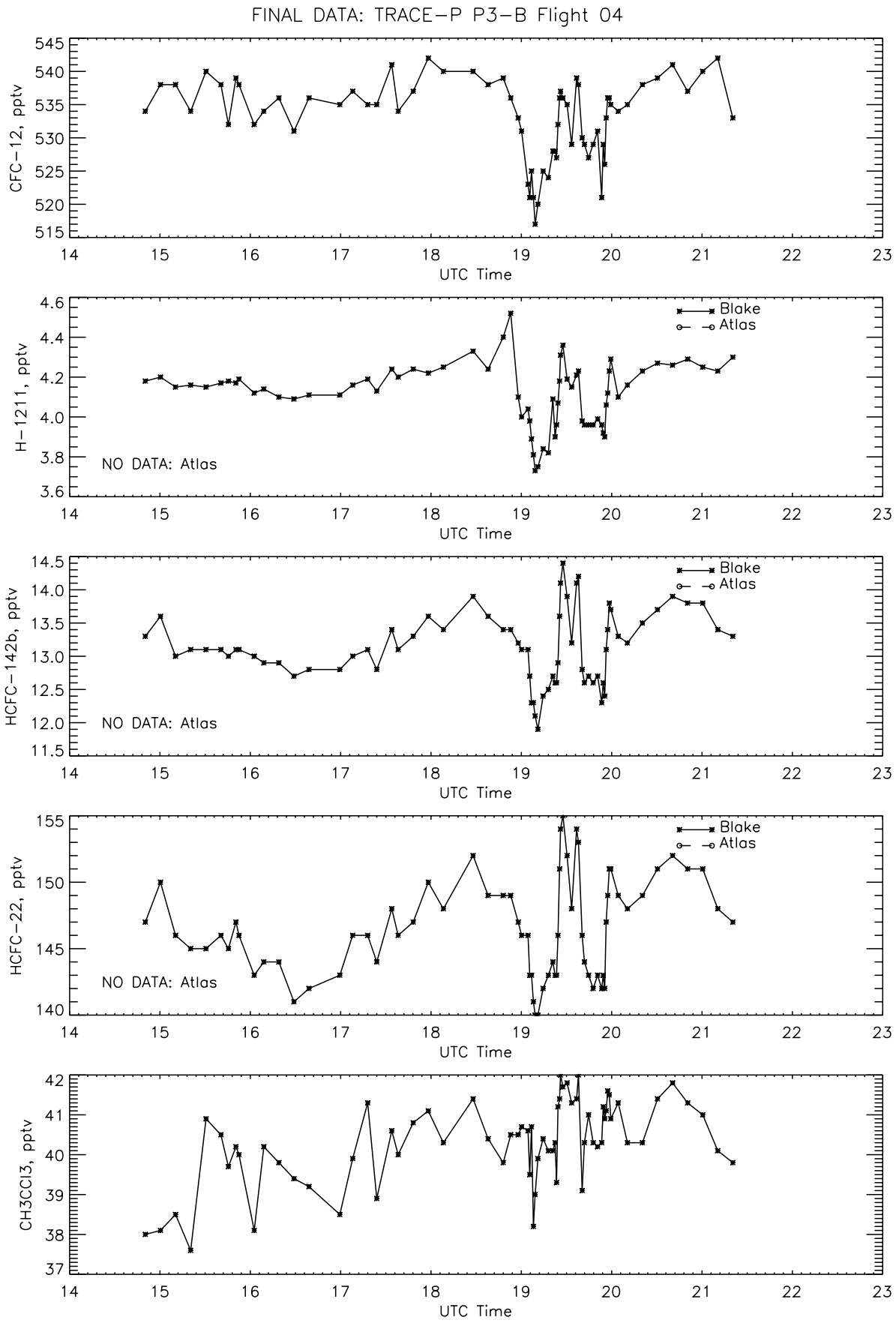
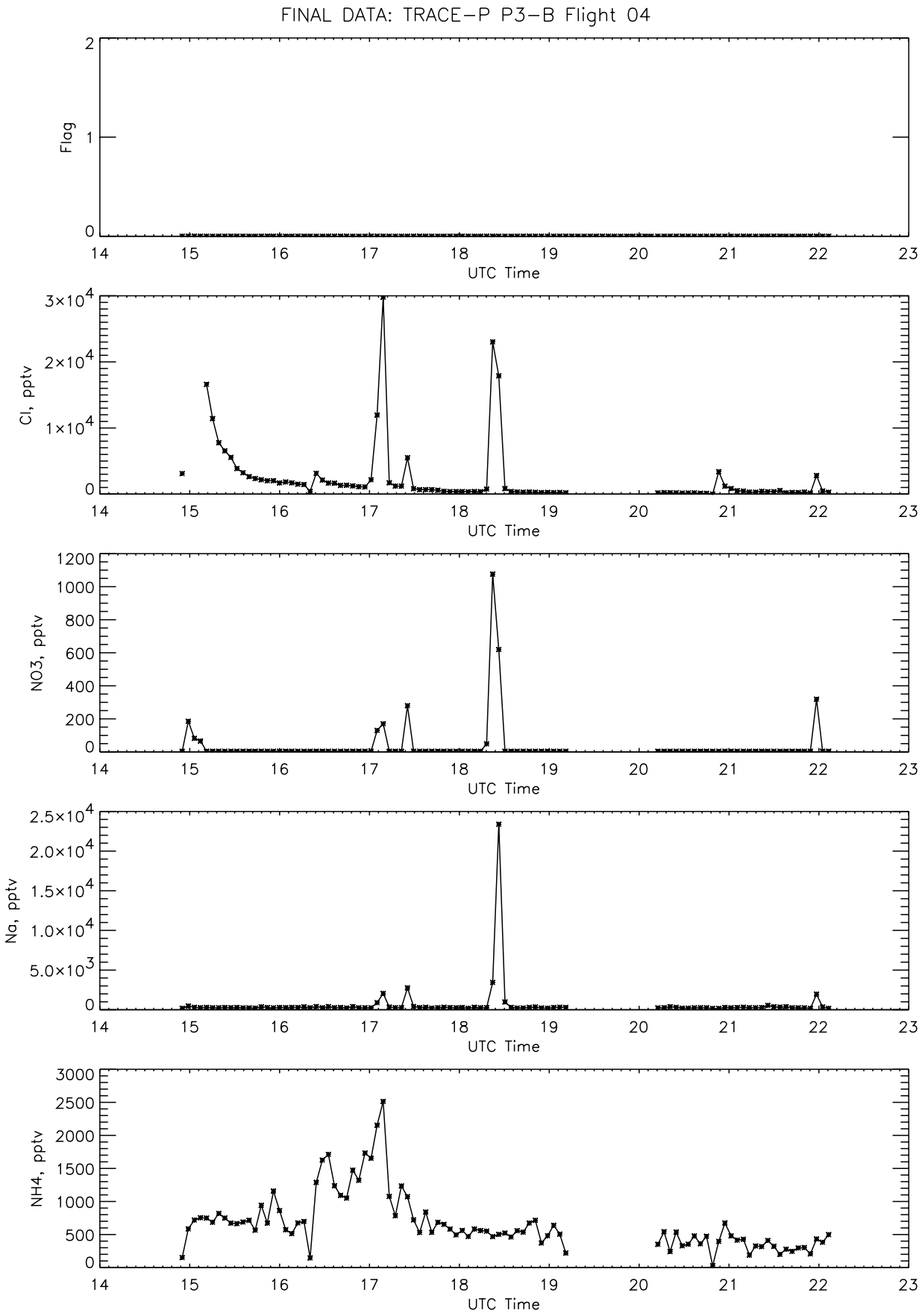
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas
NO DATA: Atlas


FINAL DATA: TRACE-P P3-B Flight 04
CFC-12, pptv
UTC Time
H-1211, pptv
Blake
Atlas
NO DATA: Atlas
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv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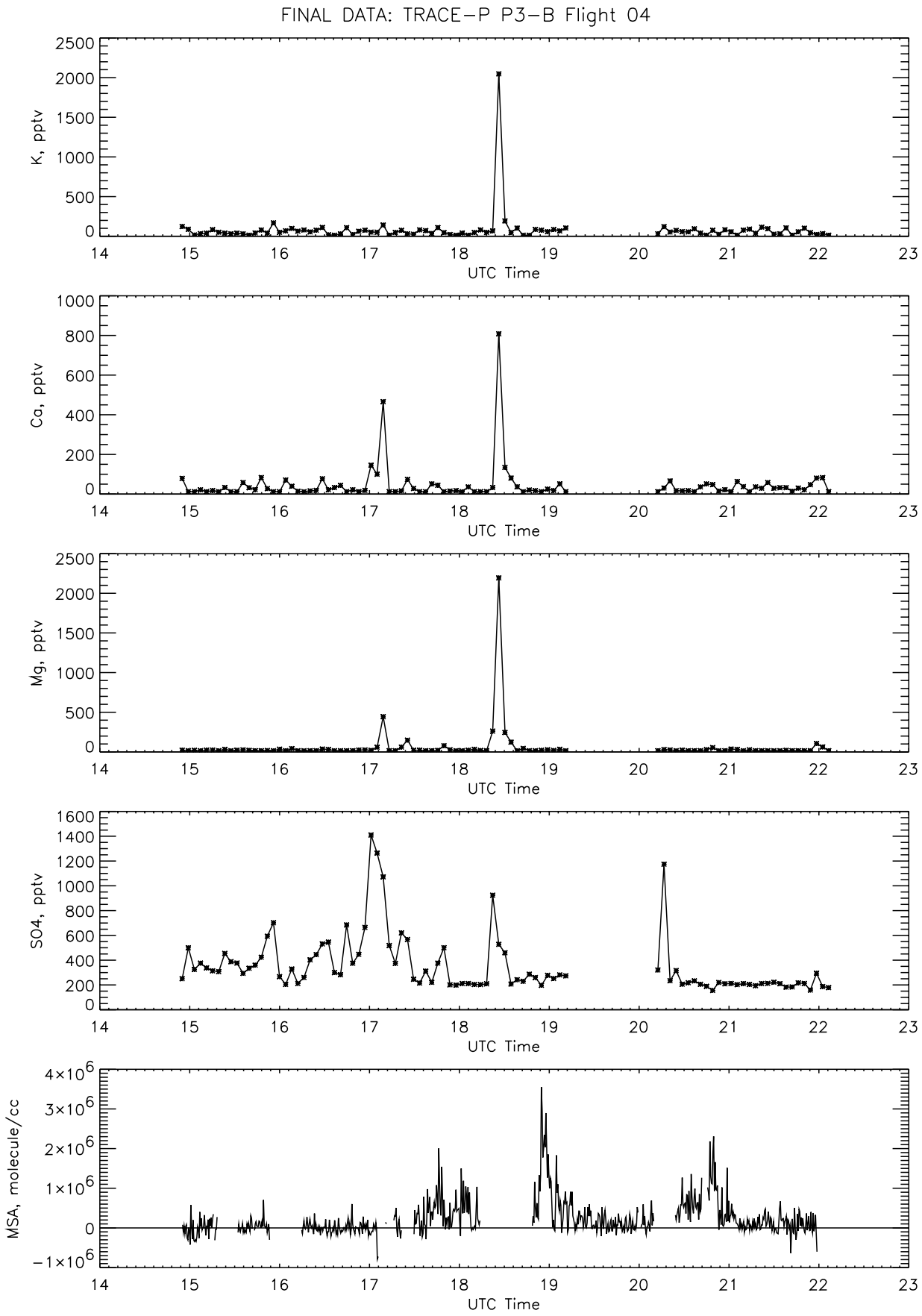
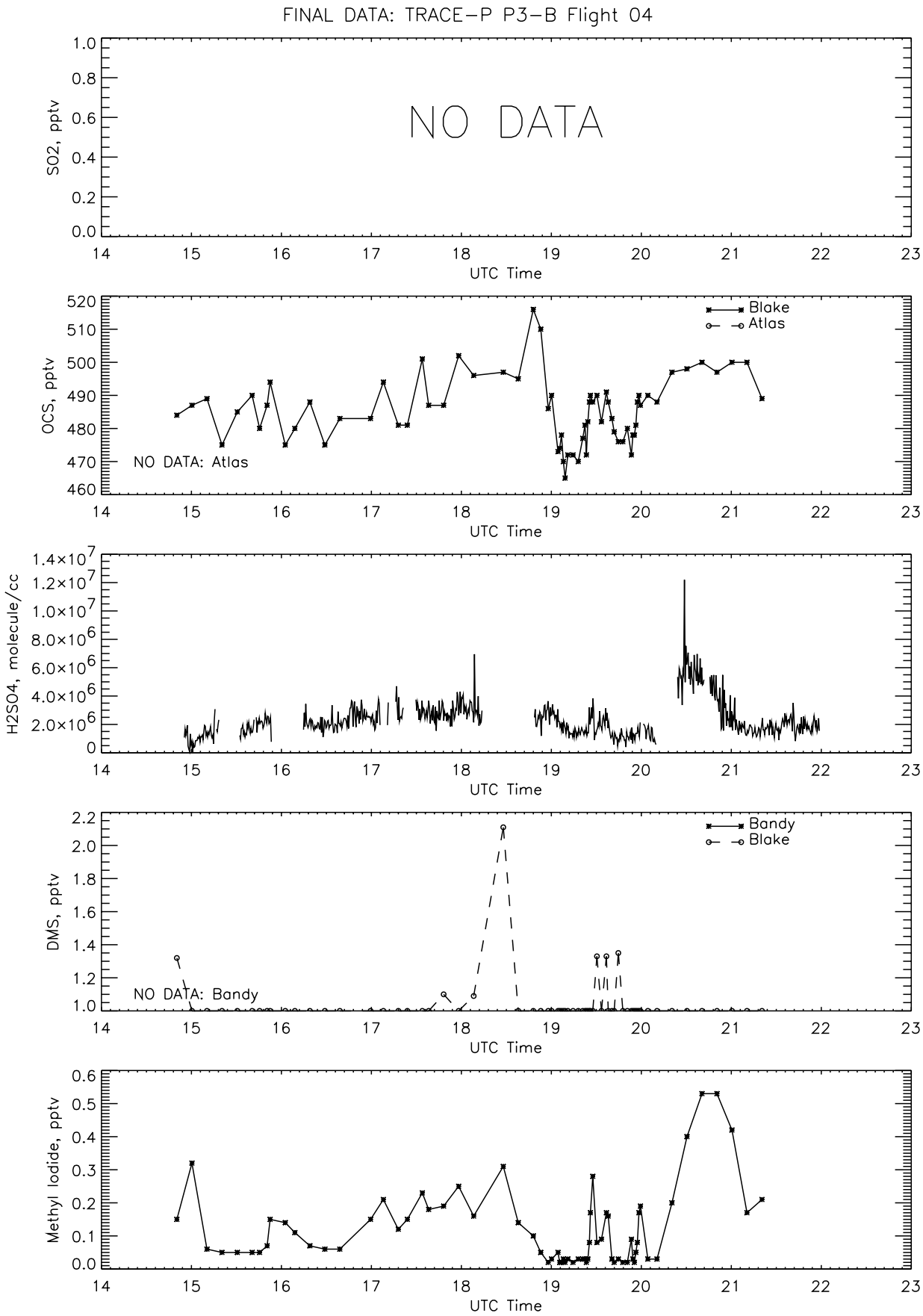
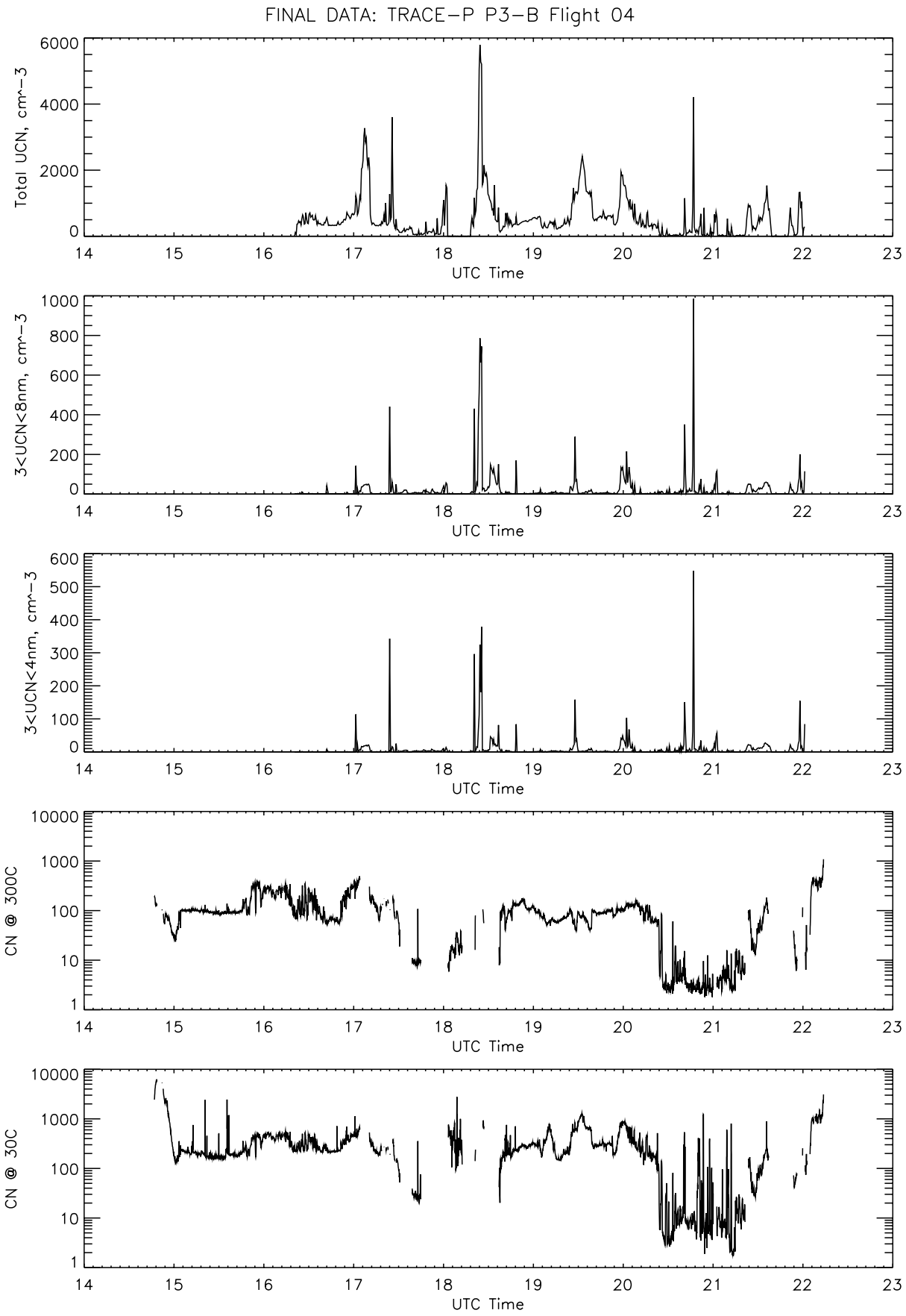
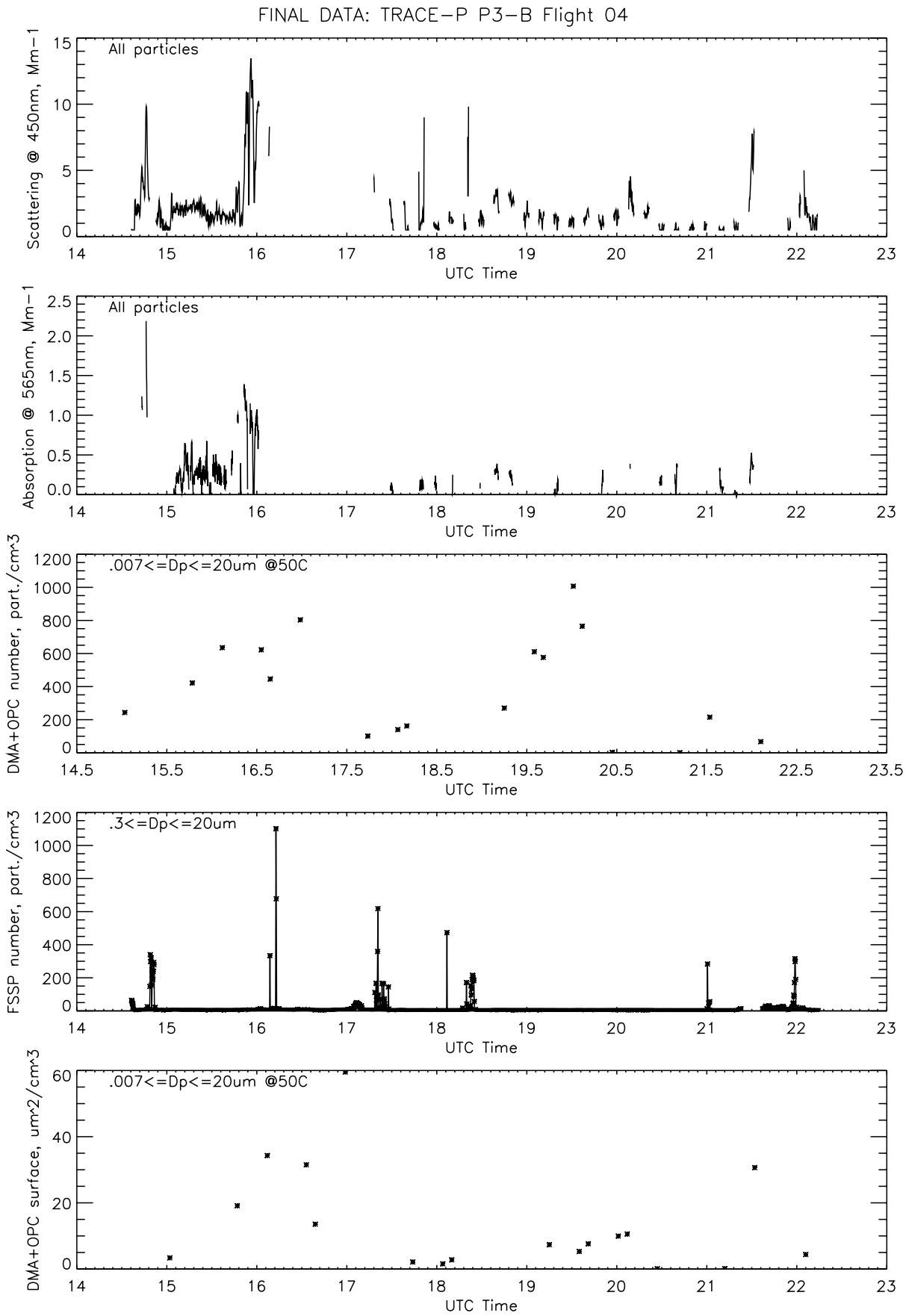
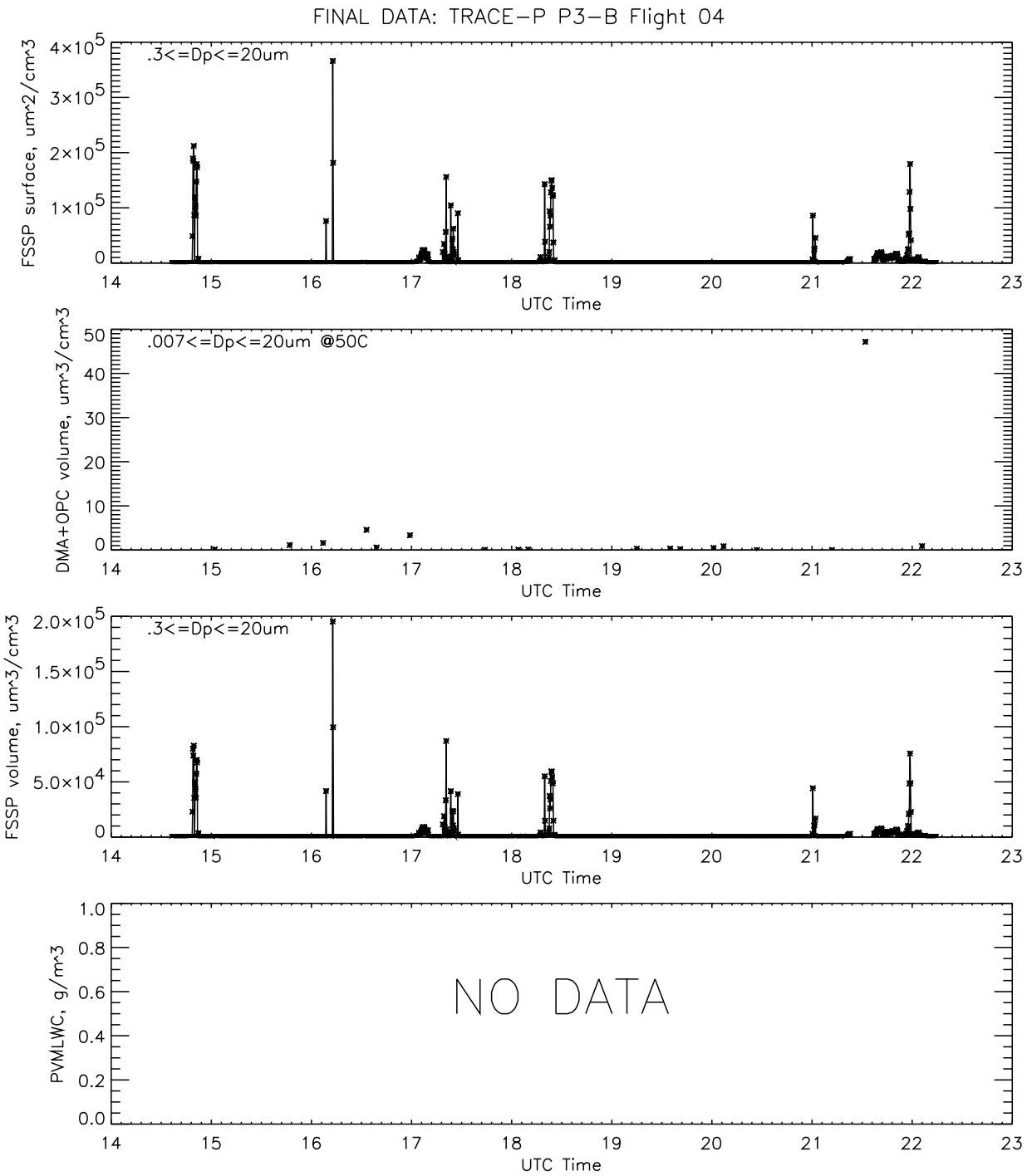
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
SO2, pptv
NO DATA
UTC Time
OCS, pptv
Blake
Atlas
NO DATA: Atlas
UTC Time
H2SO4, molecule/cc
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time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.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
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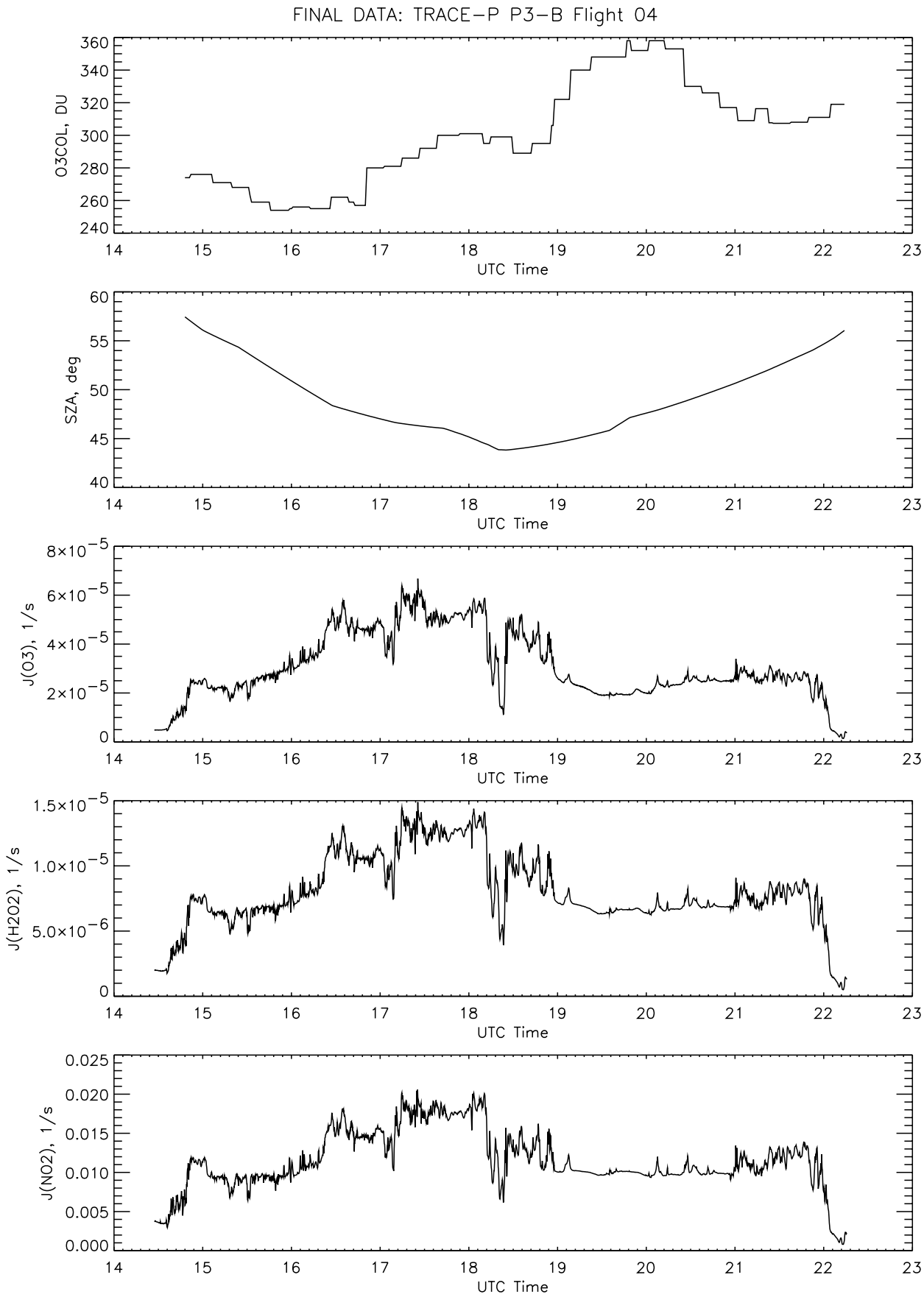
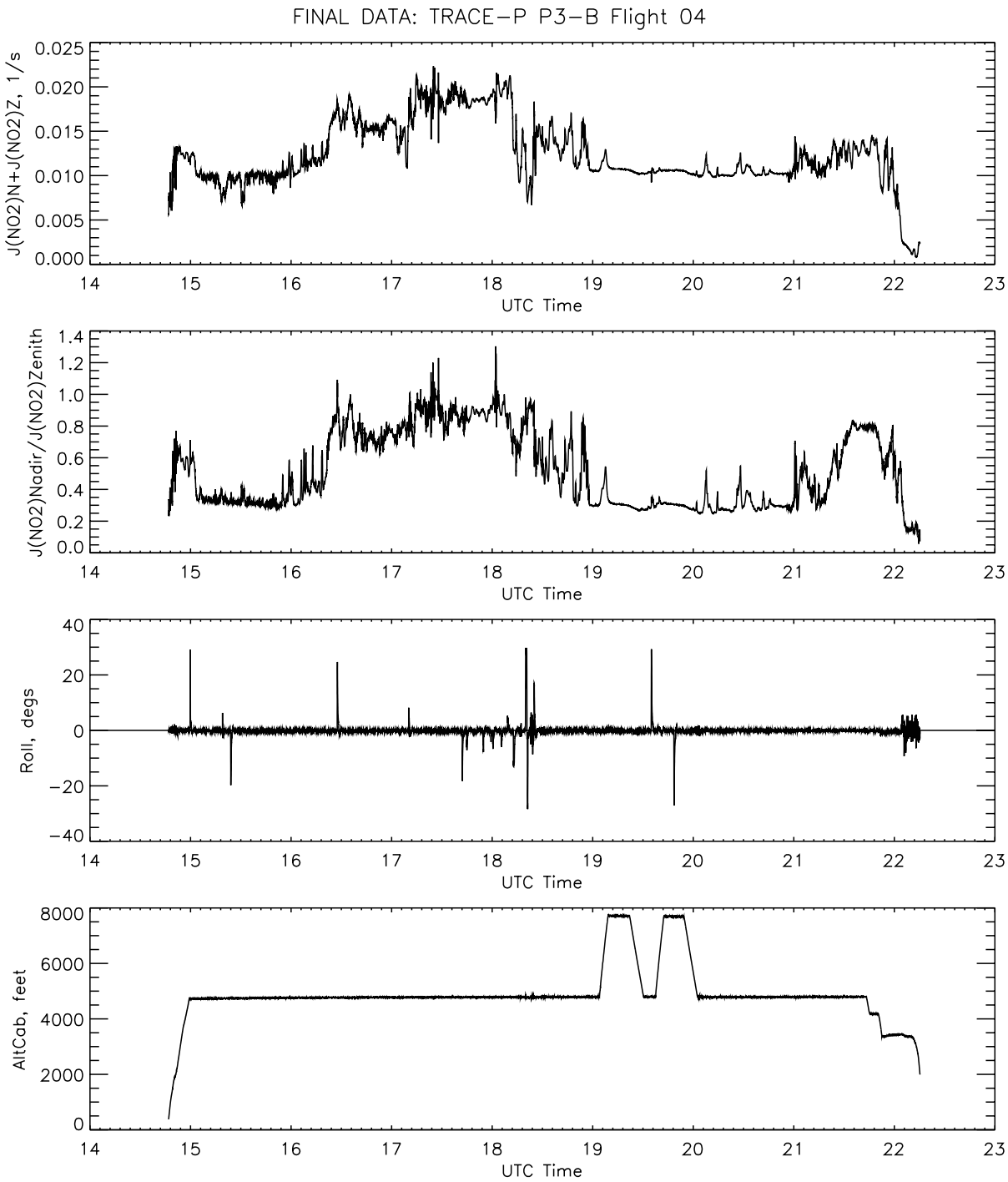
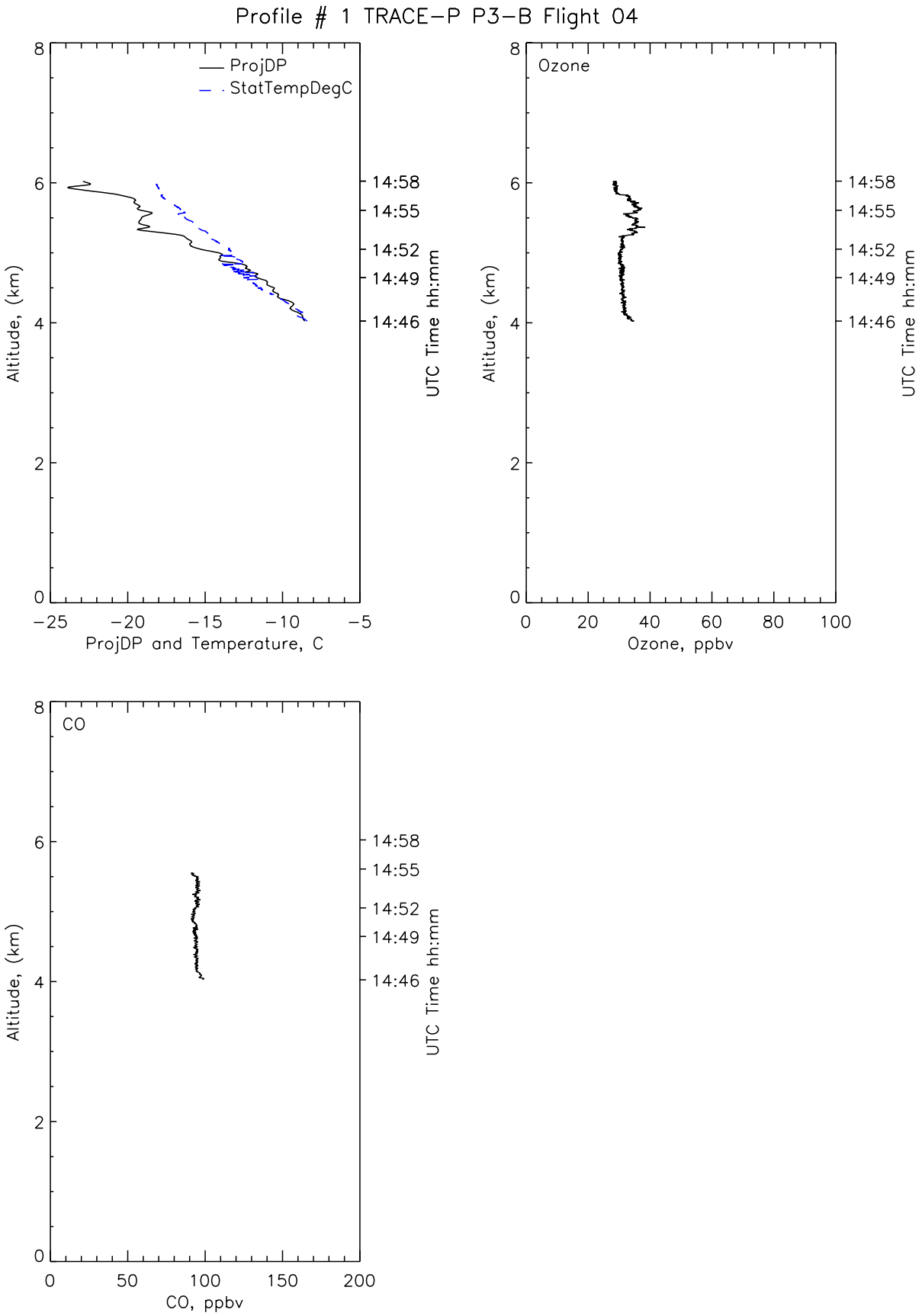
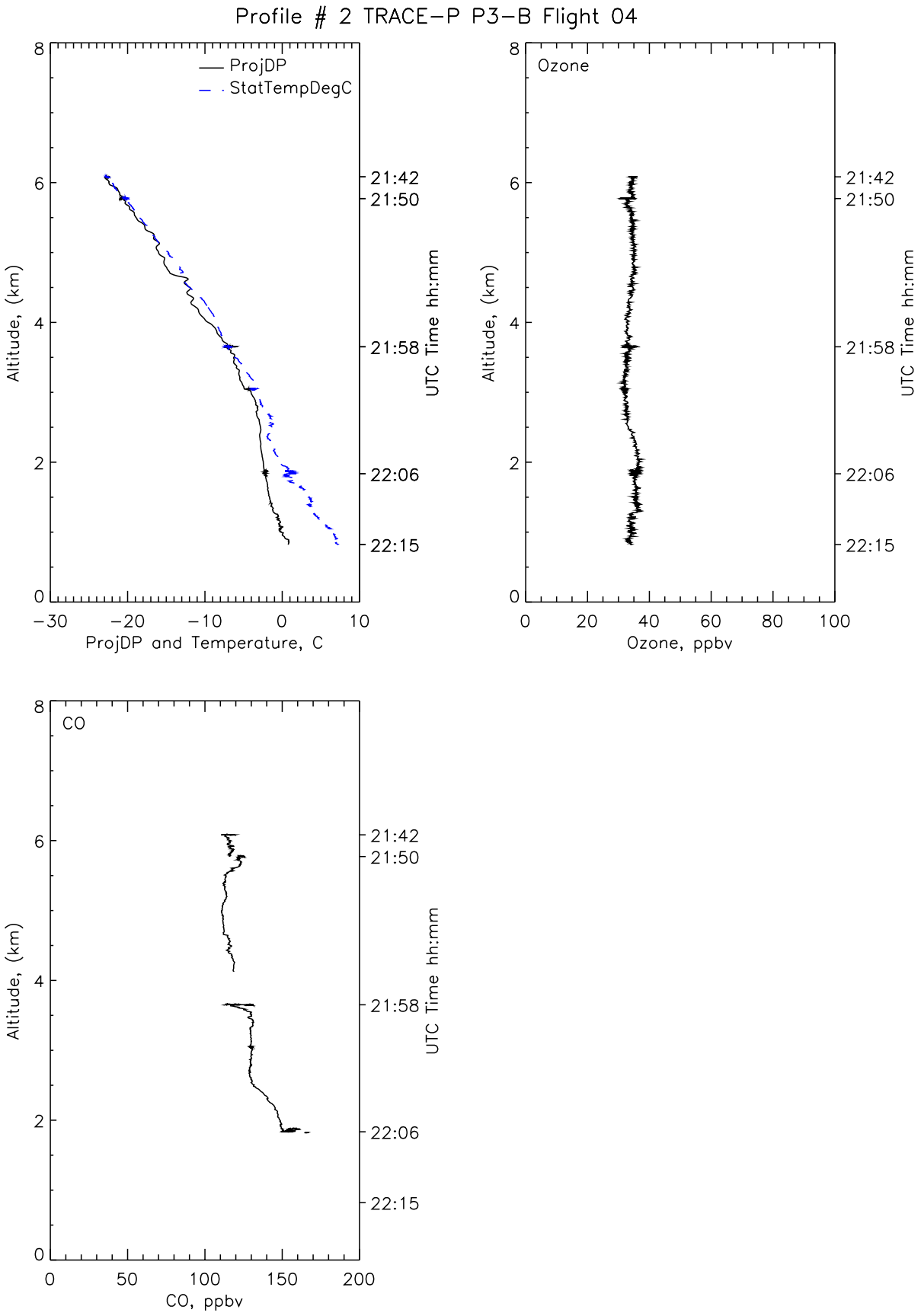
FSSP volume, um^3/cm^3
UTC Time
NO DATA
PVMLWC, g/m^3
UTC Time

LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 04
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 04
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
14
15
16
17
18
19
20
21
22
23
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
8000
6000
4000
2000
0
UTC Time


Profile # 1 TRACE-P P3-B Flight 04
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
14:58
14:55
14:52
14:49
14:46
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 2 TRACE-P P3-B Flight 04
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
21:42
21:50
21:58
22:06
22:15
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

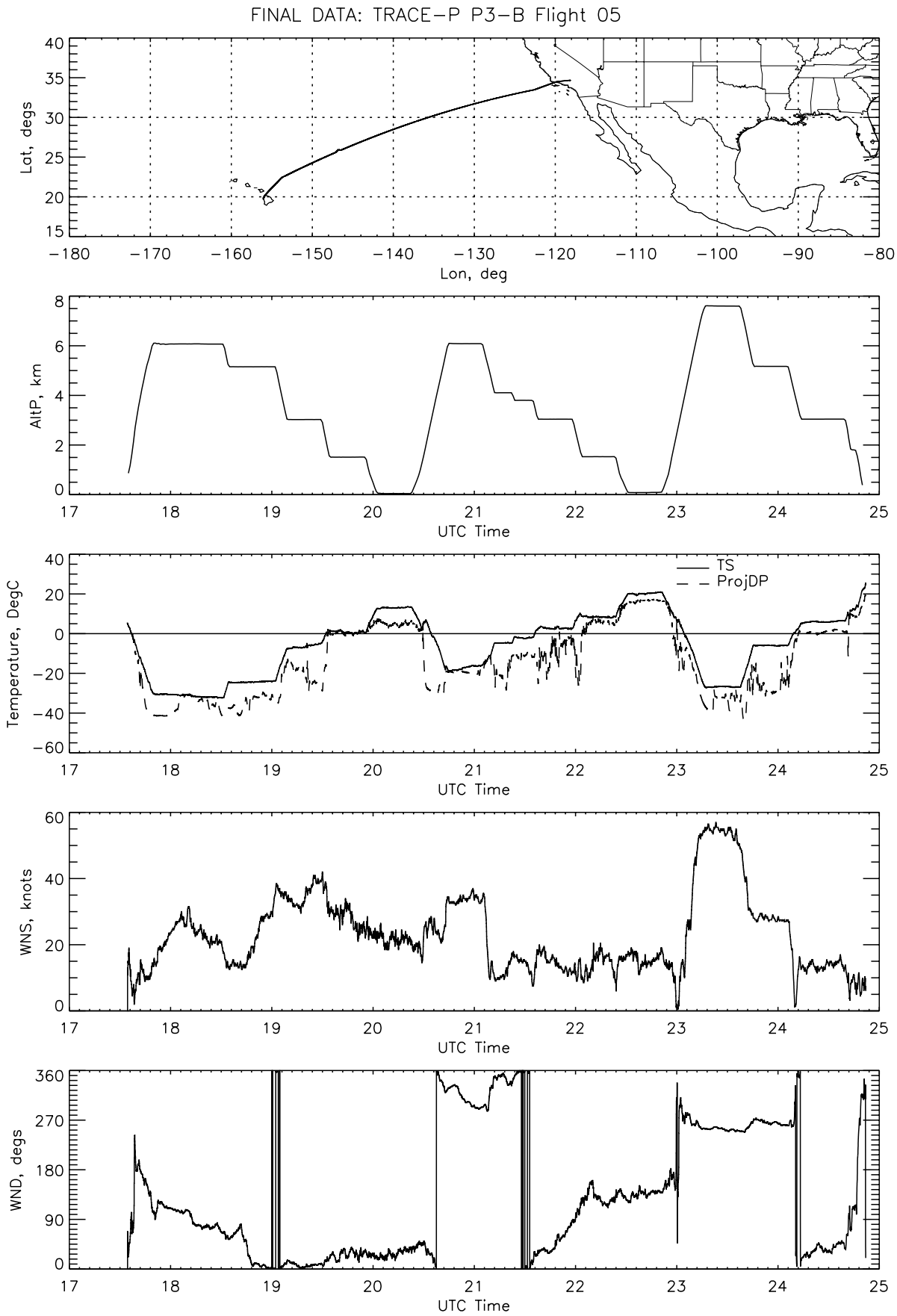
TRACE-P

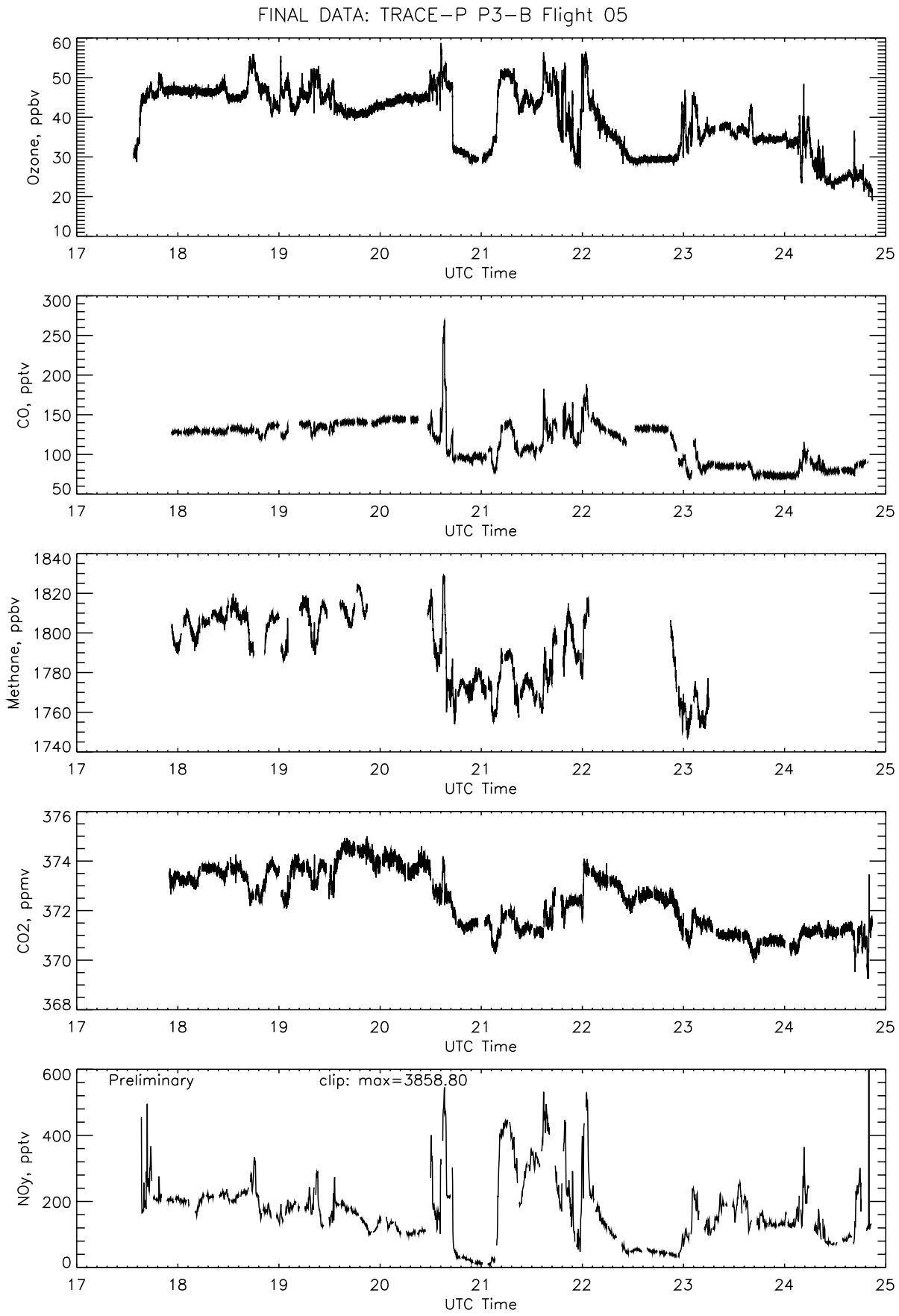
Flight 5P

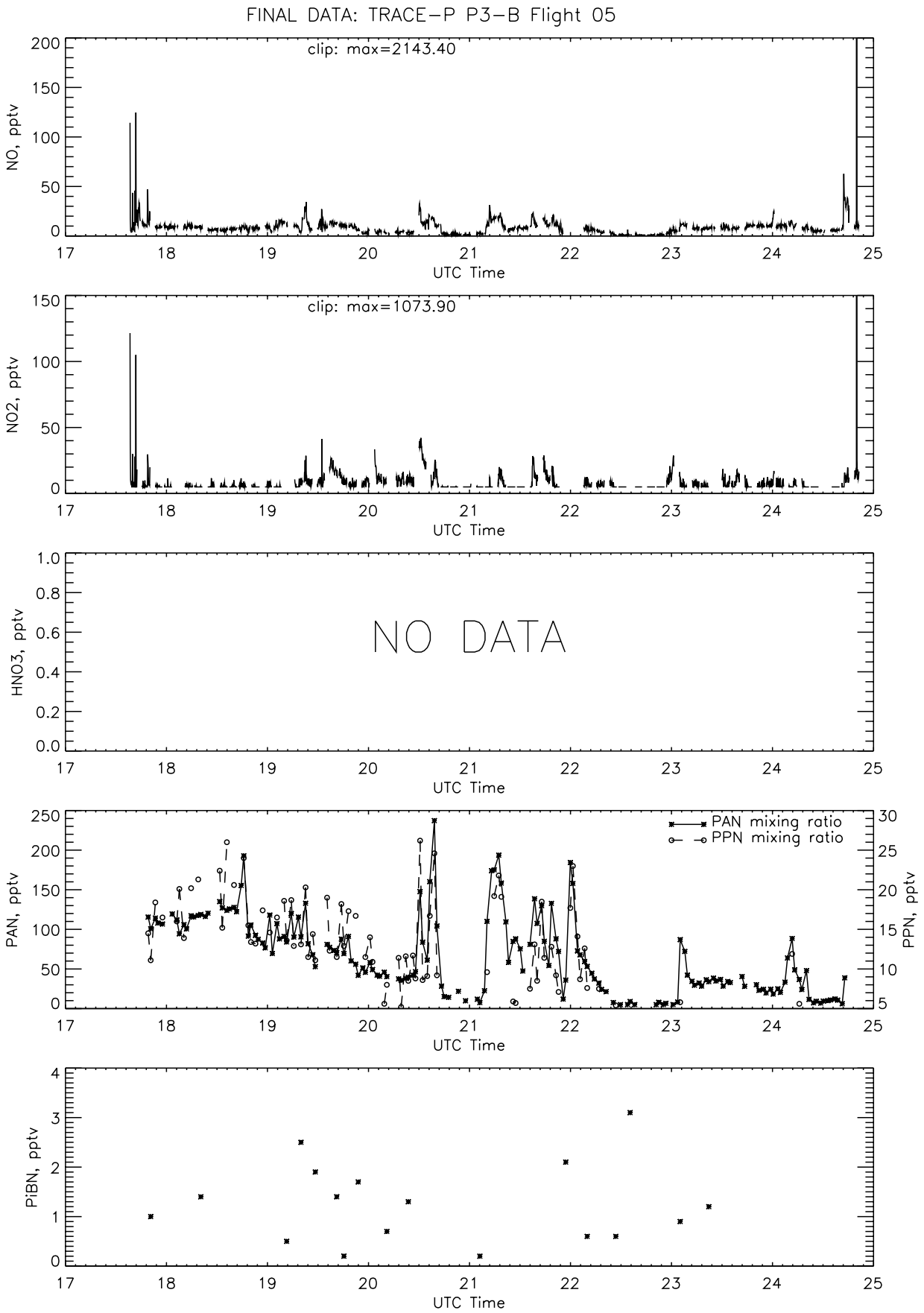
Transit: Palmdale, CA to Kona, HI

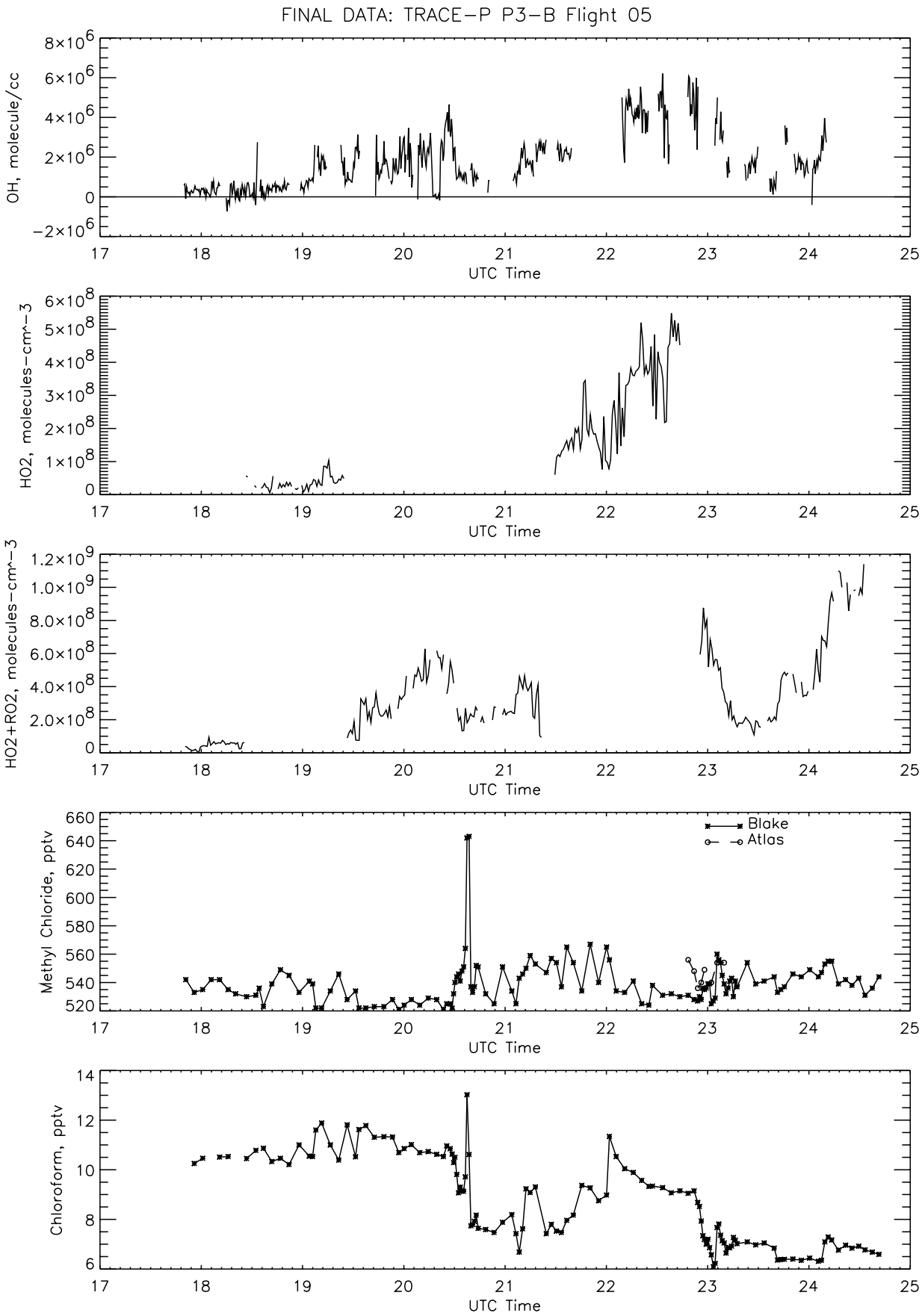
Aged Asian Pollution

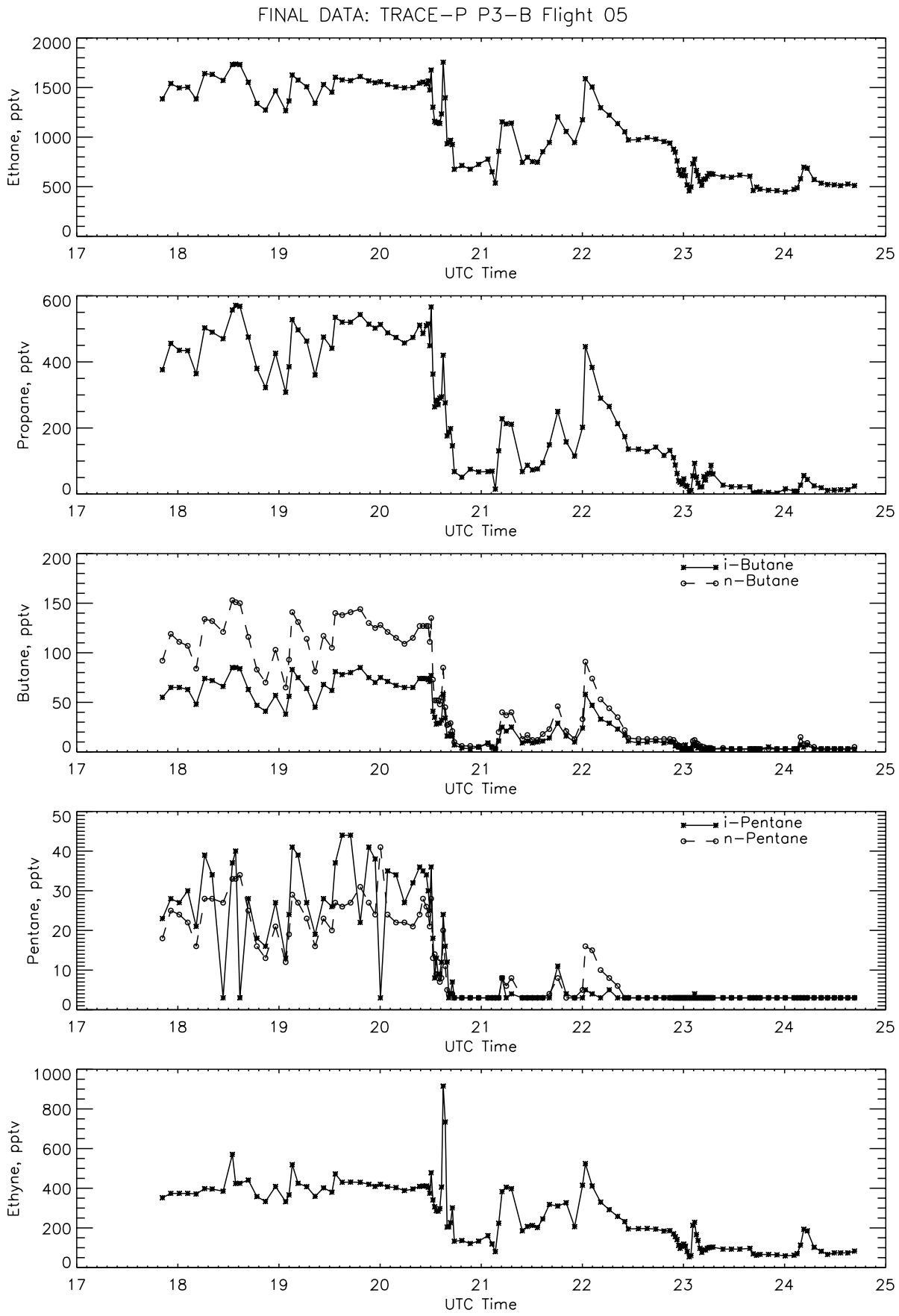
February 26, 2001

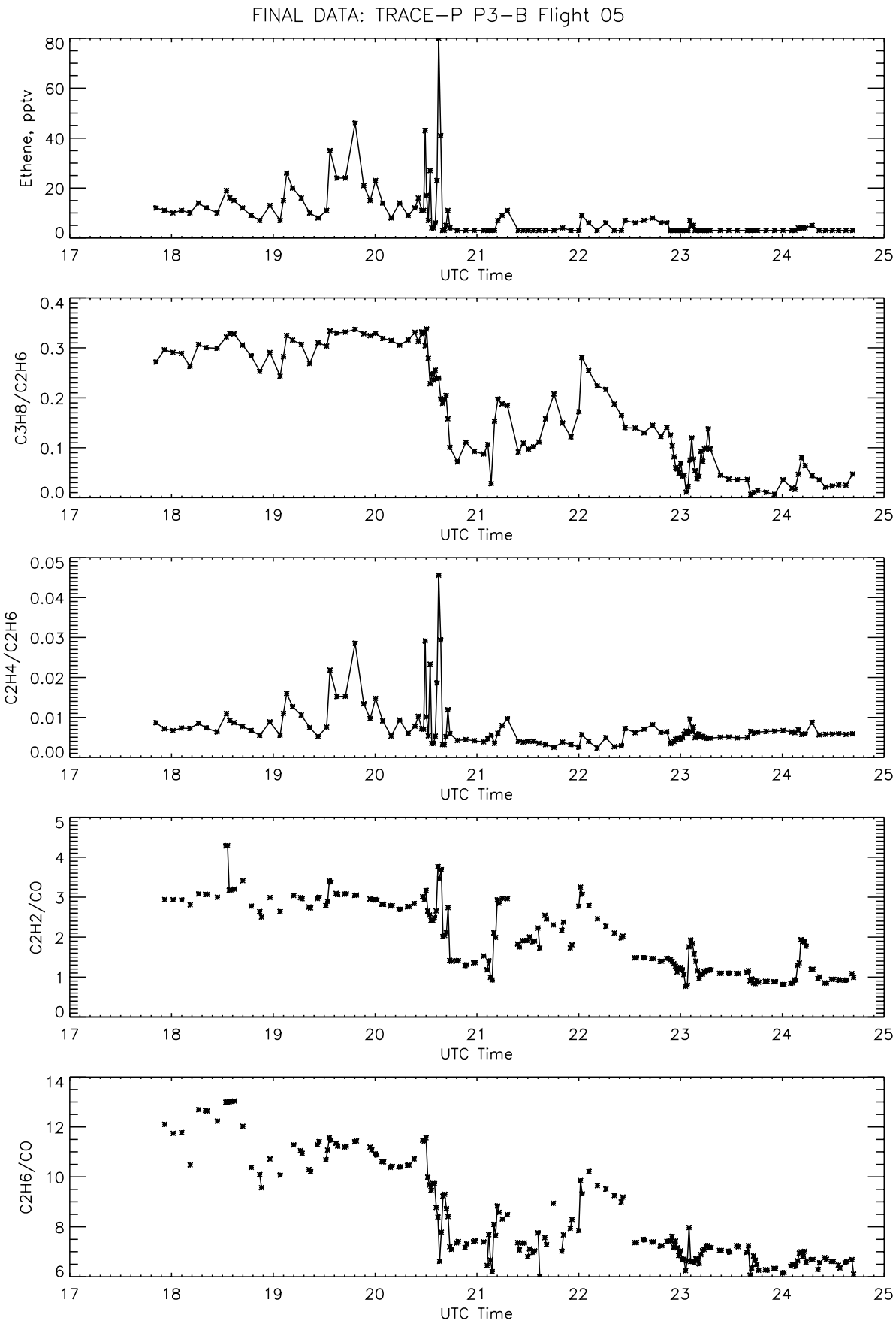

FINAL DATA: TRACE-P P3-B Flight 05
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 05
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=3858.80

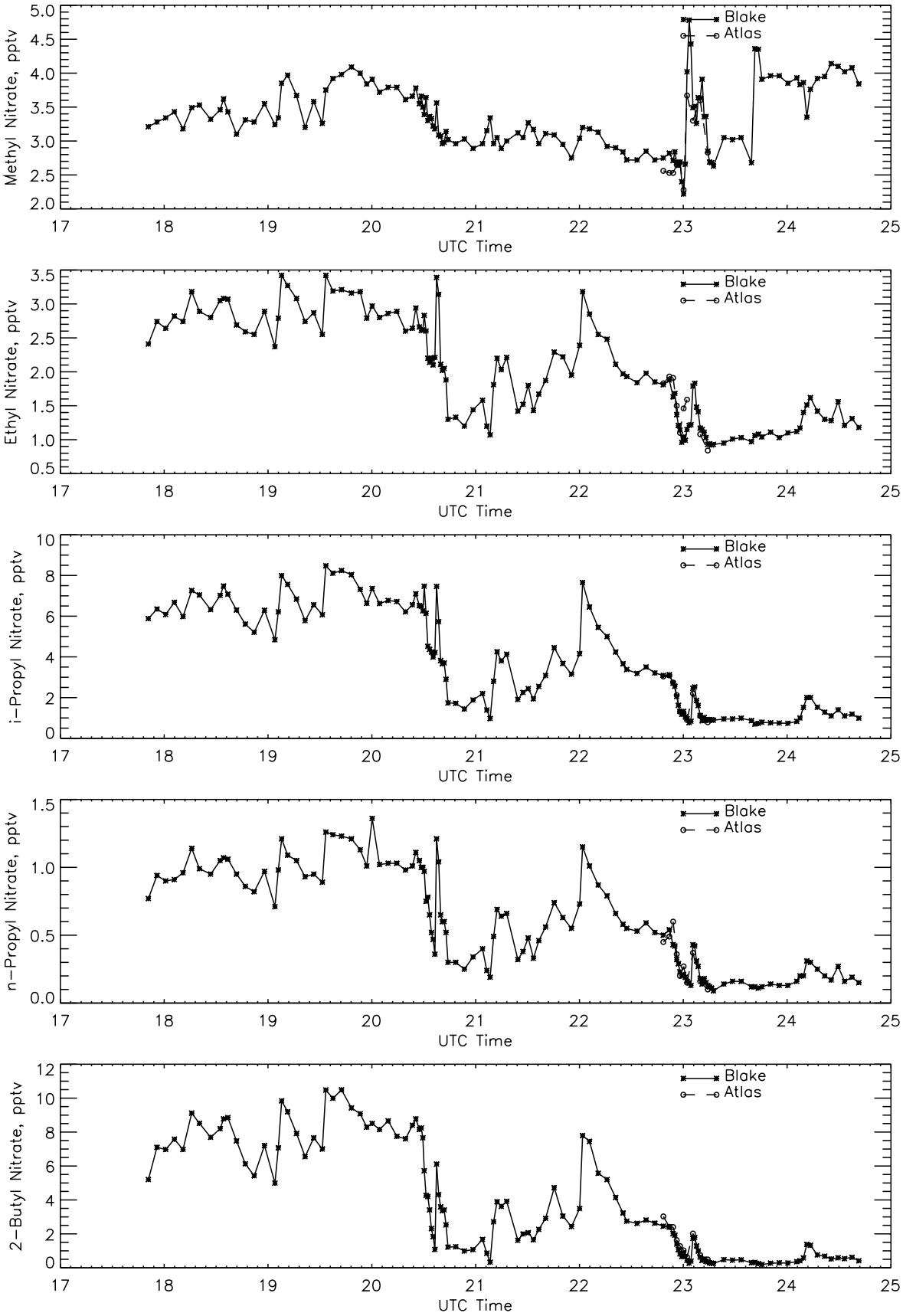

FINAL DATA: TRACE-P P3-B Flight 05
clip: max=2143.40
NO, pptv
UTC Time
clip: max=1073.90
NO2, pptv
UTC Time
HNO3, pptv
NO DATA
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

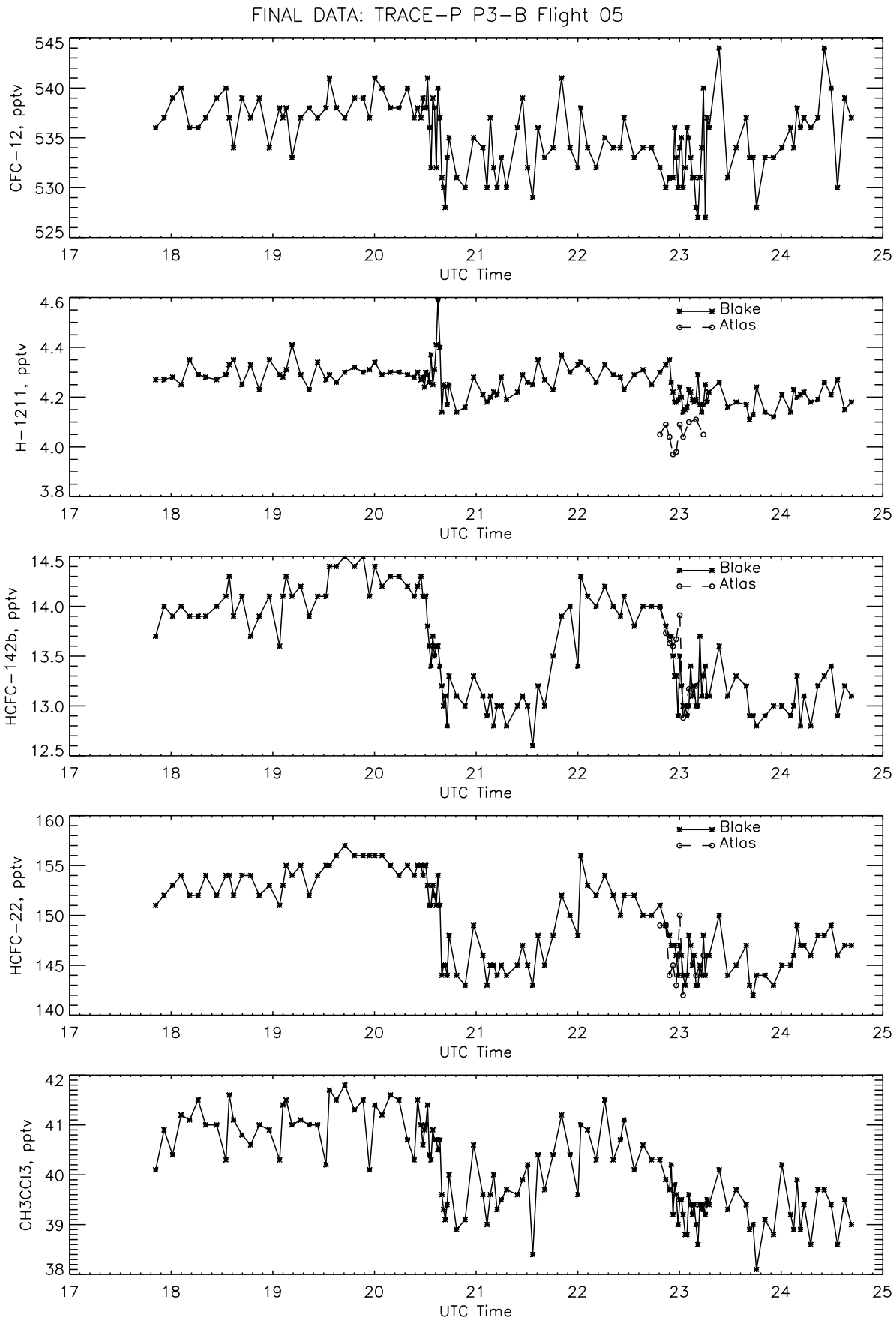

FINAL DATA: TRACE-P P3-B Flight 05
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

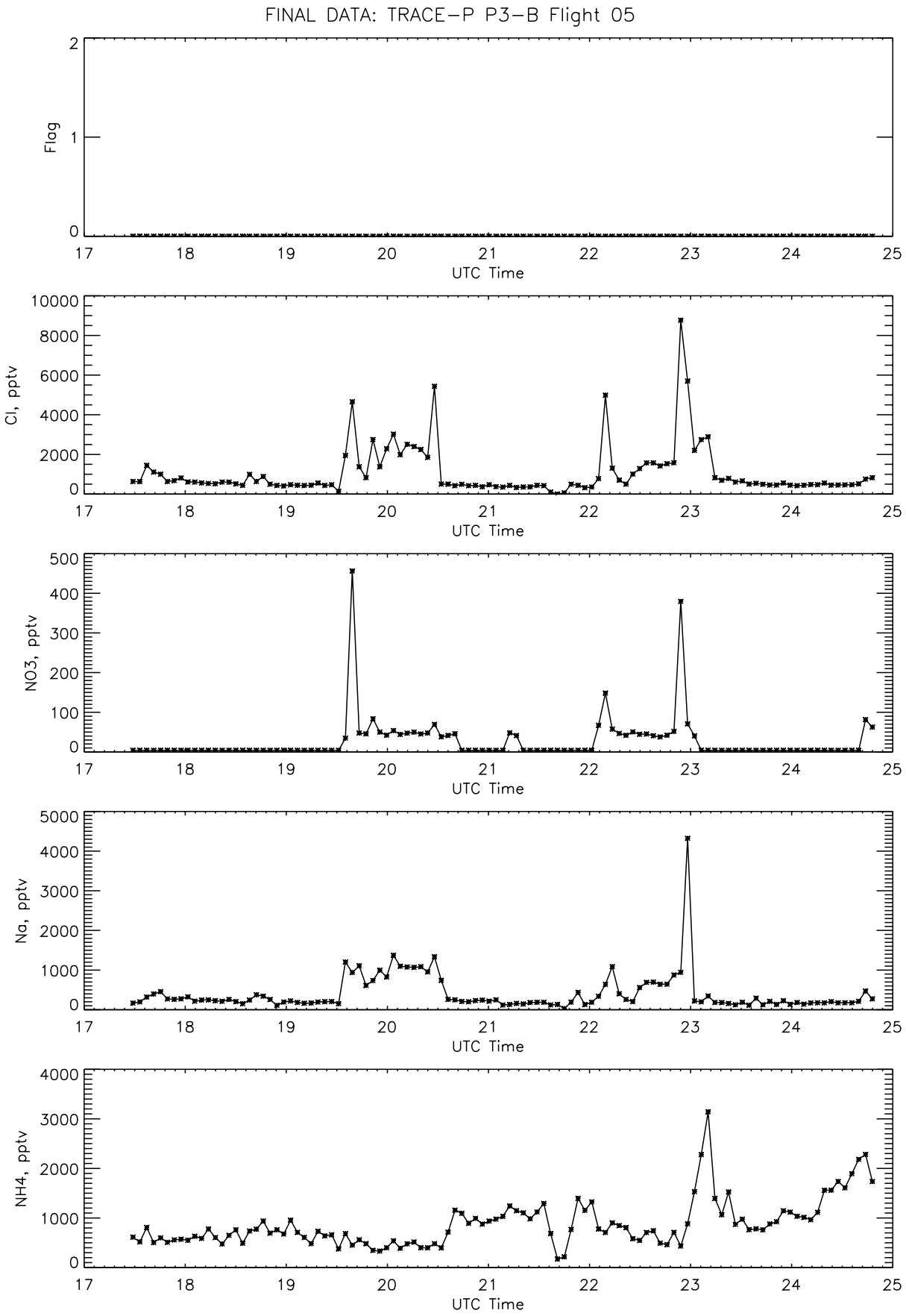

FINAL DATA: TRACE-P P3-B Flight 05
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

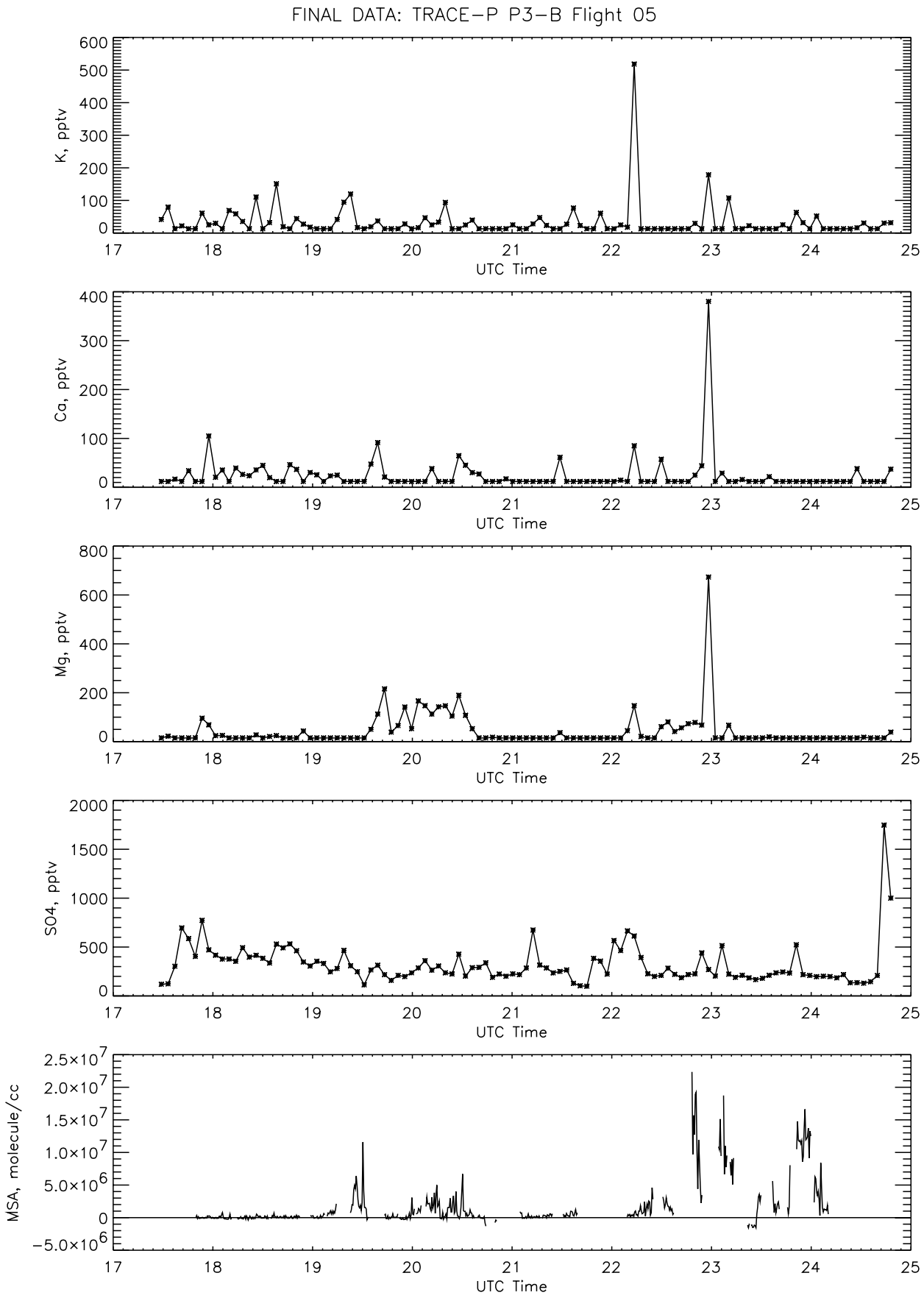

FINAL DATA: TRACE-P P3-B Flight 05
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

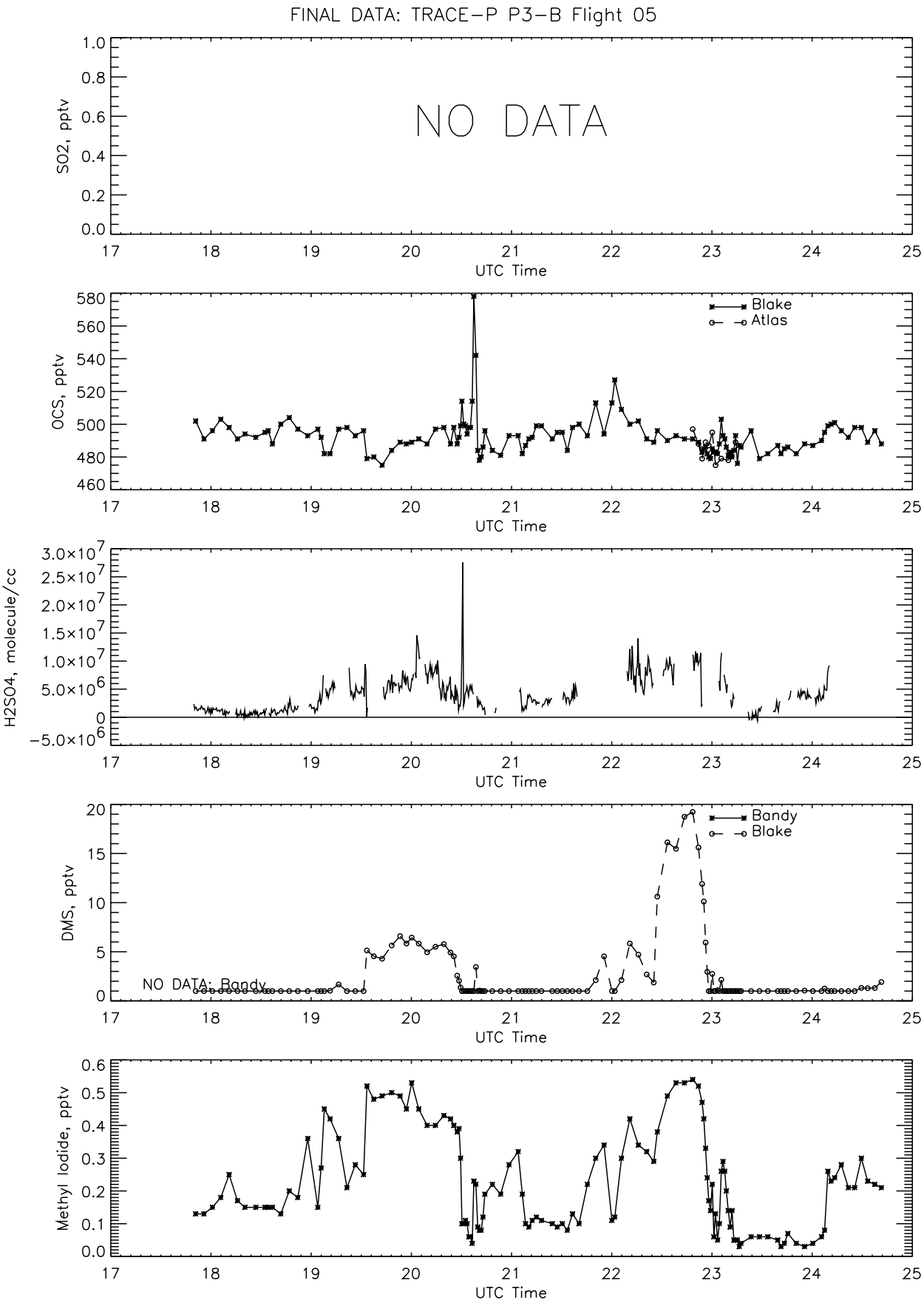
FINAL DATA: TRACE-P P3-B Flight 05

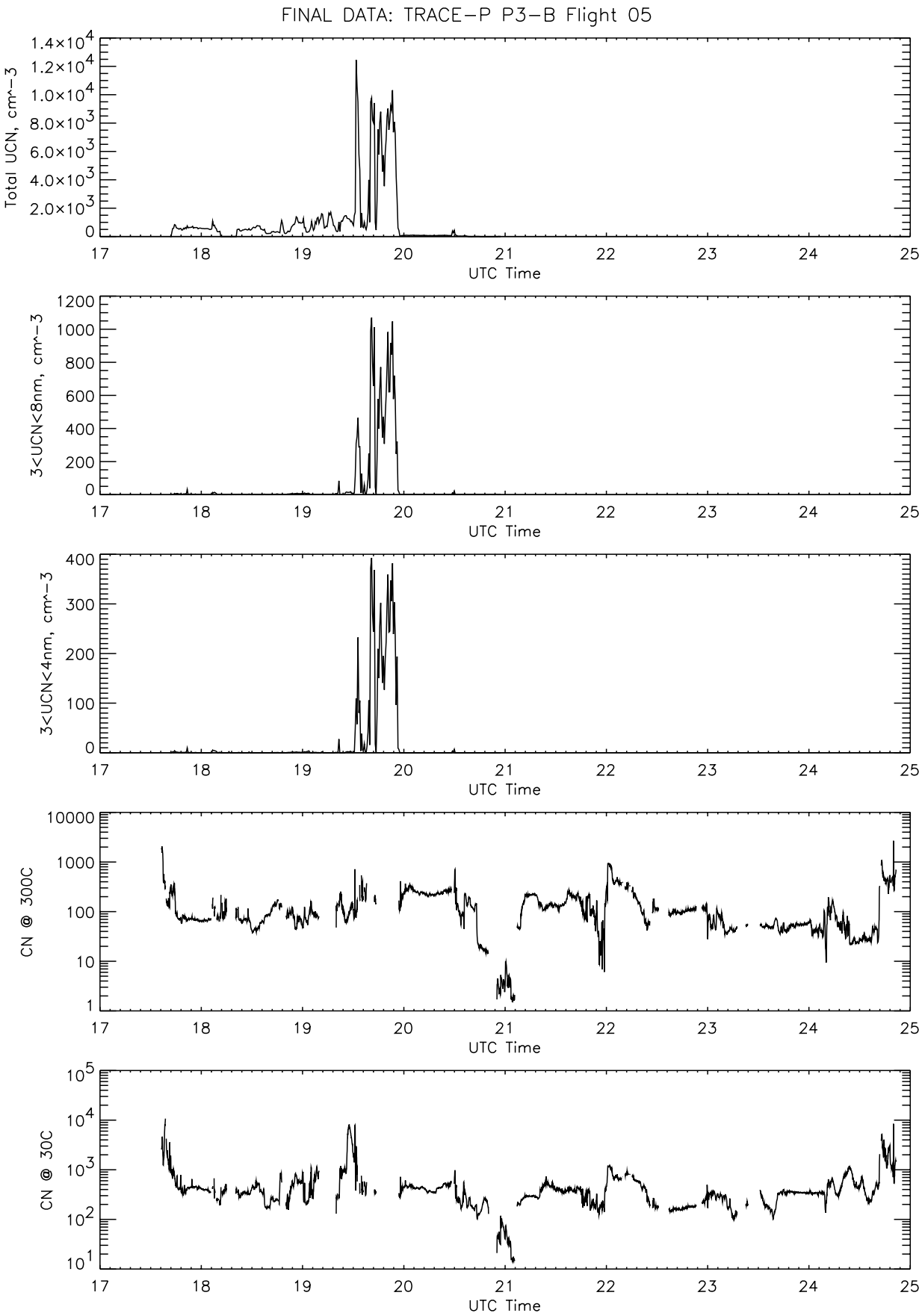


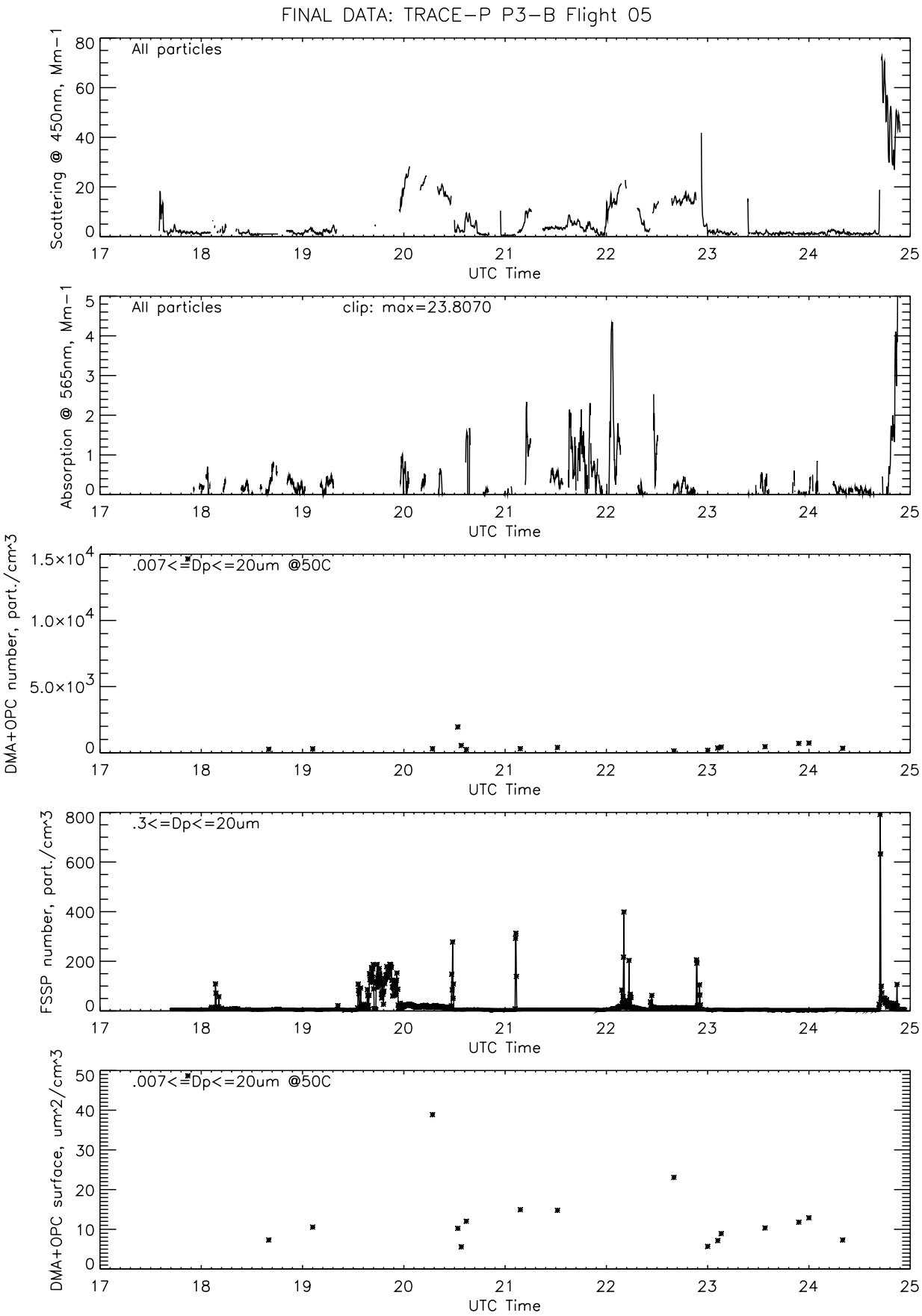

FINAL DATA: TRACE-P P3-B Flight 05
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

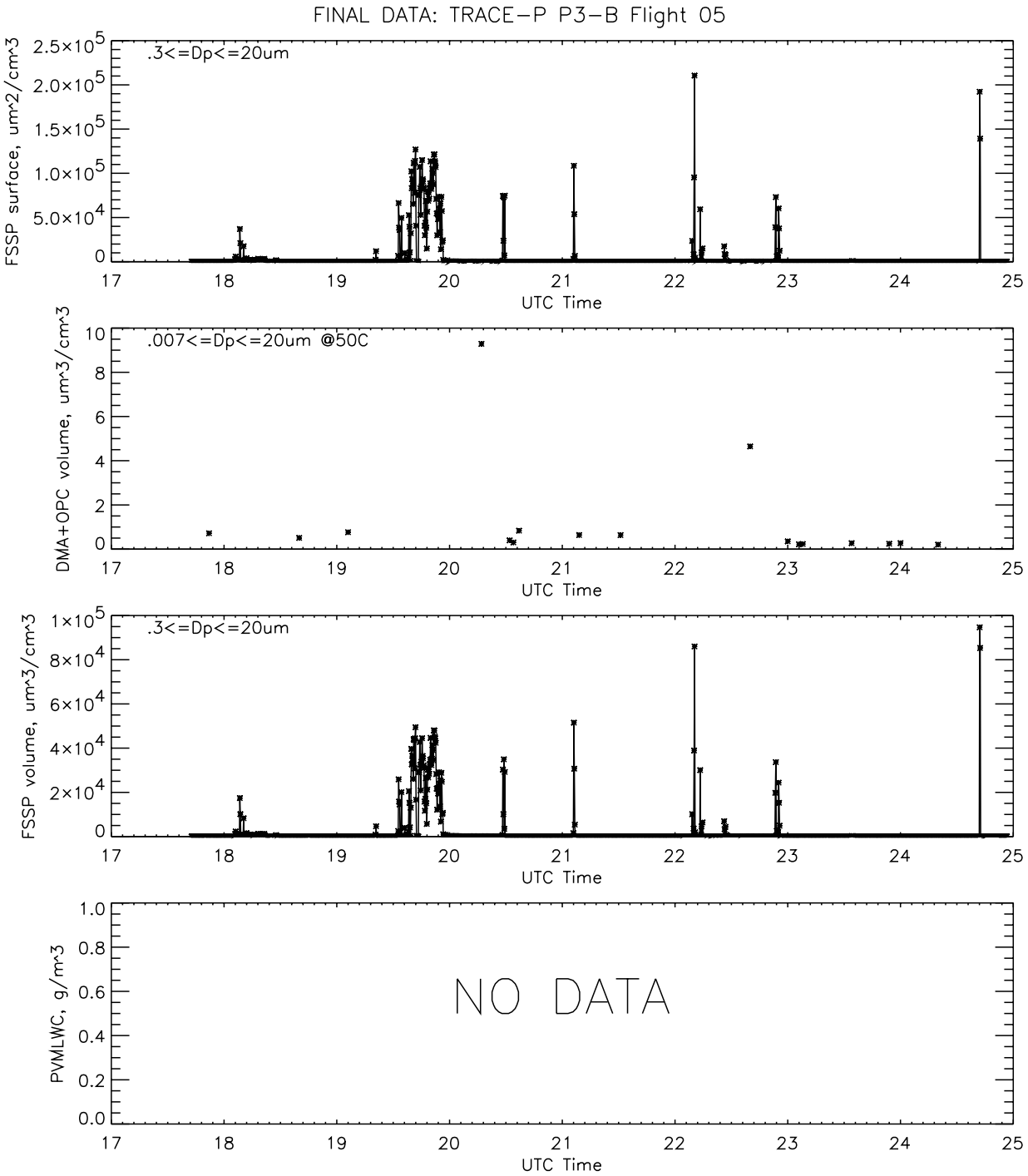

FINAL DATA: TRACE-P P3-B Flight 05
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 05
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

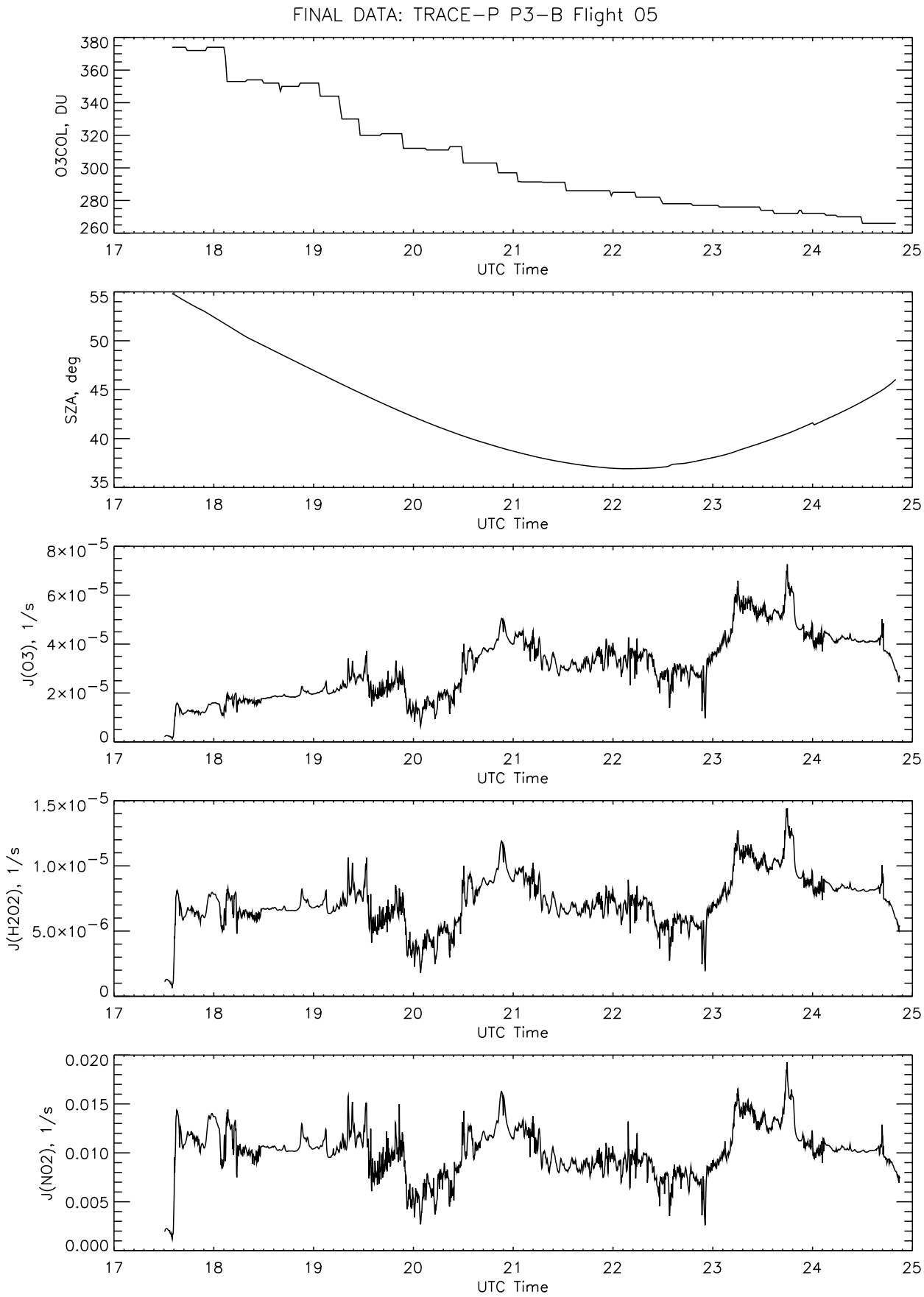

FINAL DATA: TRACE-P P3-B Flight 05
SO2, pptv
NO DATA
UTC Time
OCS, pptv
Blake
Atlas
UTC Time
H2SO4, molecule/cc
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

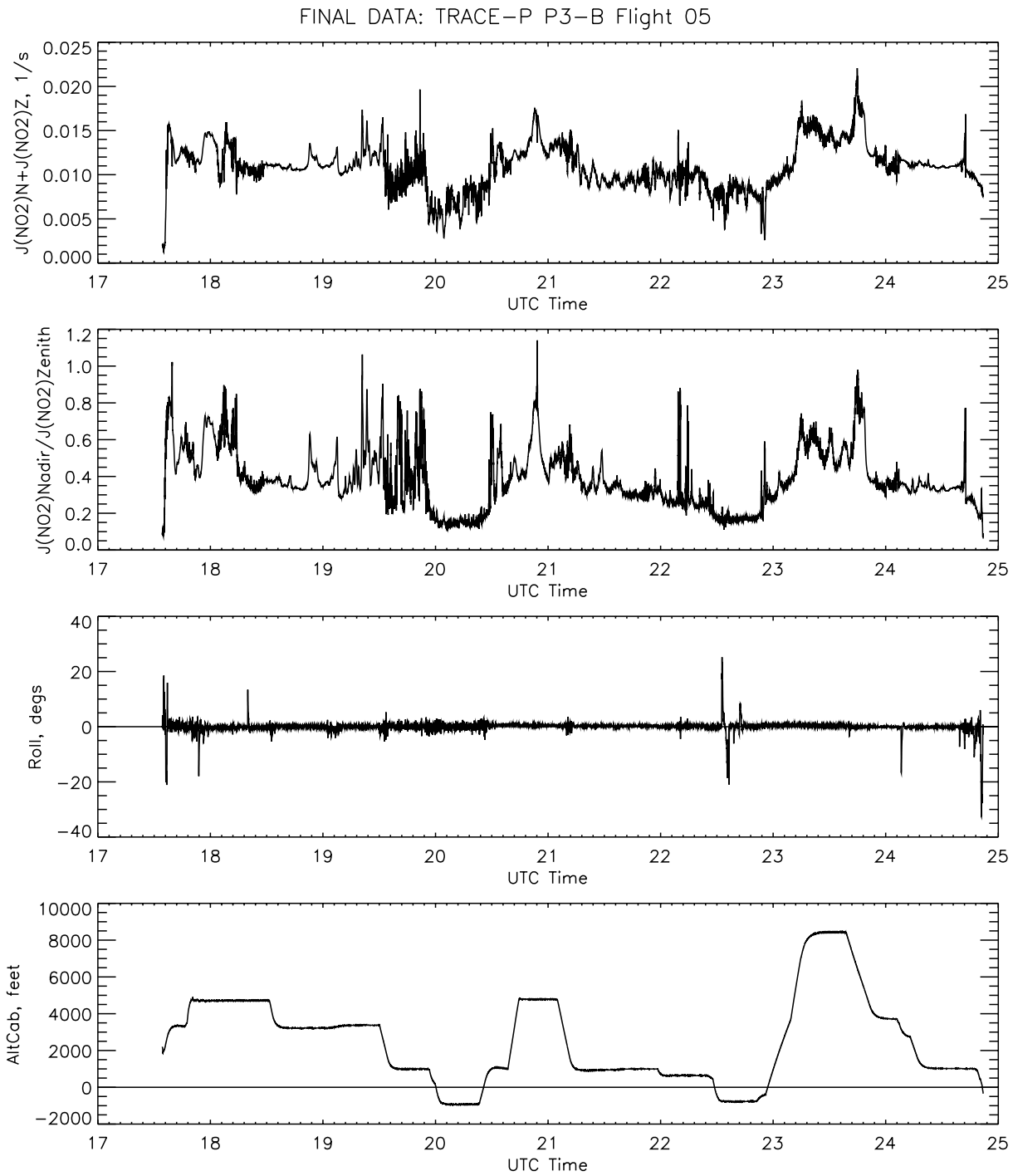

FINAL DATA: TRACE-P P3-B Flight 05
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

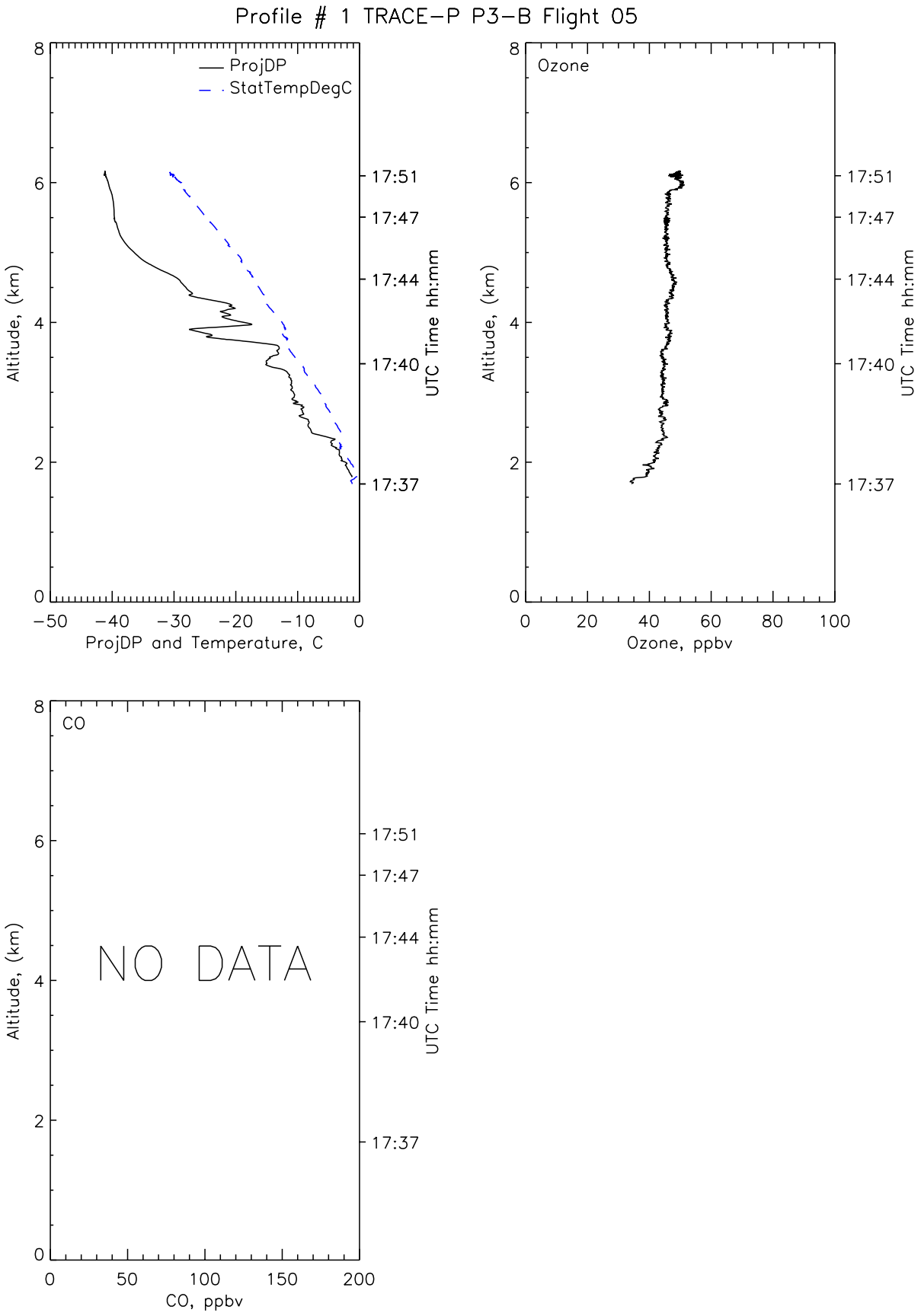

FINAL DATA: TRACE-P P3-B Flight 05
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=23.8070
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

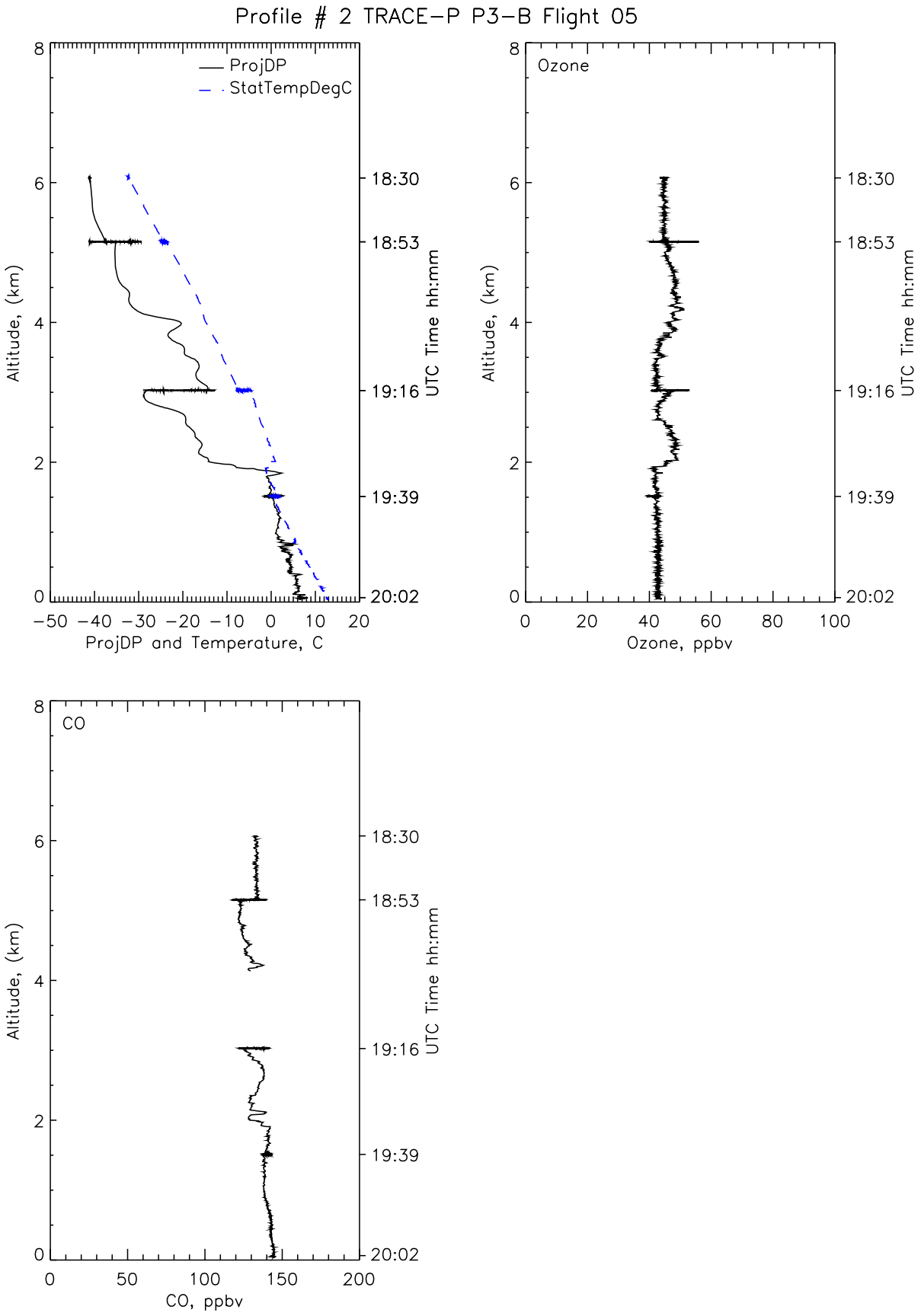

FINAL DATA: TRACE-P P3-B Flight 05
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
NO DATA
UTC Time

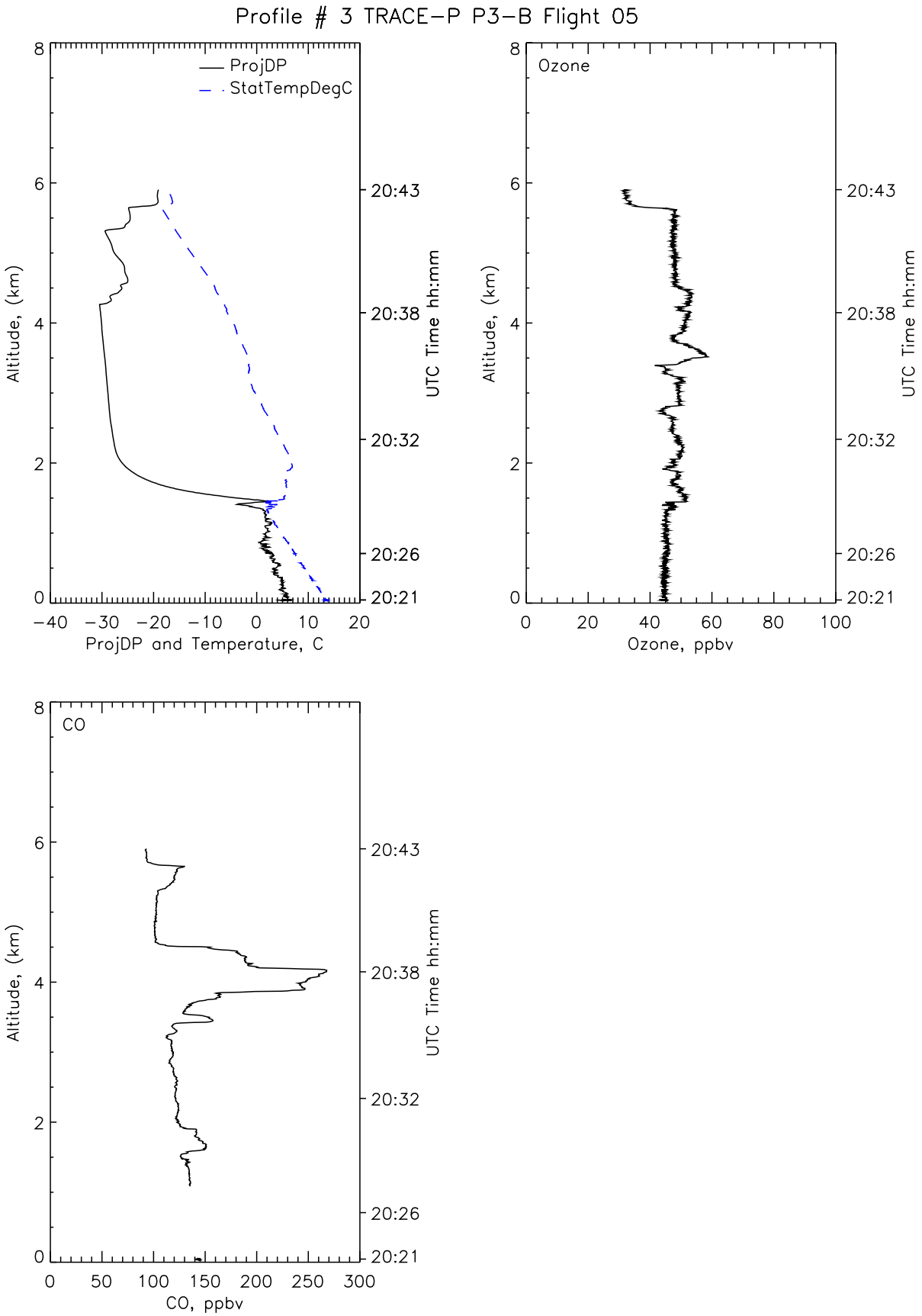
LEFT BLANK

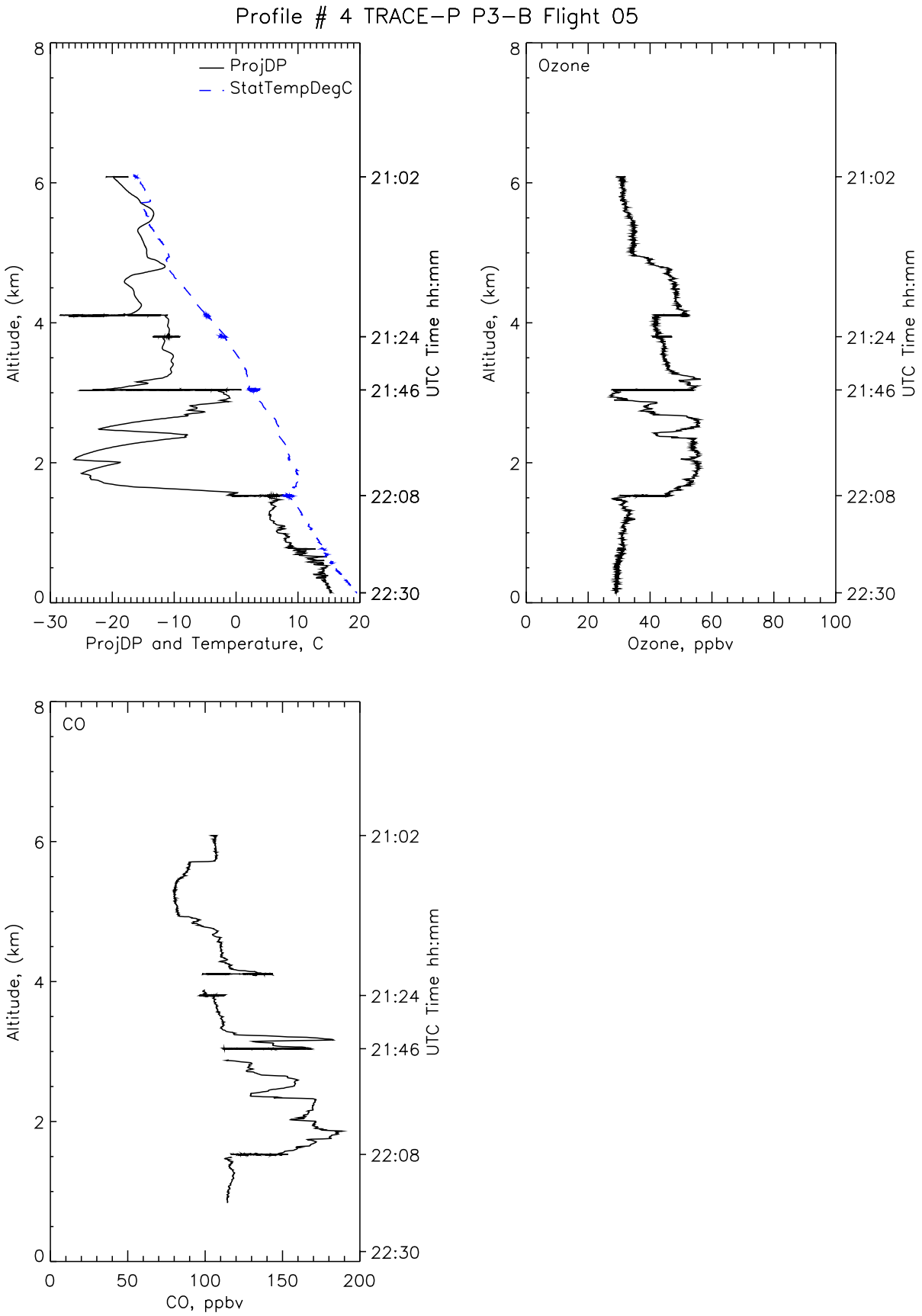

FINAL DATA: TRACE-P P3-B Flight 05
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time

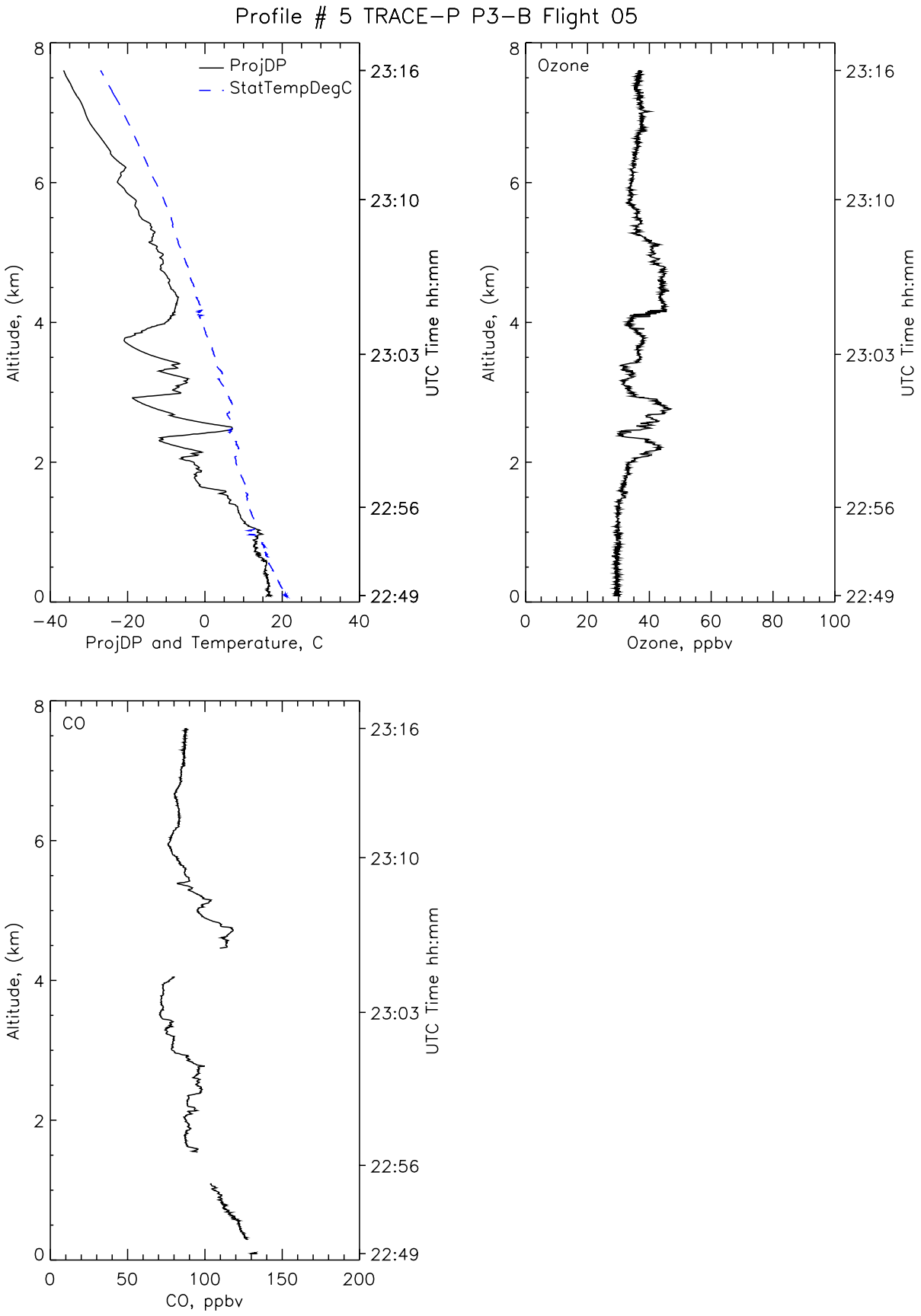

FINAL DATA: TRACE-P P3-B Flight 05
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
17
18
19
20
21
22
23
24
25
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
10000
8000
6000
4000
2000
0
−2000
UTC Time


Profile # 1 TRACE-P P3-B Flight 05
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
17:51
17:47
17:44
17:40
17:37
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
NO DATA
CO, ppbv

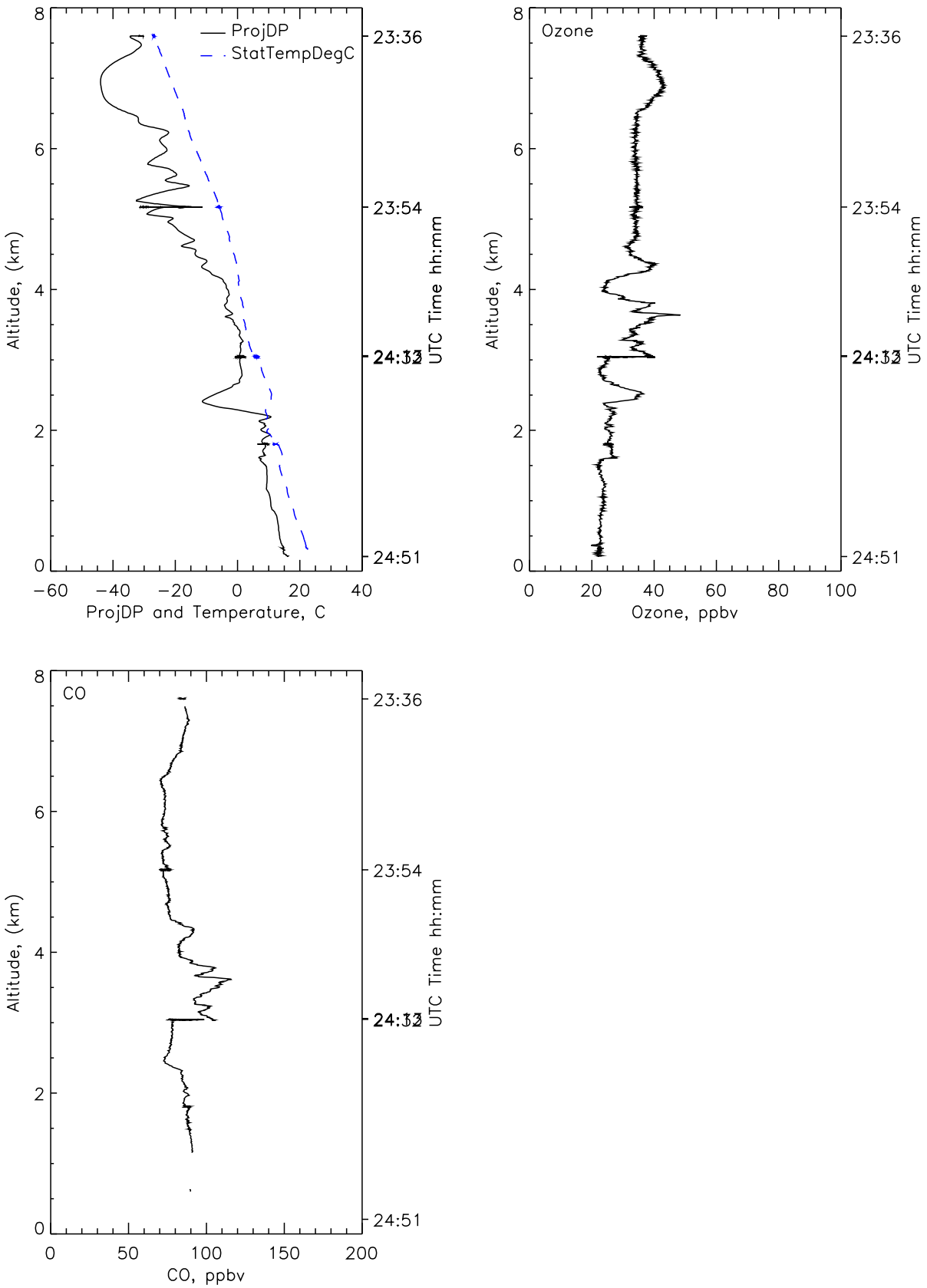

Profile # 2 TRACE-P P3-B Flight 05
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
18:30
18:53
19:16
19:39
20:02
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 3 TRACE-P P3-B Flight 05
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
20:21
20:26
20:32
20:38
20:43
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 4 TRACE-P P3-B Flight 05
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
21:02
21:24
21:46
22:08
22:30
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 5 TRACE-P P3-B Flight 05
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 6 TRACE-P P3-B Flight 05



CHEMICAL and METEOROLOGICAL DATA

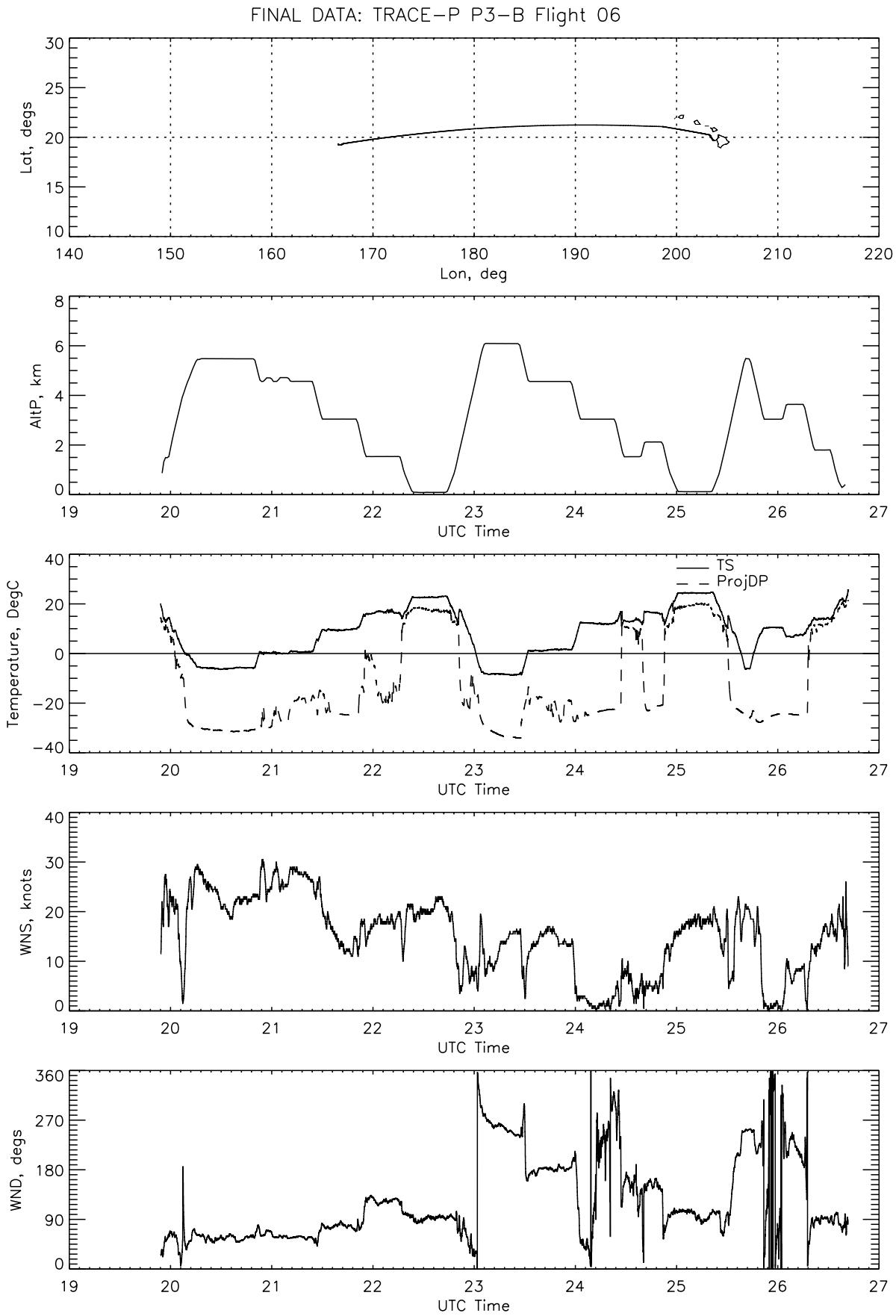
TRACE-P

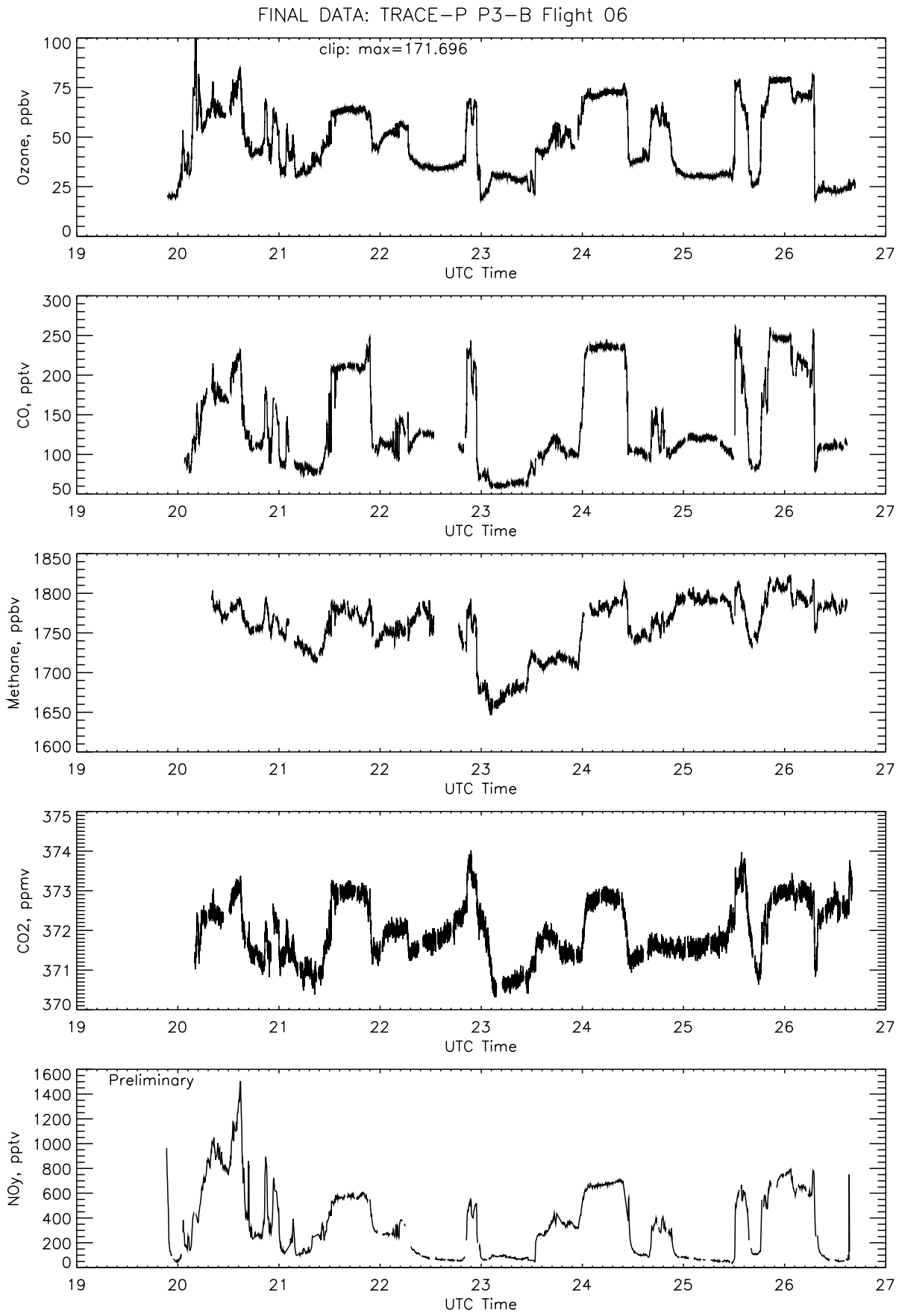
Flight 6P

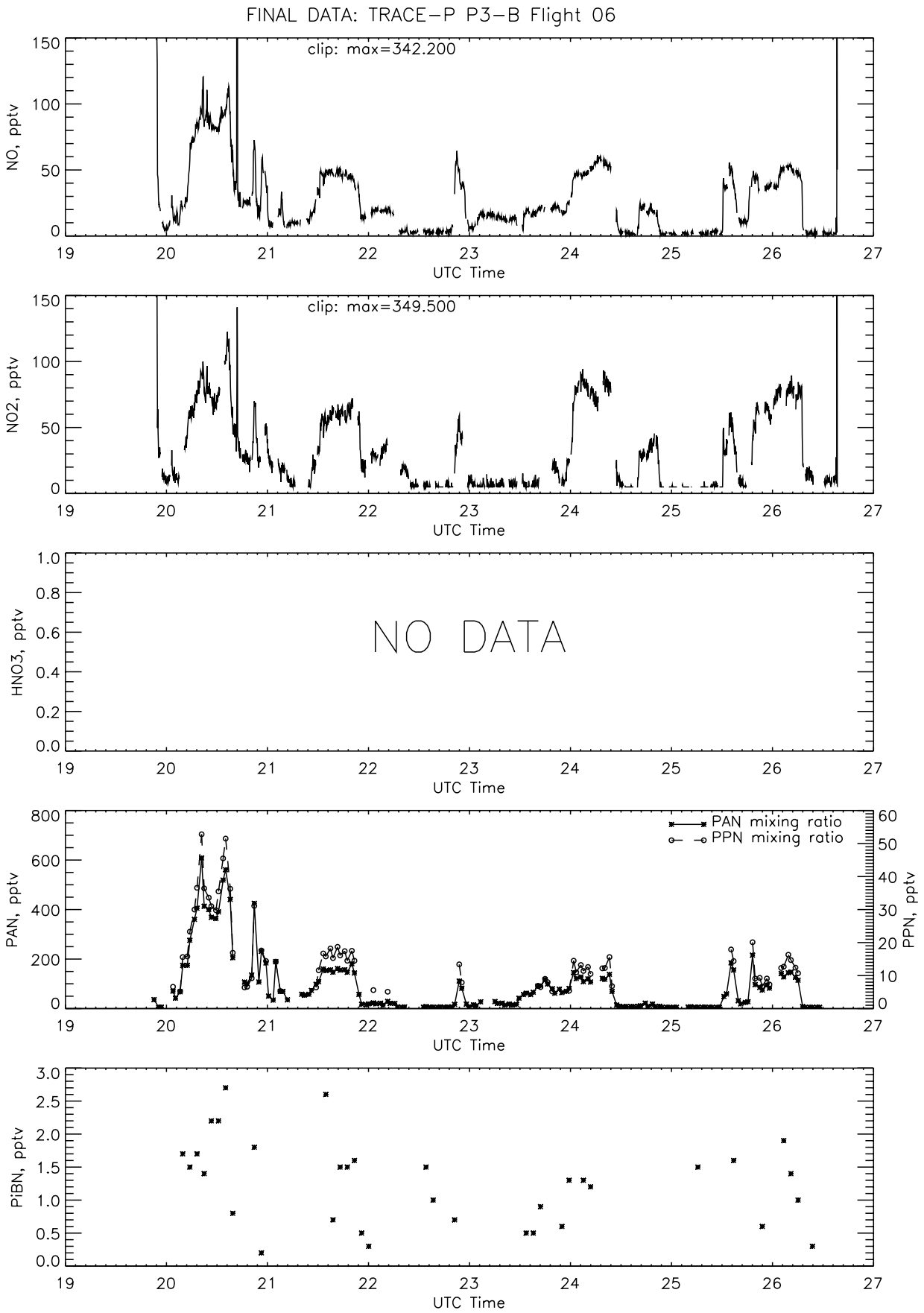
Transit: Kona, HI to Wake Island

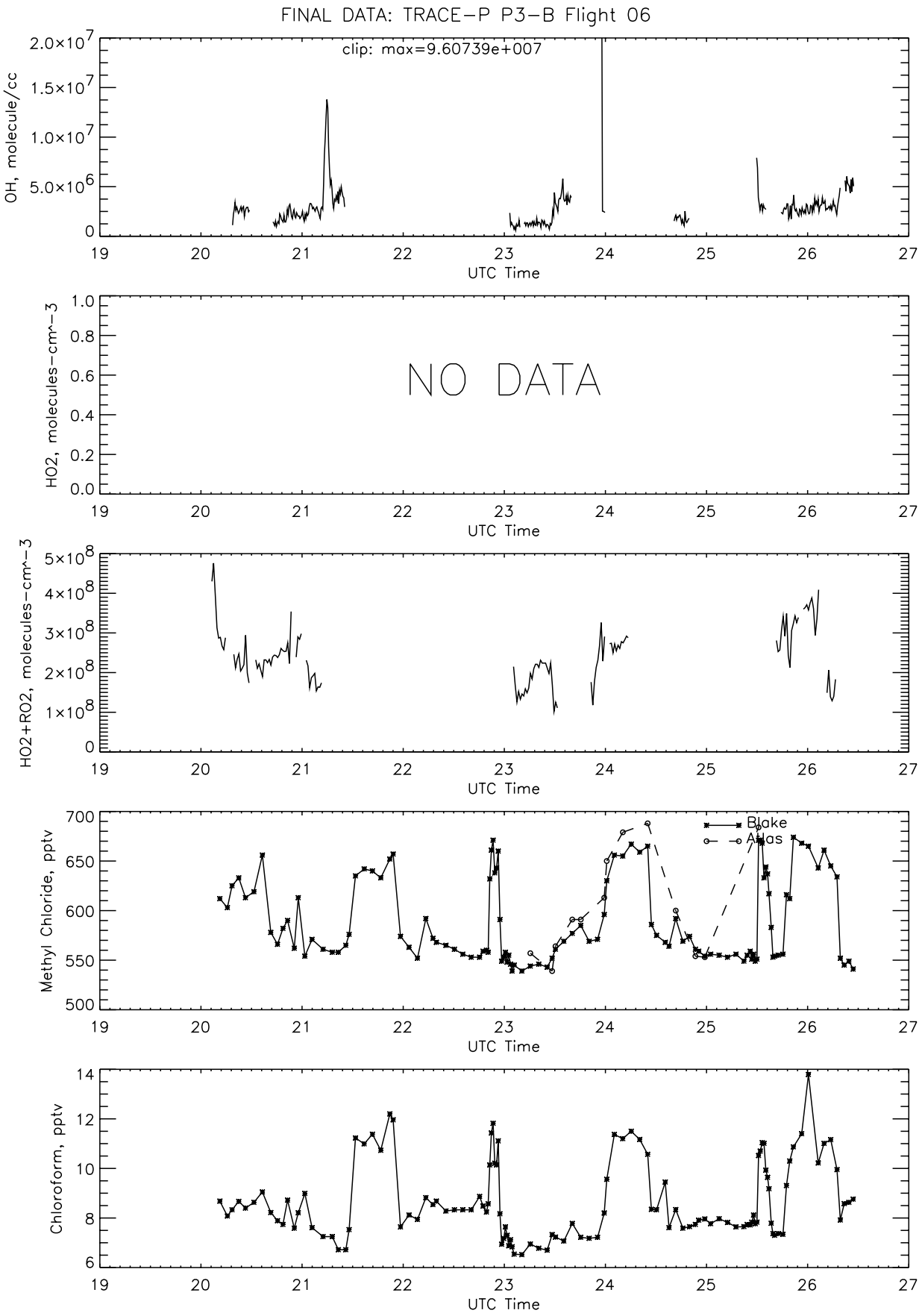
Asian Pollution Subsidence

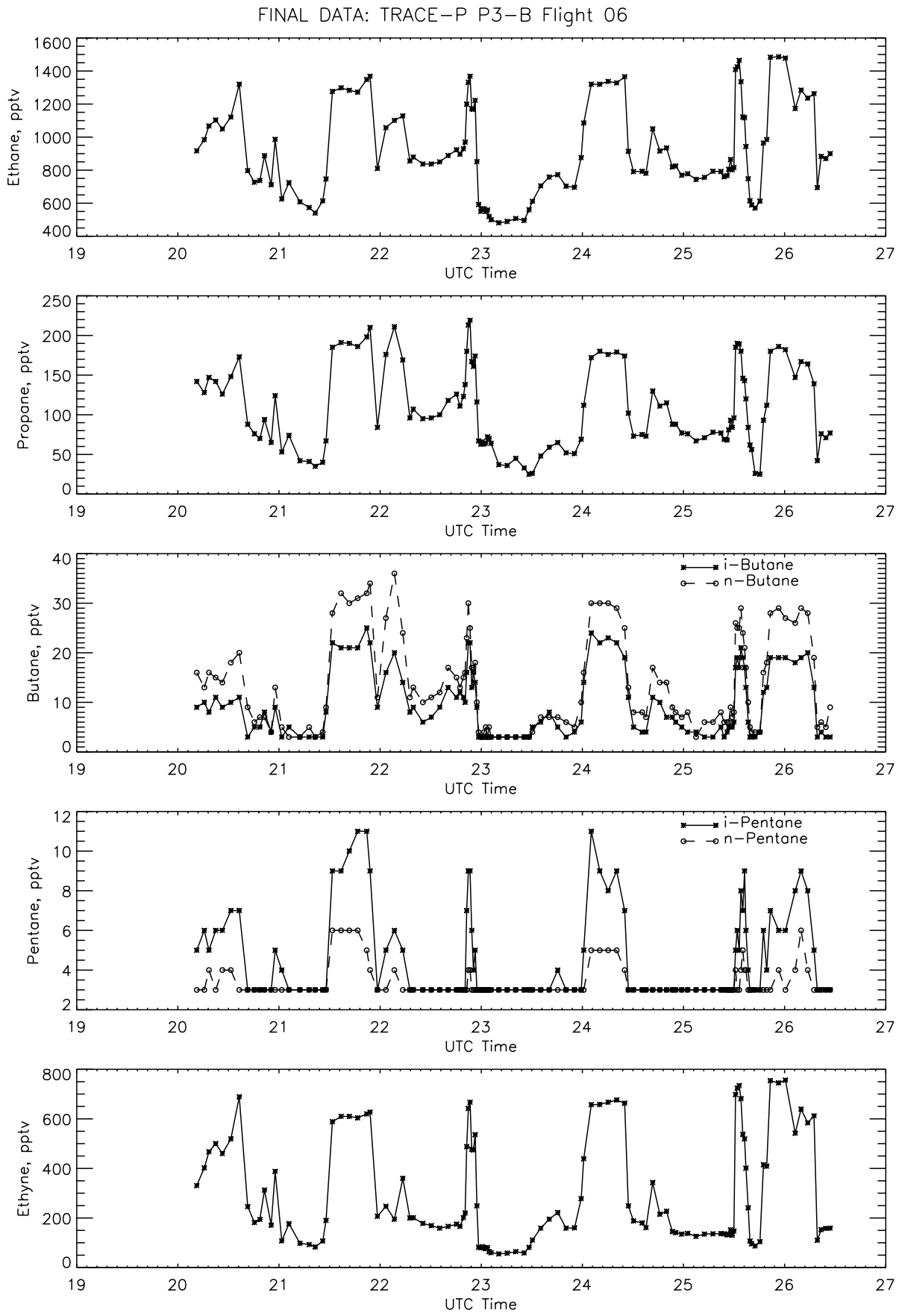
February 27, 2001

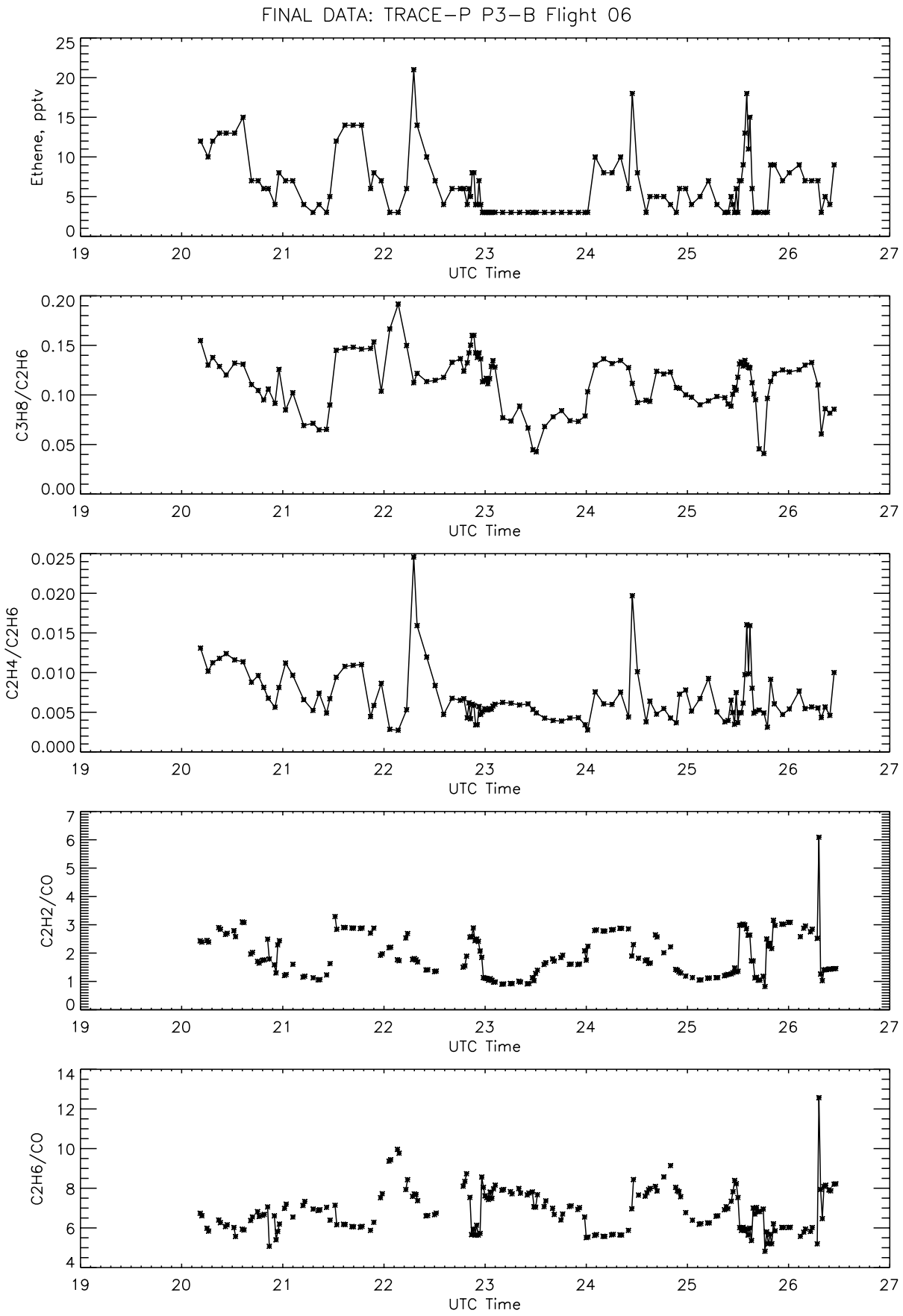

FINAL DATA: TRACE-P P3-B Flight 06
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

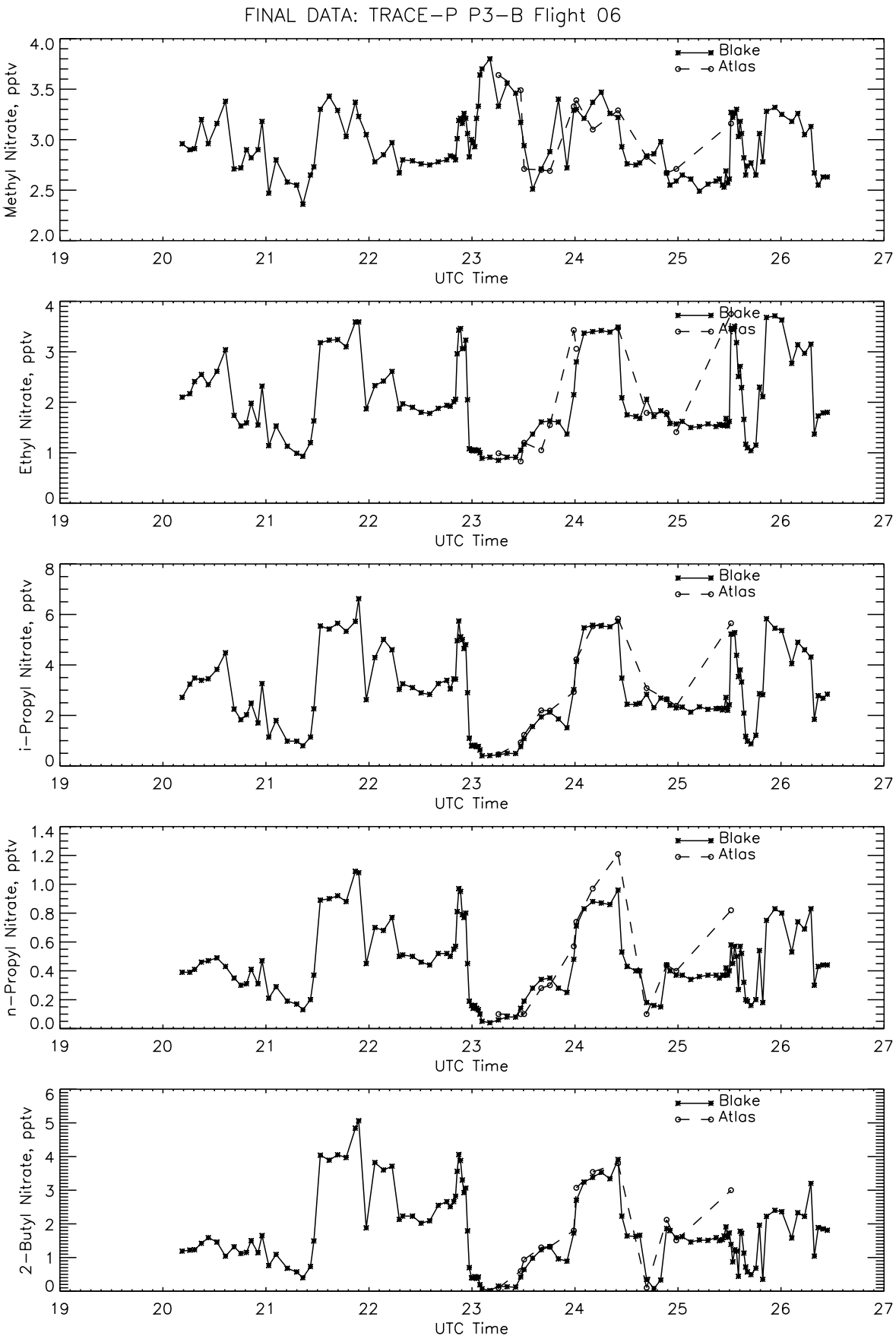

FINAL DATA: TRACE-P P3-B Flight 06
clip: max=171.696
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
Preliminary
UTC Time

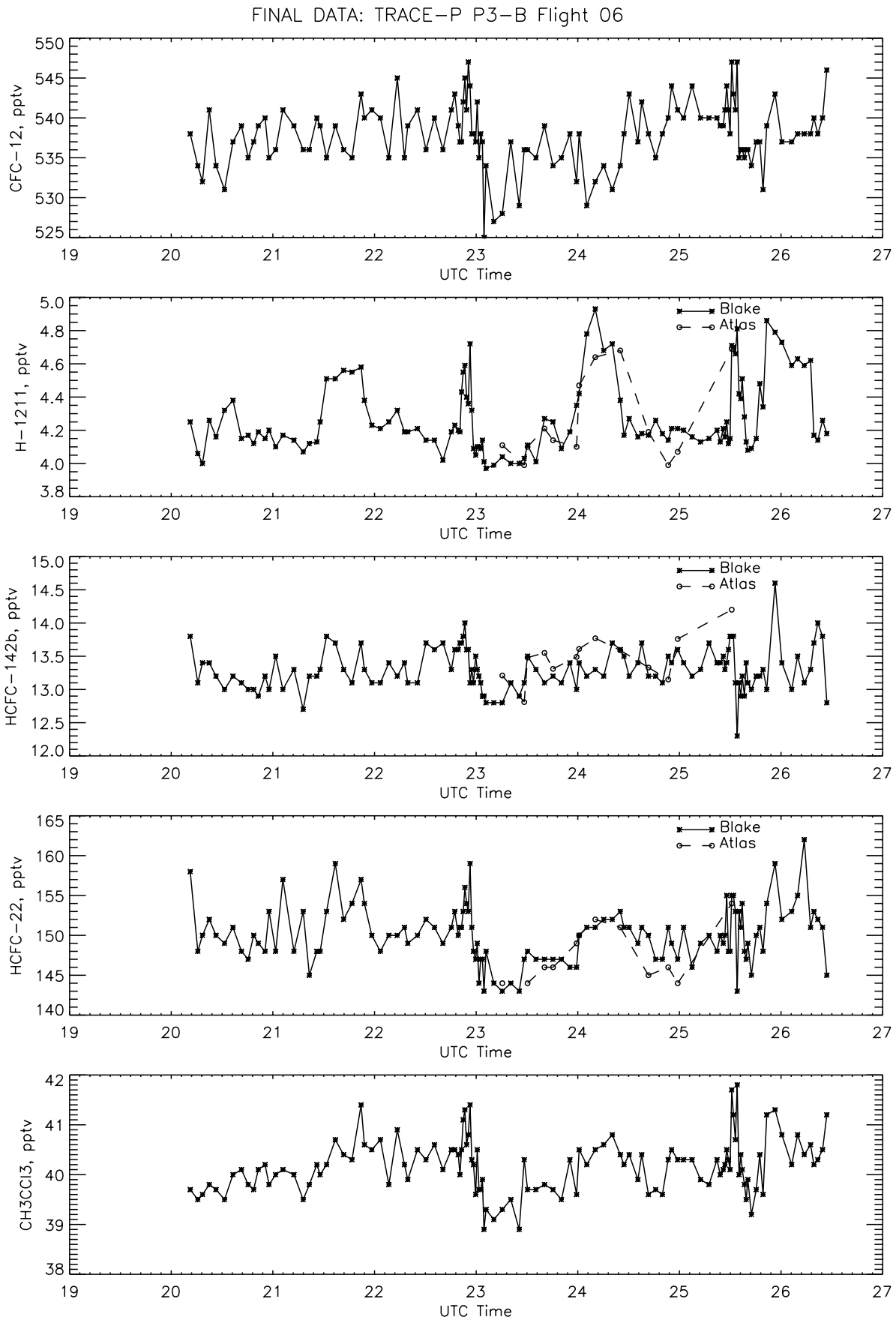

FINAL DATA: TRACE-P P3-B Flight 06
clip: max=342.200
NO, pptv
UTC Time
clip: max=349.500
NO2, pptv
UTC Time
HNO3, pptv
NO DATA
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

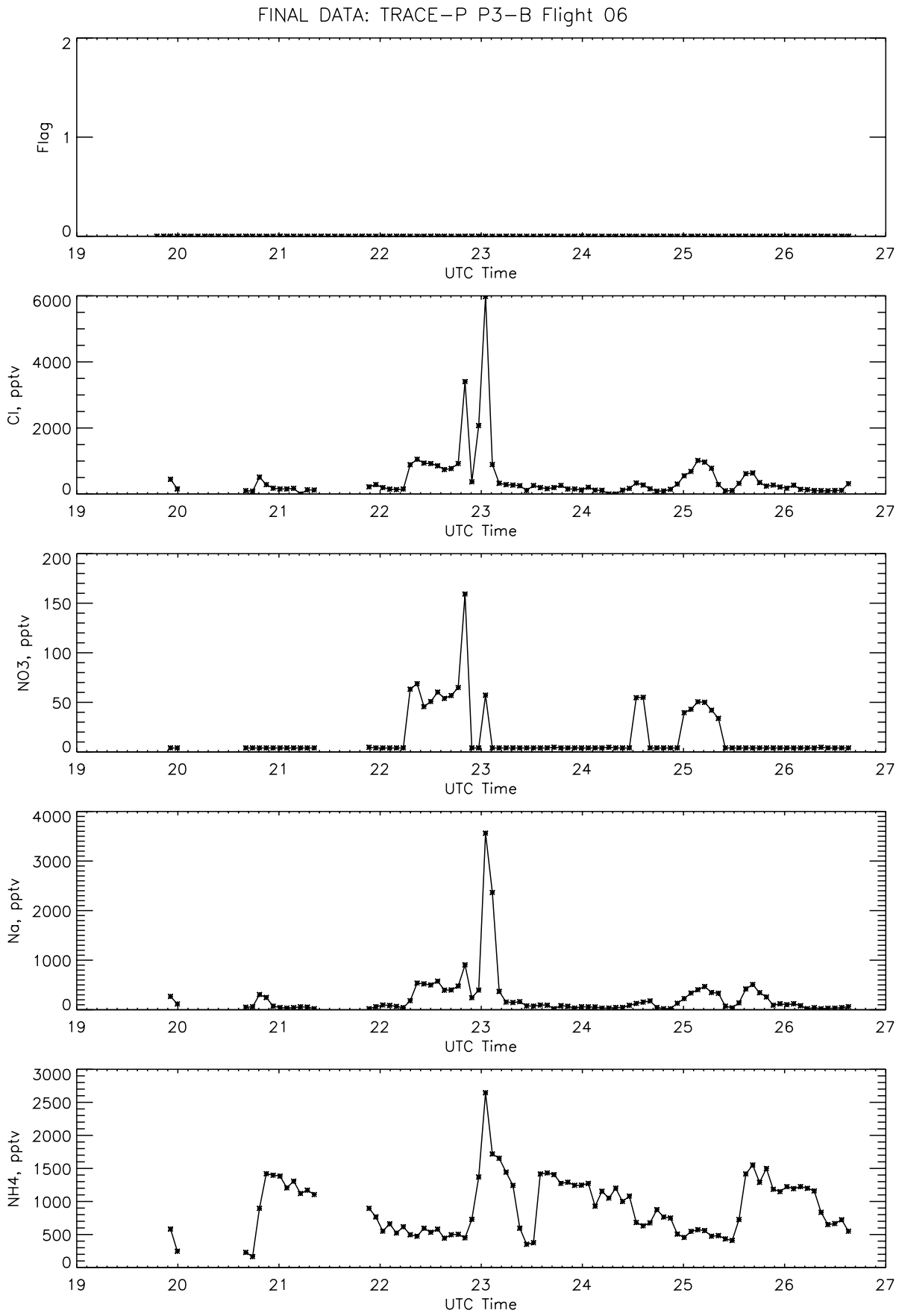

FINAL DATA: TRACE-P P3-B Flight 06
clip: max=9.60739e+007
OH, molecule/cc
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

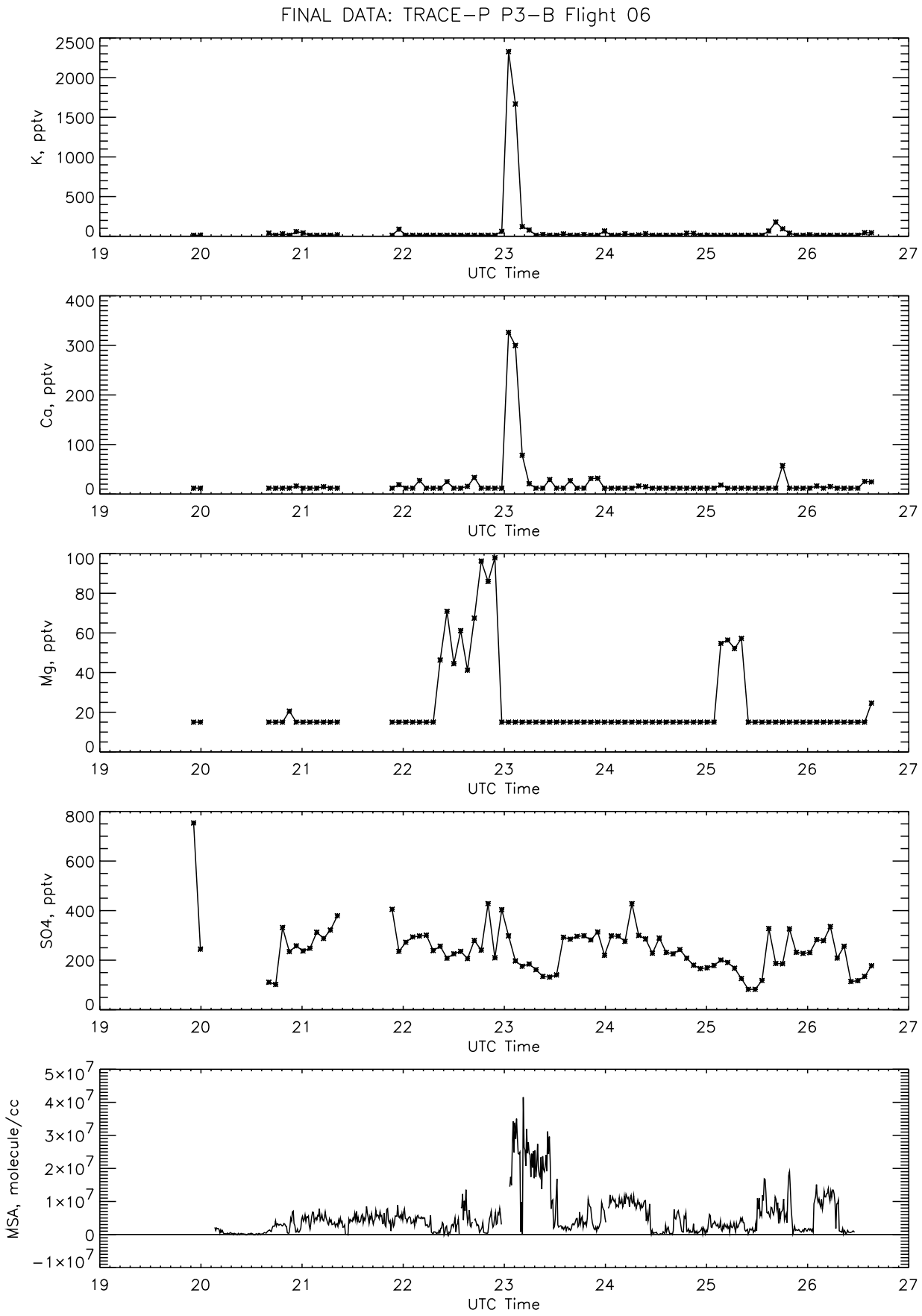

FINAL DATA: TRACE-P P3-B Flight 06
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

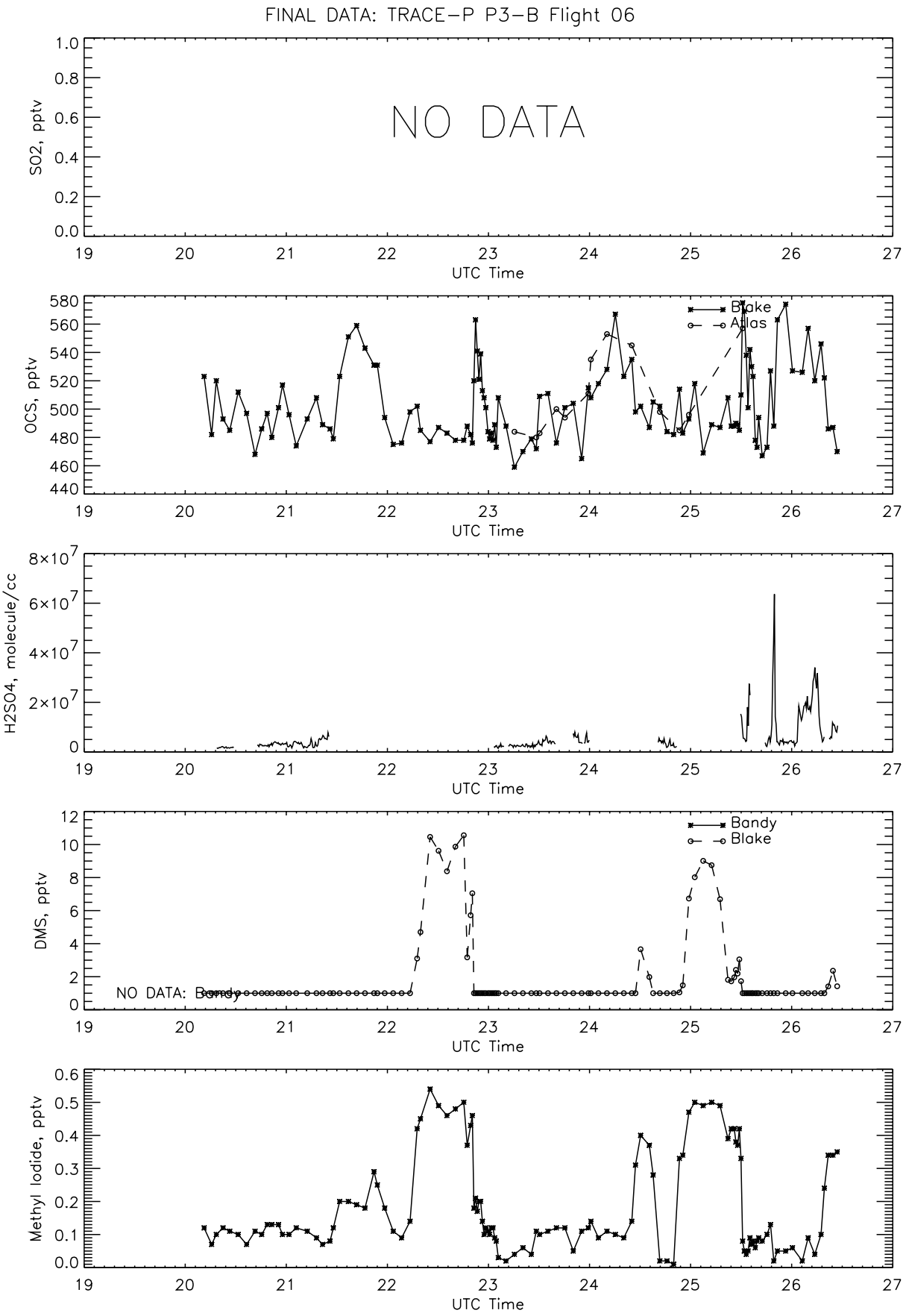

FINAL DATA: TRACE-P P3-B Flight 06
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

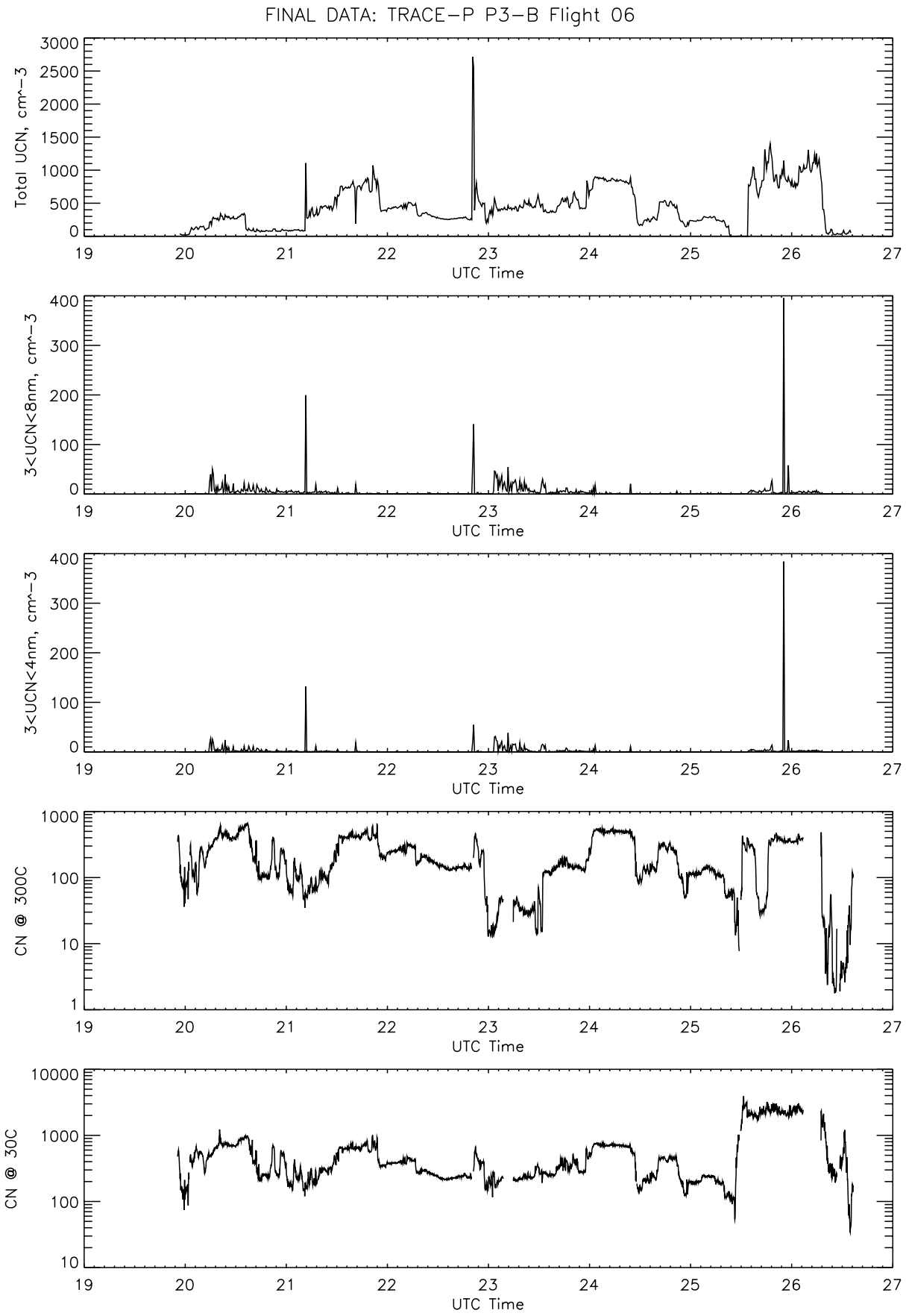

FINAL DATA: TRACE-P P3-B Flight 06
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas

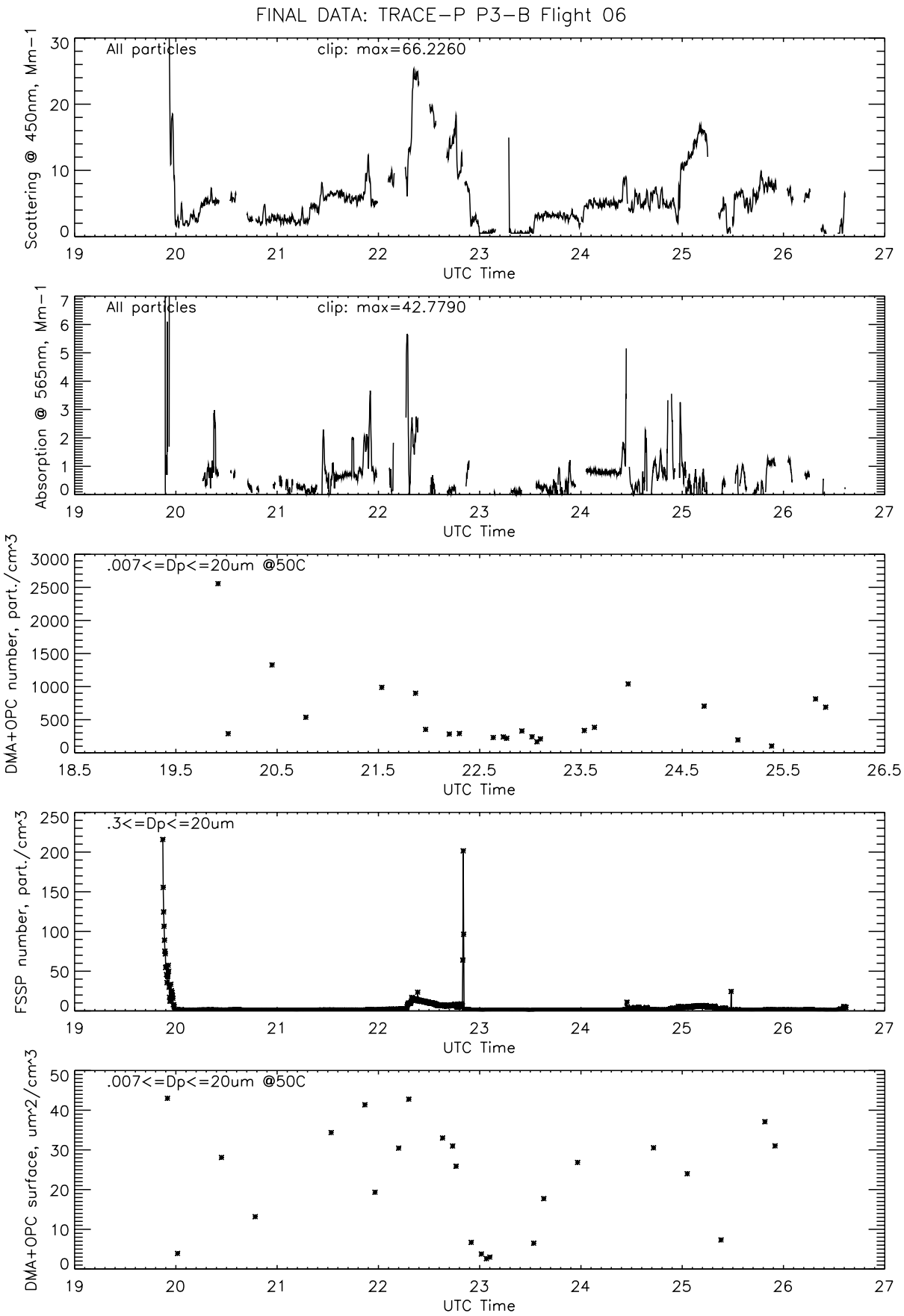

FINAL DATA: TRACE-P P3-B Flight 06
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

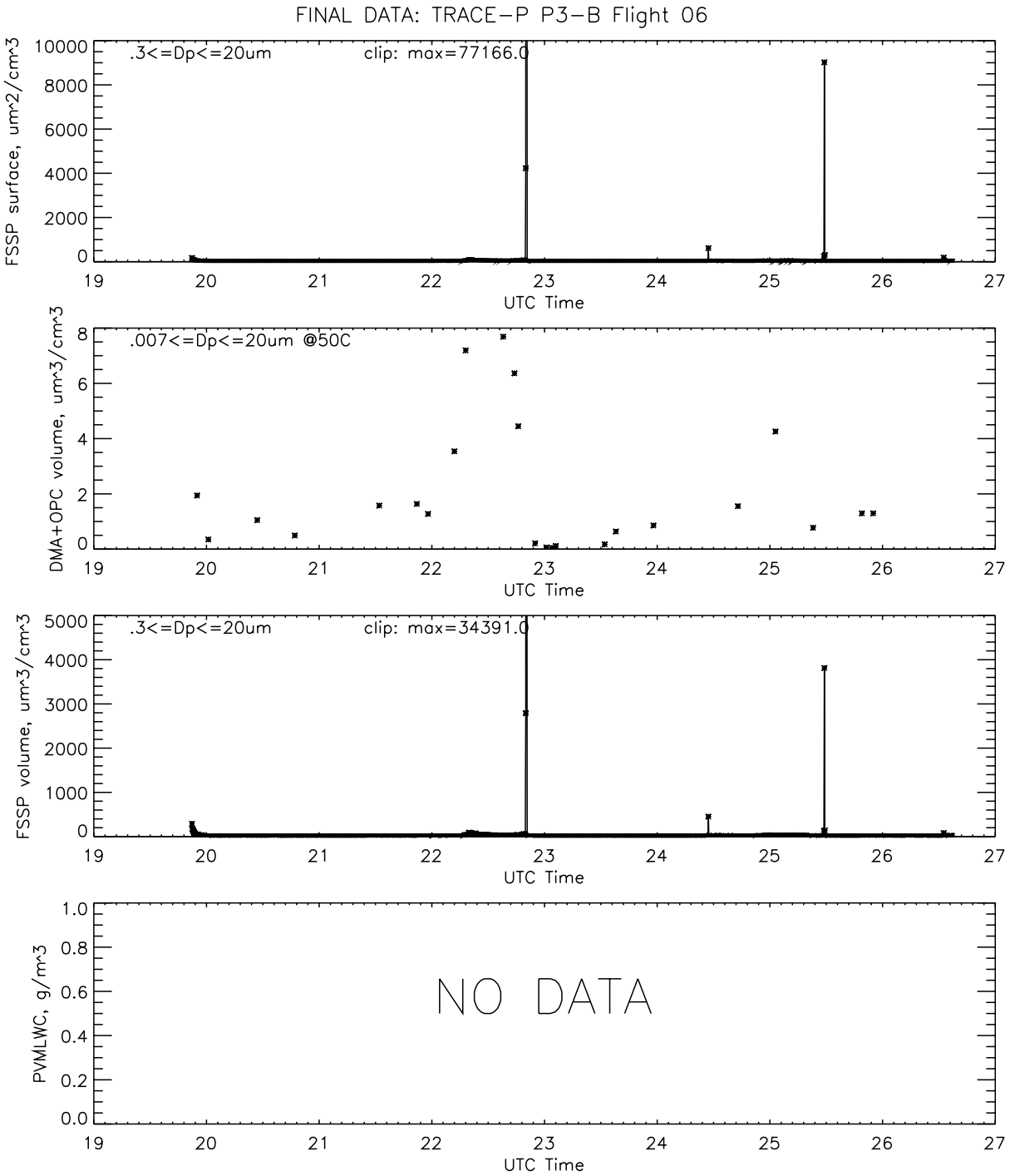

FINAL DATA: TRACE-P P3-B Flight 06
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 06
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

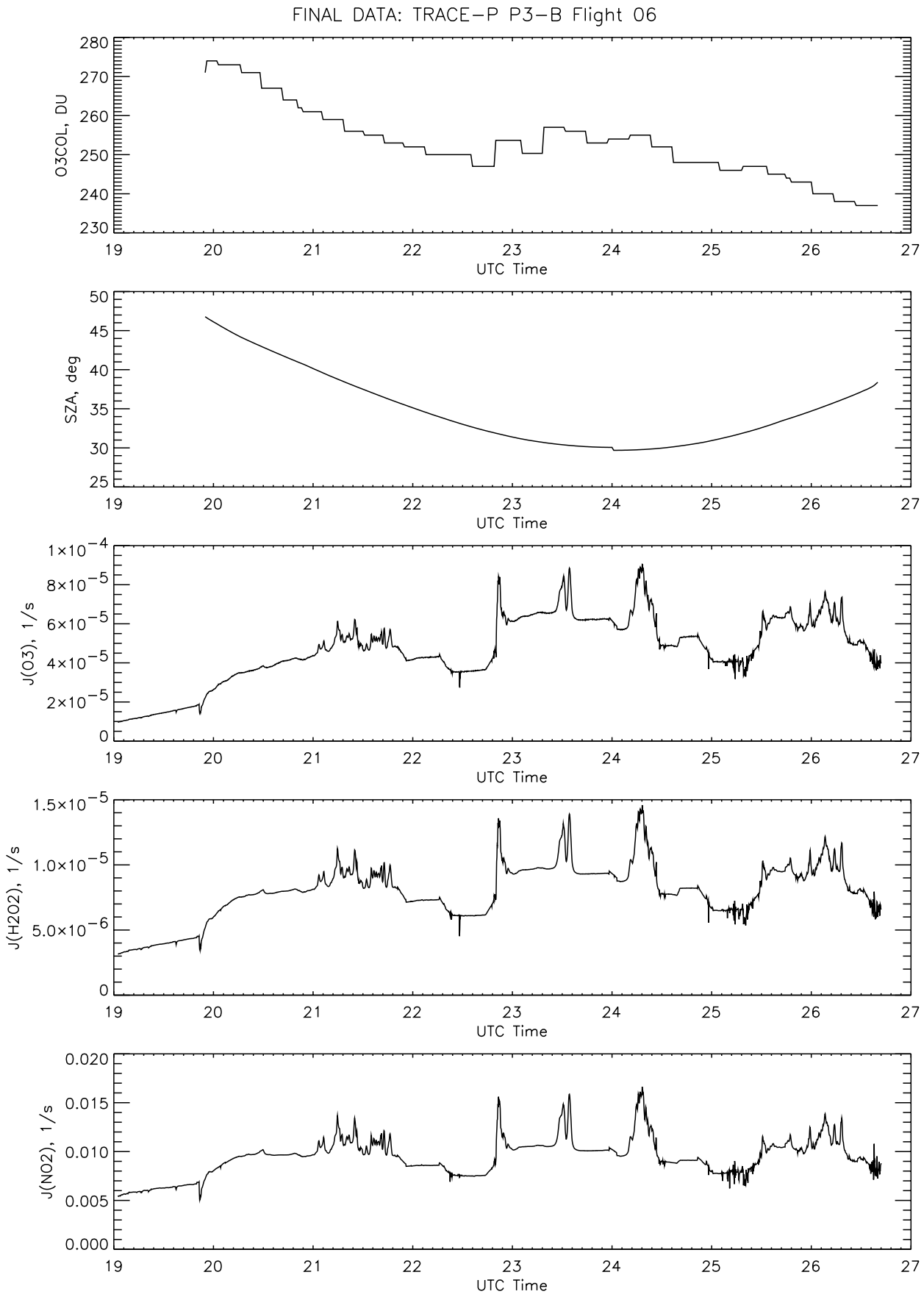

FINAL DATA: TRACE-P P3-B Flight 06
NO DATA
SO2, pptv
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv
UTC Time

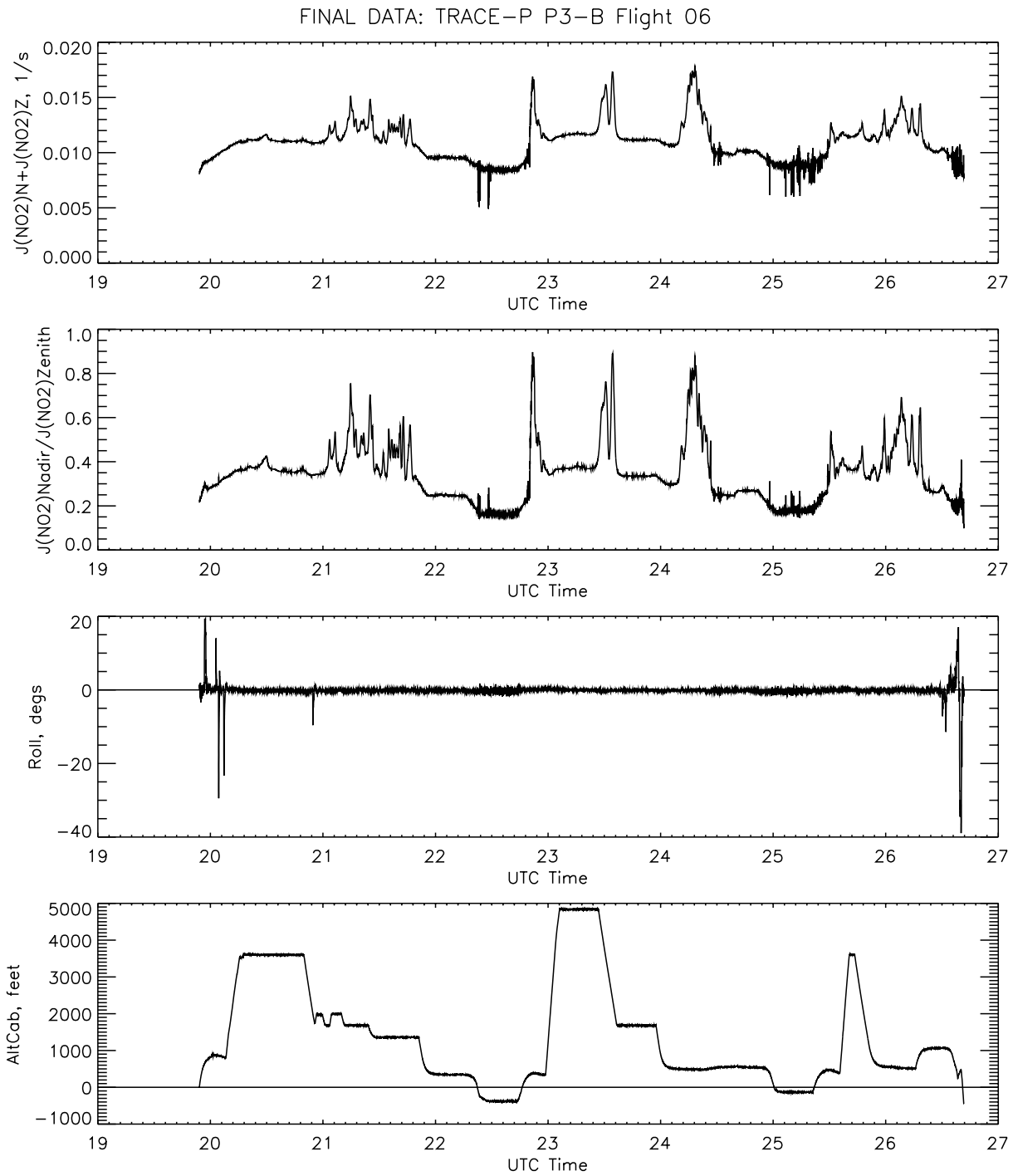

FINAL DATA: TRACE-P P3-B Flight 06
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

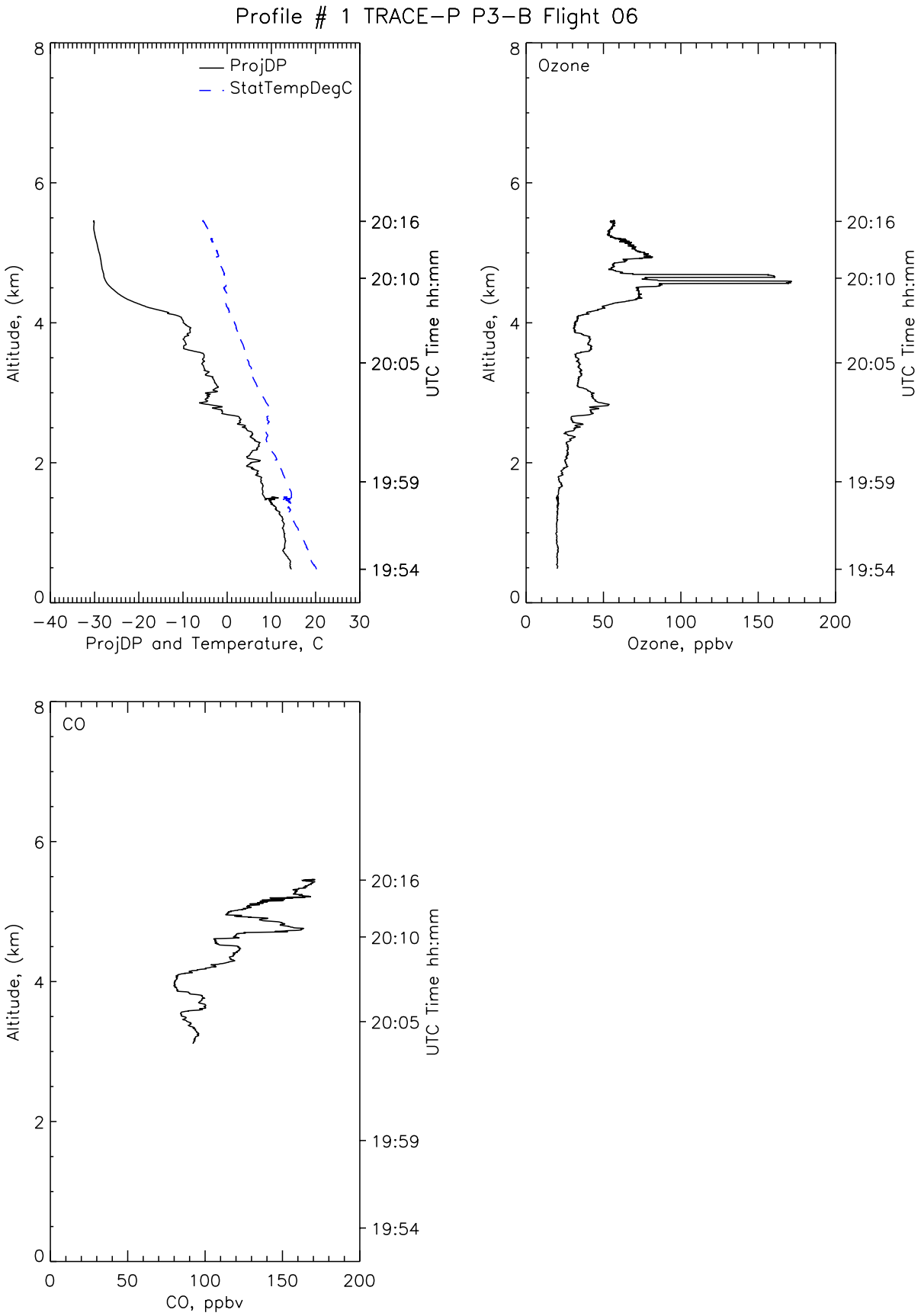

FINAL DATA: TRACE-P P3-B Flight 06
All particles
clip: max=66.2260
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=42.7790
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

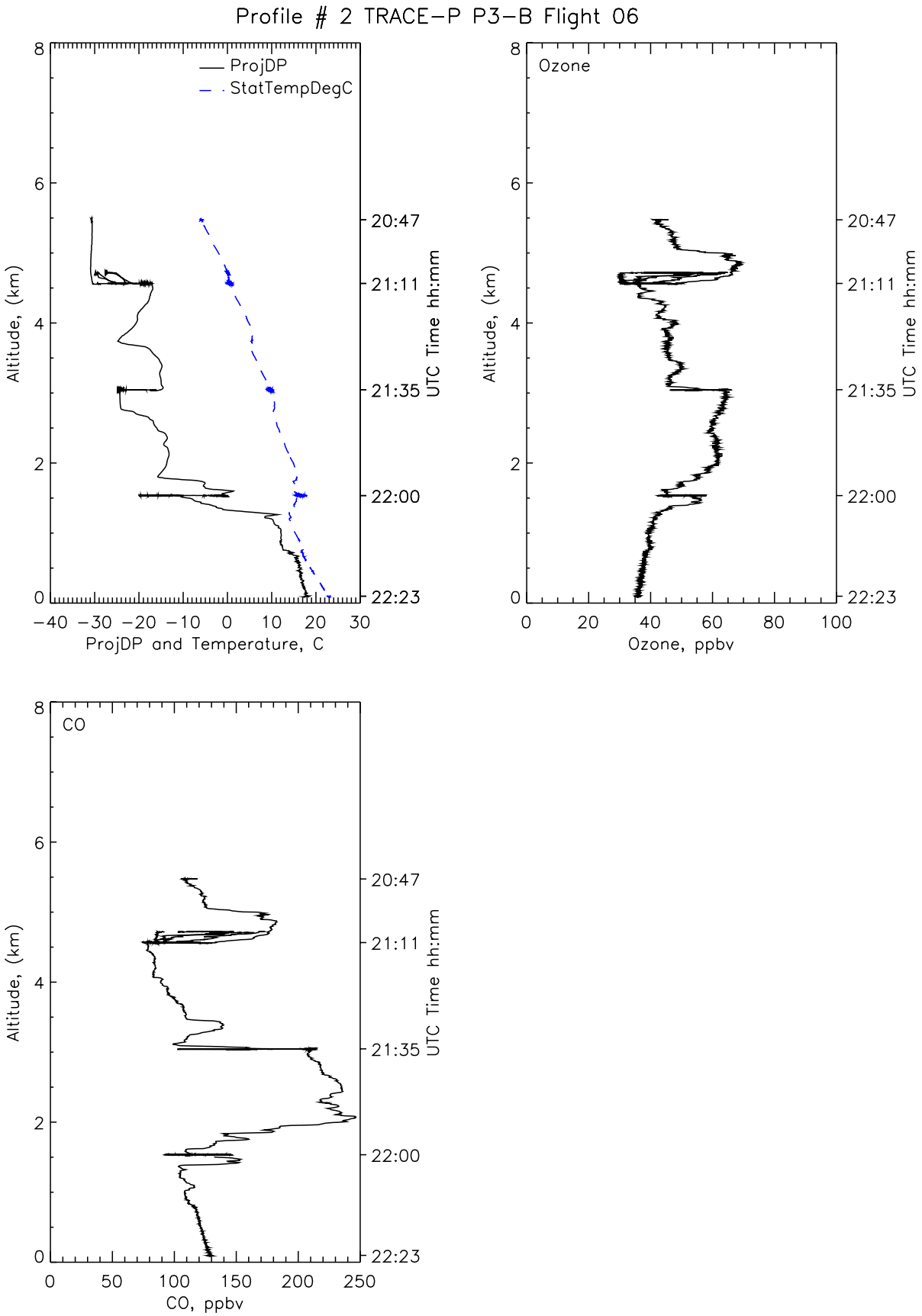

FINAL DATA: TRACE-P P3-B Flight 06
.3<=Dp<=20um
clip: max=77166.0
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
clip: max=34391.0
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
NO DATA
UTC Time

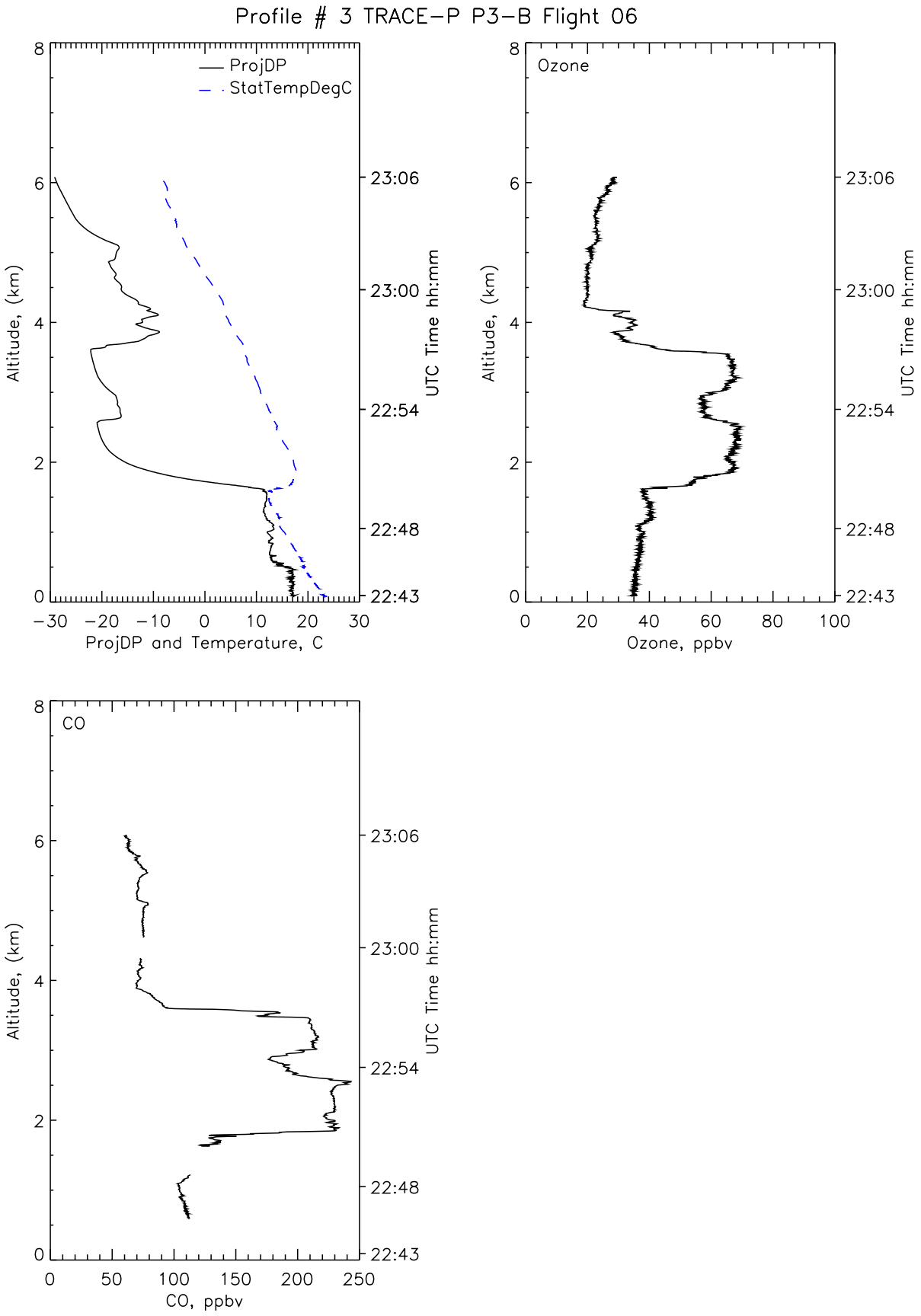
LEFT BLANK

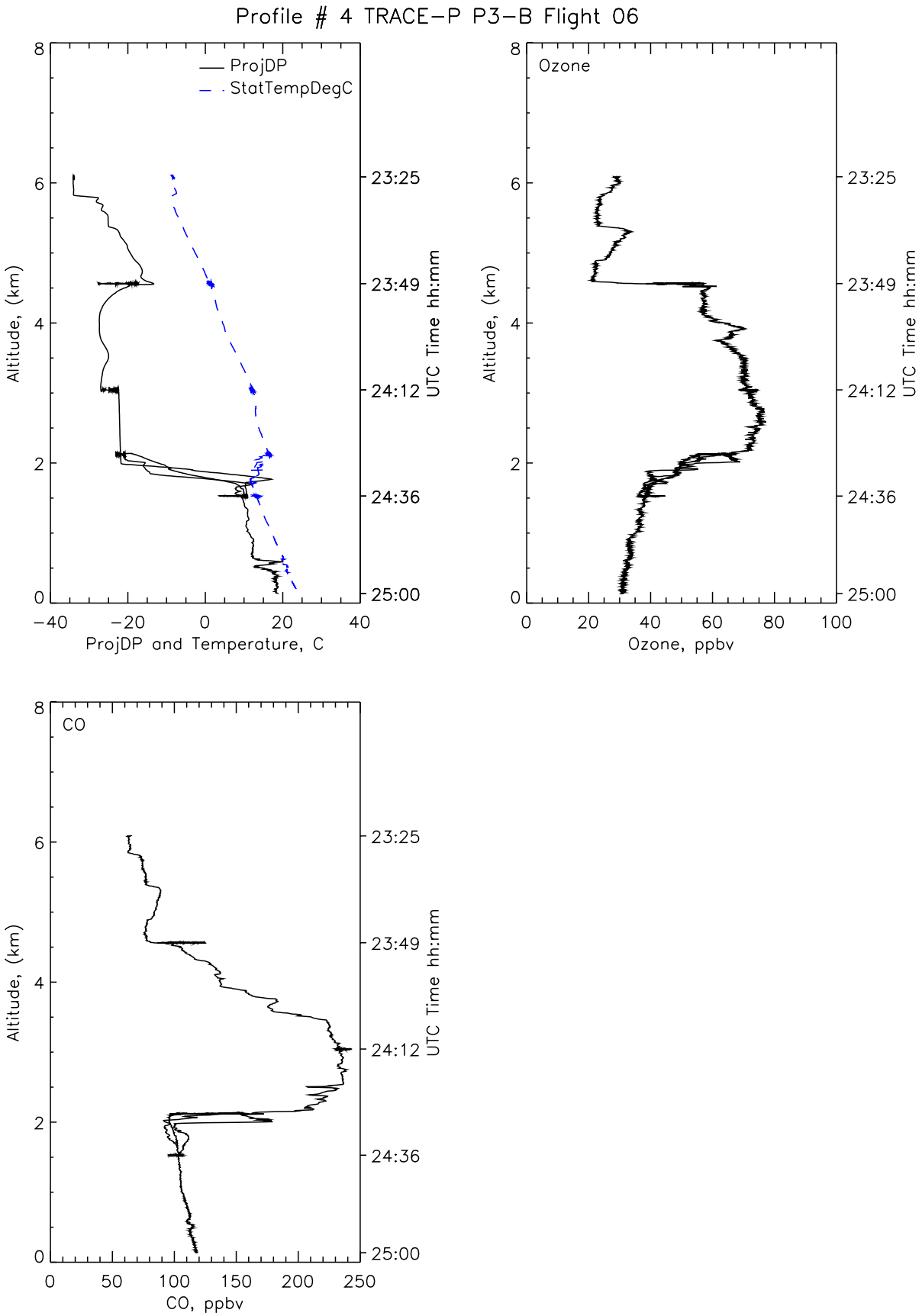

FINAL DATA: TRACE-P P3-B Flight 06
O3COL, DU
280
270
260
250
240
230
19
20
21
22
23
24
25
26
27
UTC Time
SZA, deg
50
45
40
35
30
25
UTC Time
J(O3), 1/s
1×10^-4
8×10^-5
6×10^-5
4×10^-5
2×10^-5
0
UTC Time
J(H2O2), 1/s
1.5×10^-5
1.0×10^-5
5.0×10^-6
0
UTC Time
J(NO2), 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time


FINAL DATA: TRACE-P P3-B Flight 06
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
19
20
21
22
23
24
25
26
27
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
20
0
−20
−40
UTC Time
AltCab, feet
5000
4000
3000
2000
1000
0
−1000
UTC Time

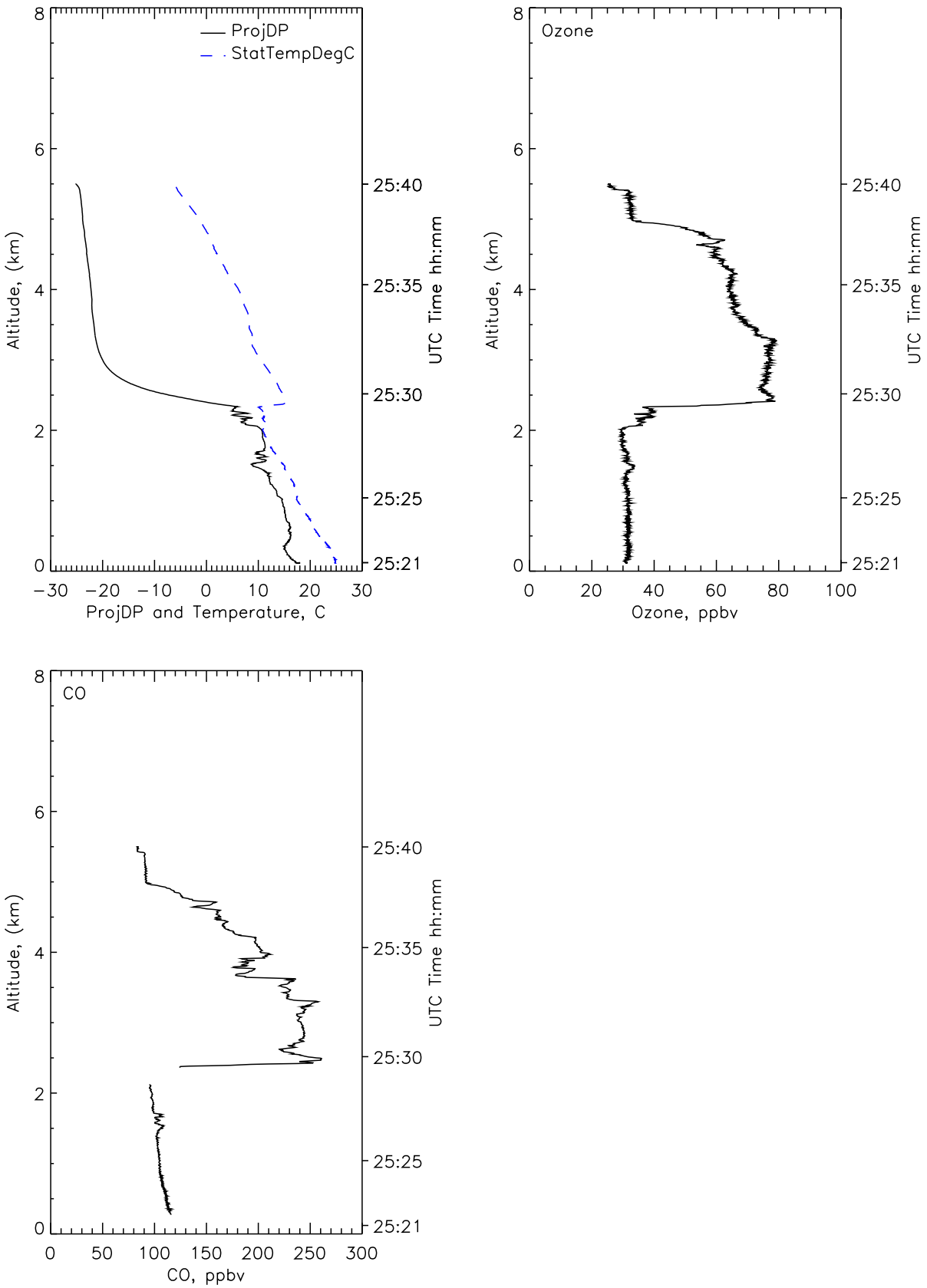

Profile # 1 TRACE-P P3-B Flight 06
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

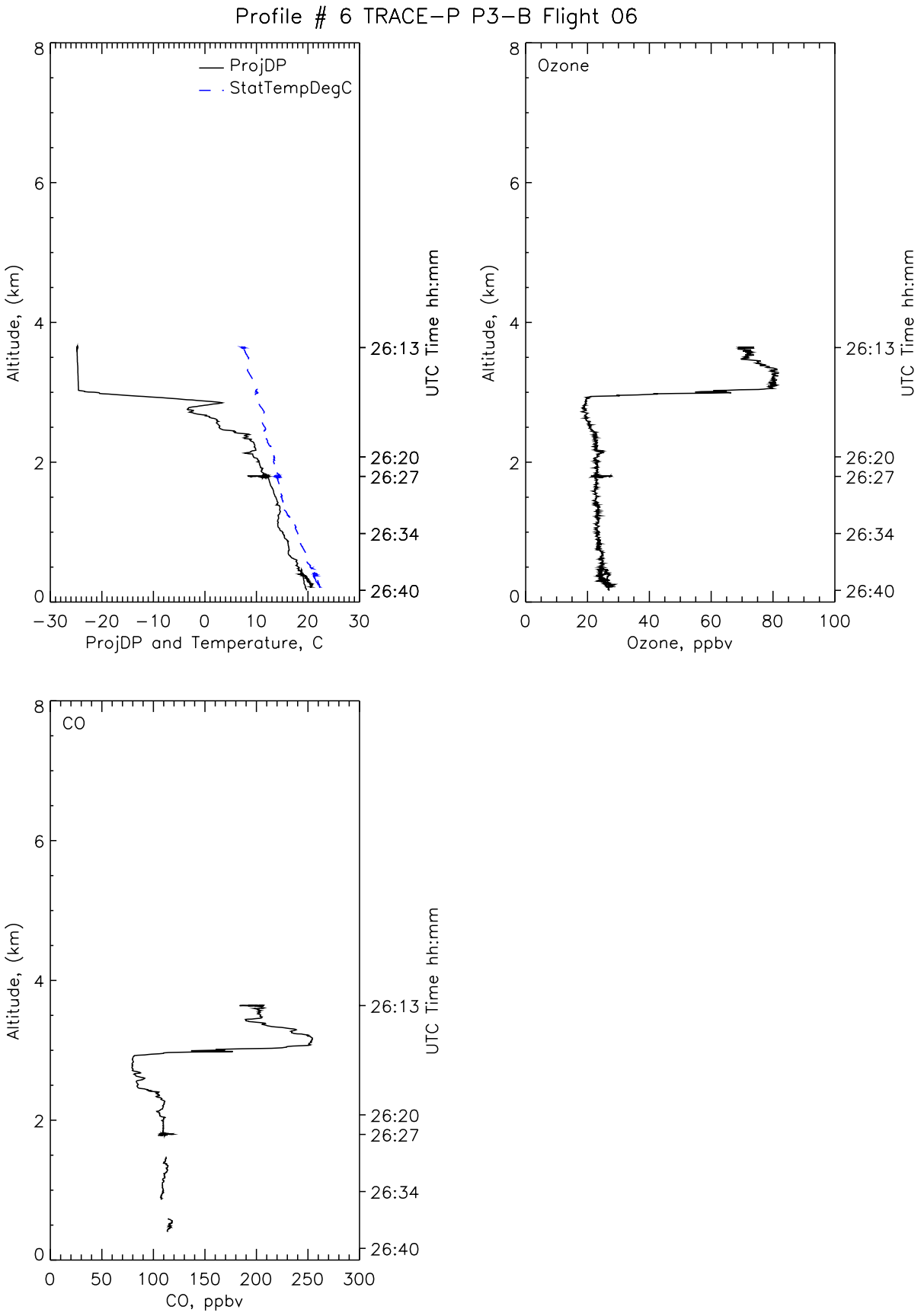

Profile # 2 TRACE-P P3-B Flight 06
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
20:47
21:11
21:35
22:00
22:23
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 3 TRACE-P P3-B Flight 06
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 4 TRACE-P P3-B Flight 06
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 5 TRACE-P P3-B Flight 06




Profile # 6 TRACE-P P3-B Flight 06
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
26:13
26:20
26:27
26:34
26:40
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

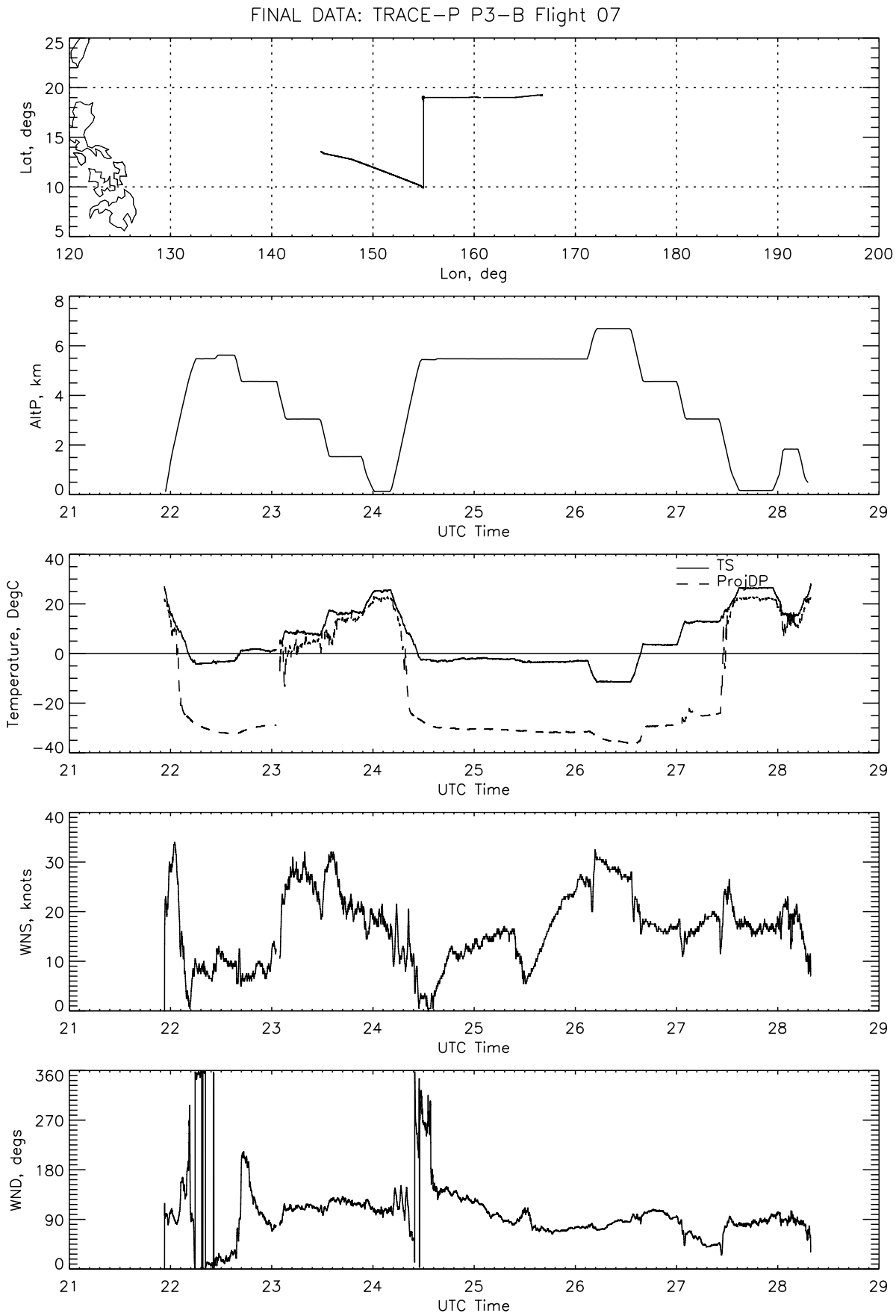
TRACE-P

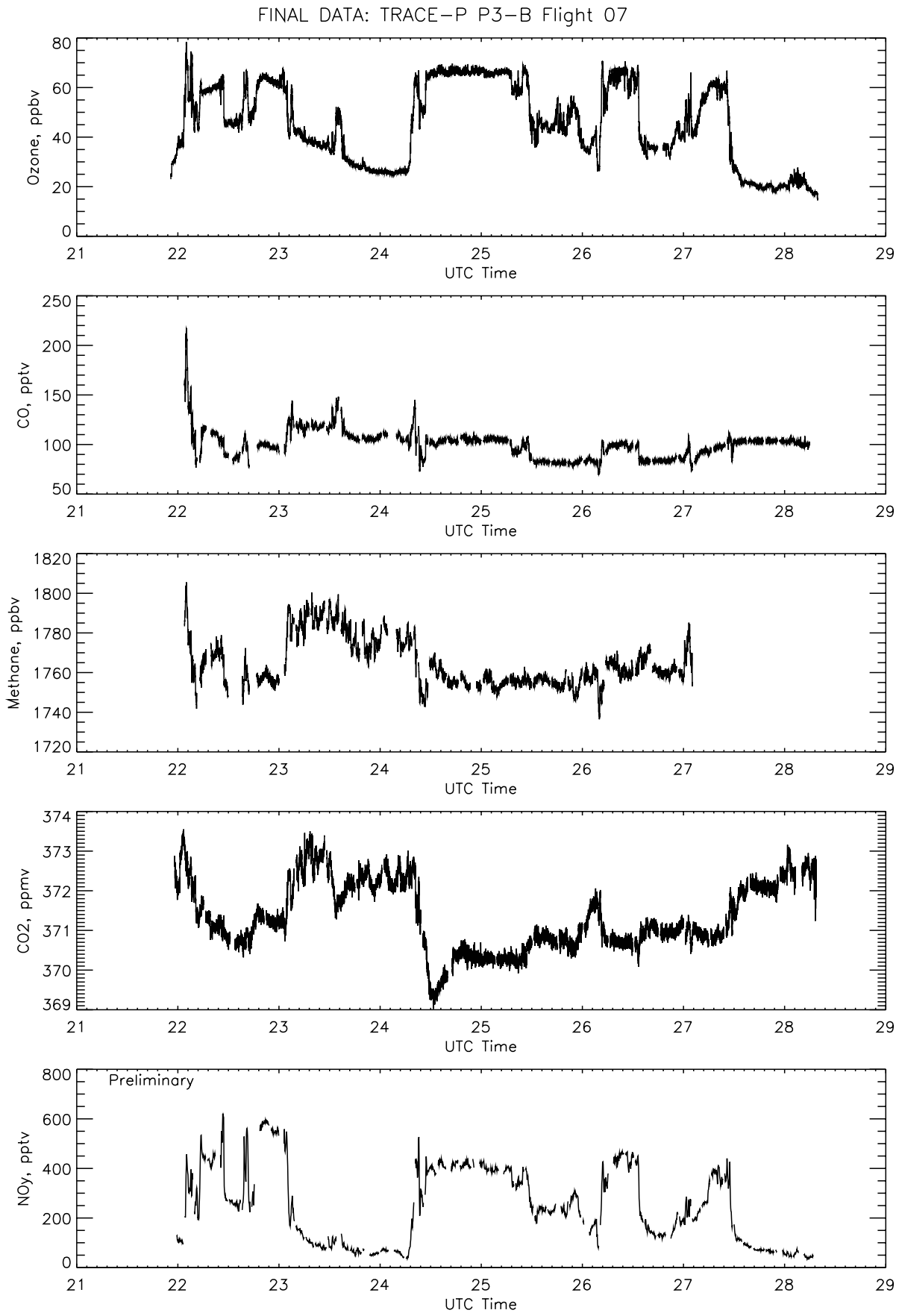
Flight 7P

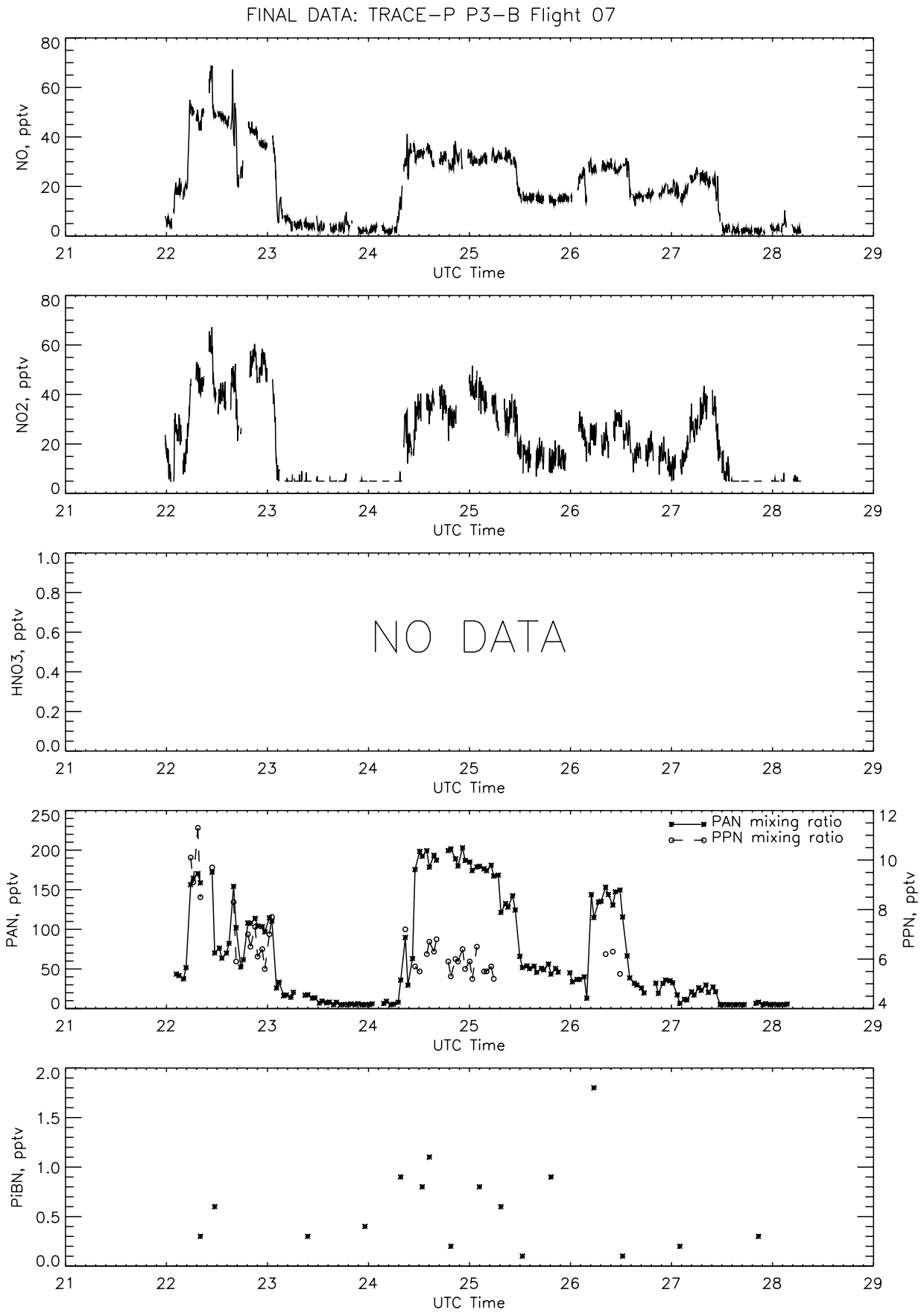
Transit: Wake Island to Guam

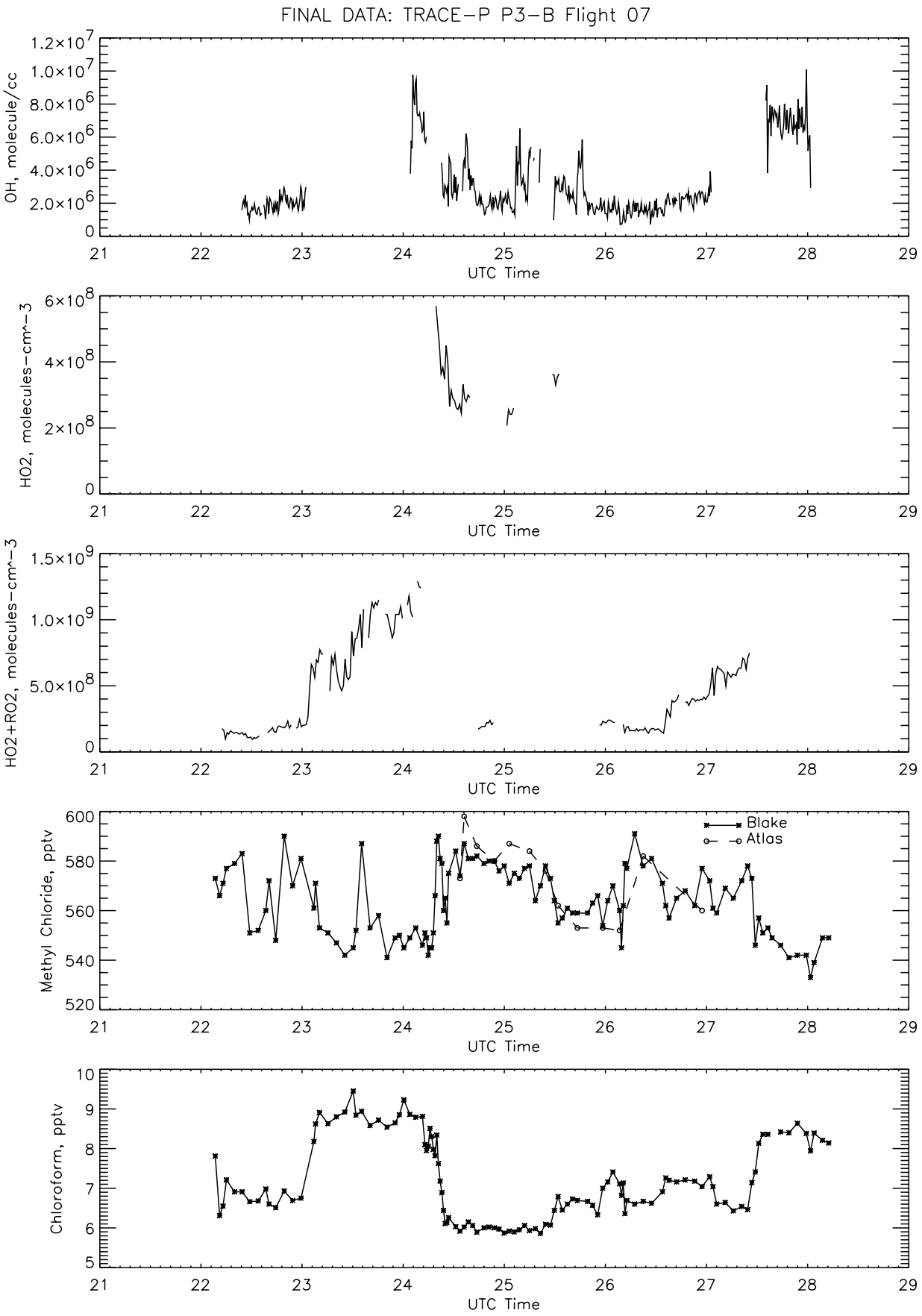
Tropical/Subtropical Gradient

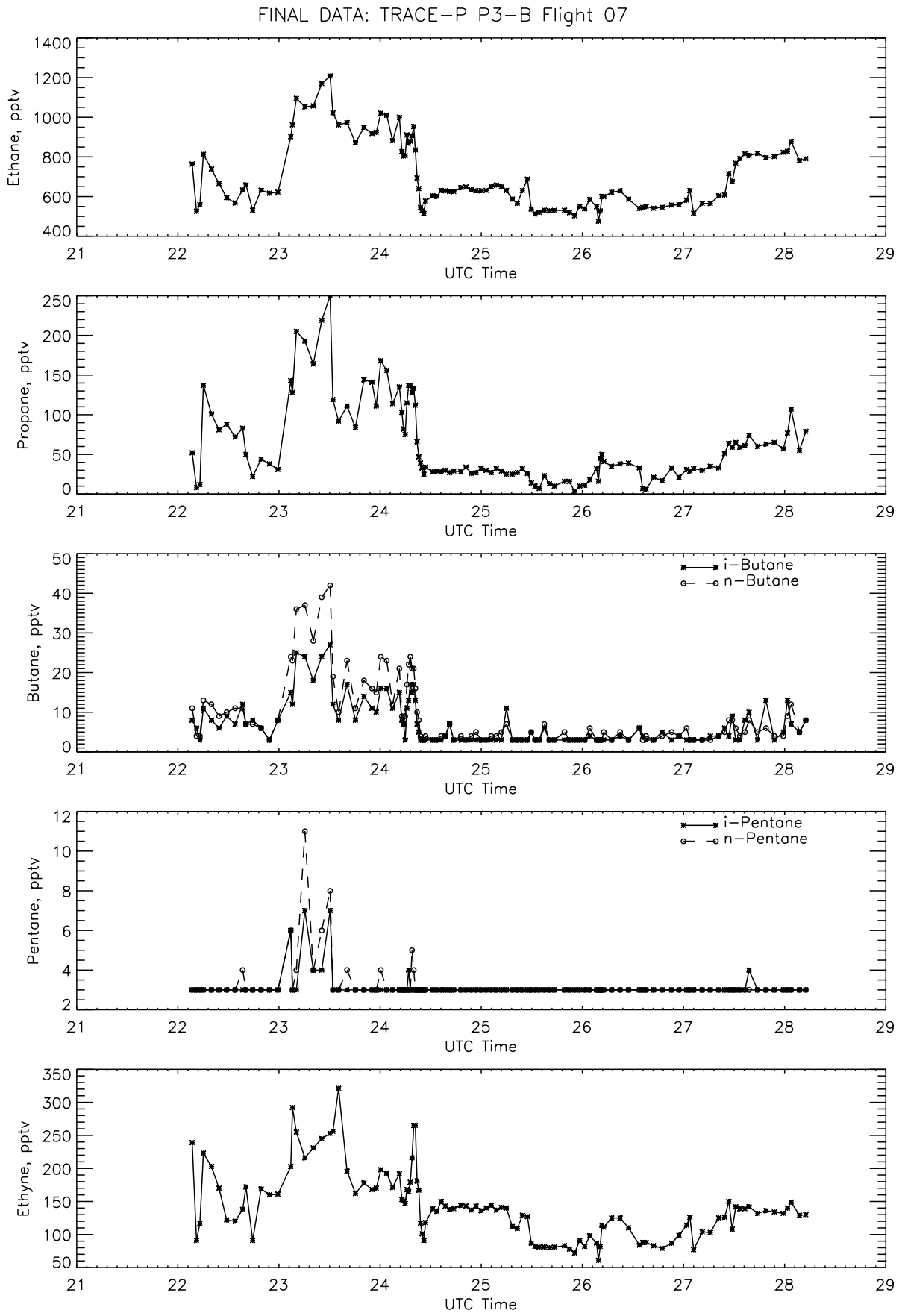
March 1, 2001

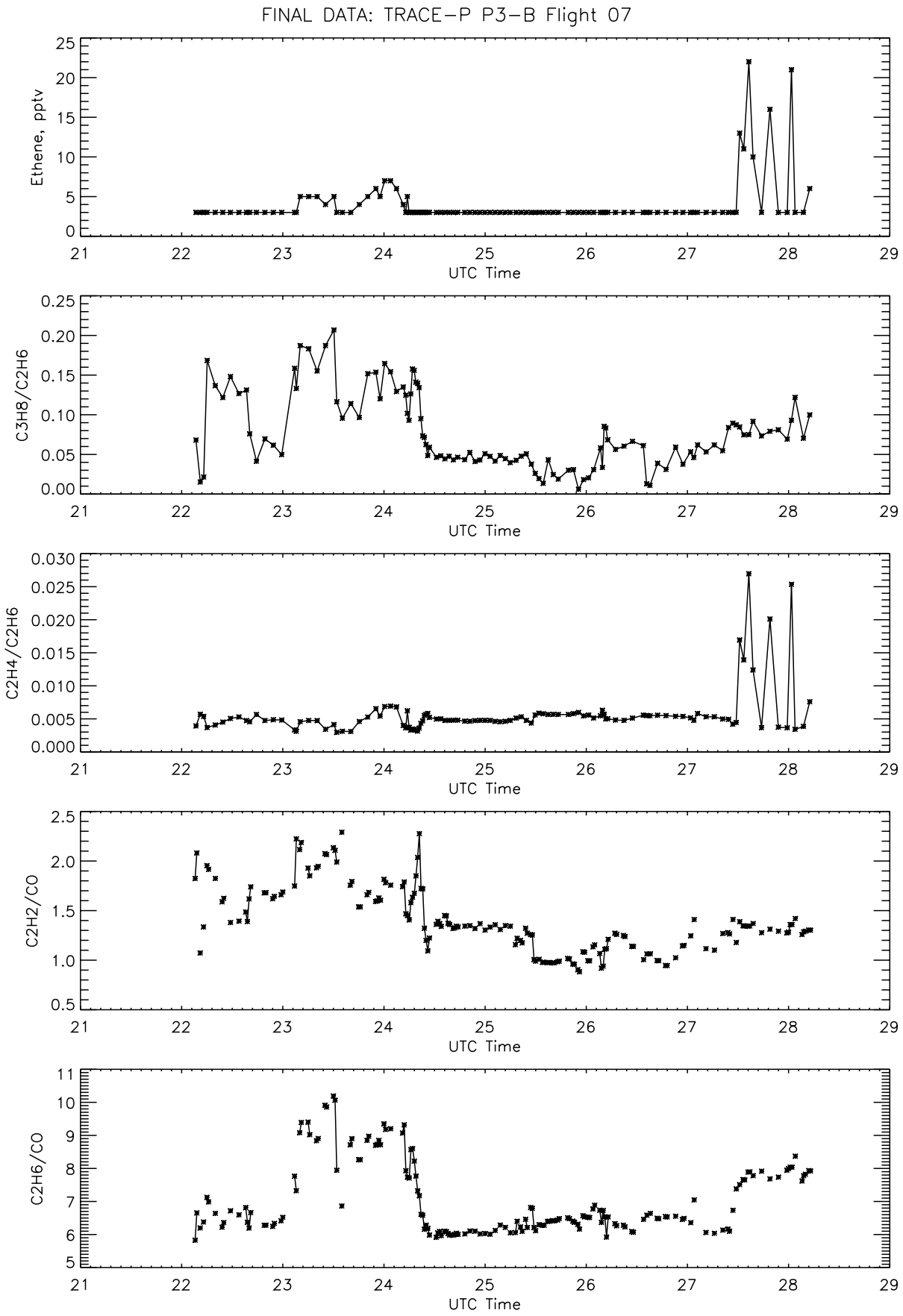

FINAL DATA: TRACE-P P3-B Flight 07
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

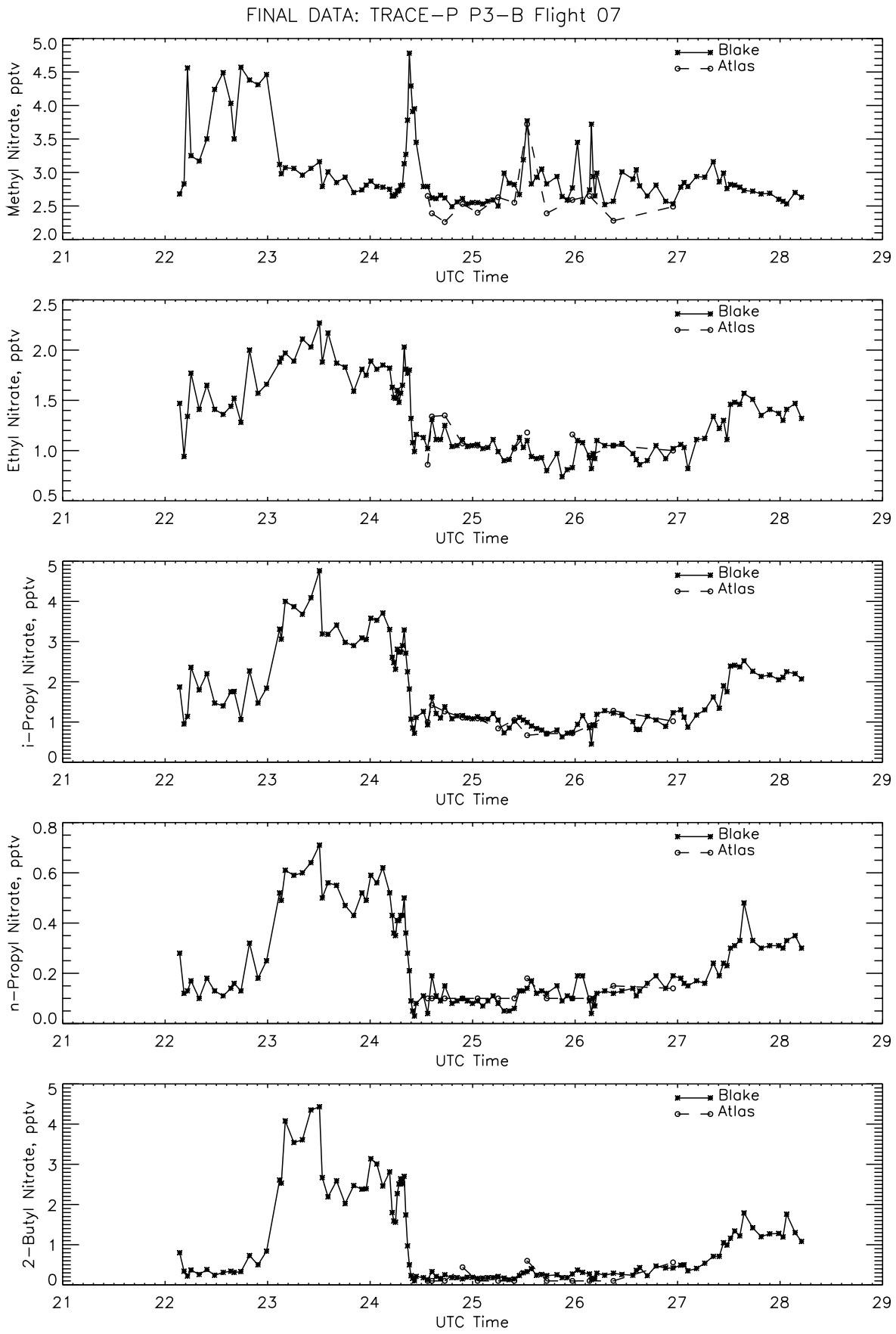

FINAL DATA: TRACE-P P3-B Flight 07
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
Preliminary
UTC Time

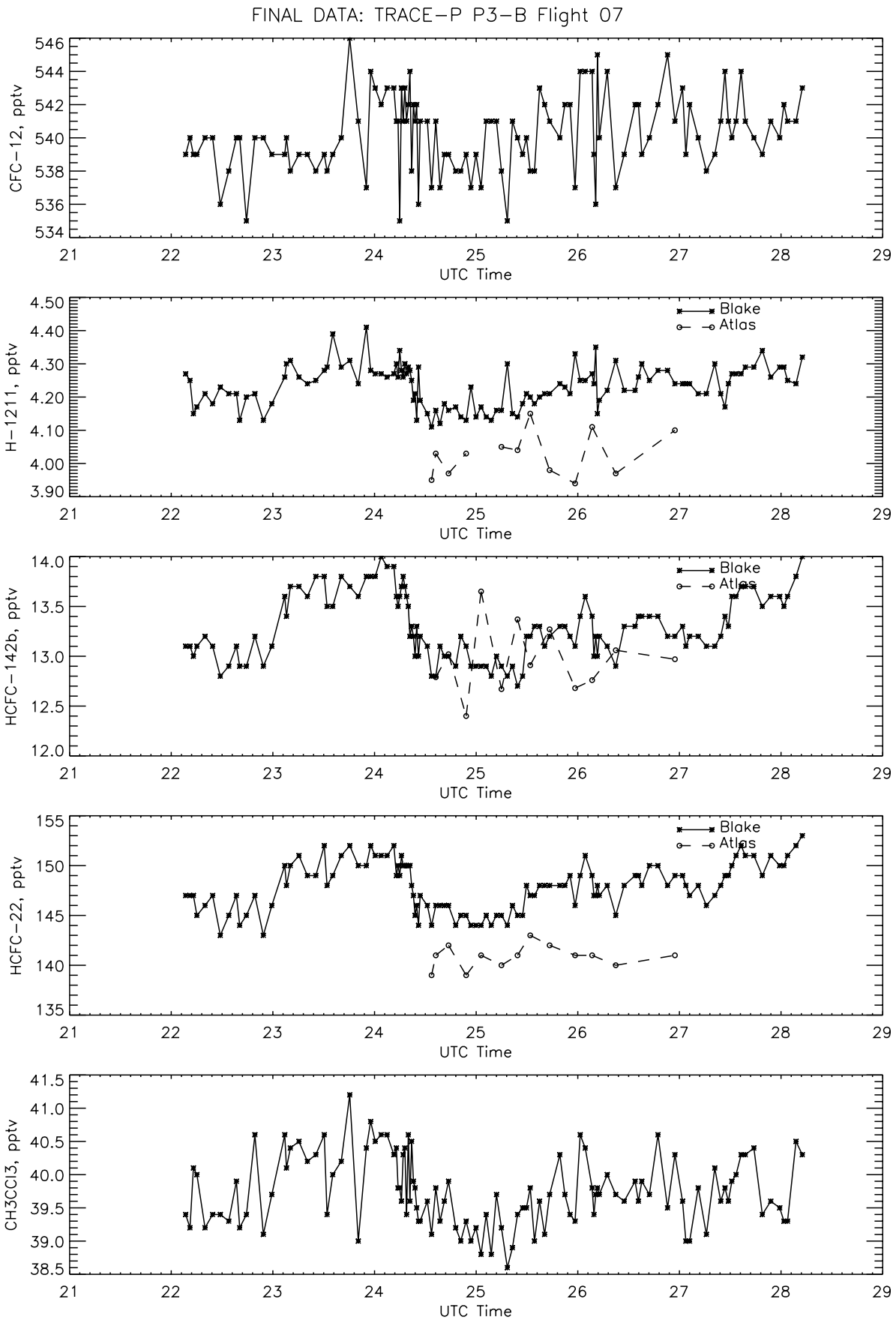

FINAL DATA: TRACE-P P3-B Flight 07
NO, pptv
NO2, pptv
HNO3, pptv
NO DATA
PAN, pptv
PPN, pptv
PAN mixing ratio
PPN mixing ratio
PiBN, pptv
UTC Time

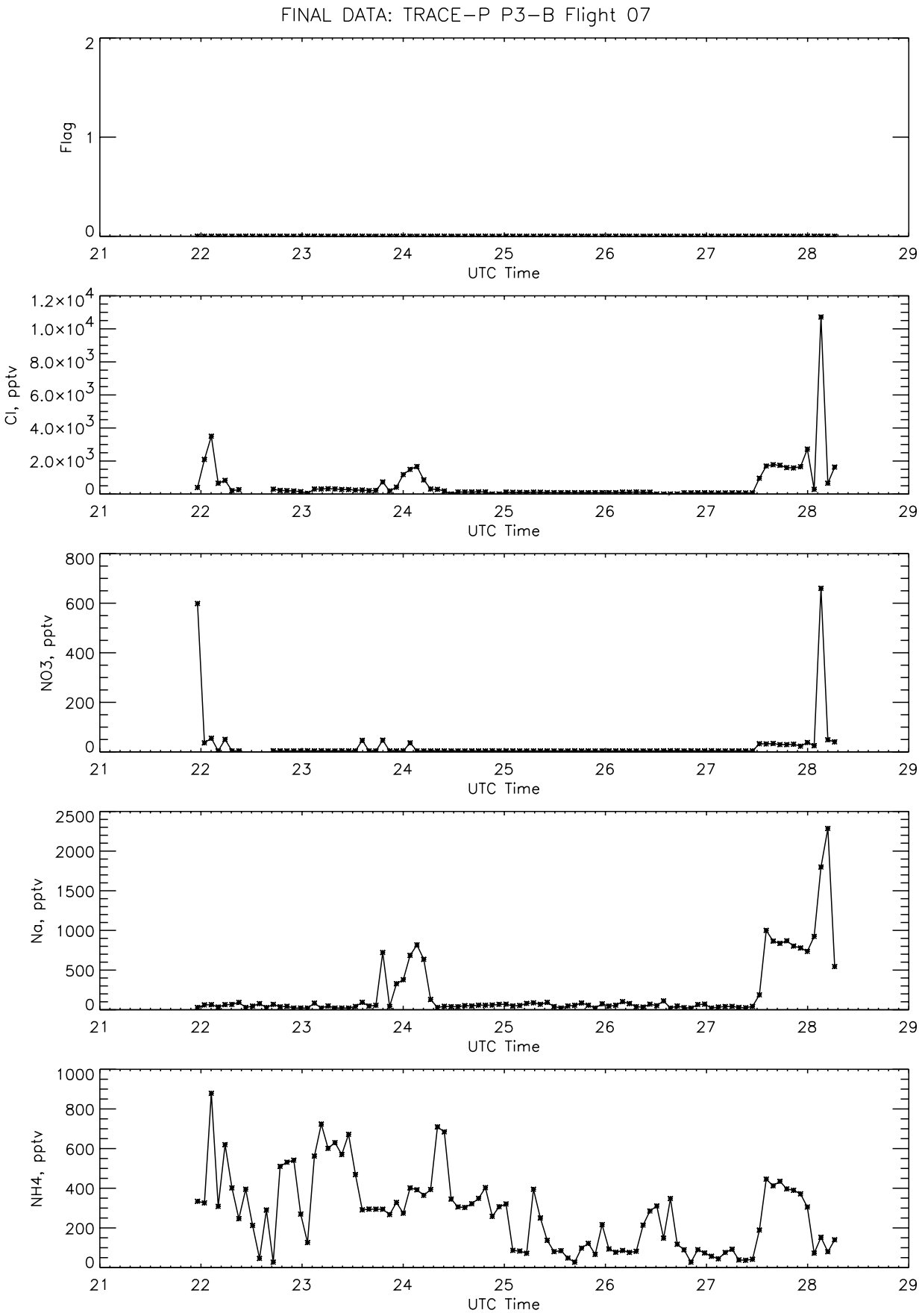

FINAL DATA: TRACE-P P3-B Flight 07
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

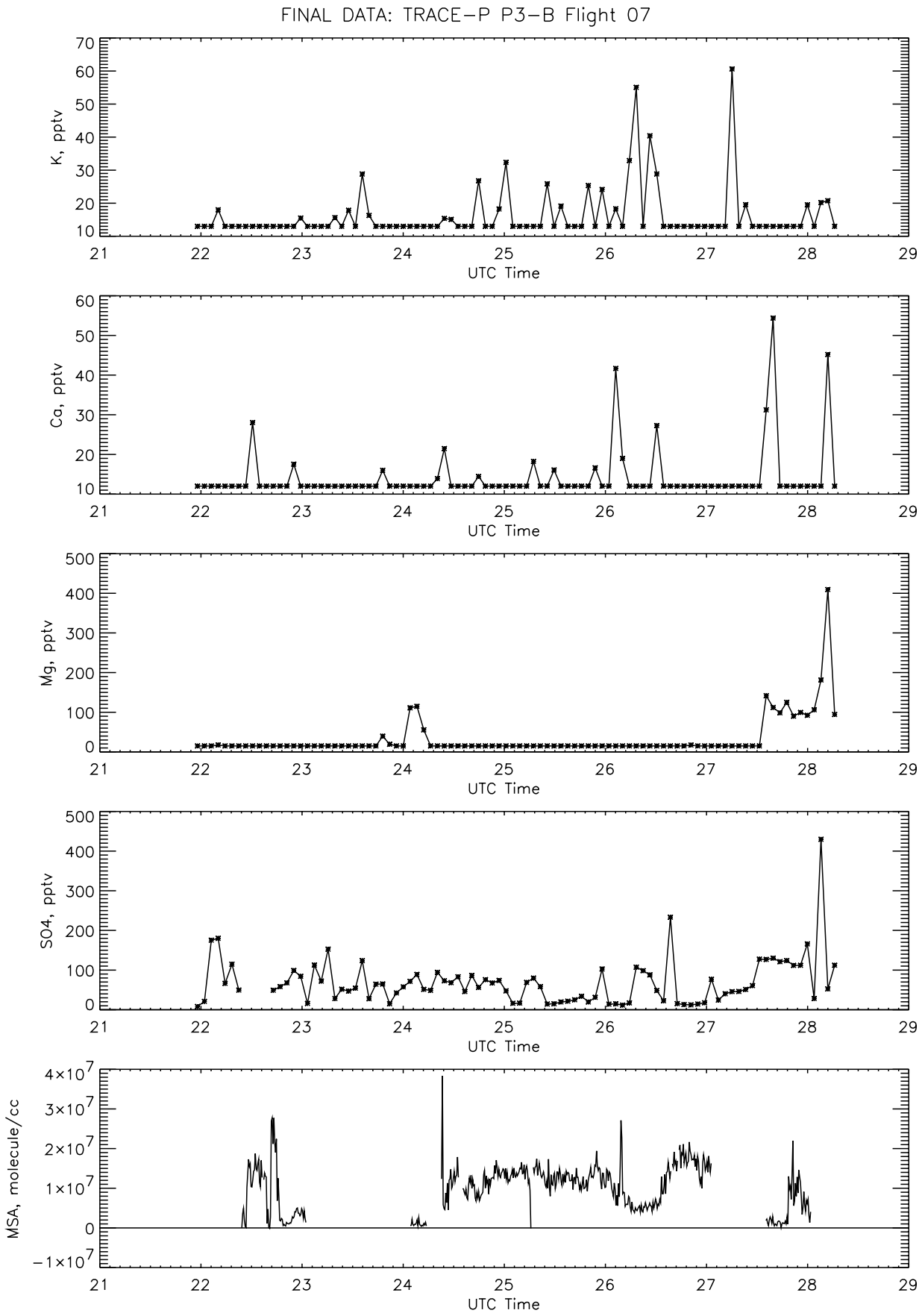

FINAL DATA: TRACE-P P3-B Flight 07
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

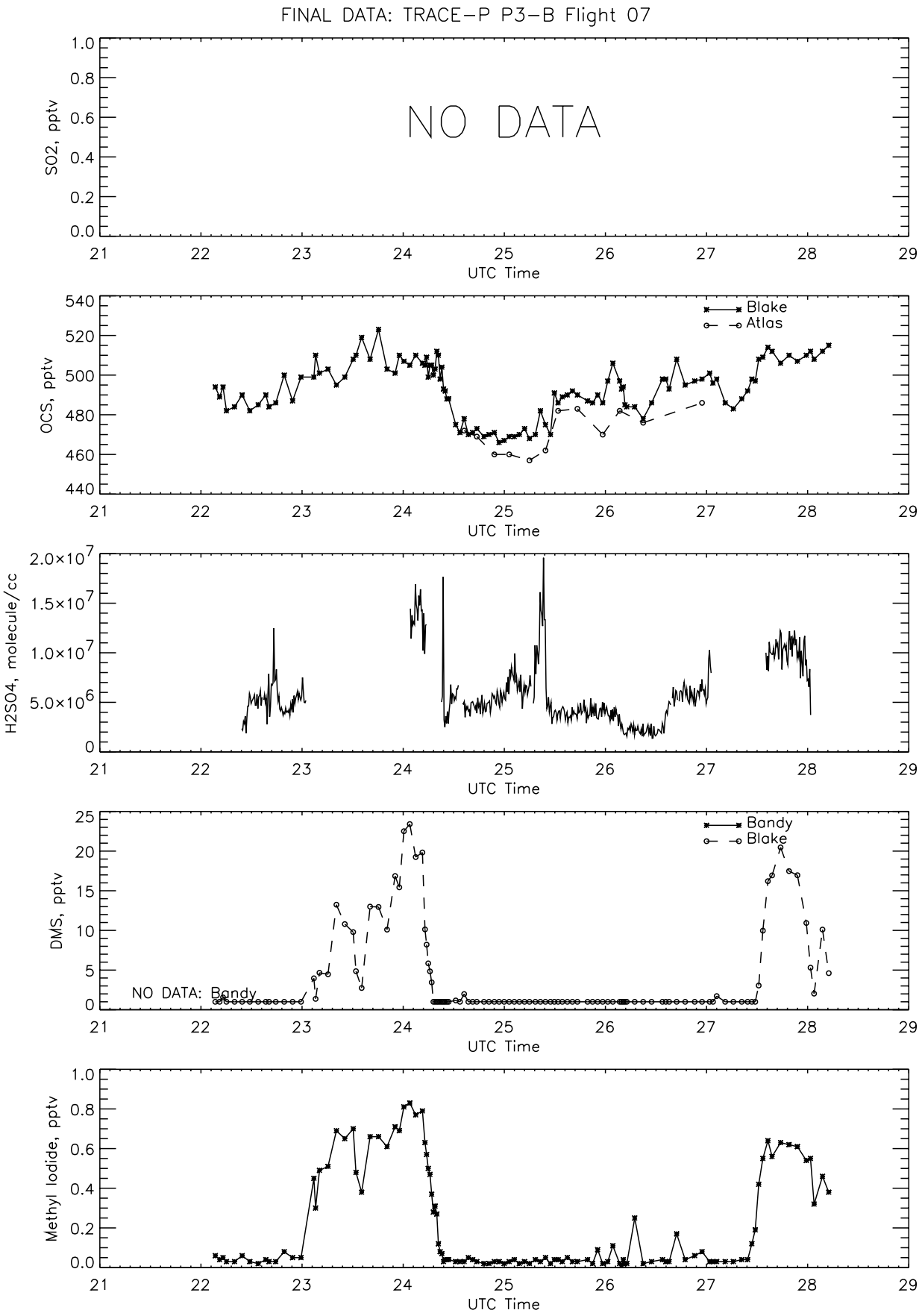

FINAL DATA: TRACE-P P3-B Flight 07
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

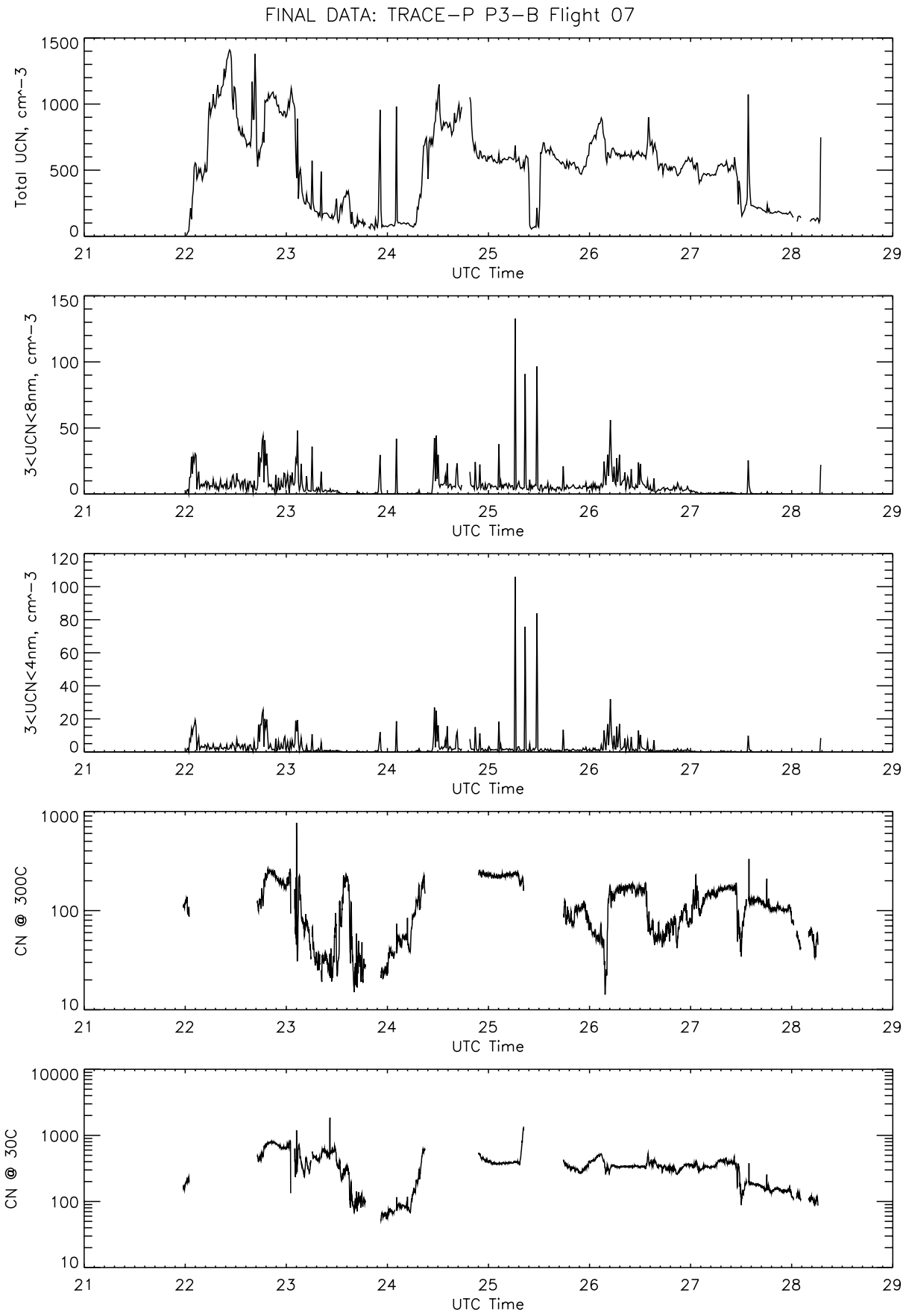

FINAL DATA: TRACE-P P3-B Flight 07
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas

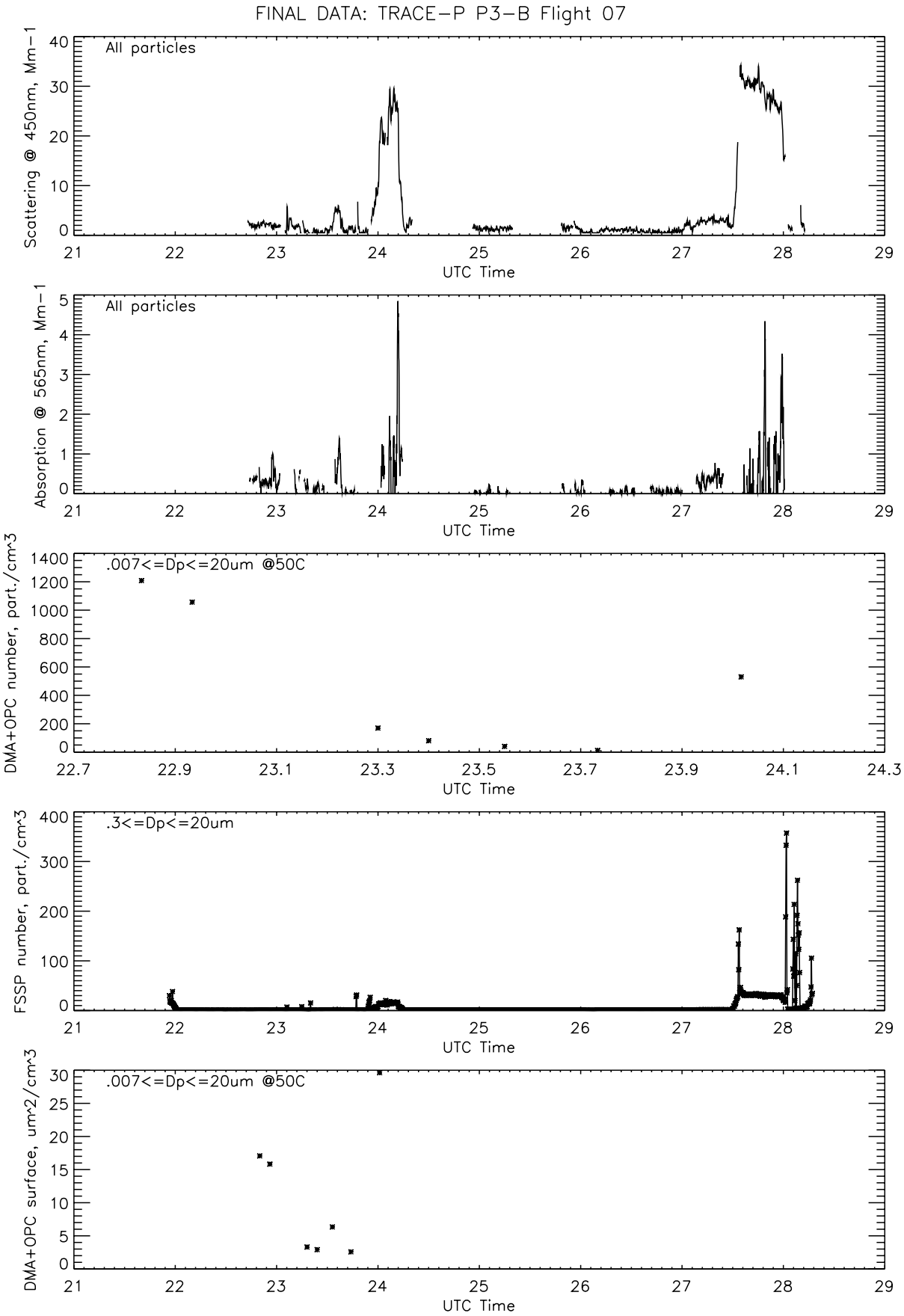

FINAL DATA: TRACE-P P3-B Flight 07
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

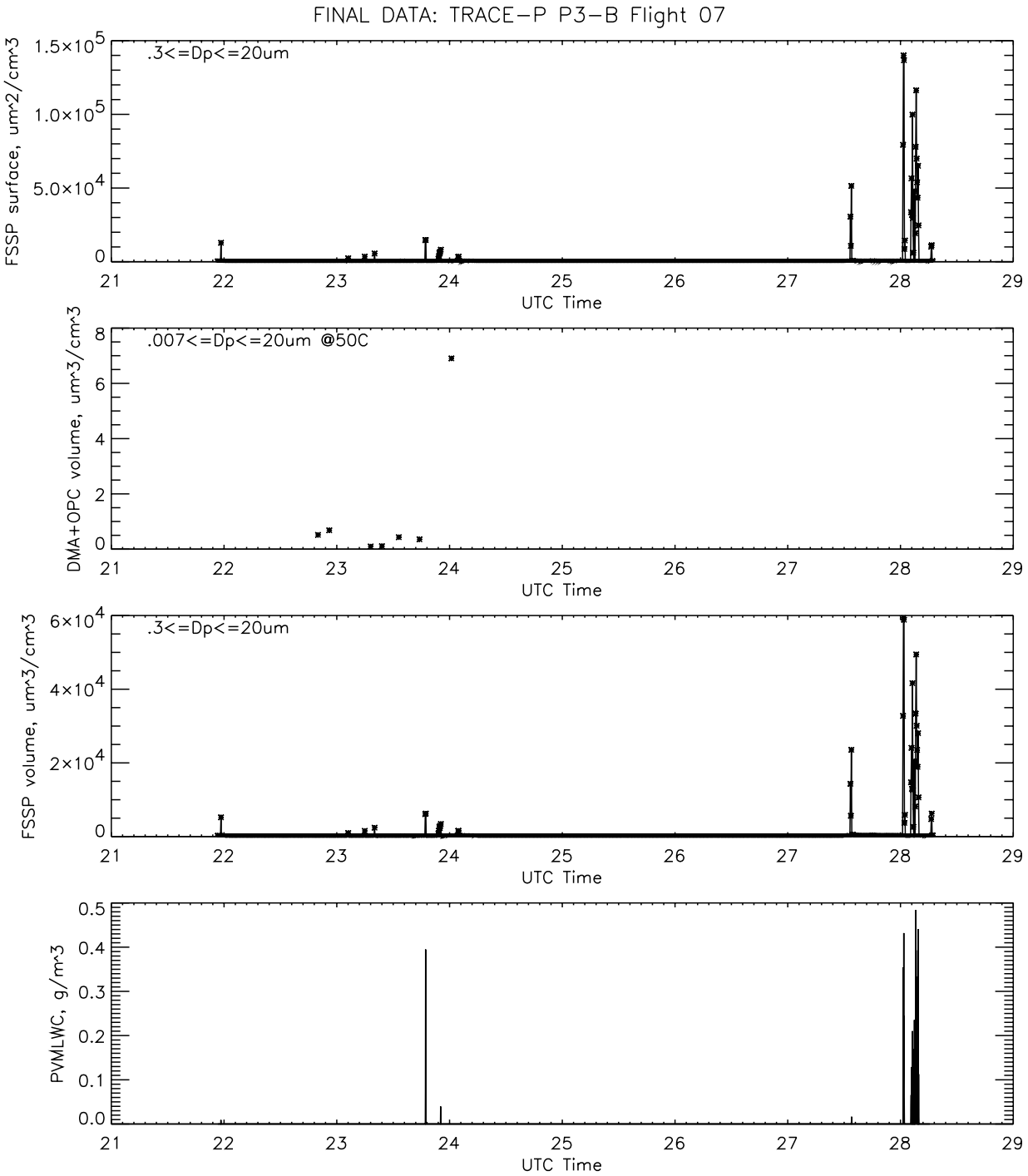

FINAL DATA: TRACE-P P3-B Flight 07
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 07
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

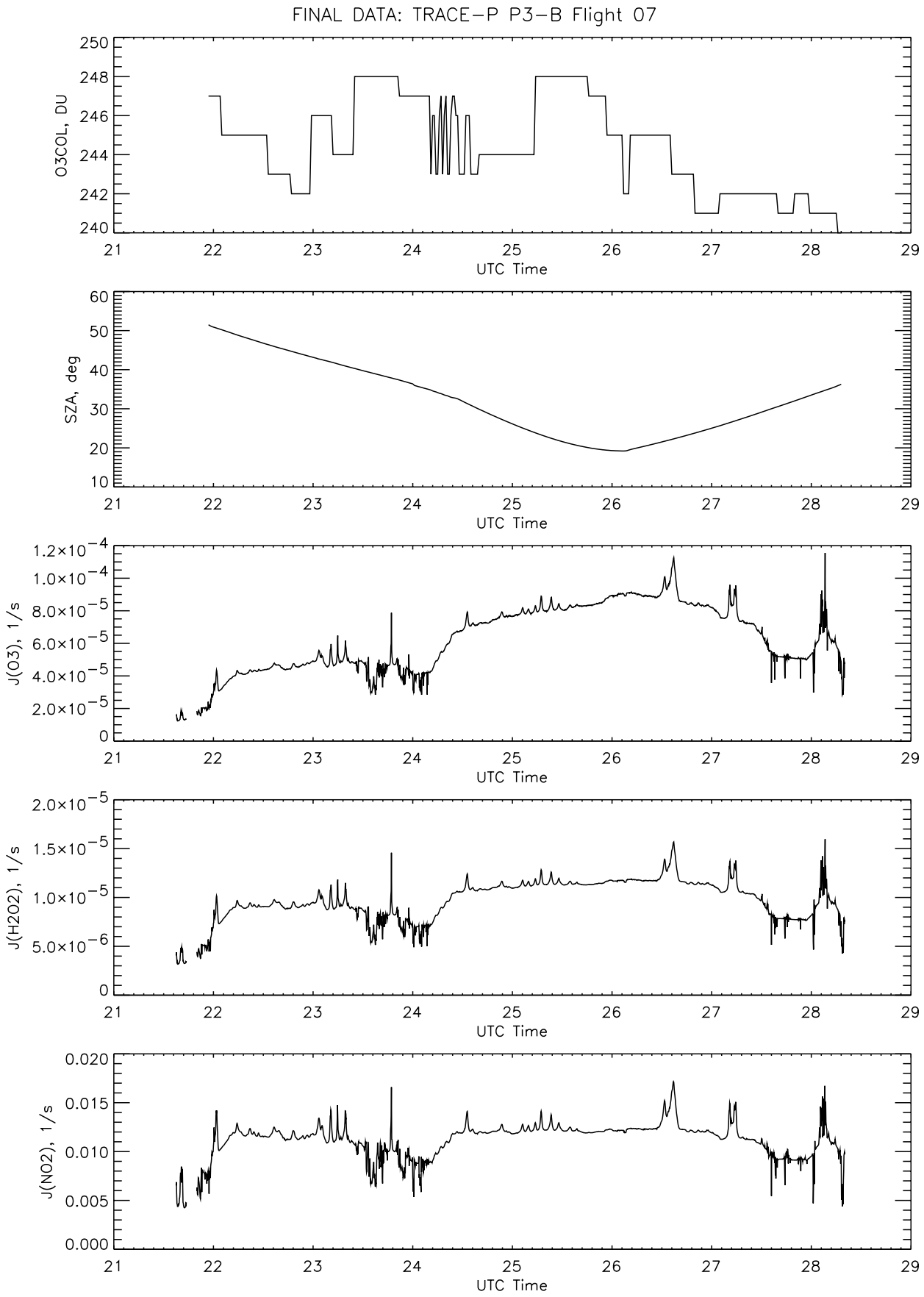

FINAL DATA: TRACE-P P3-B Flight 07
SO2, pptv
NO DATA
UTC Time
OCS, pptv
Blake
Atlas
UTC Time
H2SO4, molecule/cc
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

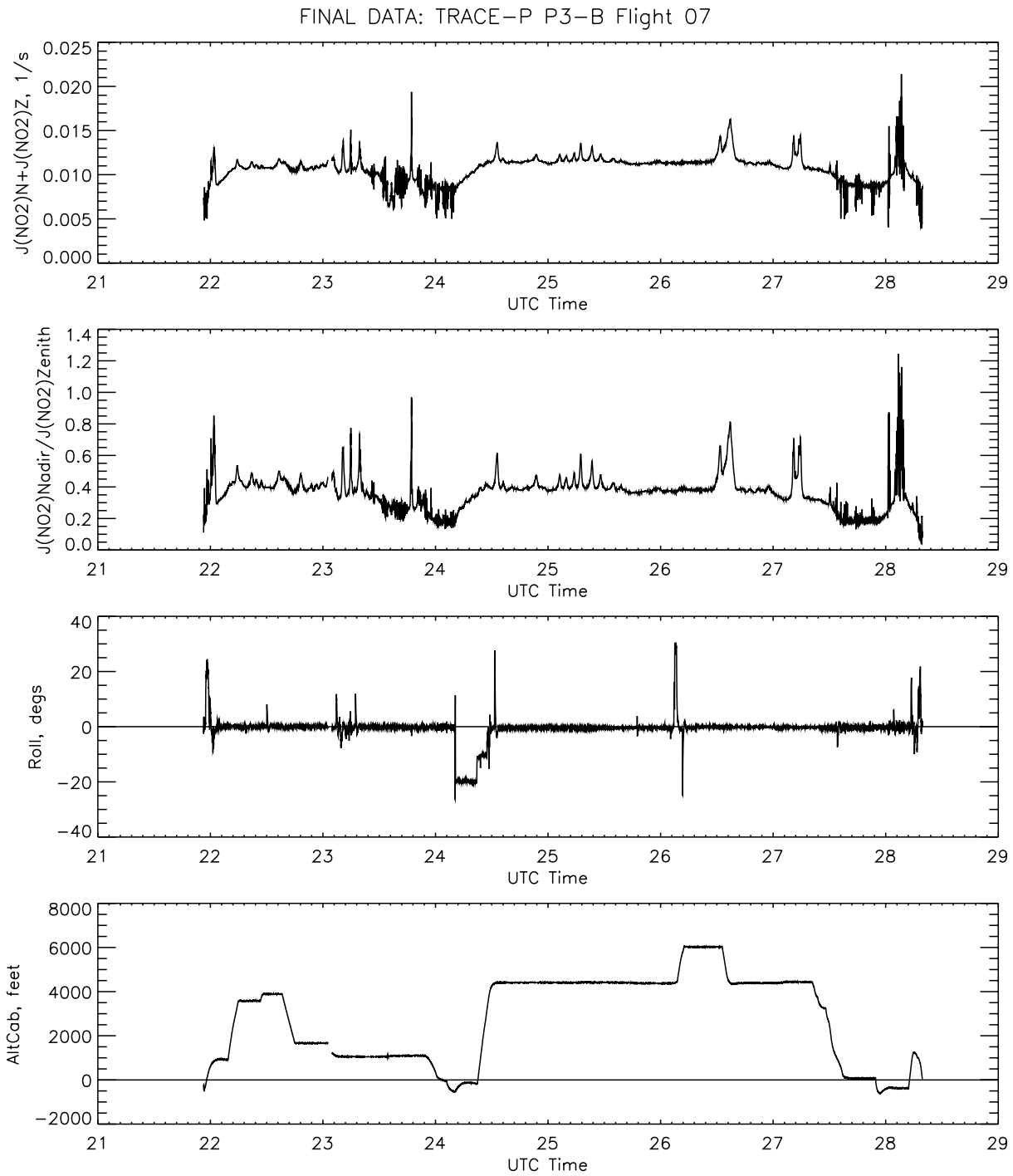

FINAL DATA: TRACE-P P3-B Flight 07
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

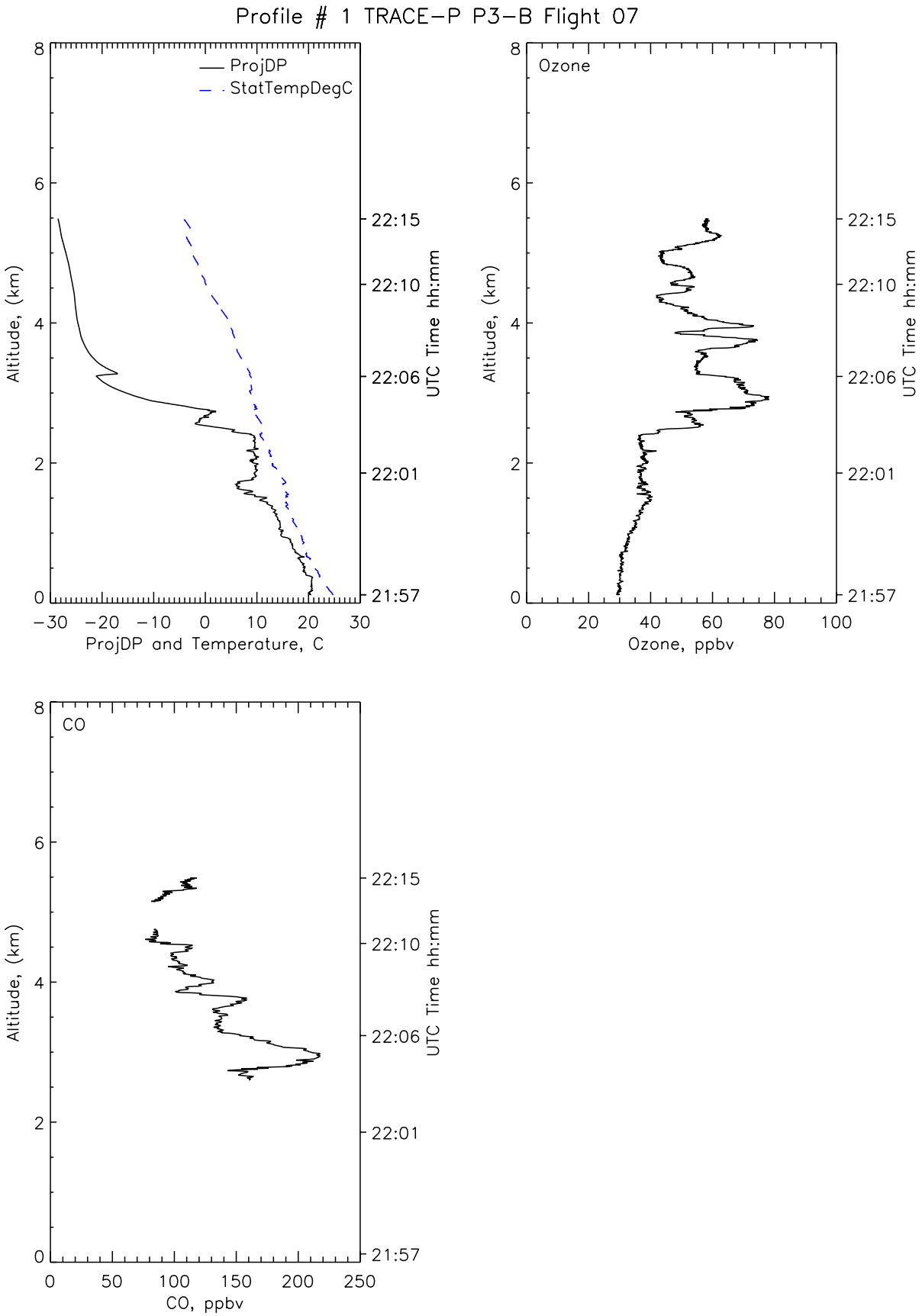

FINAL DATA: TRACE-P P3-B Flight 07
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 07
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

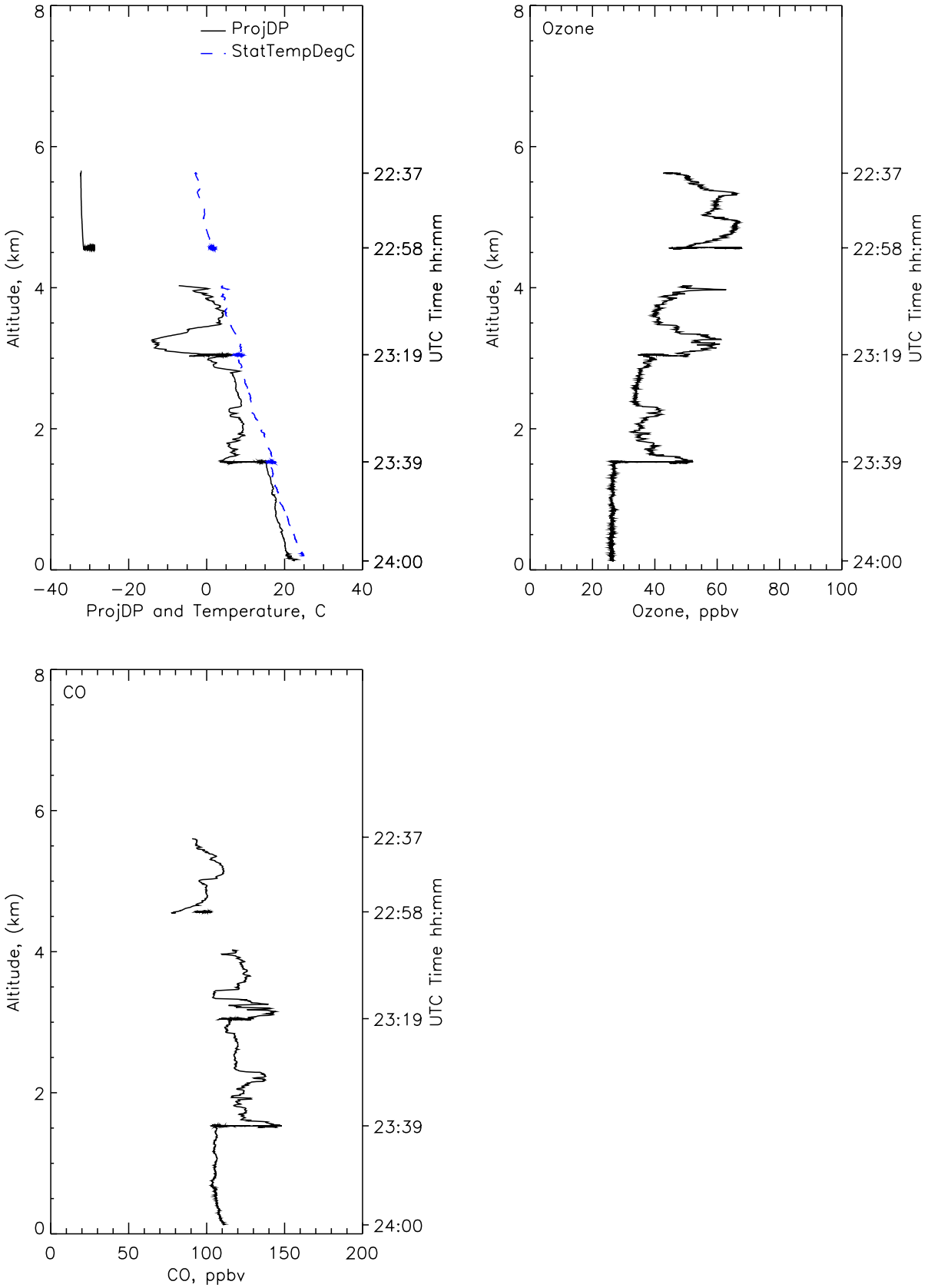
LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 07
O3COL, DU
250
248
246
244
242
240
21
22
23
24
25
26
27
28
29
UTC Time
SZA, deg
60
50
40
30
20
10
UTC Time
J(O3), 1/s
1.2×10^-4
1.0×10^-4
8.0×10^-5
6.0×10^-5
4.0×10^-5
2.0×10^-5
0
UTC Time
J(H2O2), 1/s
2.0×10^-5
1.5×10^-5
1.0×10^-5
5.0×10^-6
0
UTC Time
J(NO2), 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time

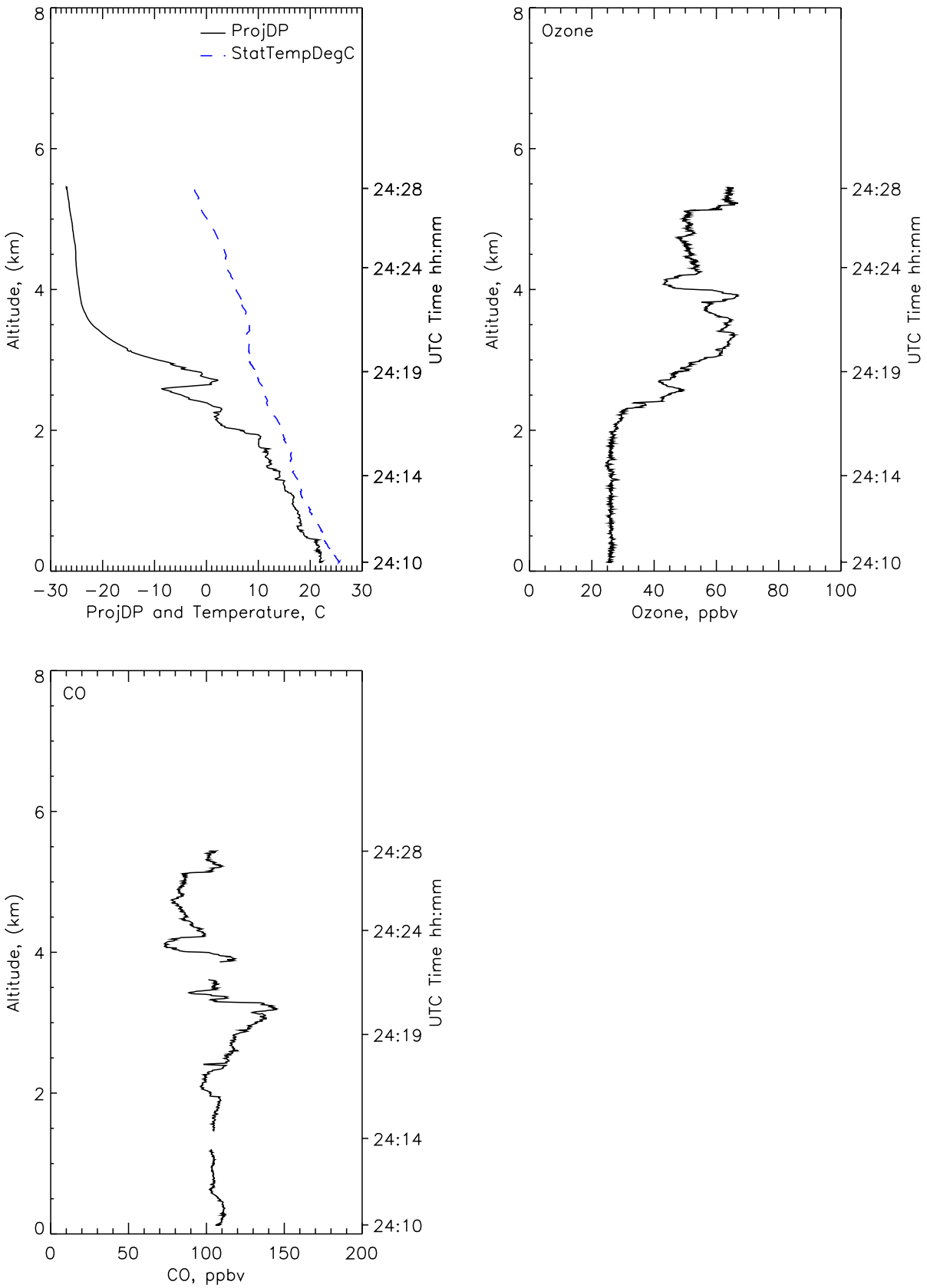

FINAL DATA: TRACE-P P3-B Flight 07
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
21
22
23
24
25
26
27
28
29
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
8000
6000
4000
2000
0
−2000
UTC Time

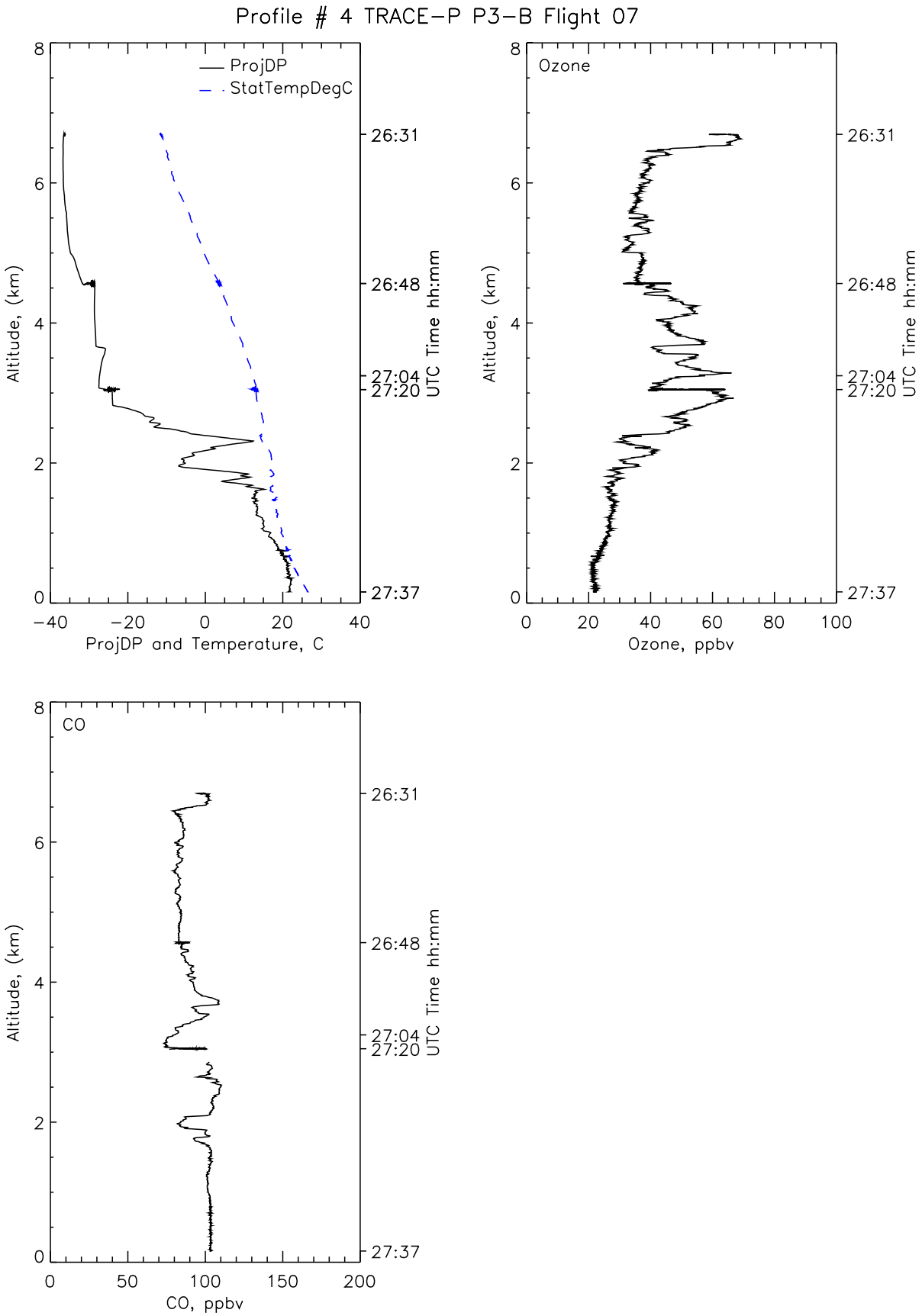

Profile # 1 TRACE-P P3-B Flight 07
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 2 TRACE-P P3-B Flight 07



Profile # 3 TRACE-P P3-B Flight 07




Profile # 4 TRACE-P P3-B Flight 07
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
26:31
26:48
27:04
27:20
27:37
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

TRACE-P

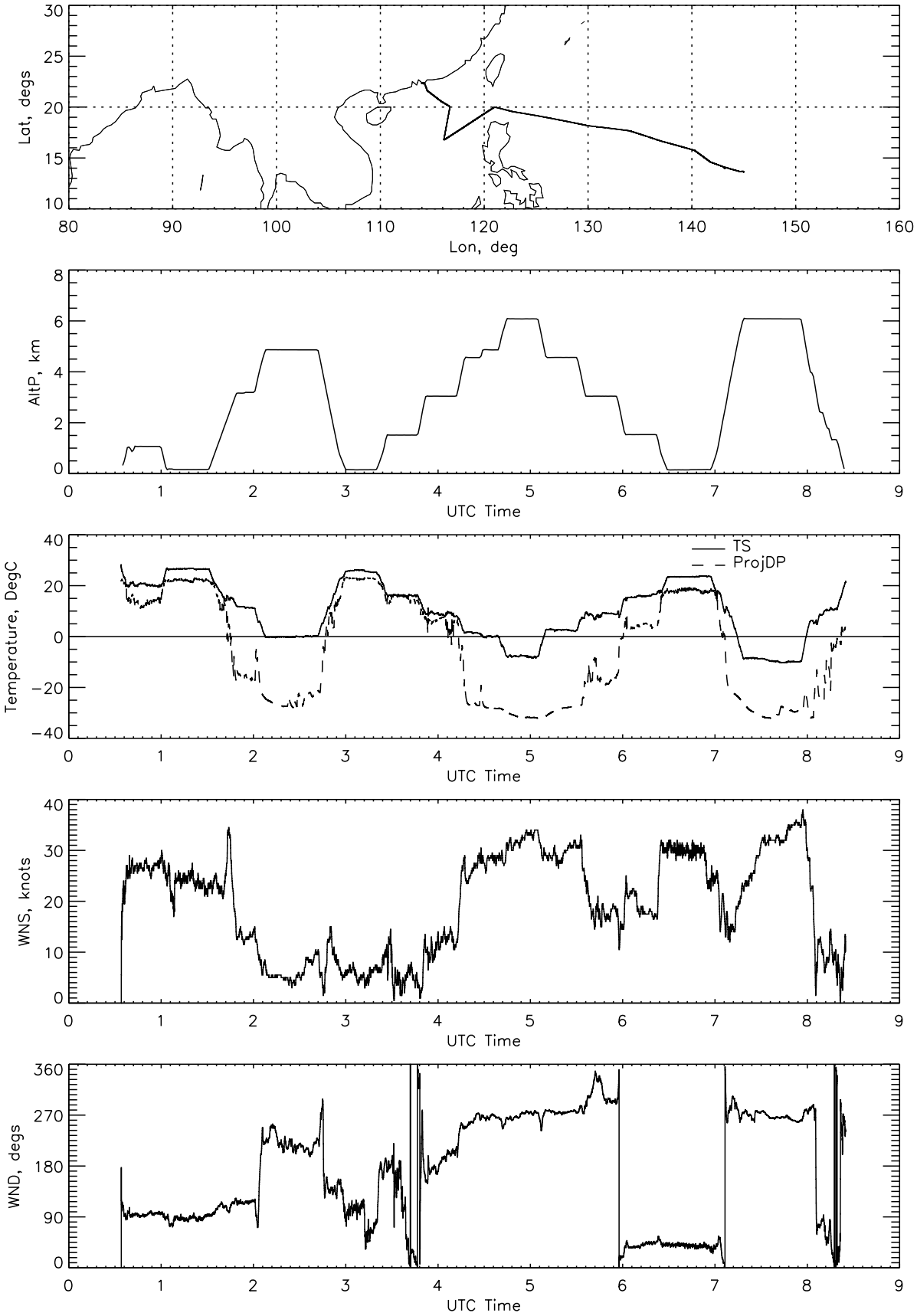
Flight 8P

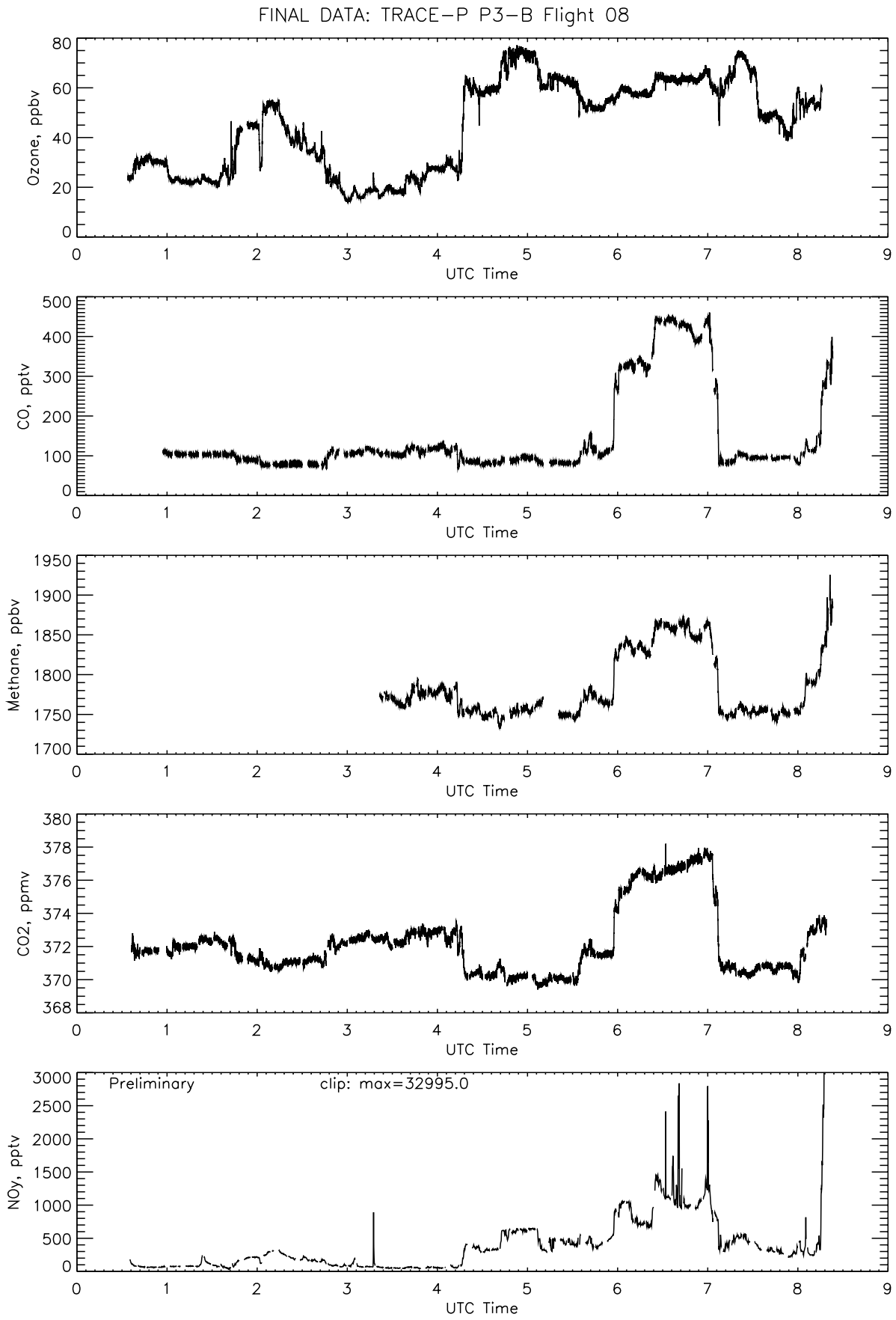
Transit: Guam to Hong Kong

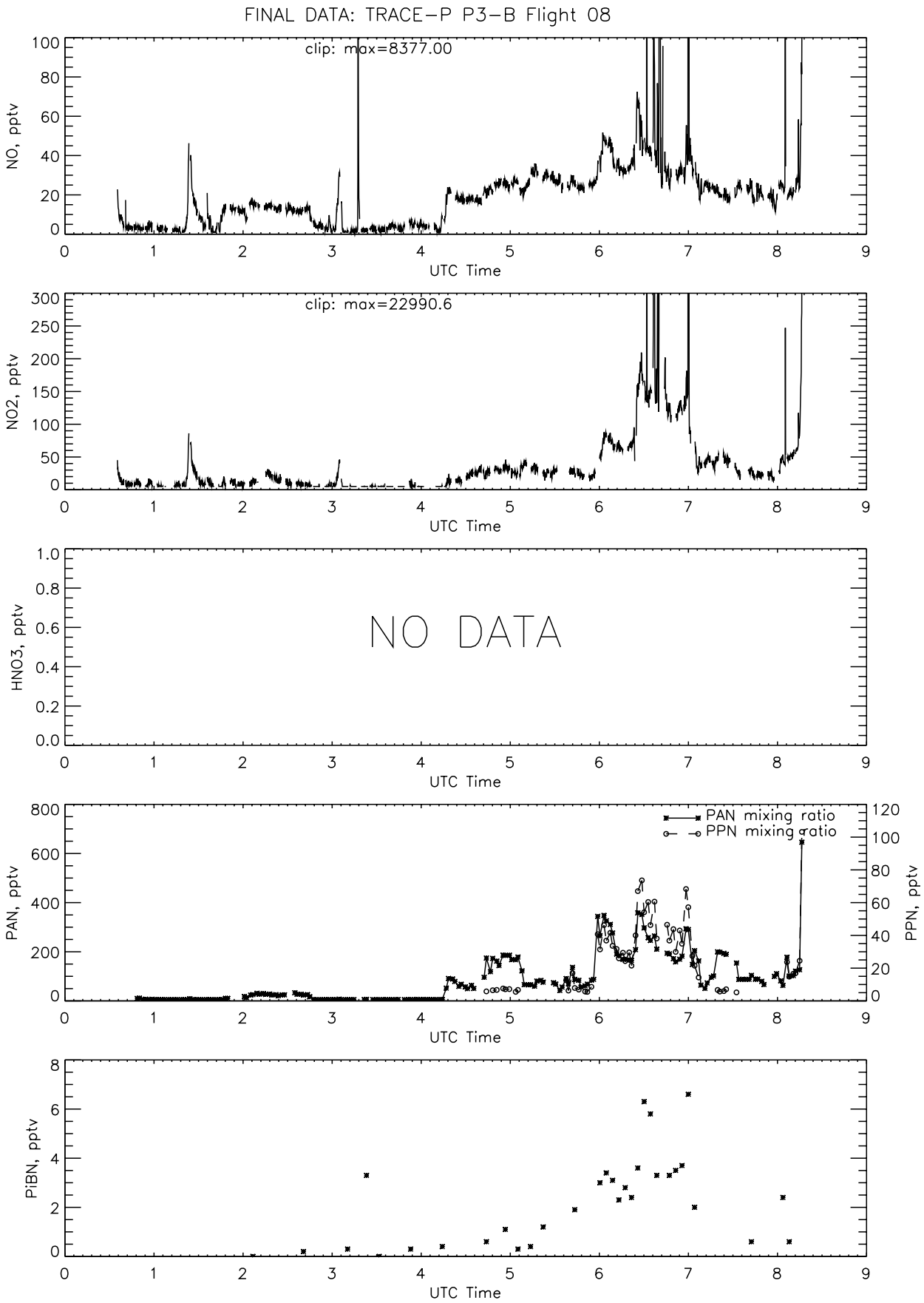
Aircraft Intercomparison; Asian Outflow to South China Sea

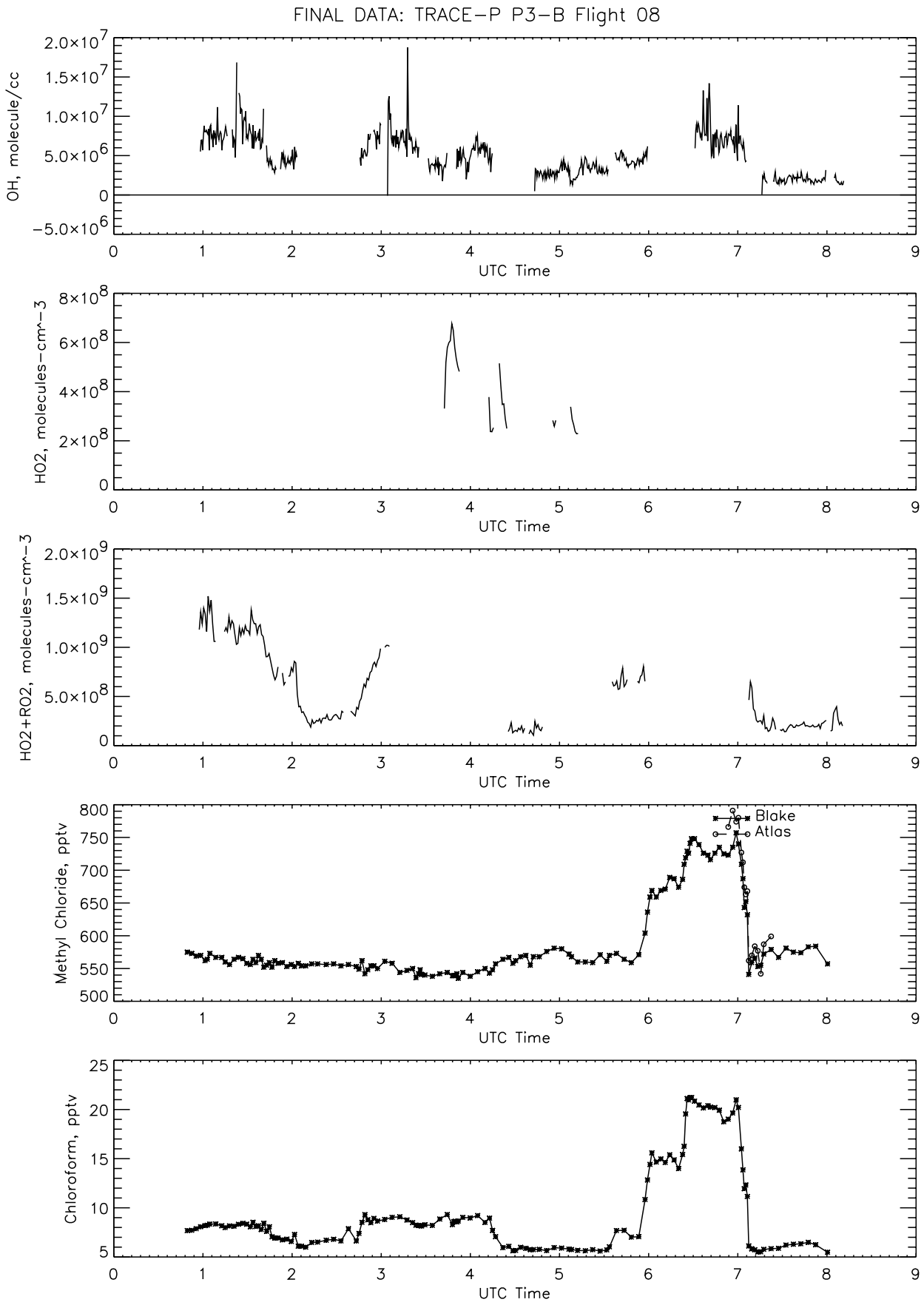
March 4, 2001

FINAL DATA: TRACE-P P3-B Flight 08

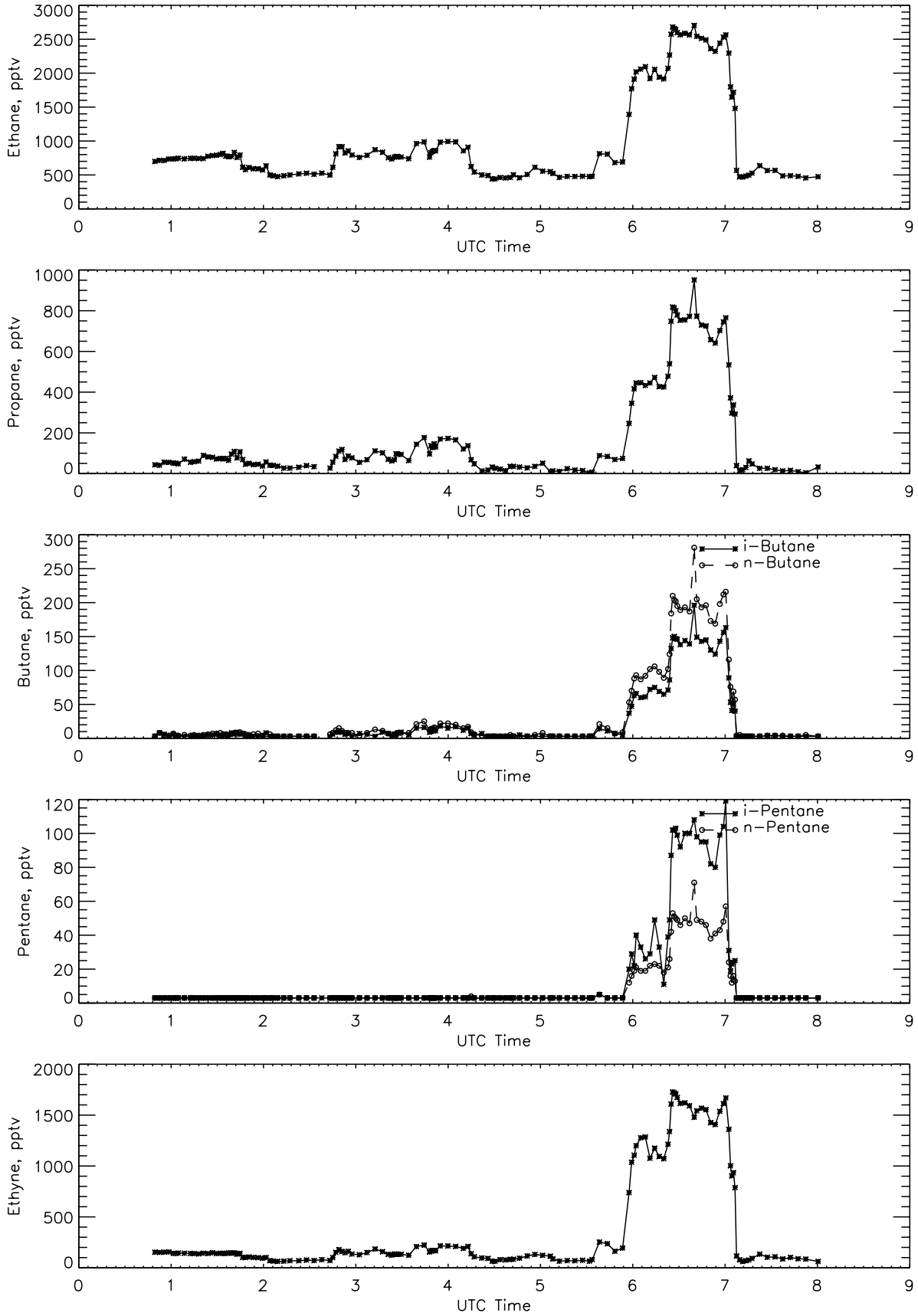


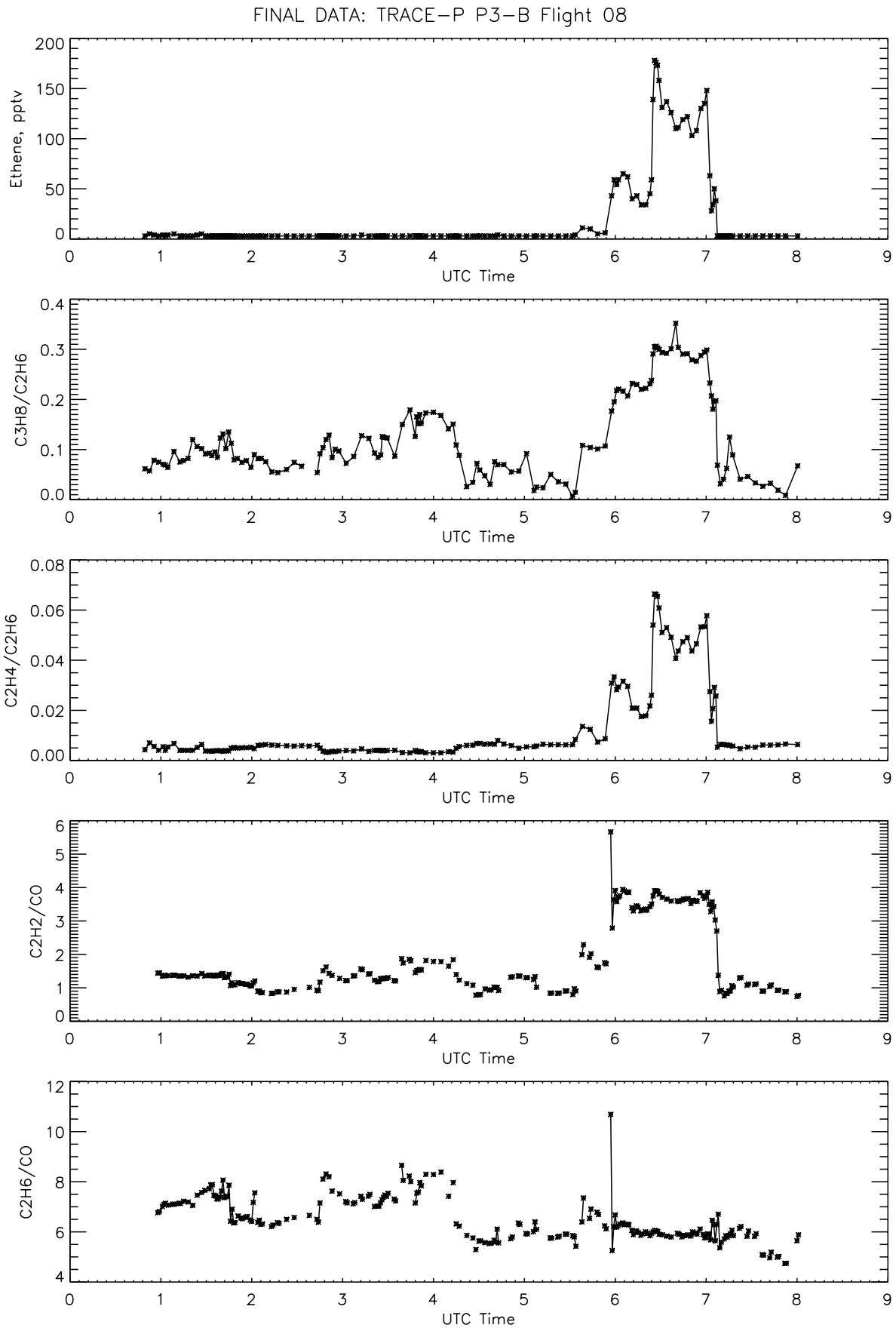

FINAL DATA: TRACE-P P3-B Flight 08
Ozone, ppbv
UTC Time
CO, pptv
UTC Time
Methane, ppbv
UTC Time
CO2, ppmv
UTC Time
NOy, pptv
Preliminary
clip: max=32995.0
UTC Time


FINAL DATA: TRACE-P P3-B Flight 08
clip: max=8377.00
NO, pptv
UTC Time
clip: max=22990.6
NO2, pptv
UTC Time
HNO3, pptv
NO DATA
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

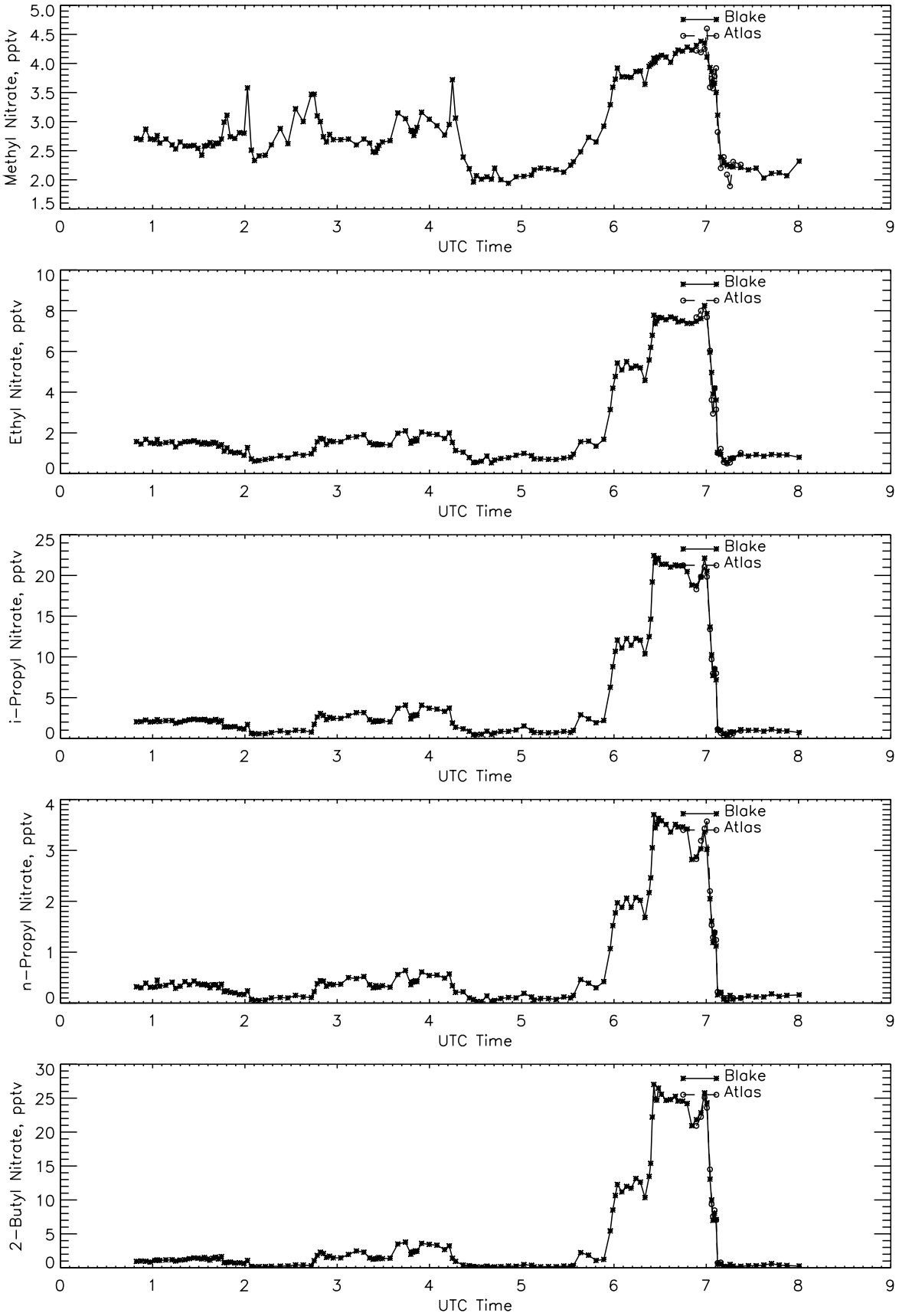

FINAL DATA: TRACE-P P3-B Flight 08
OH, molecule/cc
UTC Time
HO2, molecules-cm^-3
UTC Time
HO2+RO2, molecules-cm^-3
UTC Time
Methyl Chloride, pptv
Blake
Atlas
UTC Time
Chloroform, pptv
UTC Time

FINAL DATA: TRACE-P P3-B Flight 08

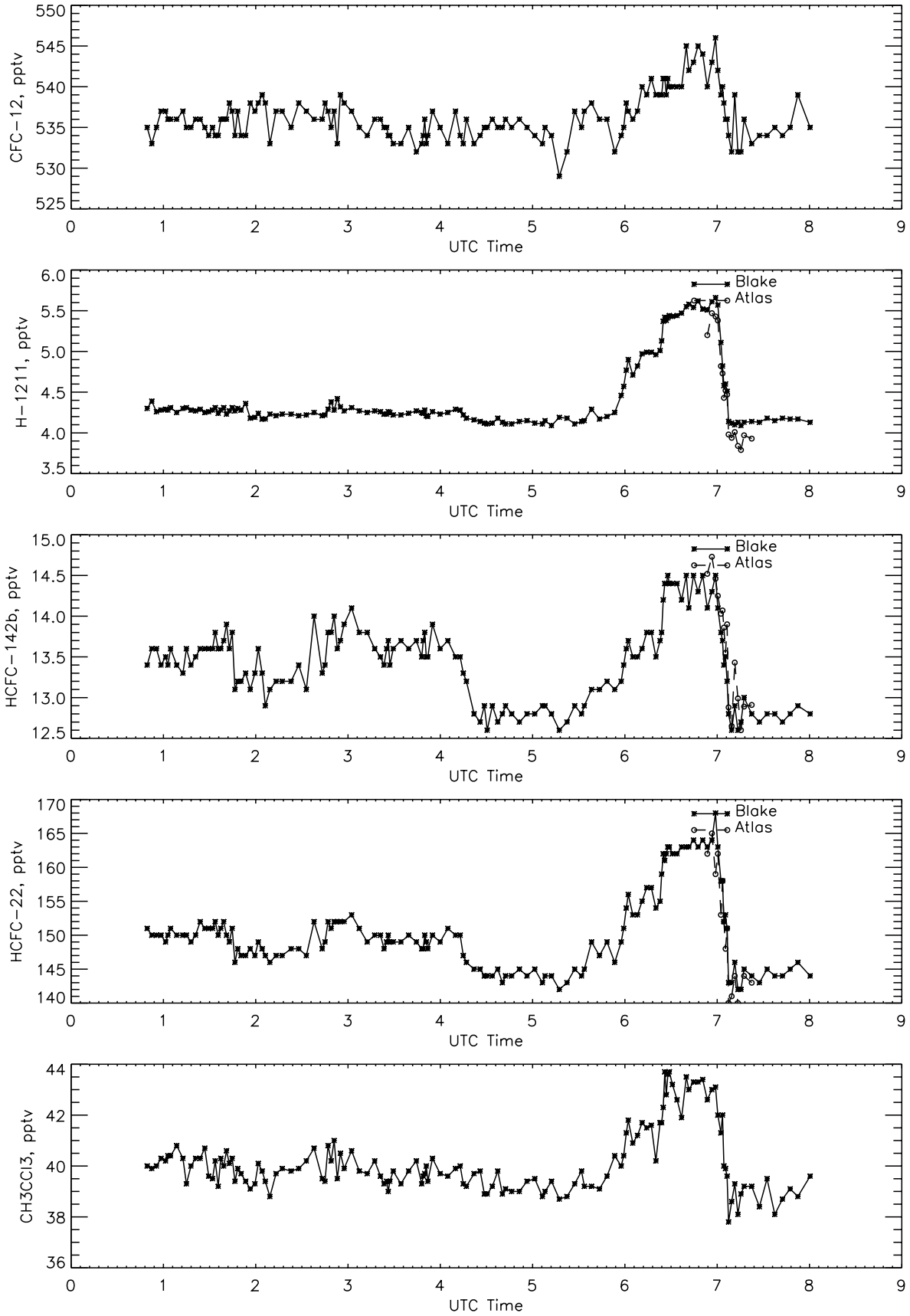



FINAL DATA: TRACE-P P3-B Flight 08
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

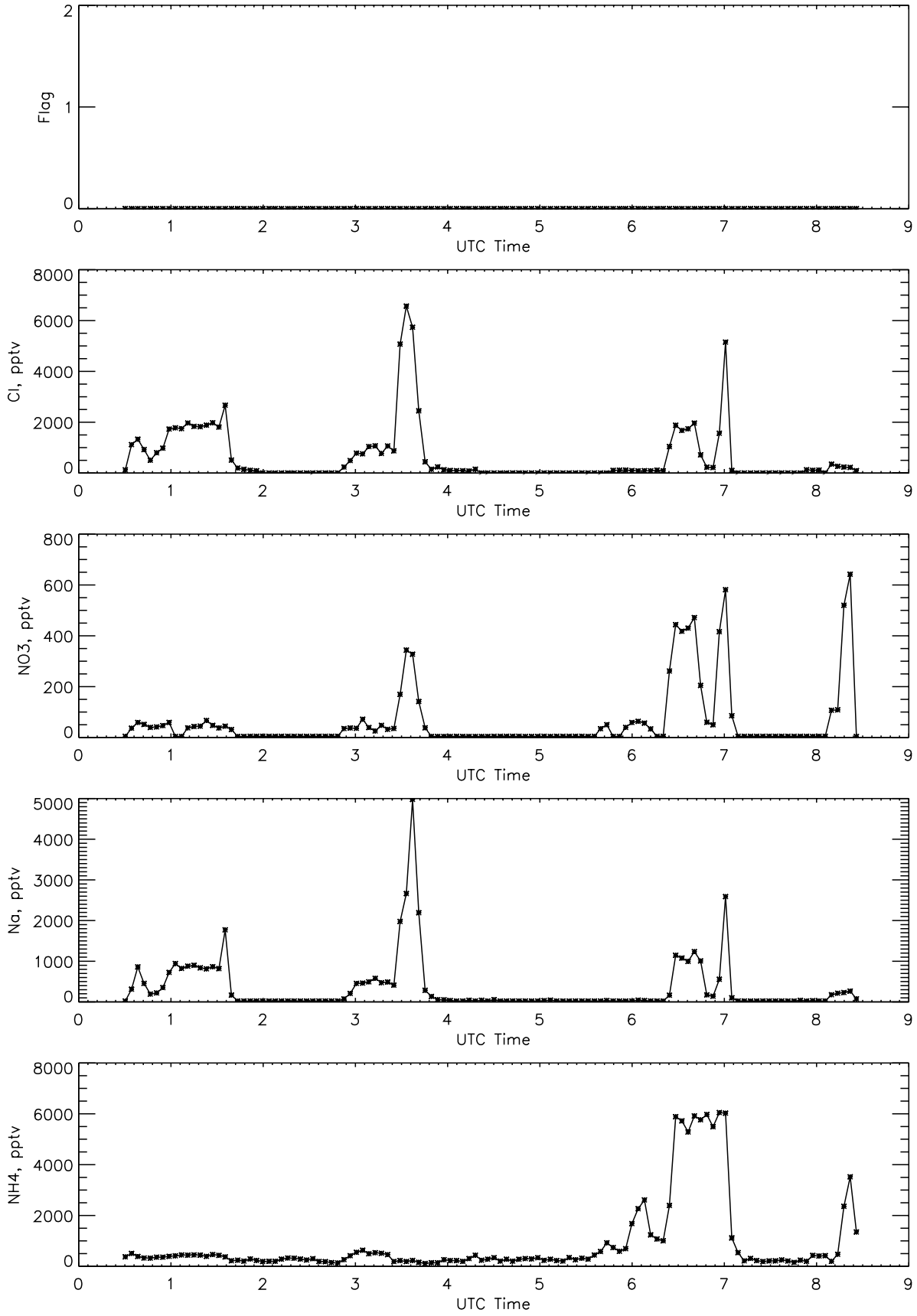
FINAL DATA: TRACE-P P3-B Flight 08

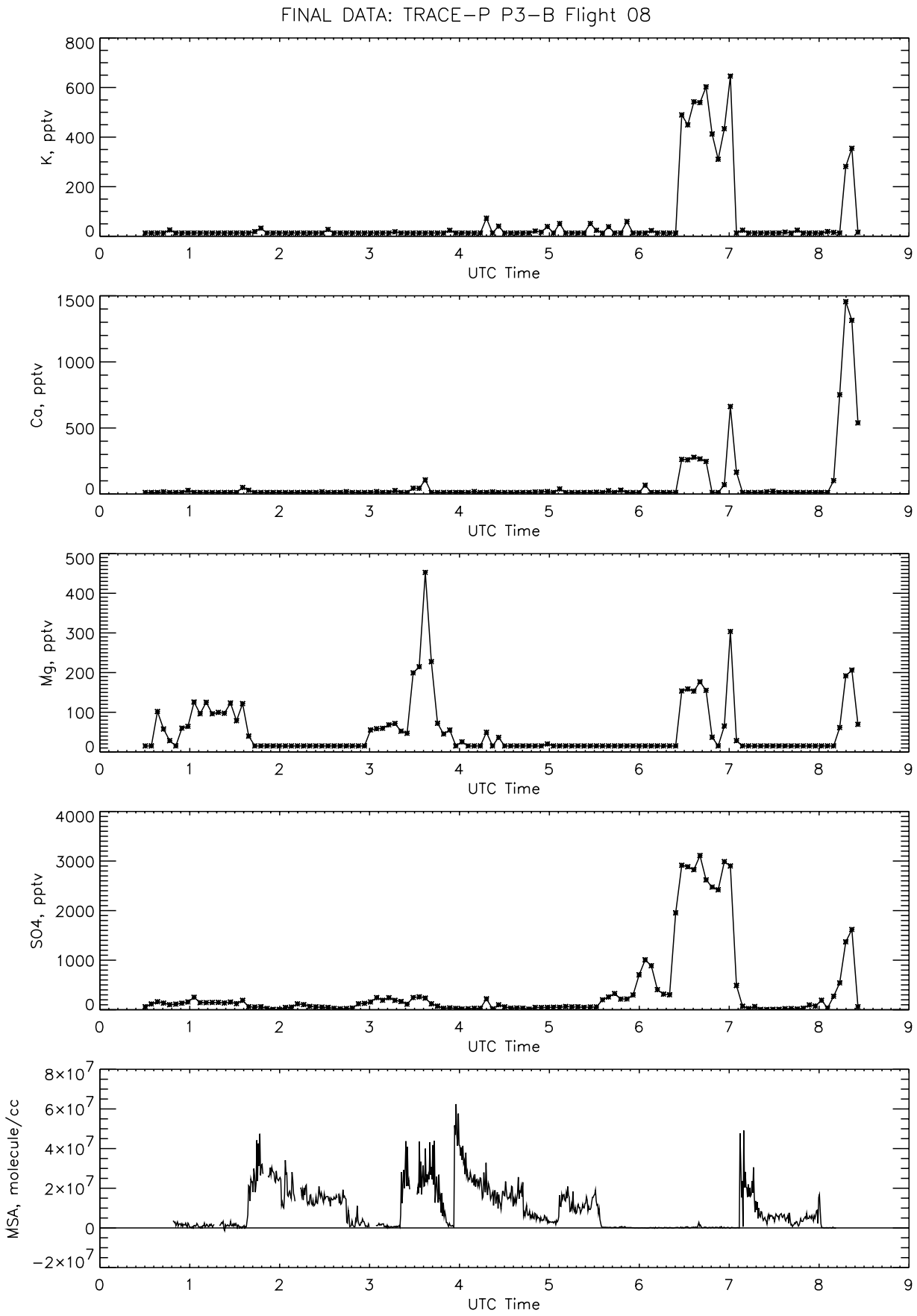


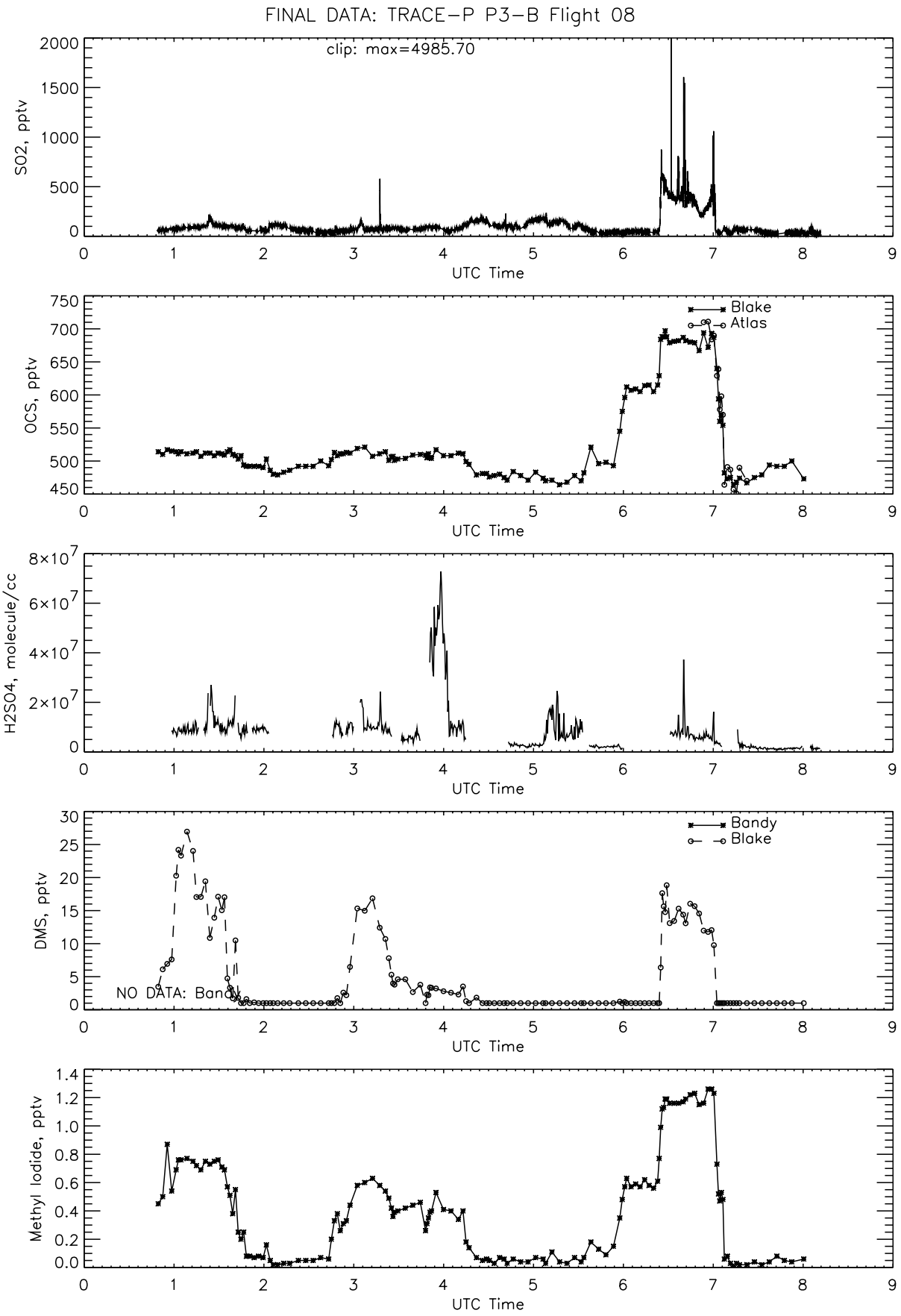
FINAL DATA: TRACE-P P3-B Flight 08

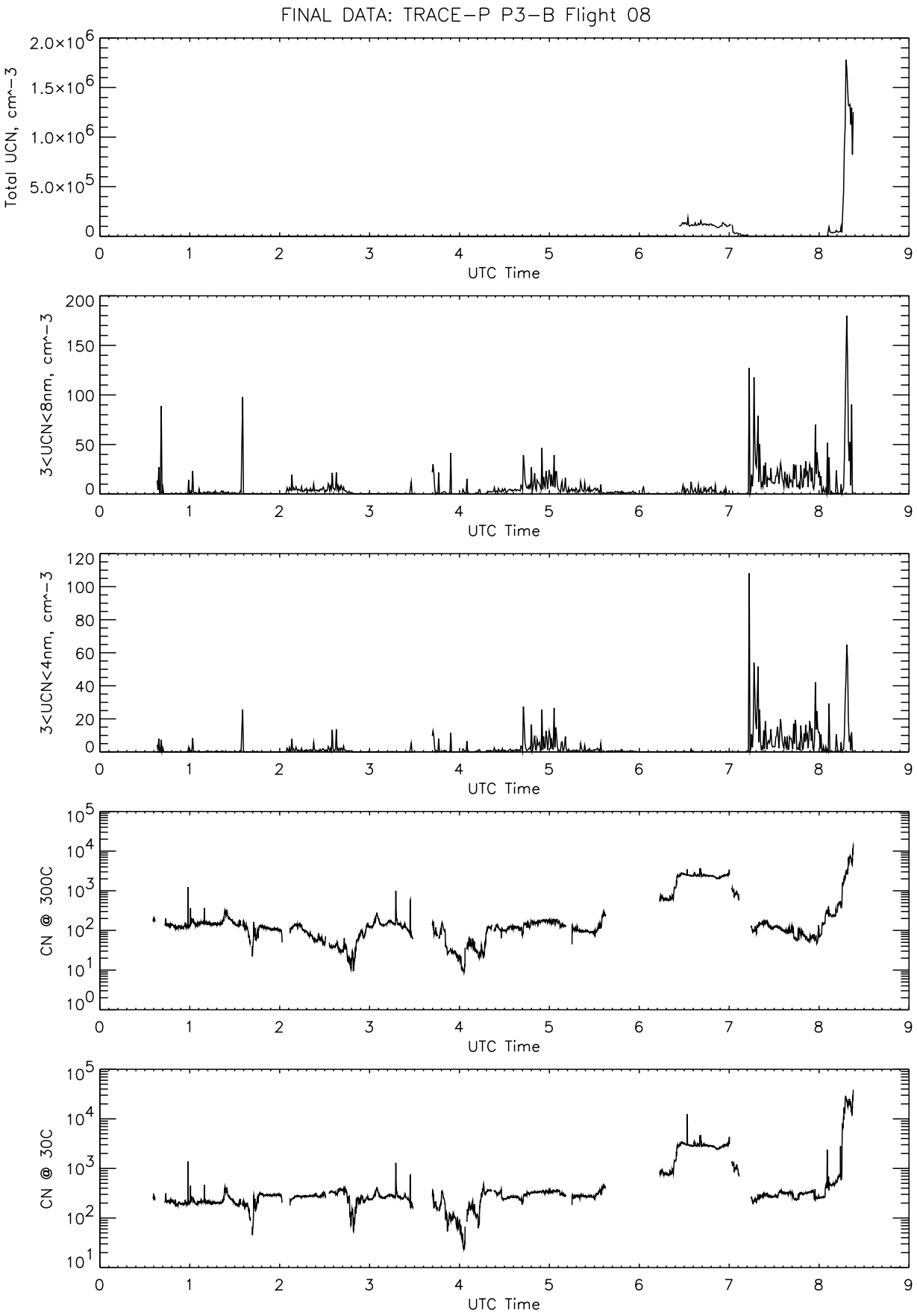


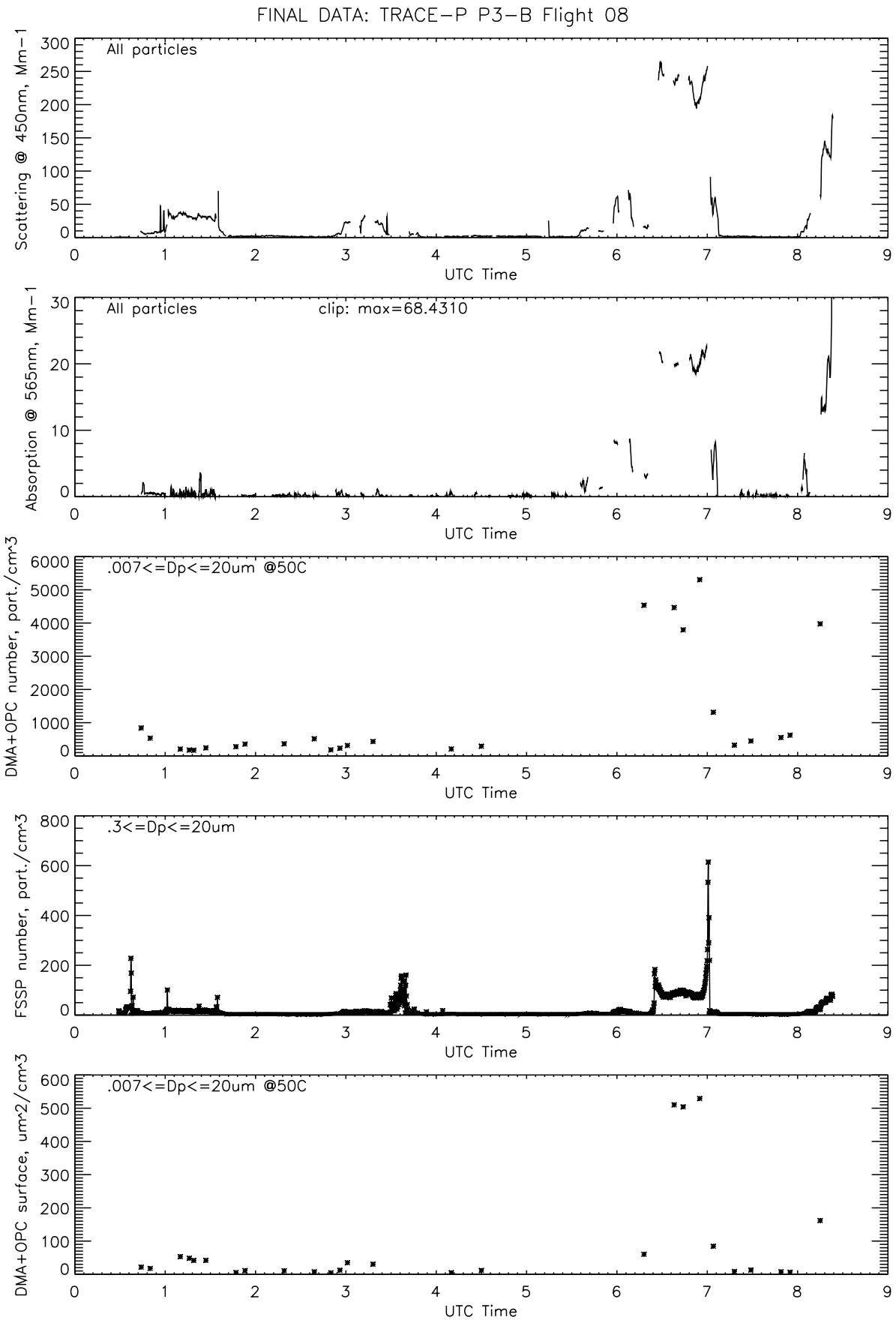
FINAL DATA: TRACE-P P3-B Flight 08

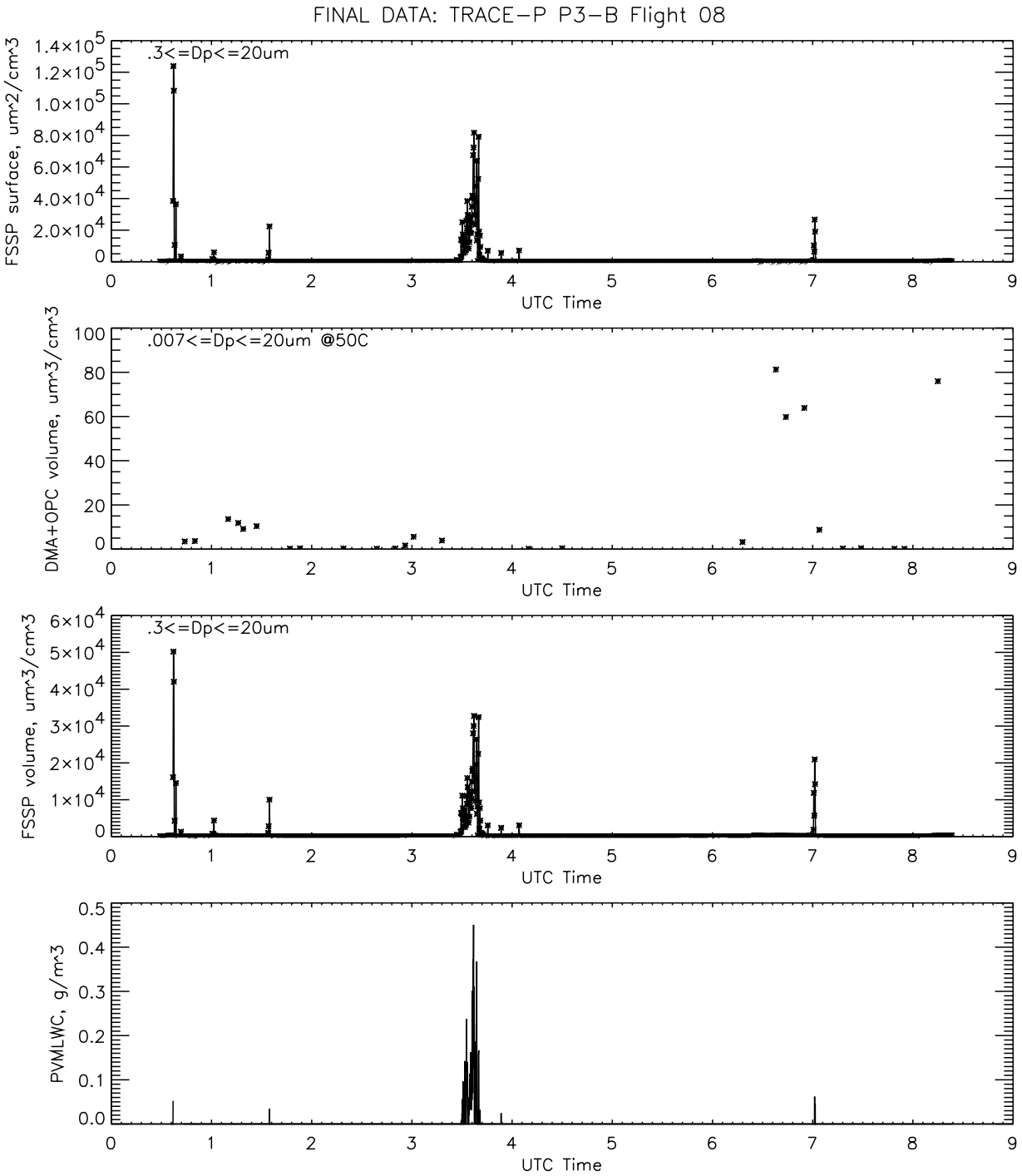



FINAL DATA: TRACE-P P3-B Flight 08
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

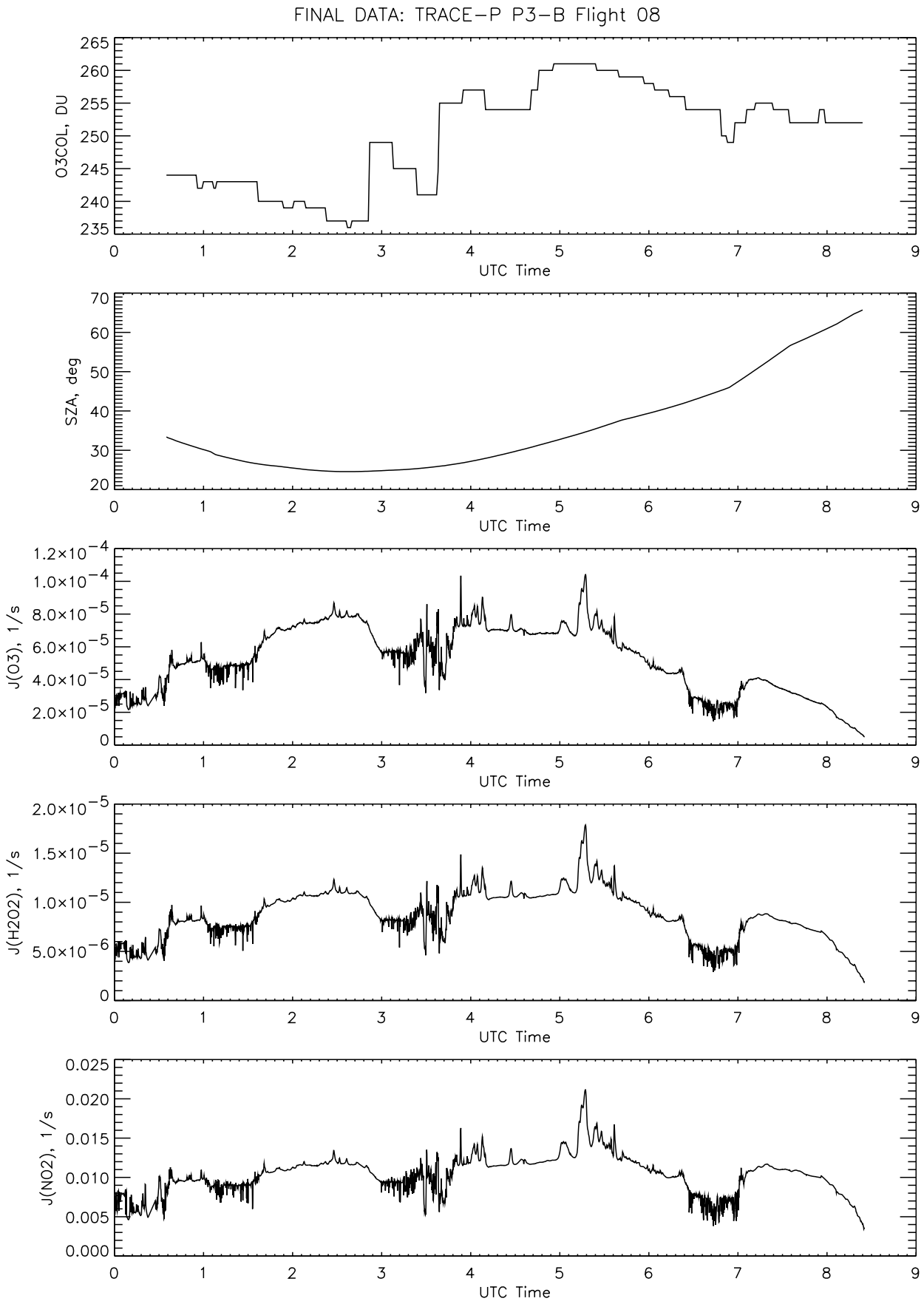

FINAL DATA: TRACE-P P3-B Flight 08
clip: max=4985.70
SO2, pptv
UTC Time
Blake
Atlas
OCS, pptv
UTC Time
H2SO4, molecule/cc
UTC Time
Bandy
Blake
DMS, pptv
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

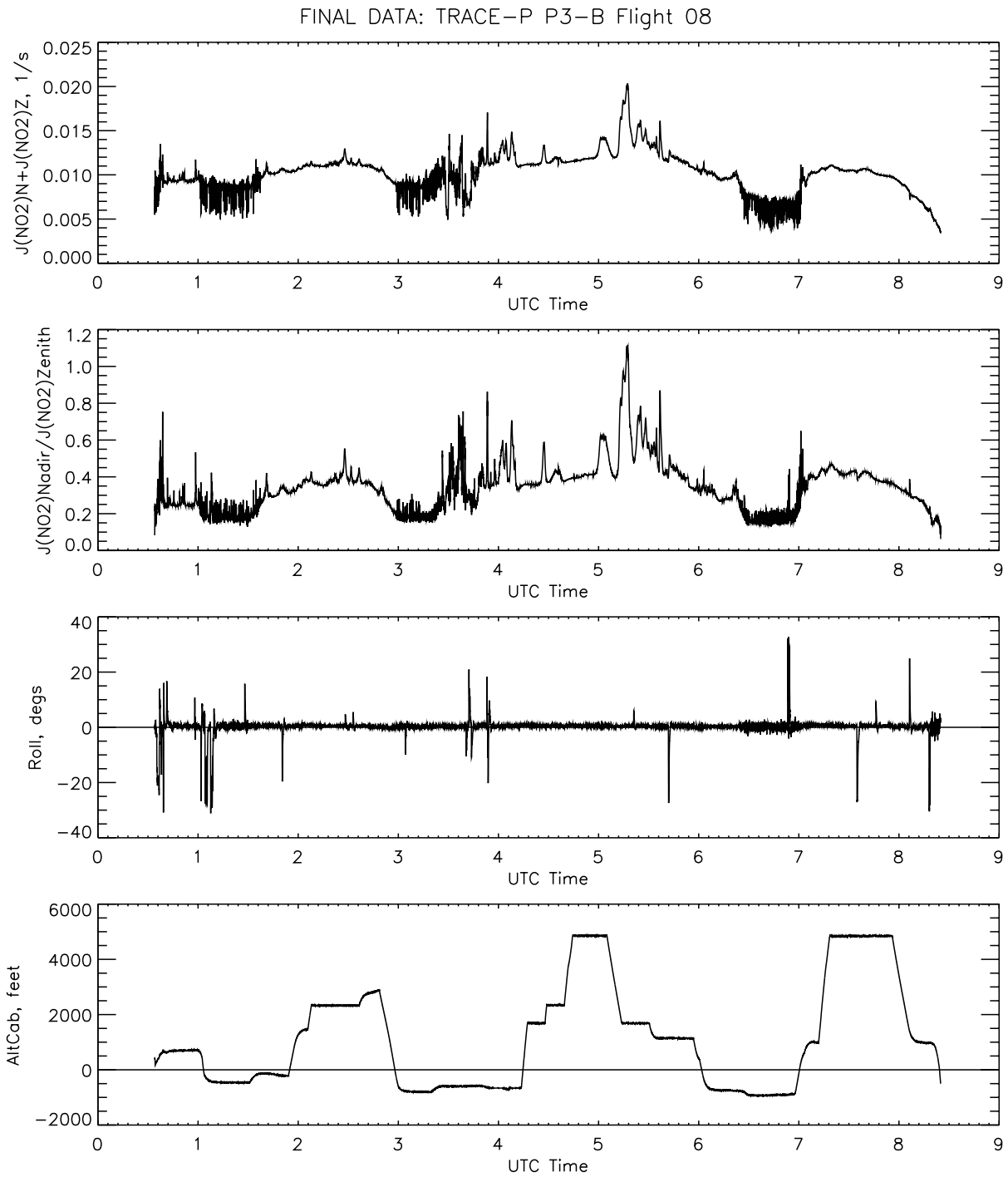

FINAL DATA: TRACE-P P3-B Flight 08
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

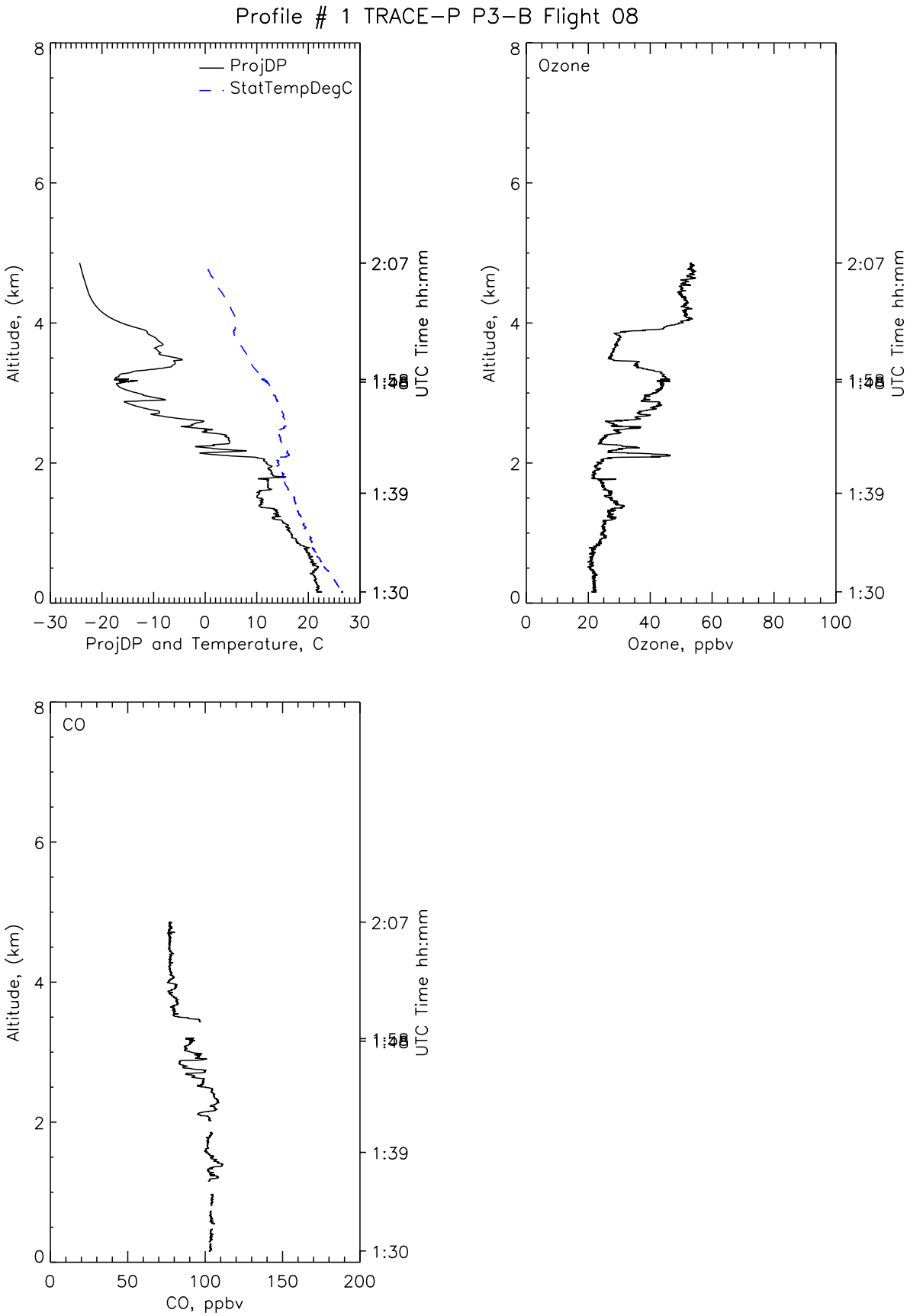

FINAL DATA: TRACE-P P3-B Flight 08
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=68.4310
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 08
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

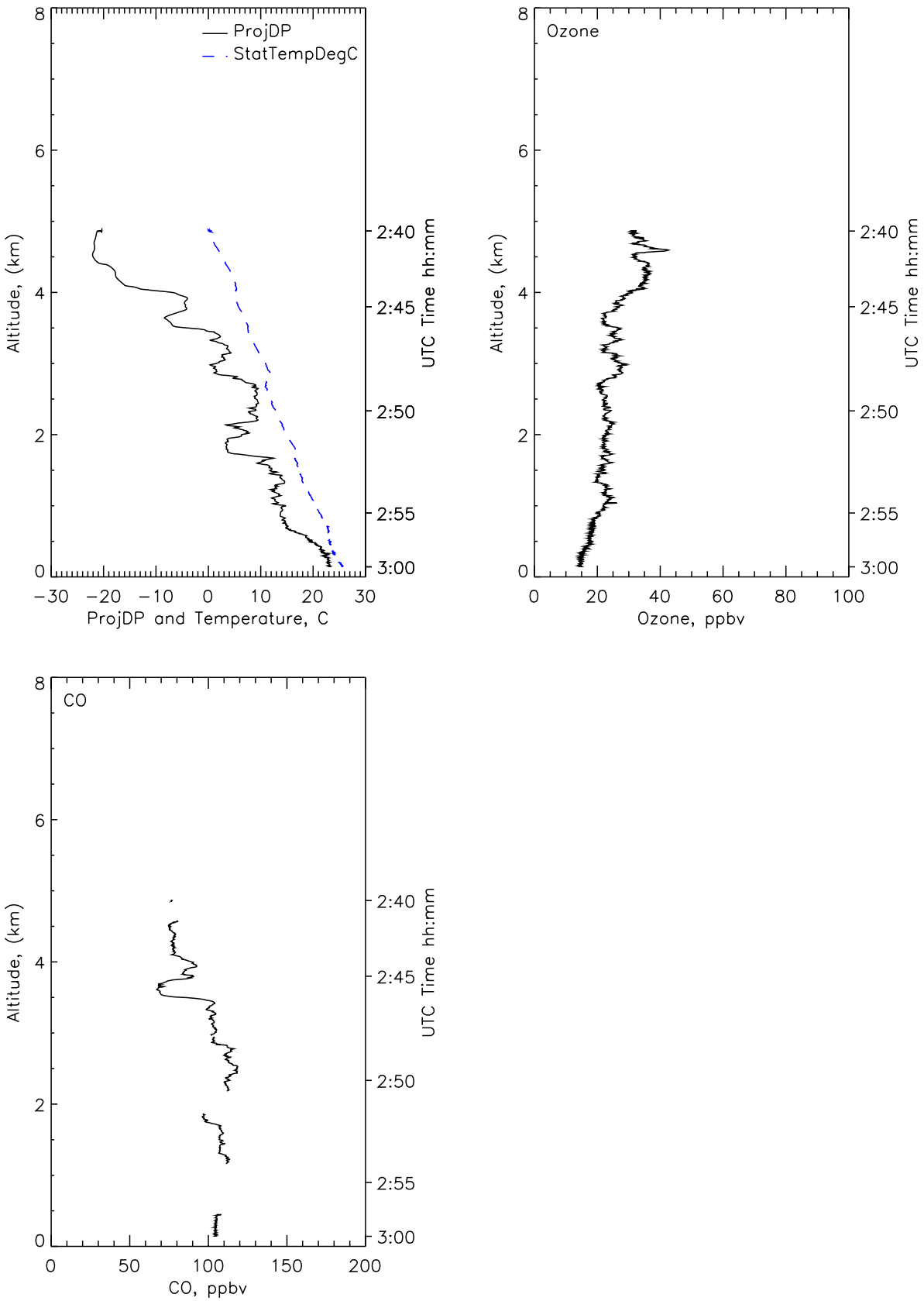
LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 08
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time

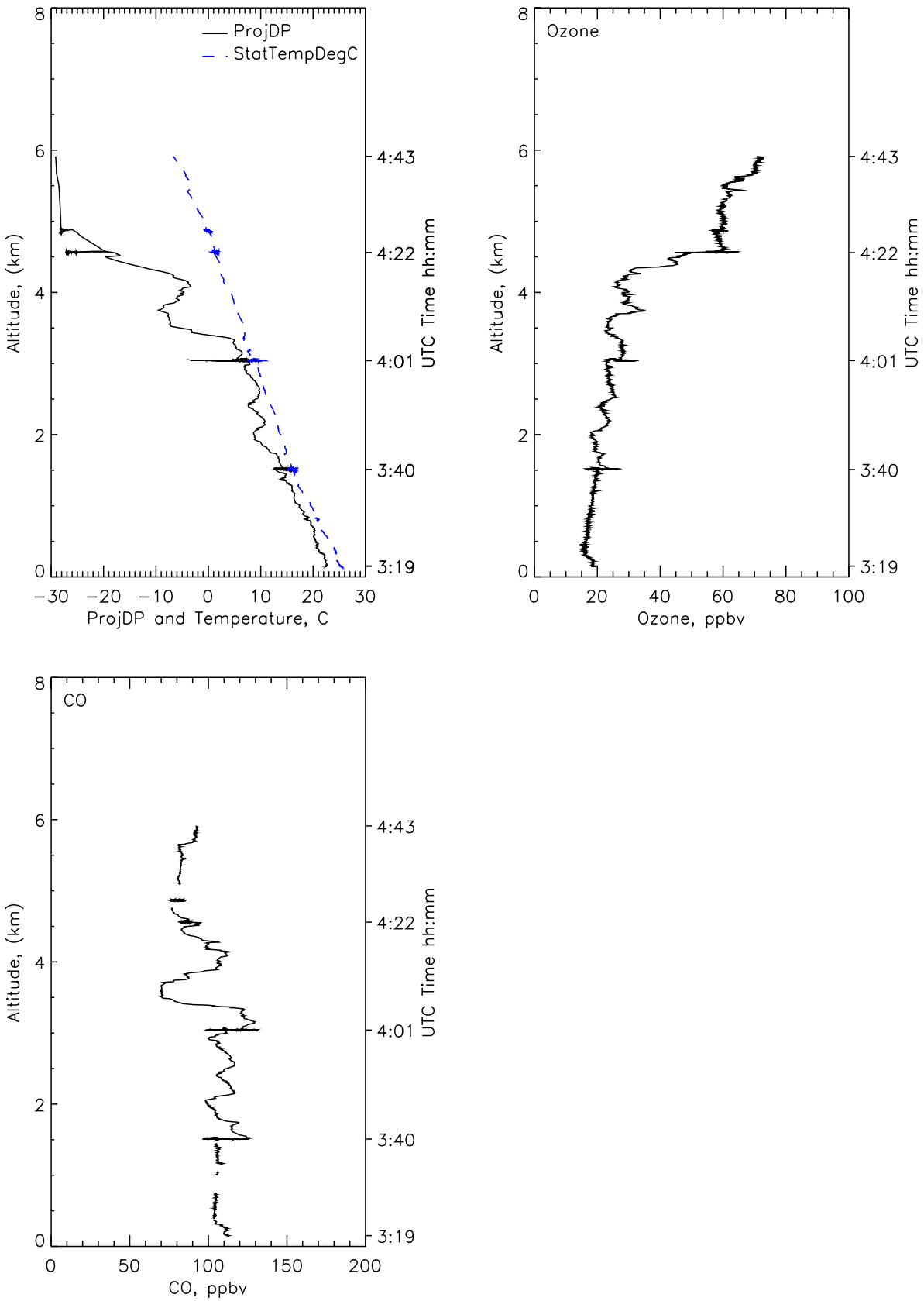

FINAL DATA: TRACE-P P3-B Flight 08
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
0
1
2
3
4
5
6
7
8
9
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
4000
2000
0
−2000
UTC Time


Profile # 1 TRACE-P P3-B Flight 08
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

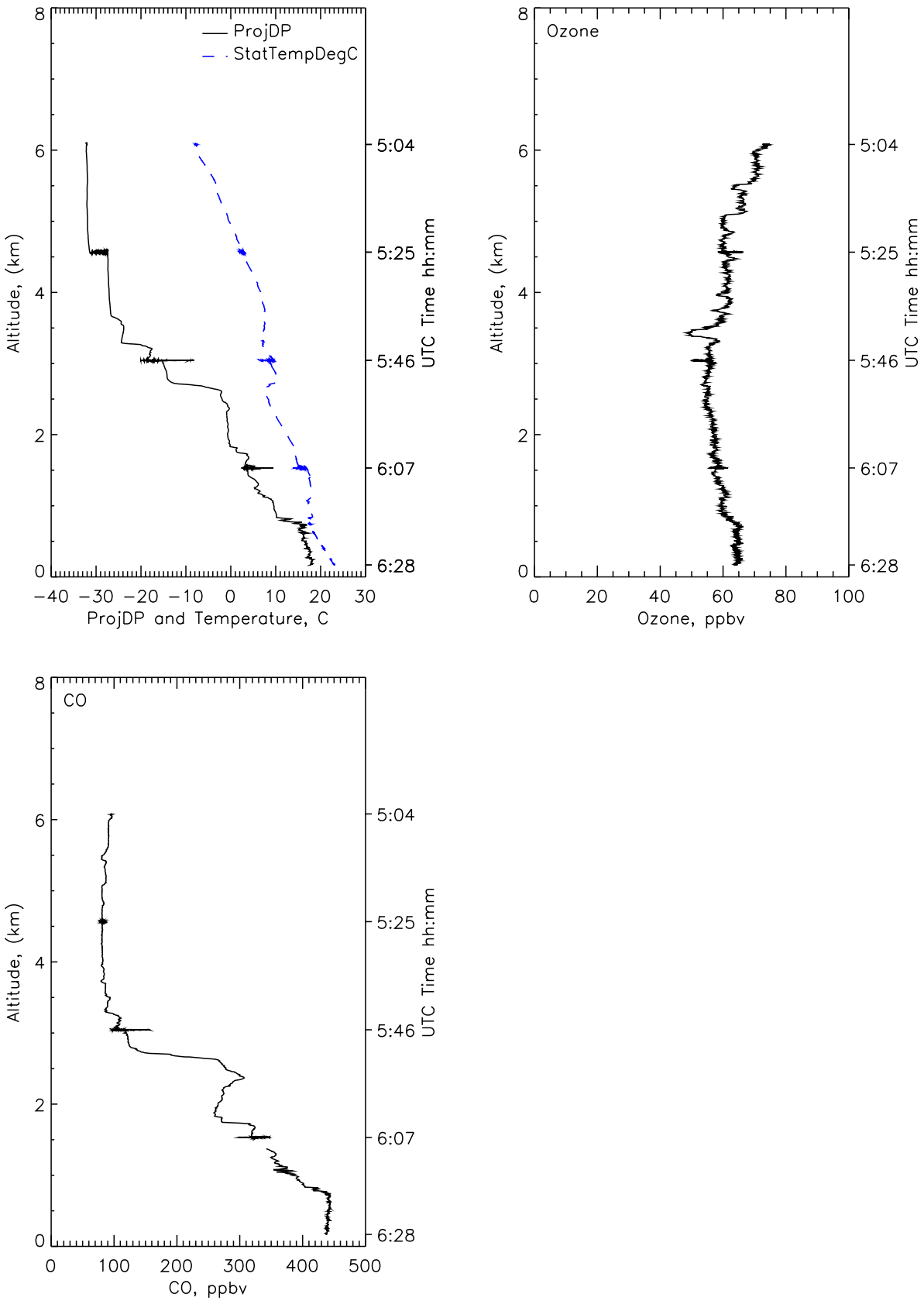
Profile # 2 TRACE−P P3−B Flight 08



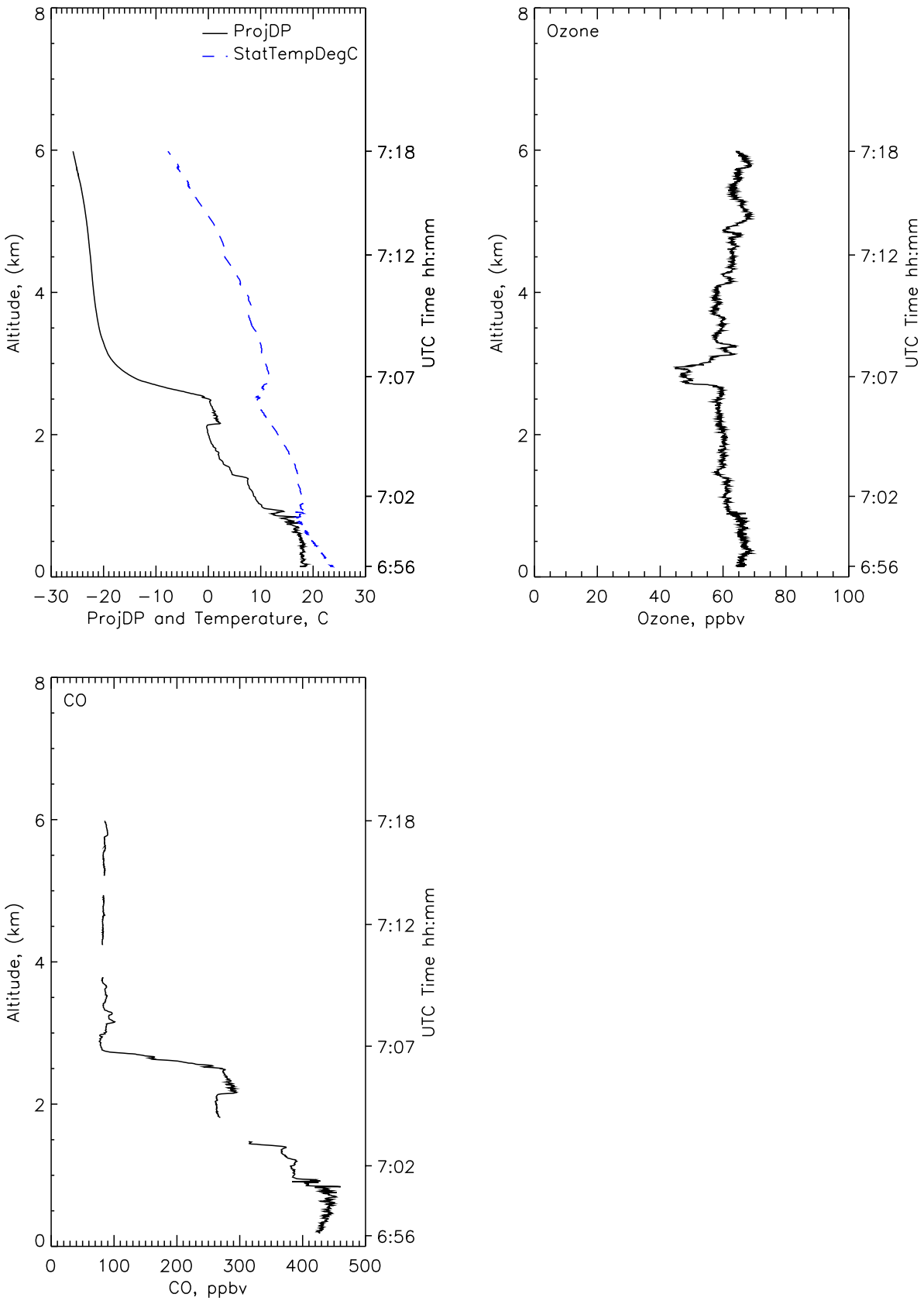
Profile # 3 TRACE−P P3−B Flight 08

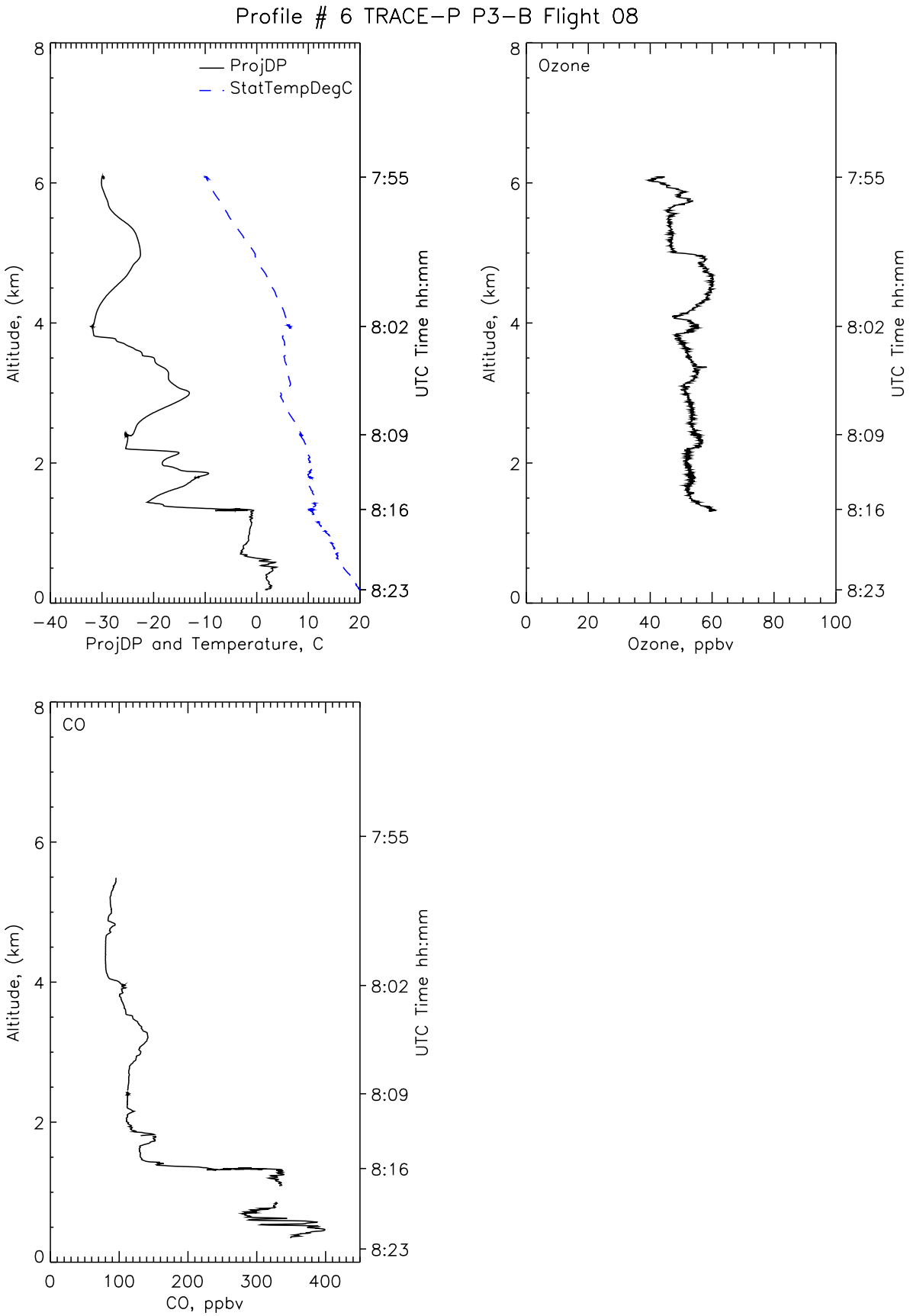


Profile # 4 TRACE−P P3−B Flight 08



Profile # 5 TRACE−P P3−B Flight 08




Profile # 6 TRACE-P P3-B Flight 08
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

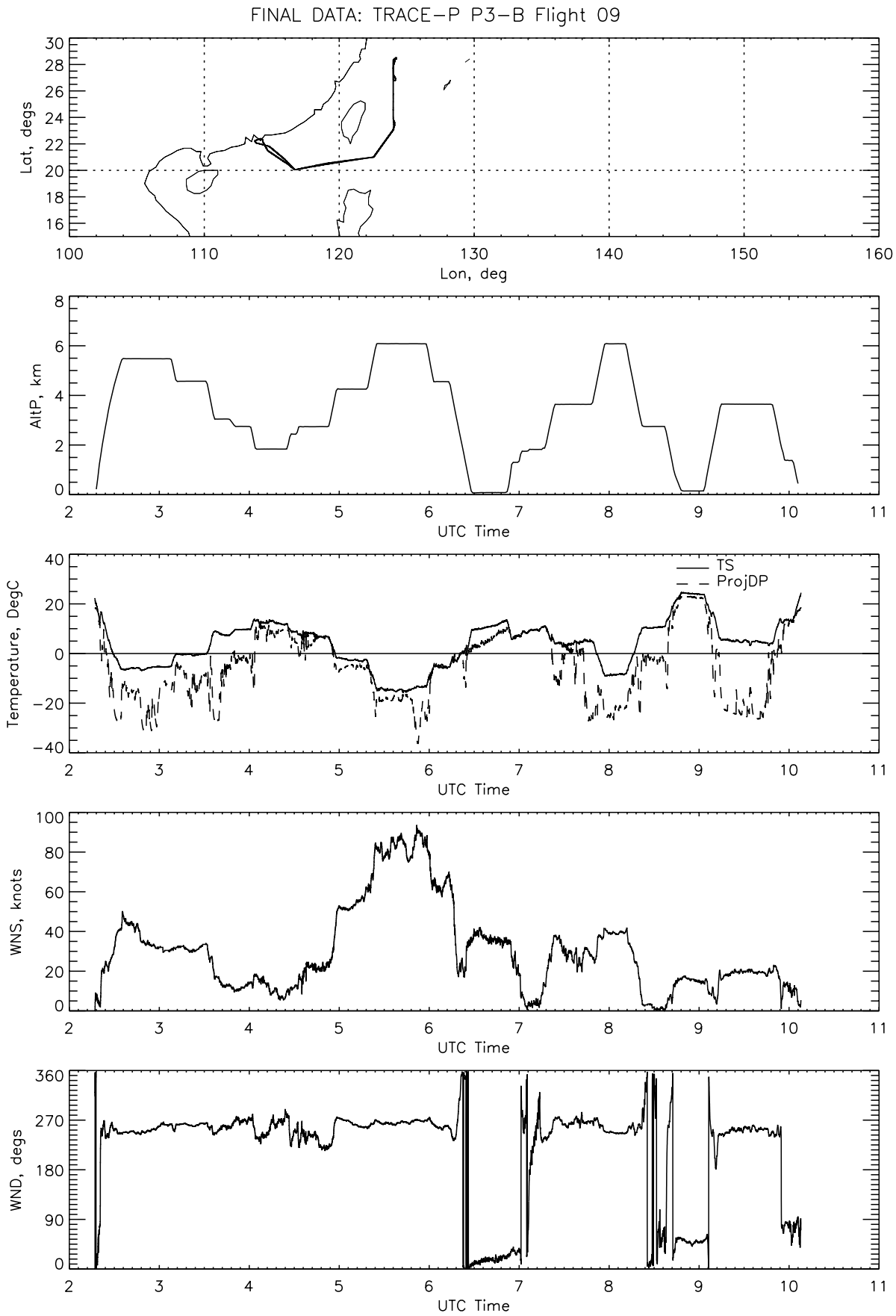
TRACE-P

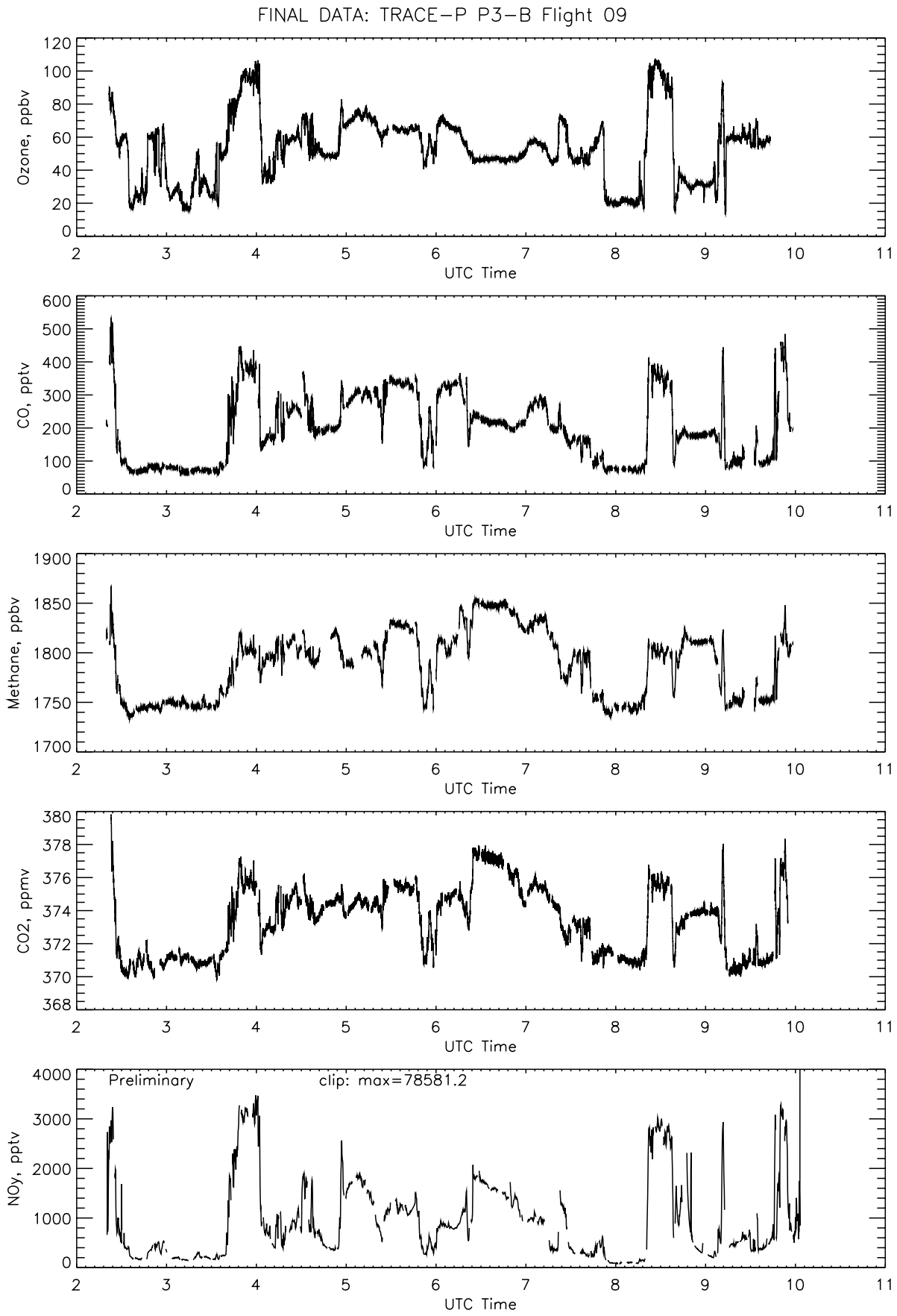
Flight 9P

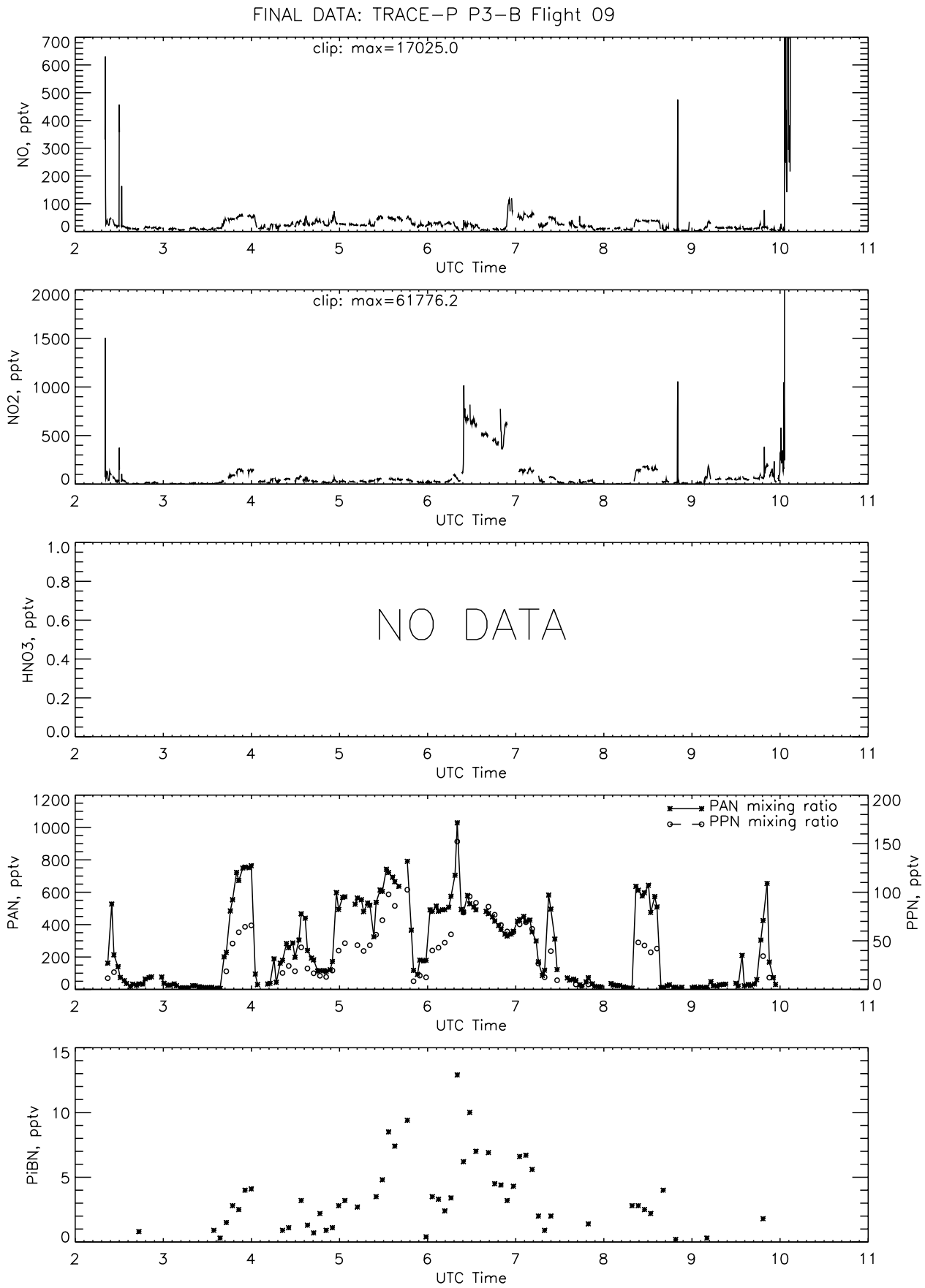
Local: Hong Kong No. 1

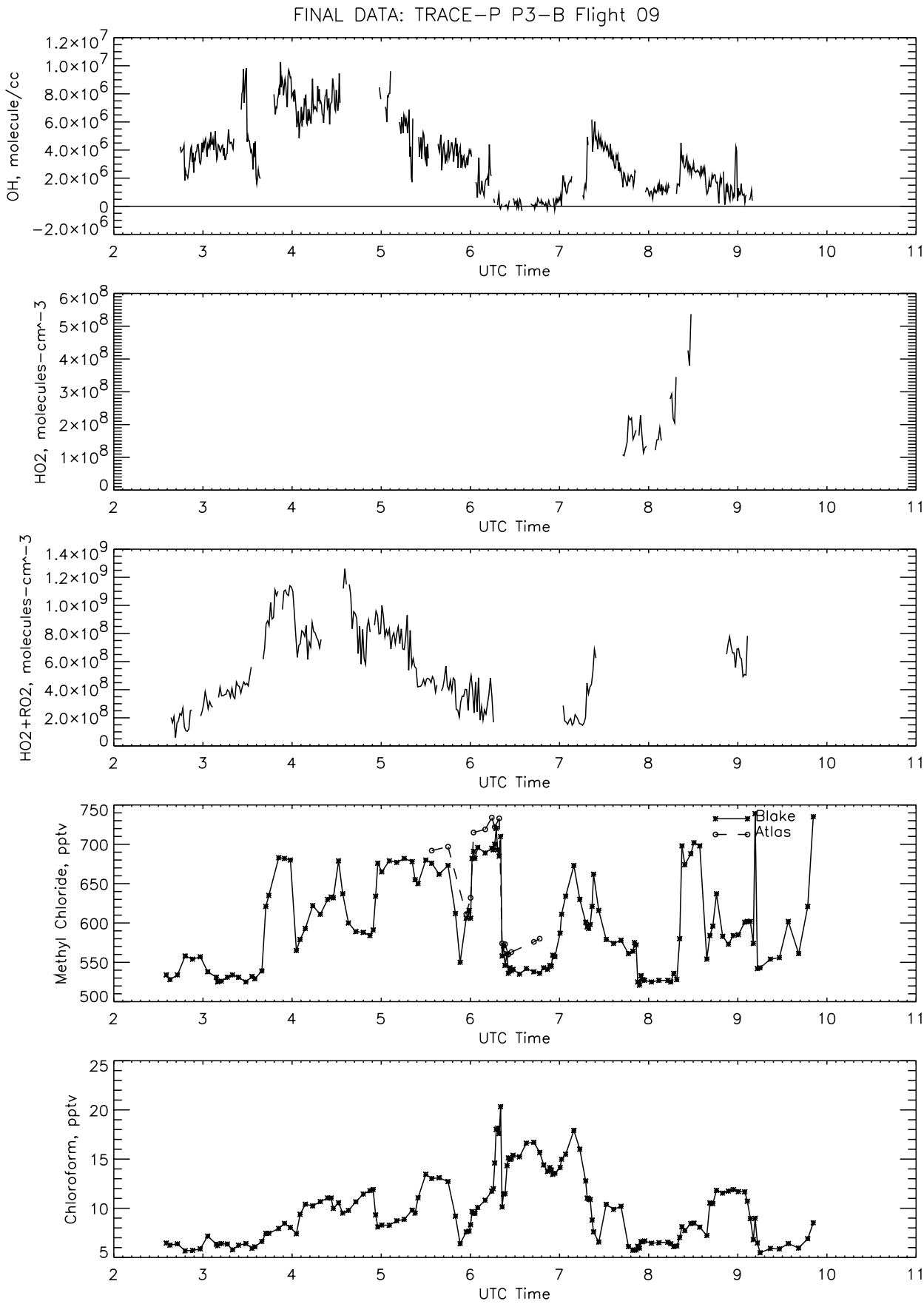
Post-Frontal Asian Outflow

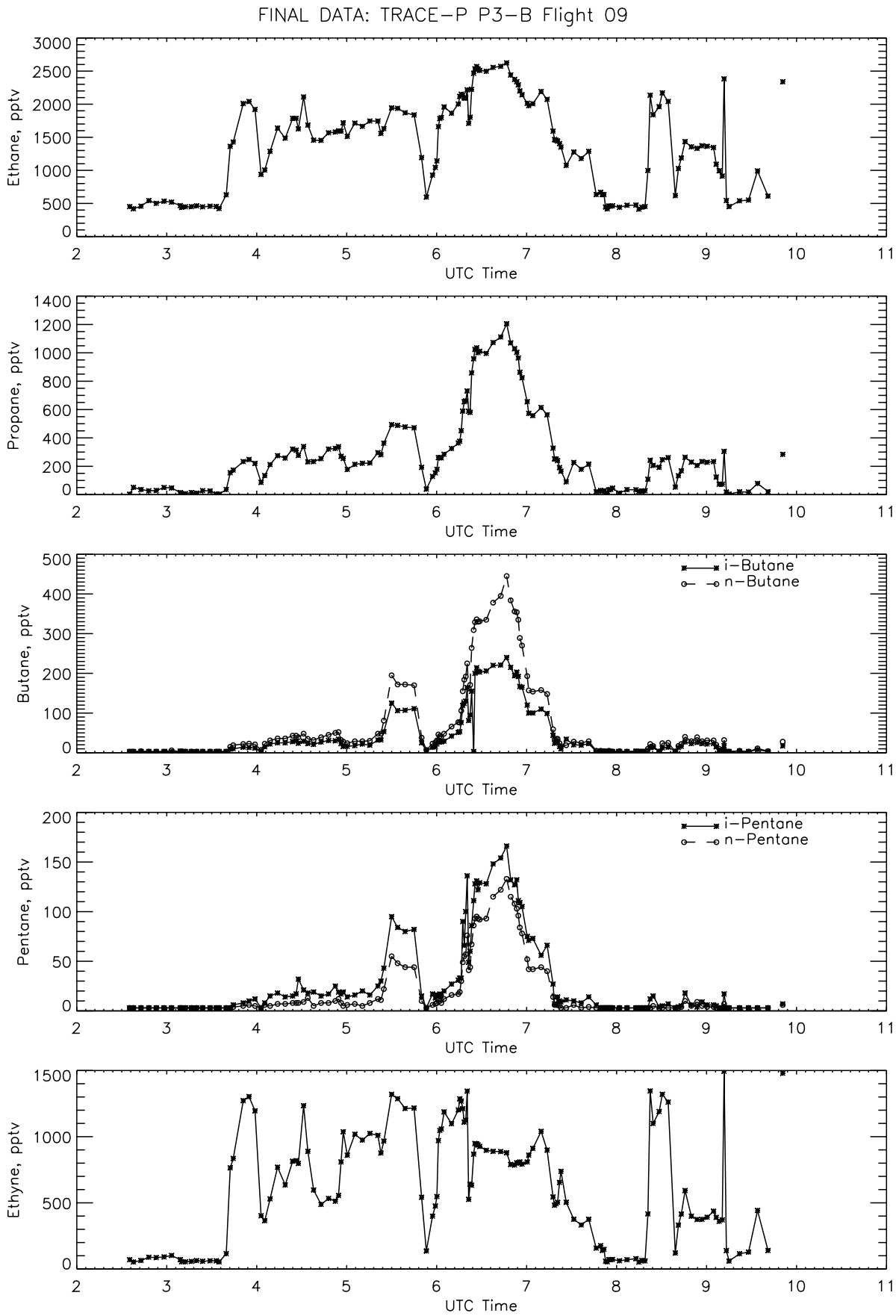
March 7, 2001

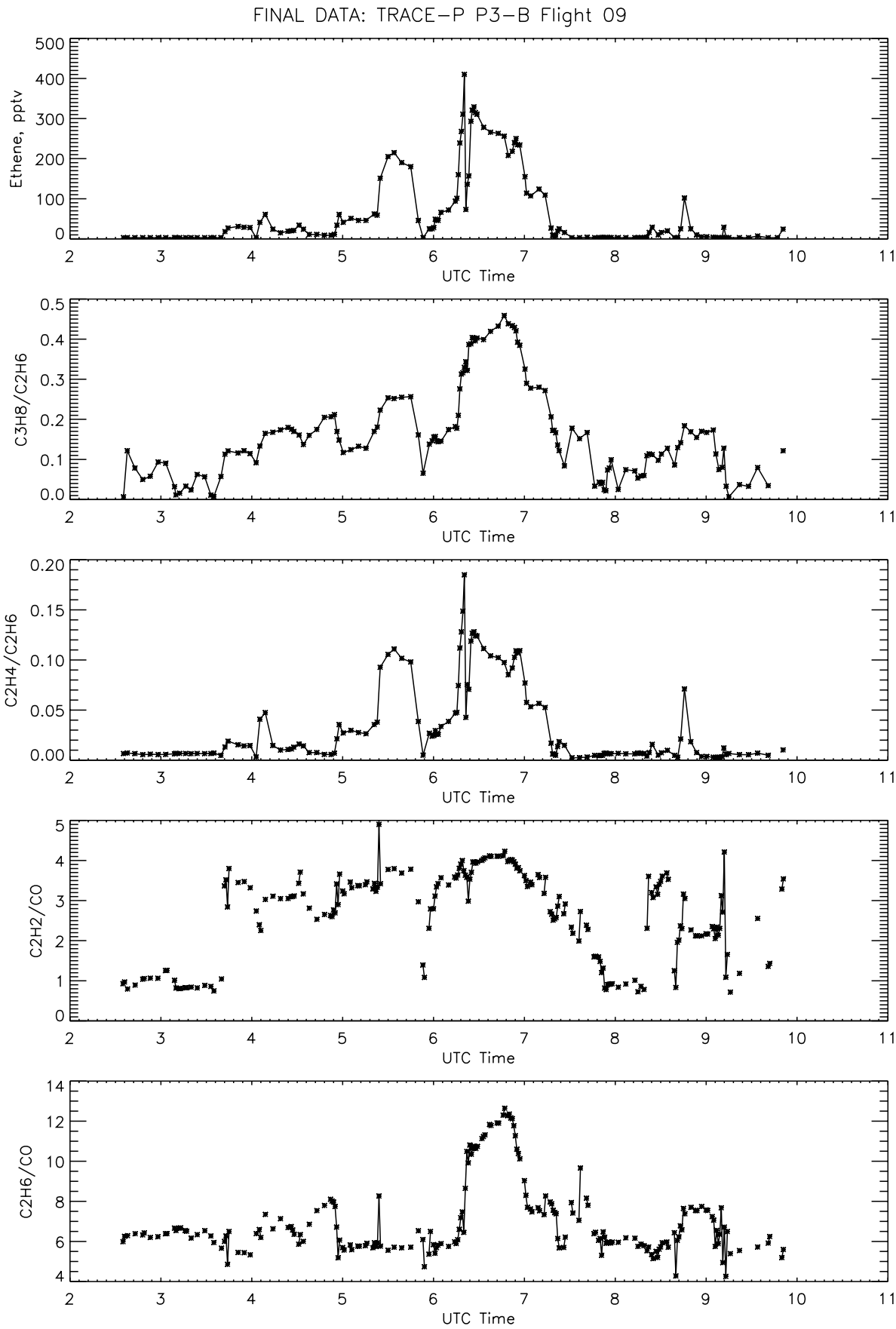

FINAL DATA: TRACE-P P3-B Flight 09
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 09
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=78581.2

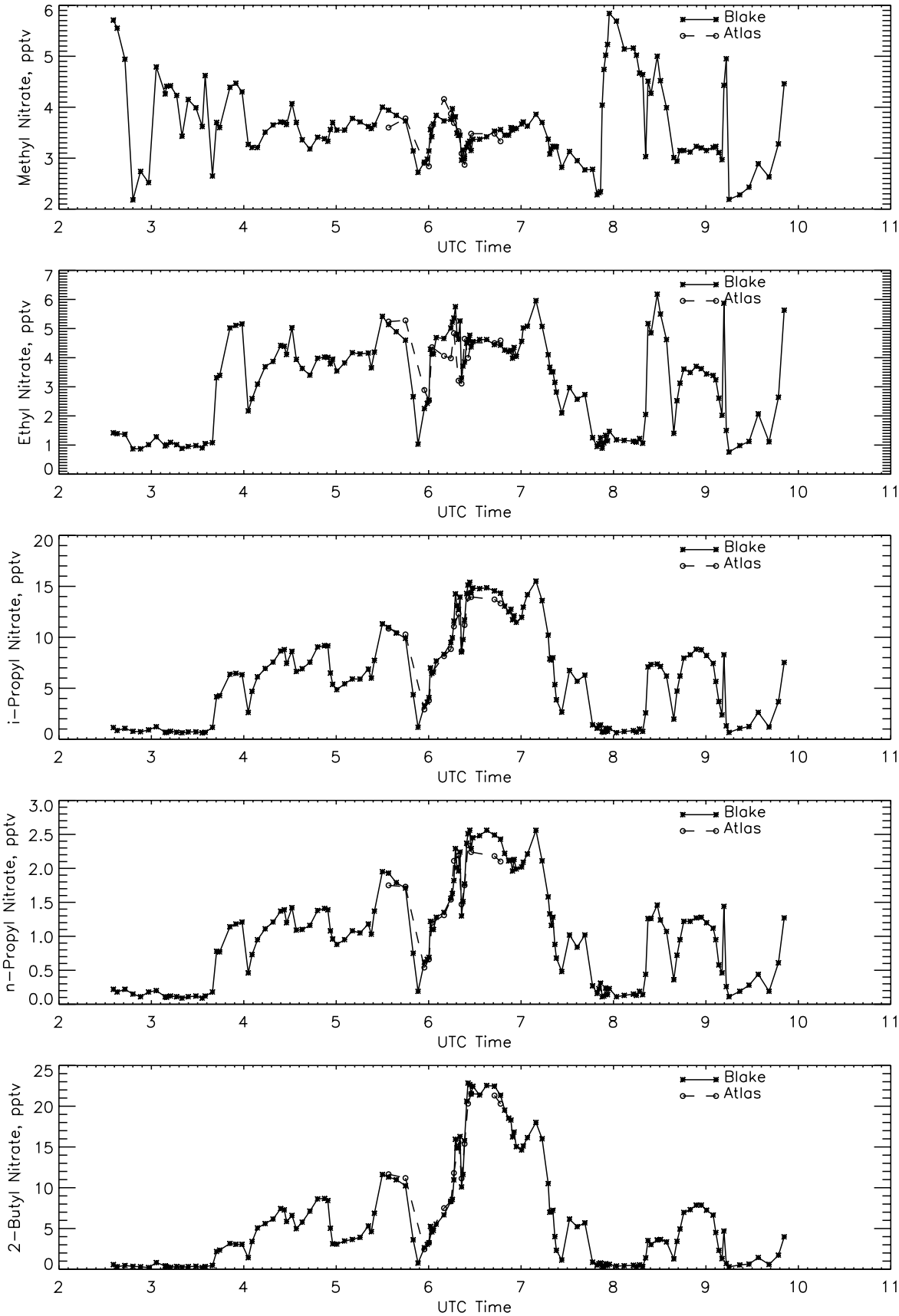

FINAL DATA: TRACE-P P3-B Flight 09
clip: max=17025.0
NO, pptv
UTC Time
clip: max=61776.2
NO2, pptv
UTC Time
NO DATA
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

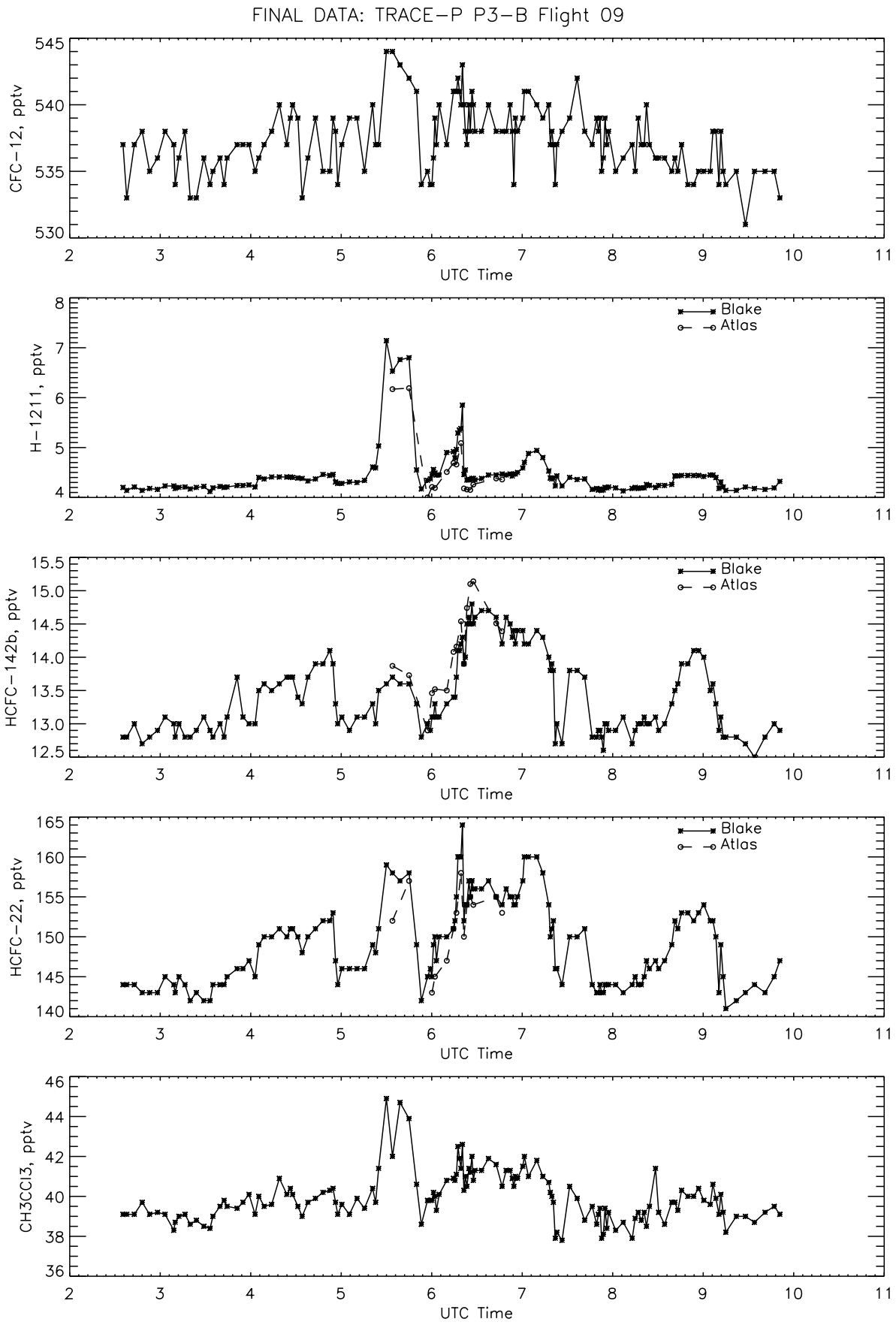

FINAL DATA: TRACE-P P3-B Flight 09
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 09
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

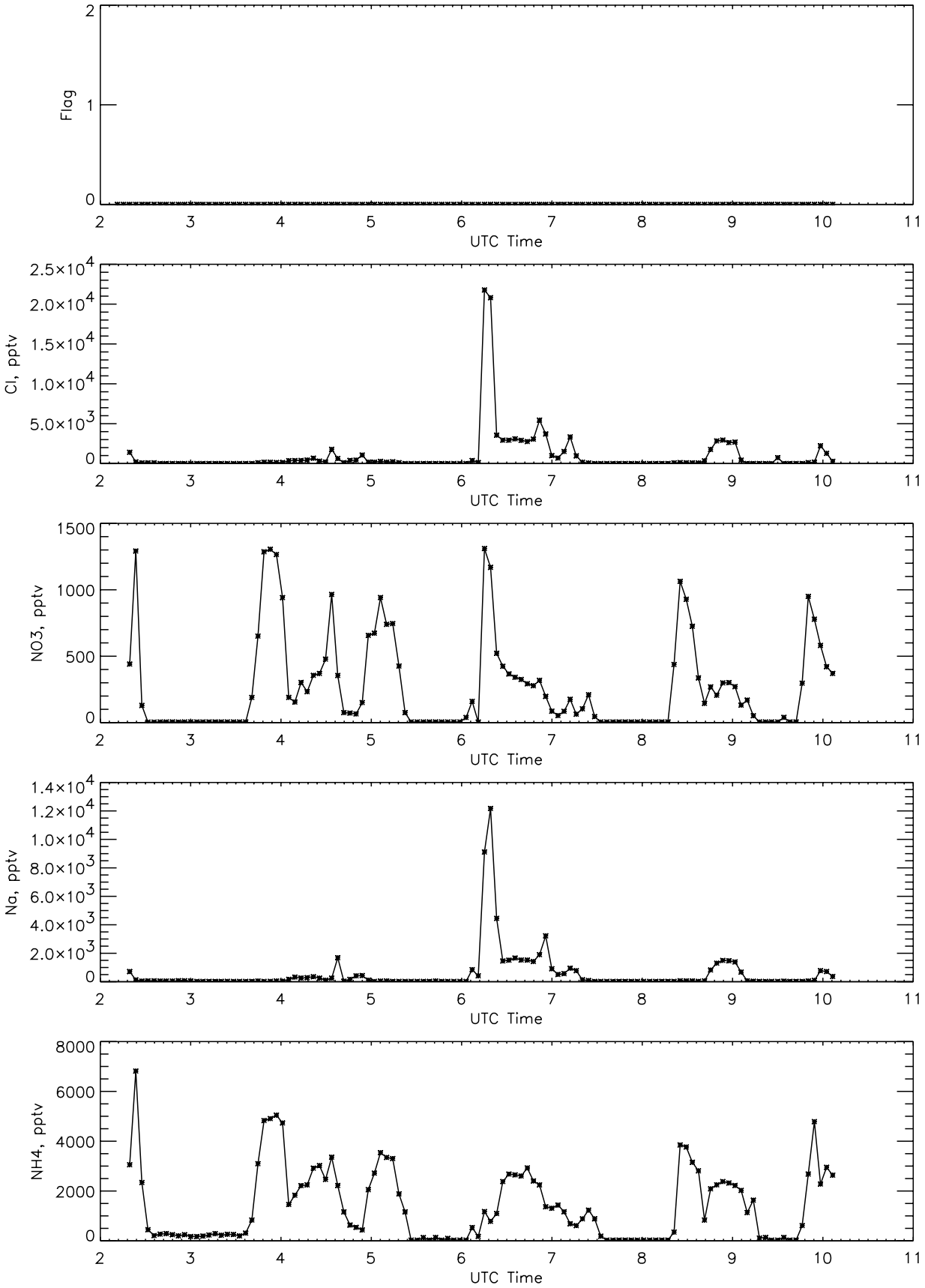

FINAL DATA: TRACE-P P3-B Flight 09
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

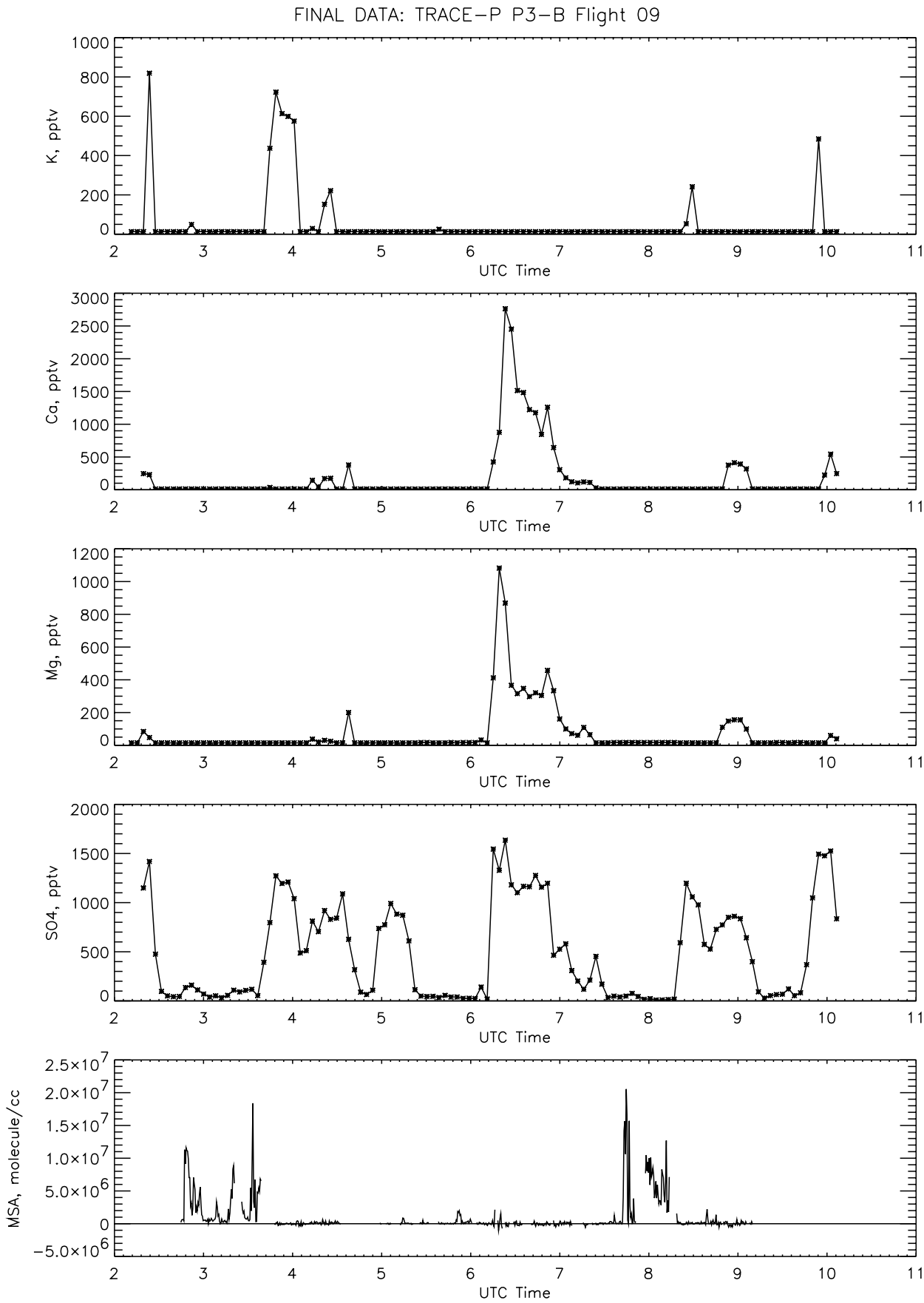
FINAL DATA: TRACE-P P3-B Flight 09

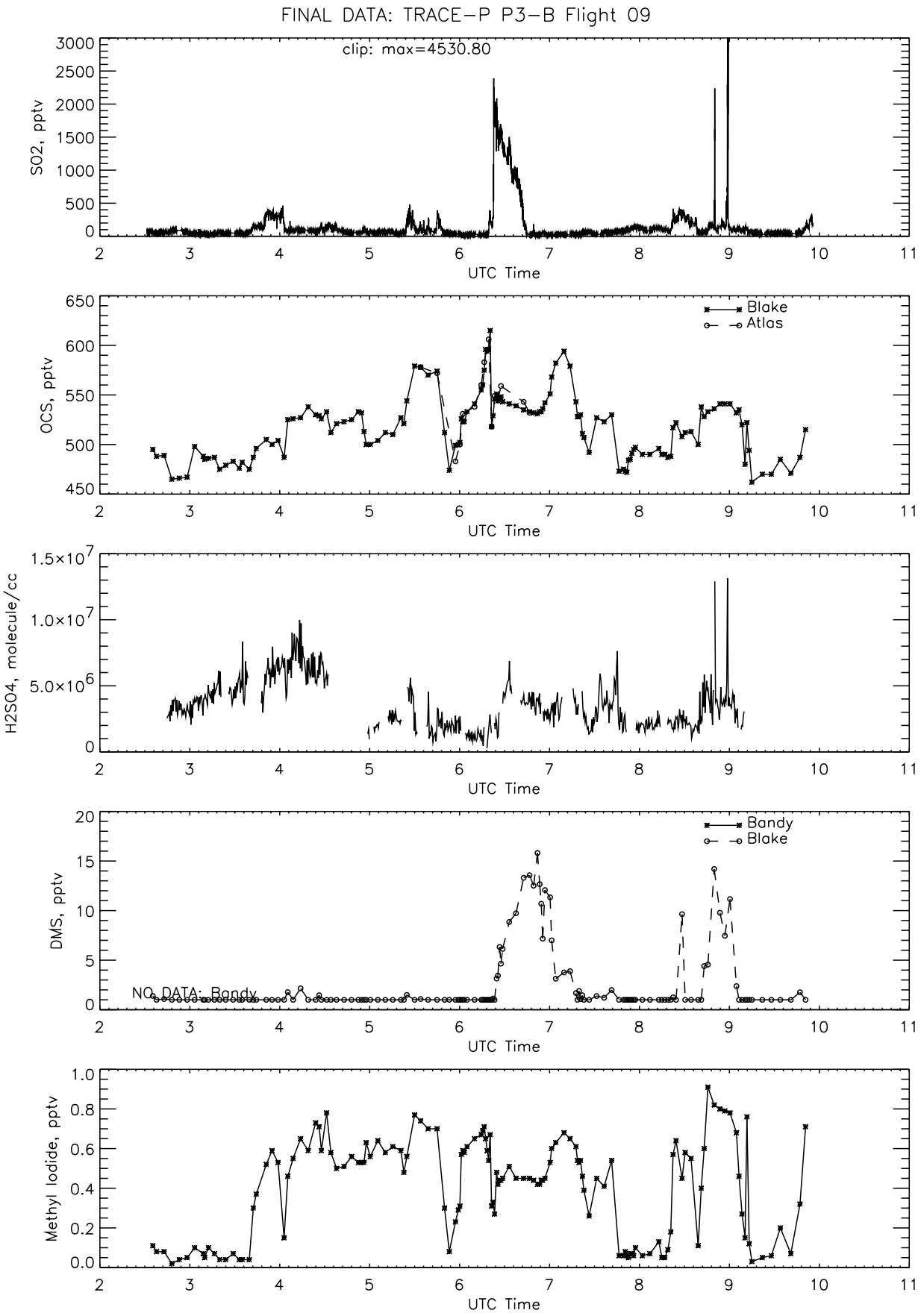


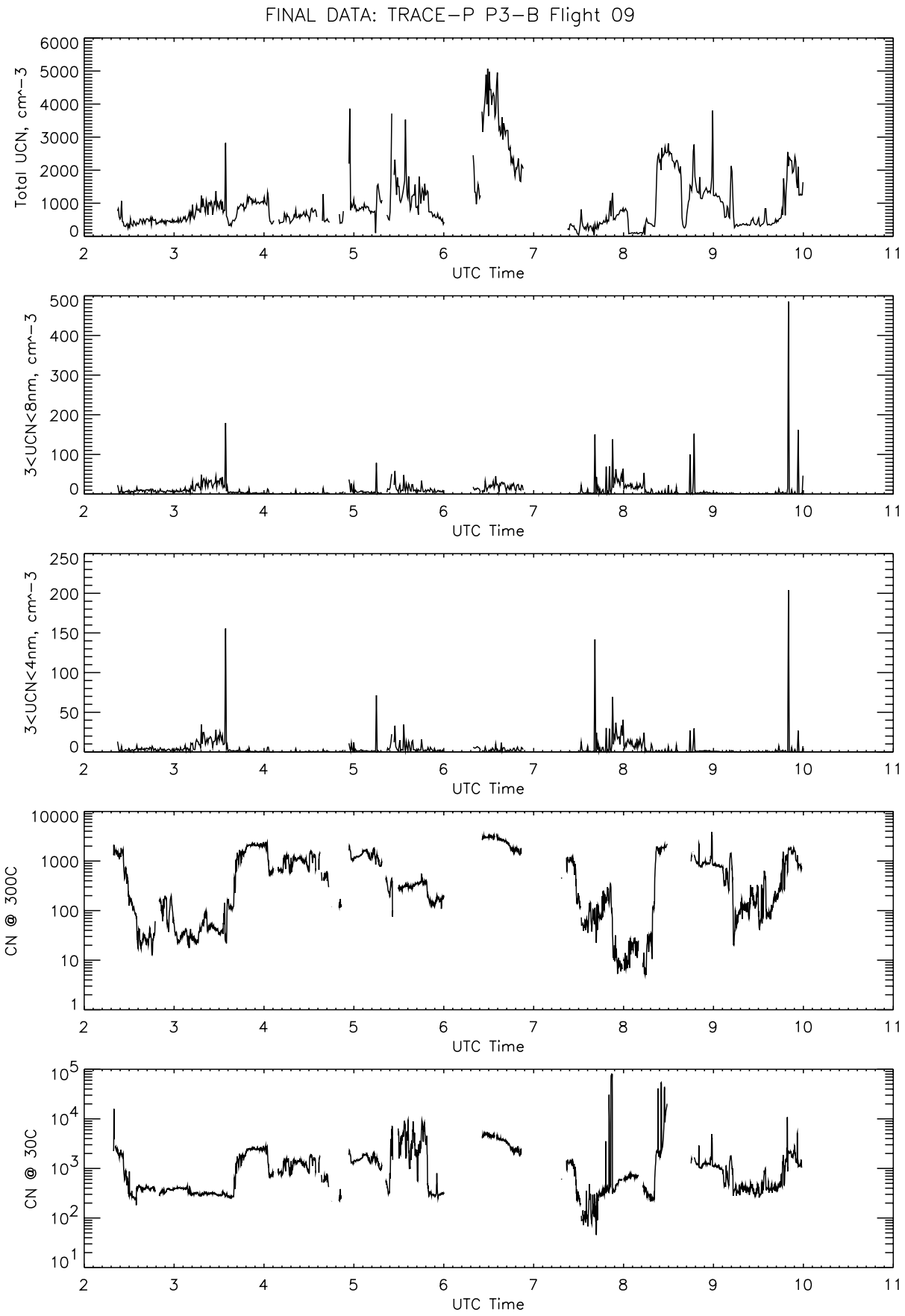

FINAL DATA: TRACE-P P3-B Flight 09
CFC-12, pptv
UTC Time
H-1211, pptv
Blake
Atlas
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv

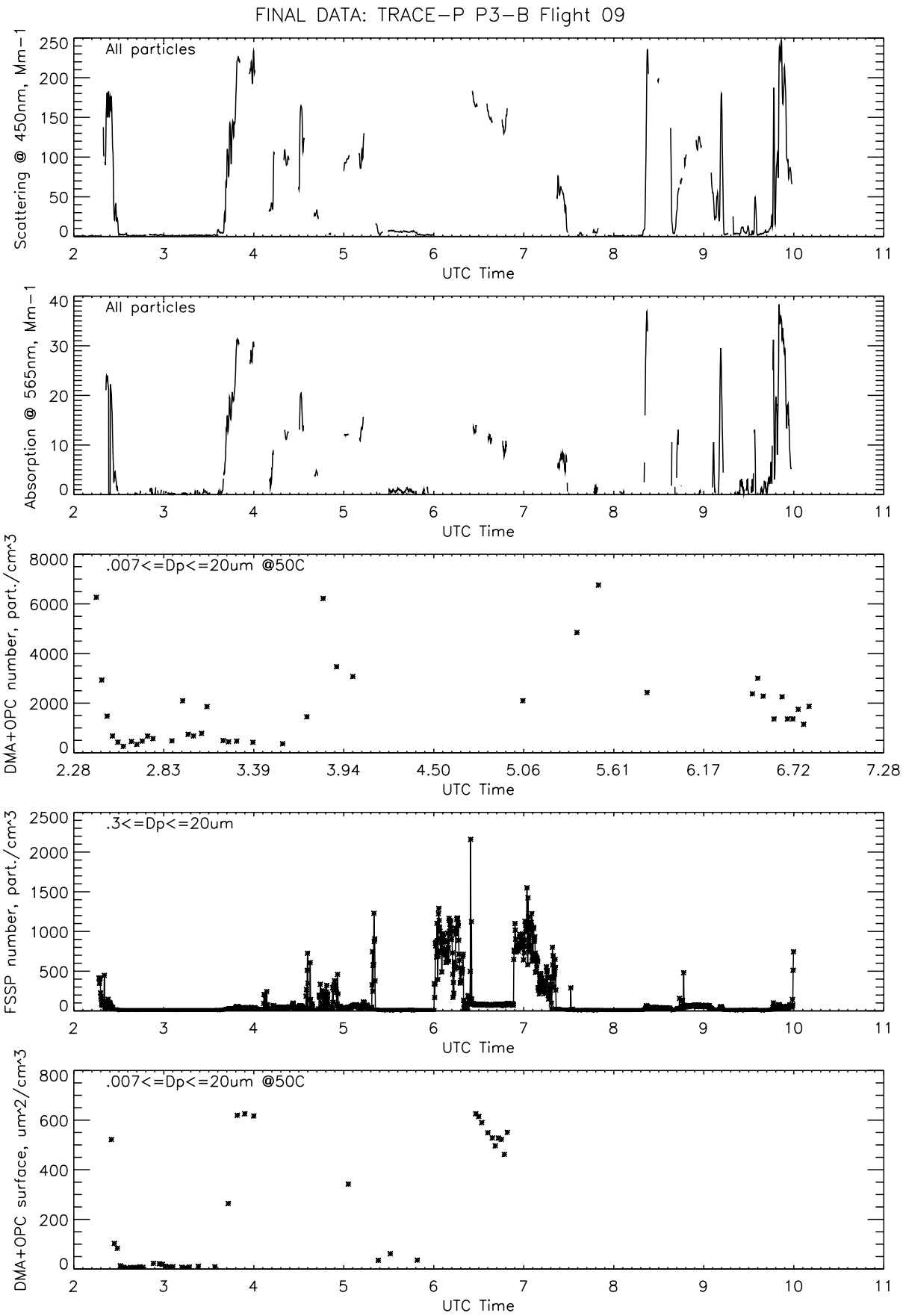
FINAL DATA: TRACE-P P3-B Flight 09

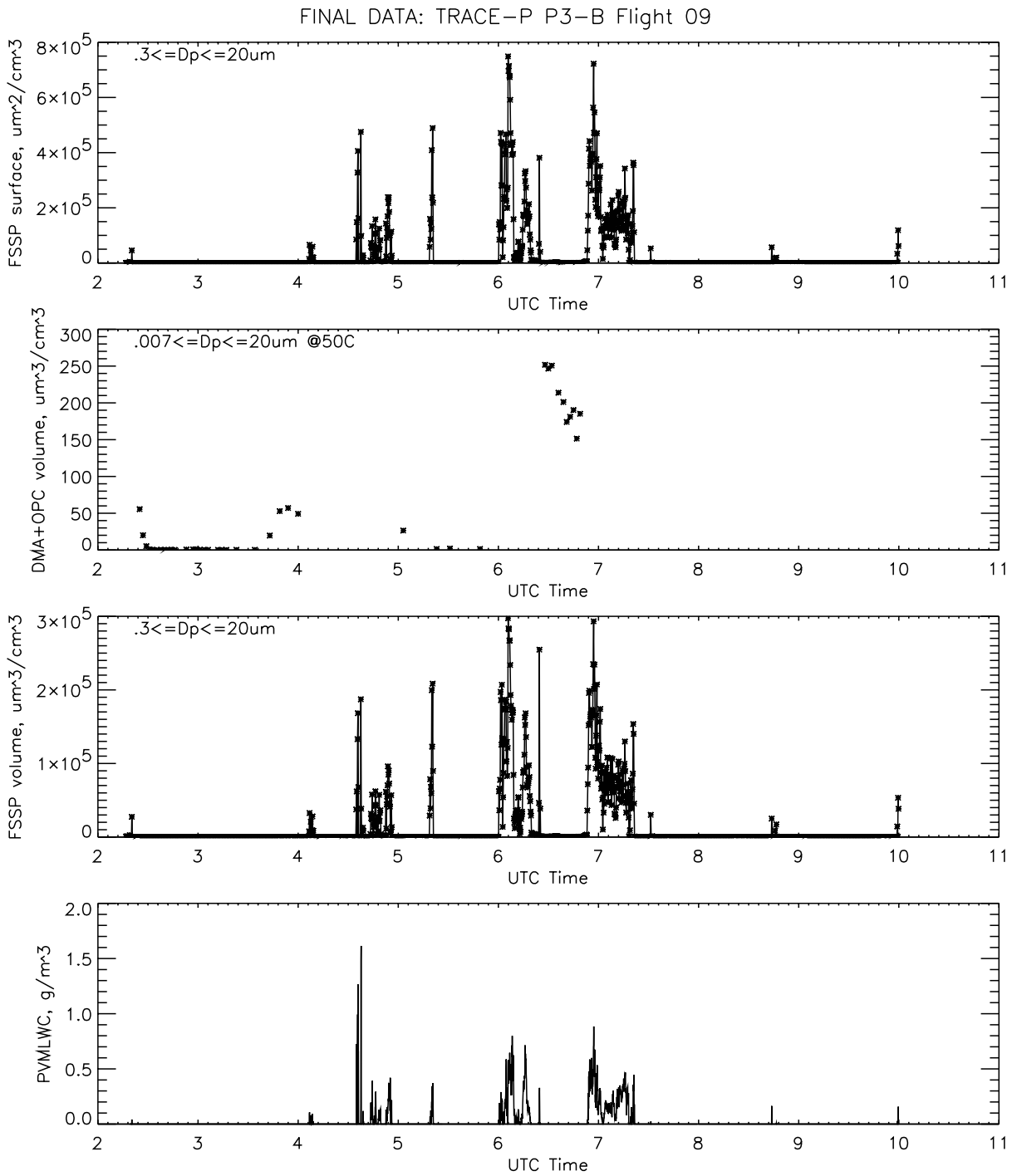



FINAL DATA: TRACE-P P3-B Flight 09
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

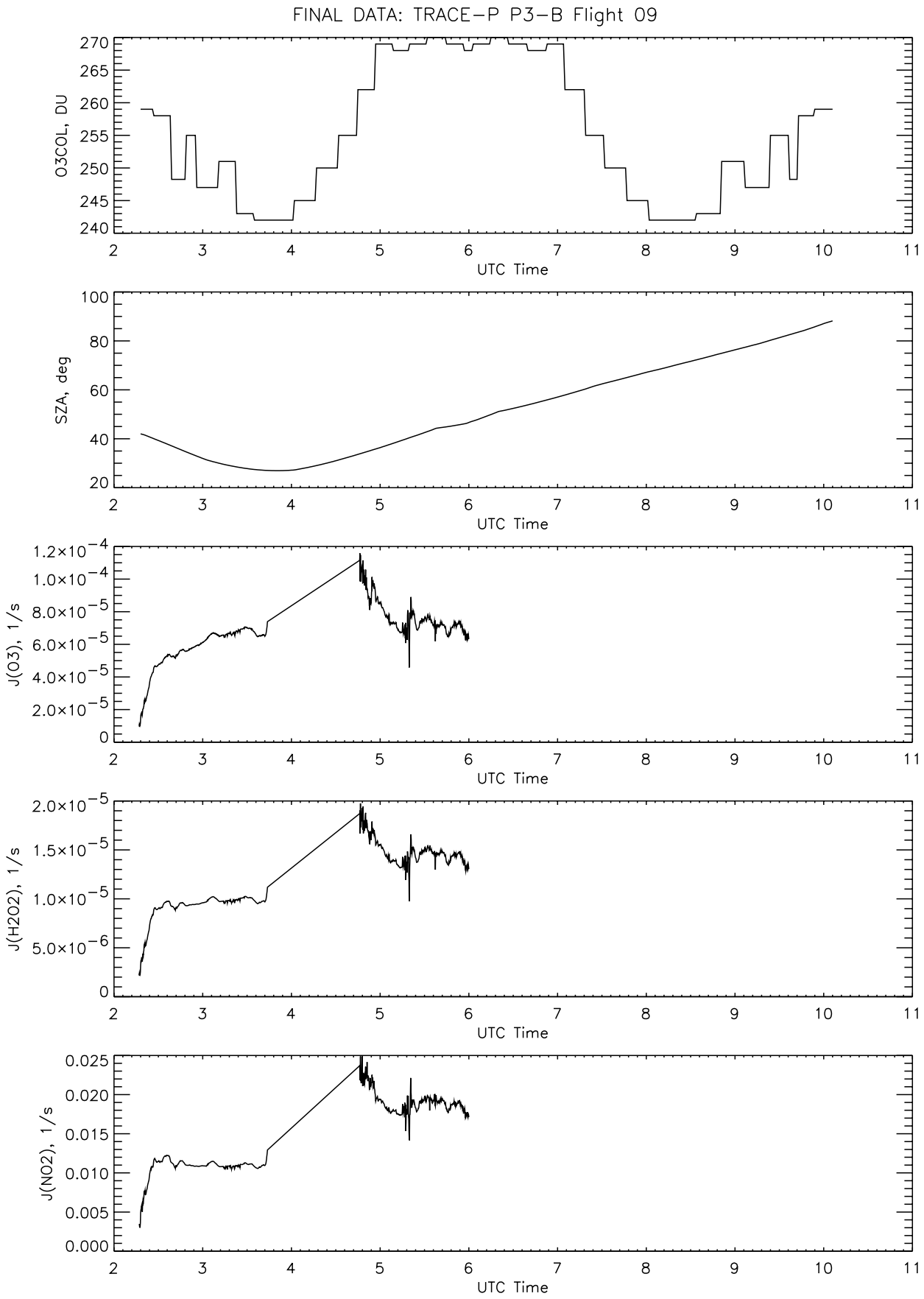

FINAL DATA: TRACE-P P3-B Flight 09
clip: max=4530.80
SO2, pptv
UTC Time
Blake
Atlas
OCS, pptv
UTC Time
H2SO4, molecule/cc
UTC Time
Bandy
Blake
DMS, pptv
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

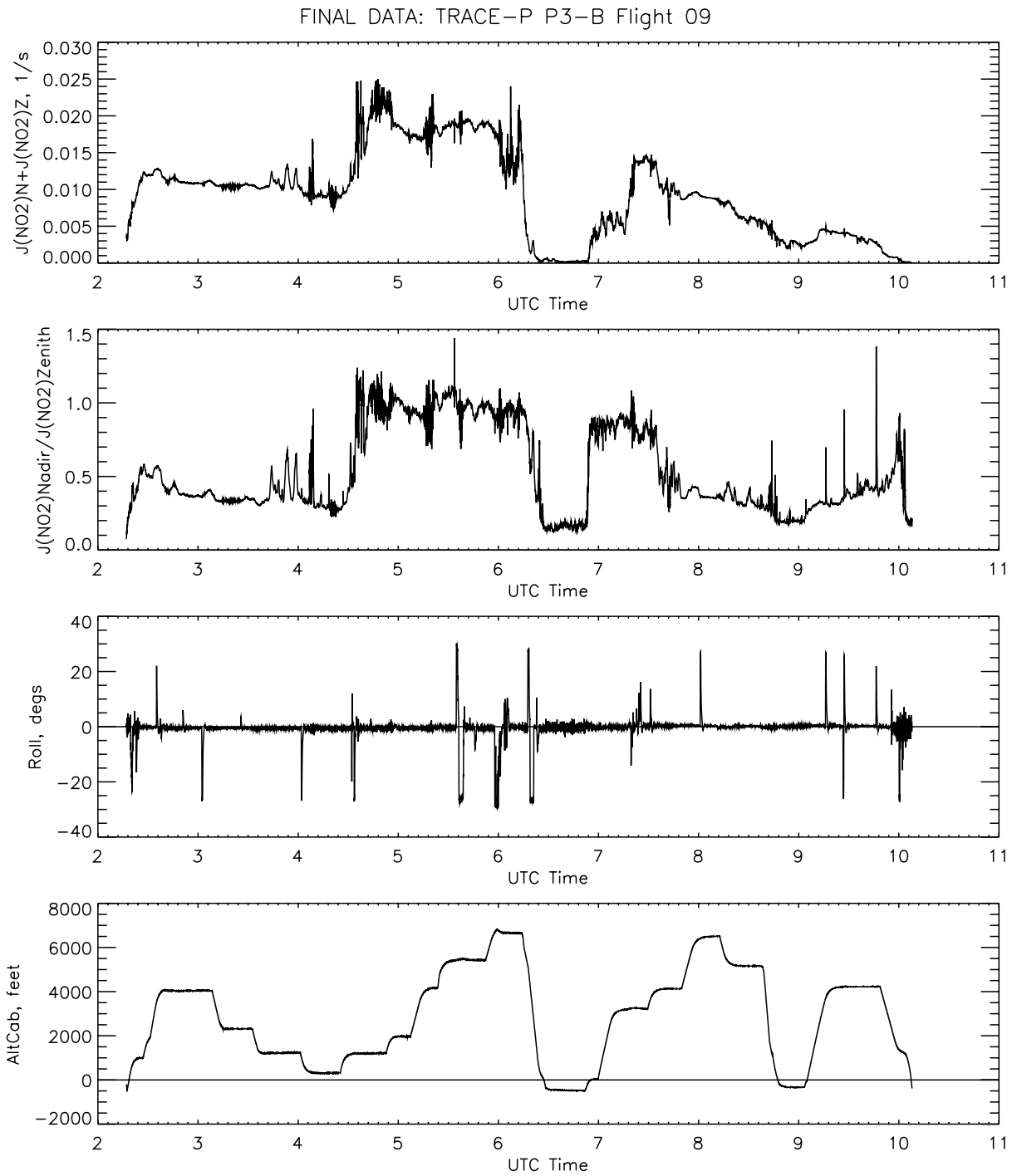

FINAL DATA: TRACE-P P3-B Flight 09
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time


FINAL DATA: TRACE-P P3-B Flight 09
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

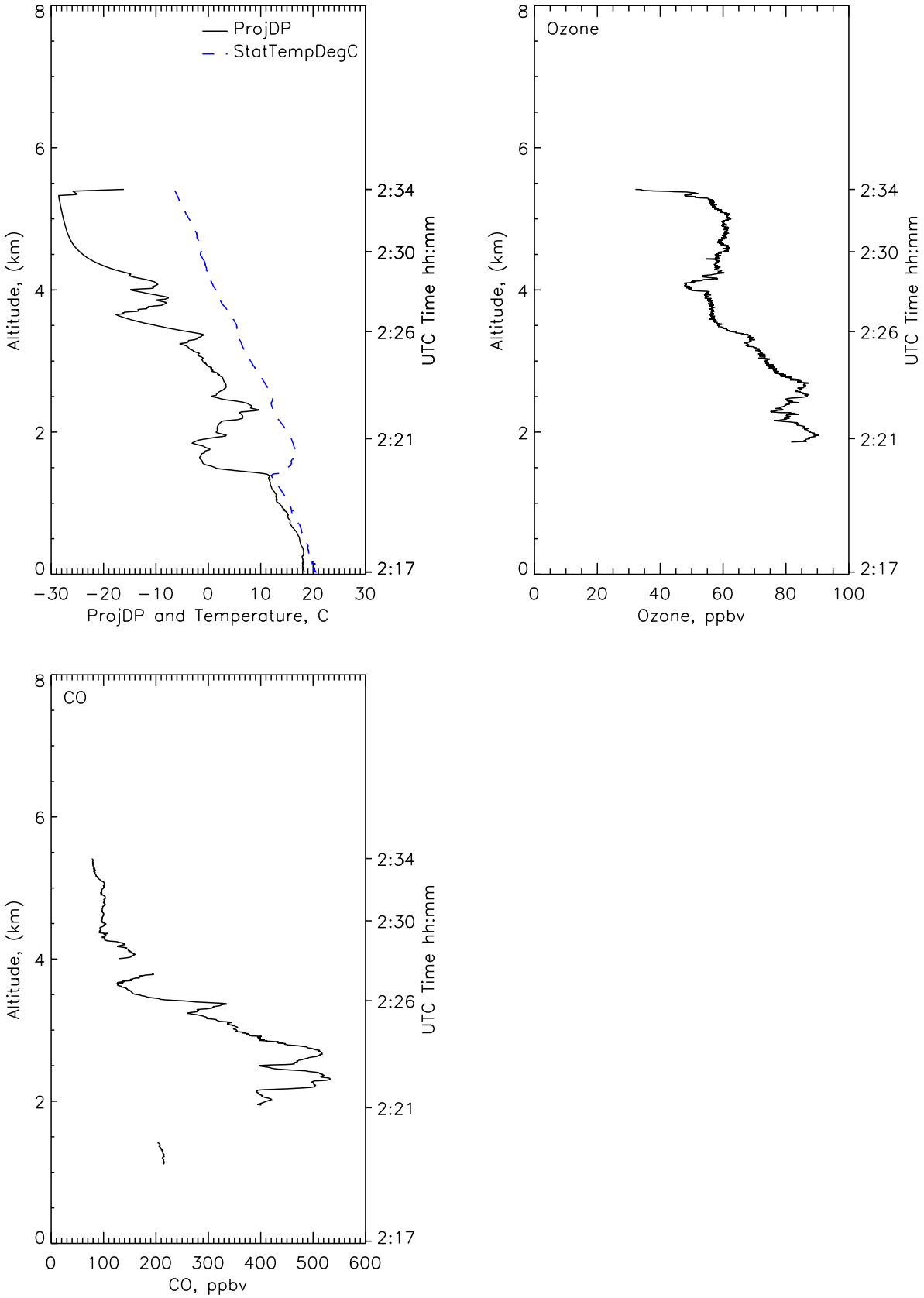

FINAL DATA: TRACE-P P3-B Flight 09
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

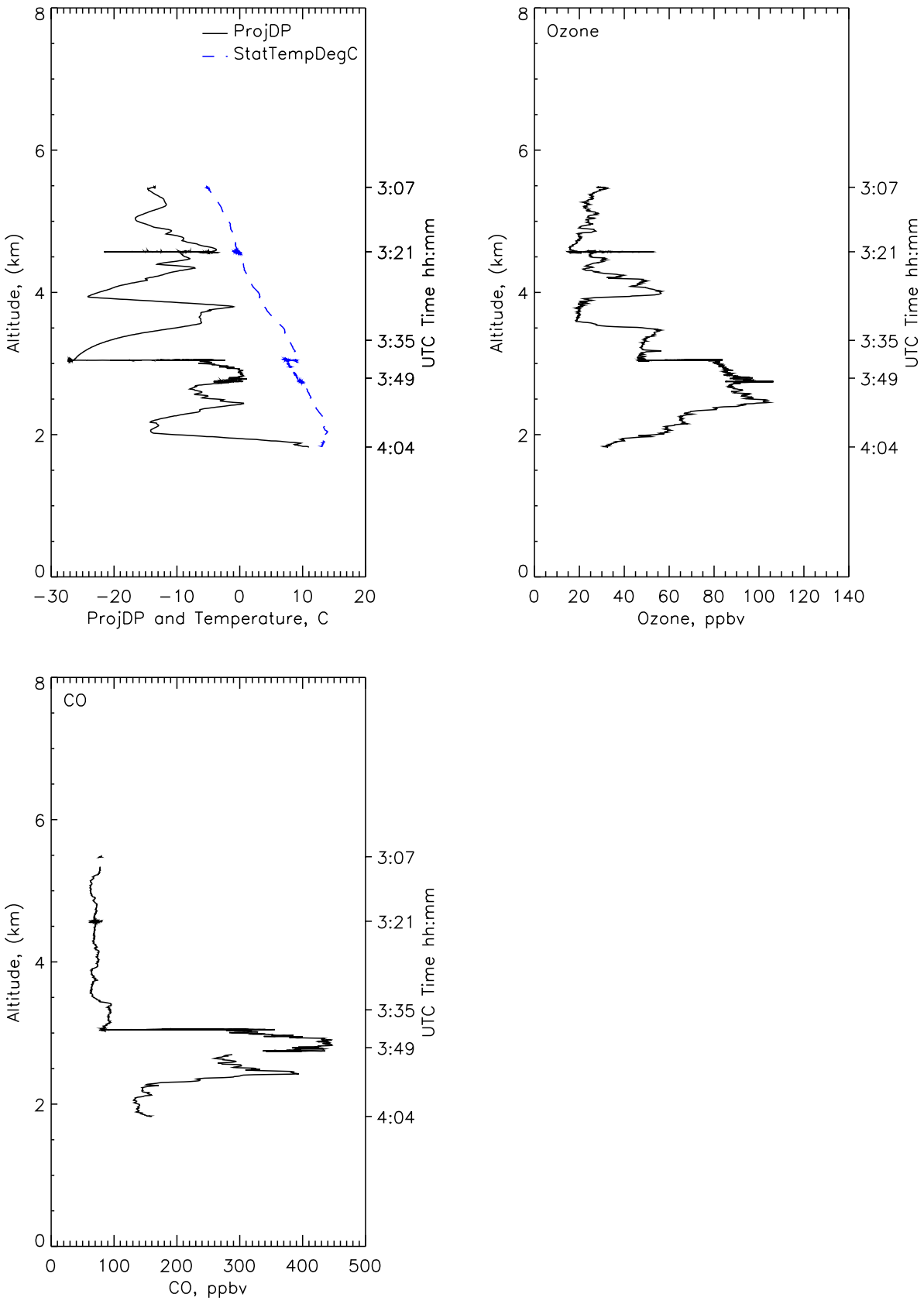

FINAL DATA: TRACE-P P3-B Flight 09
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 09
J(NO2)N+J(NO2)Z, 1/s
0.030
0.025
0.020
0.015
0.010
0.005
0.000
2 3 4 5 6 7 8 9 10 11
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.5
1.0
0.5
0.0
2 3 4 5 6 7 8 9 10 11
UTC Time
Roll, degs
40
20
0
−20
−40
2 3 4 5 6 7 8 9 10 11
UTC Time
AltCab, feet
8000
6000
4000
2000
0
−2000
2 3 4 5 6 7 8 9 10 11
UTC Time

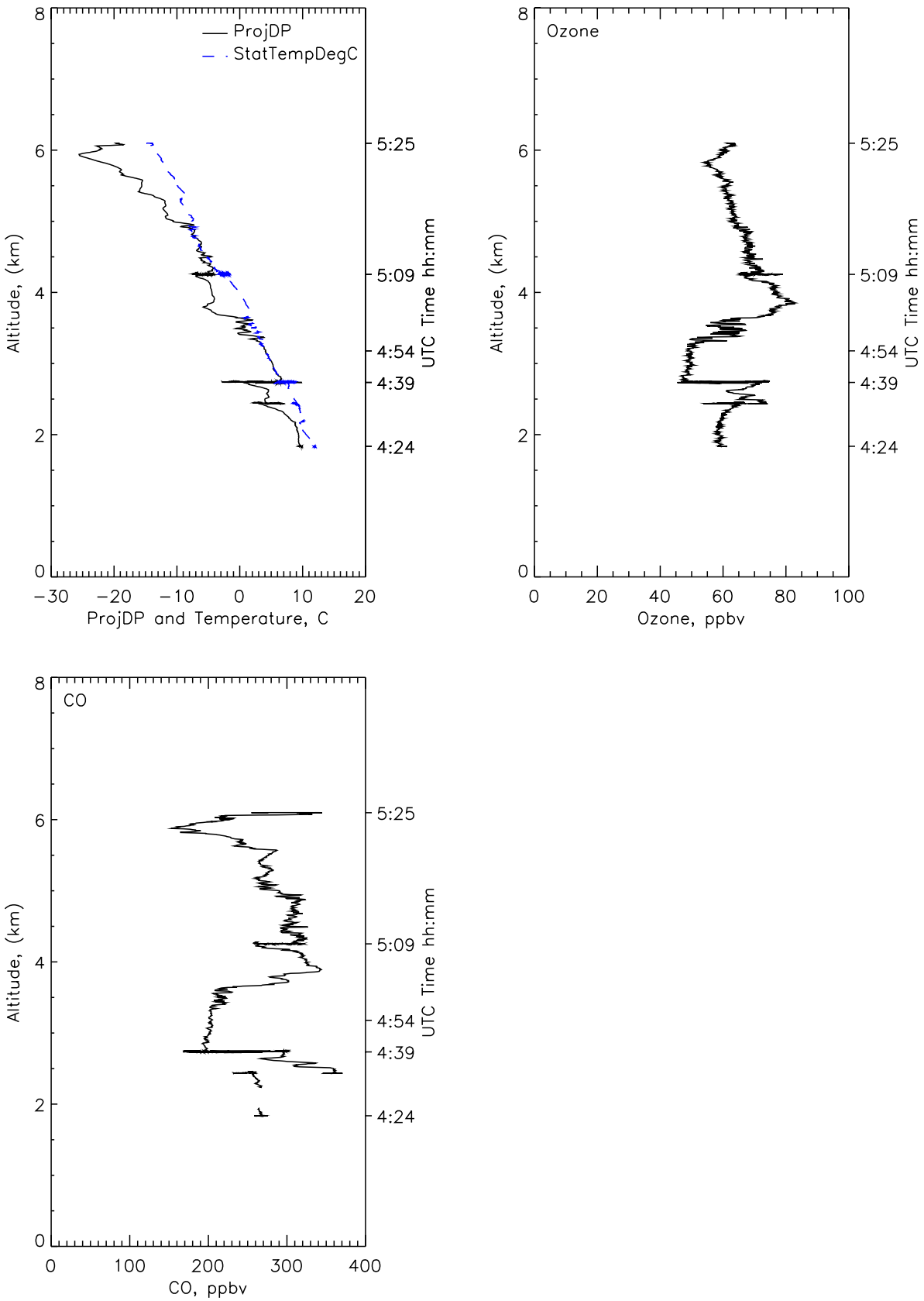
Profile # 1 TRACE-P P3-B Flight 09

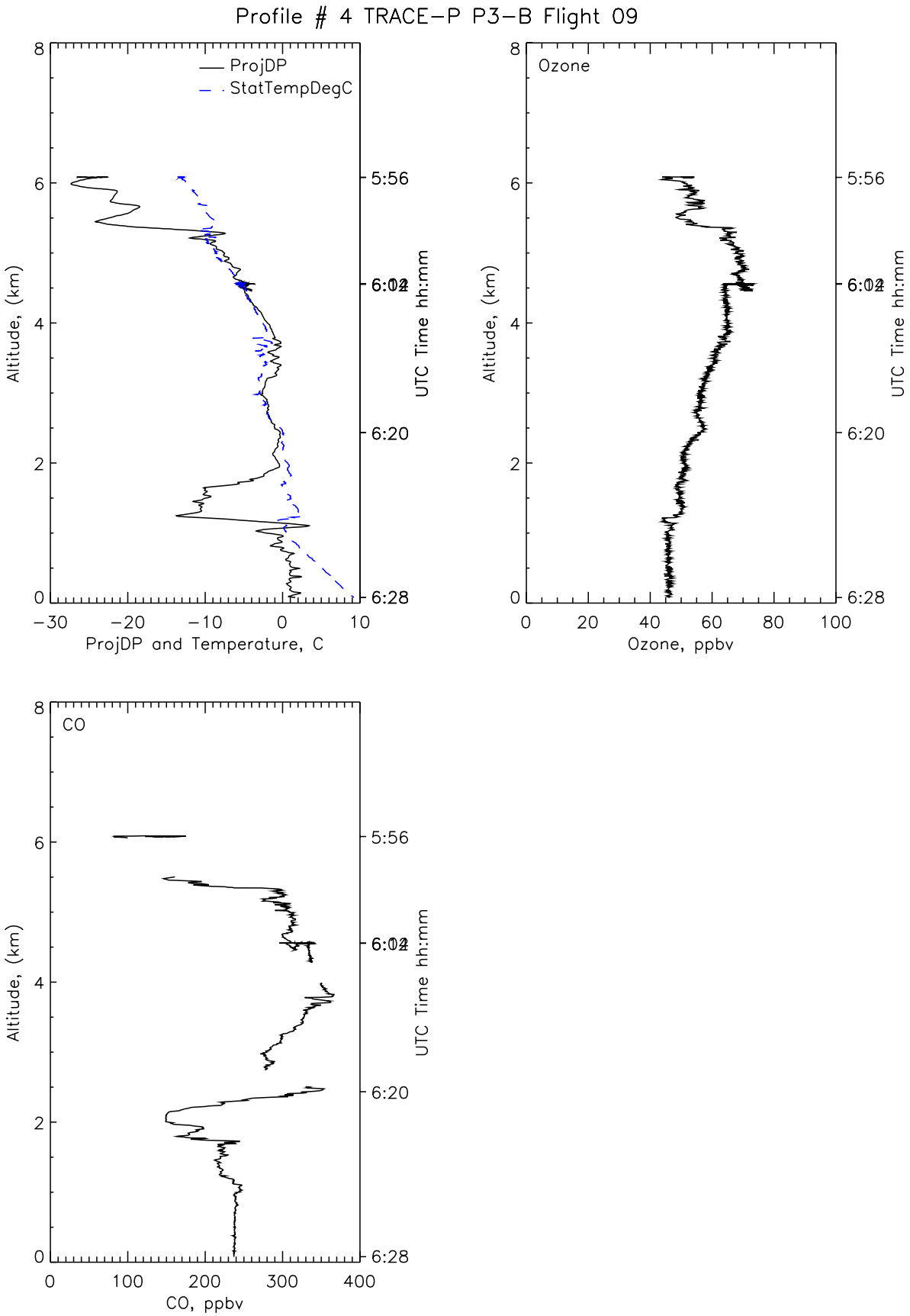


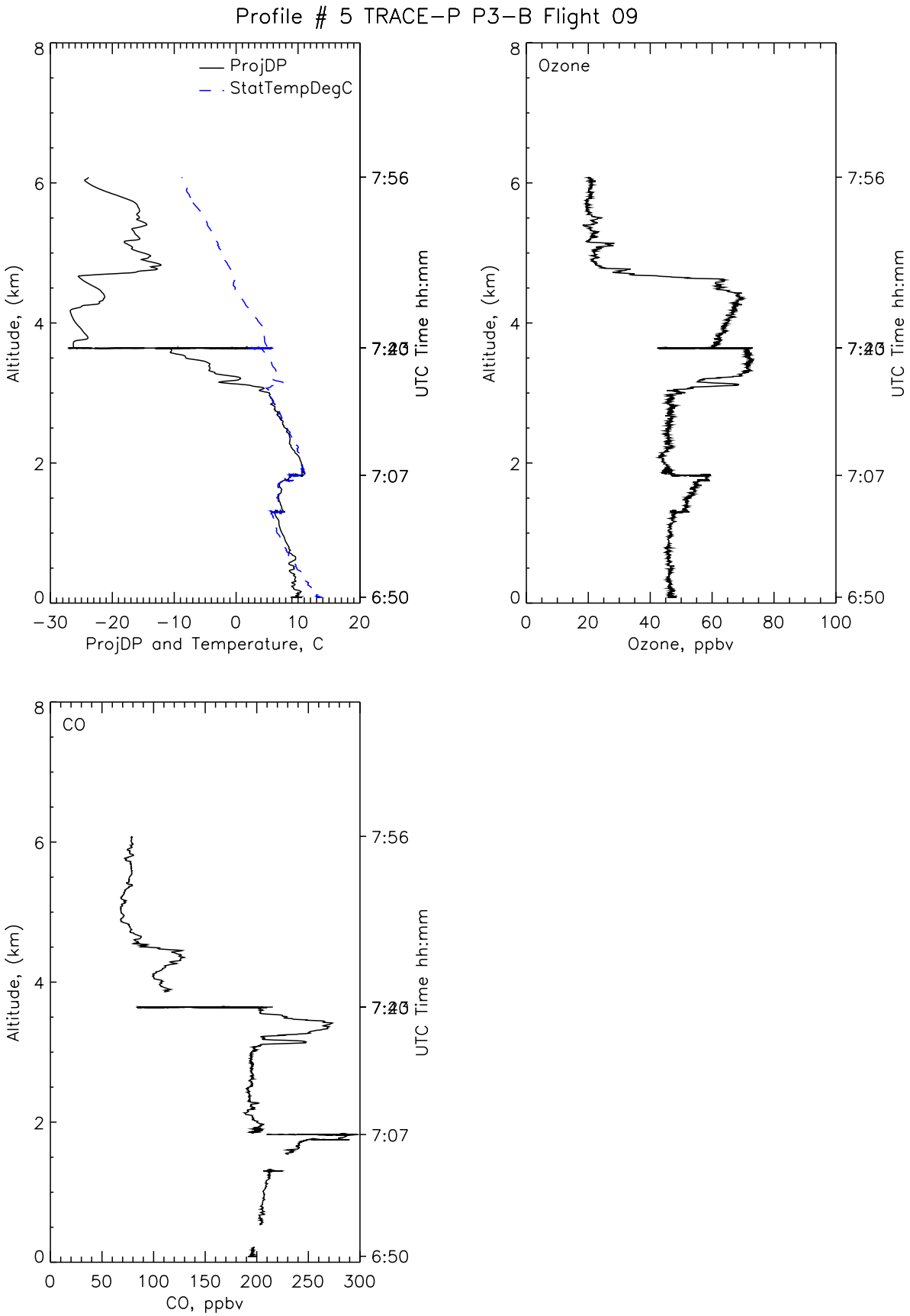
Profile # 2 TRACE-P P3-B Flight 09

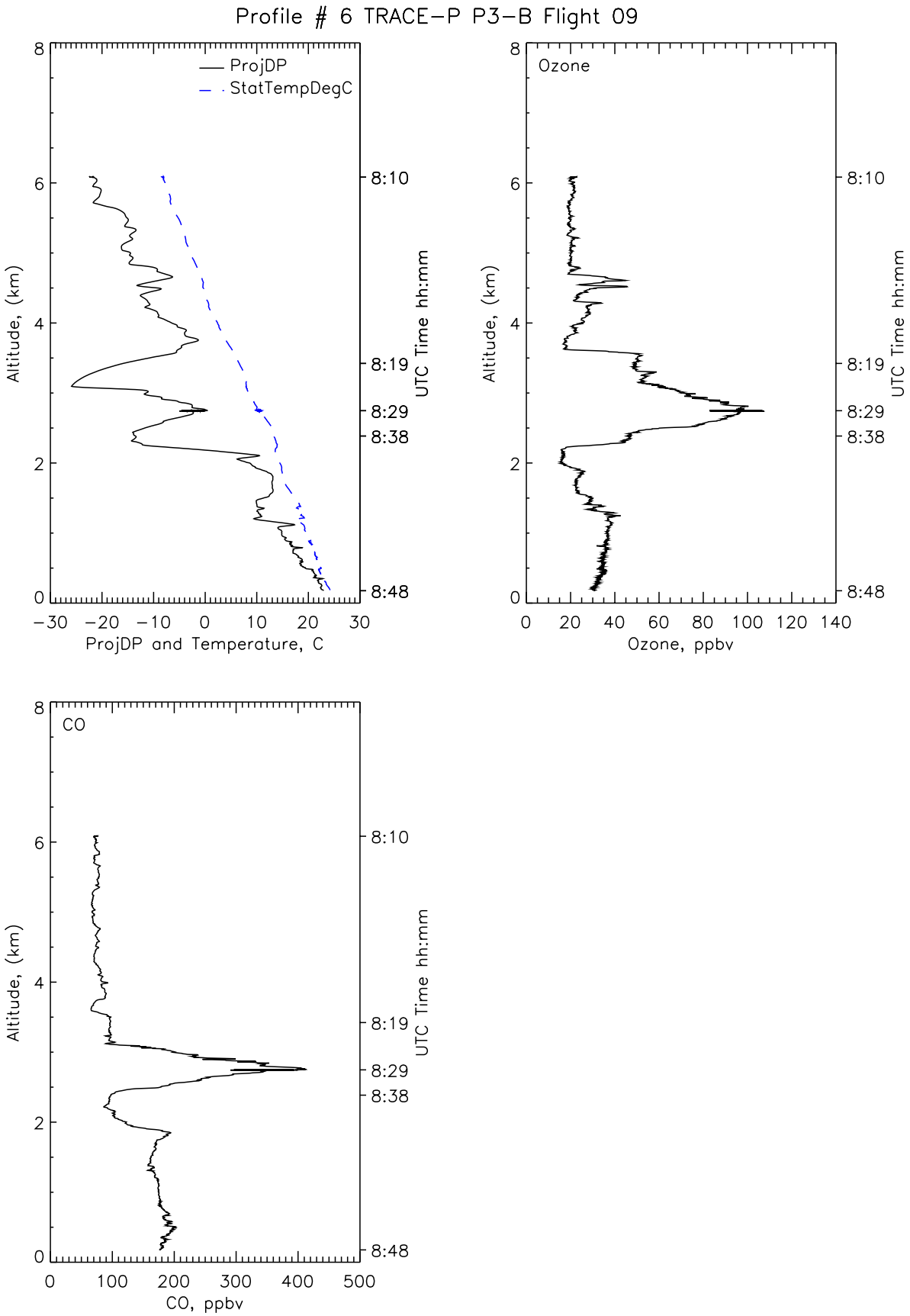


Profile # 3 TRACE-P P3-B Flight 09

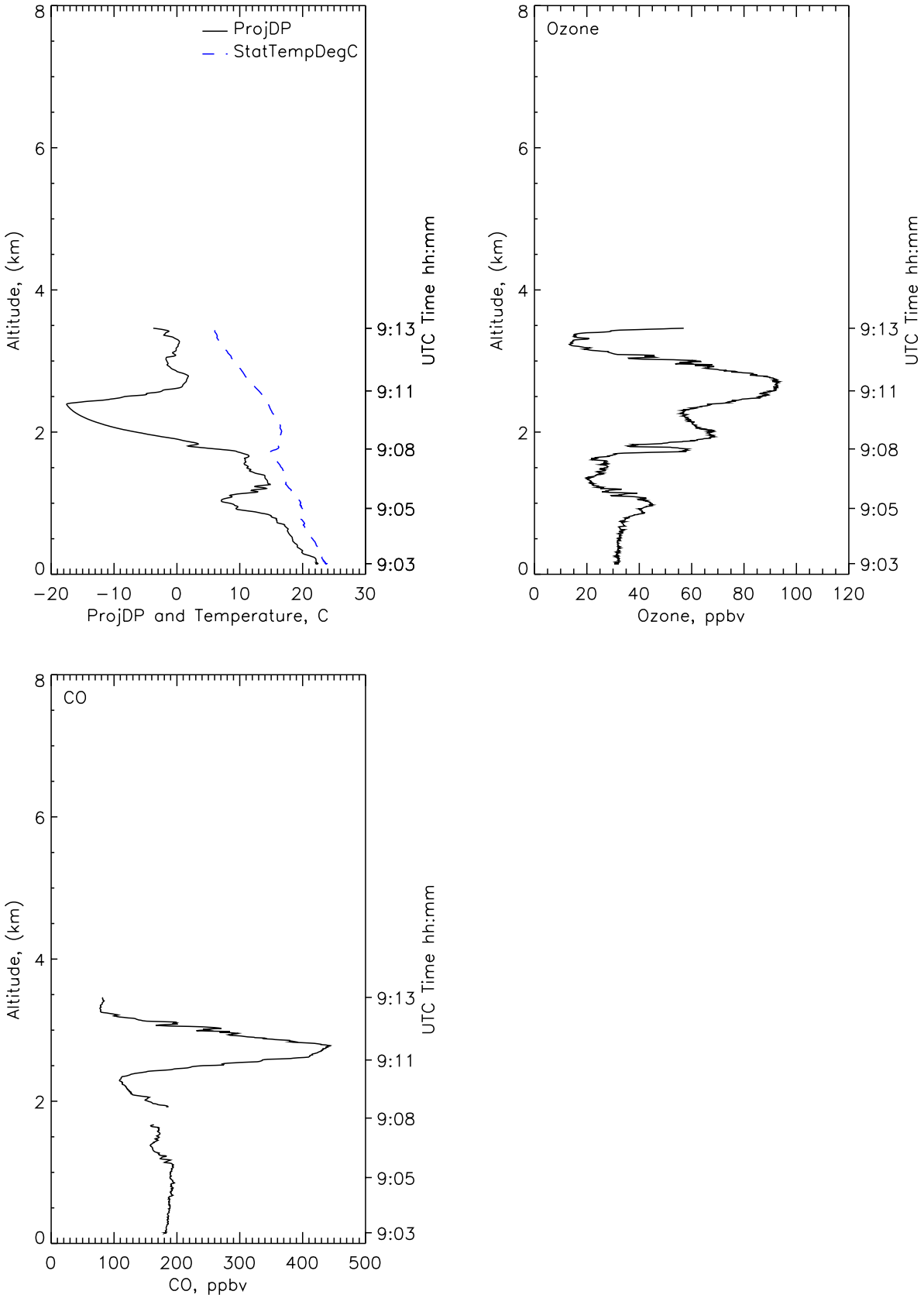



Profile # 4 TRACE-P P3-B Flight 09
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv
5:56
6:04
6:20
6:28

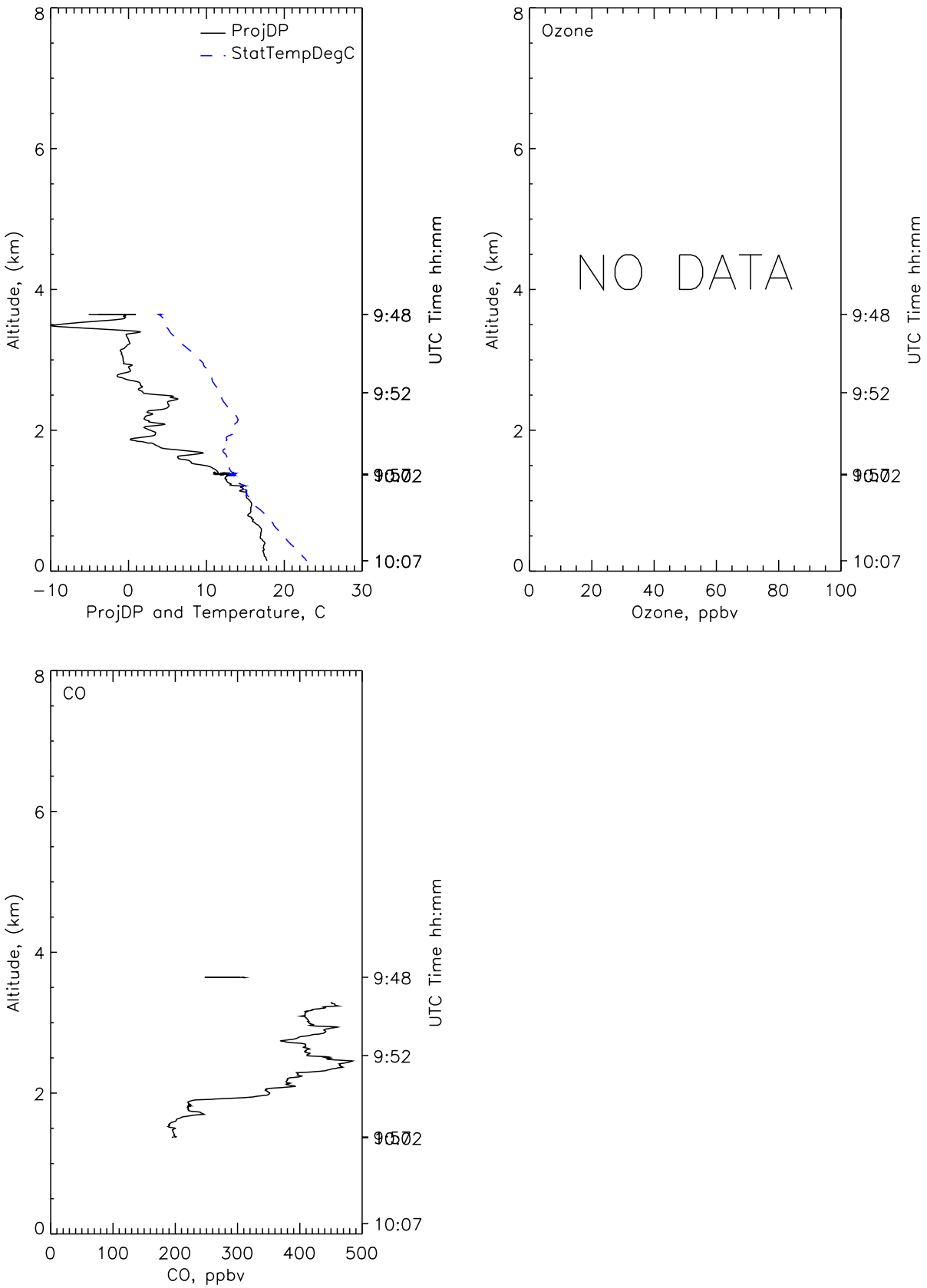

Profile # 5 TRACE-P P3-B Flight 09
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv
7:56
7:23
7:07
6:50


Profile # 6 TRACE-P P3-B Flight 09
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
8:10
8:19
8:29
8:38
8:48
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 7 TRACE-P P3-B Flight 09



Profile # 8 TRACE-P P3-B Flight 09



CHEMICAL and METEOROLOGICAL DATA

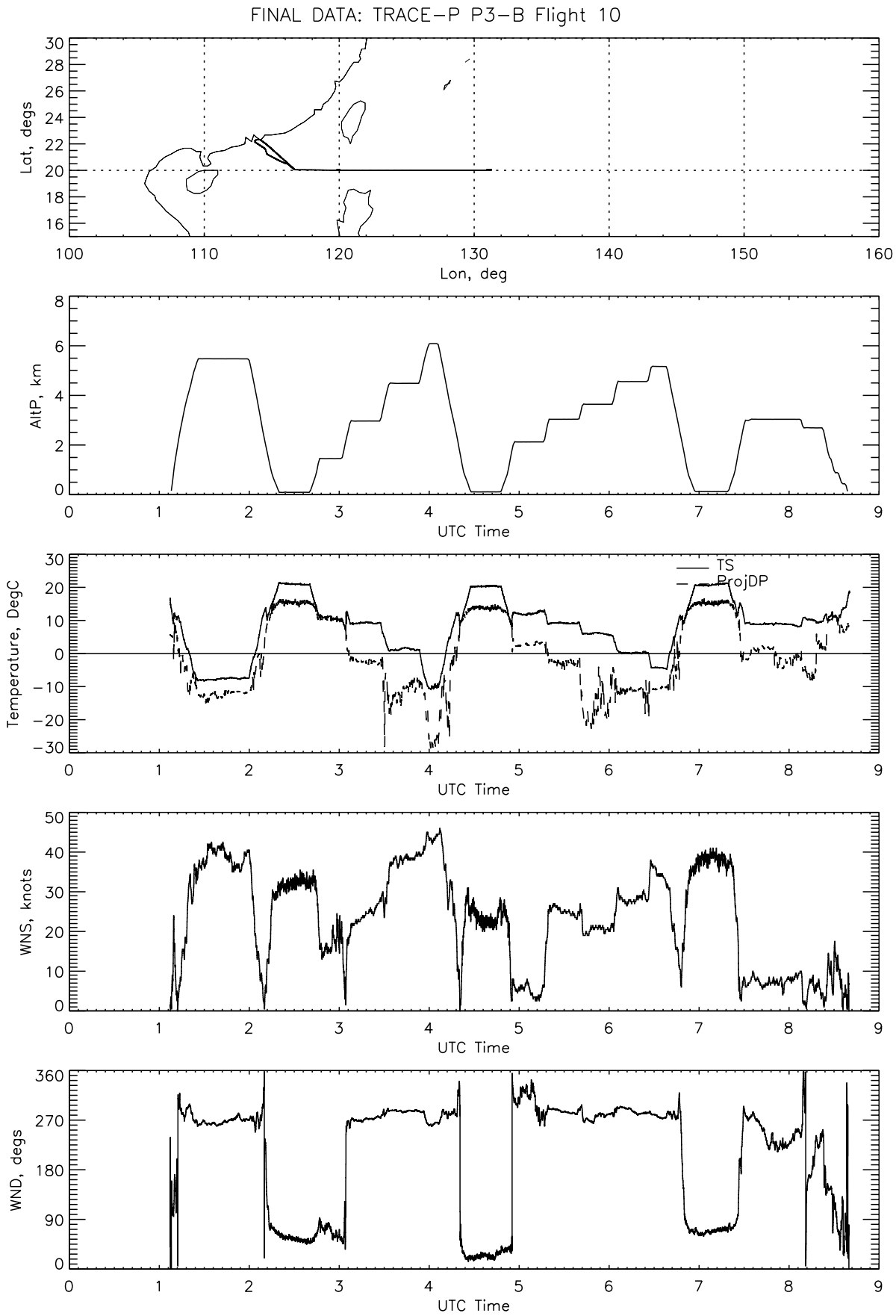
TRACE-P

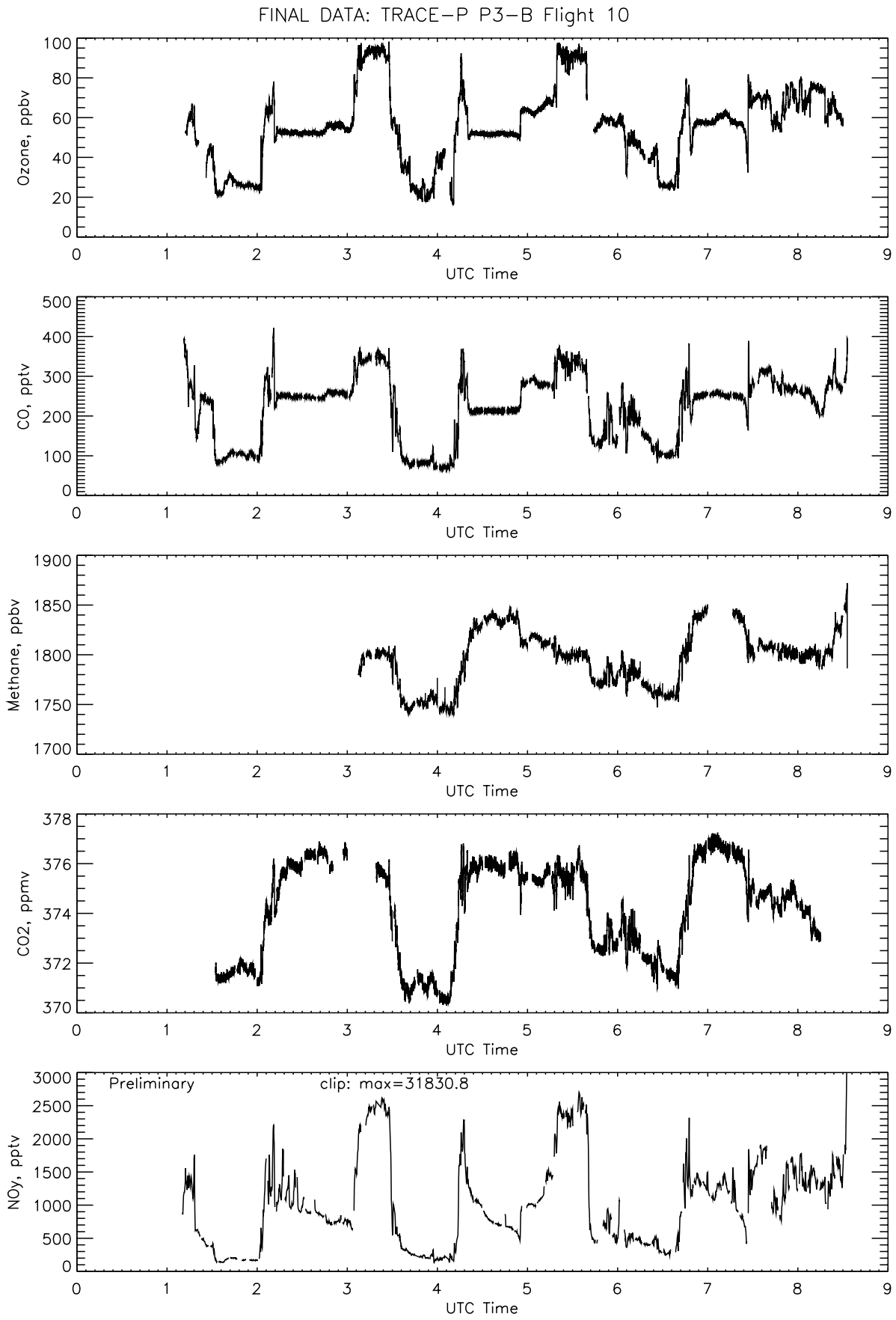
Flight 10P

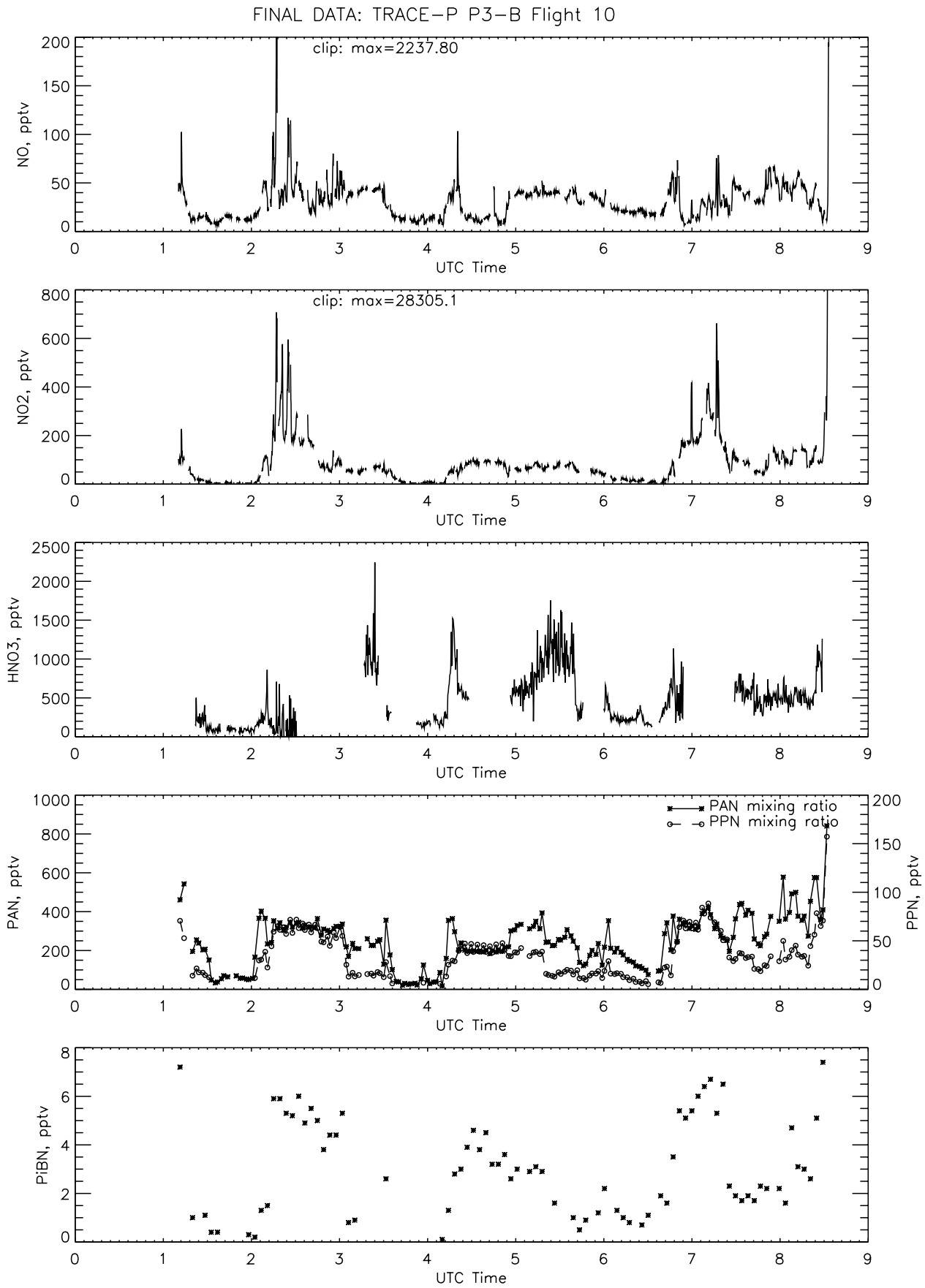
Local: Hong Kong No. 2

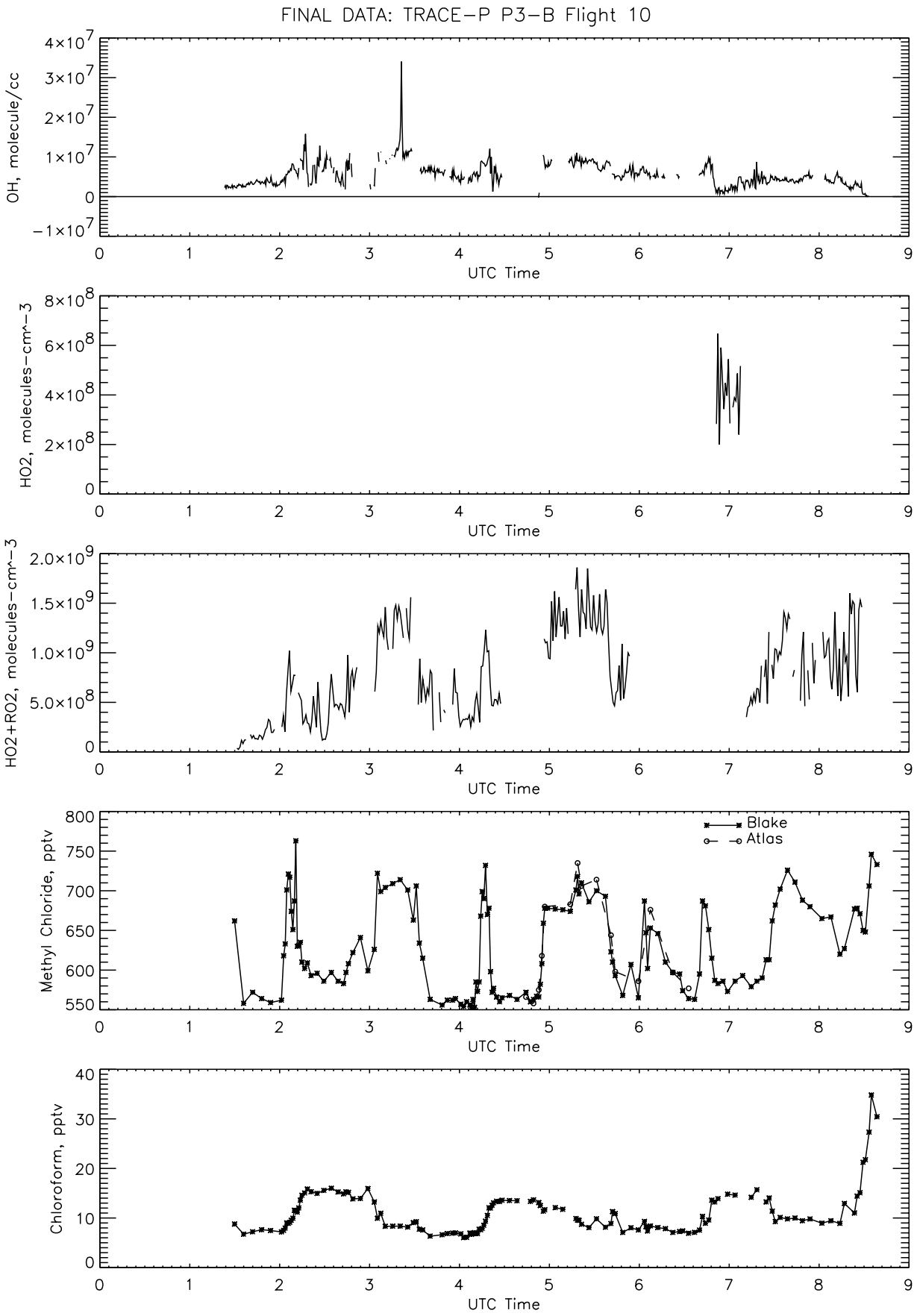
Aged Post-Frontal Outflow

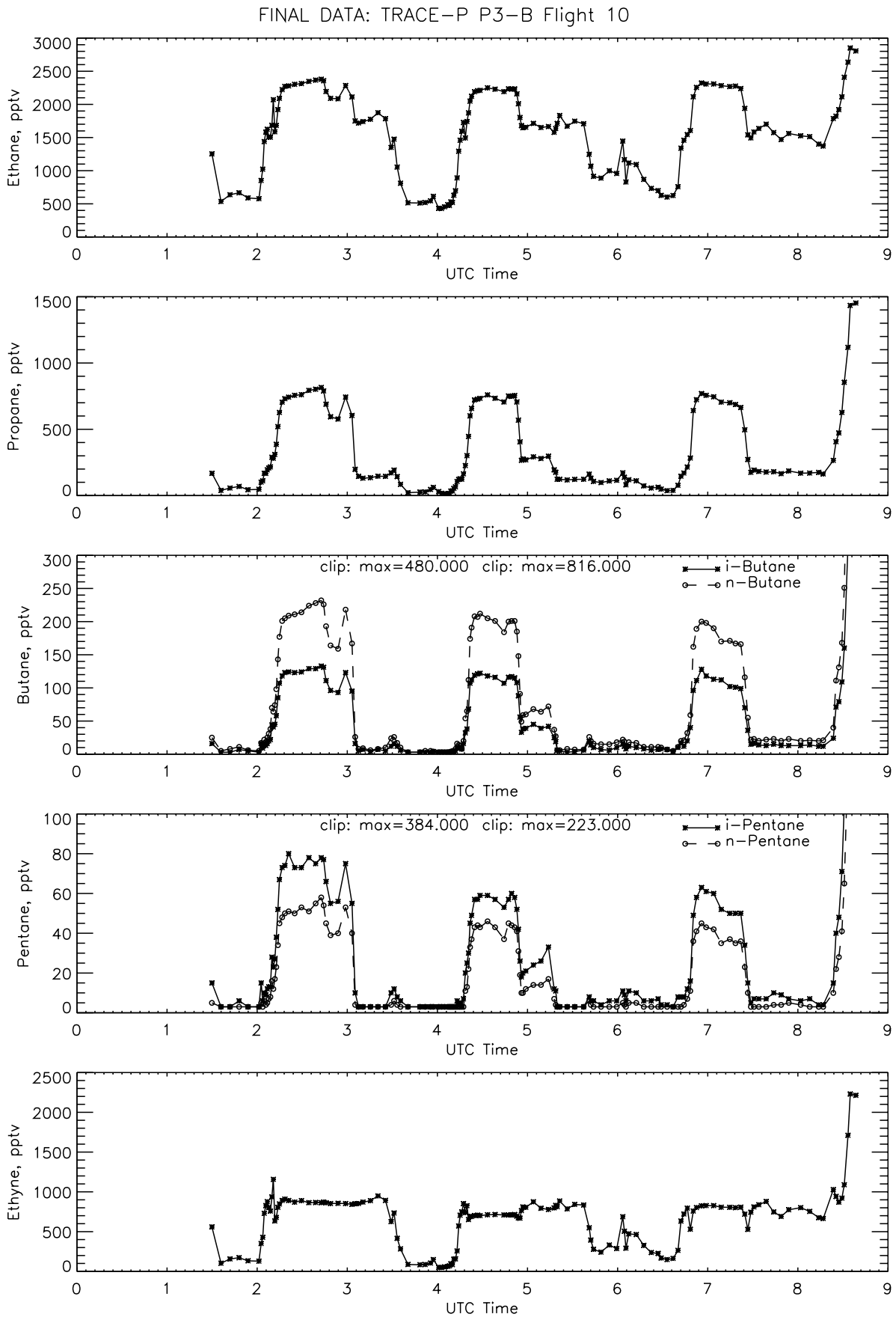
March 9, 2001

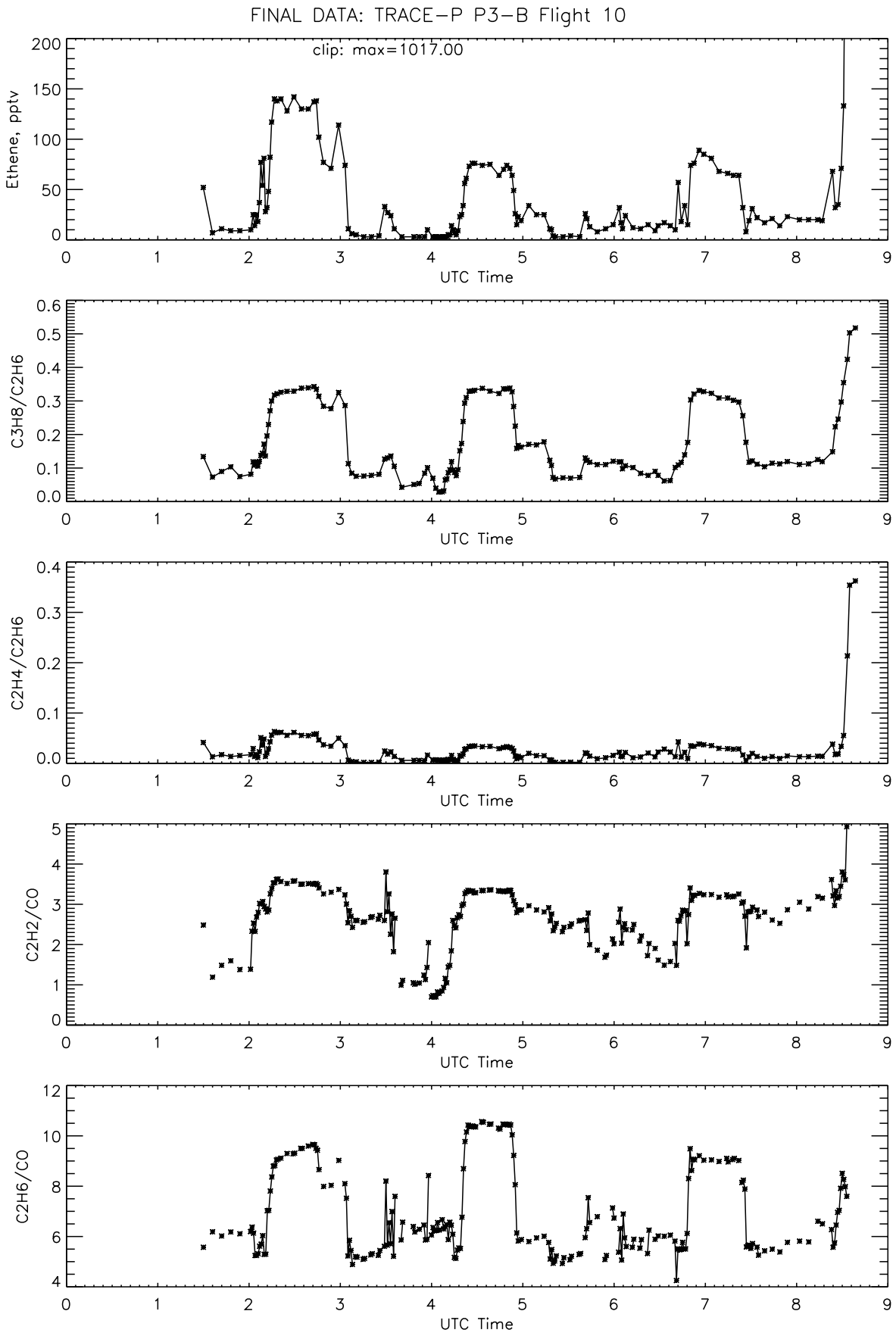

FINAL DATA: TRACE-P P3-B Flight 10
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

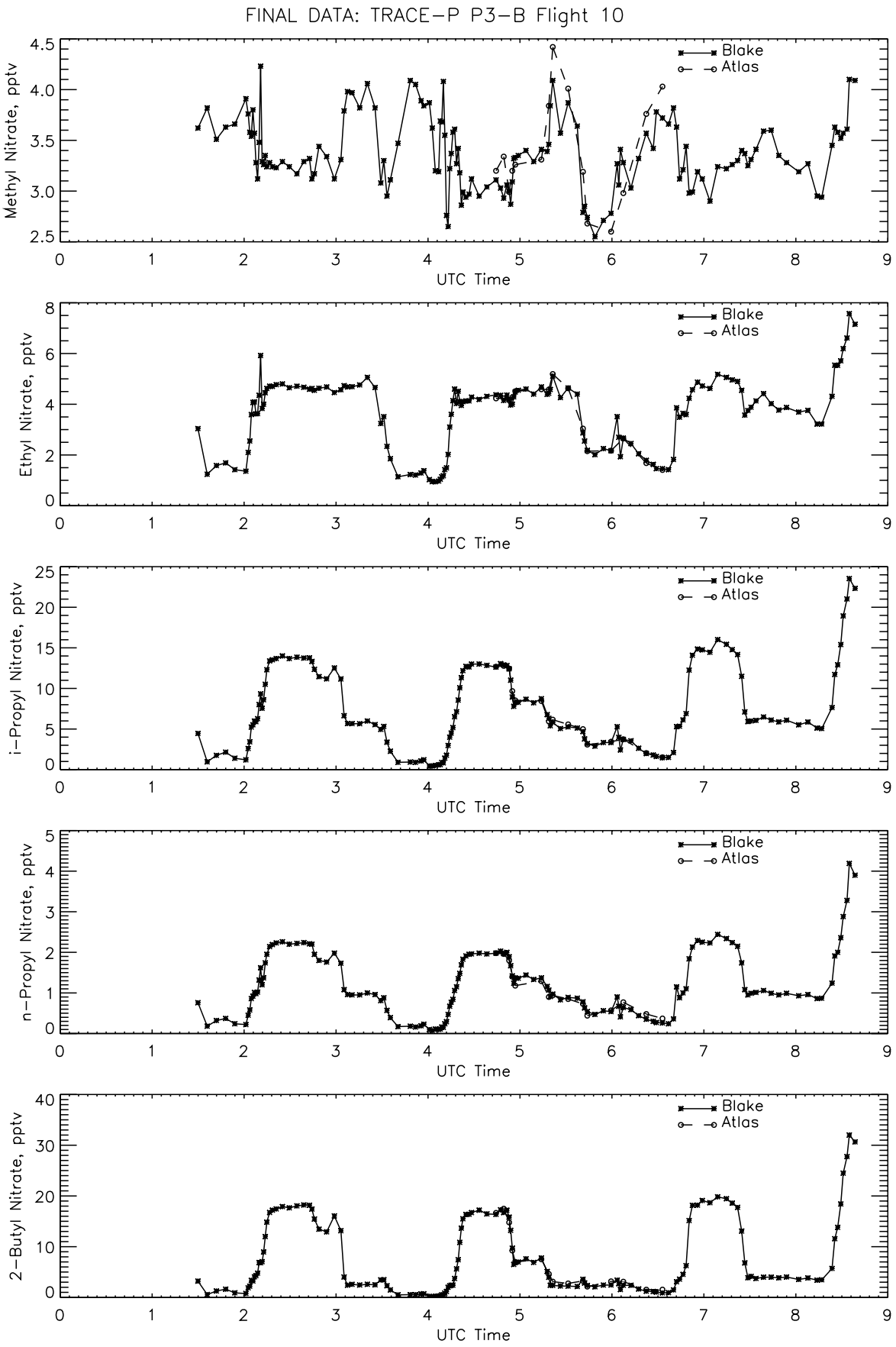

FINAL DATA: TRACE-P P3-B Flight 10
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
Preliminary
clip: max=31830.8
UTC Time

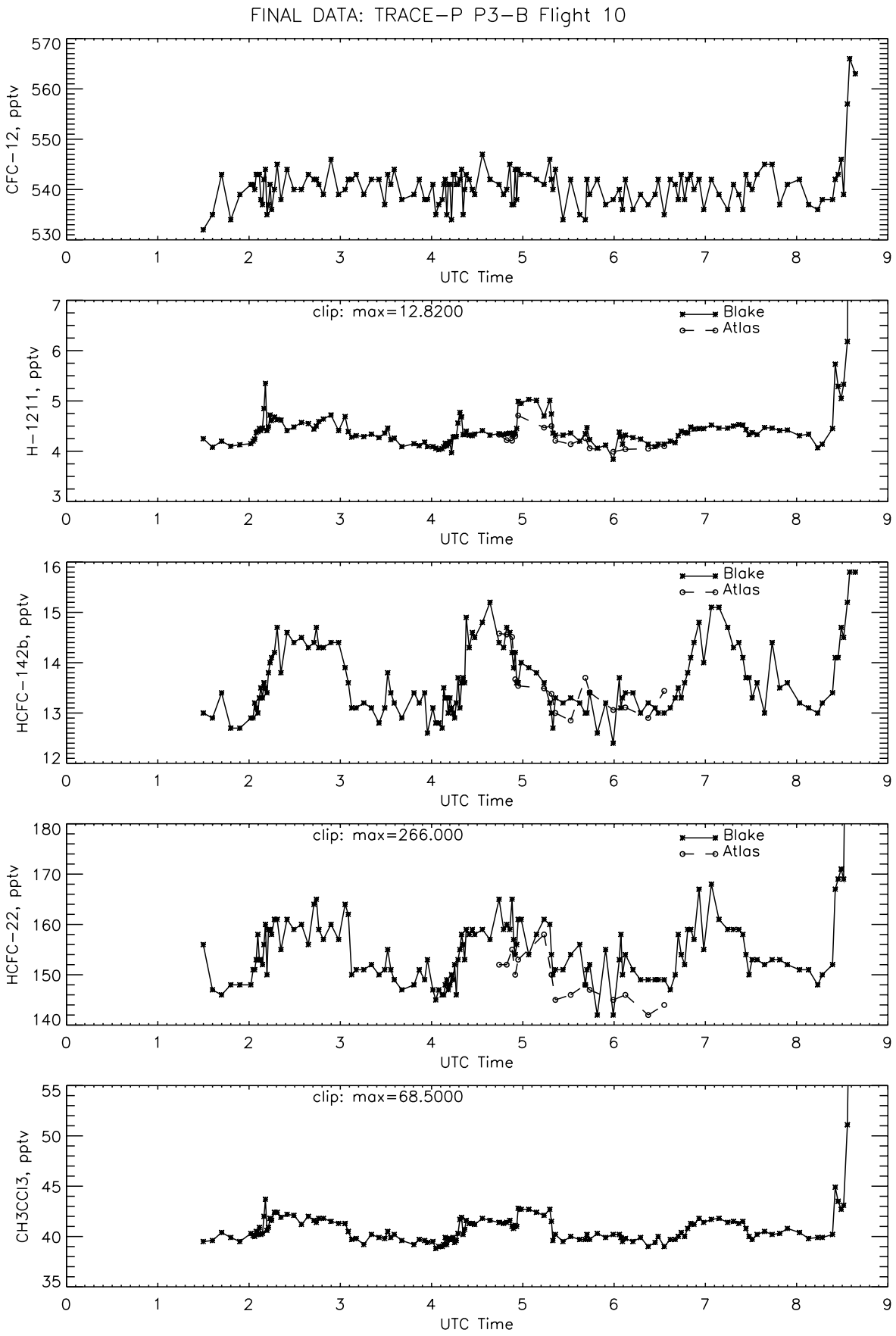

FINAL DATA: TRACE-P P3-B Flight 10
clip: max=2237.80
NO, pptv
UTC Time
clip: max=28305.1
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 10
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

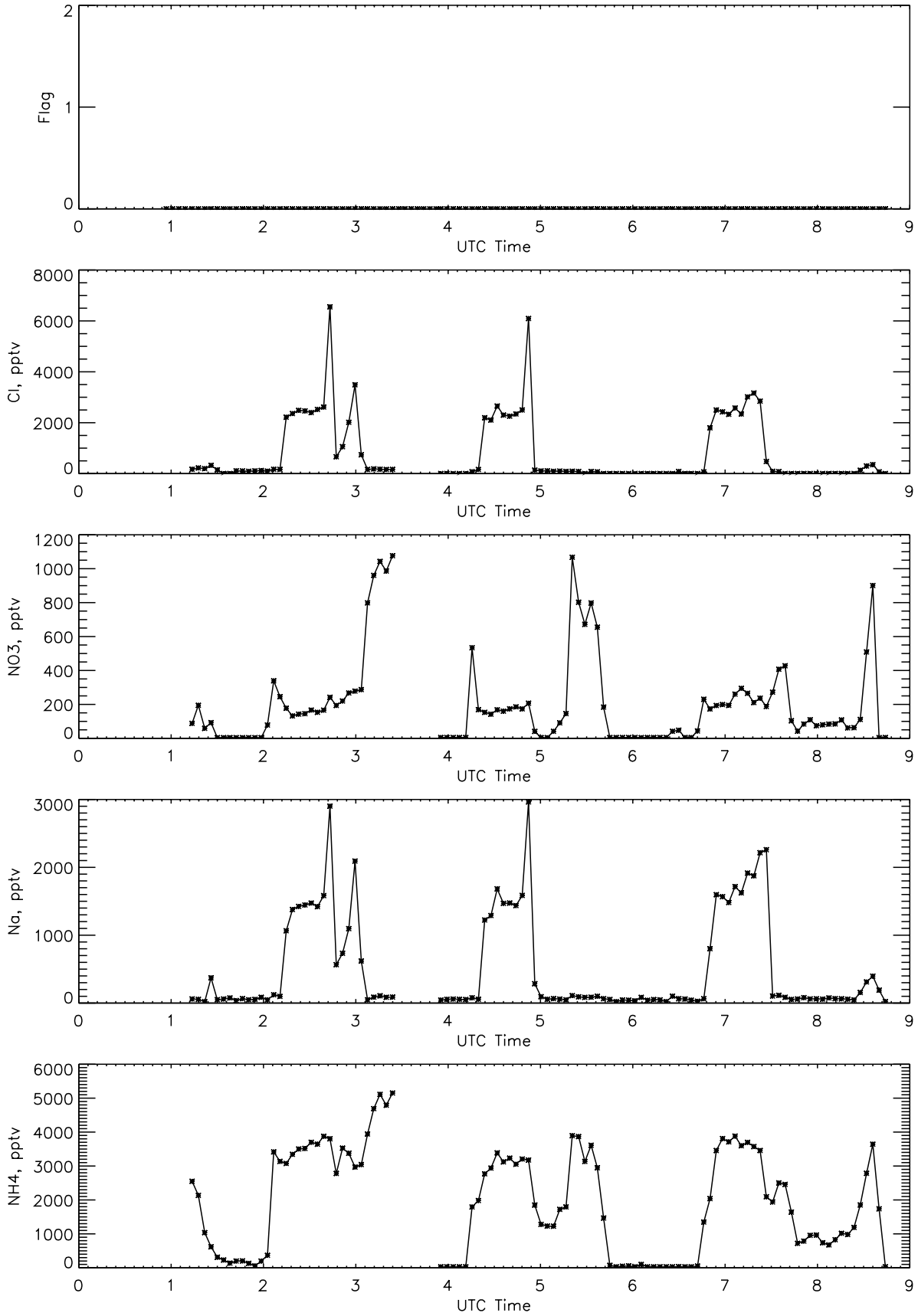

FINAL DATA: TRACE-P P3-B Flight 10
Ethane, pptv
UTC Time
Propane, pptv
UTC Time
clip: max=480.000 clip: max=816.000
i-Butane
n-Butane
Butane, pptv
UTC Time
clip: max=384.000 clip: max=223.000
i-Pentane
n-Pentane
Pentane, pptv
UTC Time
Ethyne, pptv
UTC Time

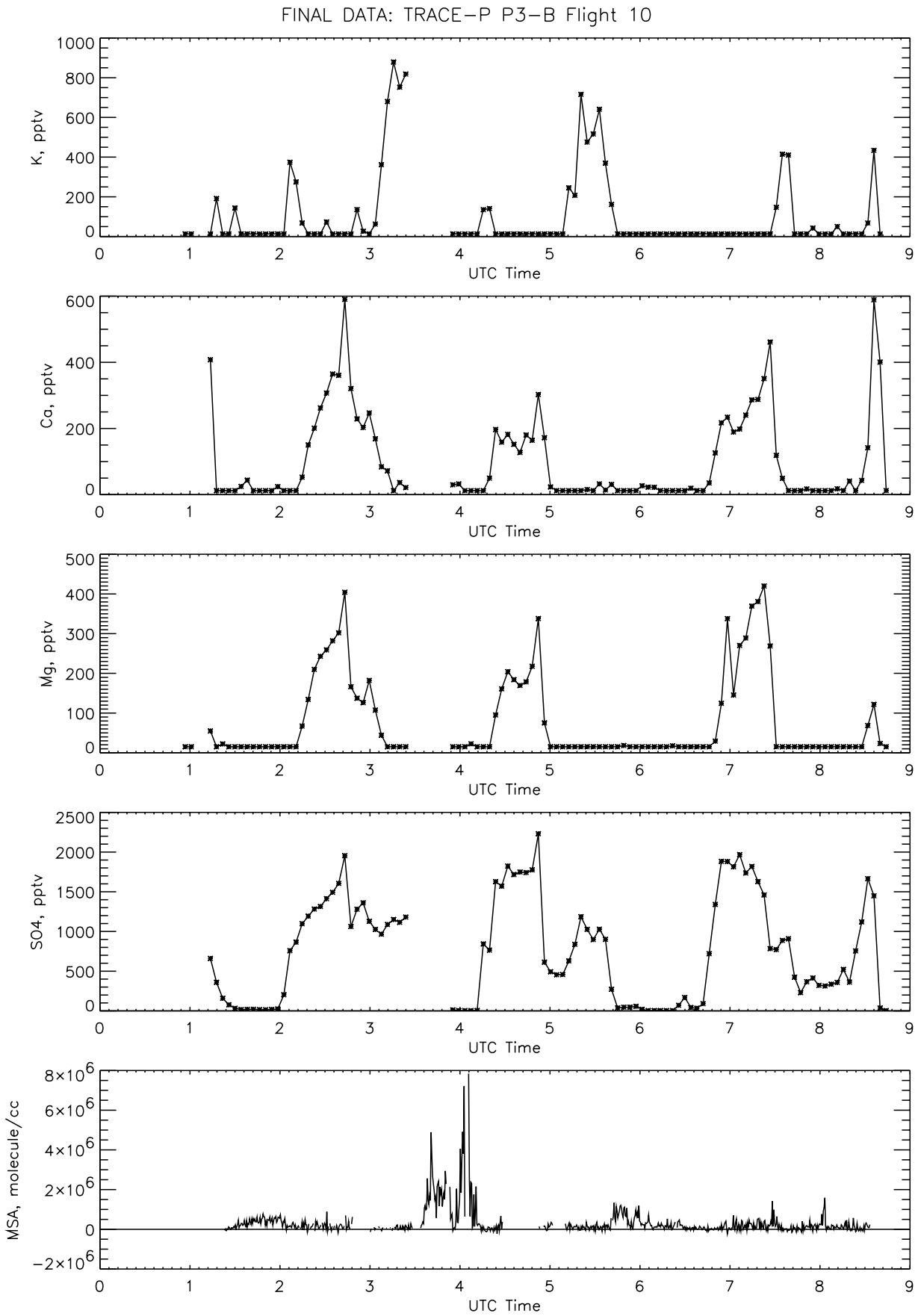

FINAL DATA: TRACE-P P3-B Flight 10
clip: max=1017.00
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

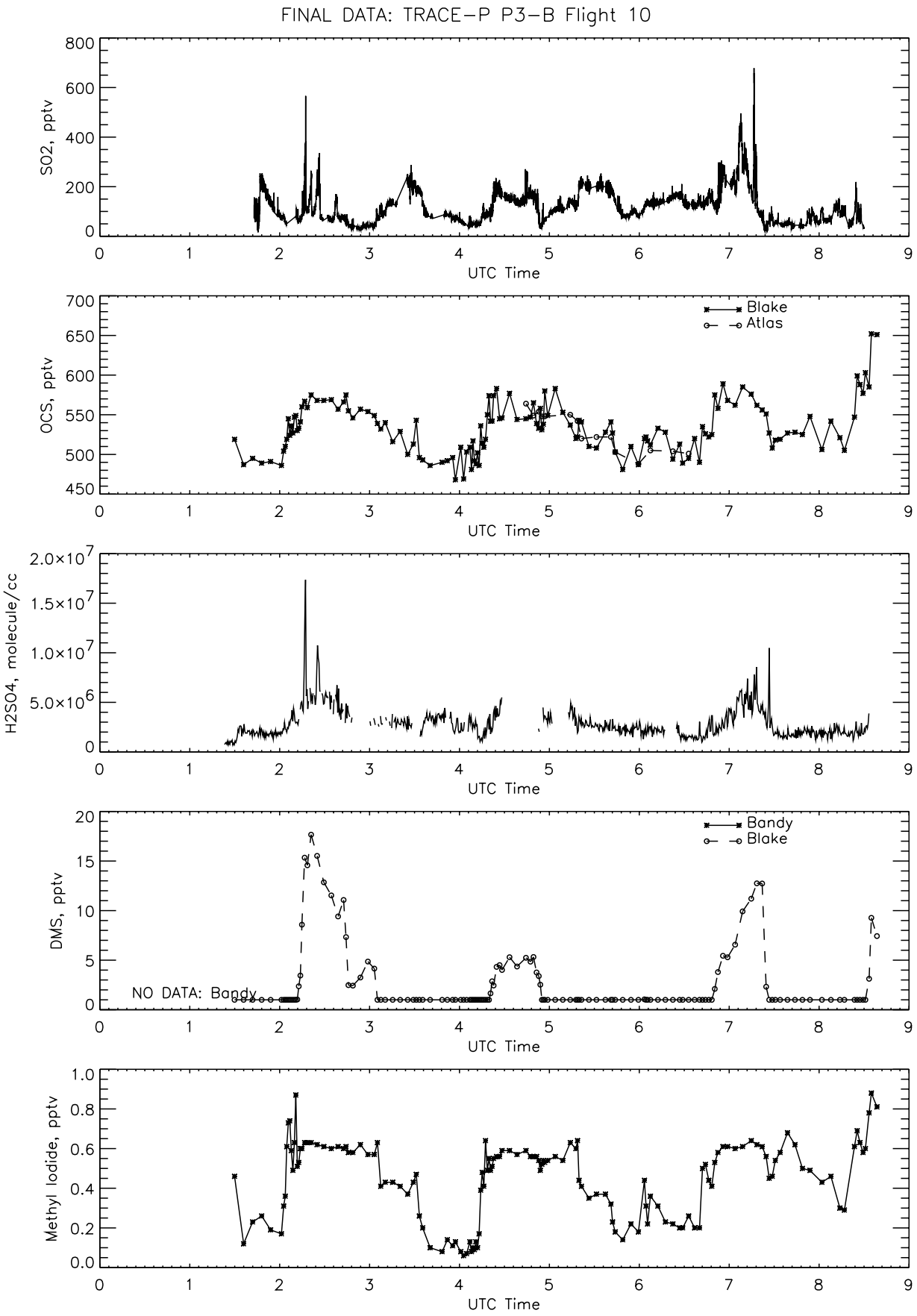

FINAL DATA: TRACE-P P3-B Flight 10
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas

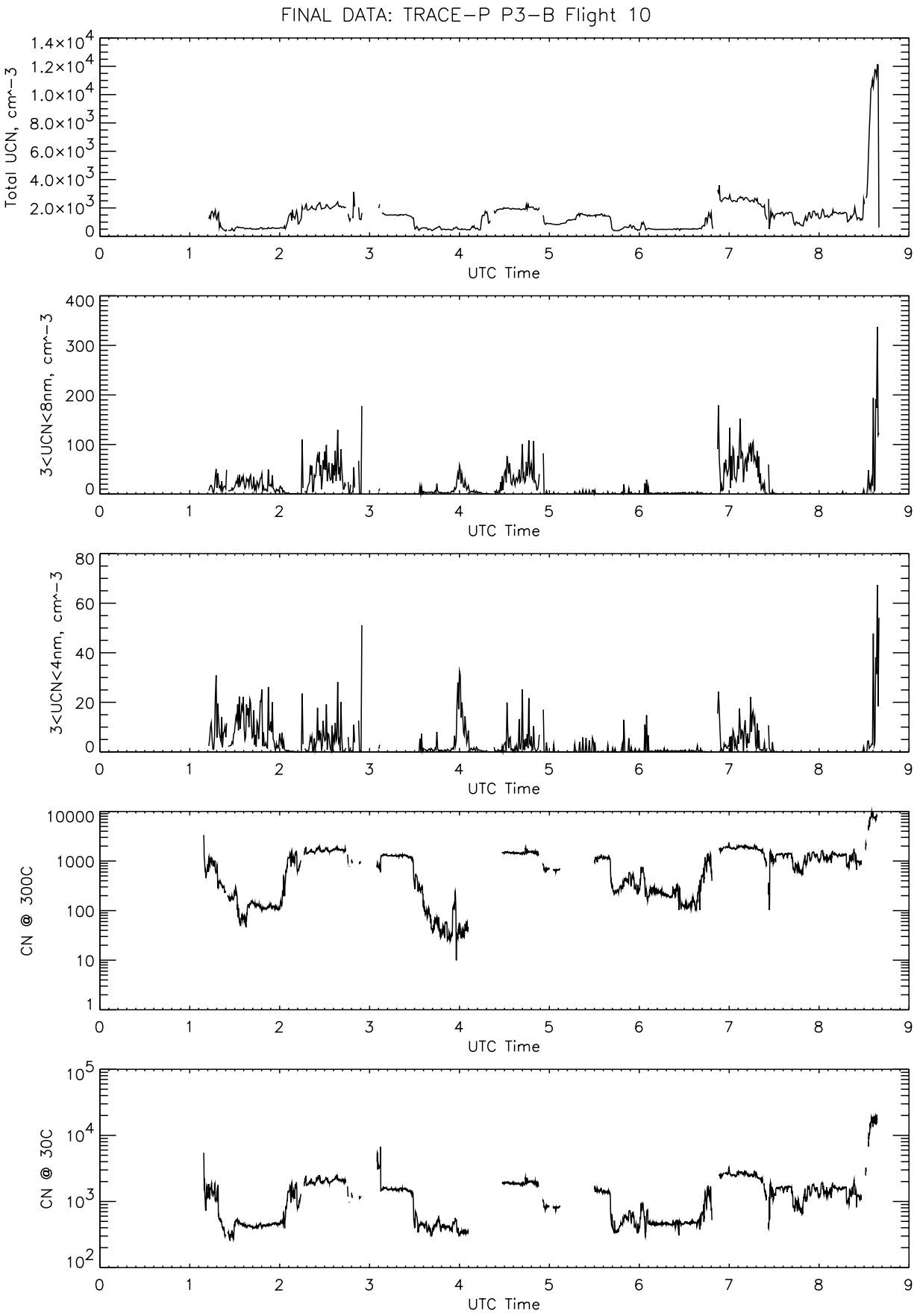

FINAL DATA: TRACE-P P3-B Flight 10
CFC-12, pptv
UTC Time
clip: max=12.8200
Blake
Atlas
H-1211, pptv
UTC Time
Blake
Atlas
HCFC-142b, pptv
UTC Time
clip: max=266.000
Blake
Atlas
HCFC-22, pptv
UTC Time
clip: max=68.5000
CH3CCl3, pptv
UTC Time

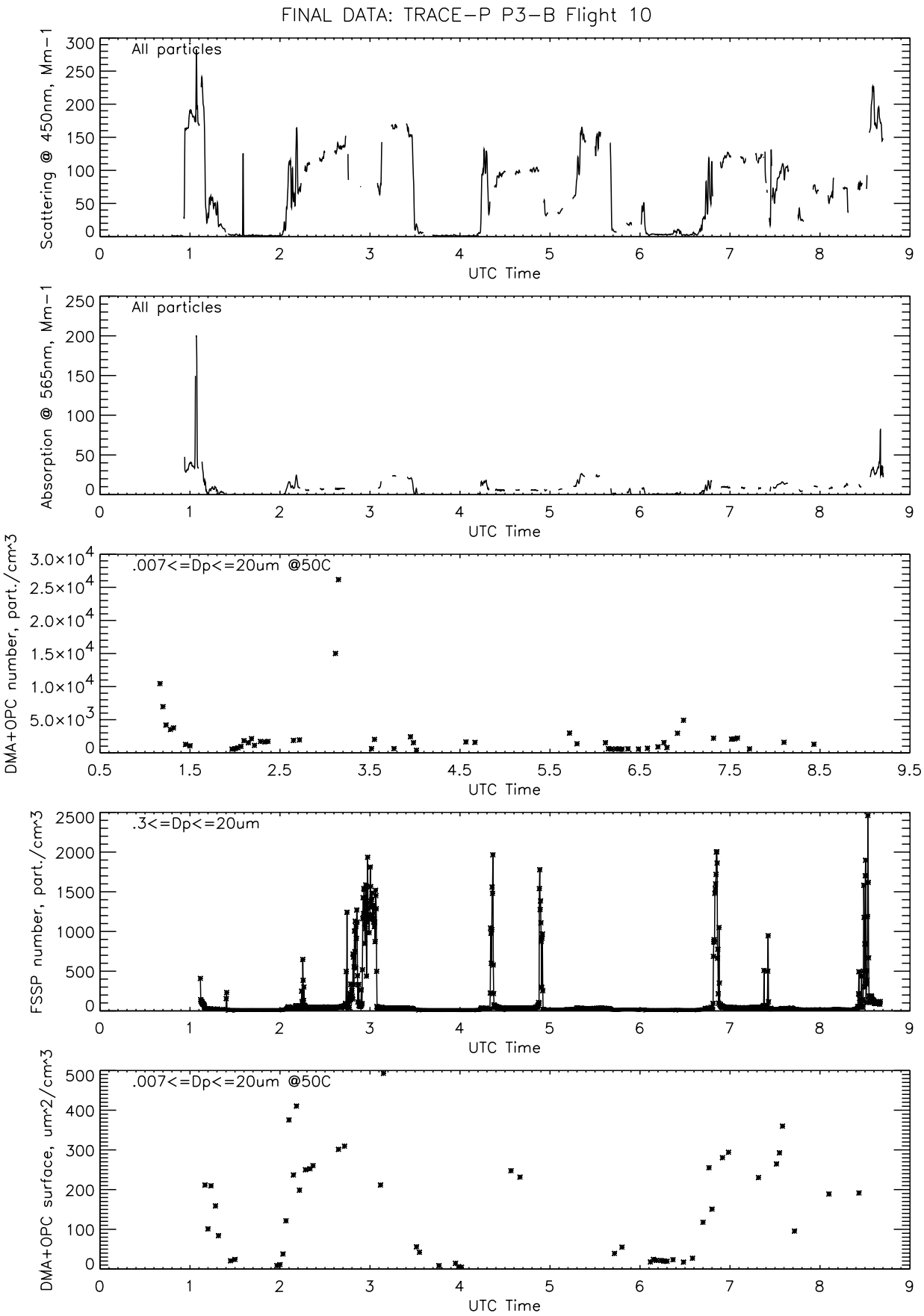
FINAL DATA: TRACE-P P3-B Flight 10

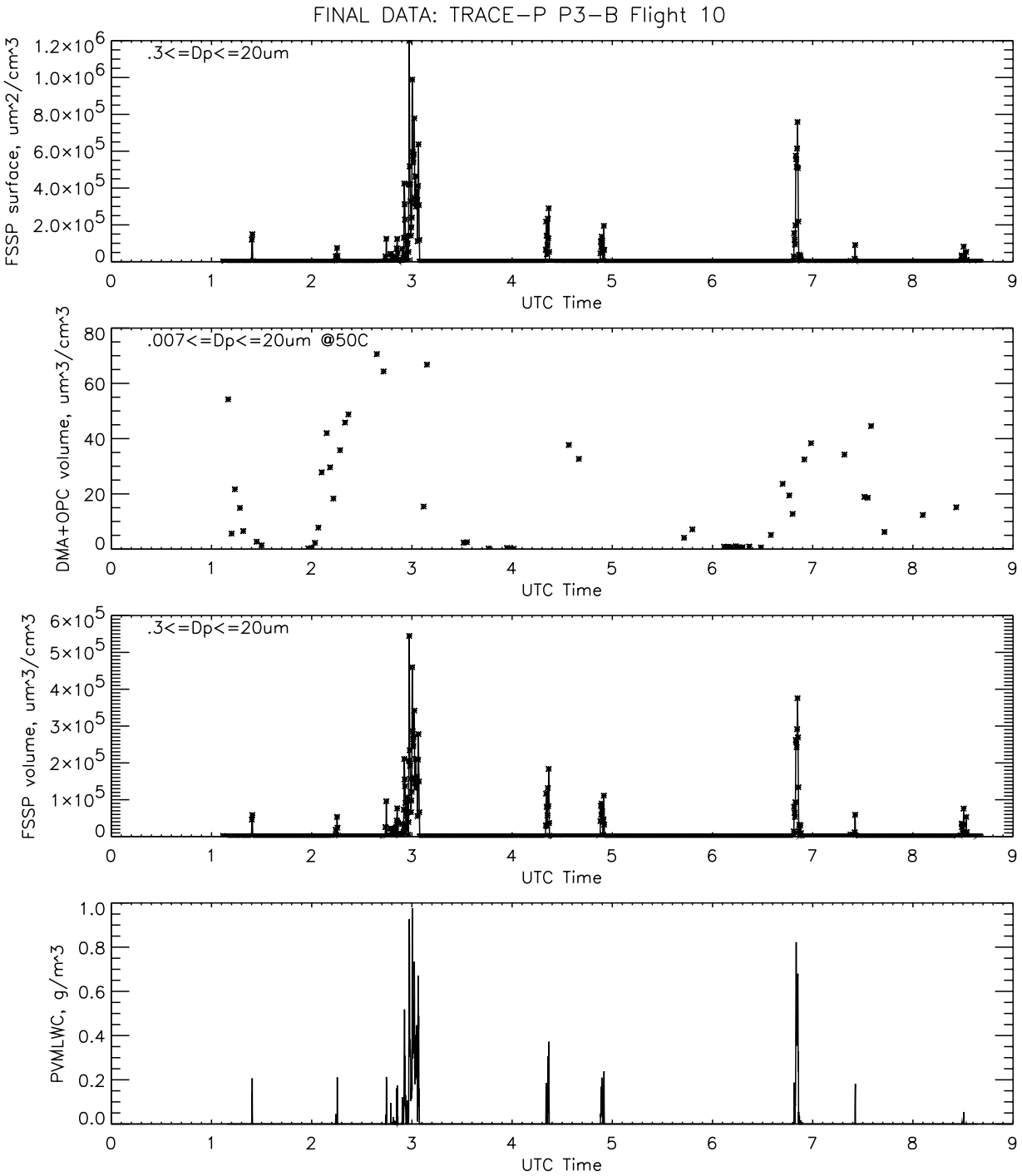



FINAL DATA: TRACE-P P3-B Flight 10
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

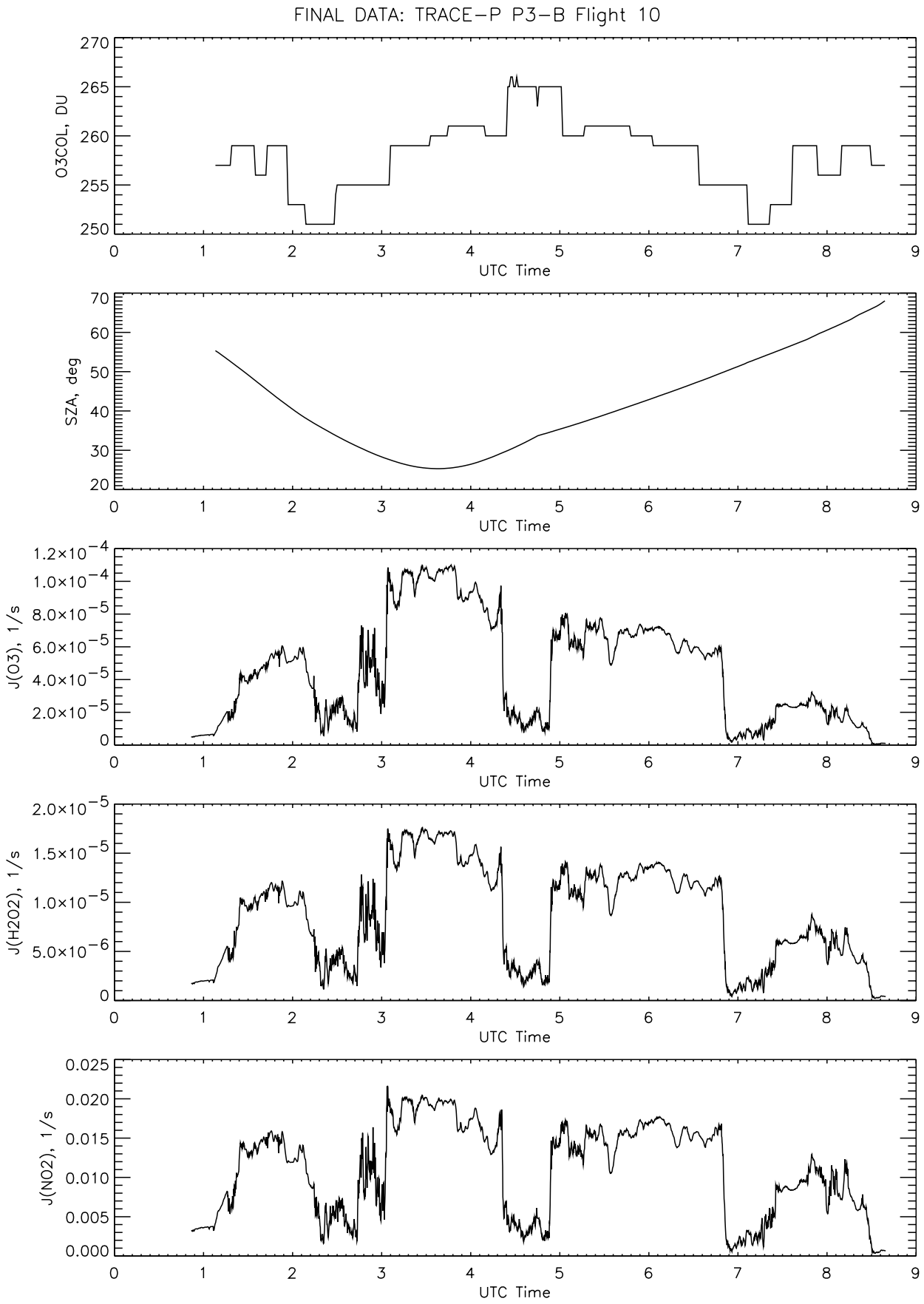

FINAL DATA: TRACE-P P3-B Flight 10
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
UTC Time
H2SO4, molecule/cc
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

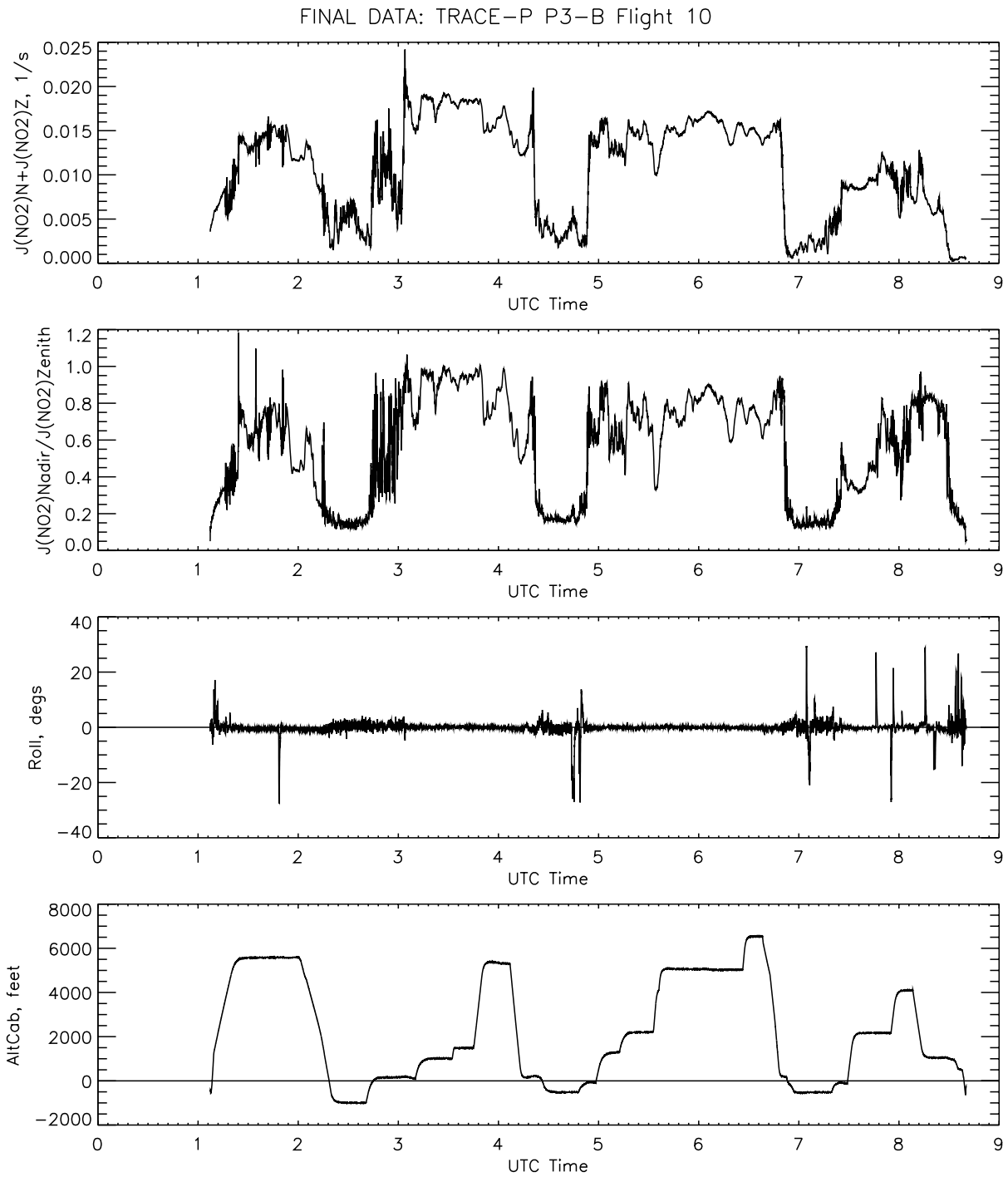

FINAL DATA: TRACE-P P3-B Flight 10
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

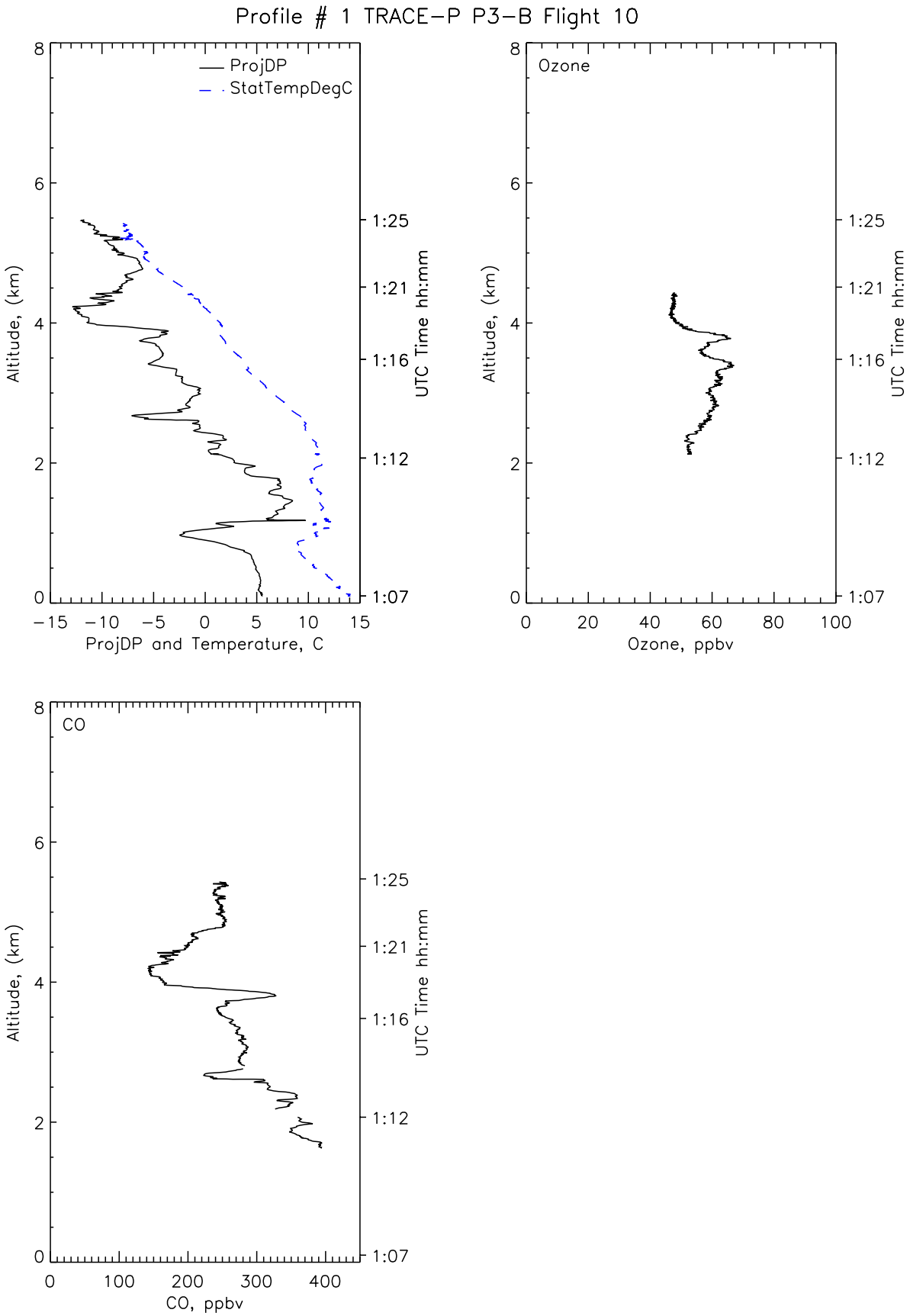

FINAL DATA: TRACE-P P3-B Flight 10
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 10
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

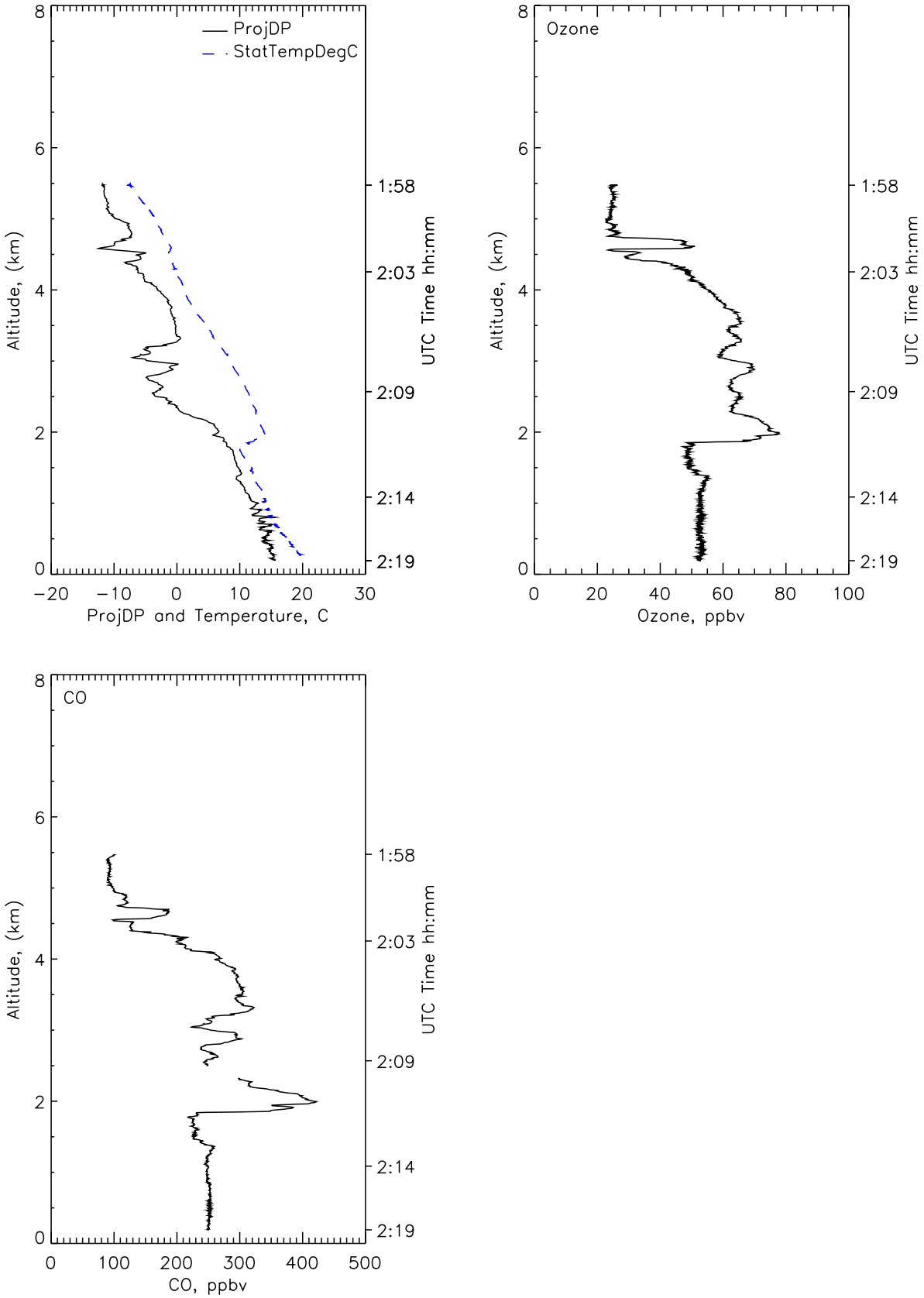
LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 10
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time

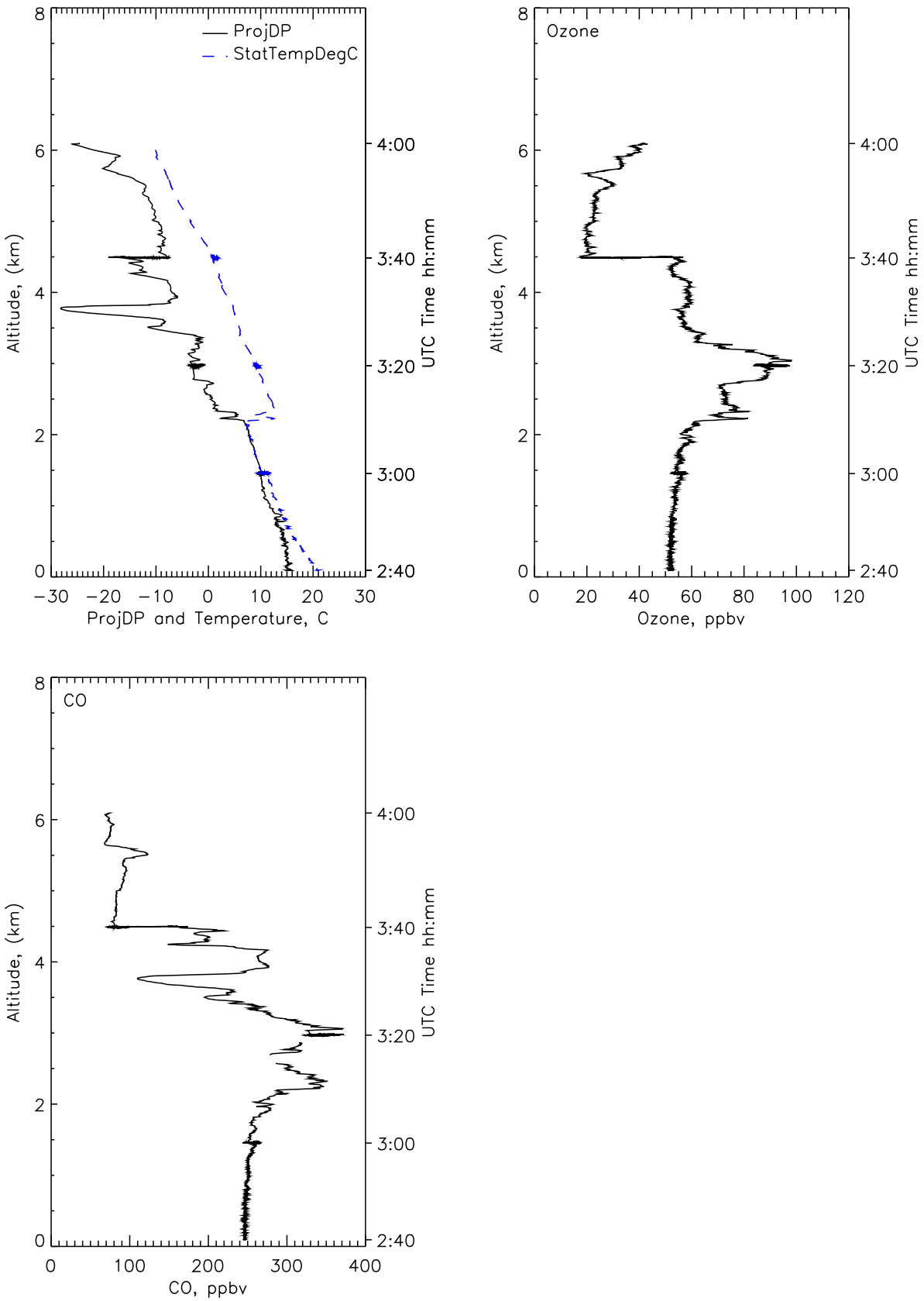

FINAL DATA: TRACE-P P3-B Flight 10
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
0
1
2
3
4
5
6
7
8
9
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
8000
6000
4000
2000
0
−2000
UTC Time


Profile # 1 TRACE-P P3-B Flight 10
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

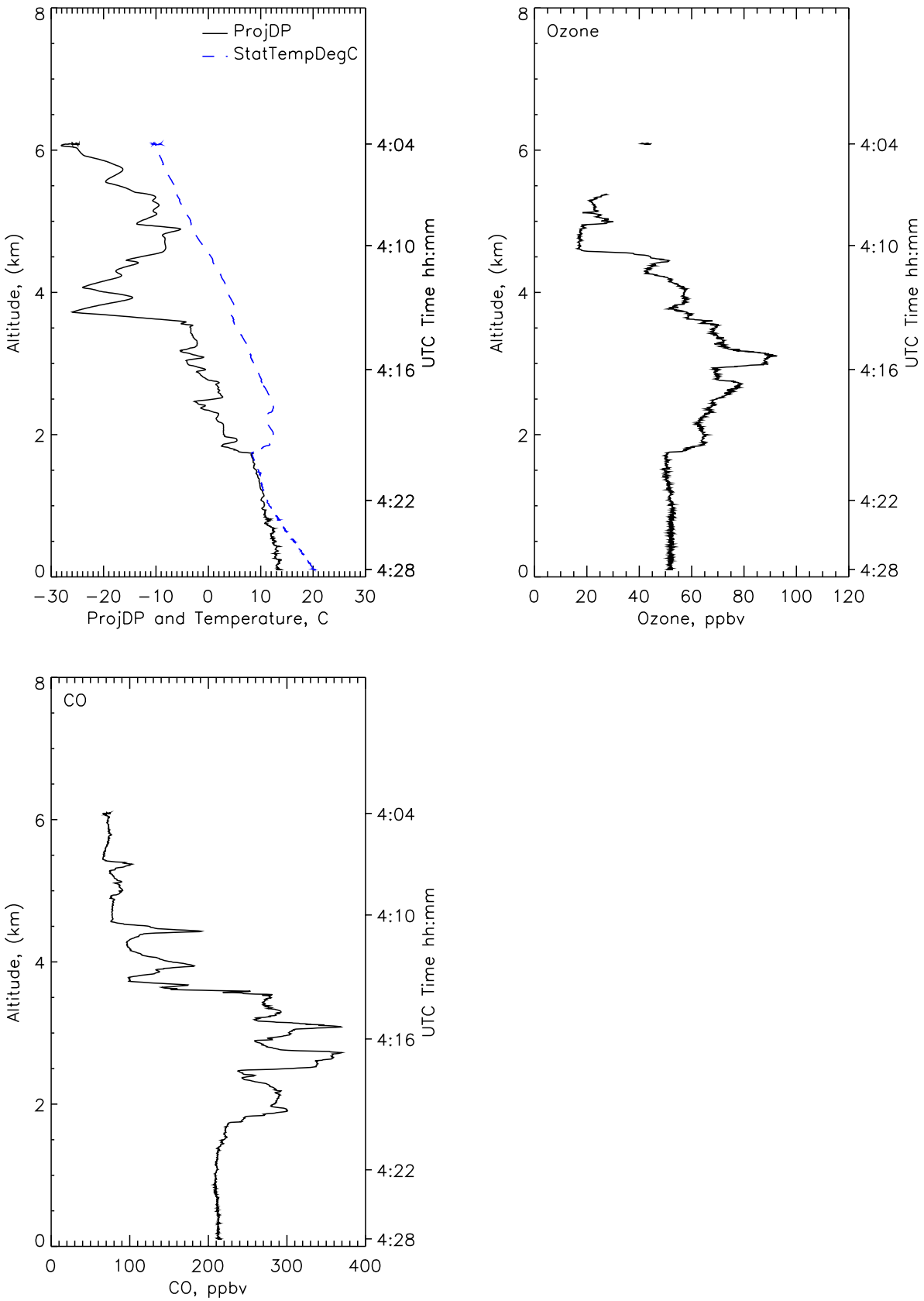
Profile # 2 TRACE-P P3-B Flight 10



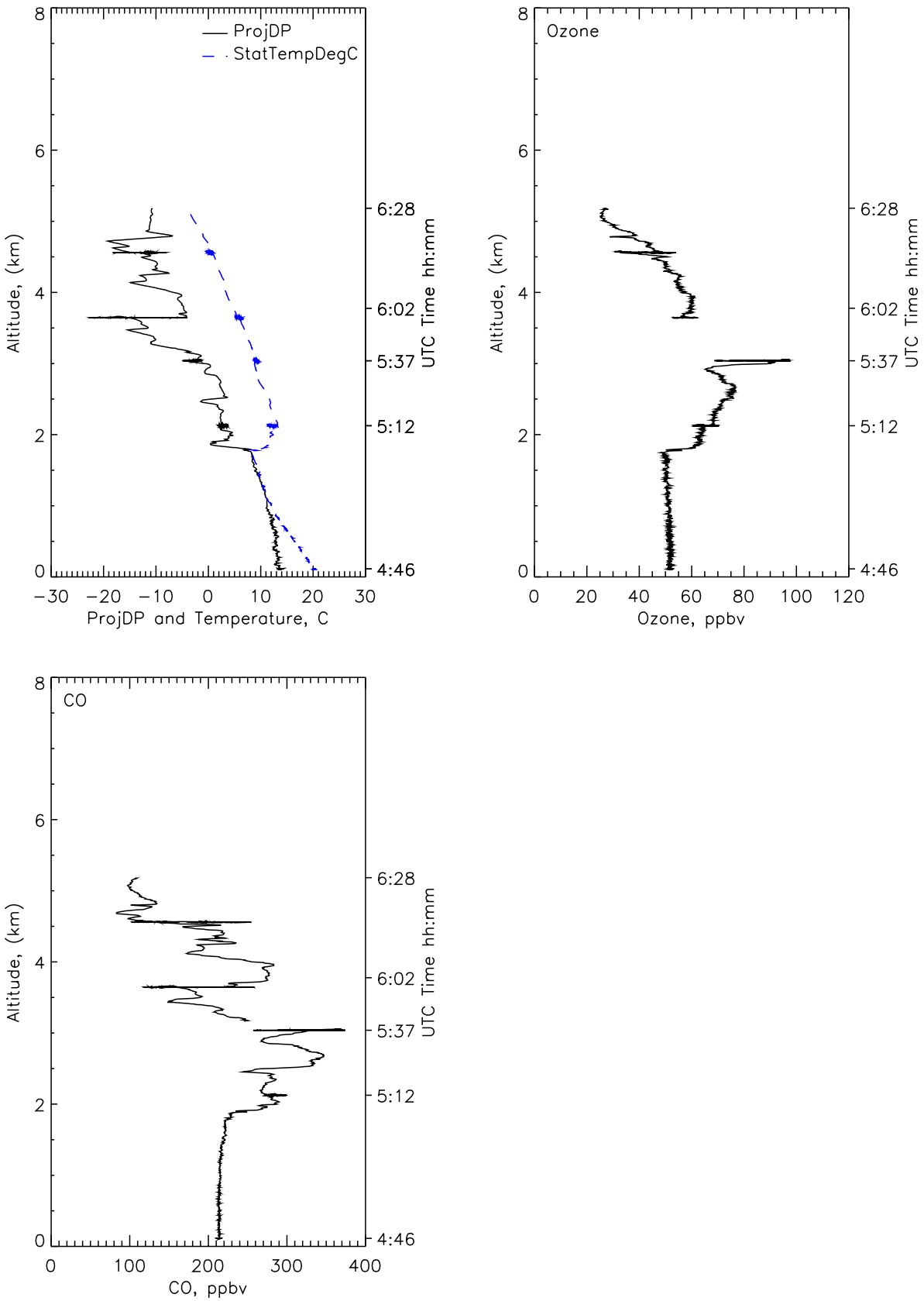
Profile # 3 TRACE−P P3−B Flight 10

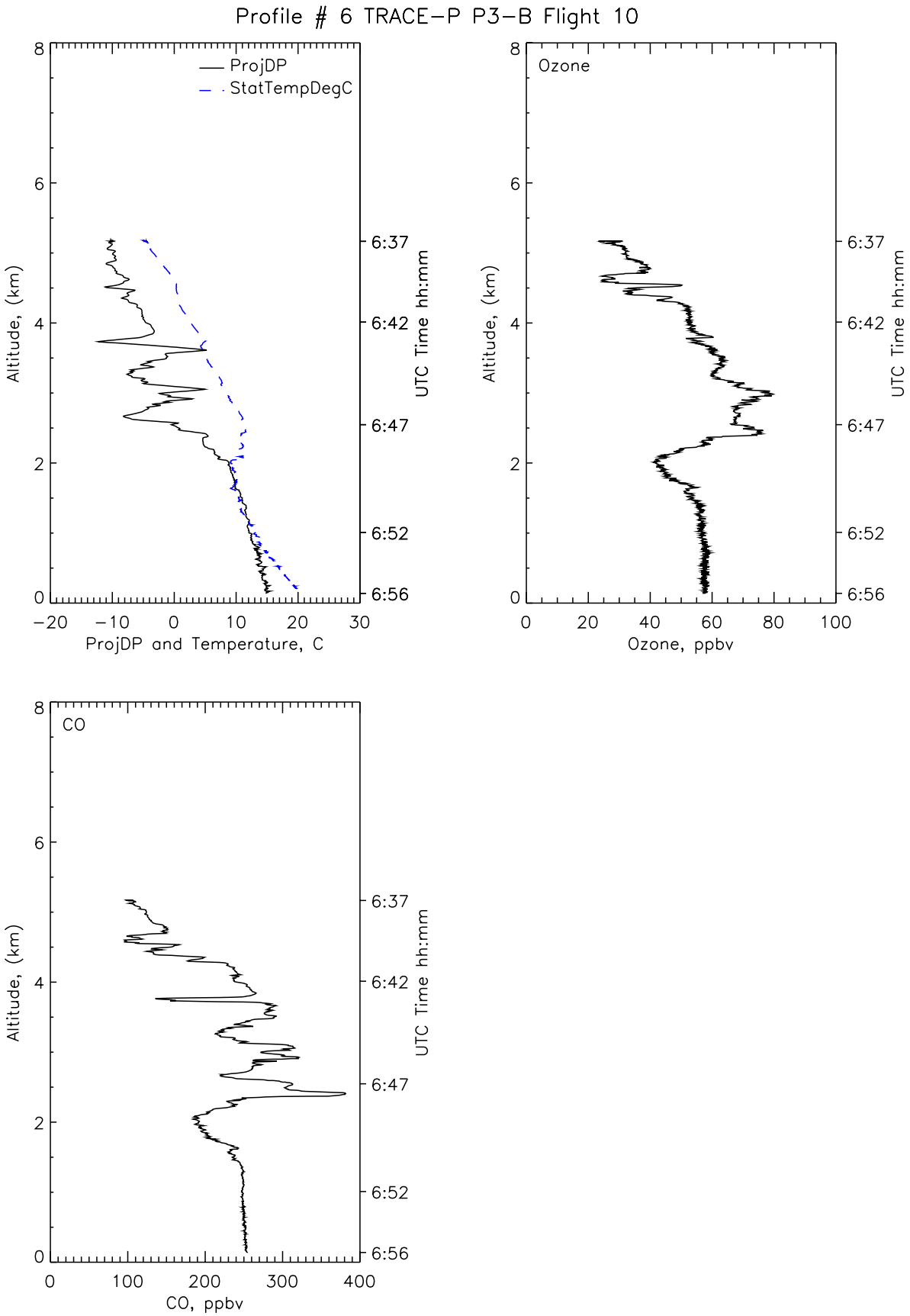


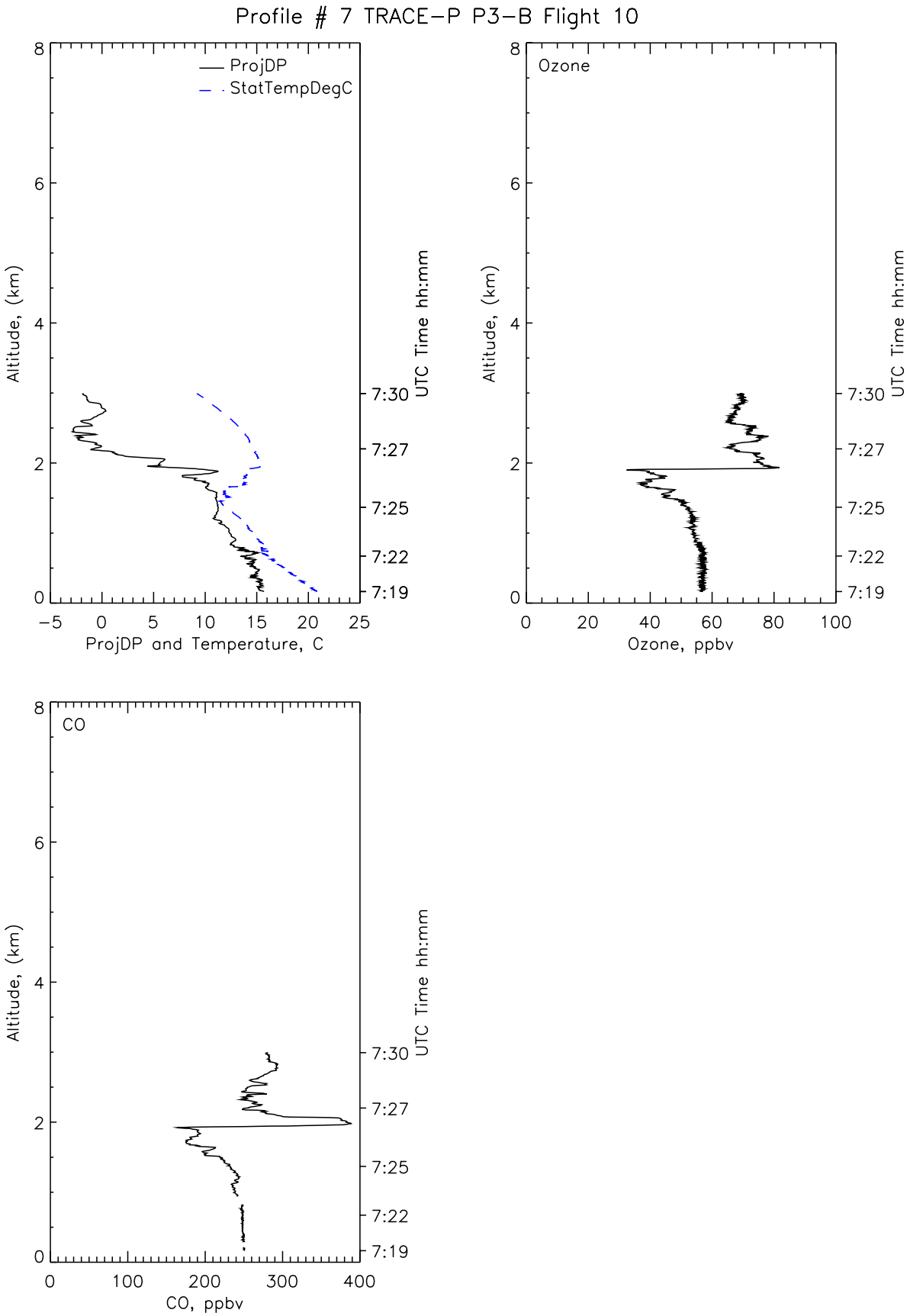
Profile # 4 TRACE−P P3−B Flight 10

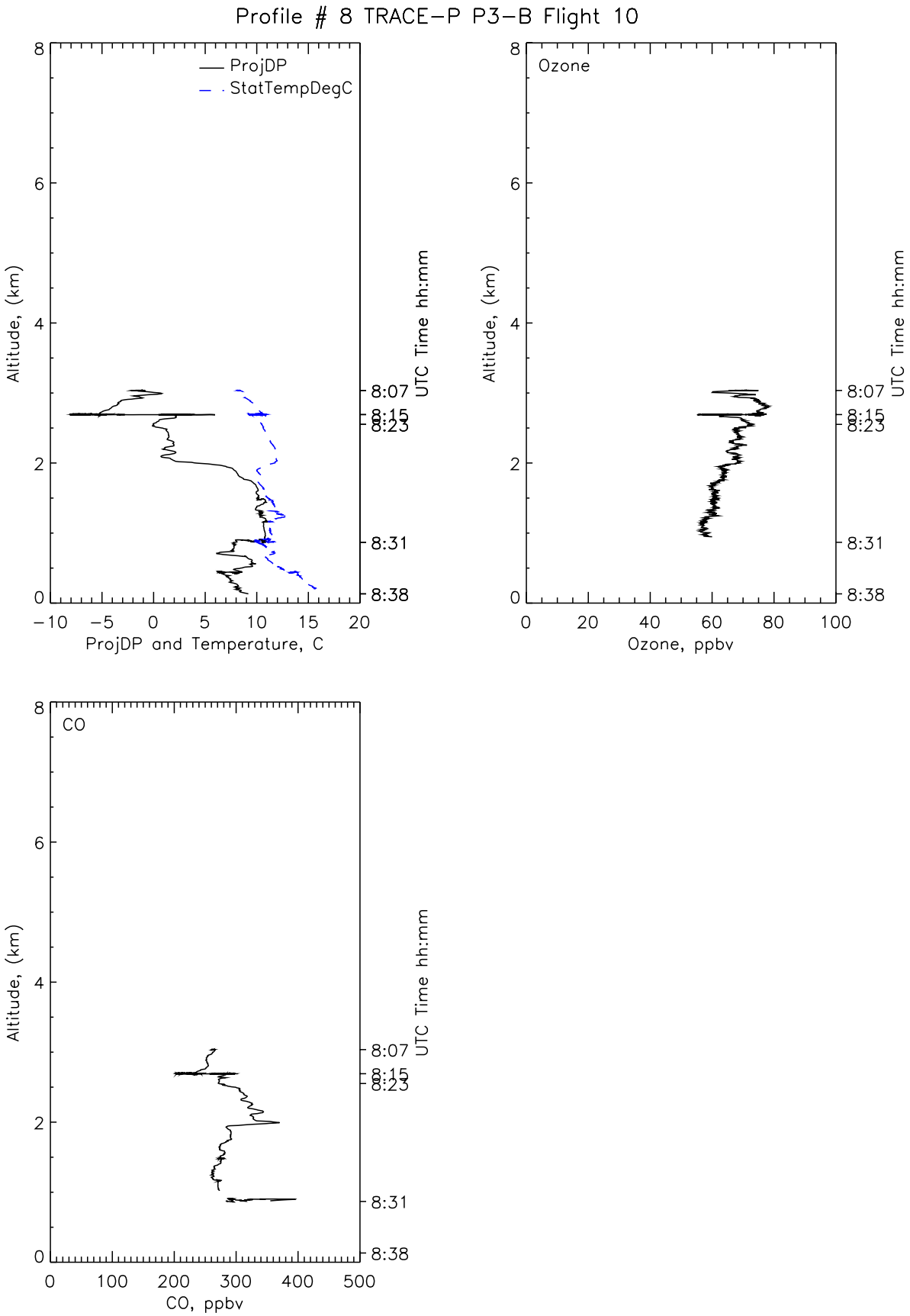


Profile # 5 TRACE-P P3-B Flight 10




Profile # 6 TRACE-P P3-B Flight 10
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 7 TRACE-P P3-B Flight 10
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
7:30
7:27
7:25
7:22
7:19
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 8 TRACE-P P3-B Flight 10
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
8:07
8:15
8:23
8:31
8:38
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

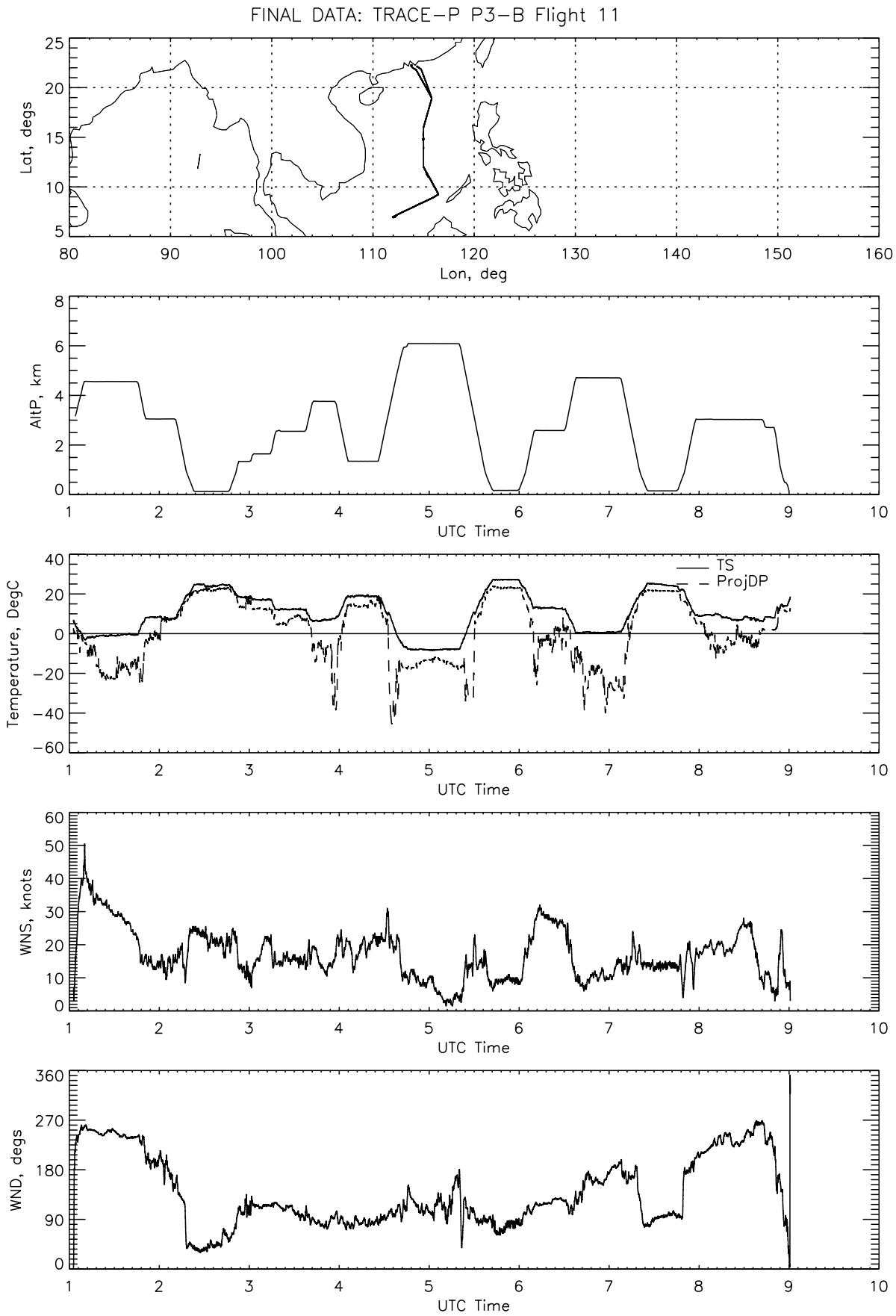
TRACE-P

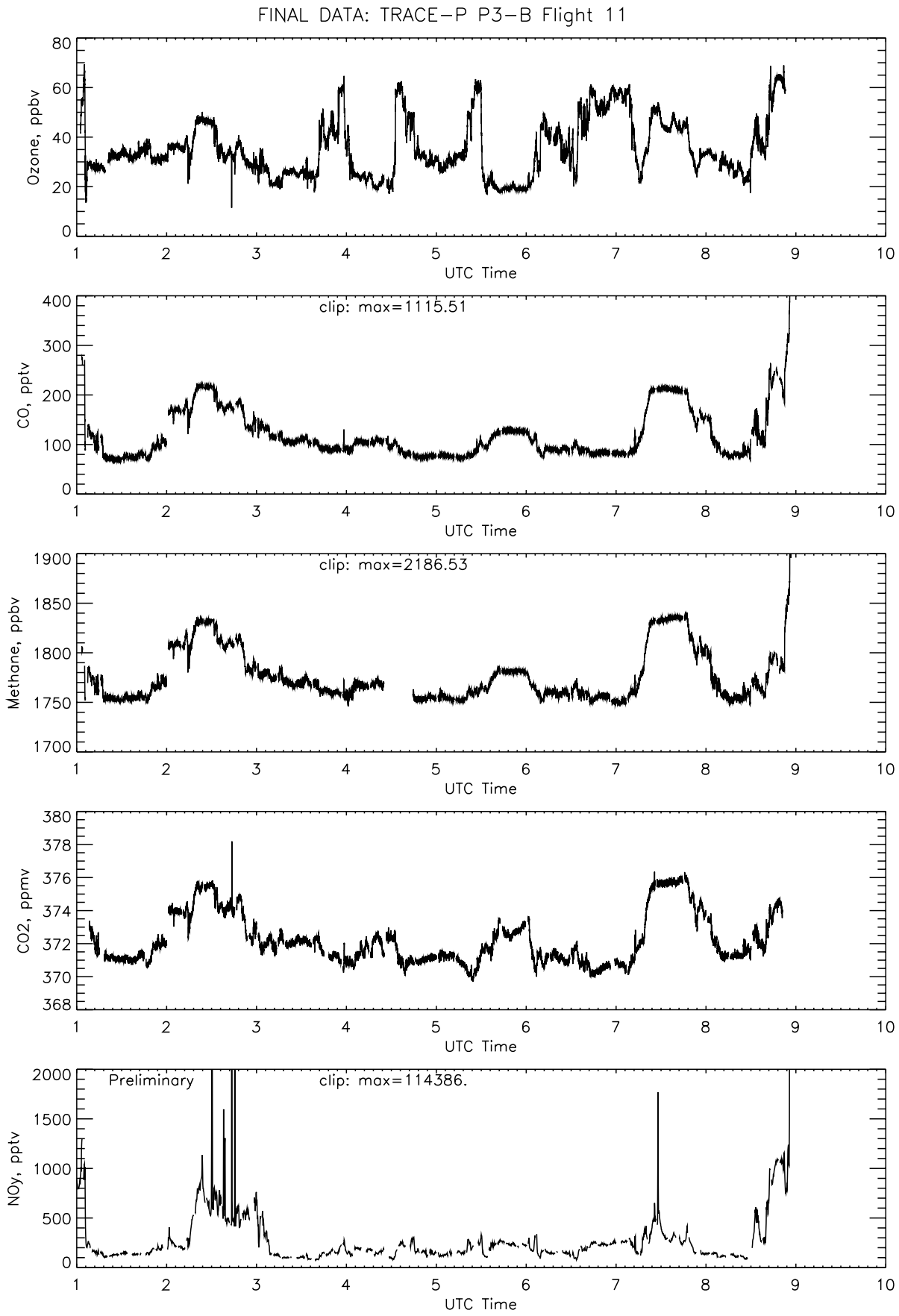
Flight 11P

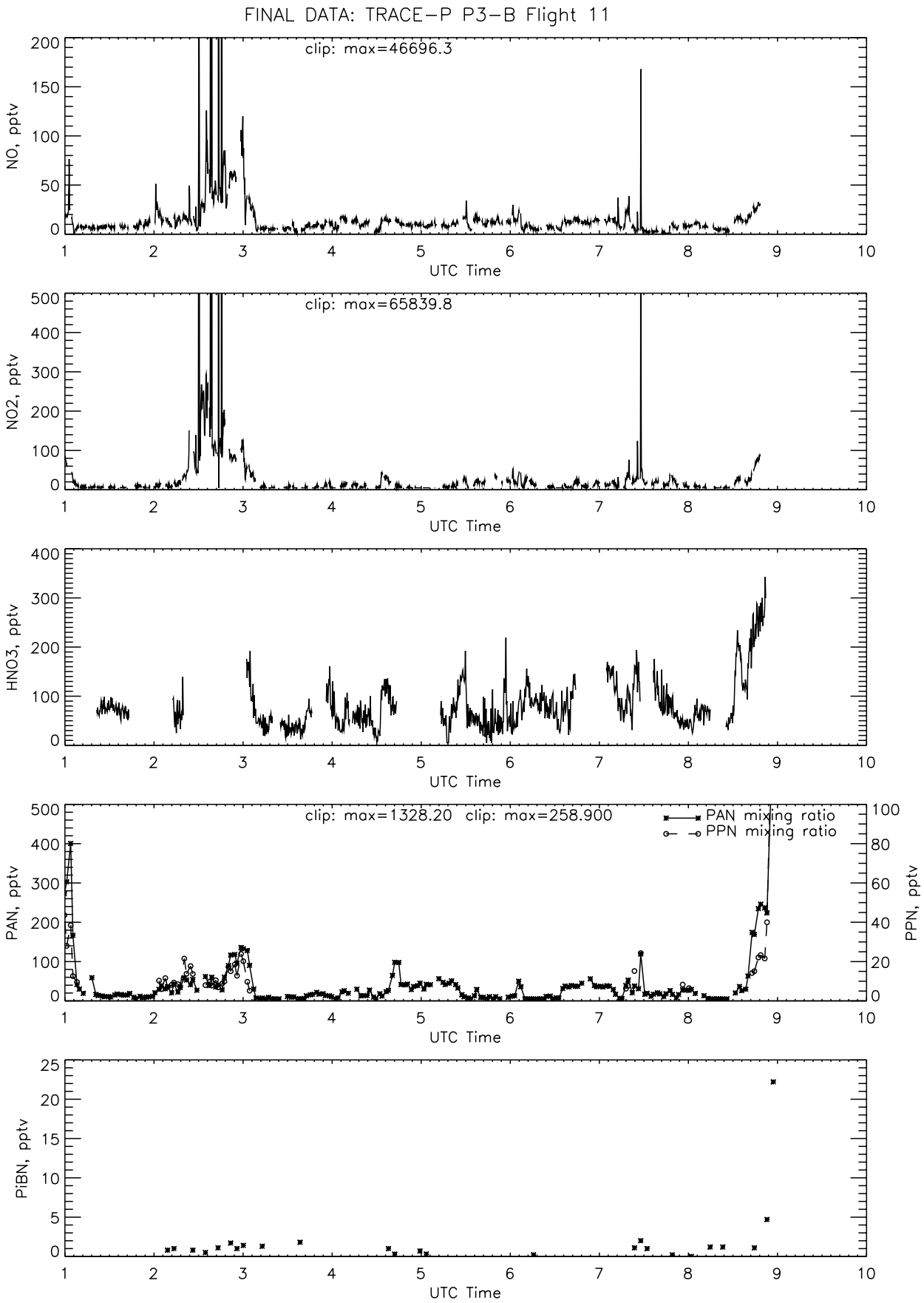
Local: Hong Kong No. 3

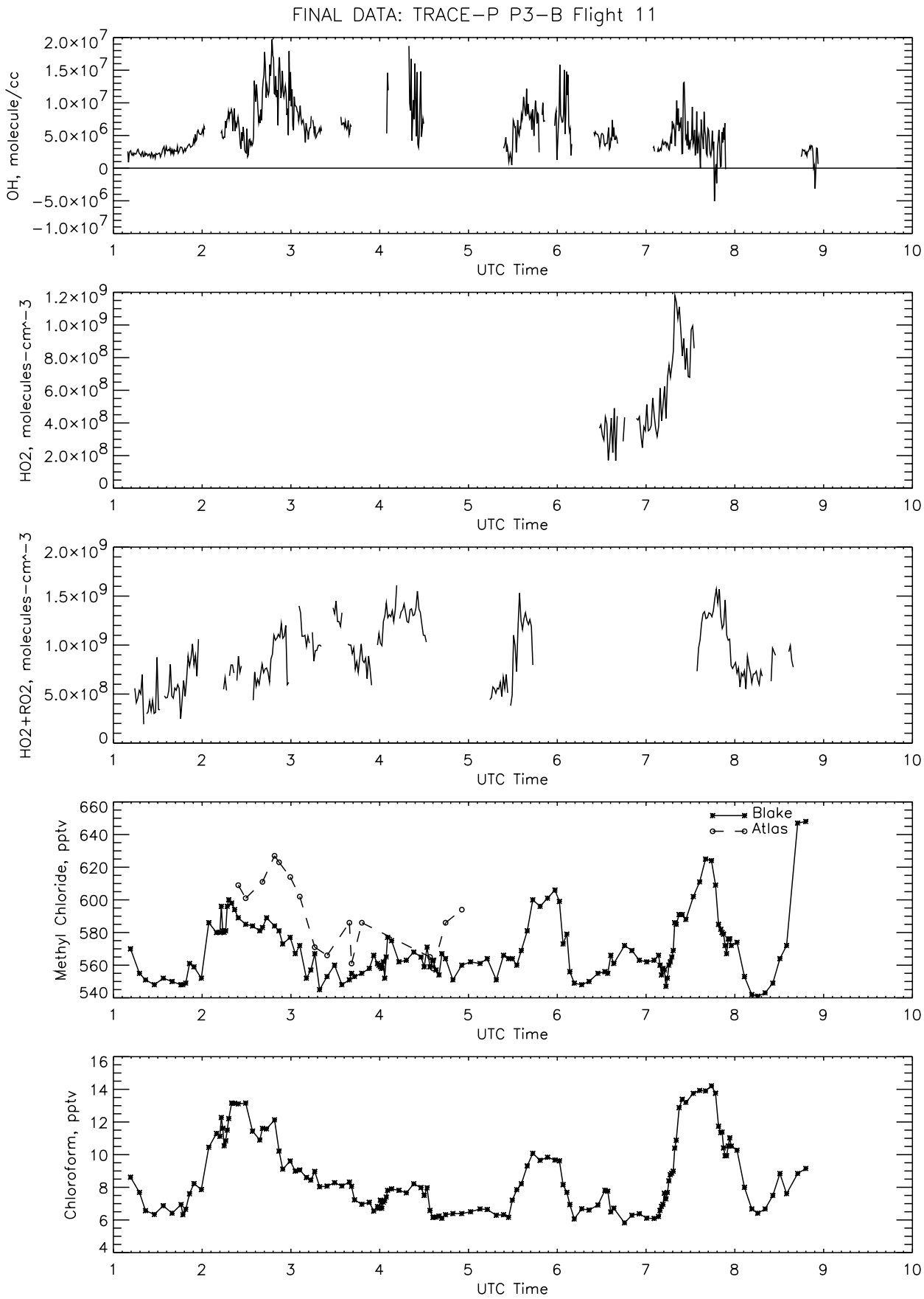
South China Sea Quiescent Period

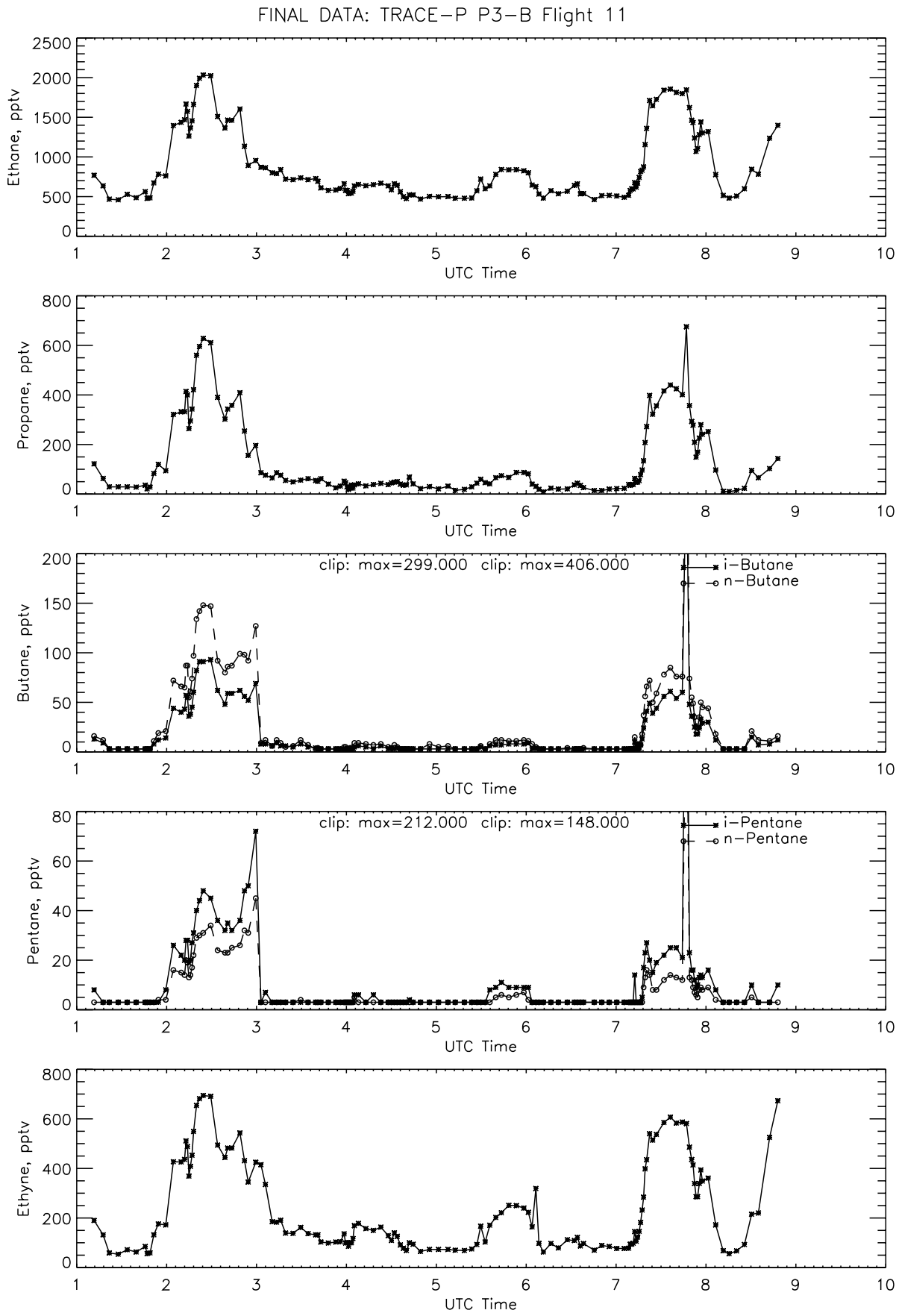
March 10, 2001

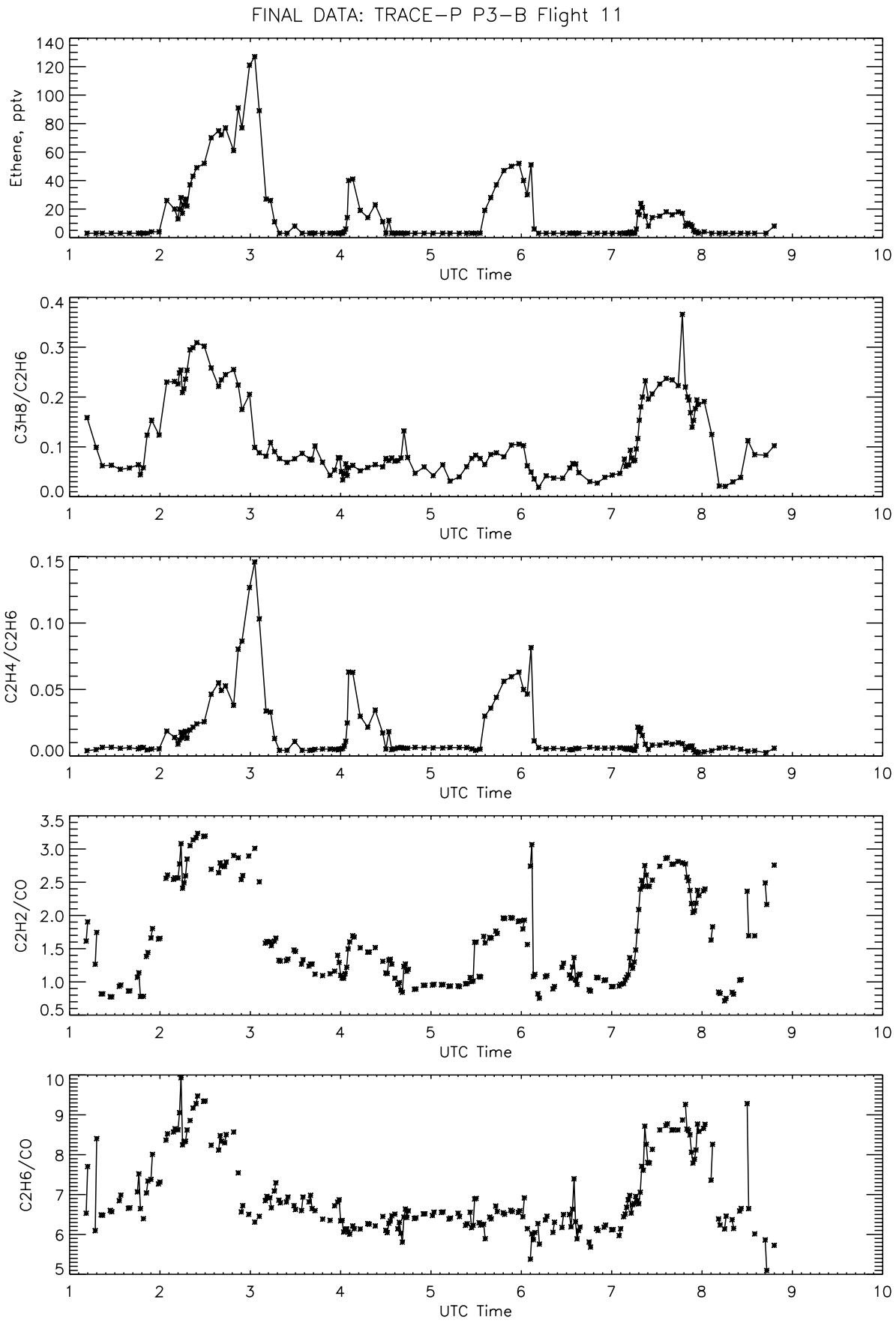

FINAL DATA: TRACE-P P3-B Flight 11
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 11
Ozone, ppbv
UTC Time
CO, pptv
clip: max=1115.51
UTC Time
Methane, ppbv
clip: max=2186.53
UTC Time
CO2, ppmv
UTC Time
NOy, pptv
Preliminary
clip: max=114386.
UTC Time

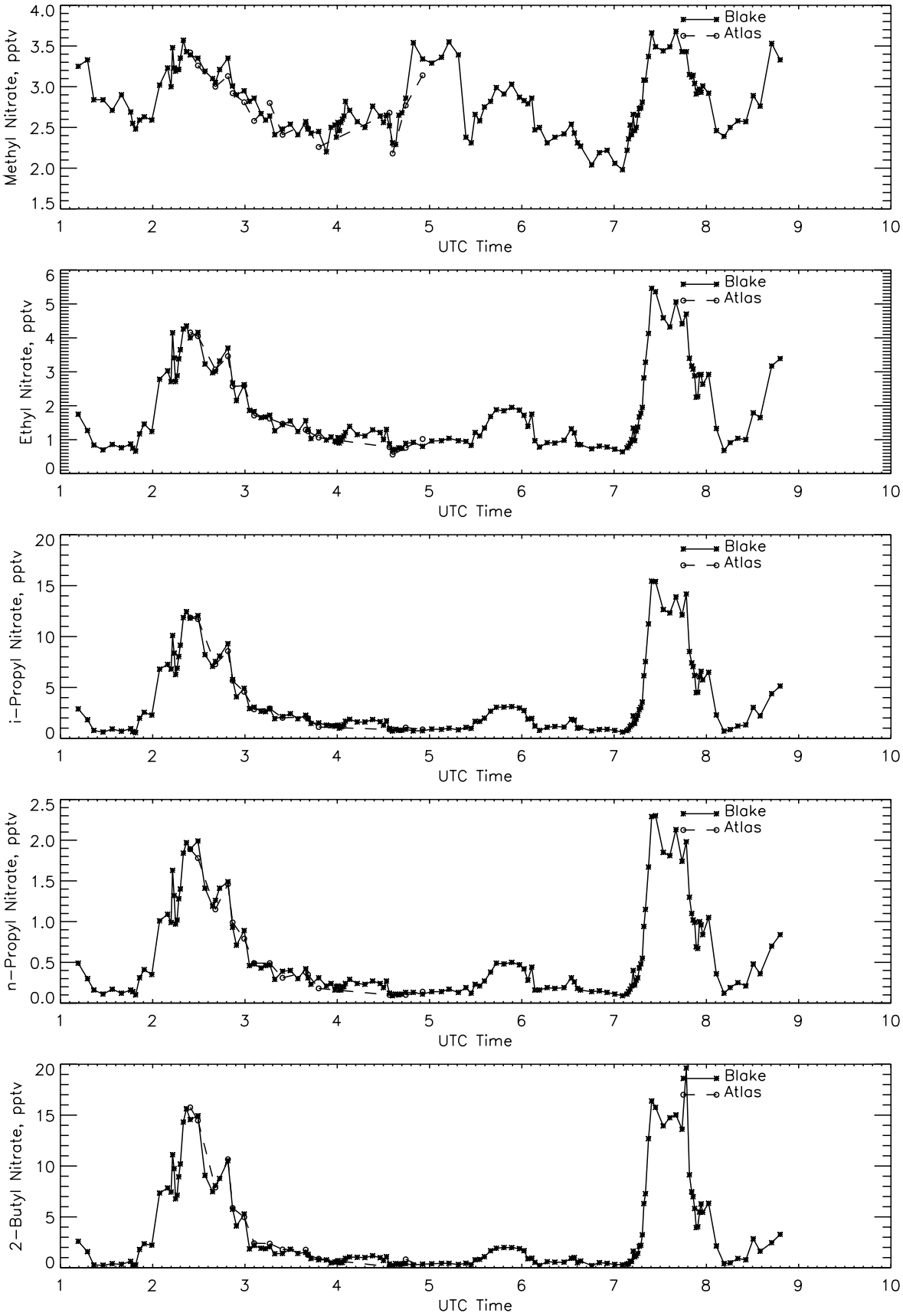

FINAL DATA: TRACE-P P3-B Flight 11
clip: max=46696.3
NO, pptv
UTC Time
clip: max=65839.8
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
clip: max=1328.20 clip: max=258.900
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

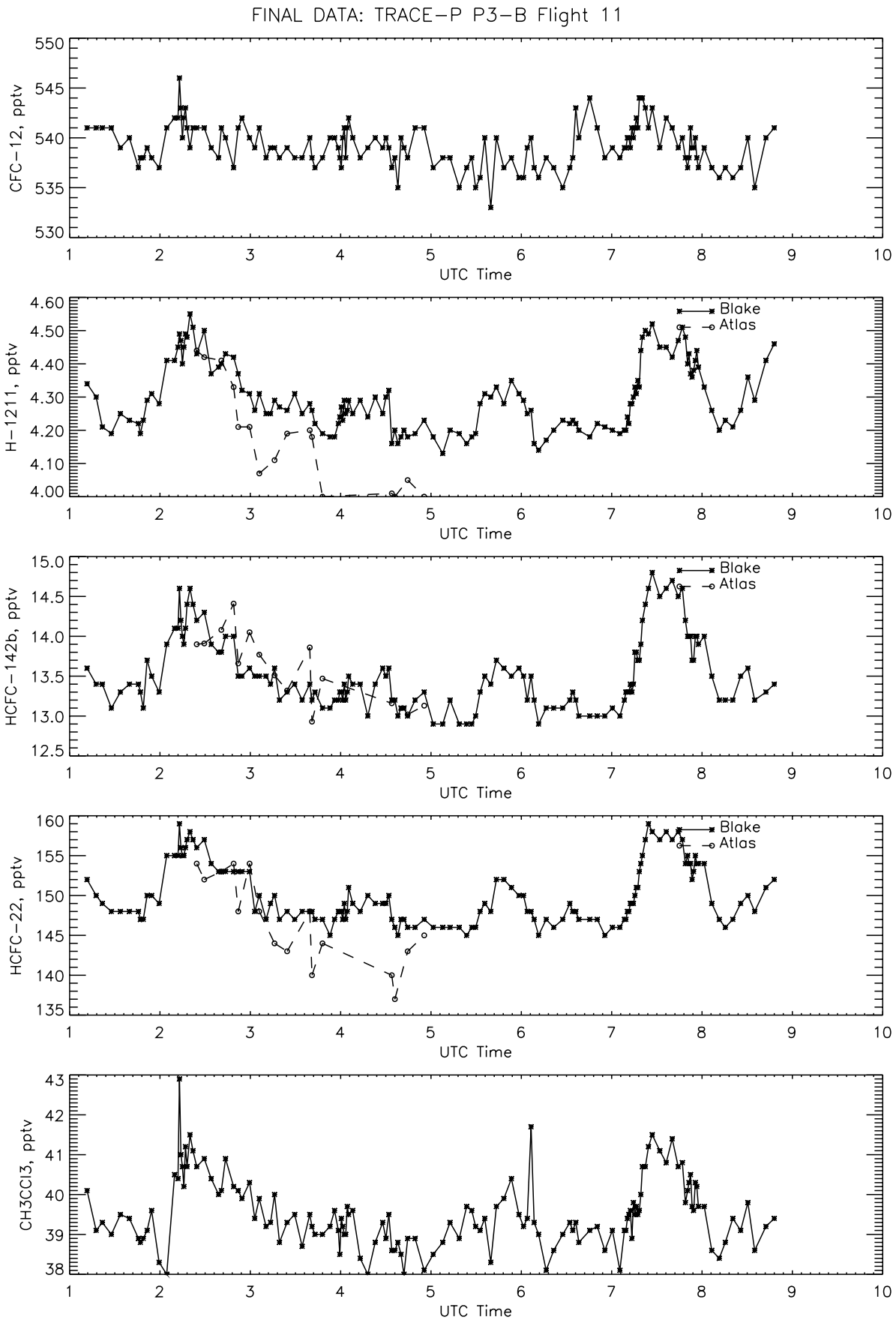

FINAL DATA: TRACE-P P3-B Flight 11
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 11
Ethane, pptv
Propane, pptv
Butane, pptv
clip: max=299.000 clip: max=406.000
i-Butane
n-Butane
Pentane, pptv
clip: max=212.000 clip: max=148.000
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

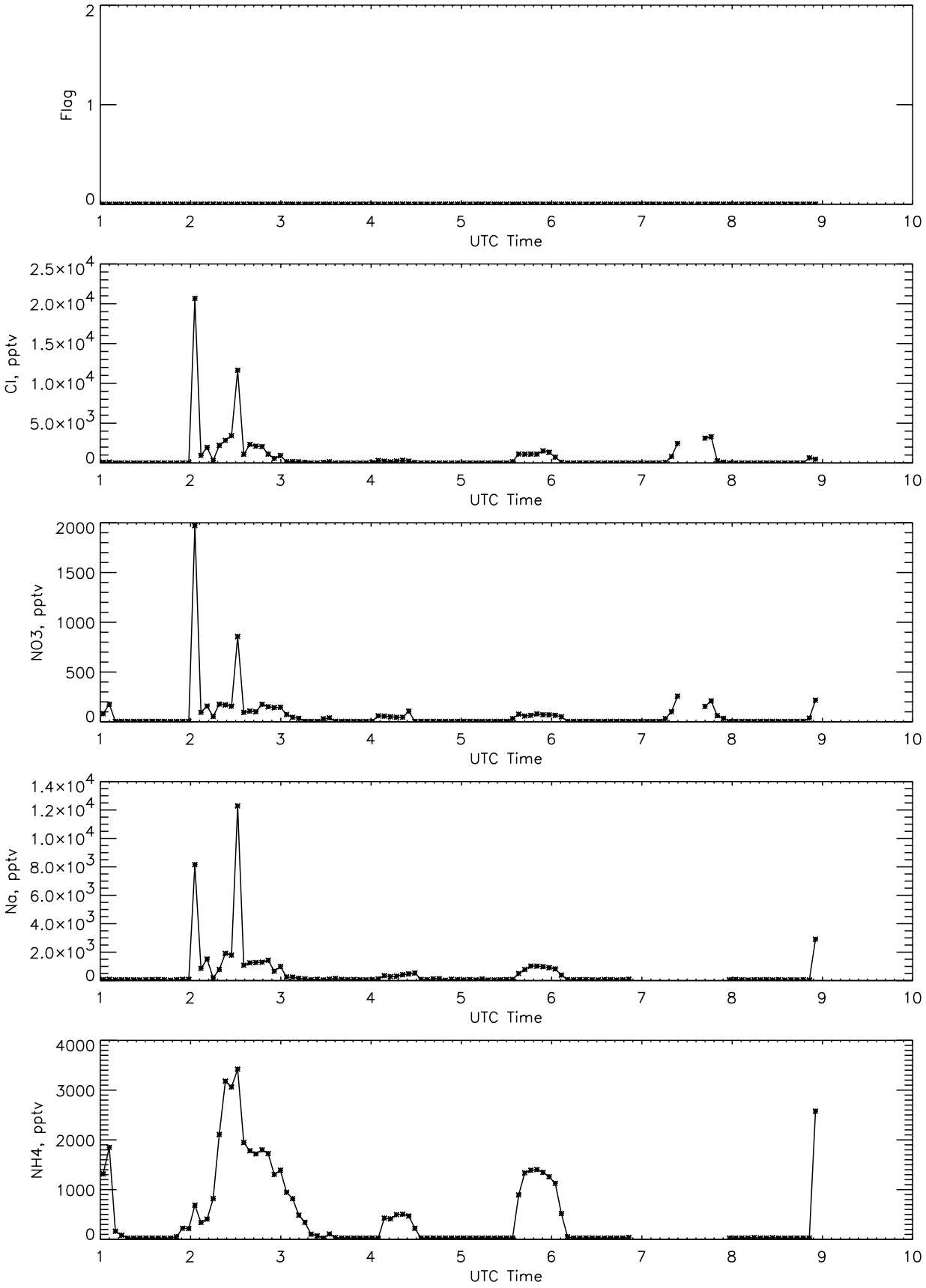

FINAL DATA: TRACE-P P3-B Flight 11
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

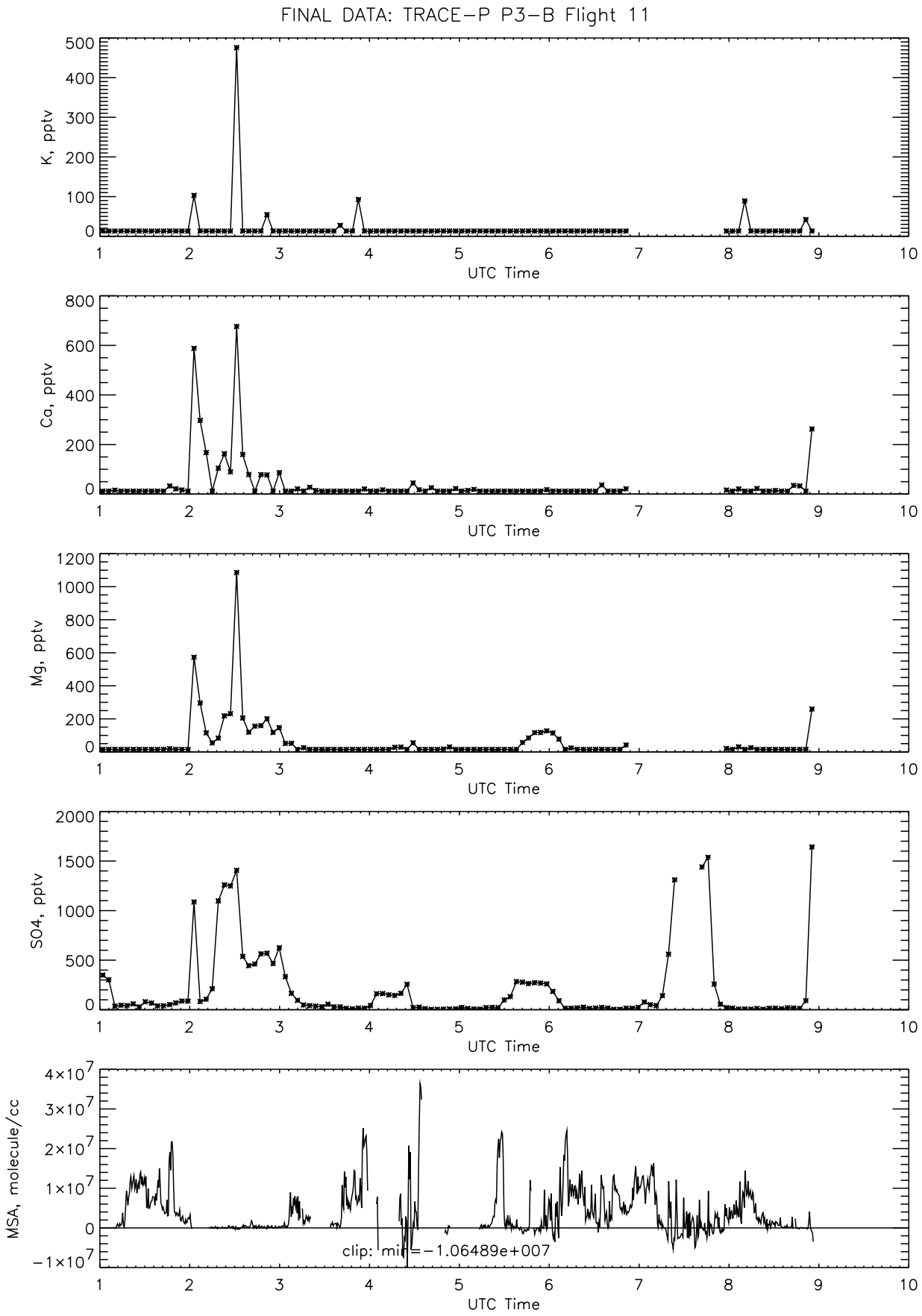
FINAL DATA: TRACE-P P3-B Flight 11

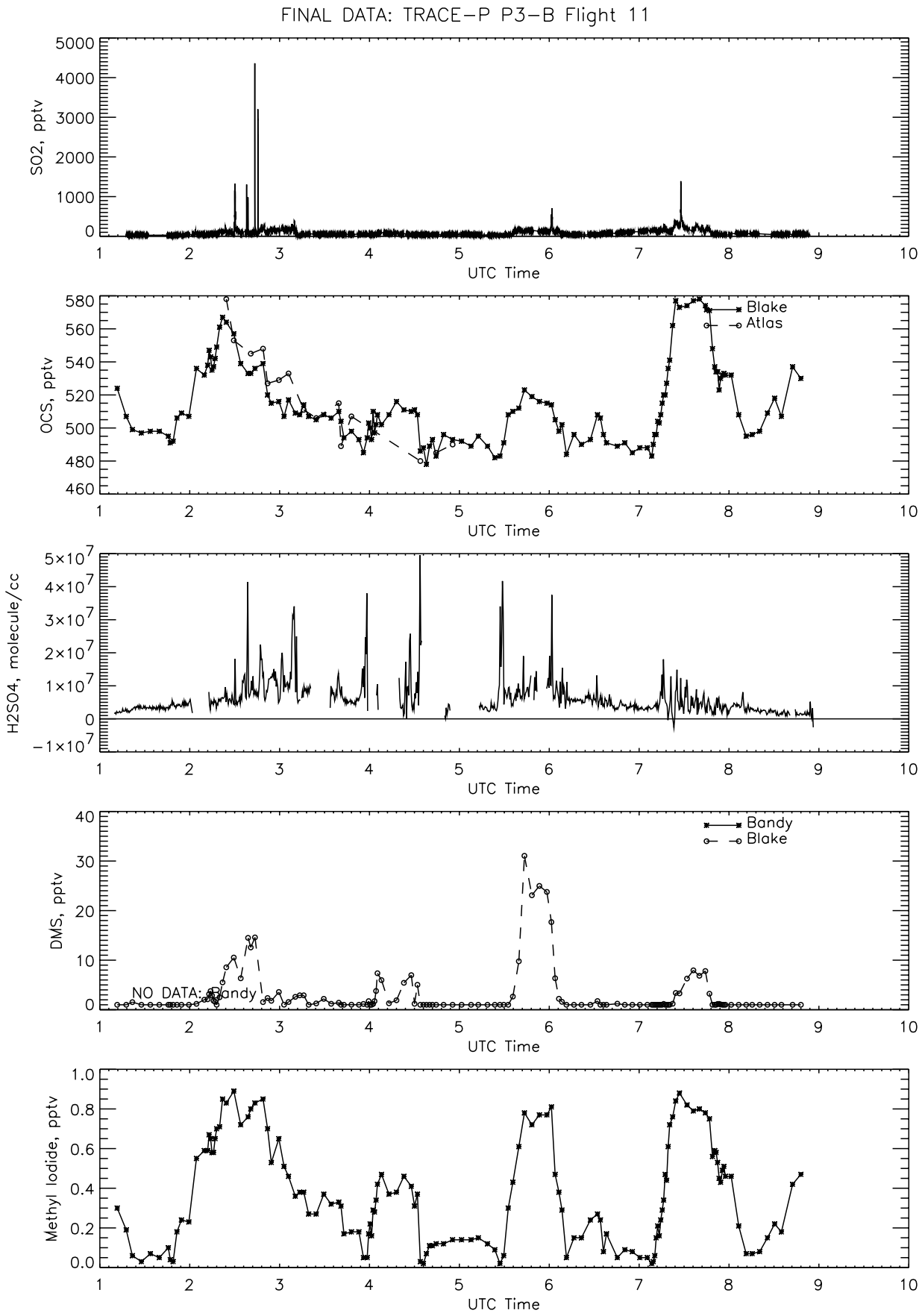


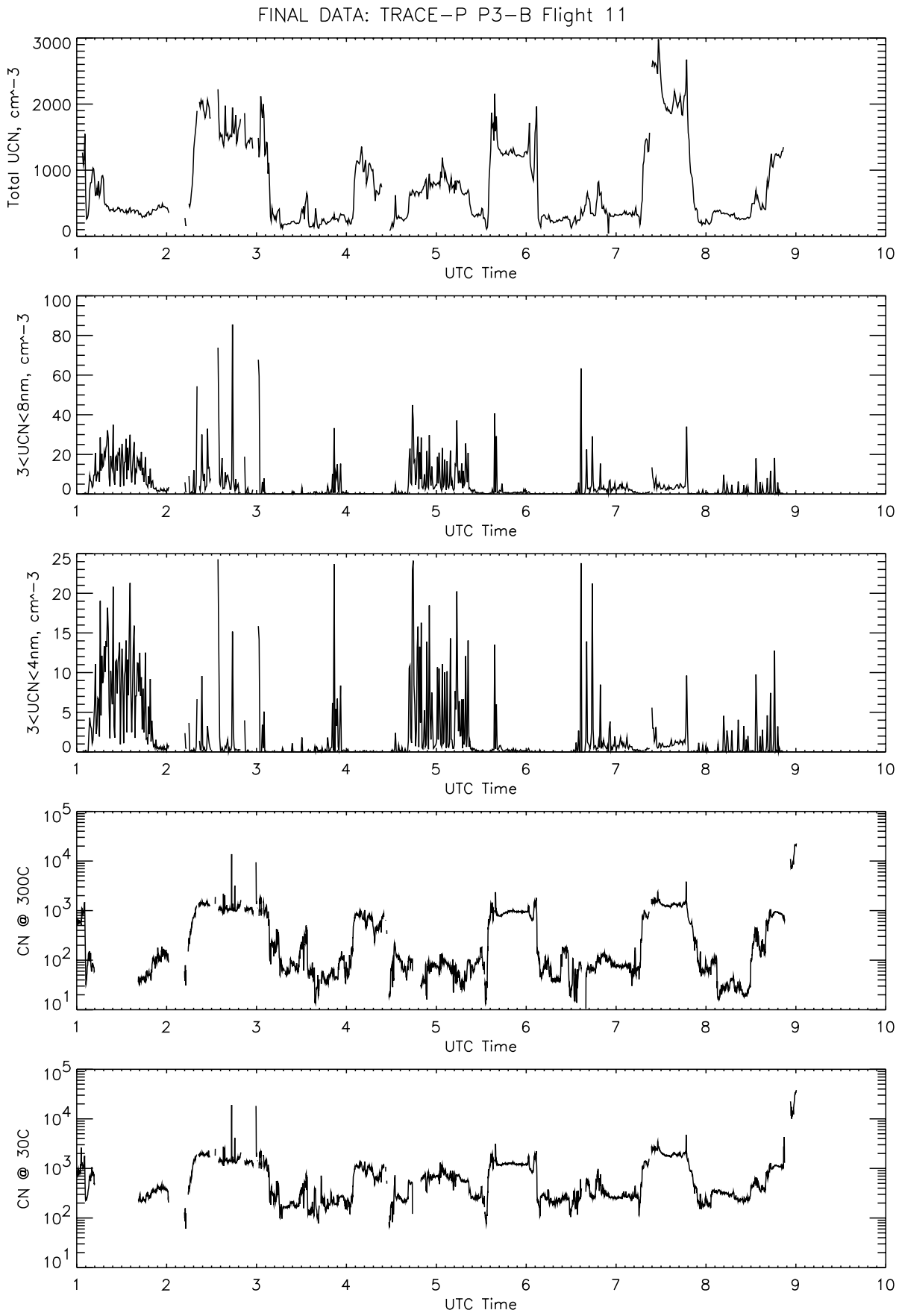

FINAL DATA: TRACE-P P3-B Flight 11
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

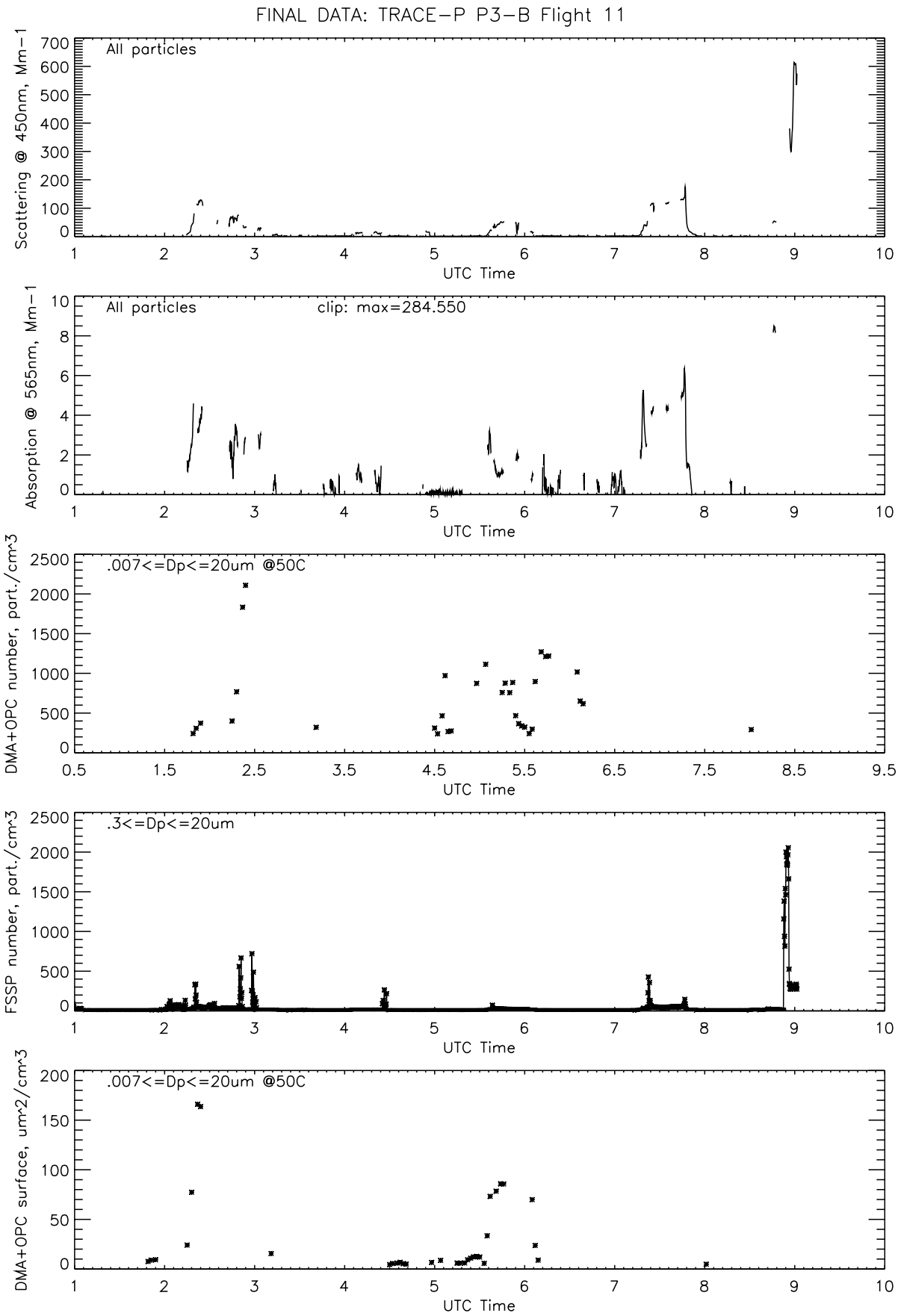
FINAL DATA: TRACE-P P3-B Flight 11

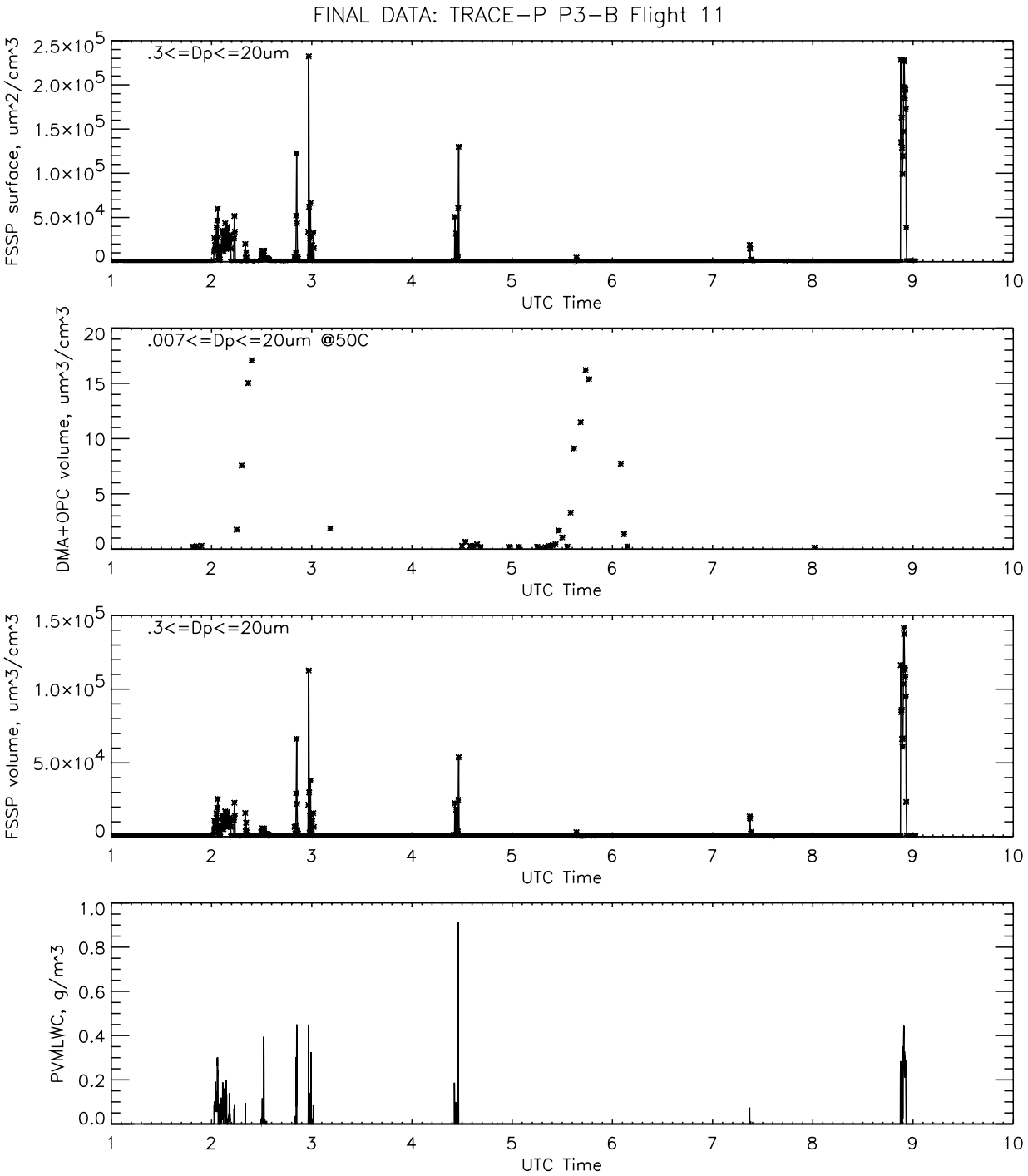



FINAL DATA: TRACE-P P3-B Flight 11
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time
clip: min=-1.06489e+007

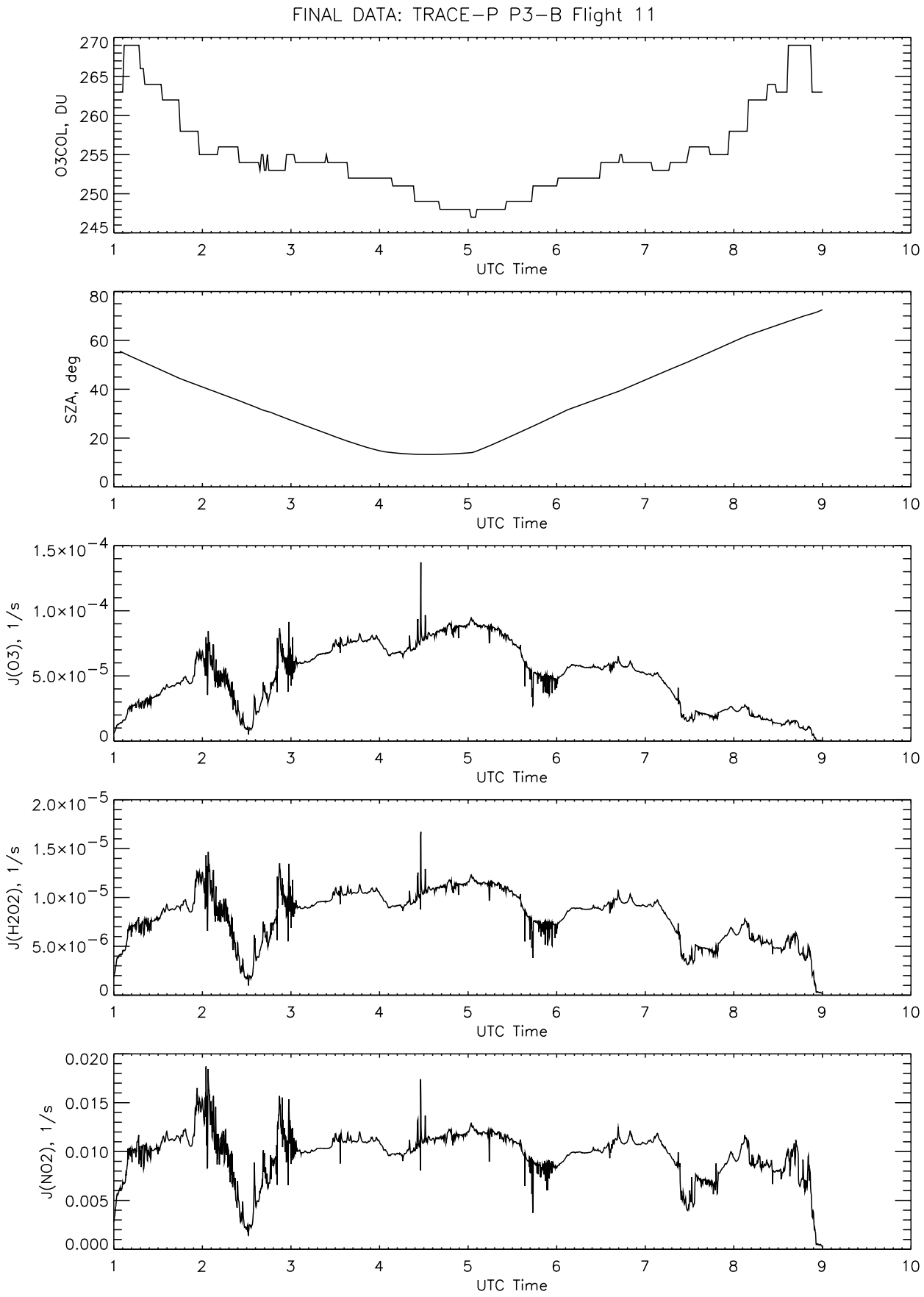

FINAL DATA: TRACE-P P3-B Flight 11
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

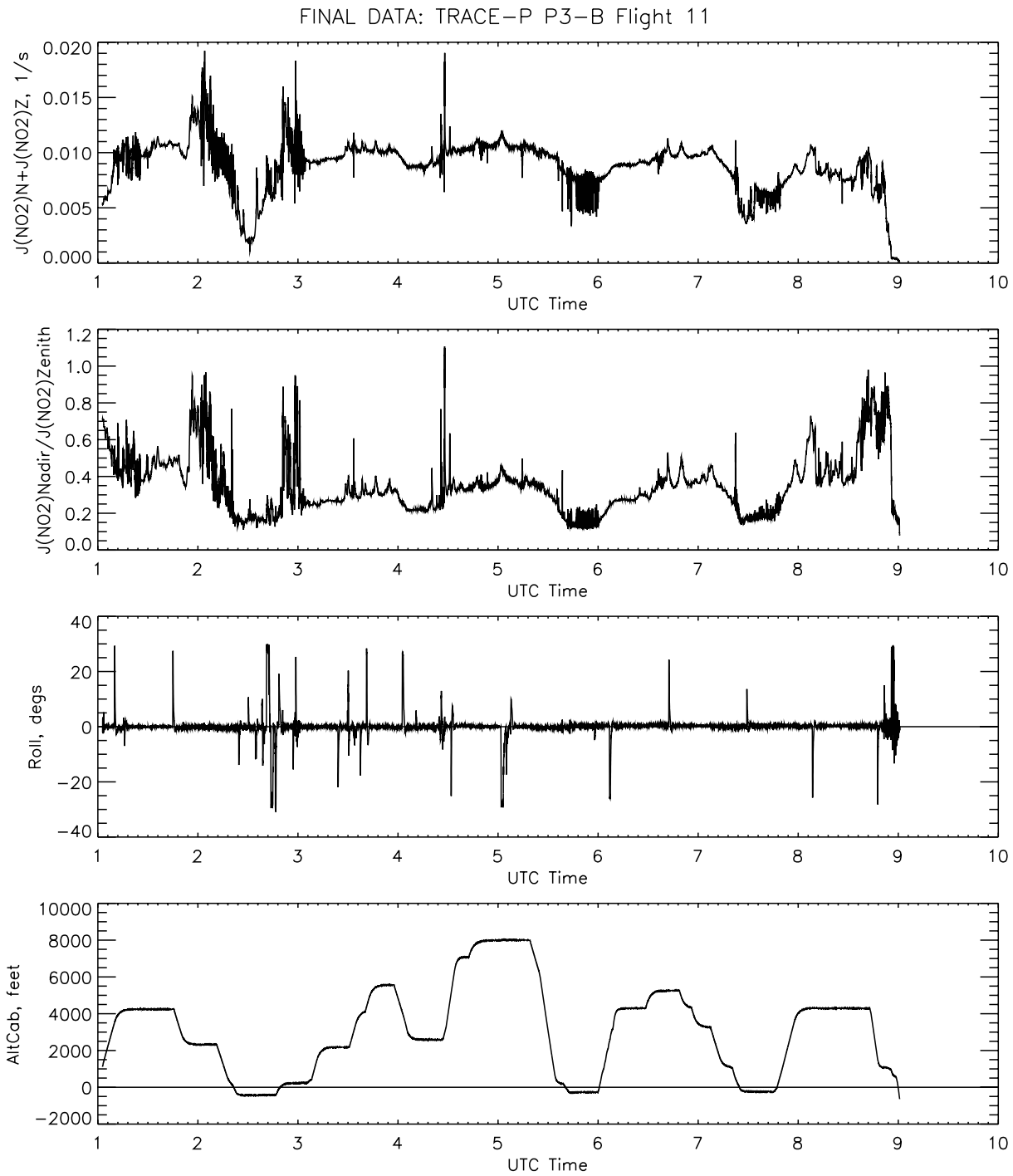

FINAL DATA: TRACE-P P3-B Flight 11
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time


FINAL DATA: TRACE-P P3-B Flight 11
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=284.550
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

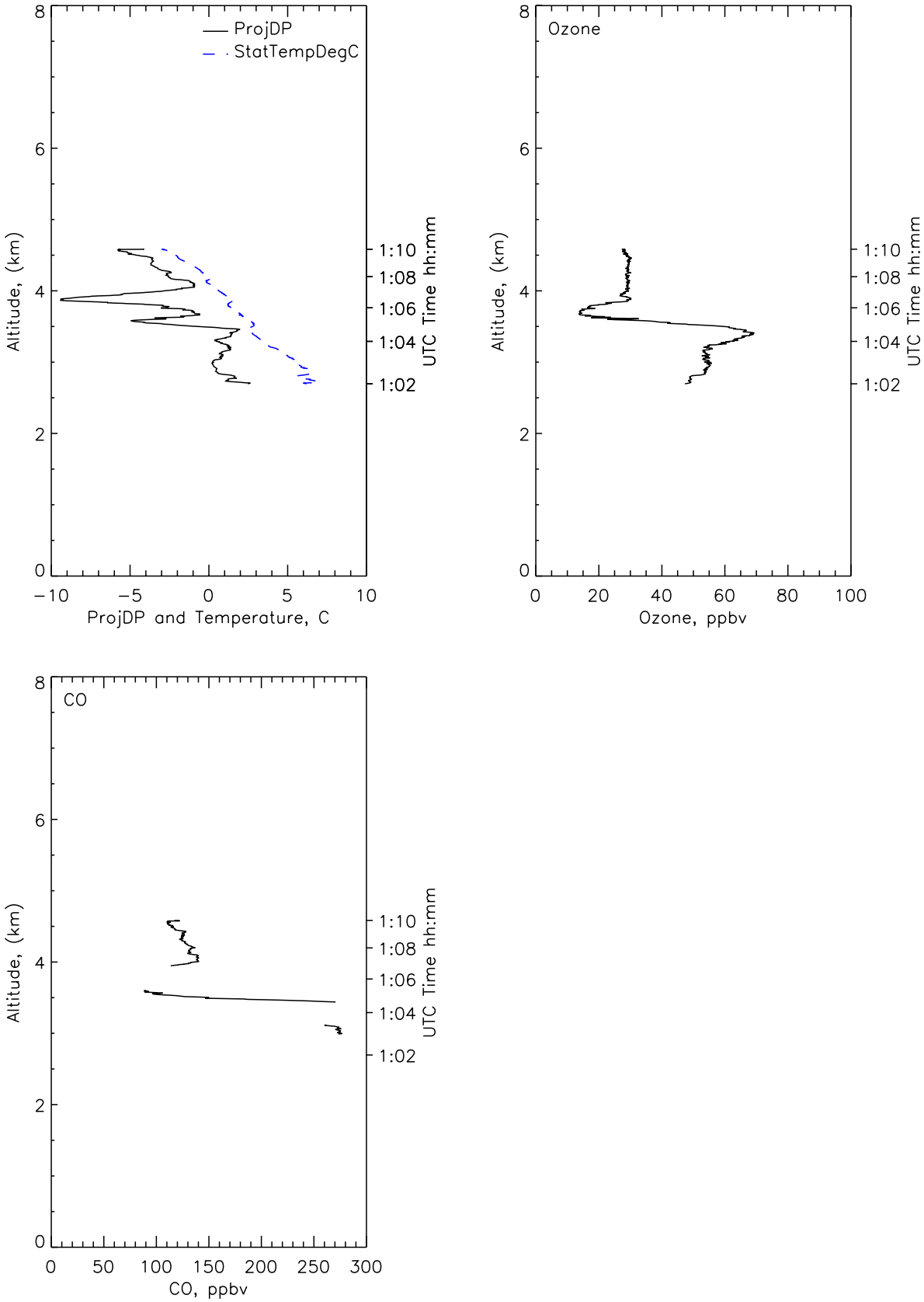

FINAL DATA: TRACE-P P3-B Flight 11
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

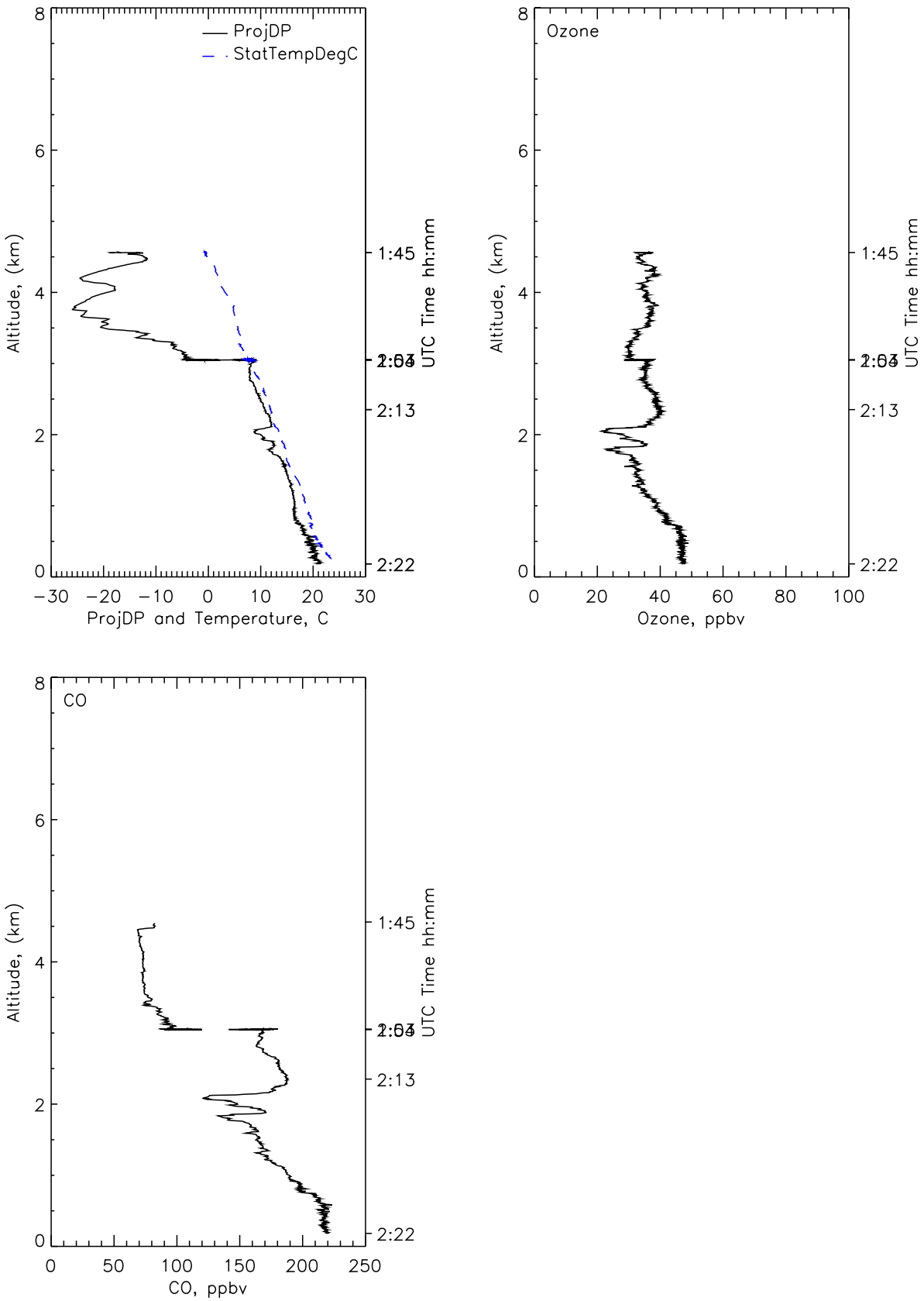

FINAL DATA: TRACE-P P3-B Flight 11
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time

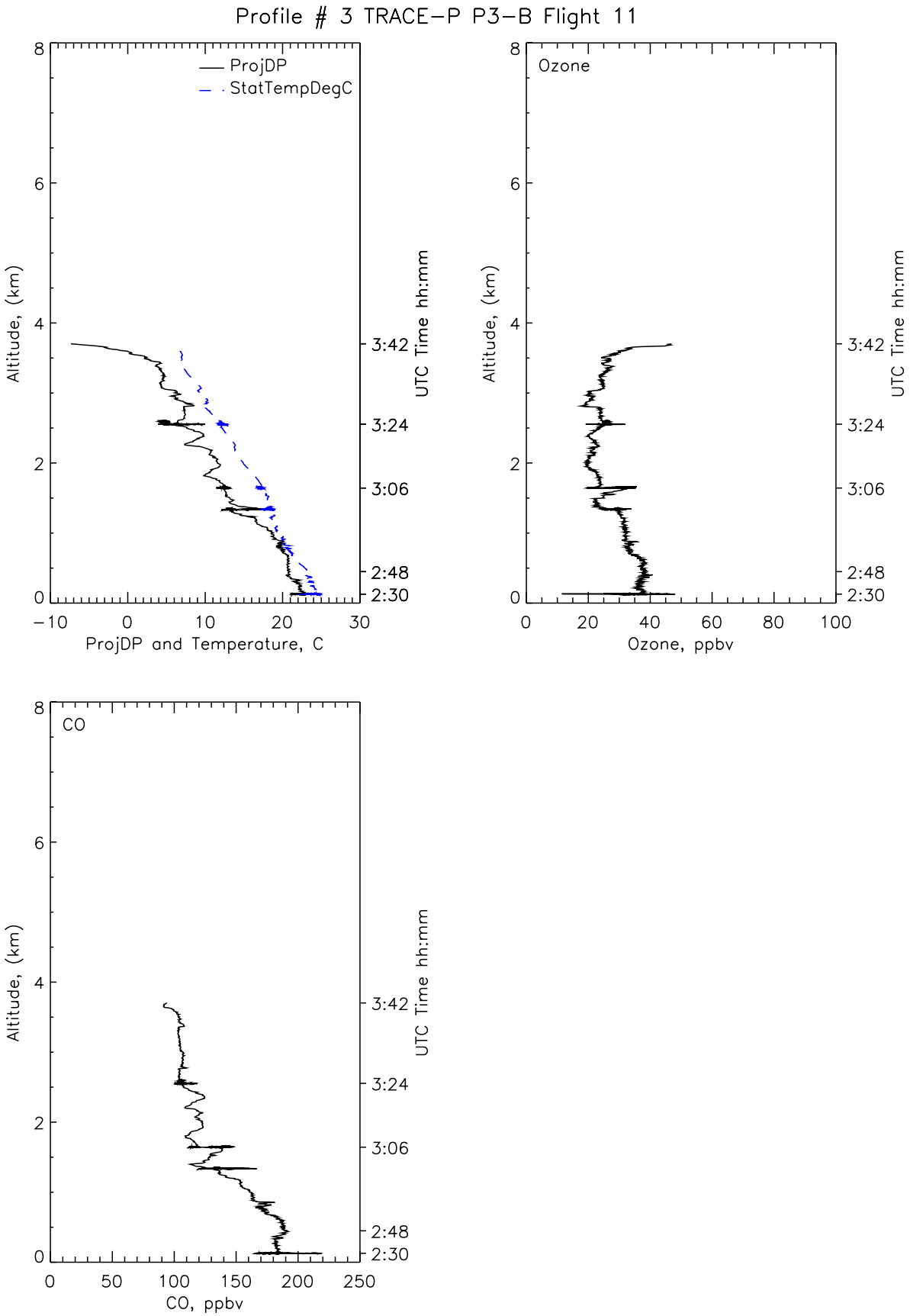

FINAL DATA: TRACE-P P3-B Flight 11
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
10000
8000
6000
4000
2000
0
−2000
UTC Time
1
2
3
4
5
6
7
8
9
10

Profile # 1 TRACE-P P3-B Flight 11

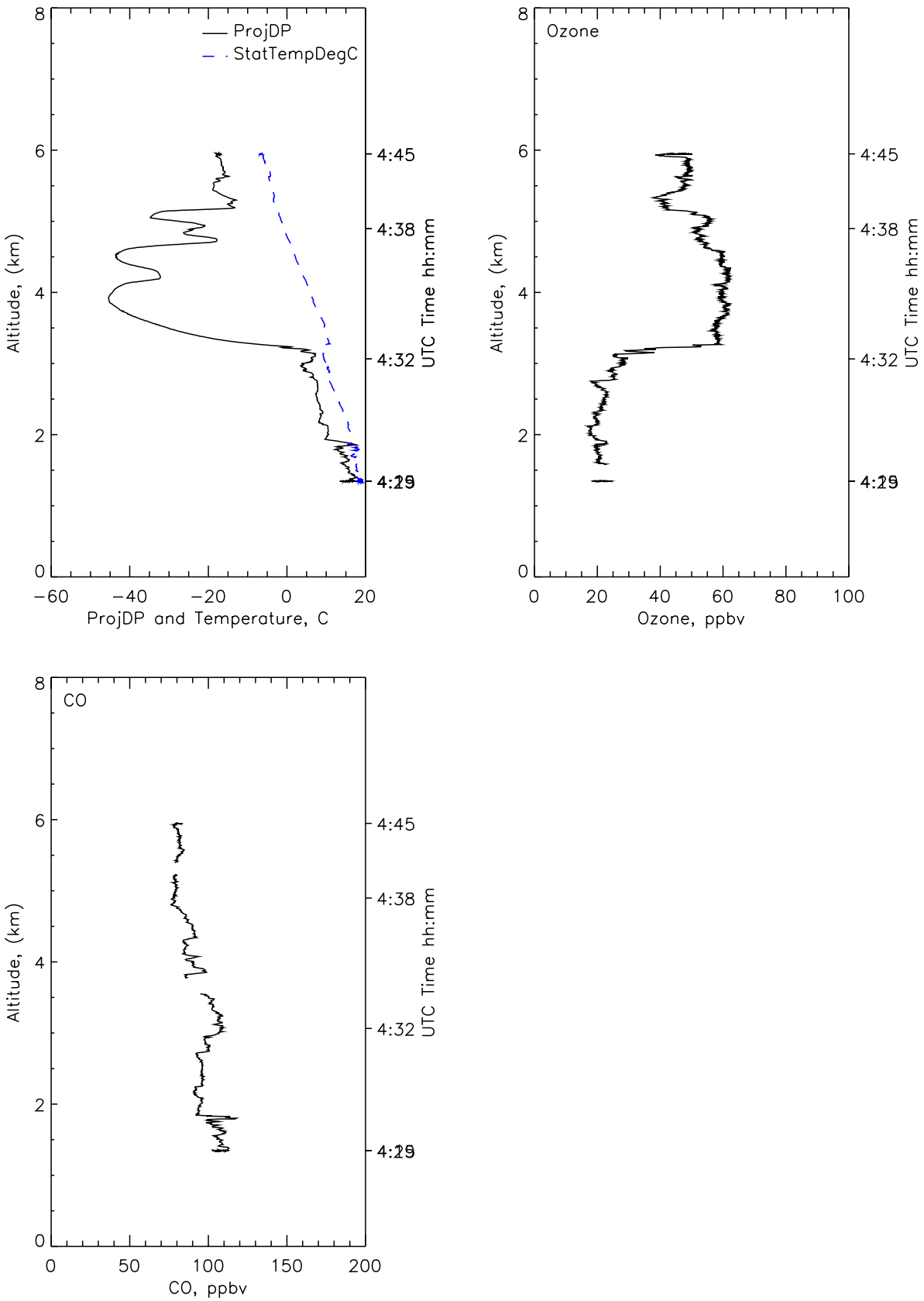


Profile # 2 TRACE−P P3−B Flight 11

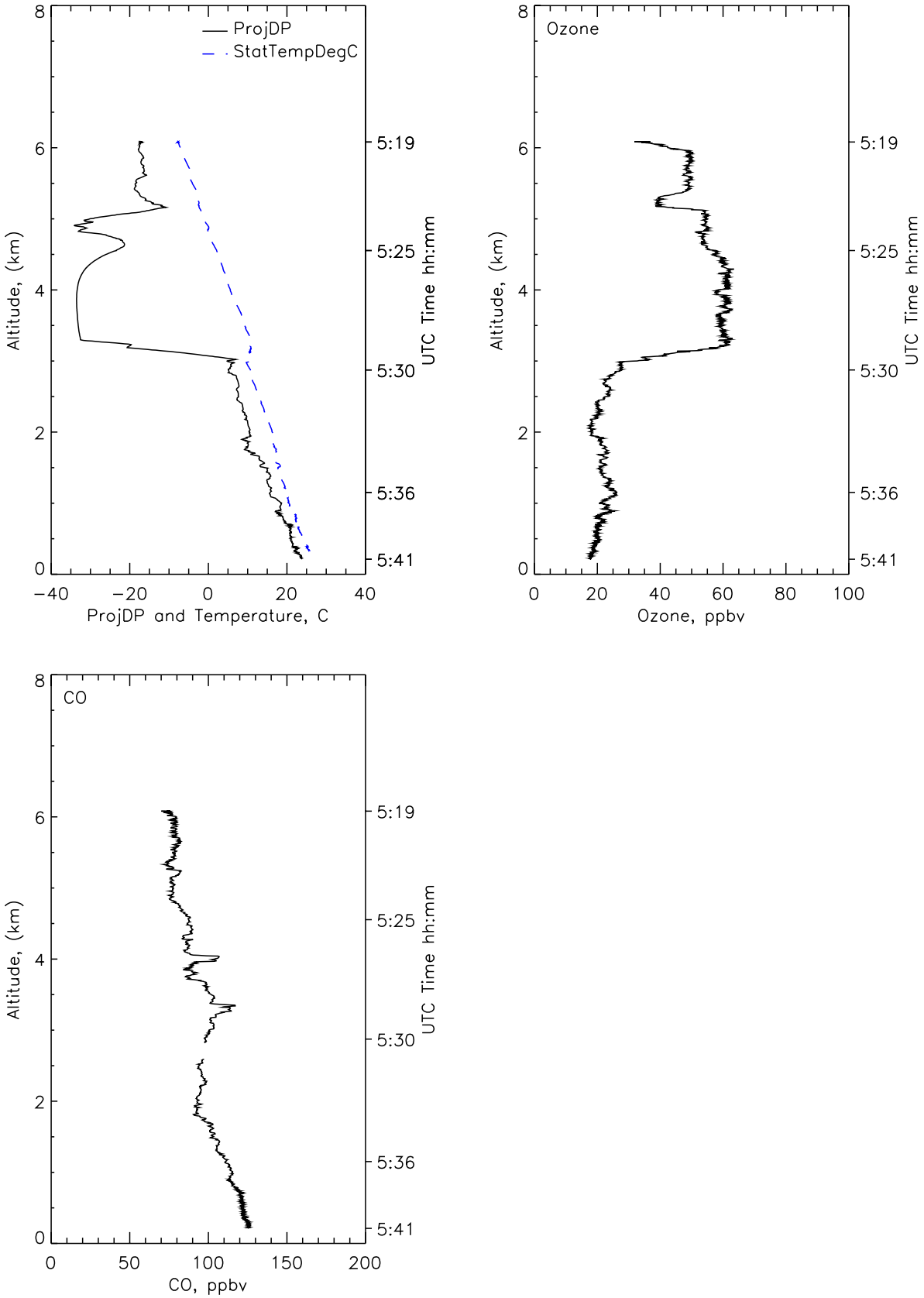



Profile # 3 TRACE-P P3-B Flight 11
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
3:42
3:24
3:06
2:48
2:30
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

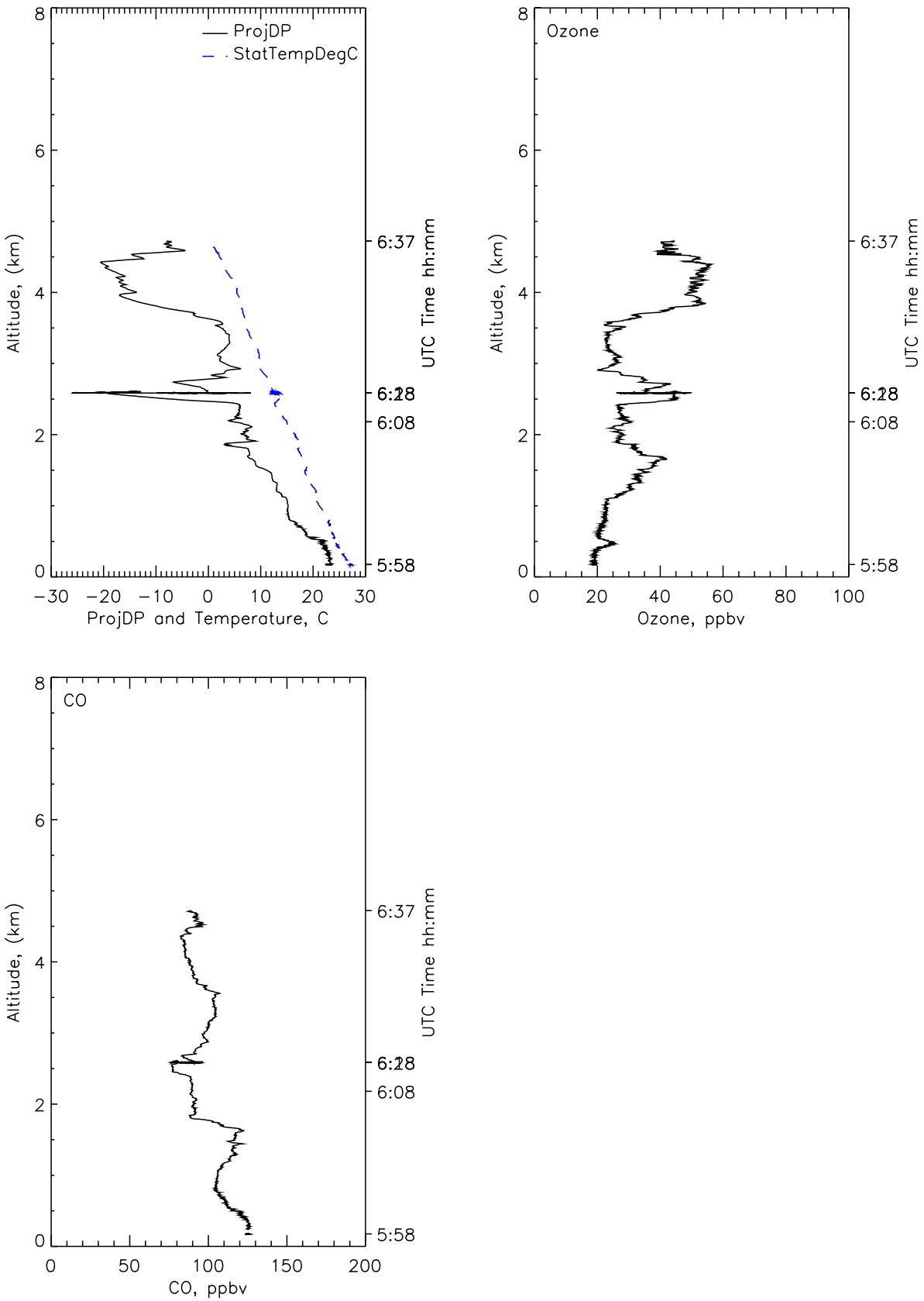
Profile # 4 TRACE-P P3-B Flight 11



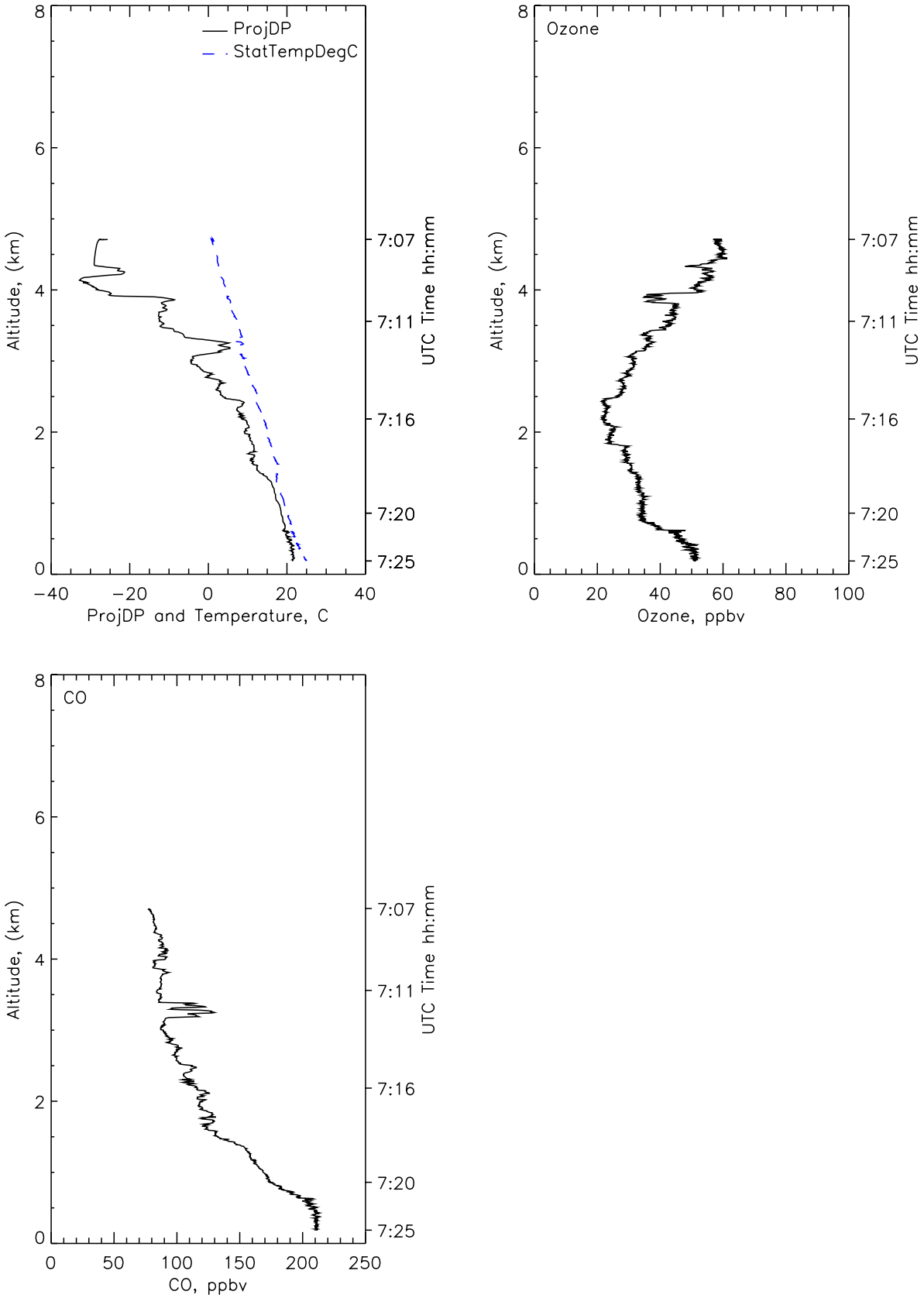
Profile # 5 TRACE-P P3-B Flight 11



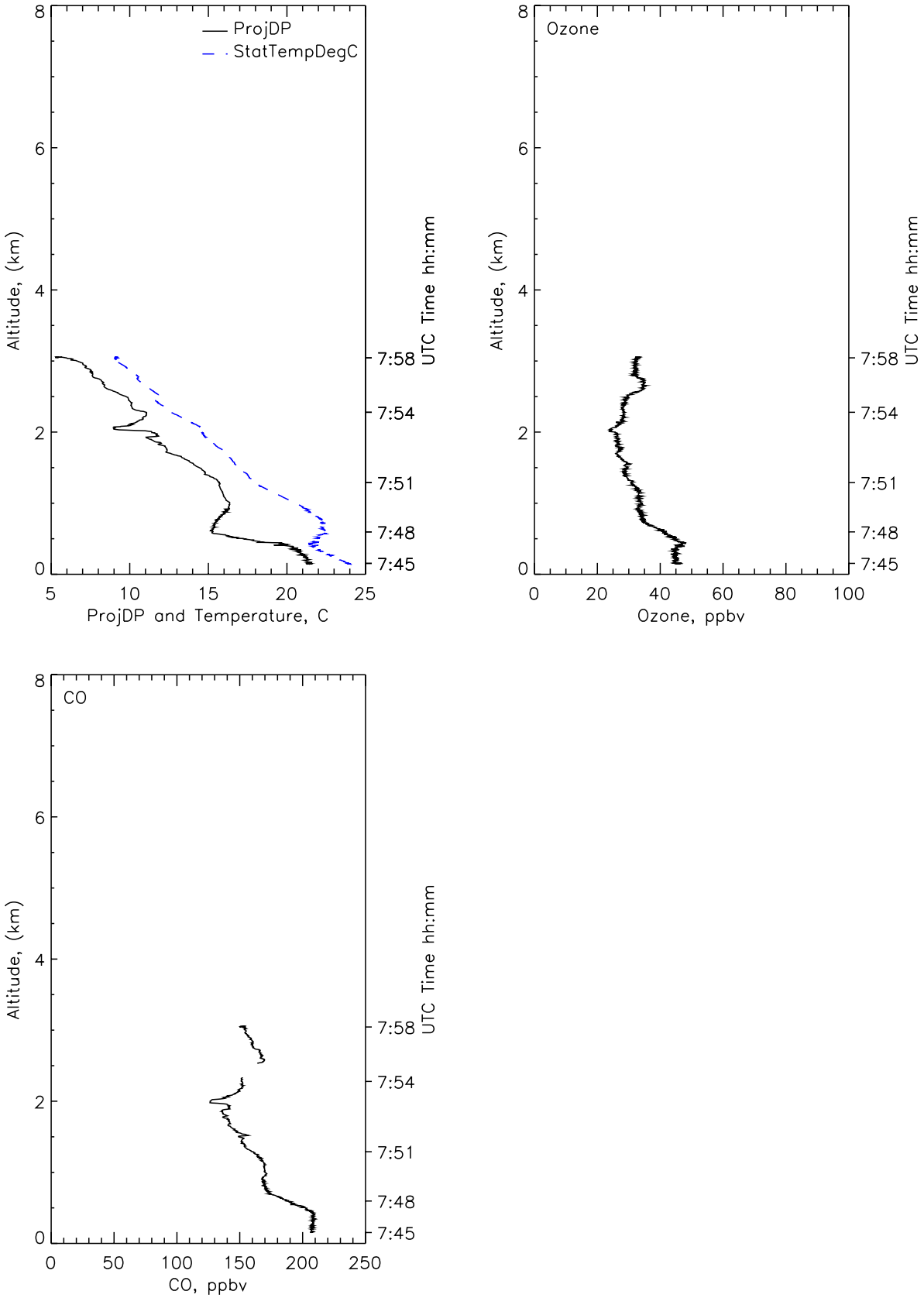
Profile # 6 TRACE-P P3-B Flight 11



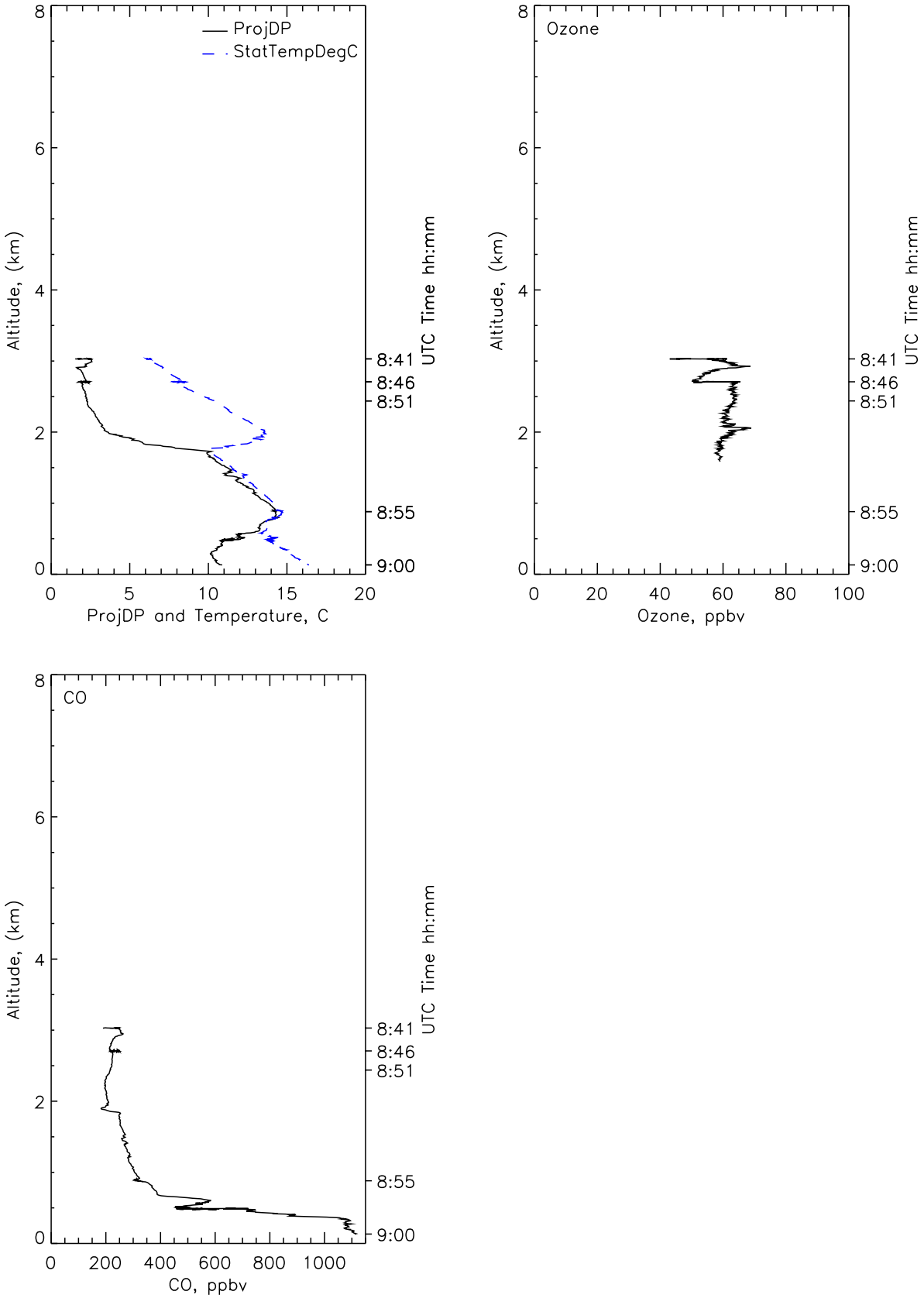
Profile # 7 TRACE-P P3-B Flight 11



Profile # 8 TRACE-P P3-B Flight 11



Profile # 9 TRACE-P P3-B Flight 11



CHEMICAL and METEOROLOGICAL DATA

TRACE-P

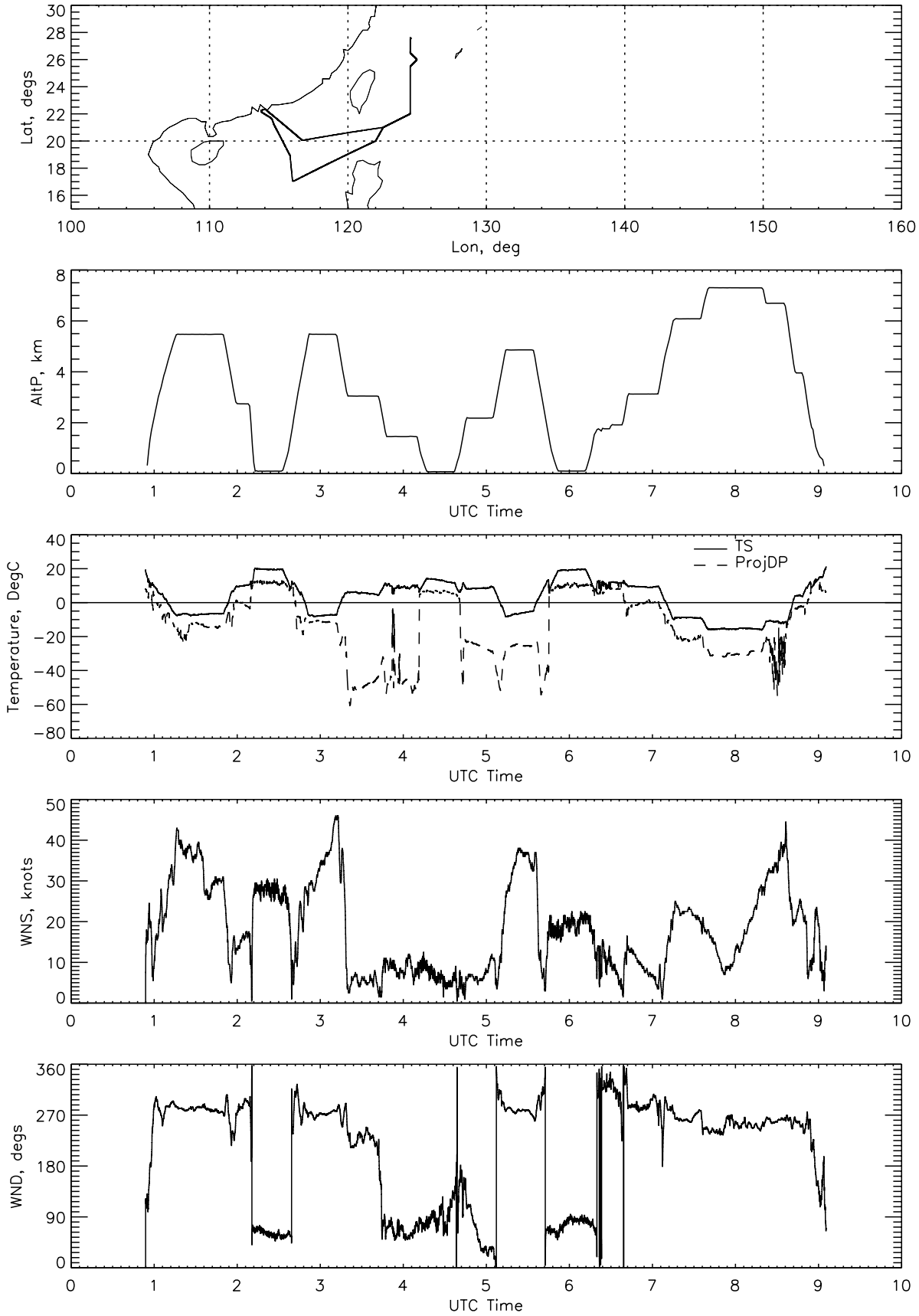
Flight 12P

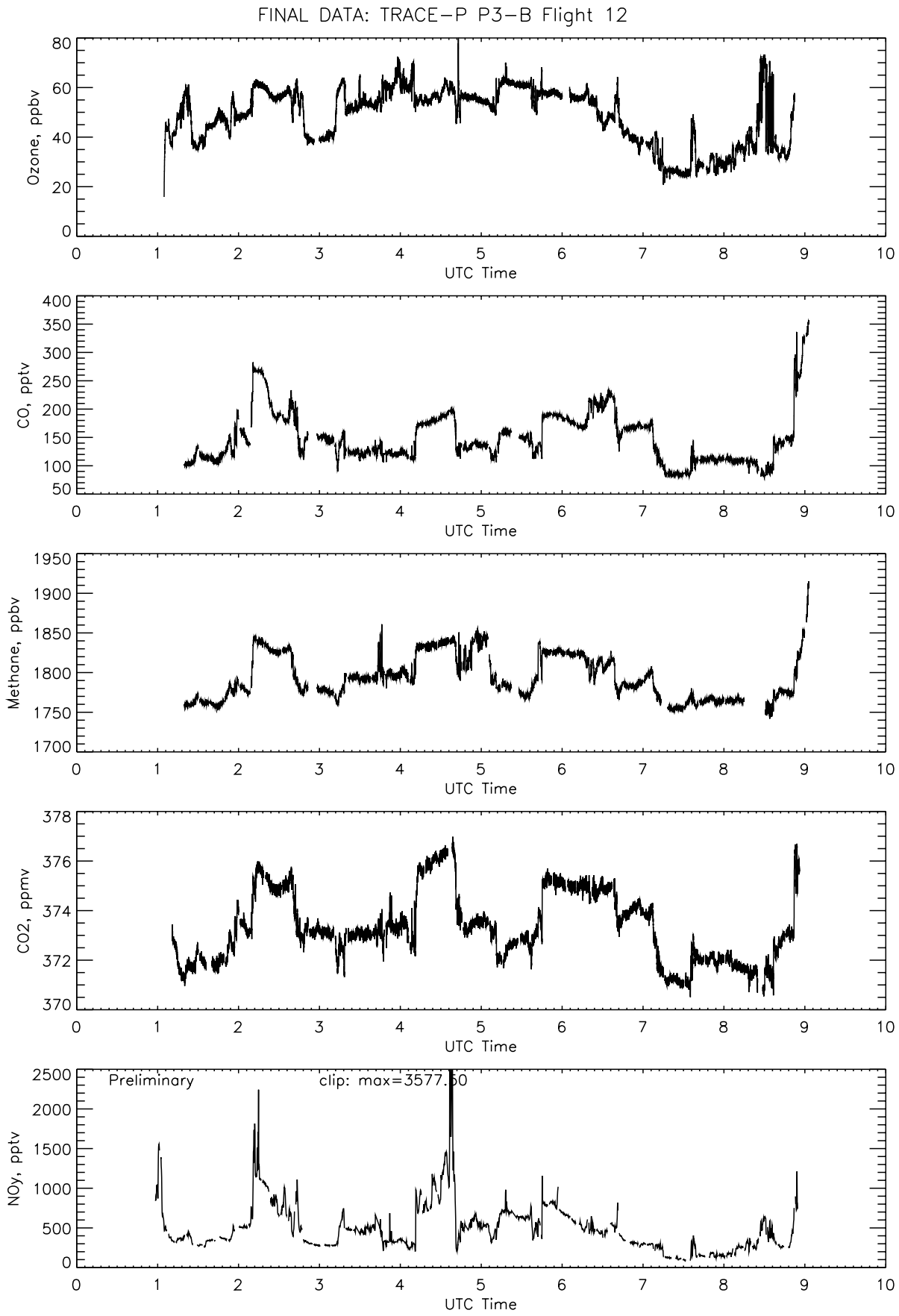
Local: Hong Kong No. 4

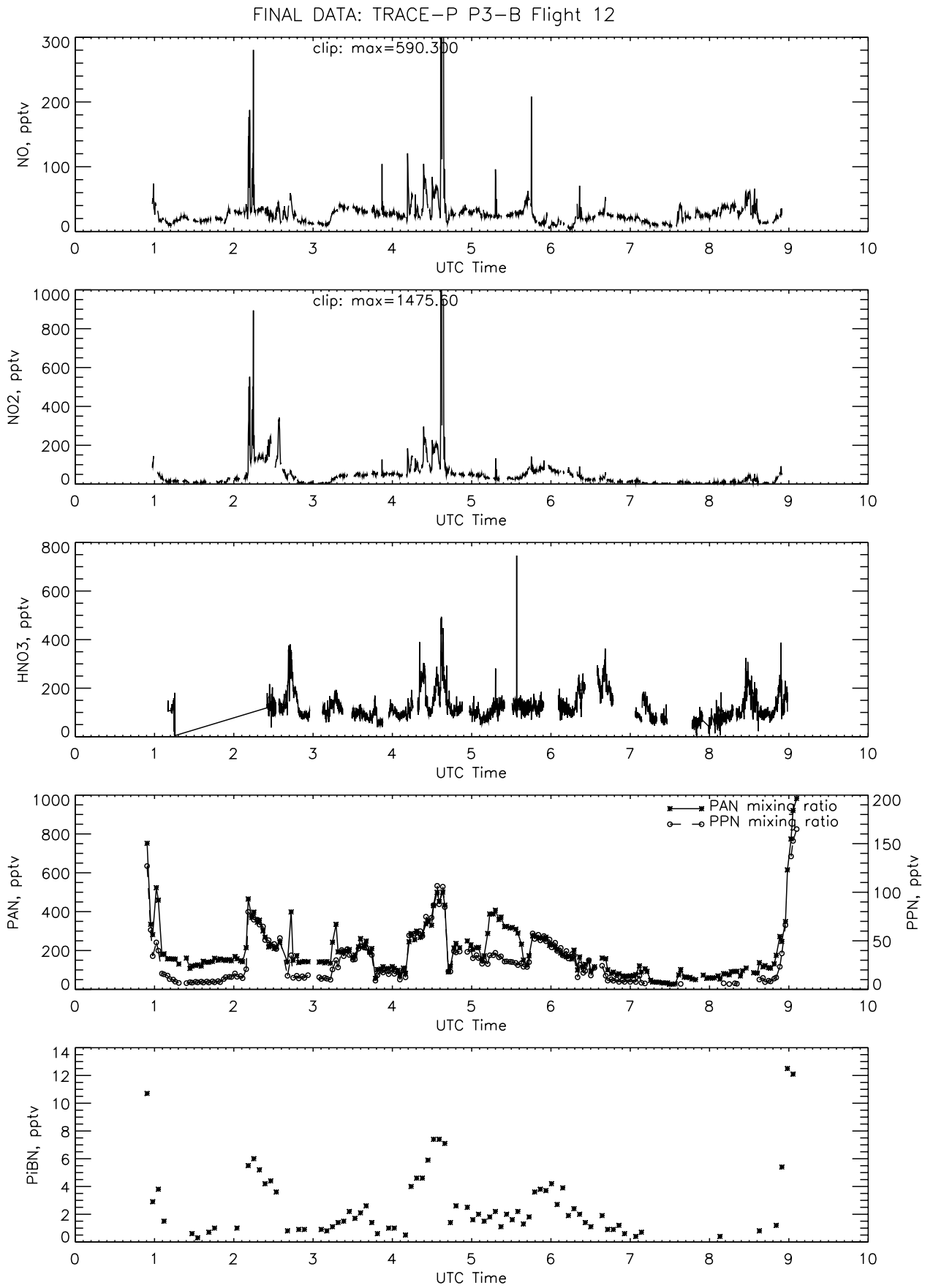
Stratospheric Intrusion; Biomass Burning Outflow

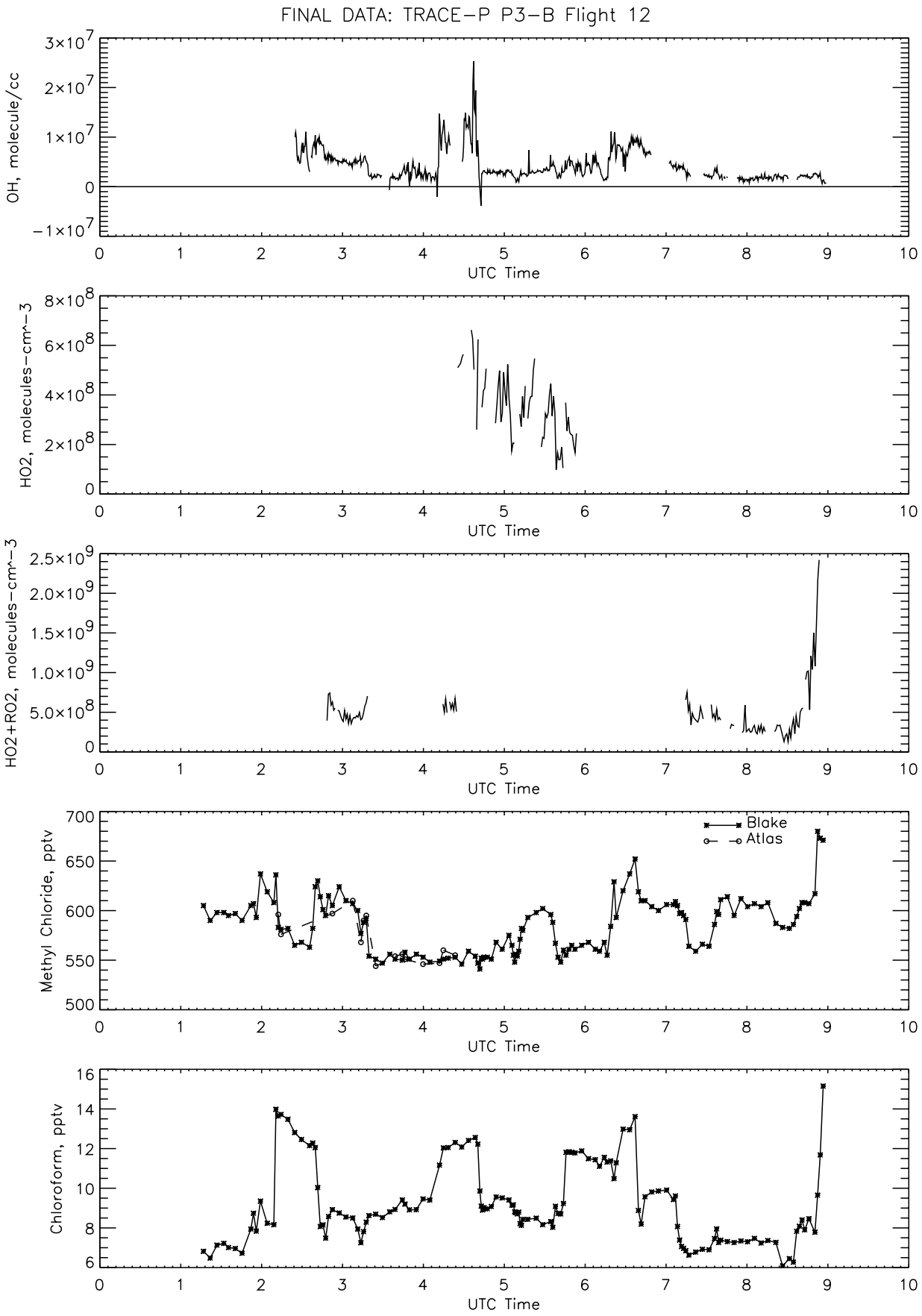
March 13, 2001

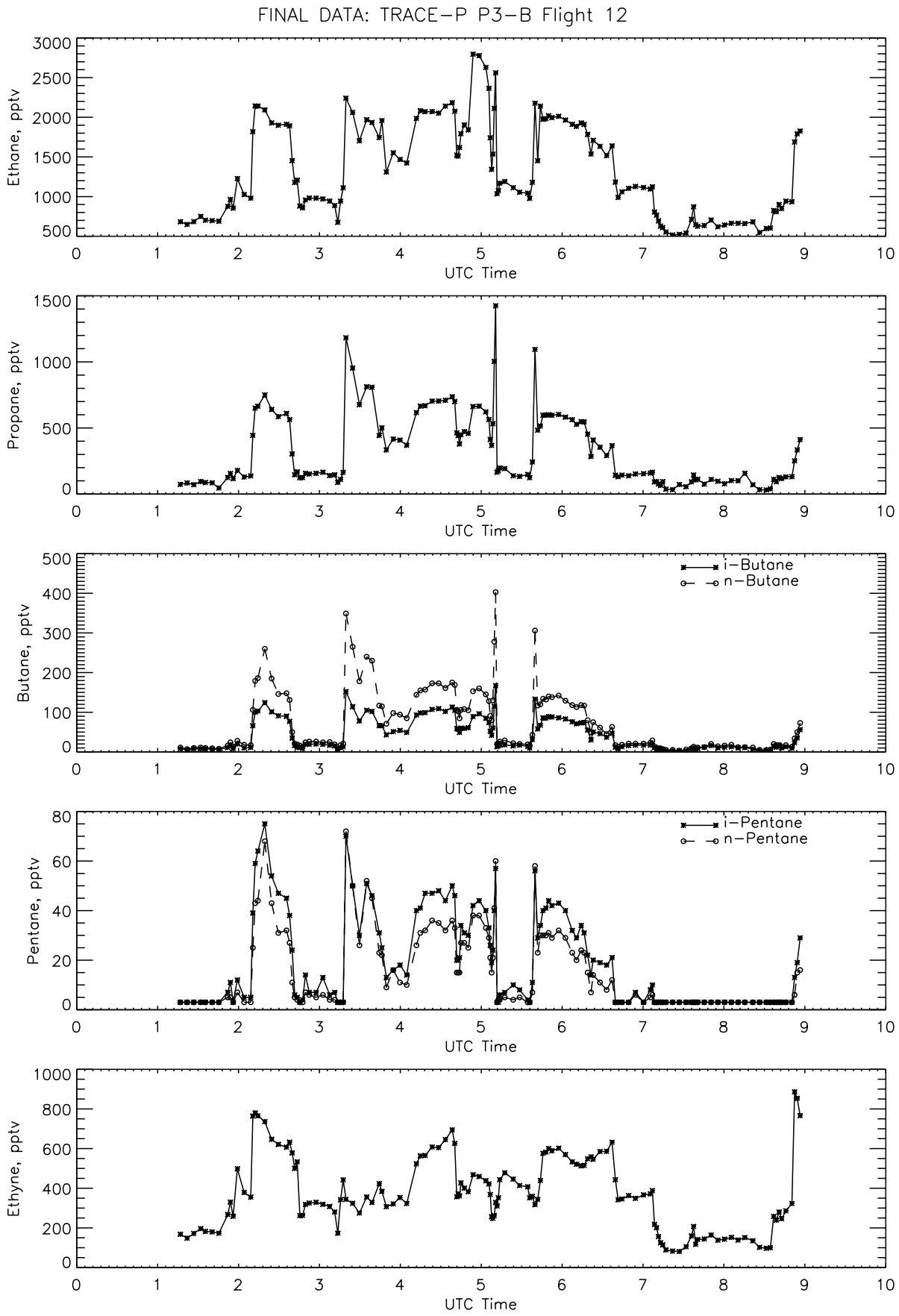
FINAL DATA: TRACE-P P3-B Flight 12

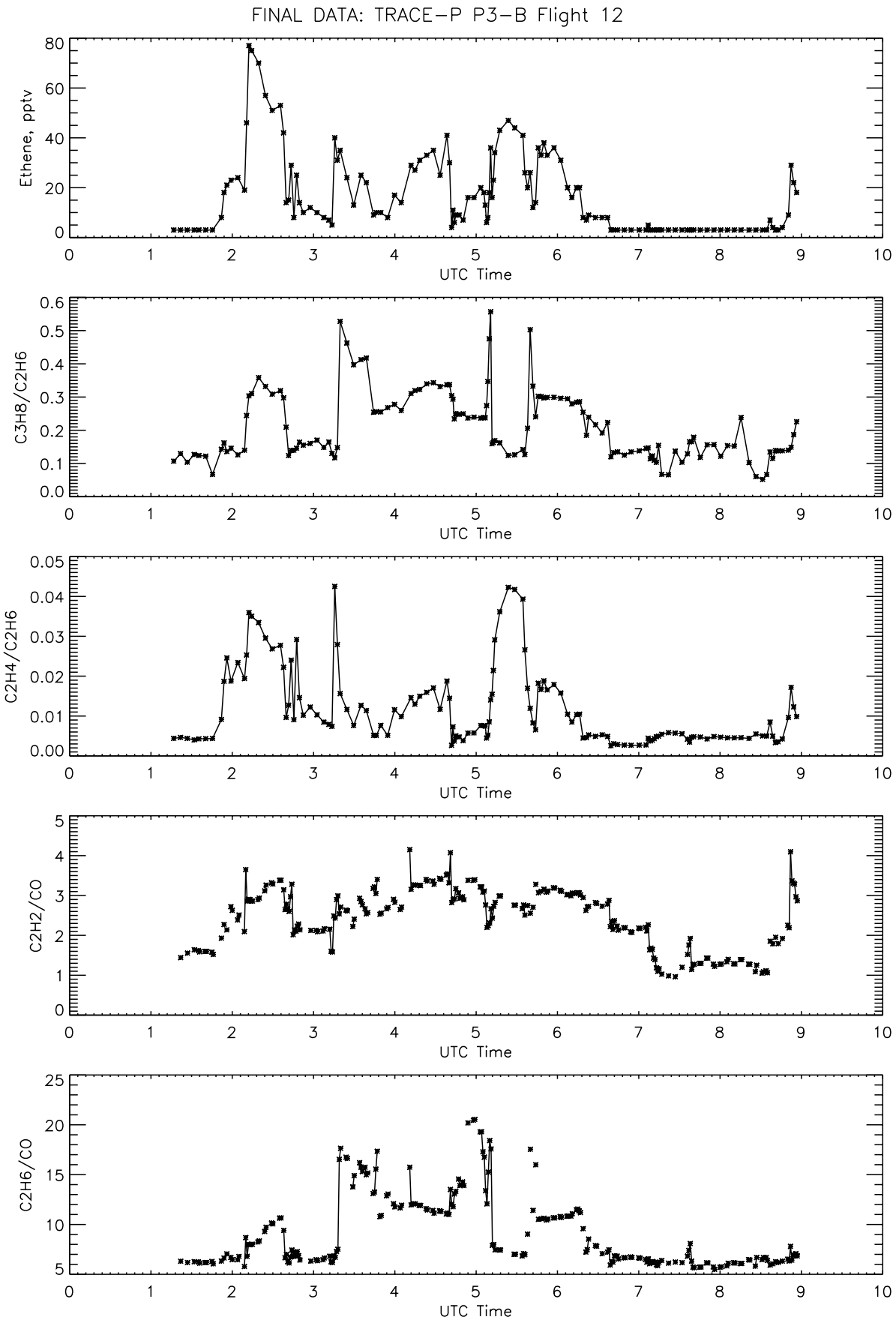



FINAL DATA: TRACE-P P3-B Flight 12
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=3577.50

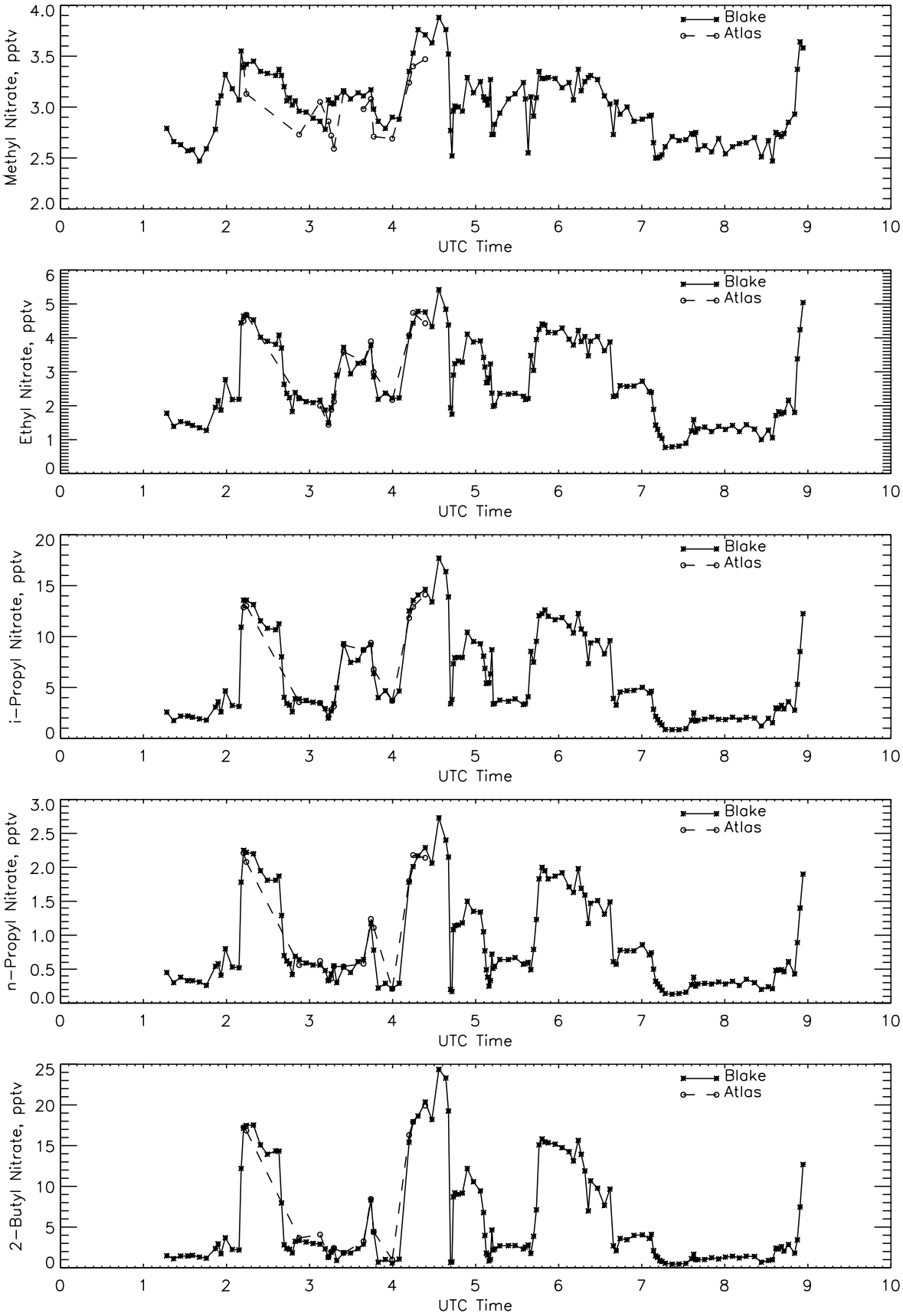

FINAL DATA: TRACE-P P3-B Flight 12
clip: max=590.300
NO, pptv
UTC Time
clip: max=1475.60
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

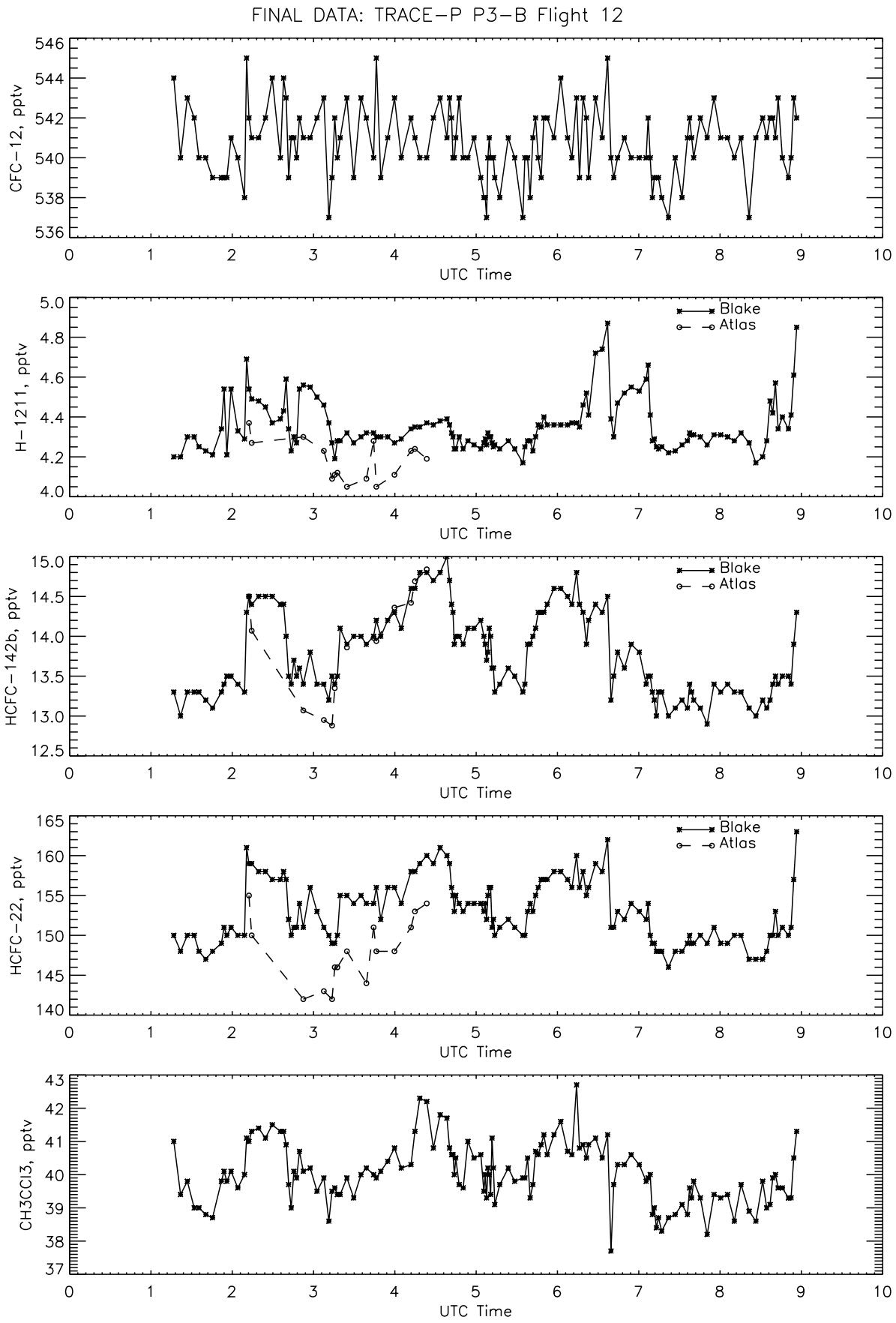

FINAL DATA: TRACE-P P3-B Flight 12
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 12
Ethane, pptv
UTC Time
Propane, pptv
UTC Time
Butane, pptv
i-Butane
n-Butane
UTC Time
Pentane, pptv
i-Pentane
n-Pentane
UTC Time
Ethyne, pptv
UTC Time

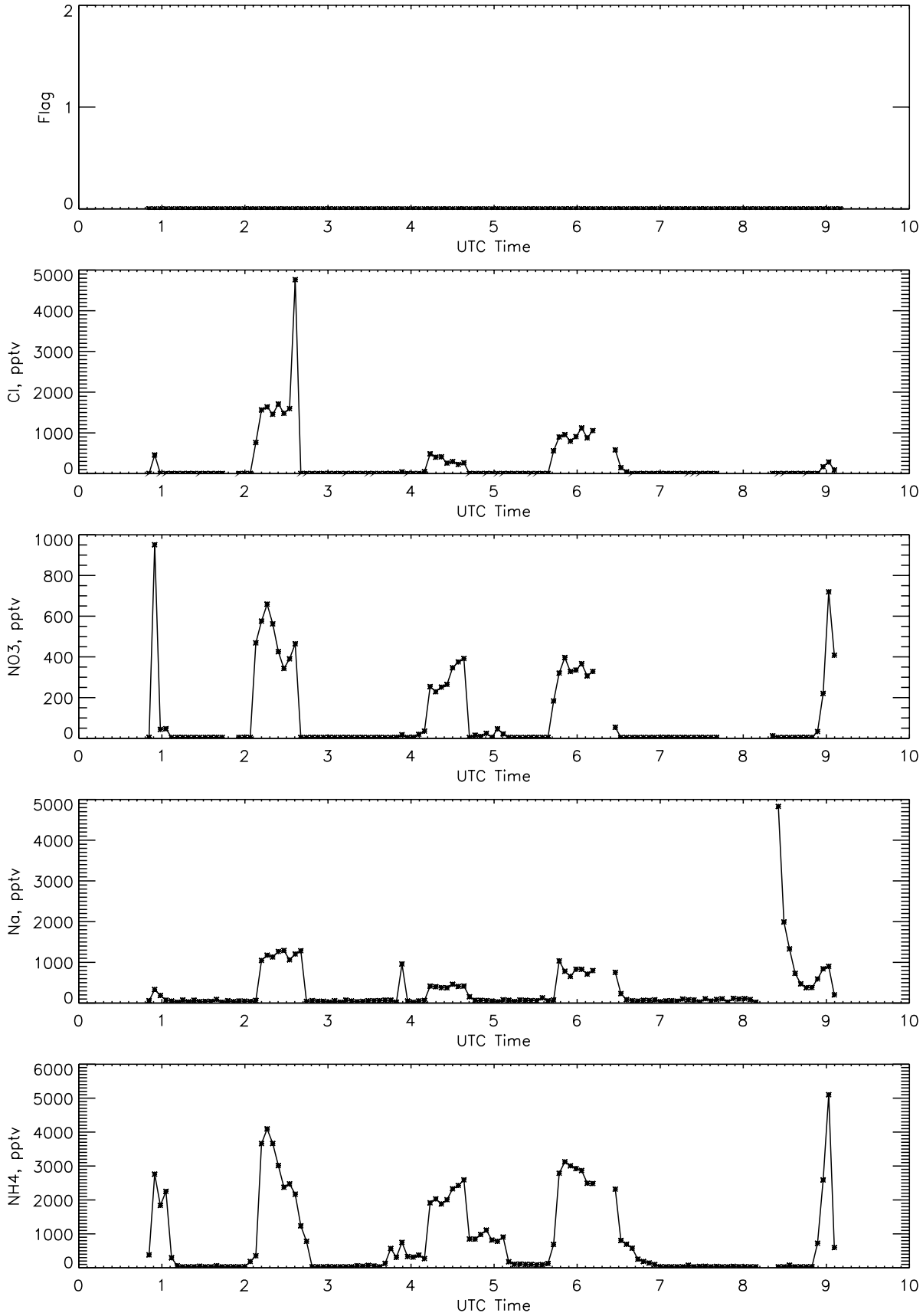

FINAL DATA: TRACE-P P3-B Flight 12
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

FINAL DATA: TRACE-P P3-B Flight 12

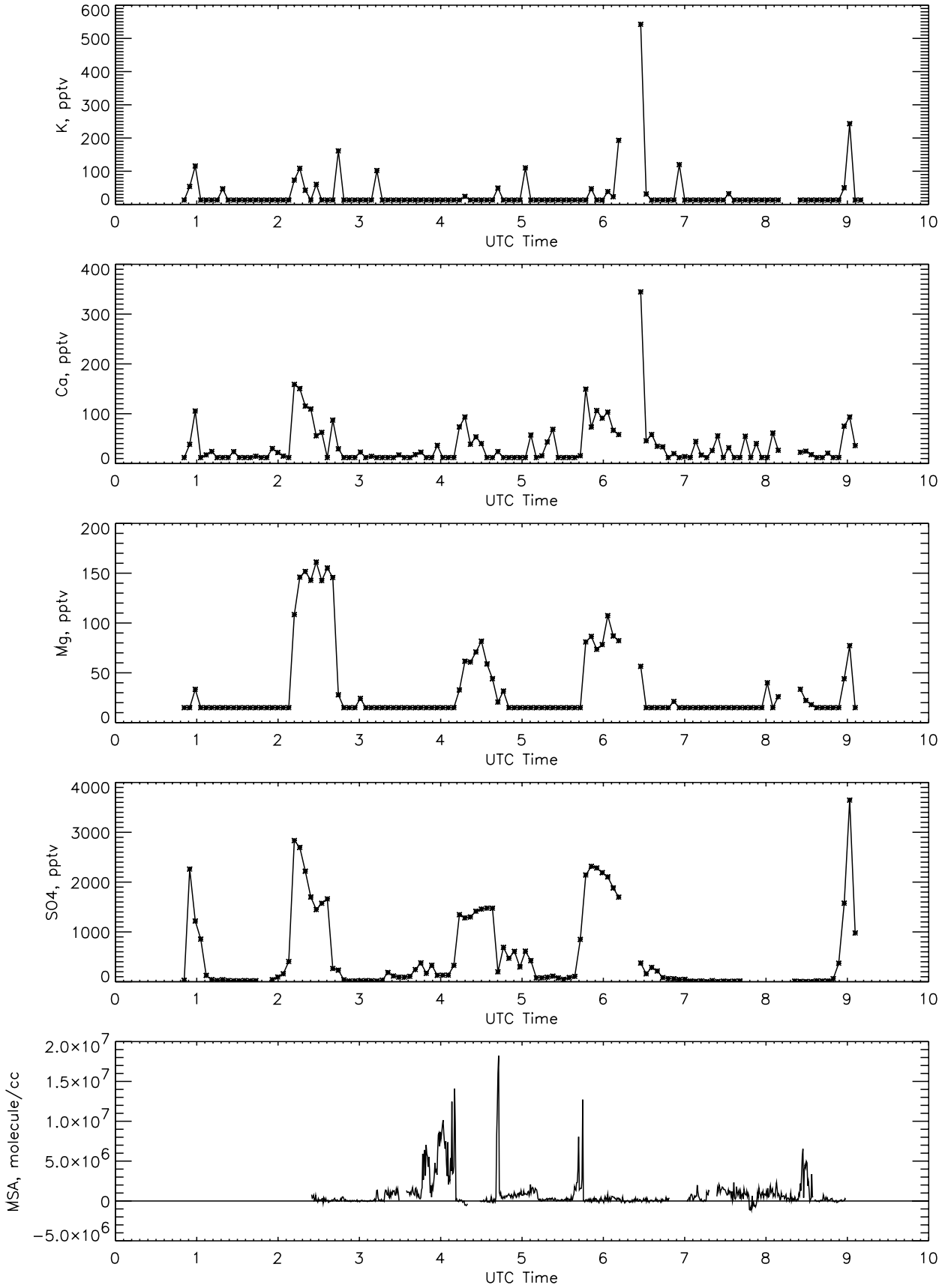


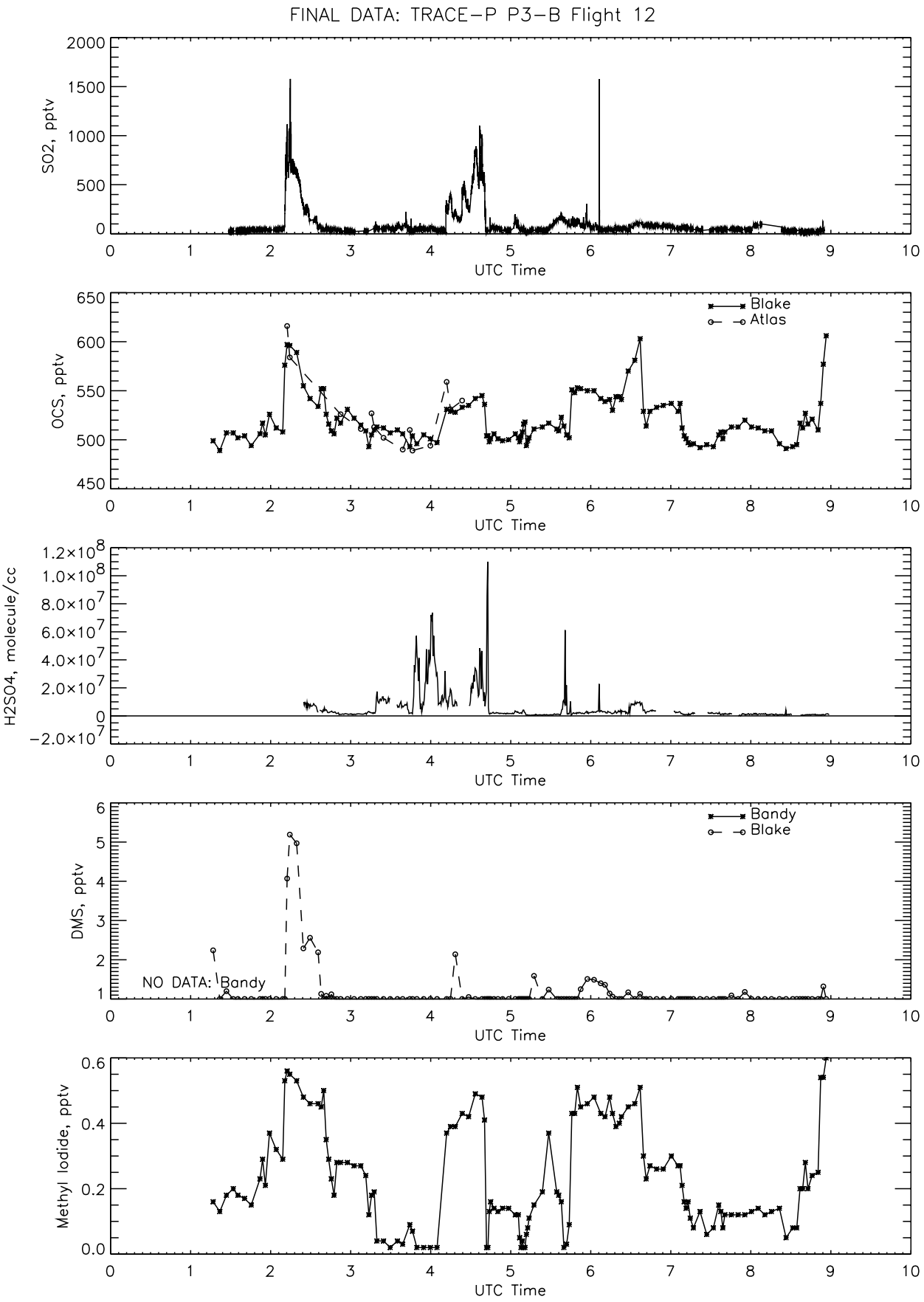

FINAL DATA: TRACE-P P3-B Flight 12
CFC-12, pptv
UTC Time
H-1211, pptv
Blake
Atlas
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv

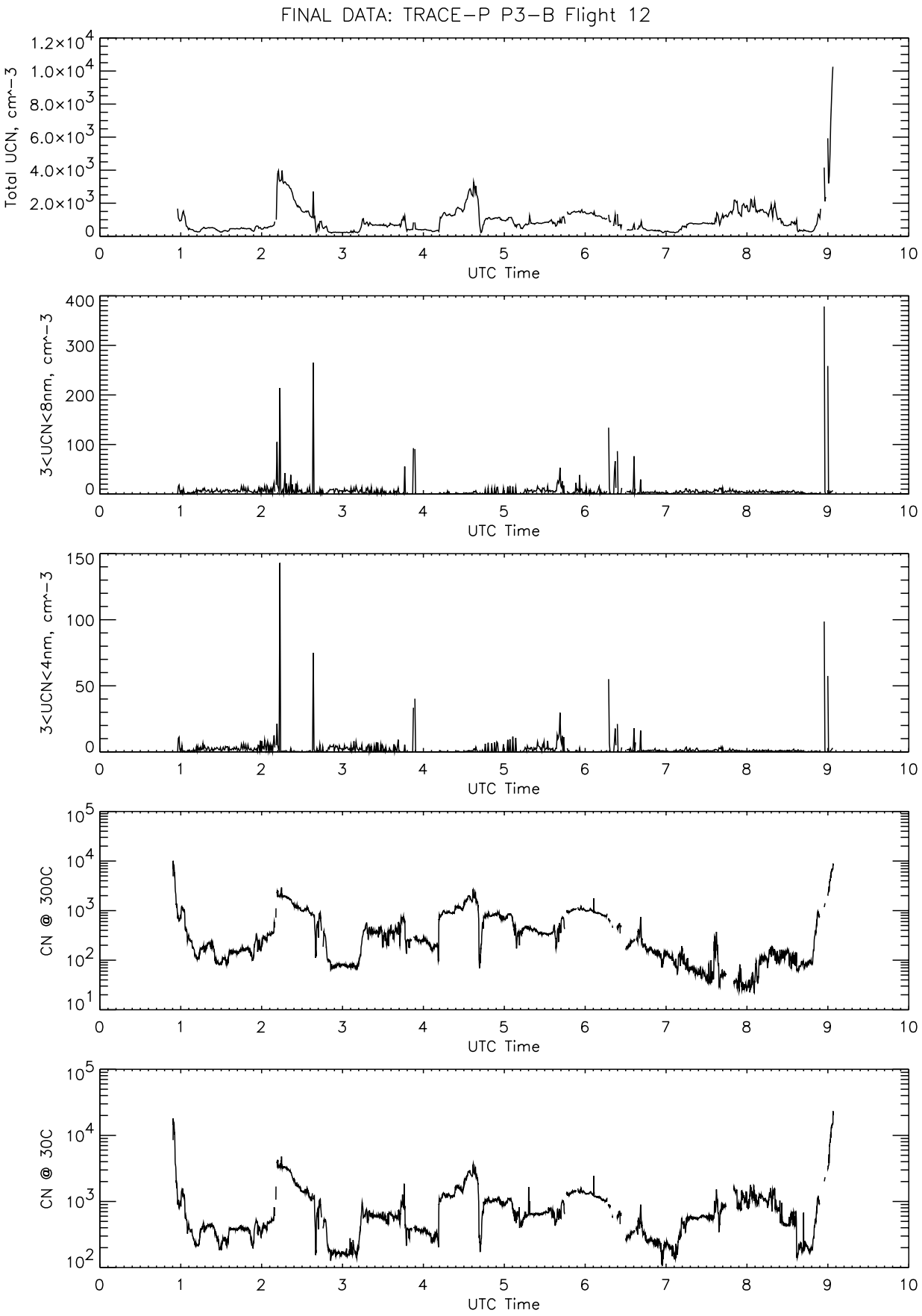
FINAL DATA: TRACE-P P3-B Flight 12

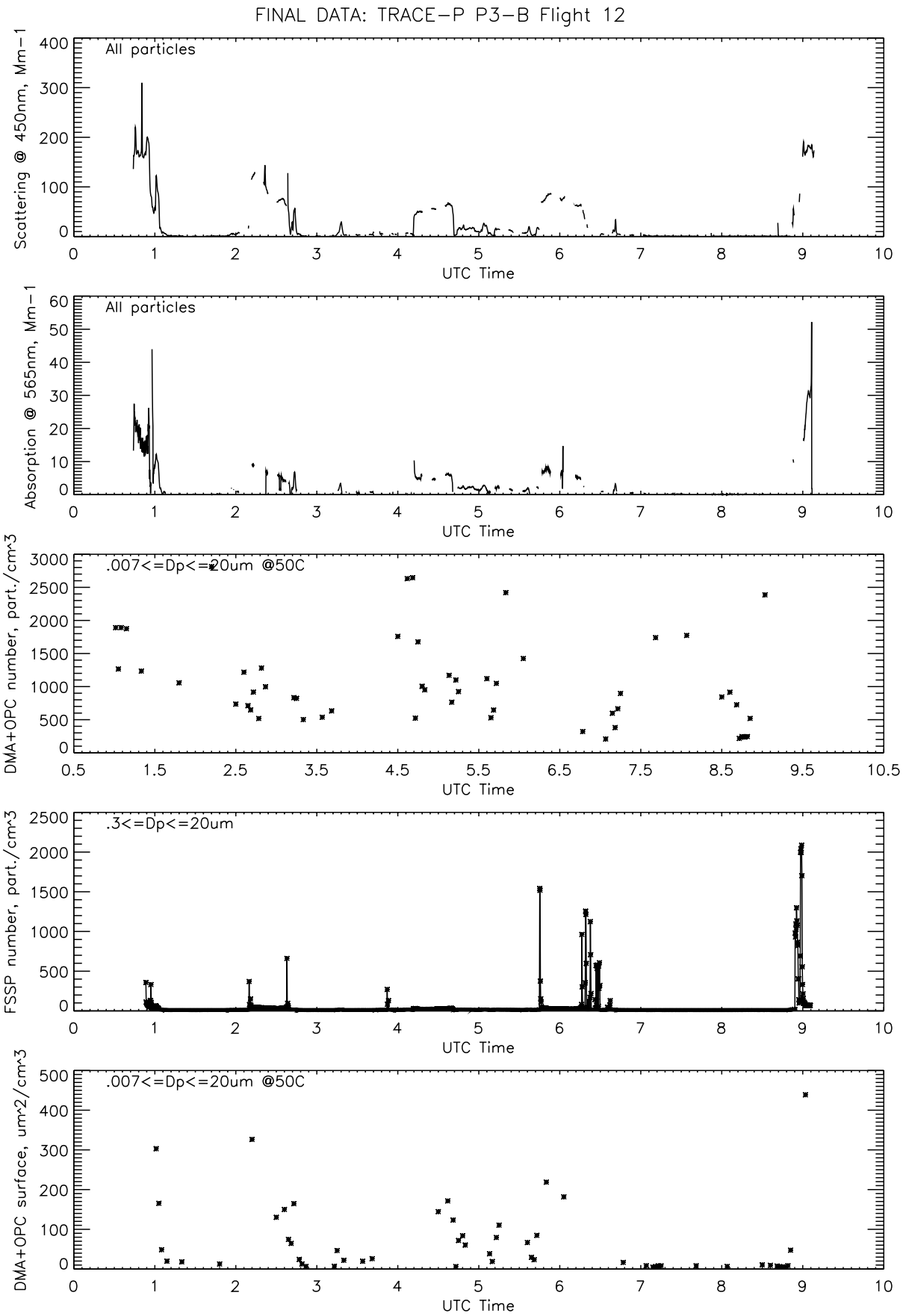


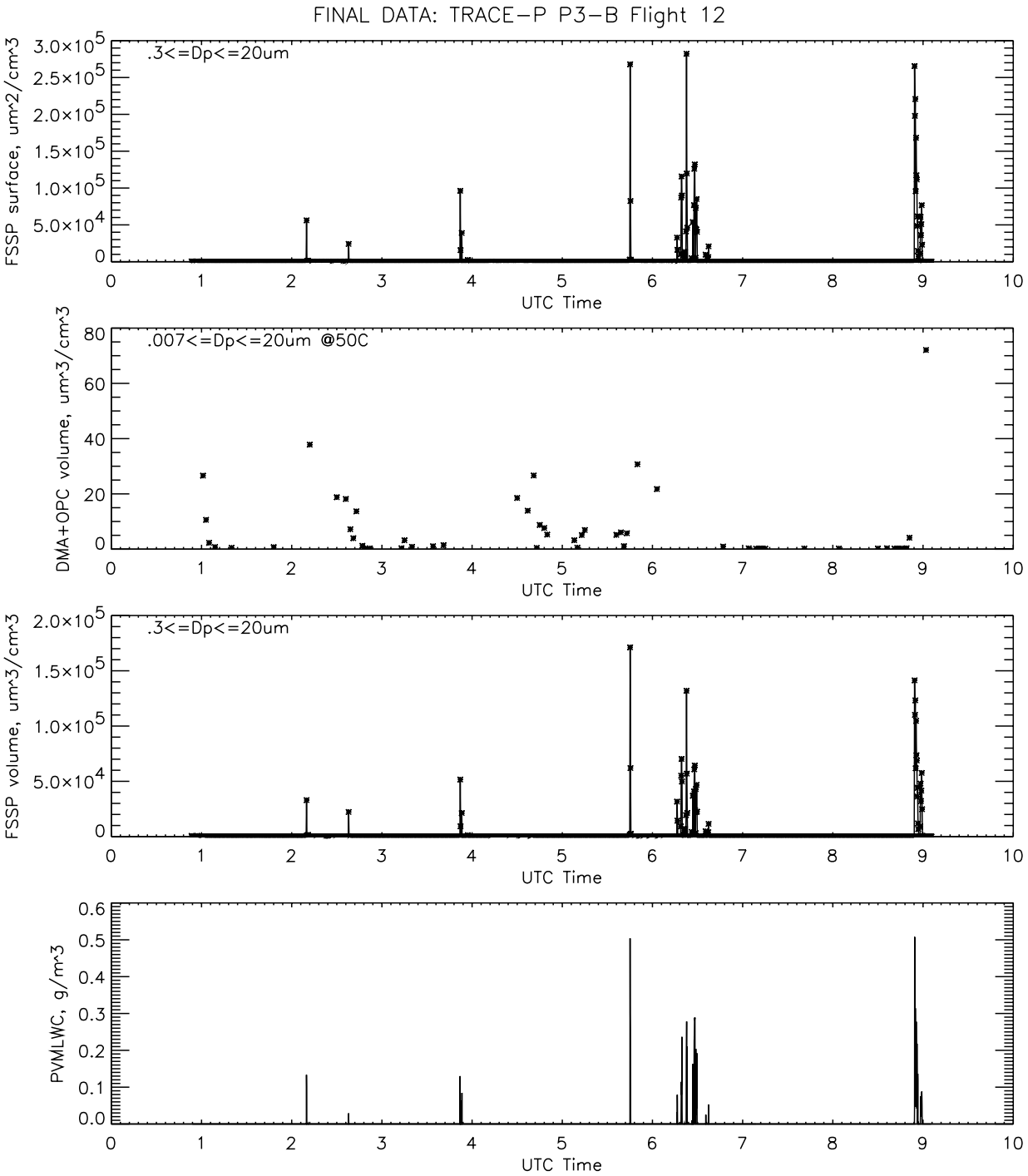
FINAL DATA: TRACE-P P3-B Flight 12



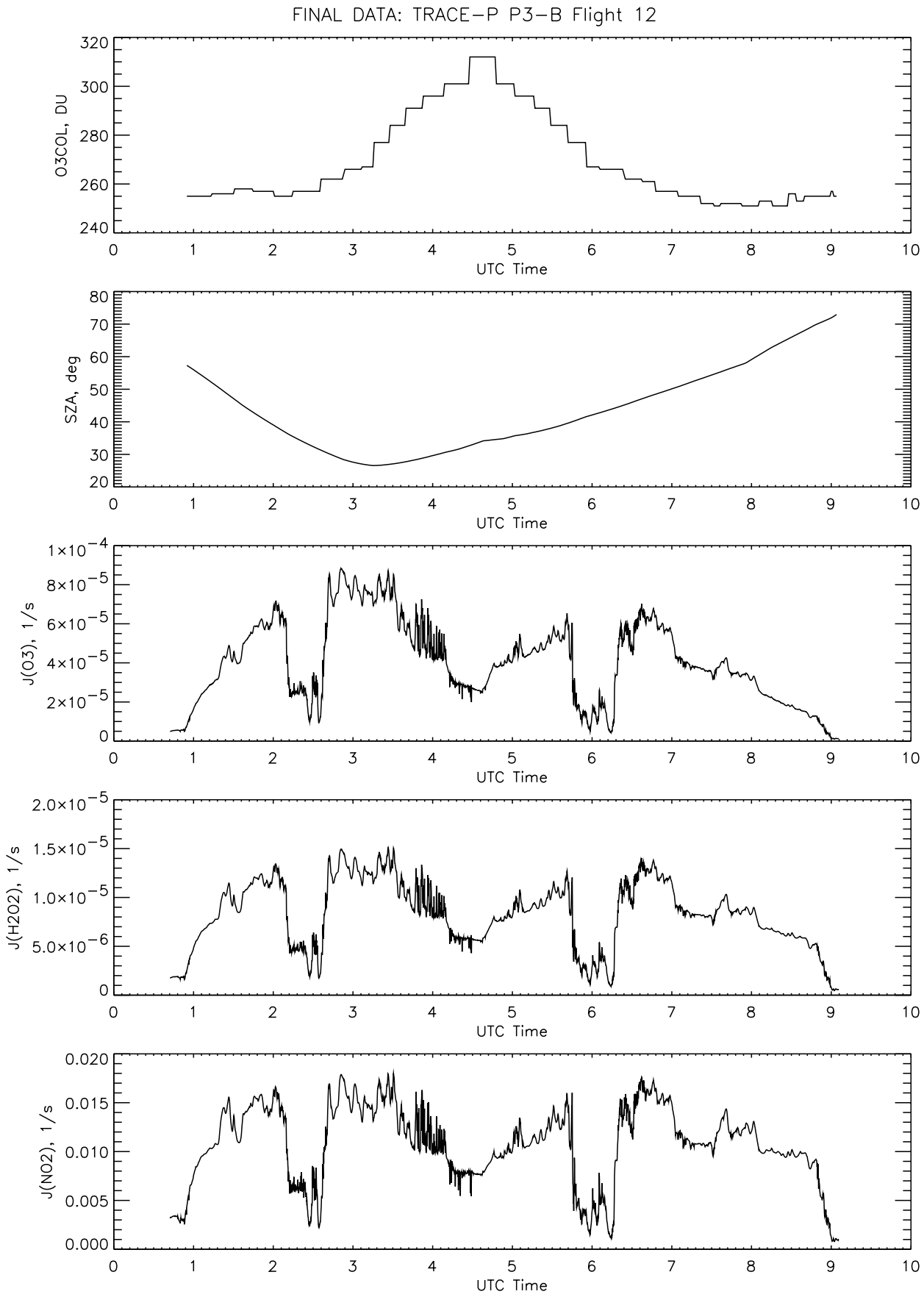

FINAL DATA: TRACE-P P3-B Flight 12
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

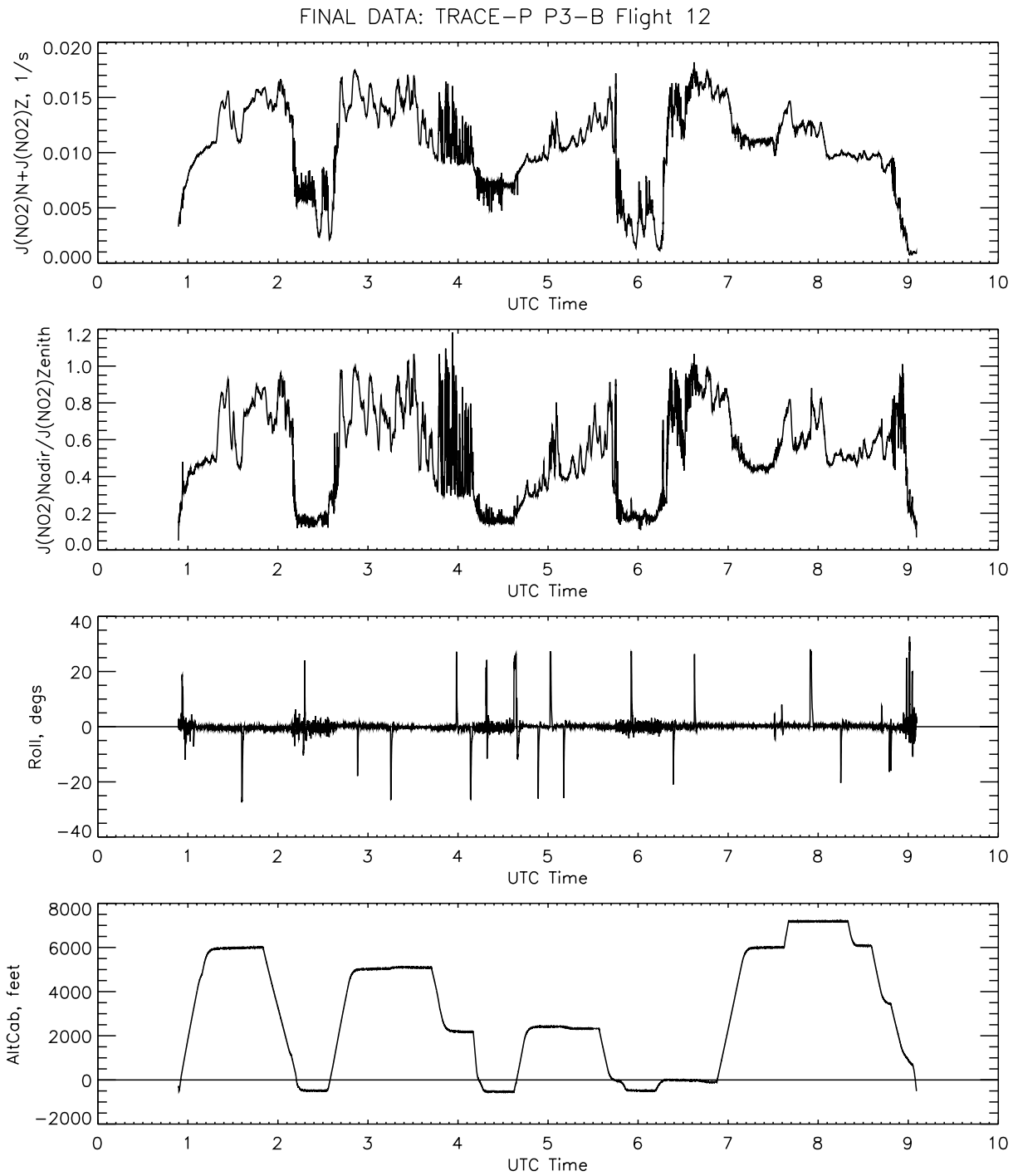

FINAL DATA: TRACE-P P3-B Flight 12
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

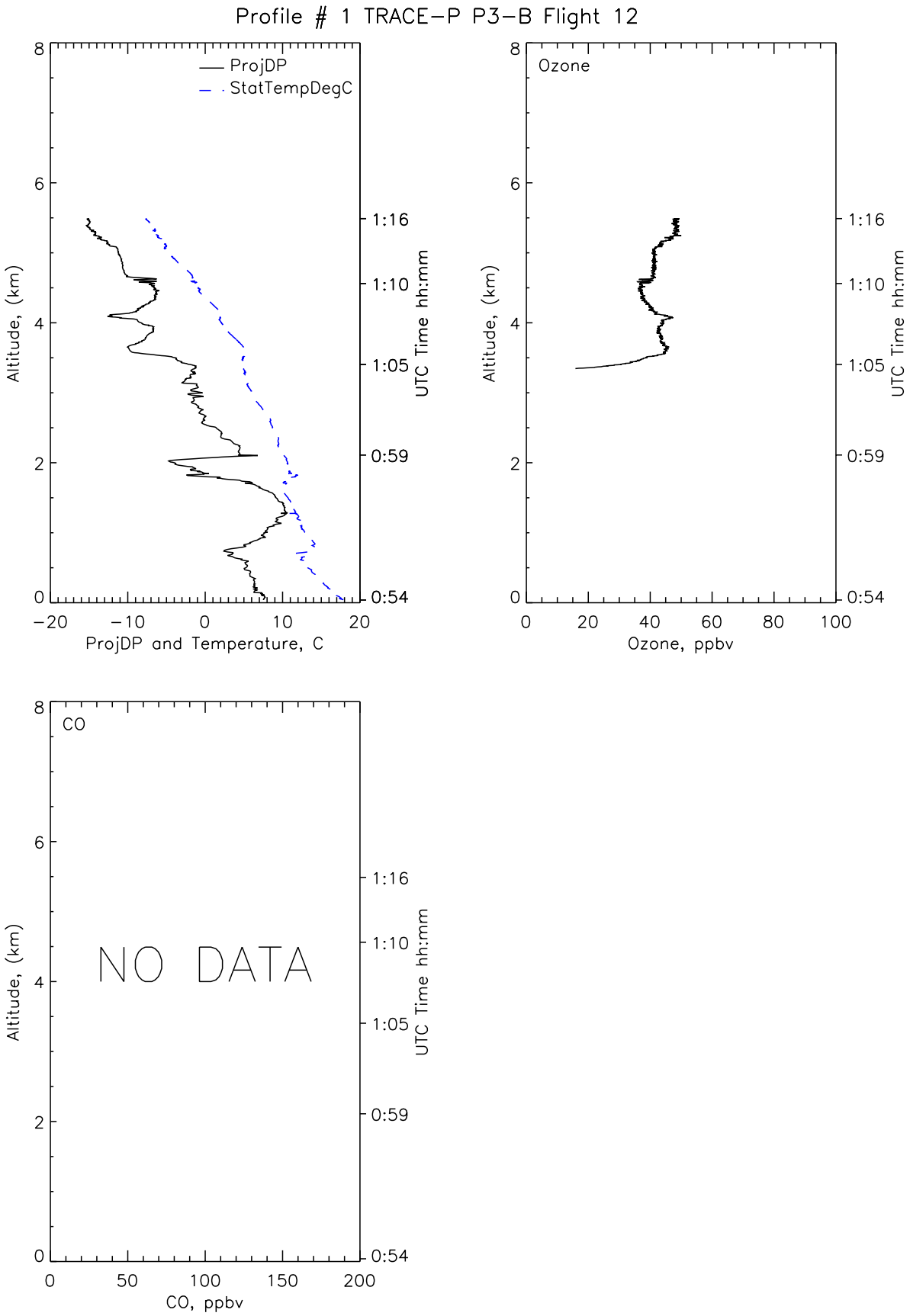

FINAL DATA: TRACE-P P3-B Flight 12
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 12
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

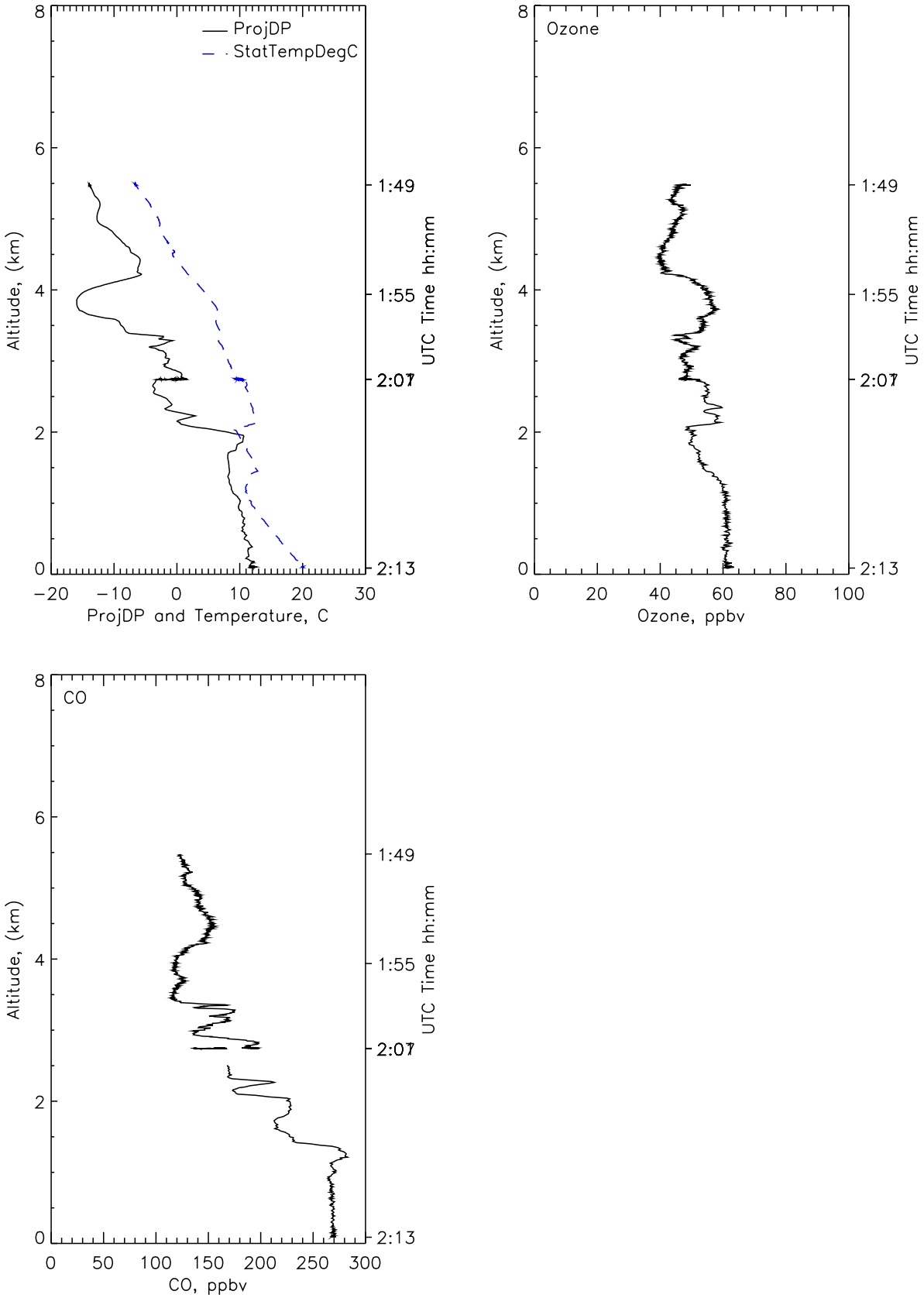
LEFT BLANK

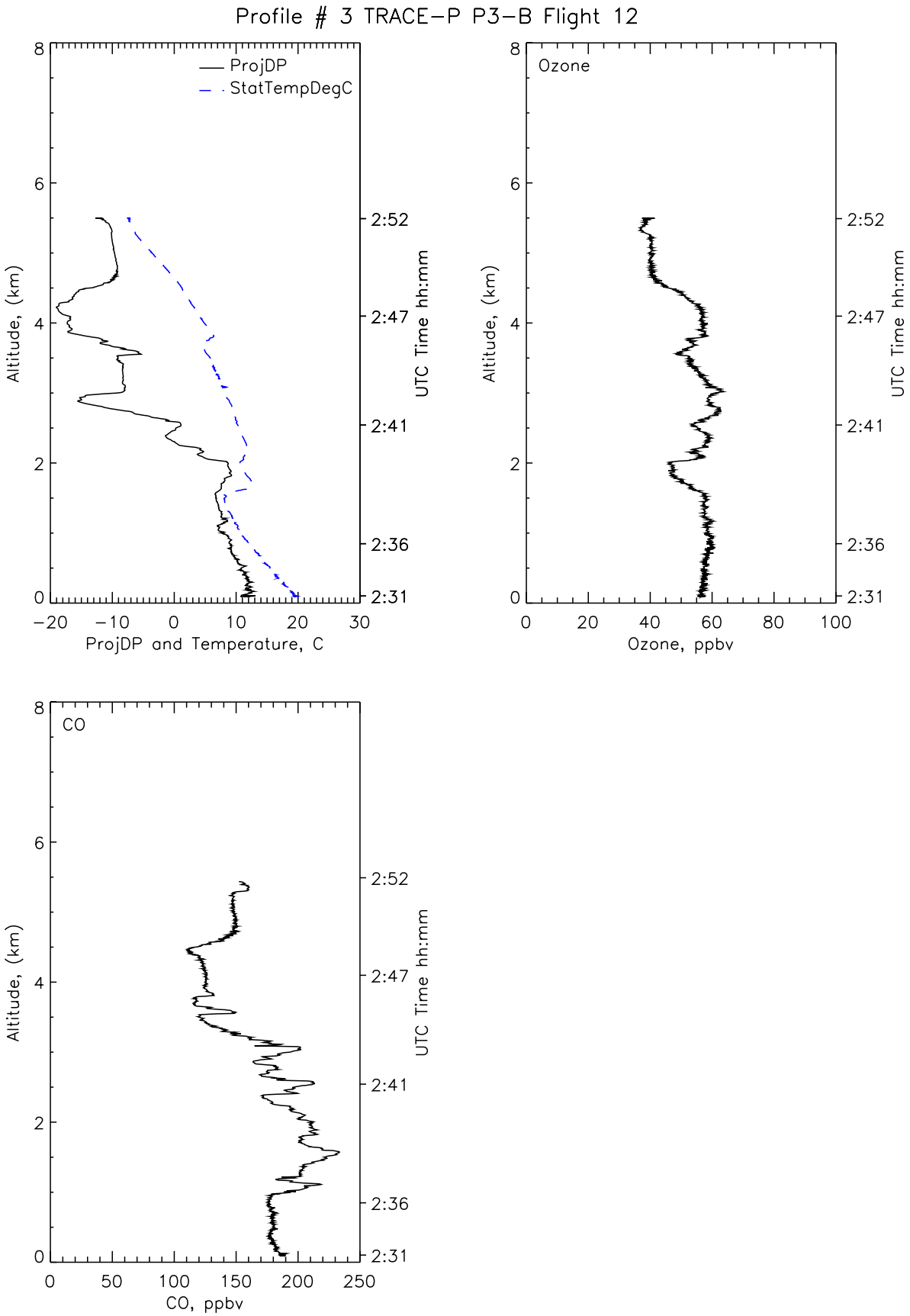

FINAL DATA: TRACE-P P3-B Flight 12
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 12
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
8000
6000
4000
2000
0
−2000
UTC Time
0 1 2 3 4 5 6 7 8 9 10

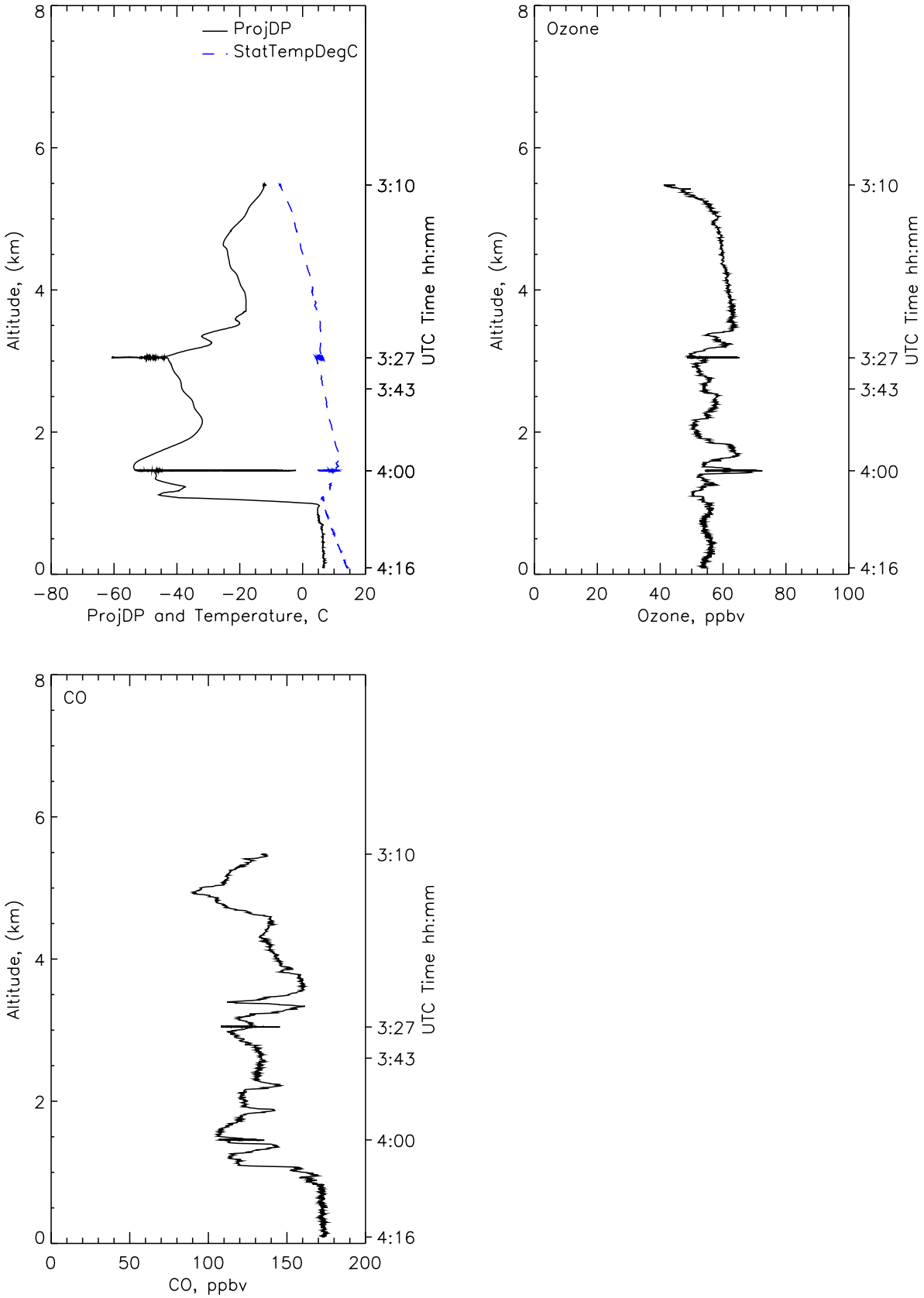

Profile # 1 TRACE-P P3-B Flight 12
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
NO DATA
CO, ppbv

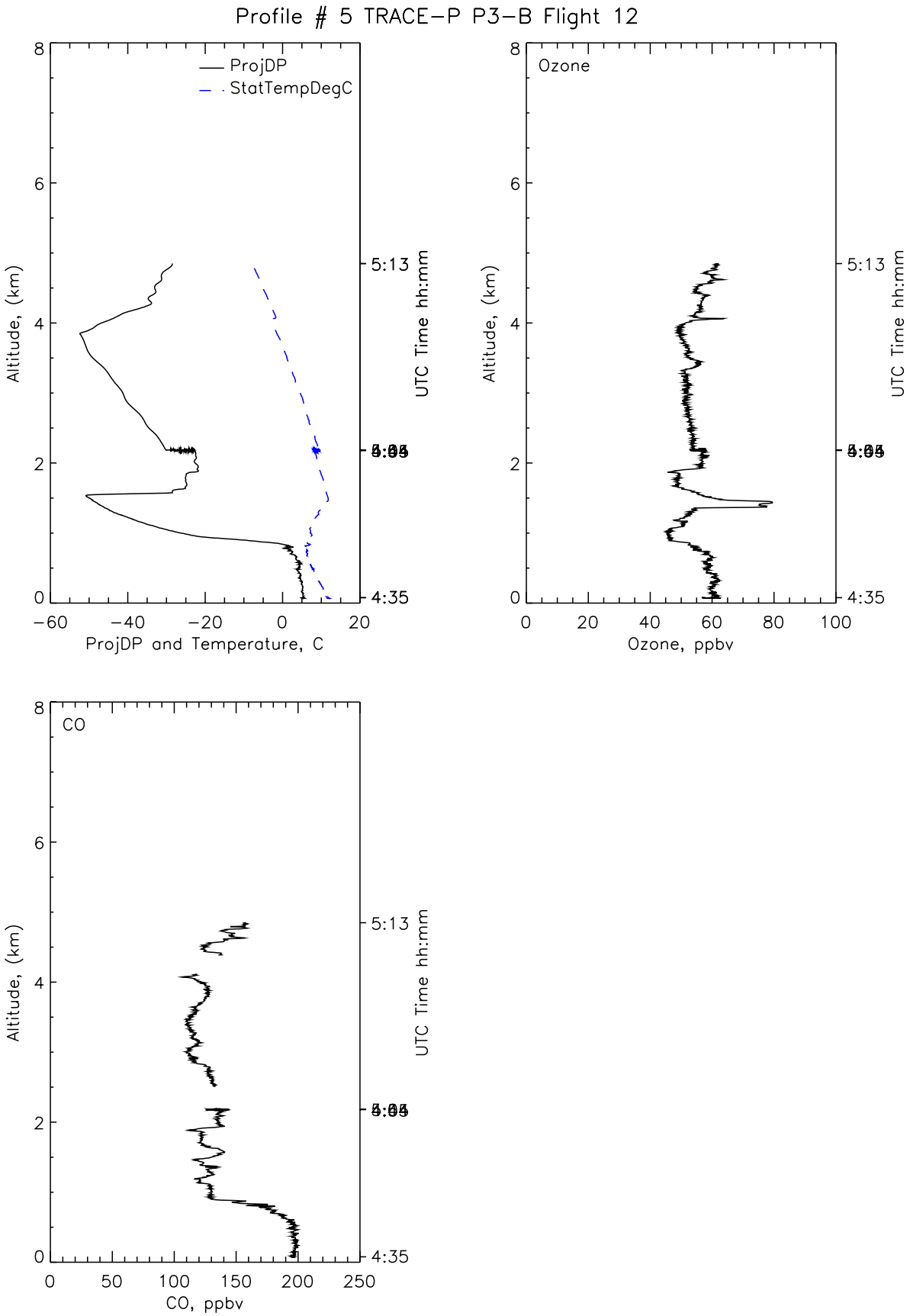
Profile # 2 TRACE−P P3−B Flight 12



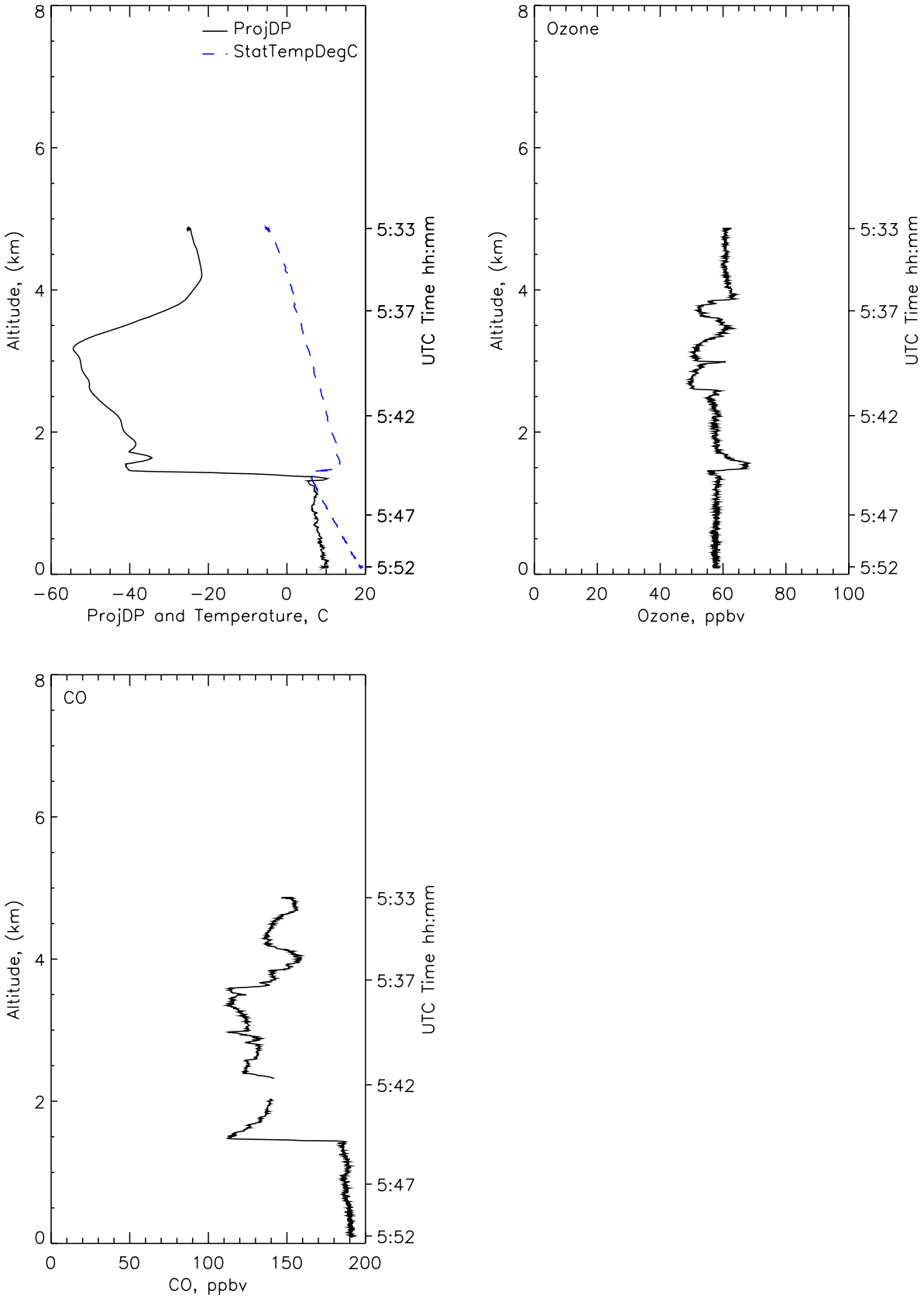

Profile # 3 TRACE-P P3-B Flight 12
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

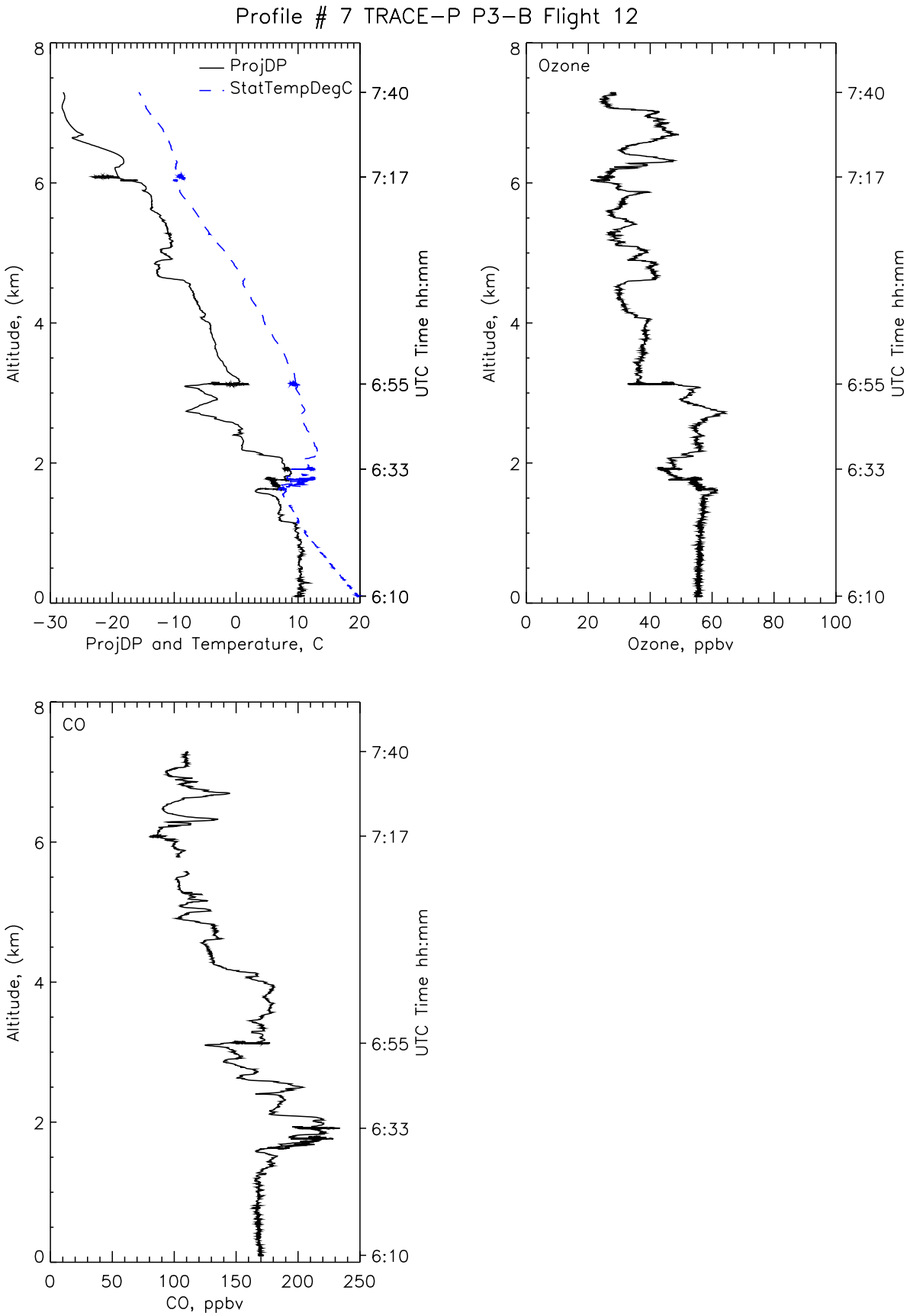
Profile # 4 TRACE-P P3-B Flight 12

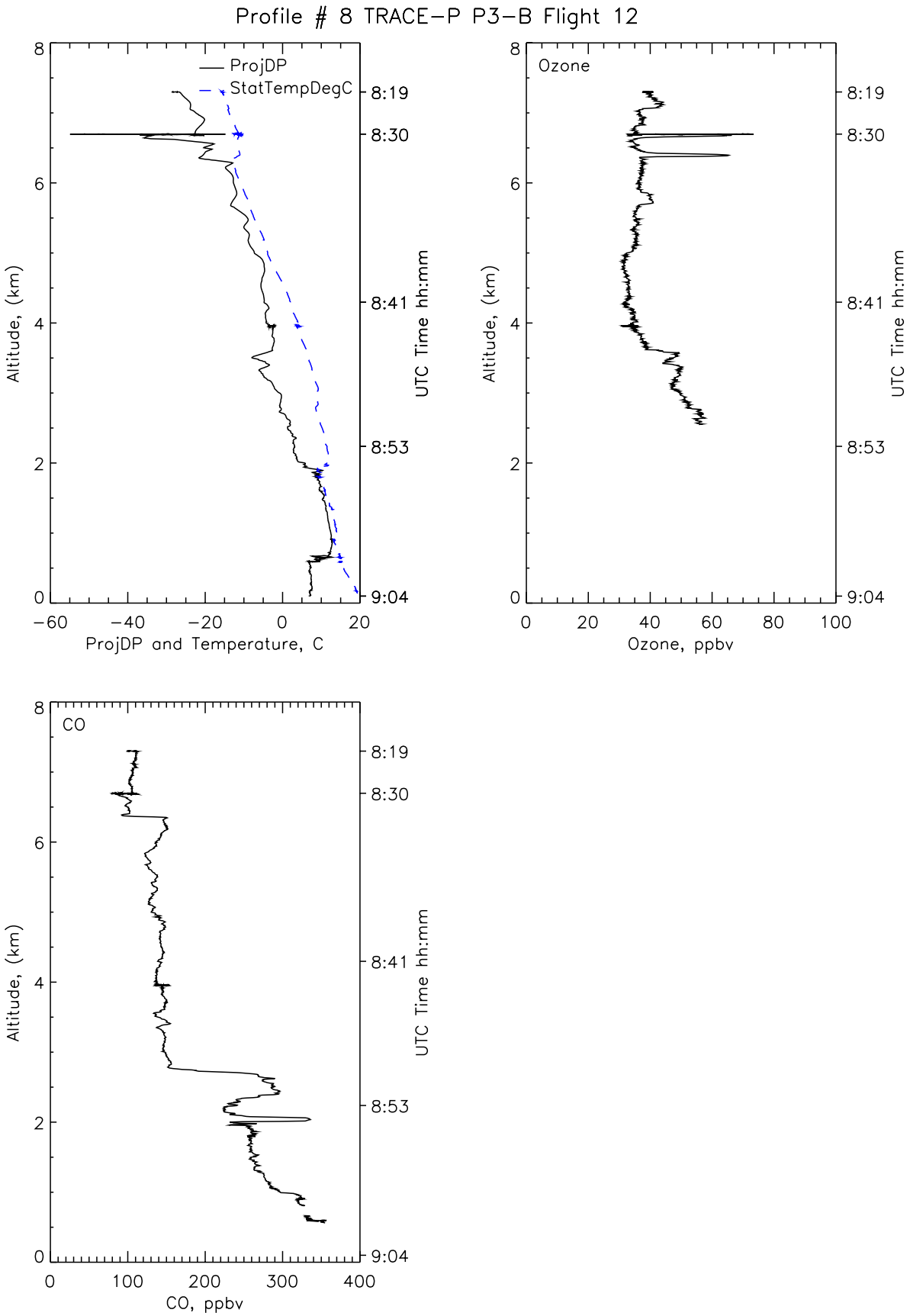



Profile # 5 TRACE-P P3-B Flight 12
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
5:13
4:35
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 6 TRACE-P P3-B Flight 12




Profile # 7 TRACE-P P3-B Flight 12
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 8 TRACE-P P3-B Flight 12
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
8:19
8:30
8:41
8:53
9:04
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

TRACE-P

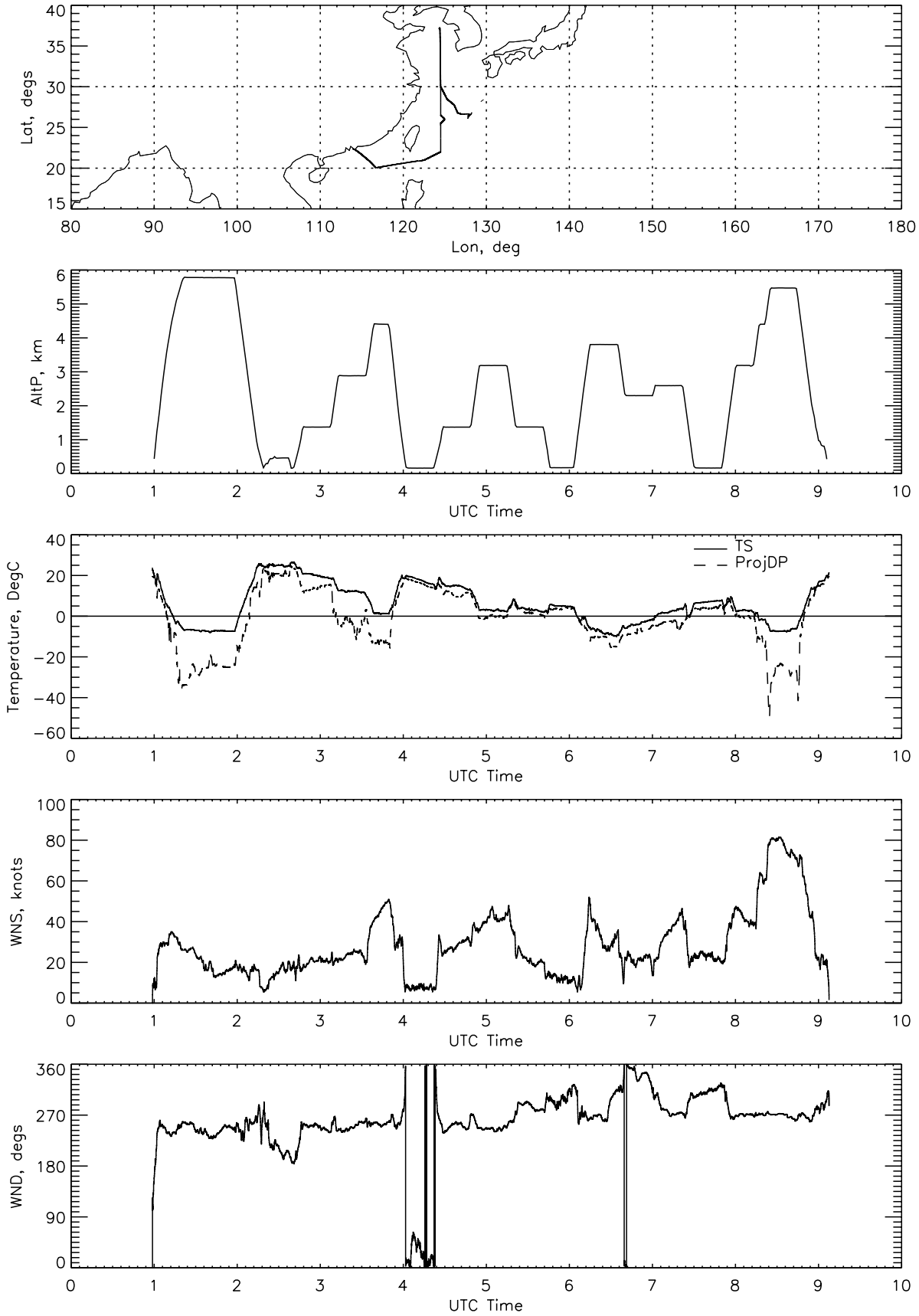
Flight 13P

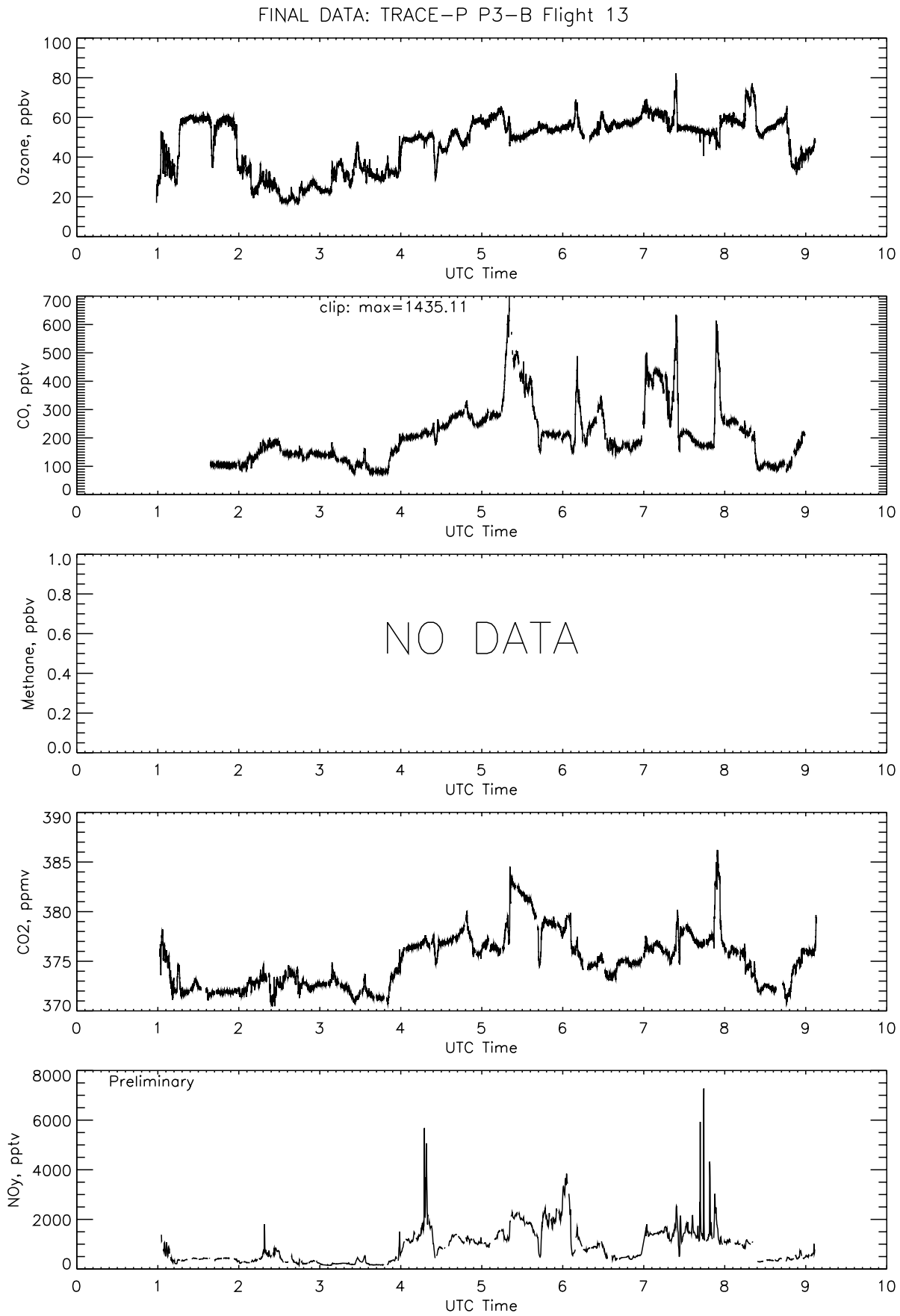
Transit: Hong Kong to Okinawa

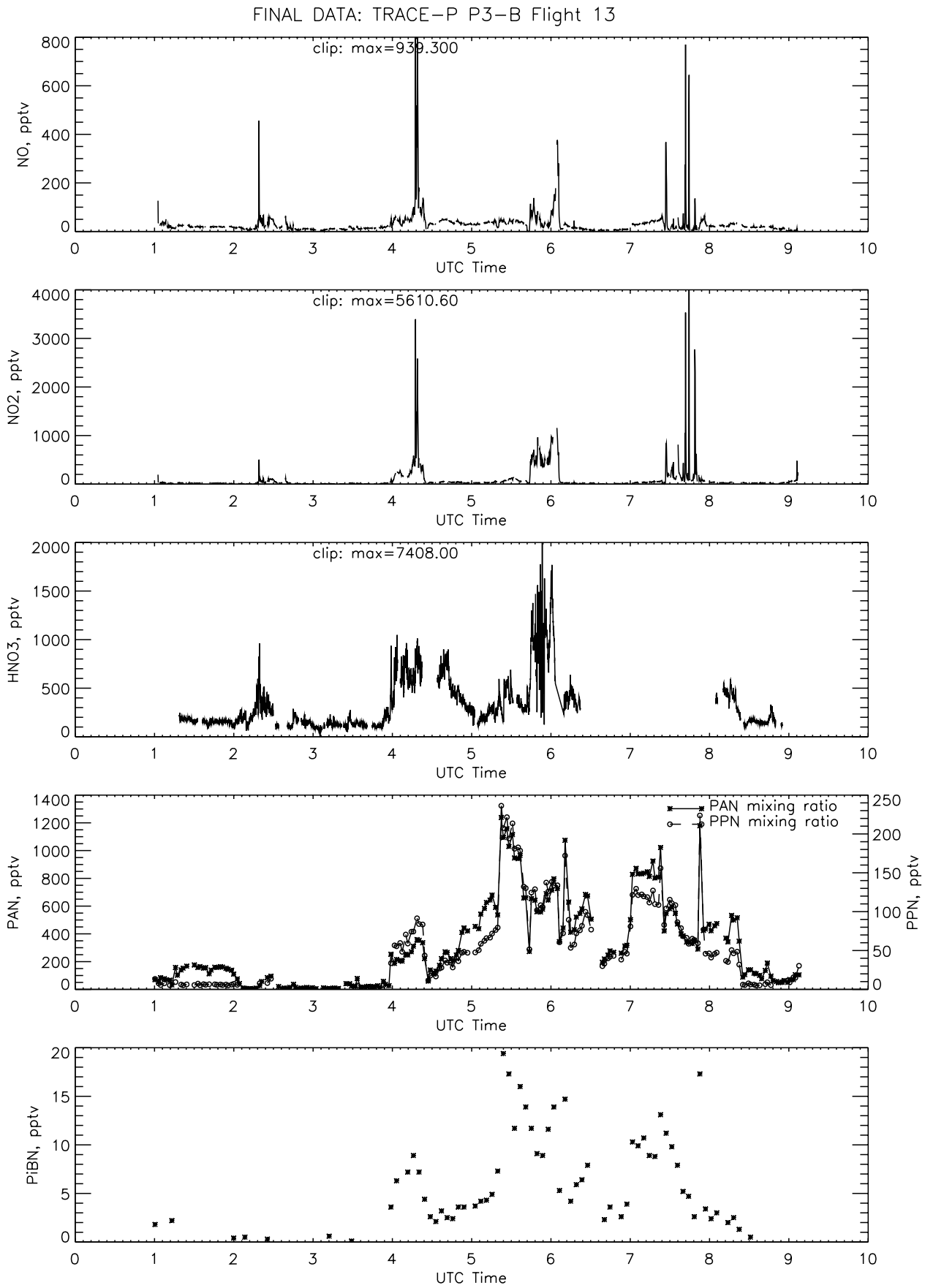
Low Level Outflow to Yellow Sea

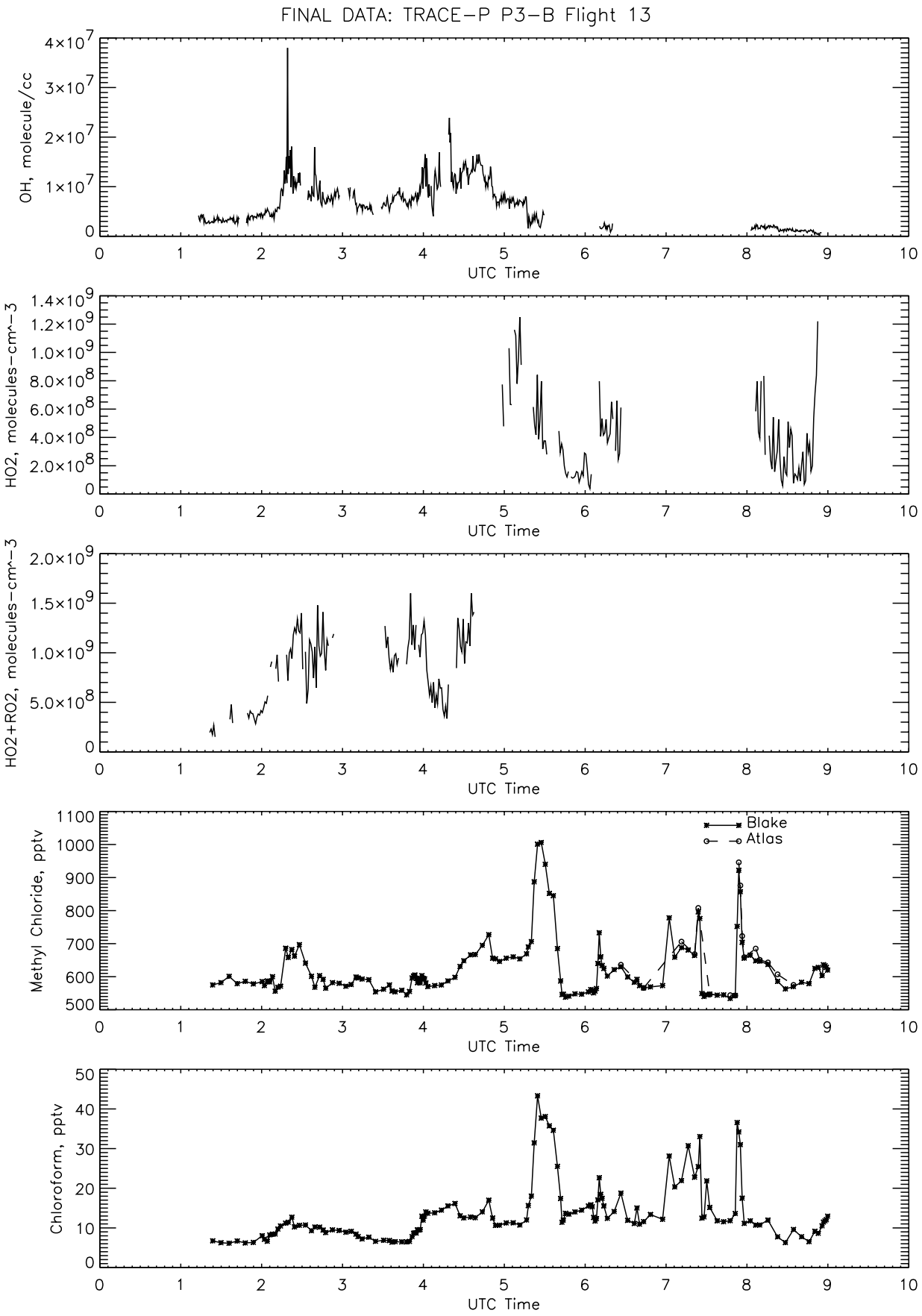
March 17, 2001

FINAL DATA: TRACE-P P3-B Flight 13

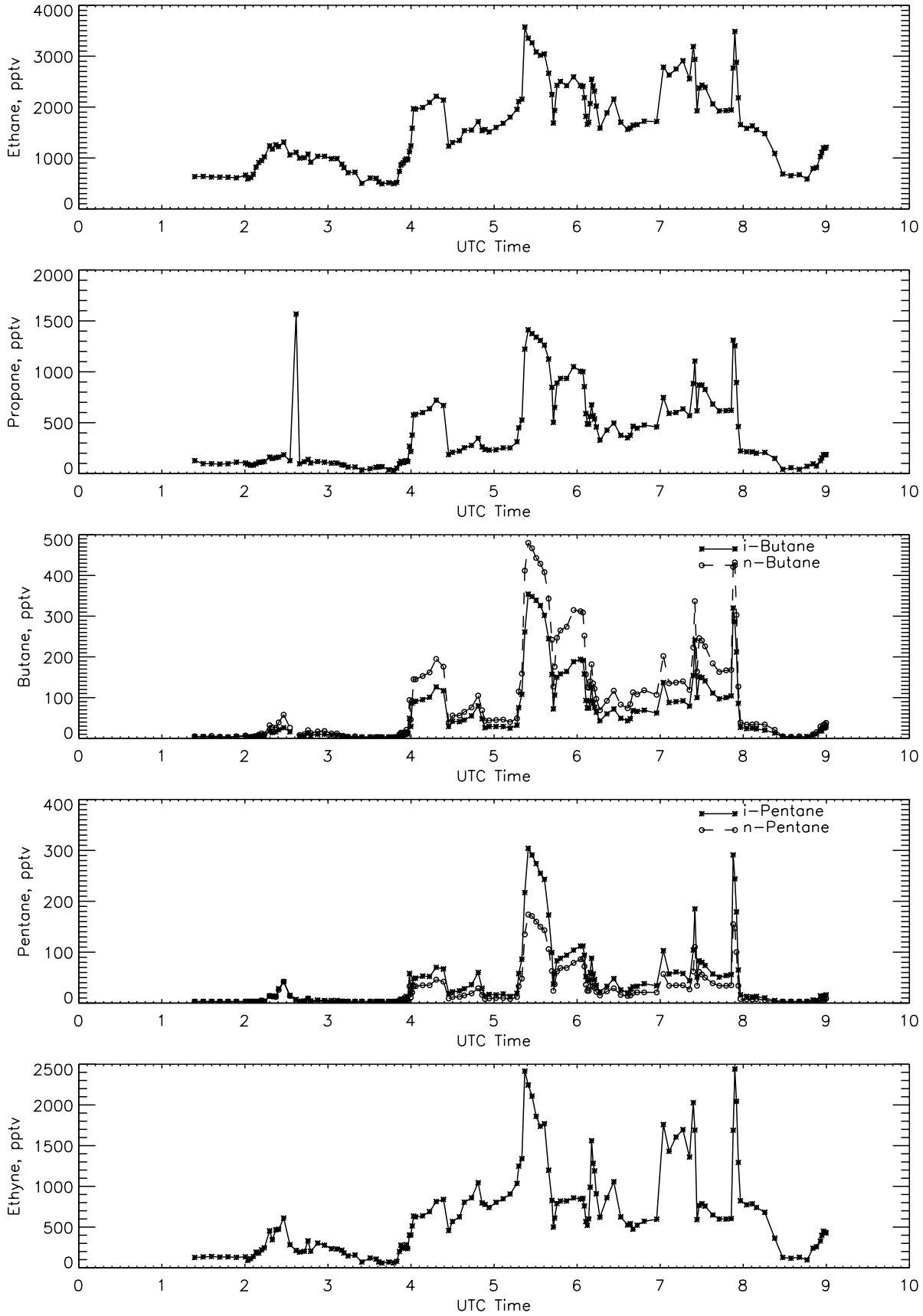


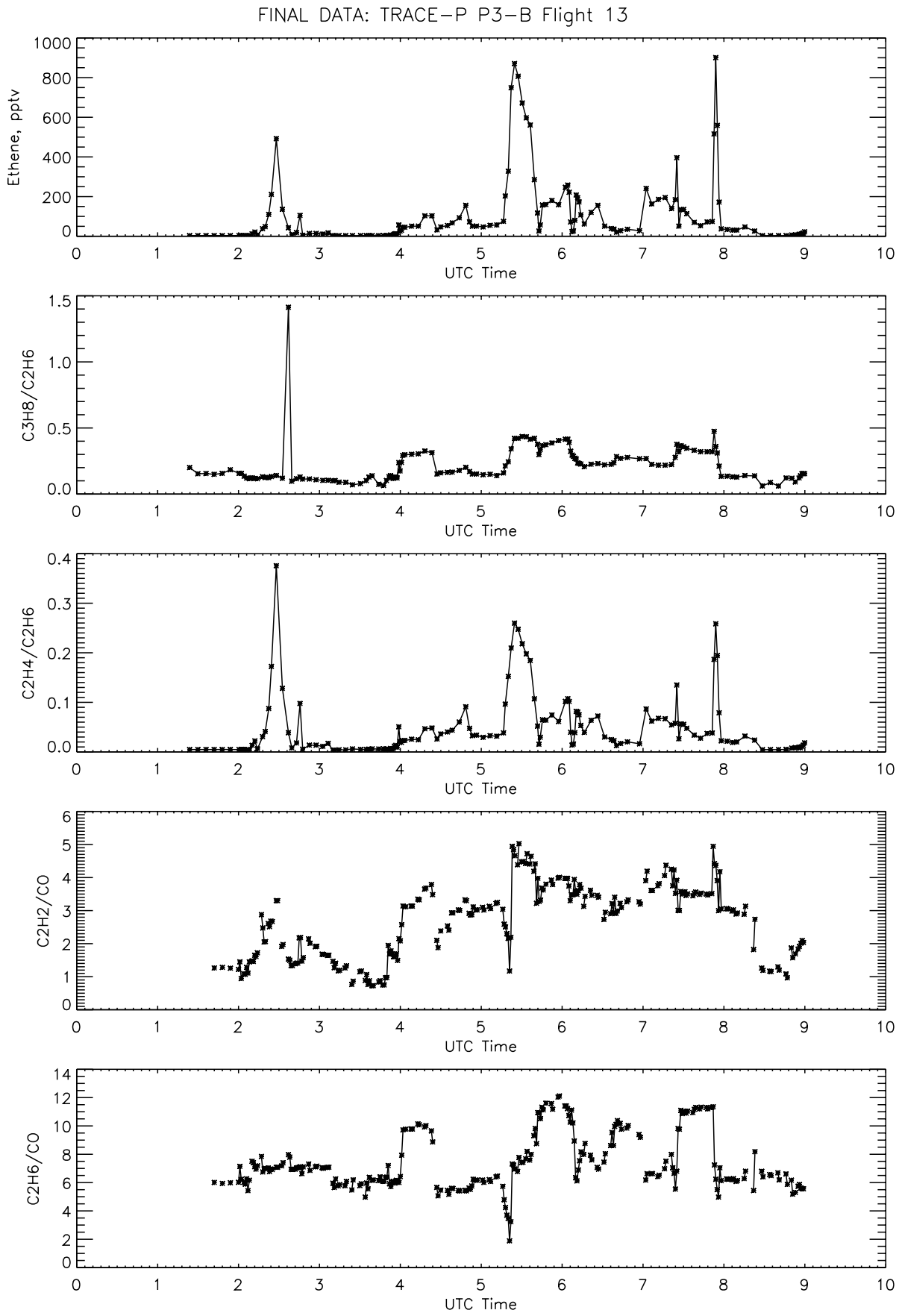

FINAL DATA: TRACE-P P3-B Flight 13
Ozone, ppbv
UTC Time
CO, pptv
clip: max=1435.11
UTC Time
Methane, ppbv
NO DATA
UTC Time
CO2, ppmv
UTC Time
NOy, pptv
Preliminary
UTC Time


FINAL DATA: TRACE-P P3-B Flight 13
clip: max=939.300
NO, pptv
UTC Time
clip: max=5610.60
NO2, pptv
UTC Time
clip: max=7408.00
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

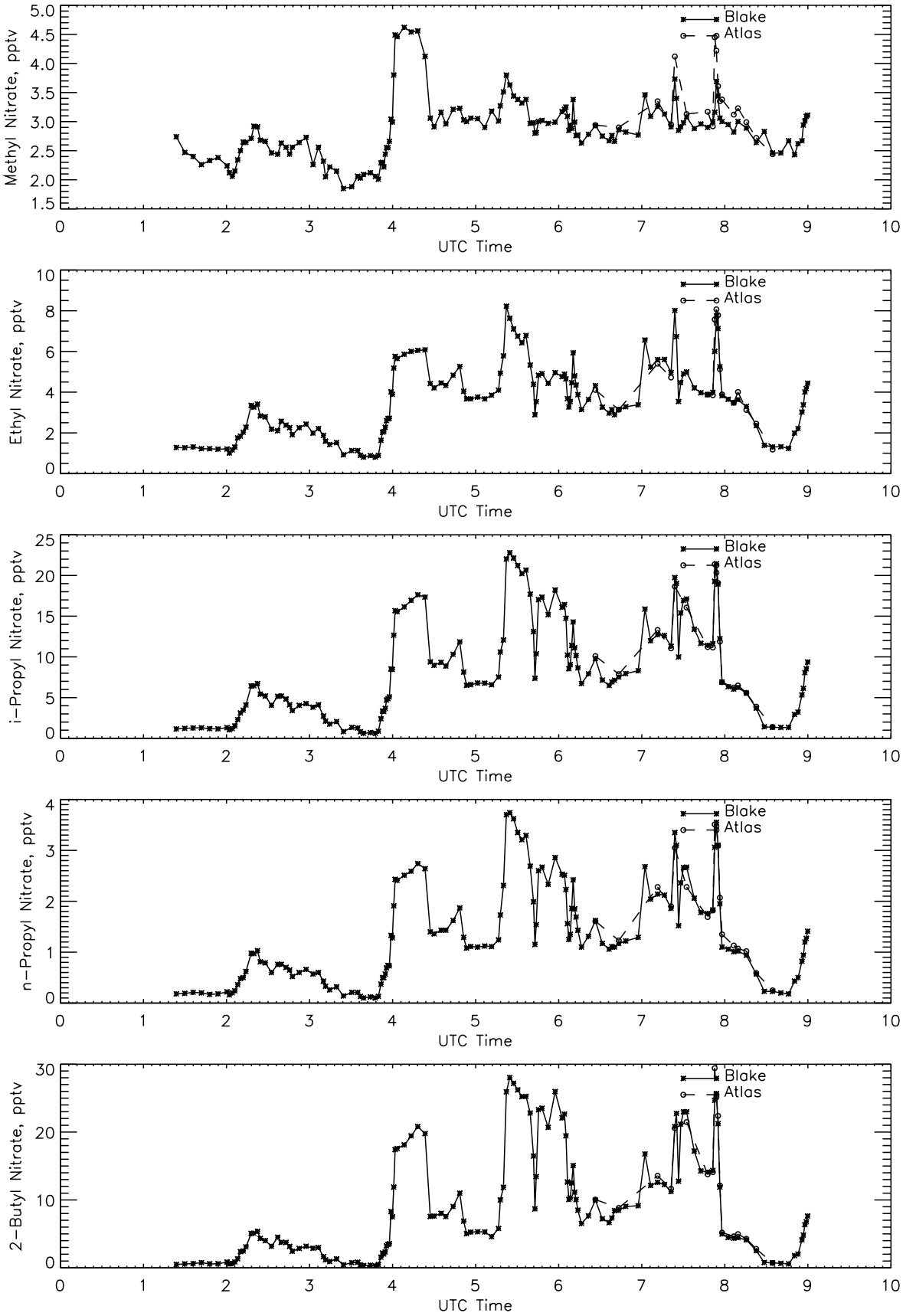

FINAL DATA: TRACE-P P3-B Flight 13
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

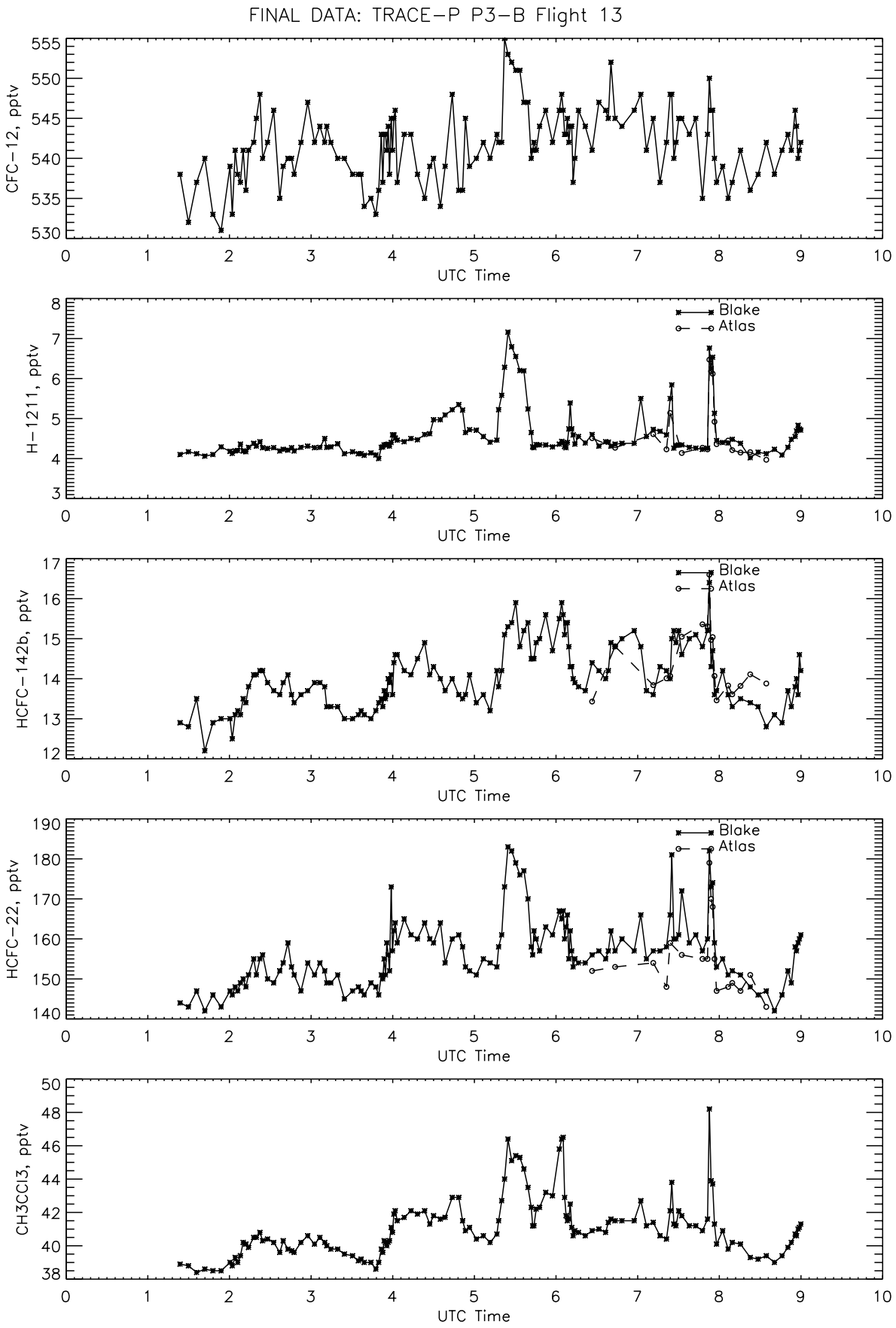
FINAL DATA: TRACE-P P3-B Flight 13



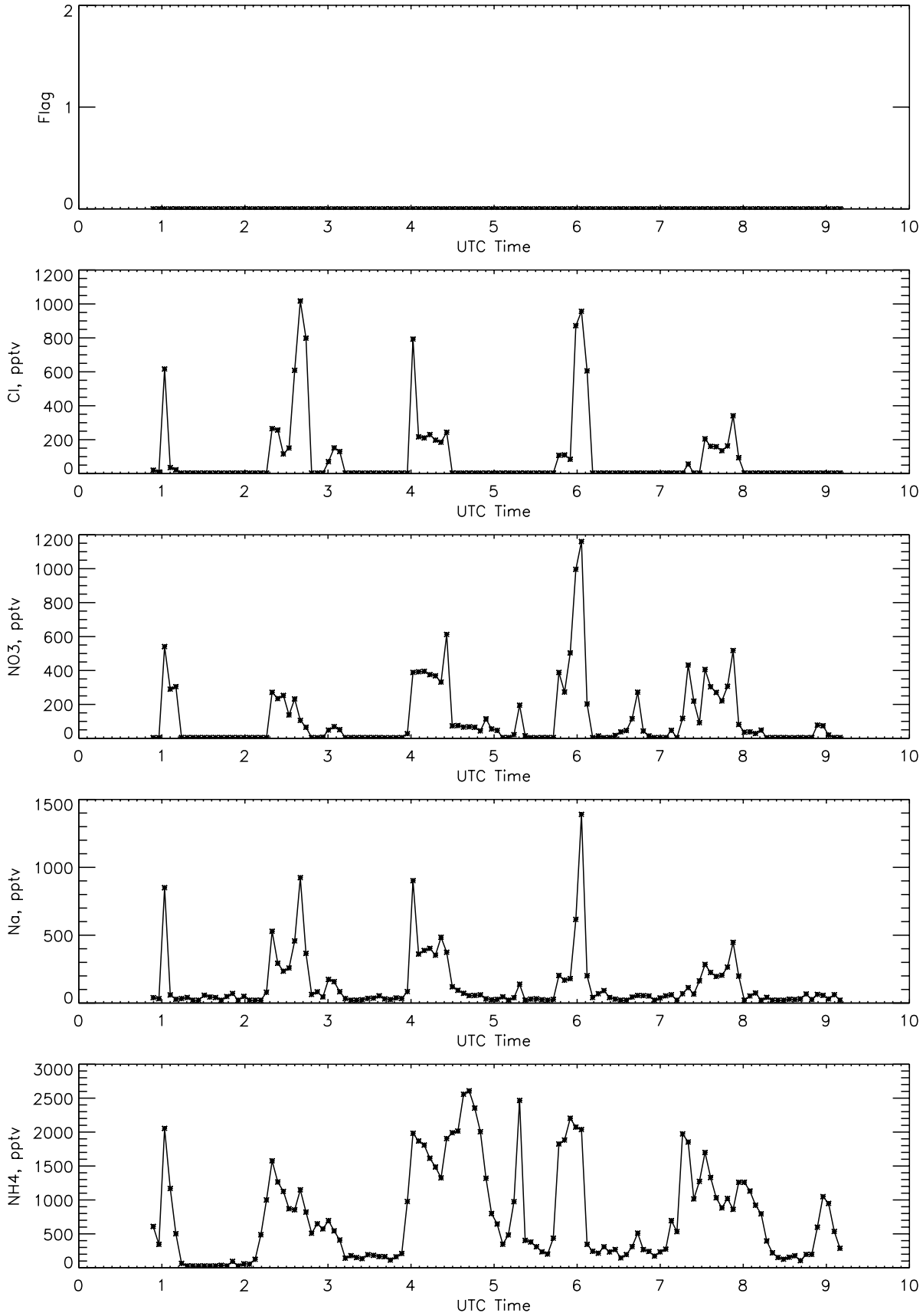

FINAL DATA: TRACE-P P3-B Flight 13
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

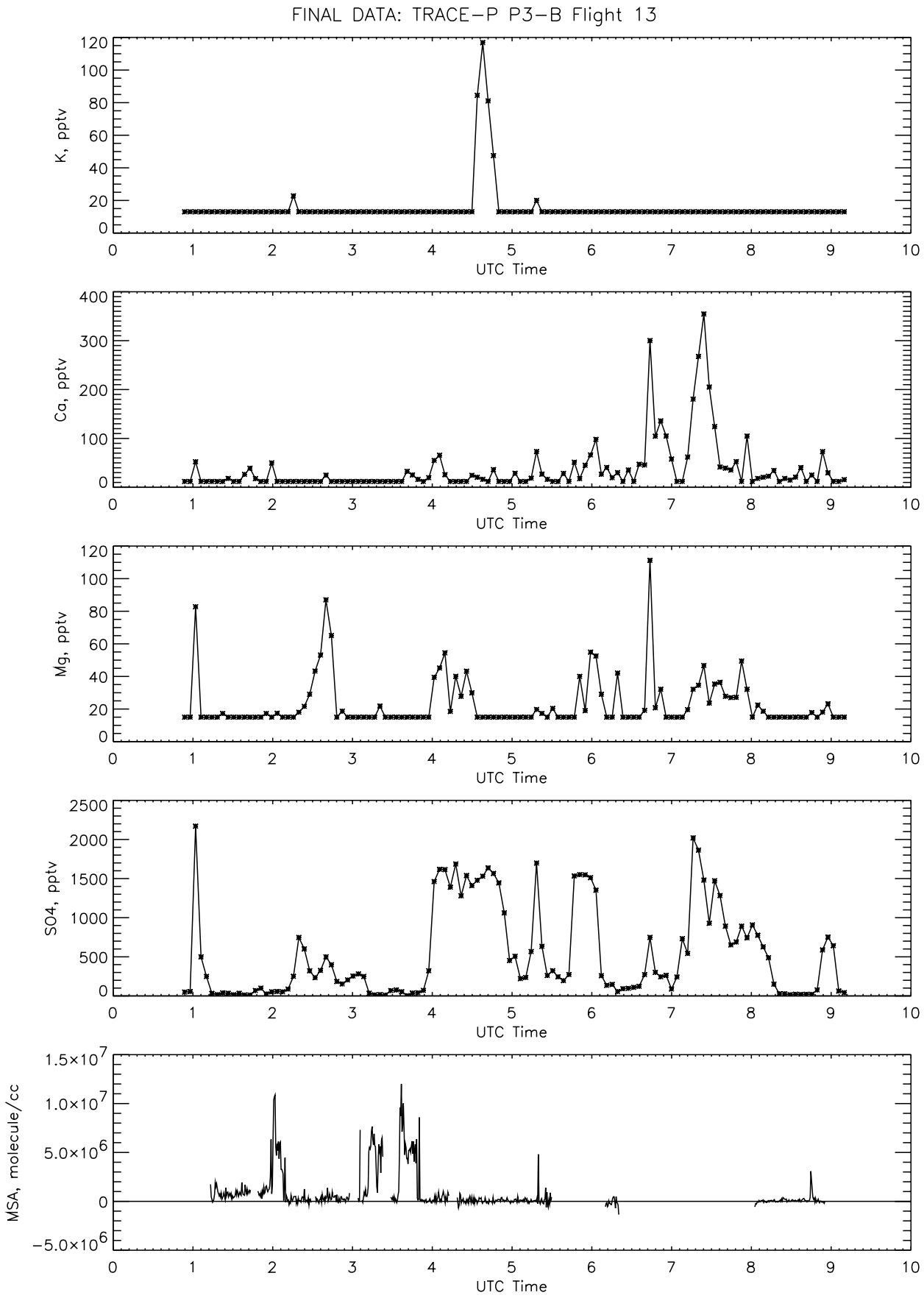
FINAL DATA: TRACE-P P3-B Flight 13

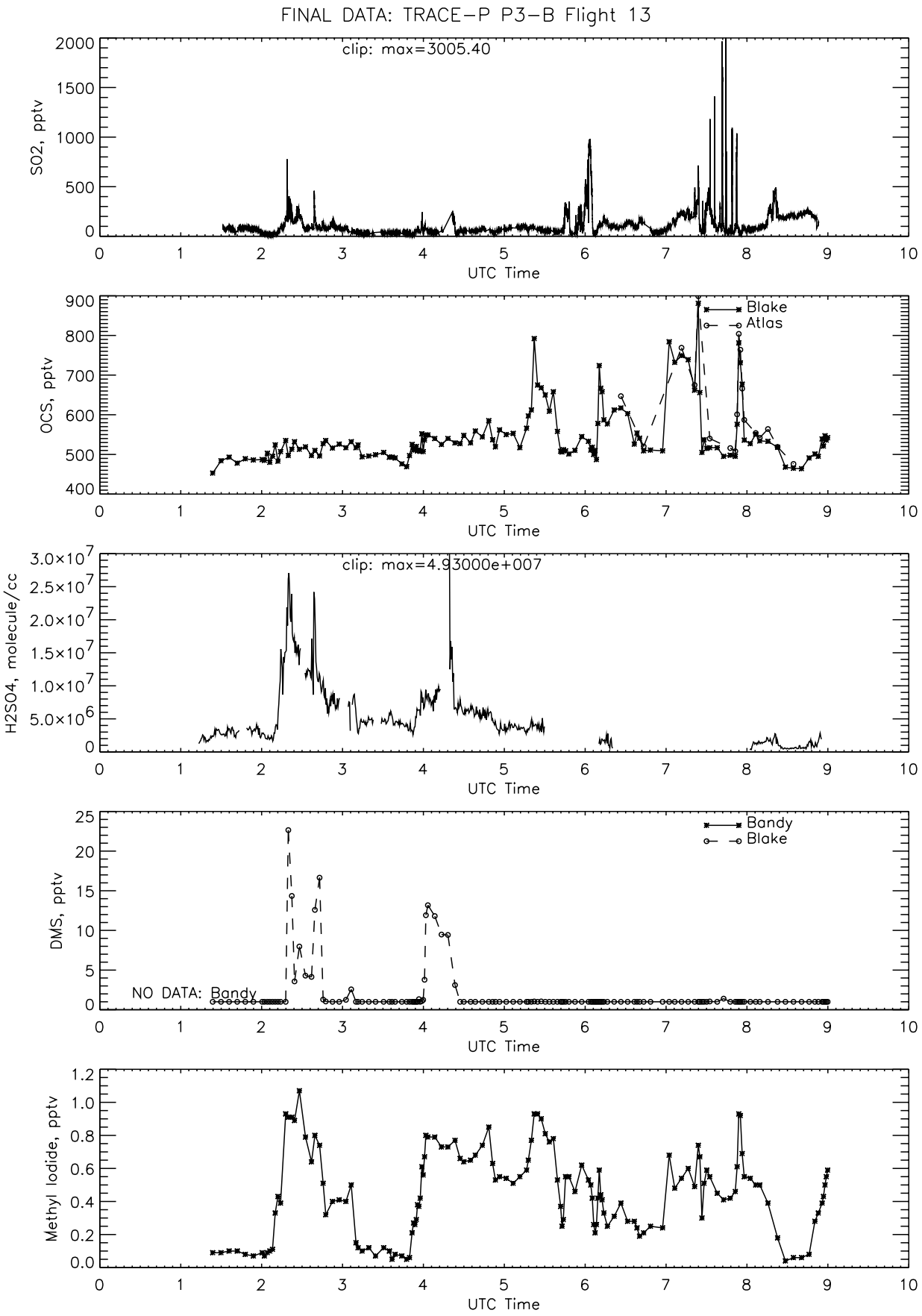


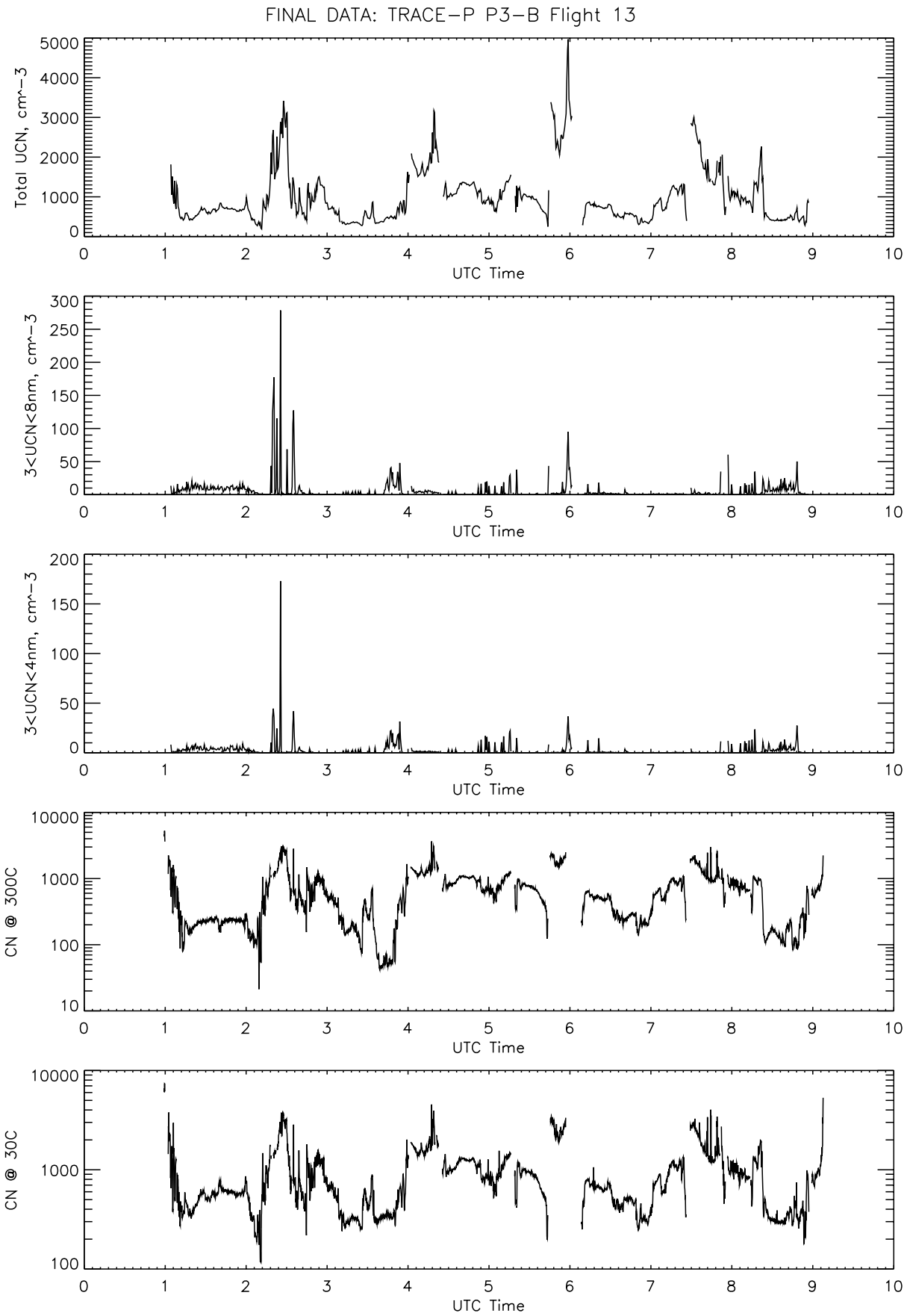

FINAL DATA: TRACE-P P3-B Flight 13
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

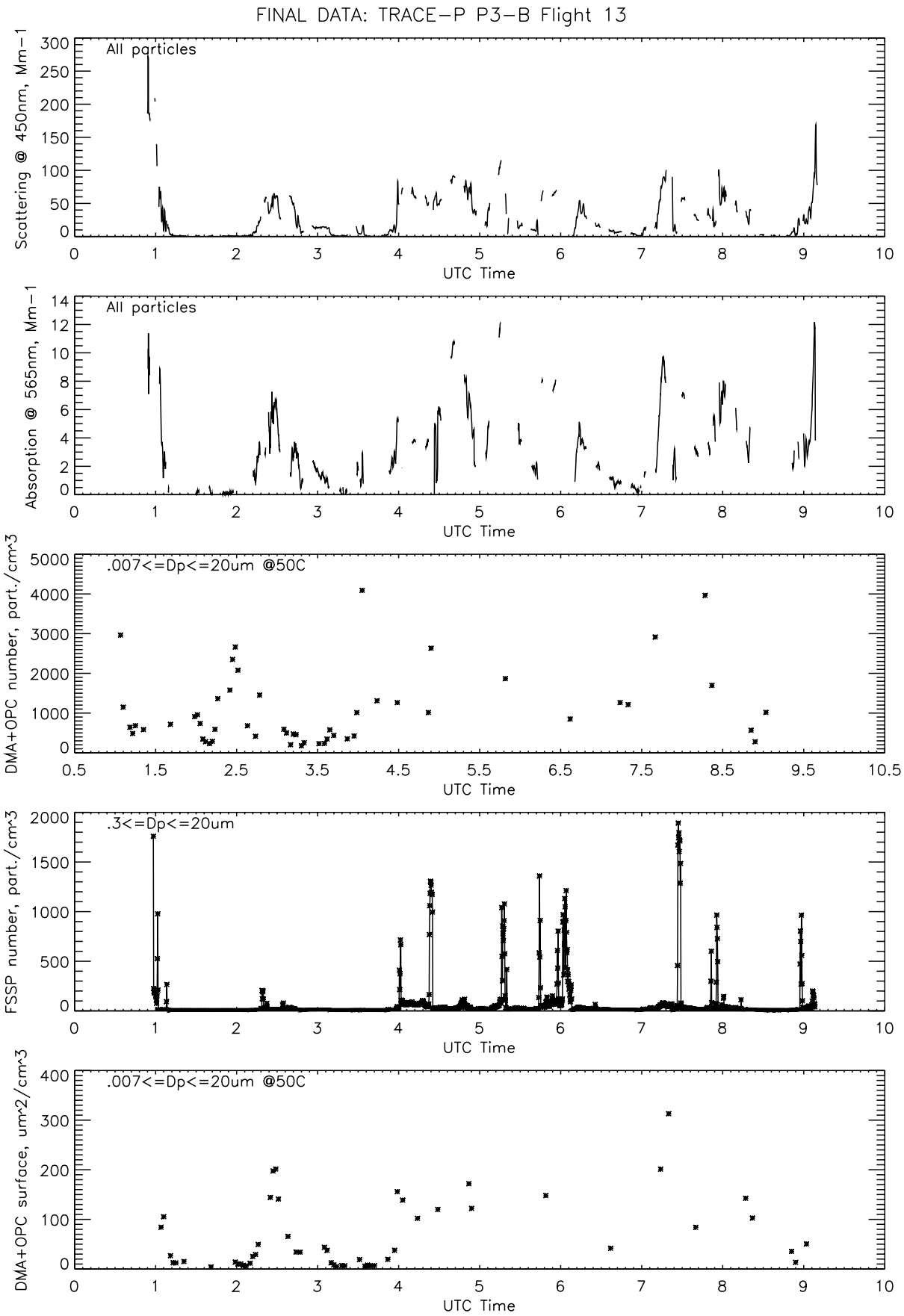
FINAL DATA: TRACE-P P3-B Flight 13

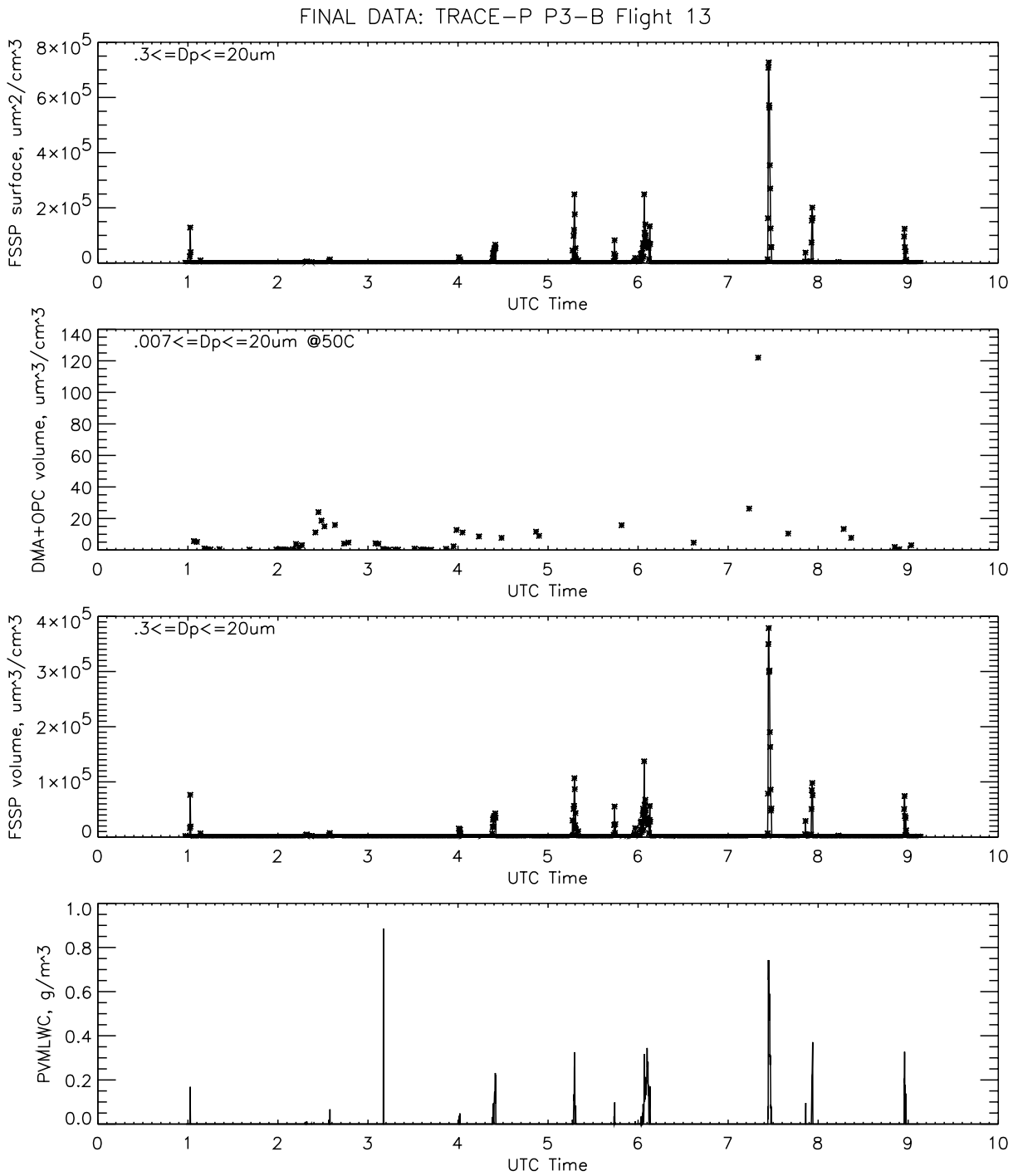



FINAL DATA: TRACE-P P3-B Flight 13
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

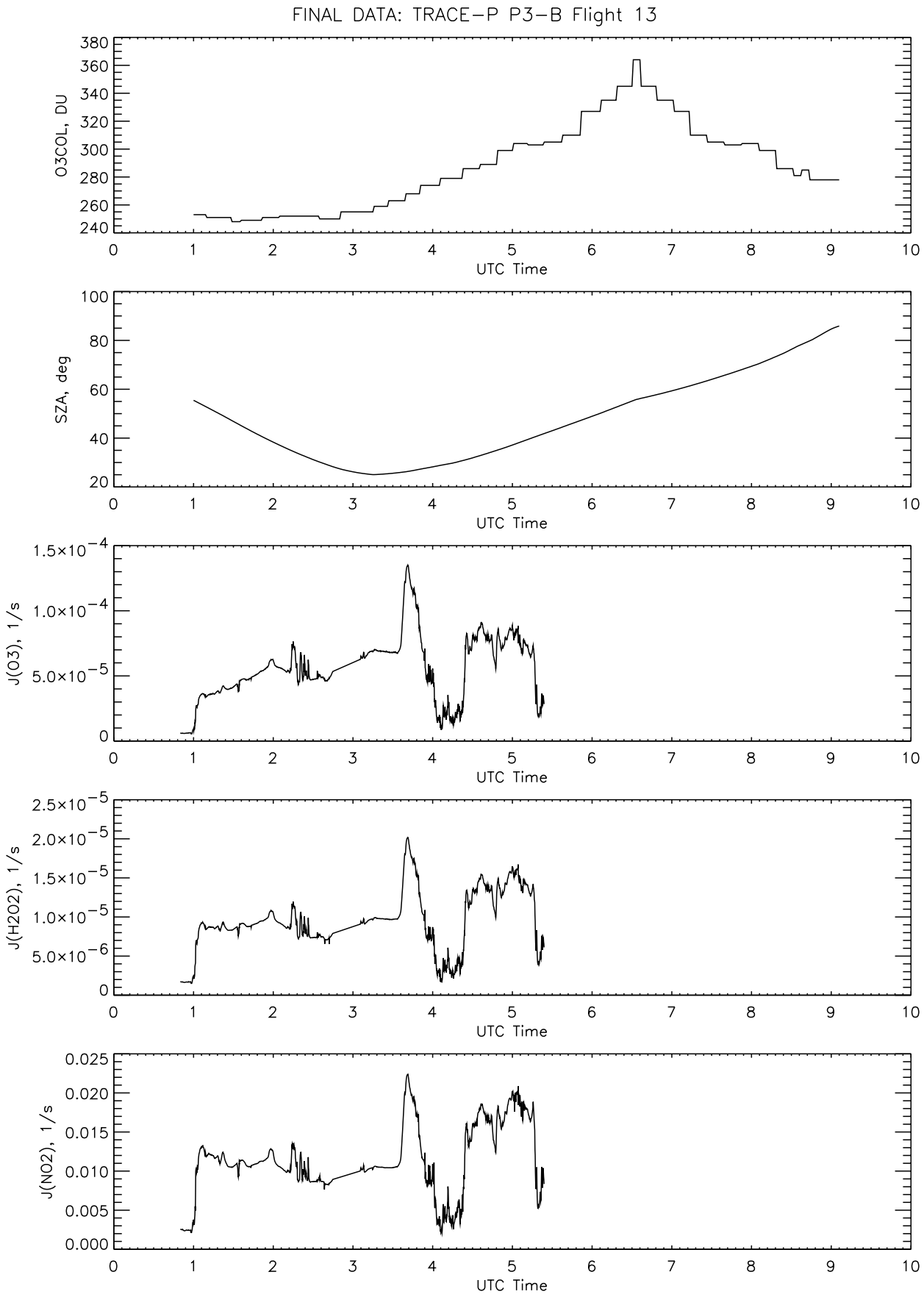

FINAL DATA: TRACE-P P3-B Flight 13
clip: max=3005.40
SO2, pptv
UTC Time
Blake
Atlas
OCS, pptv
UTC Time
clip: max=4.93000e+007
H2SO4, molecule/cc
UTC Time
Bandy
Blake
NO DATA: Bandy
DMS, pptv
UTC Time
Methyl Iodide, pptv
UTC Time

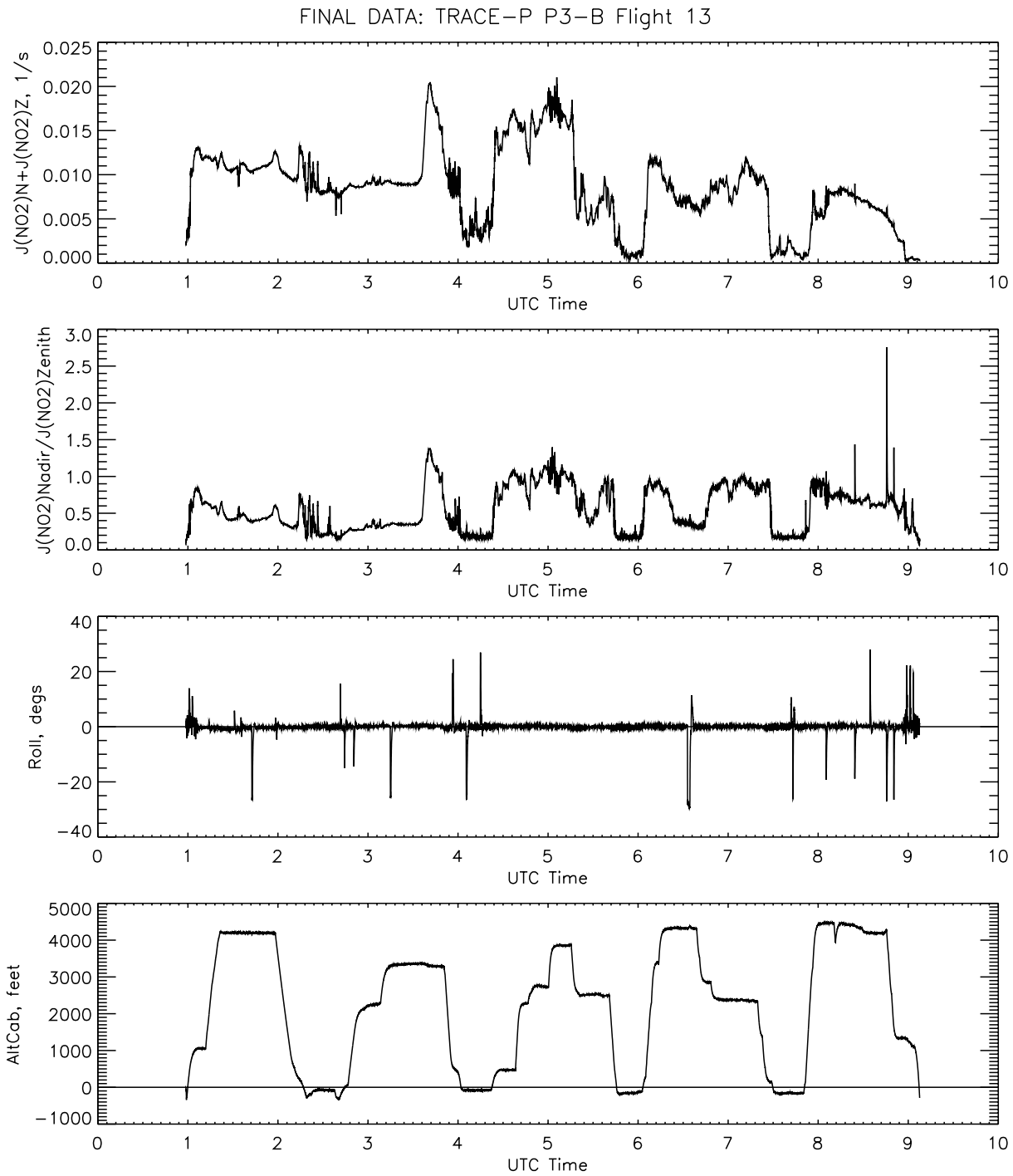

FINAL DATA: TRACE-P P3-B Flight 13
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

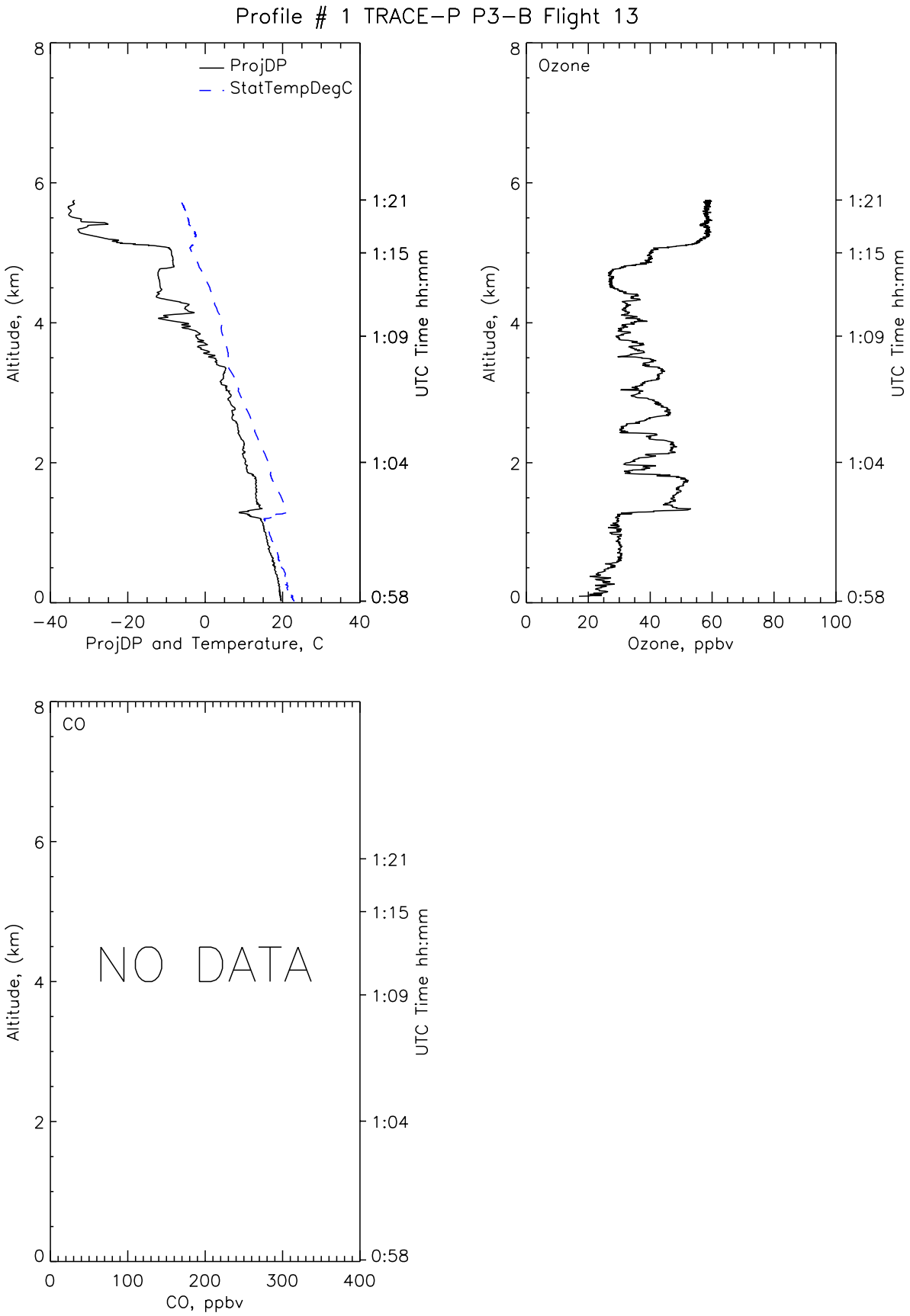

FINAL DATA: TRACE-P P3-B Flight 13
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 13
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

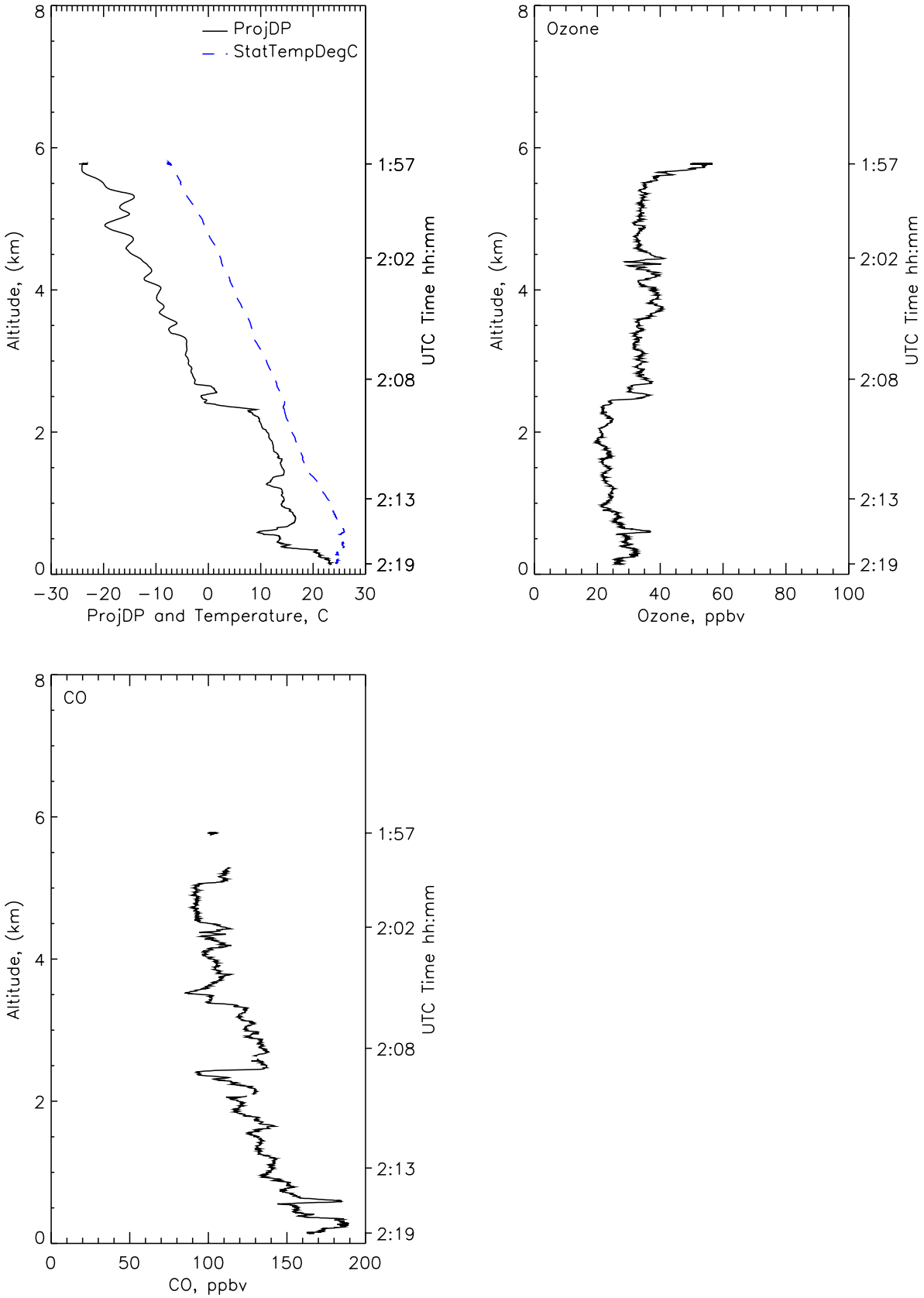
LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 13
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time

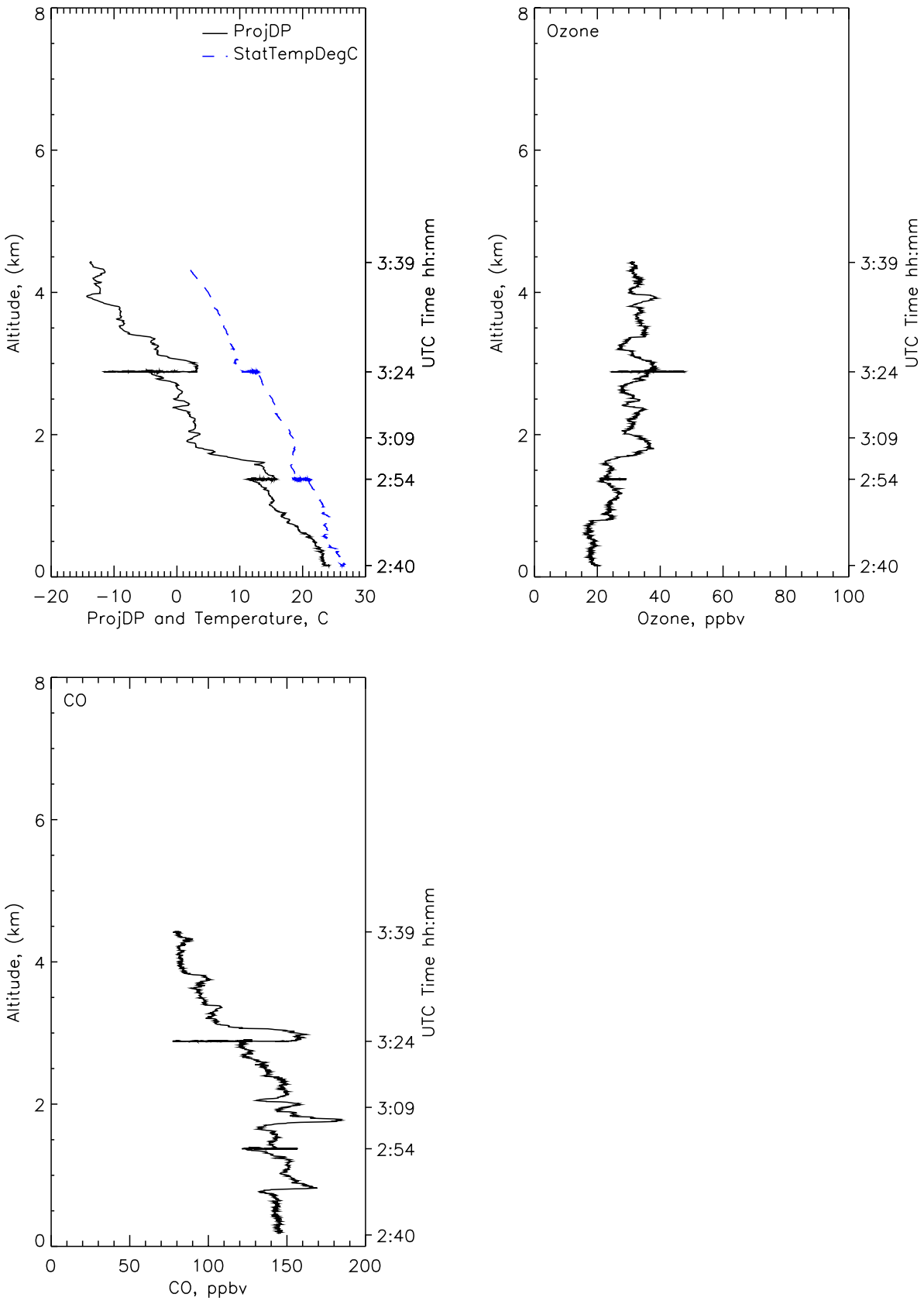

FINAL DATA: TRACE-P P3-B Flight 13
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
0
1
2
3
4
5
6
7
8
9
10
UTC Time
J(NO2)Nadir/J(NO2)Zenith
3.0
2.5
2.0
1.5
1.0
0.5
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
5000
4000
3000
2000
1000
0
−1000
UTC Time


Profile # 1 TRACE-P P3-B Flight 13
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
NO DATA
CO, ppbv

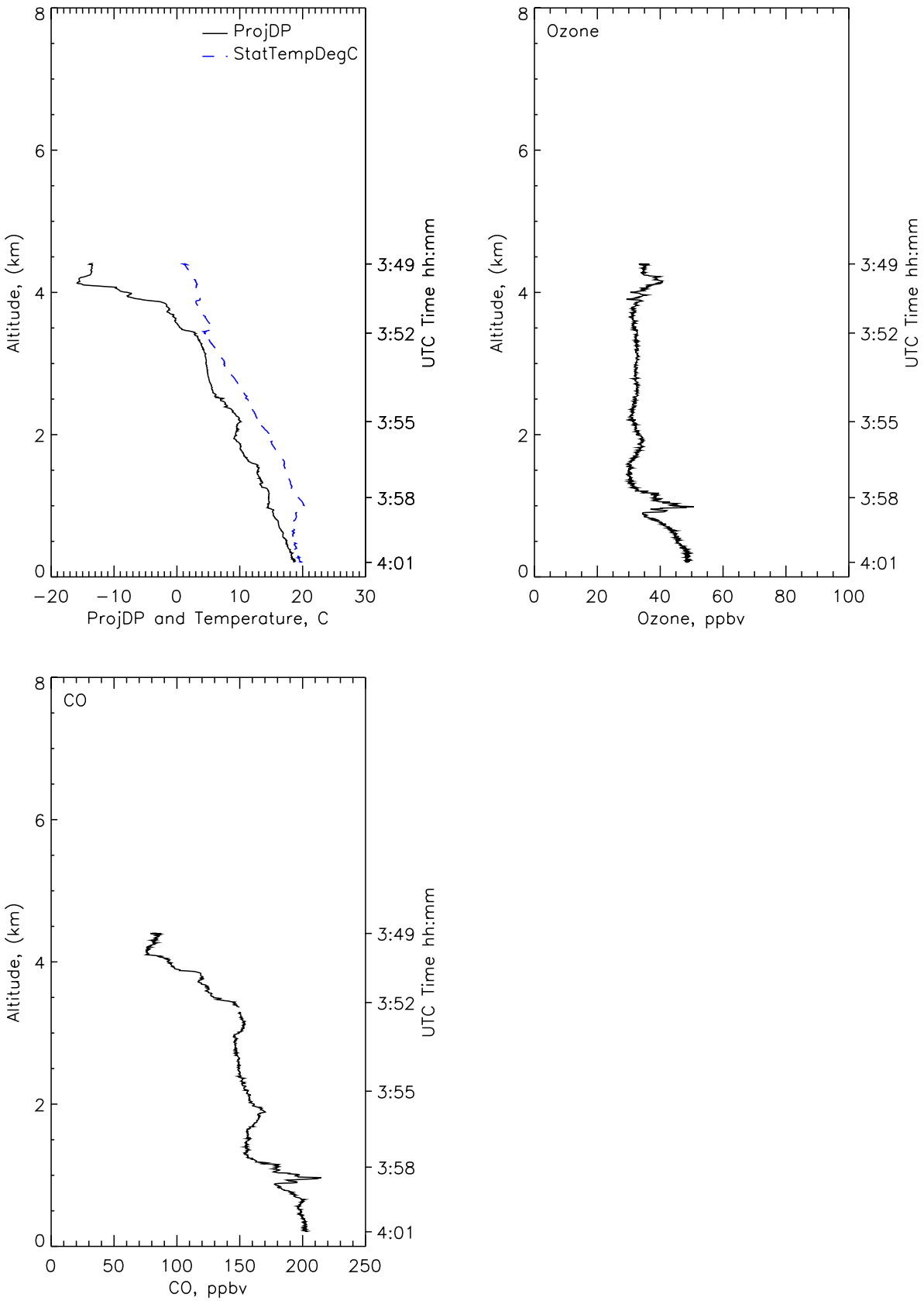
Profile # 2 TRACE−P P3−B Flight 13



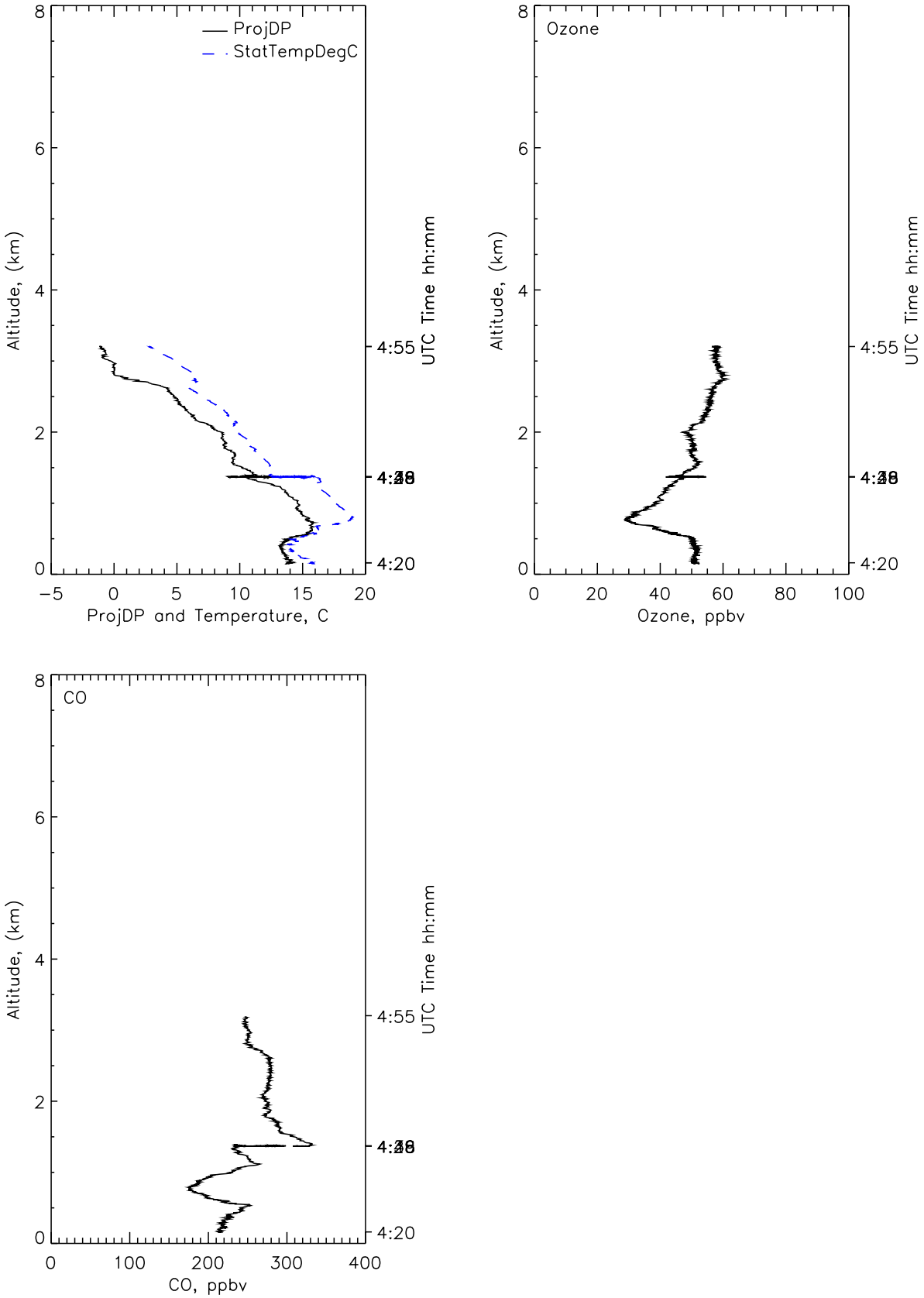
Profile # 3 TRACE-P P3-B Flight 13

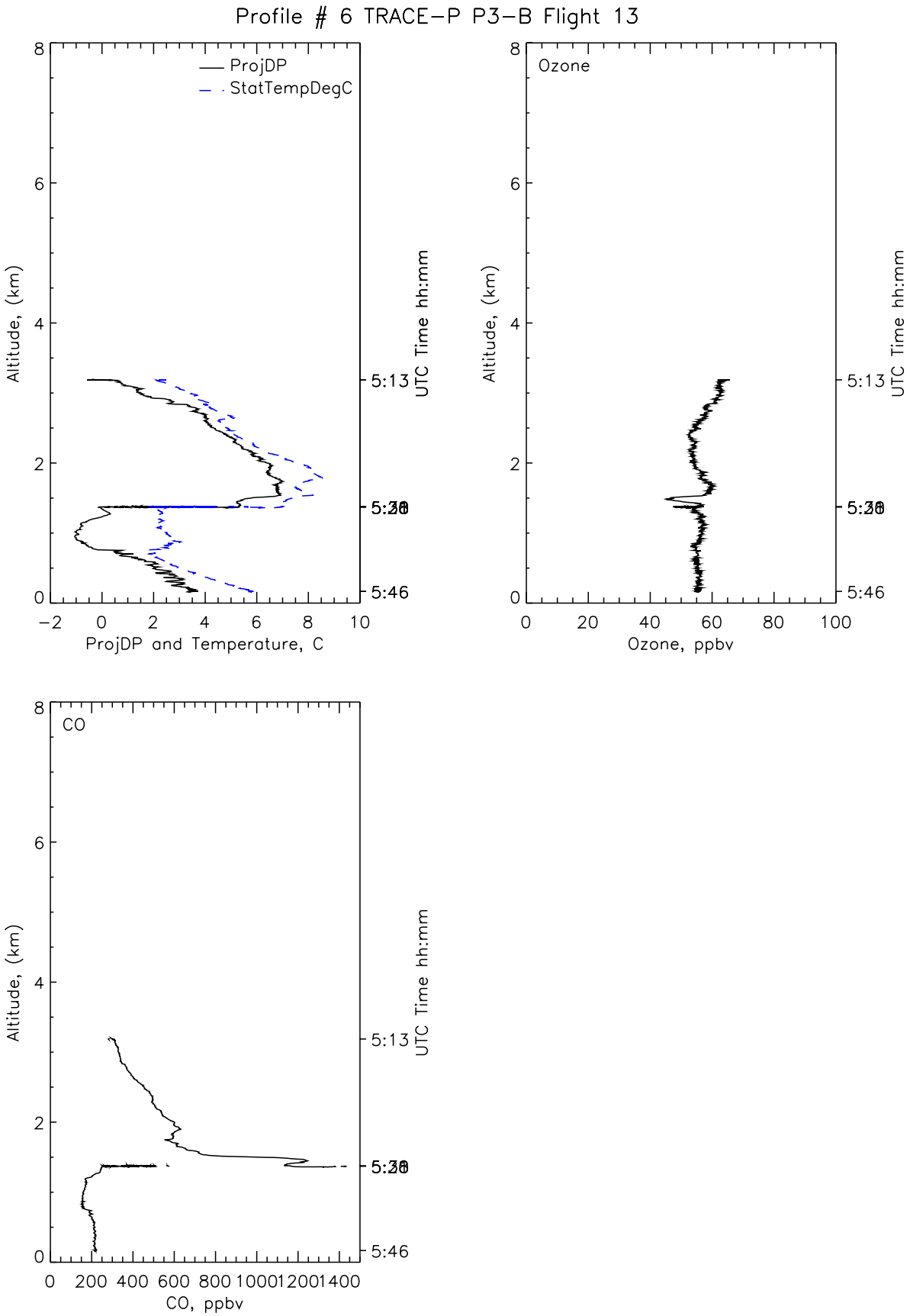


Profile # 4 TRACE-P P3-B Flight 13

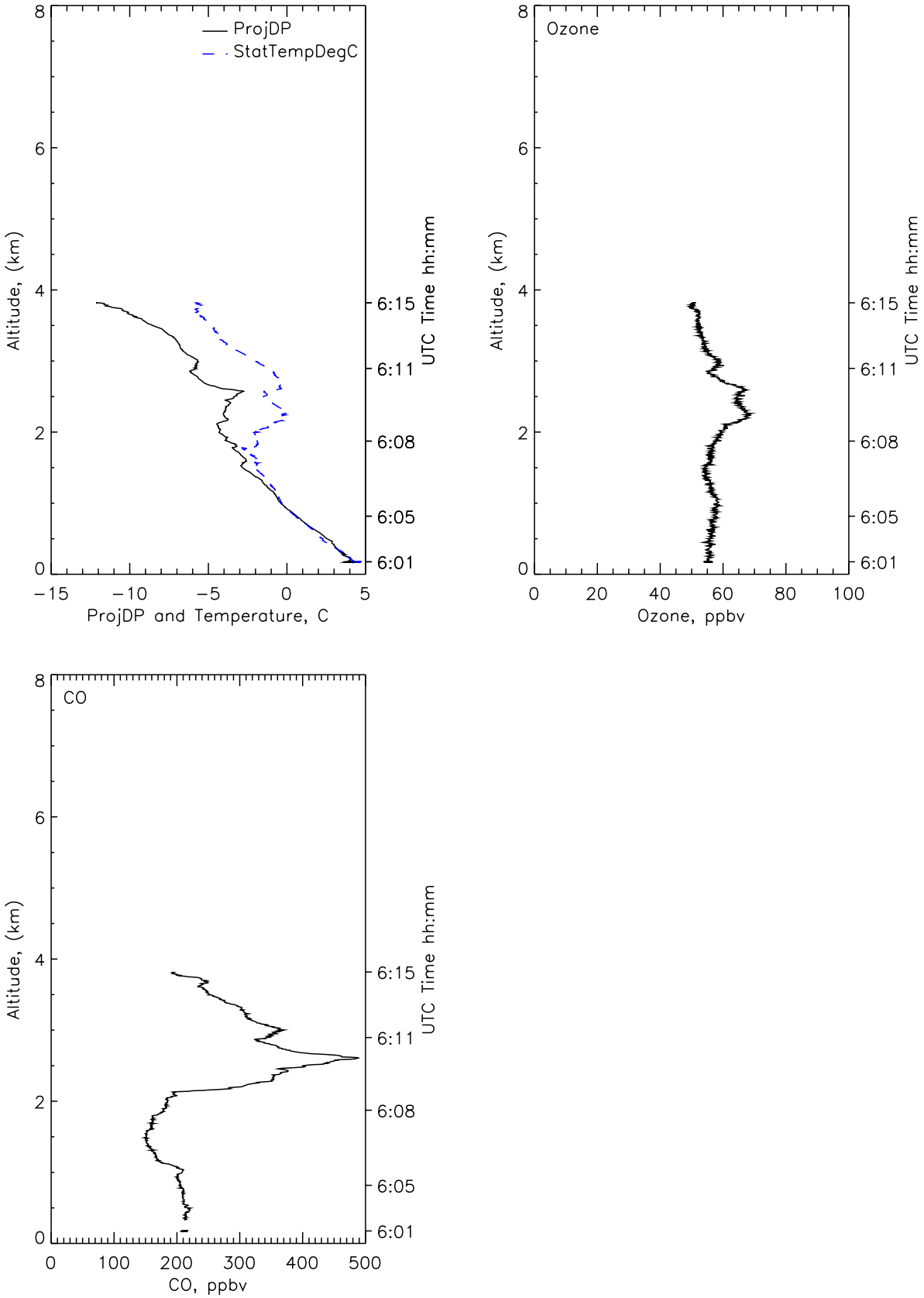


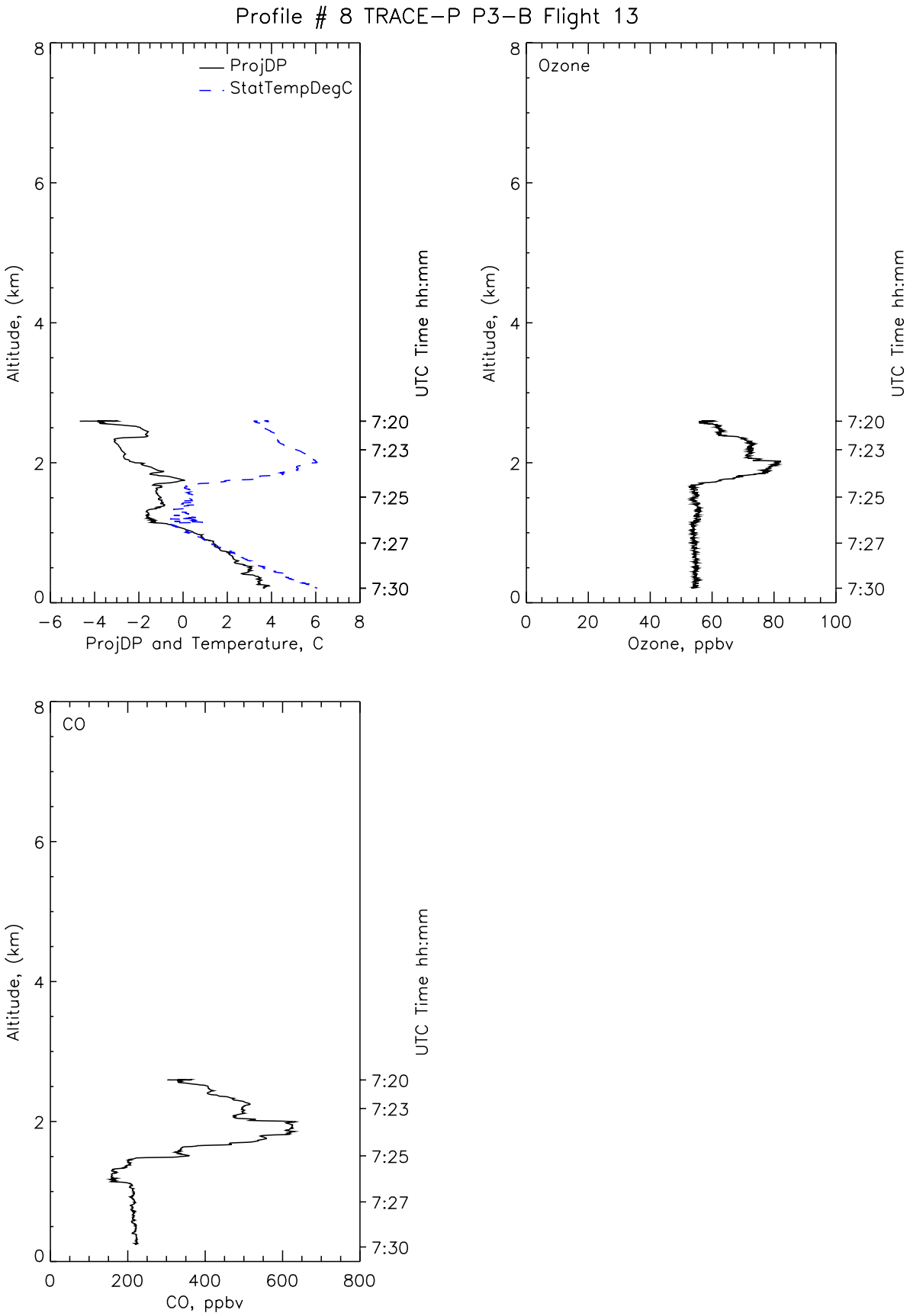
Profile # 5 TRACE-P P3-B Flight 13



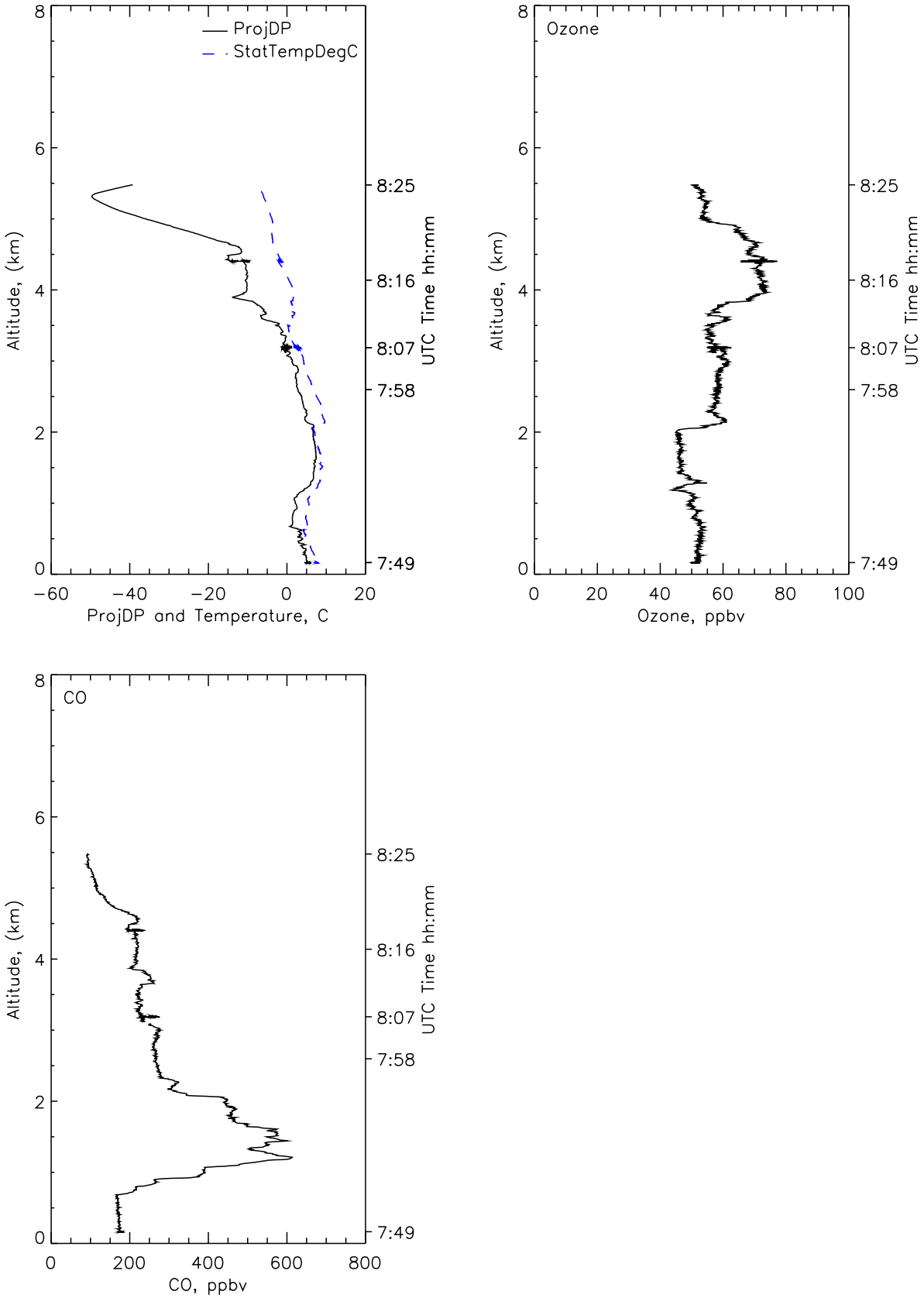

Profile # 6 TRACE-P P3-B Flight 13
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
5:13
5:46
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 7 TRACE-P P3-B Flight 13

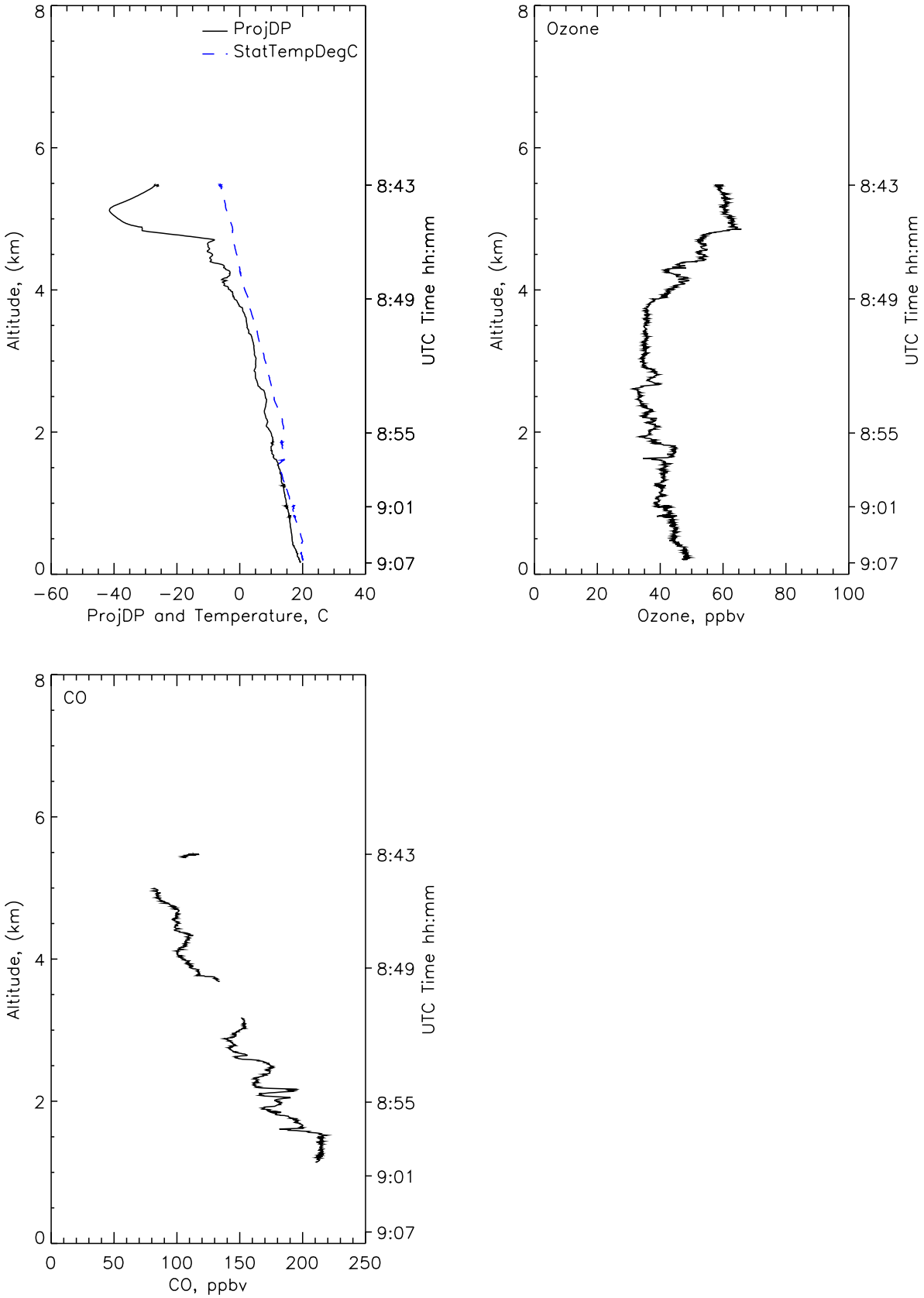



Profile # 8 TRACE-P P3-B Flight 13
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
7:20
7:23
7:25
7:27
7:30
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 9 TRACE-P P3-B Flight 13



Profile #10 TRACE-P P3-B Flight 13



CHEMICAL and METEOROLOGICAL DATA

TRACE-P

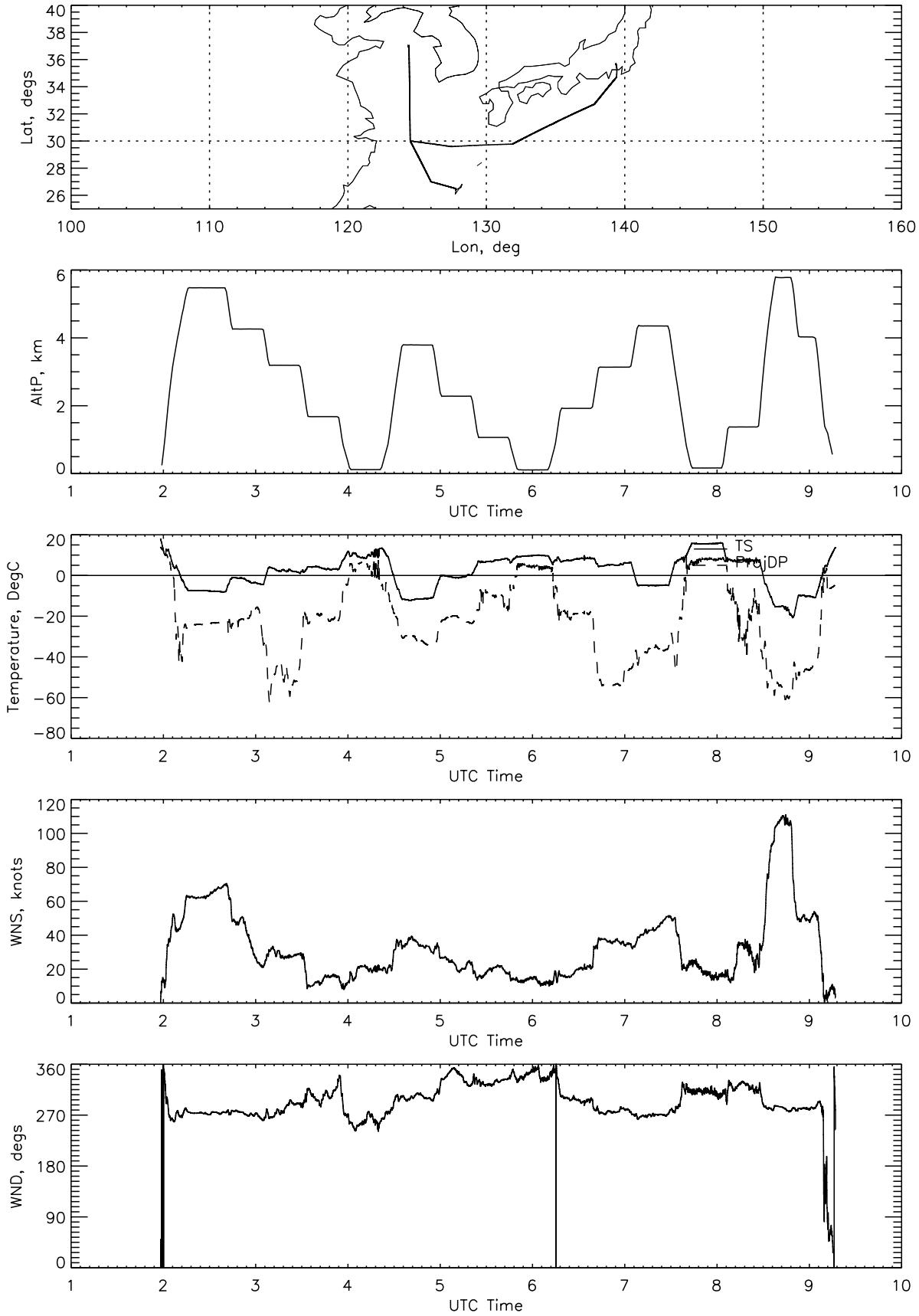
Flight 14P

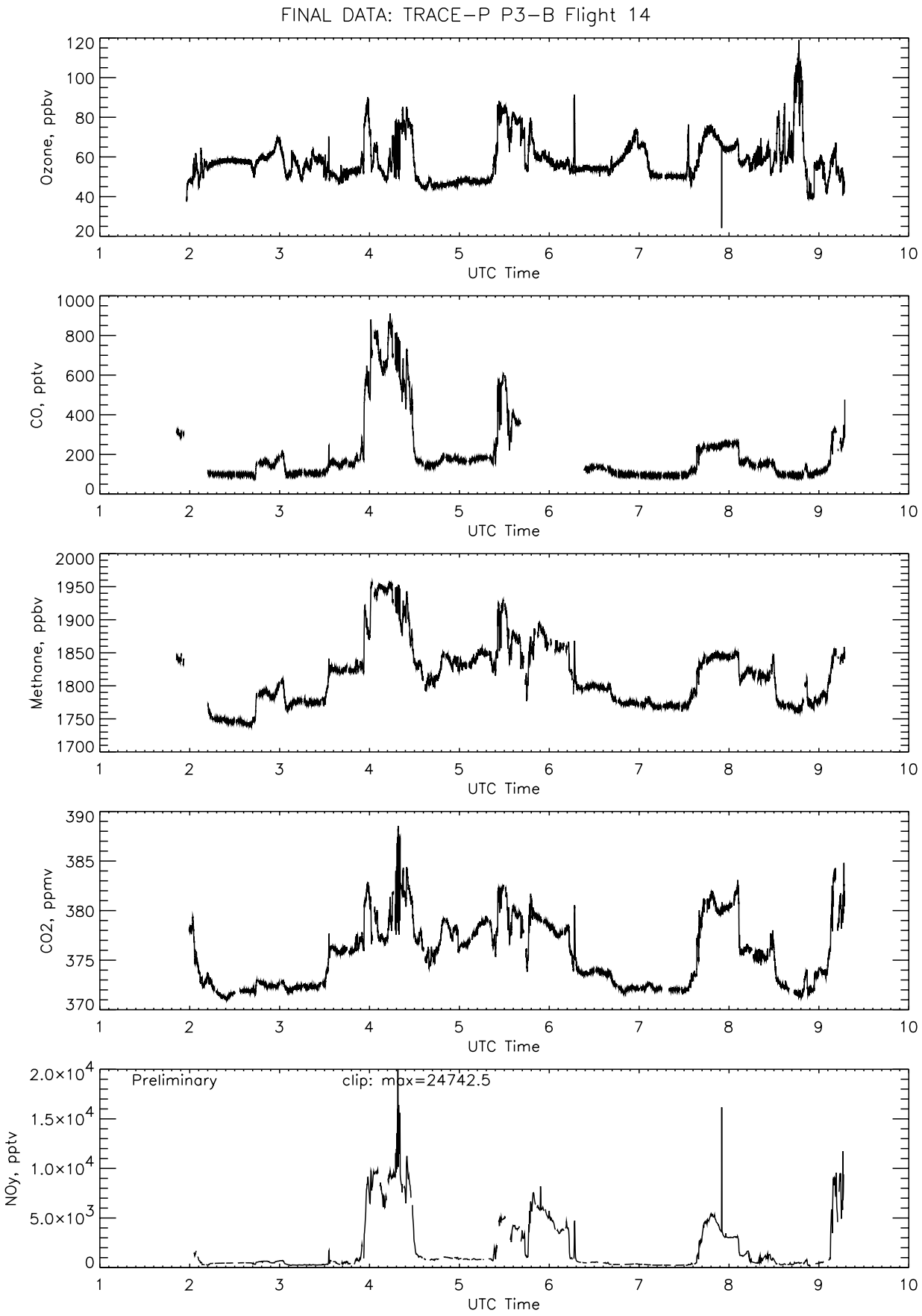
Transit: Okinawa to Yokota AFB, Japan

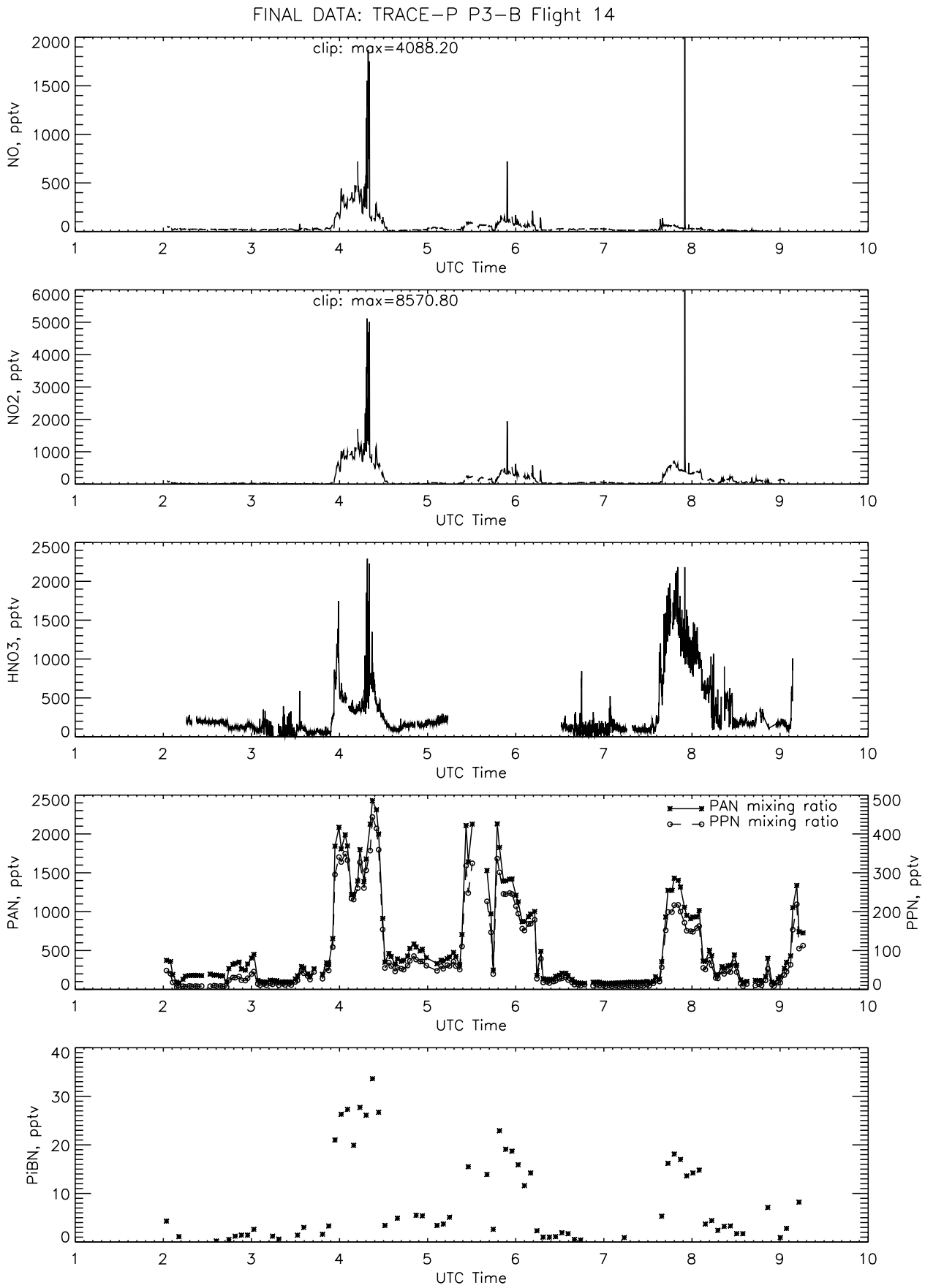
Surface Outflow to Yellow Sea;
Volcanic Plume

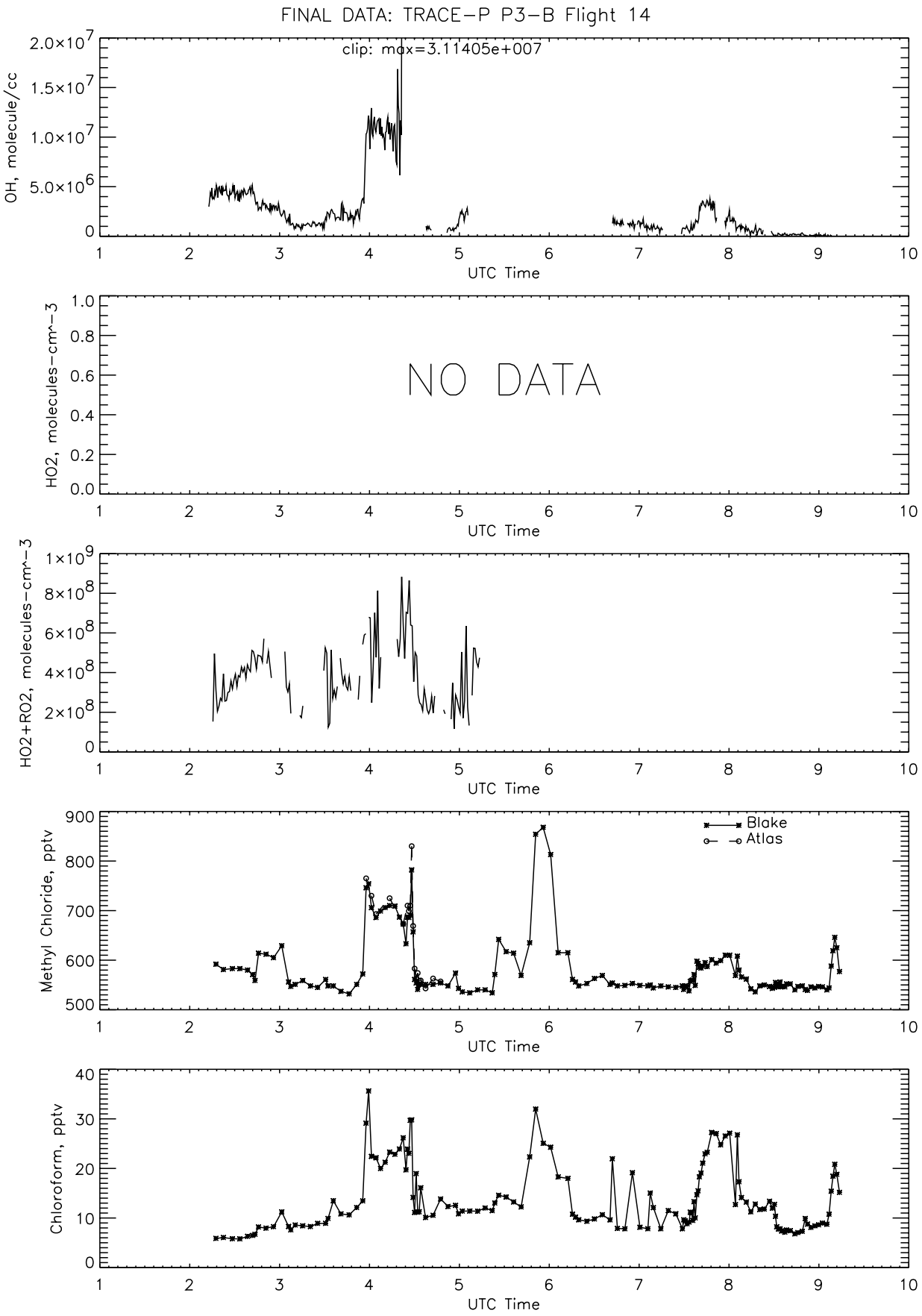
March 18, 2001

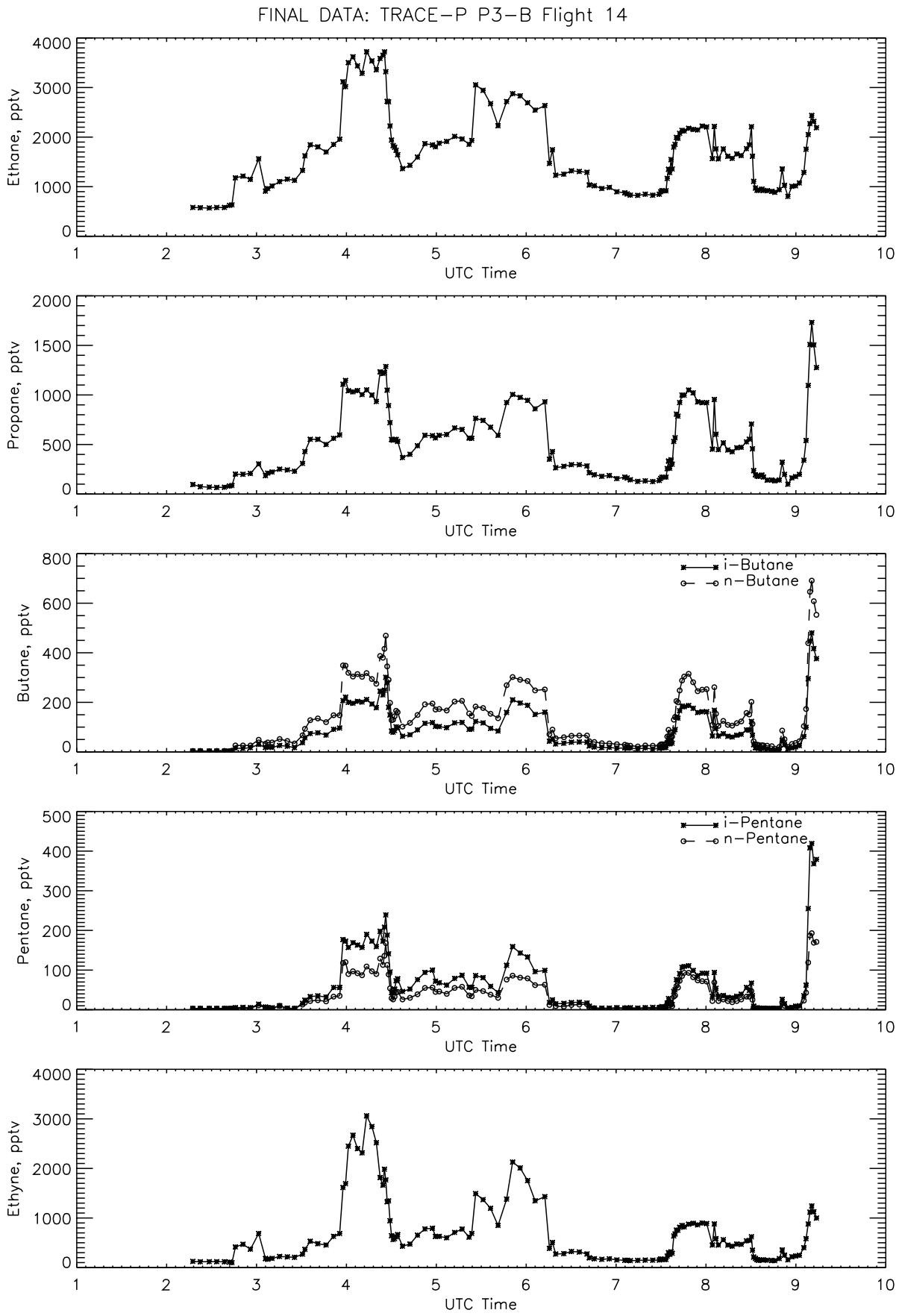
FINAL DATA: TRACE-P P3-B Flight 14

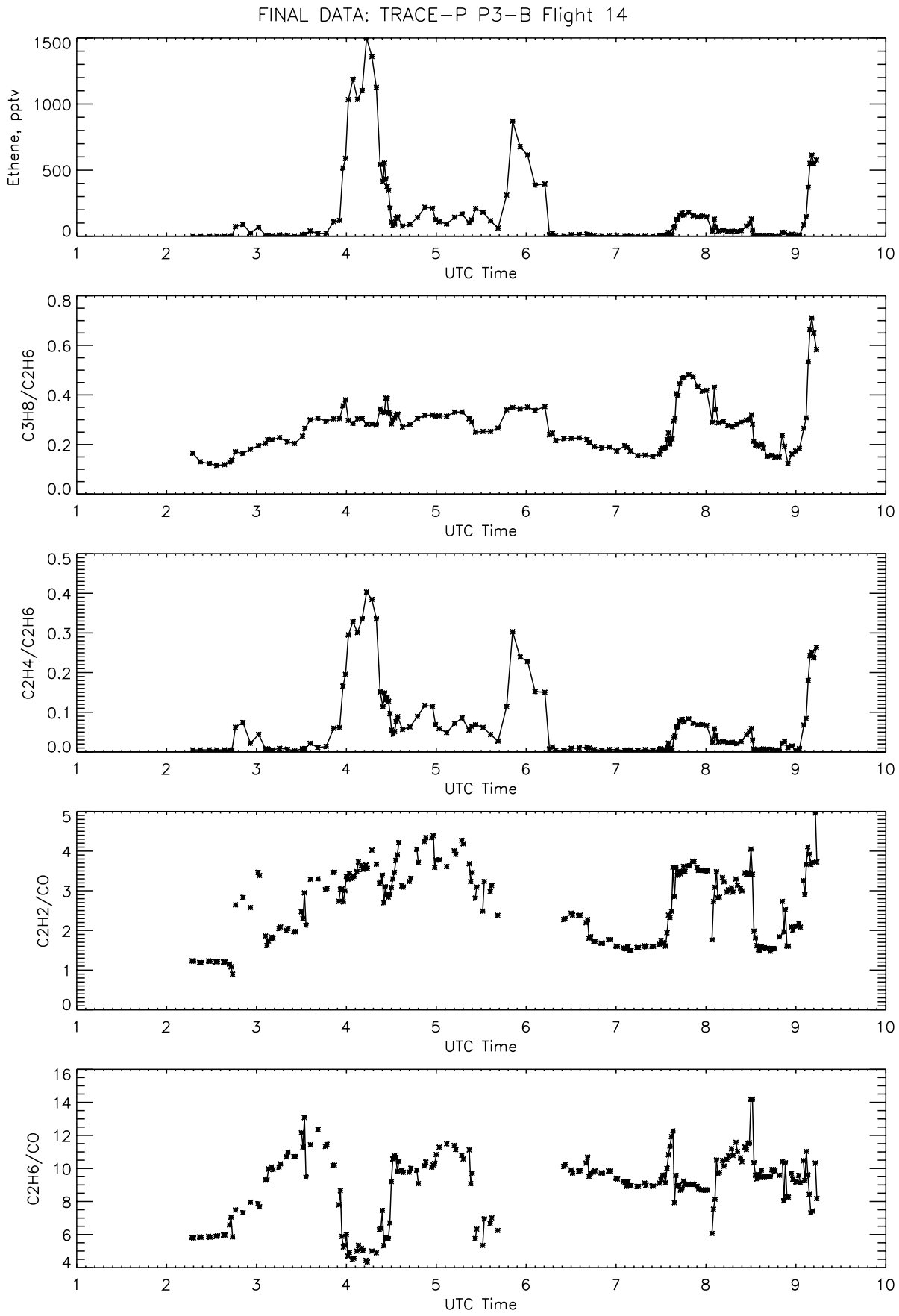



FINAL DATA: TRACE-P P3-B Flight 14
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=24742.5

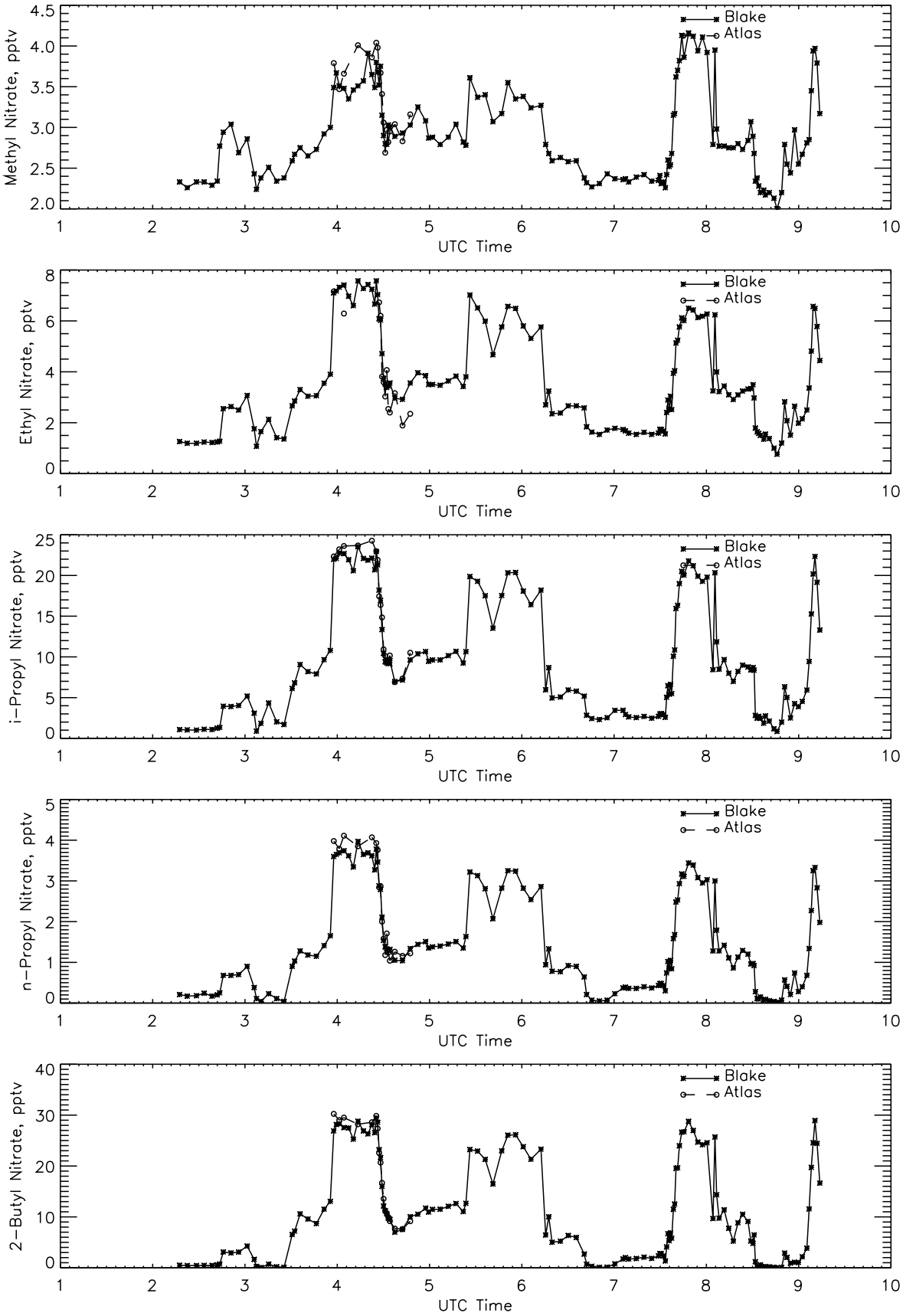

FINAL DATA: TRACE-P P3-B Flight 14
clip: max=4088.20
NO, pptv
UTC Time
clip: max=8570.80
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 14
clip: max=3.11405e+007
OH, molecule/cc
UTC Time
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv

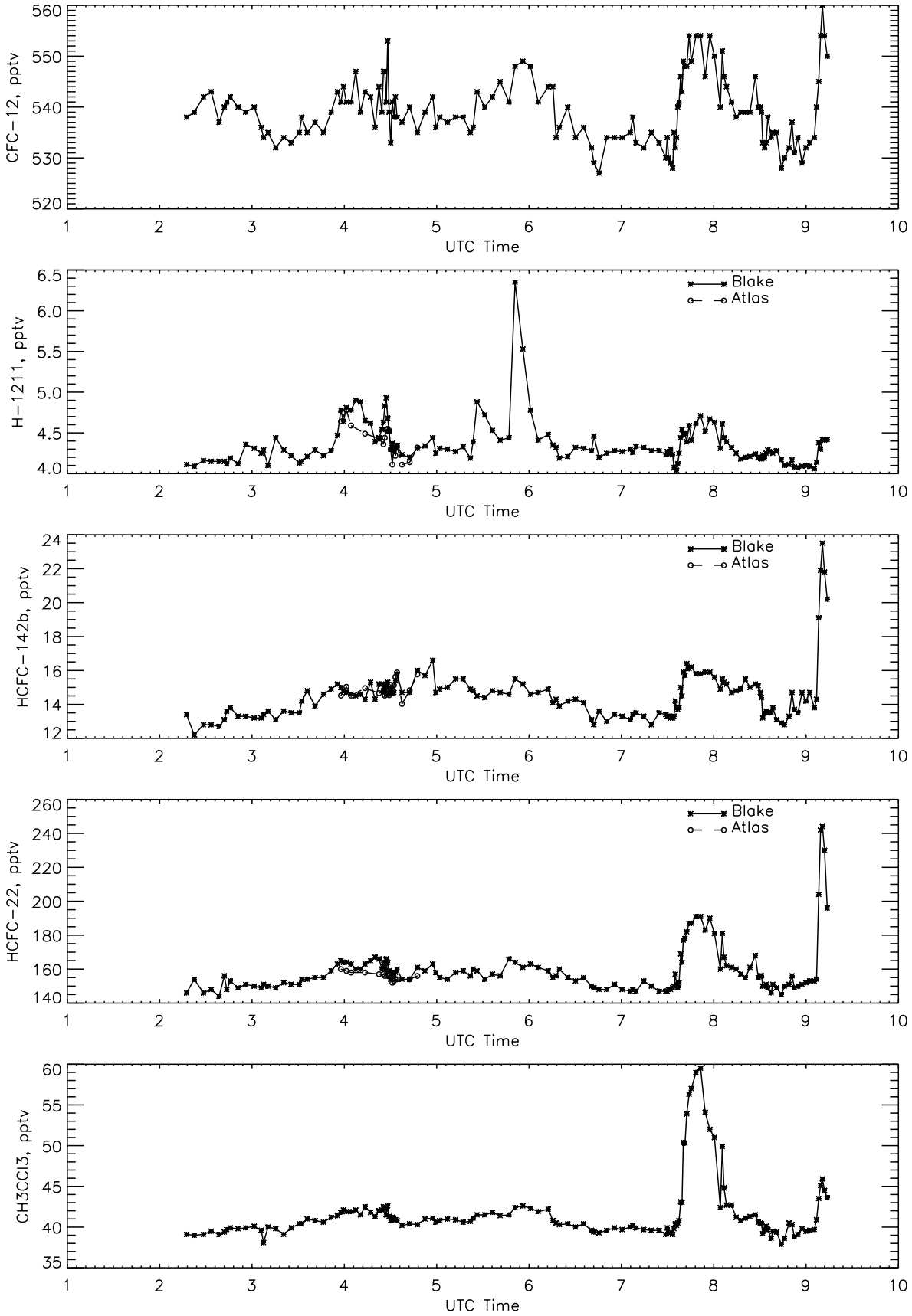

FINAL DATA: TRACE-P P3-B Flight 14
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 14
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

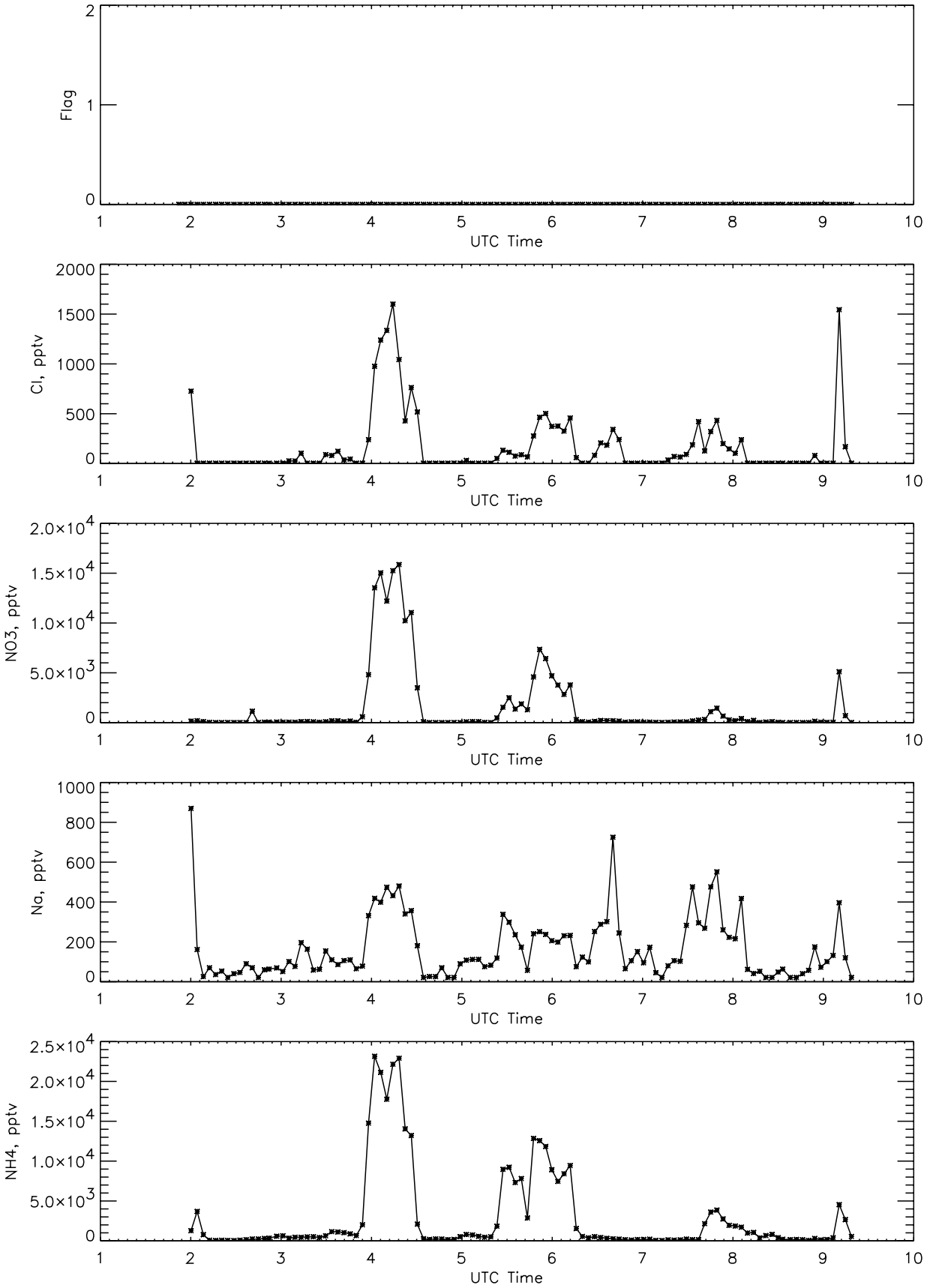
FINAL DATA: TRACE-P P3-B Flight 14

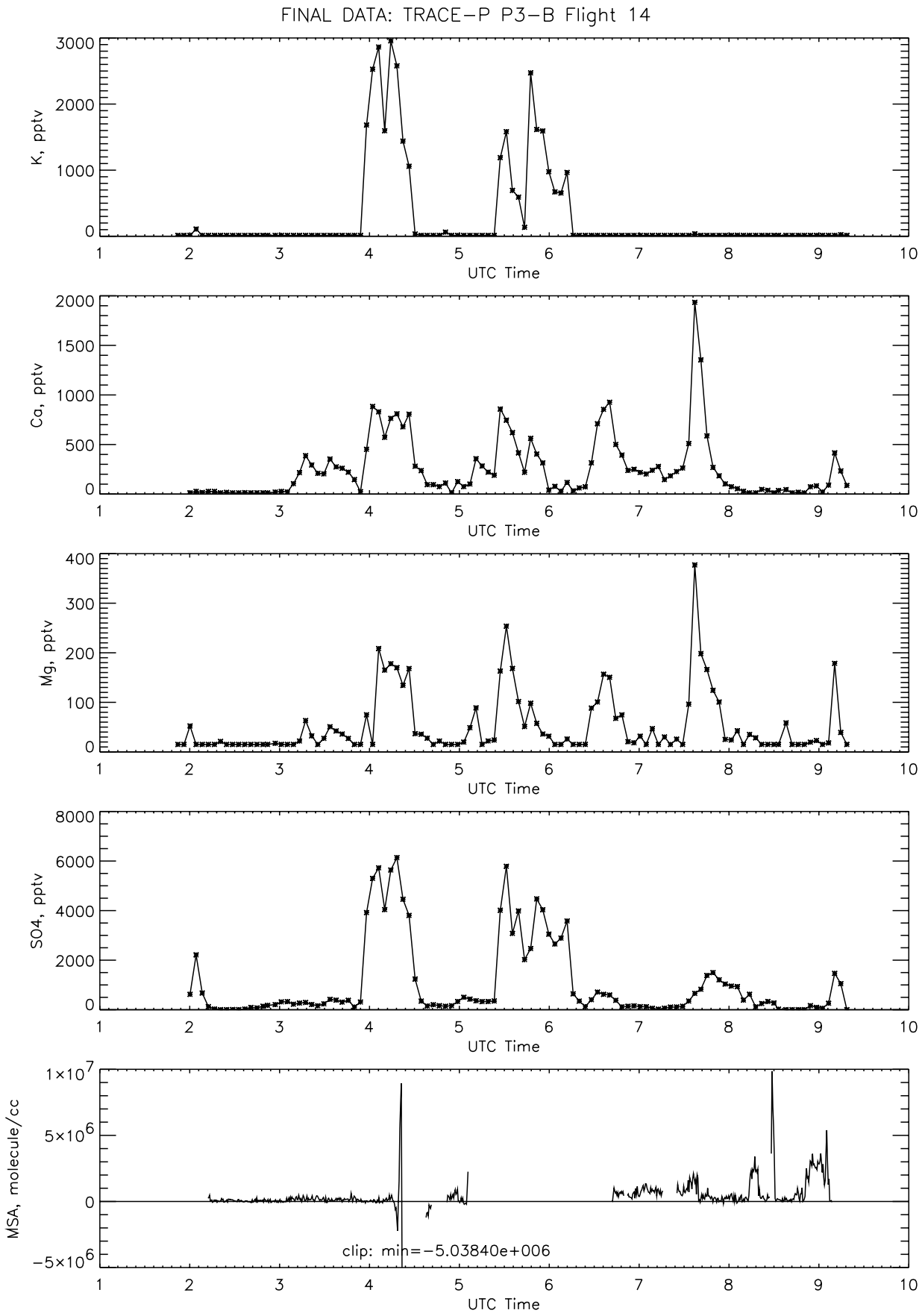


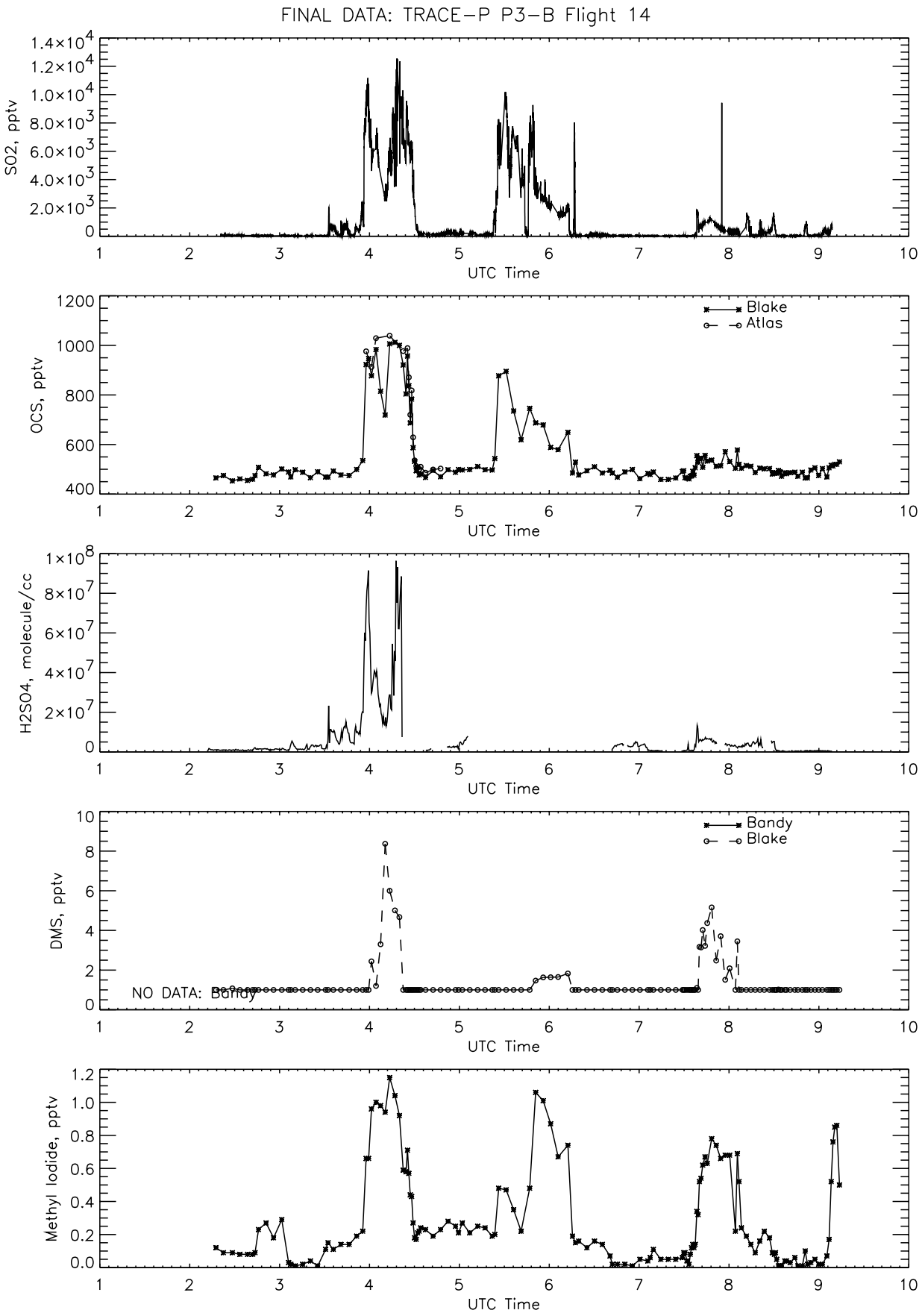
FINAL DATA: TRACE-P P3-B Flight 14

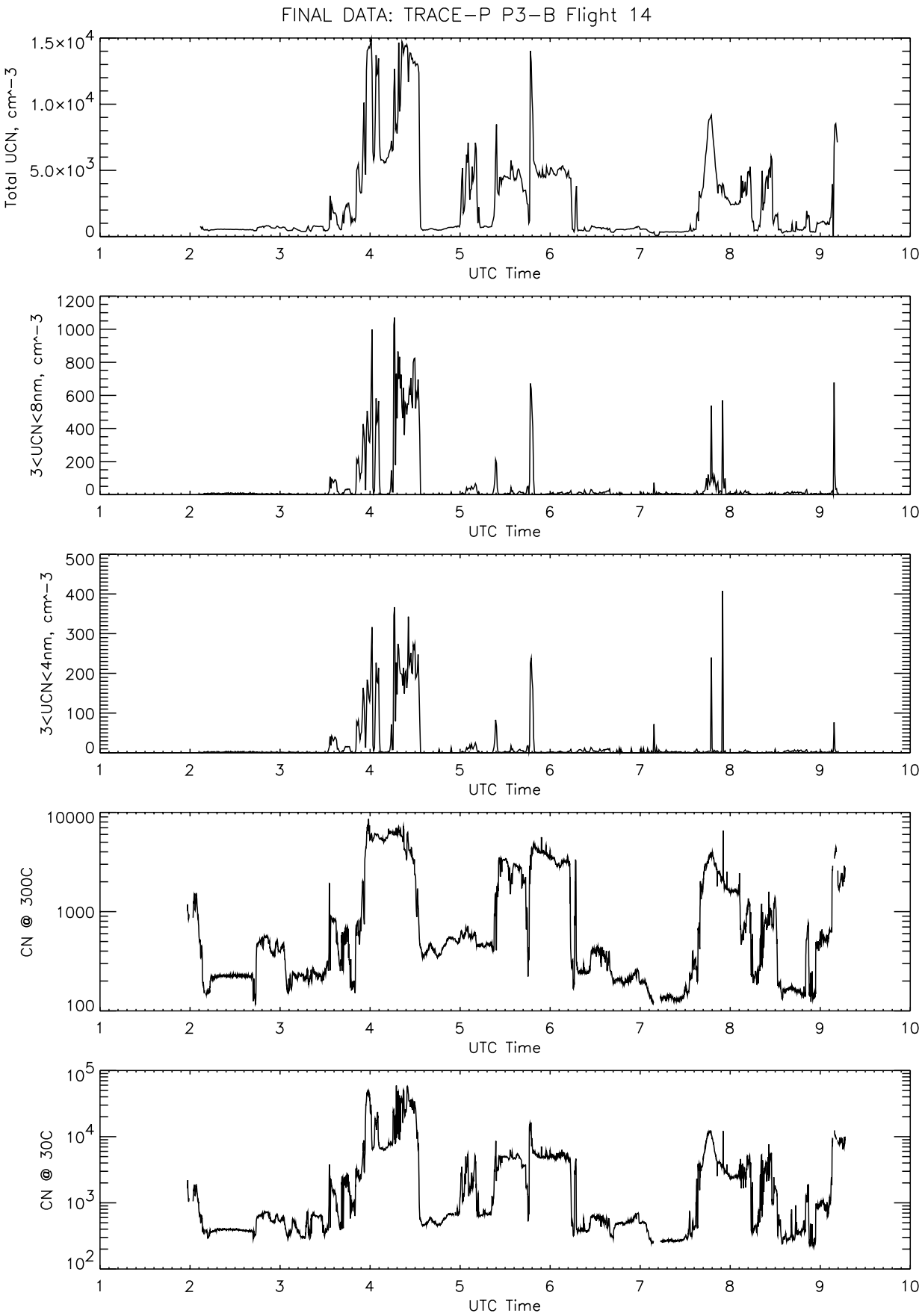


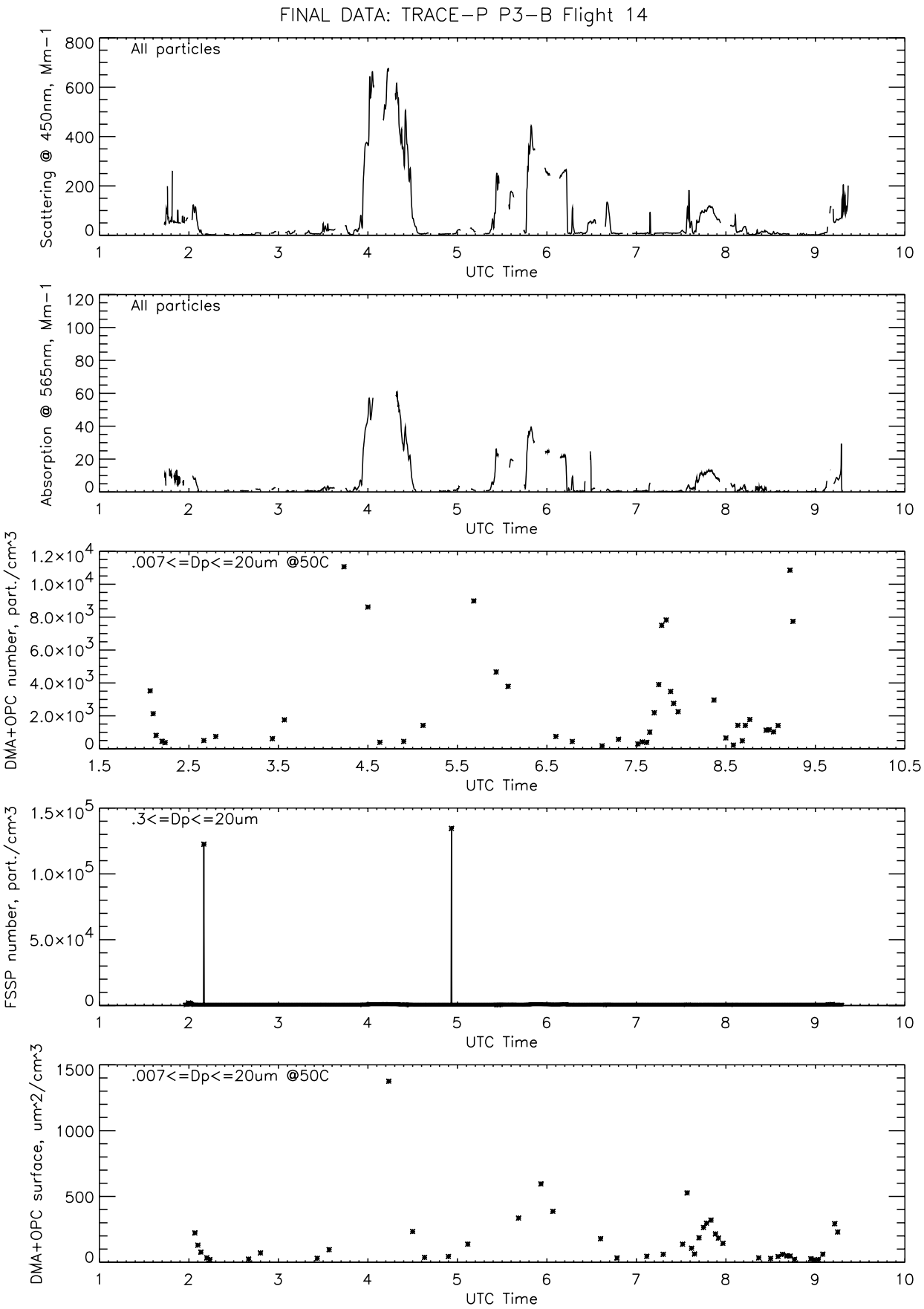
FINAL DATA: TRACE-P P3-B Flight 14

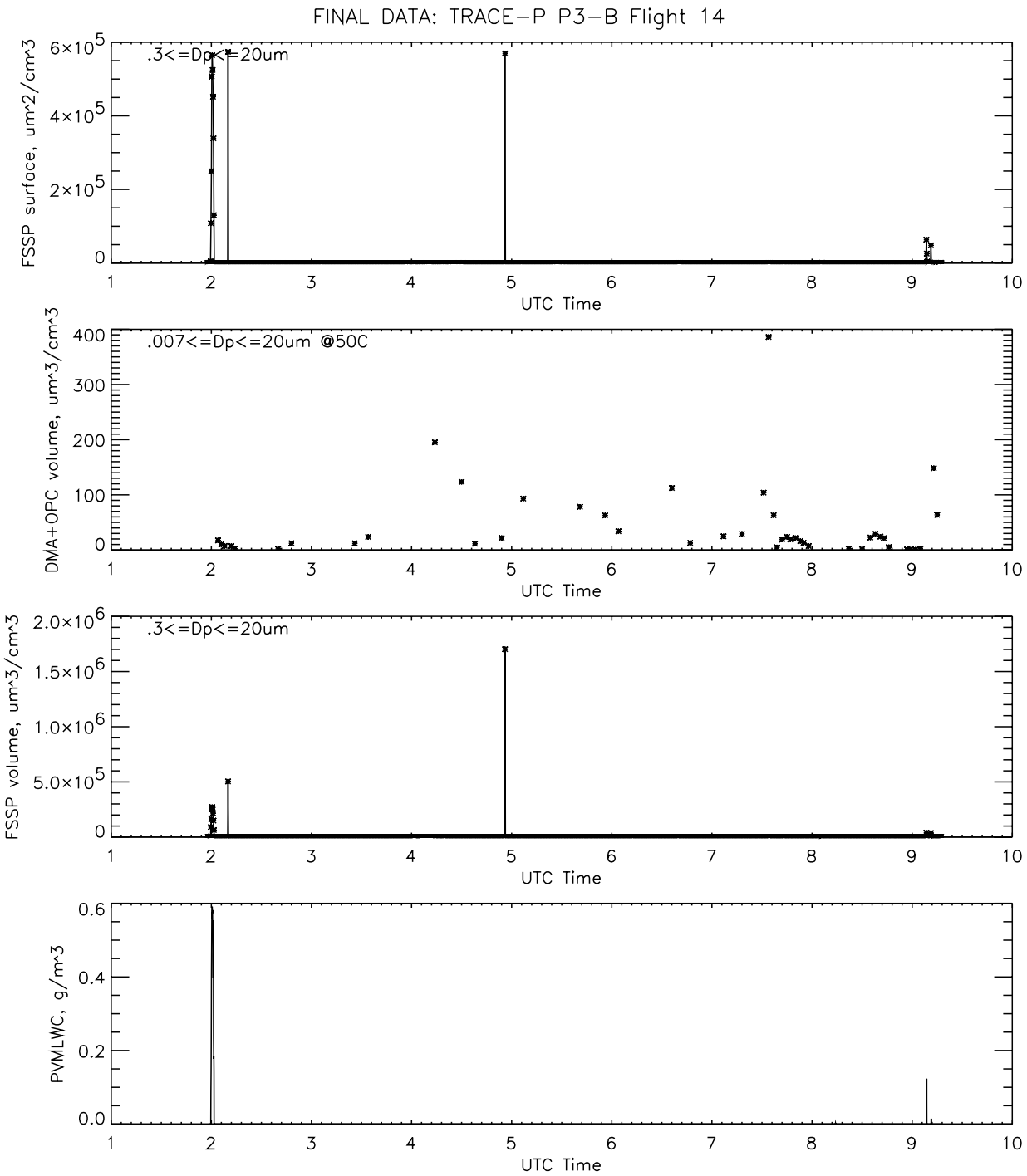



FINAL DATA: TRACE-P P3-B Flight 14
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time
clip: min=-5.03840e+006

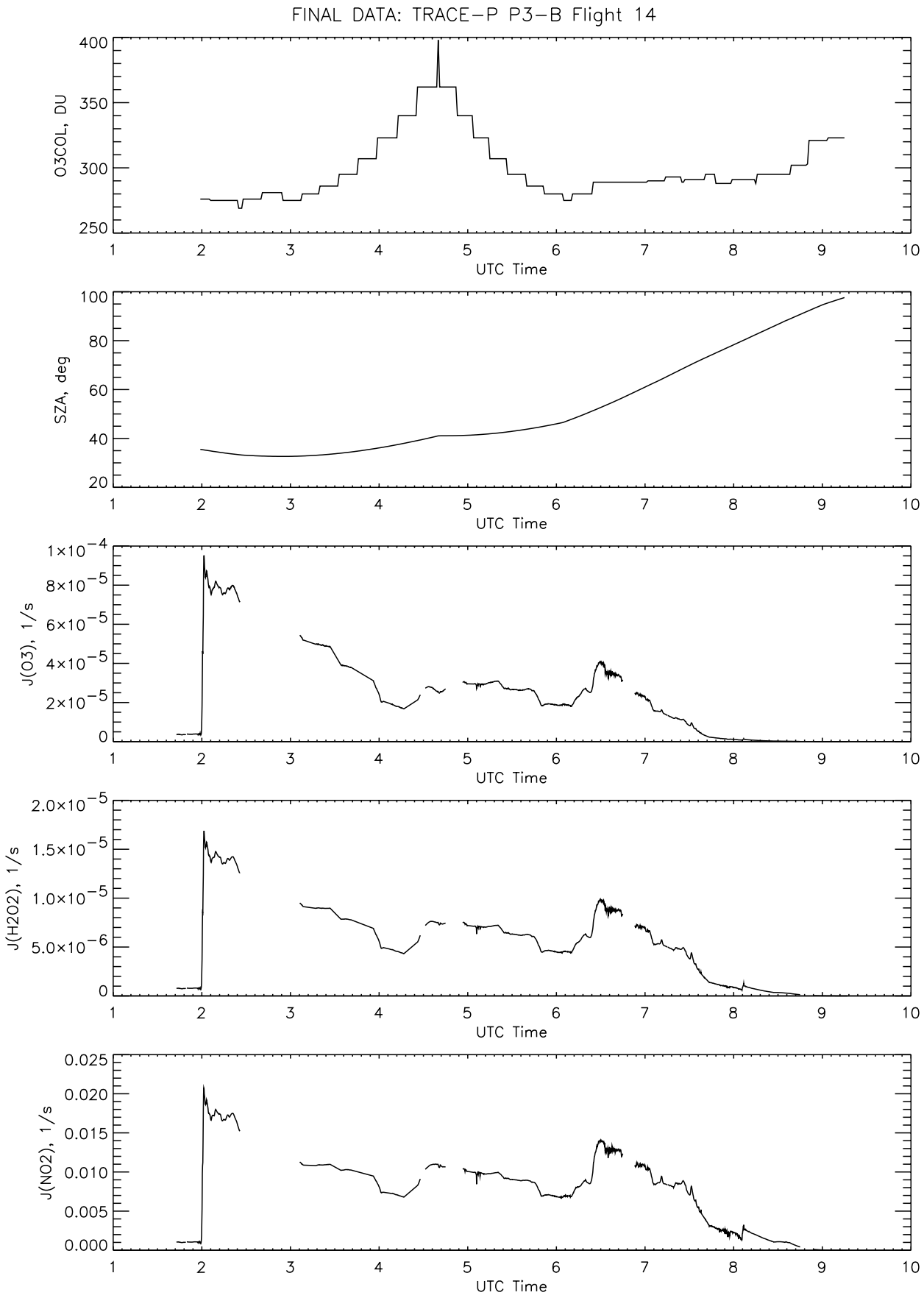

FINAL DATA: TRACE-P P3-B Flight 14
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

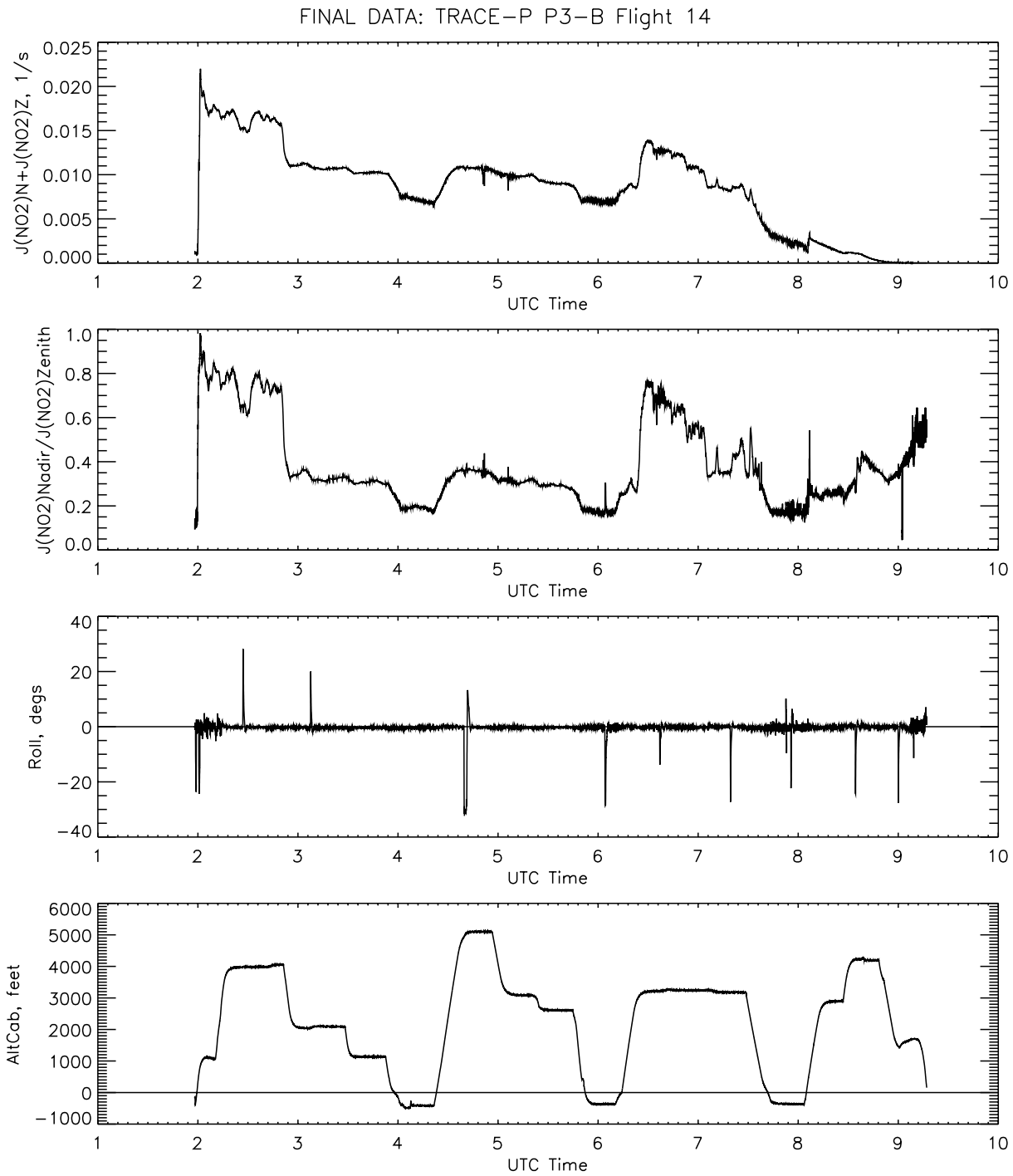

FINAL DATA: TRACE-P P3-B Flight 14
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

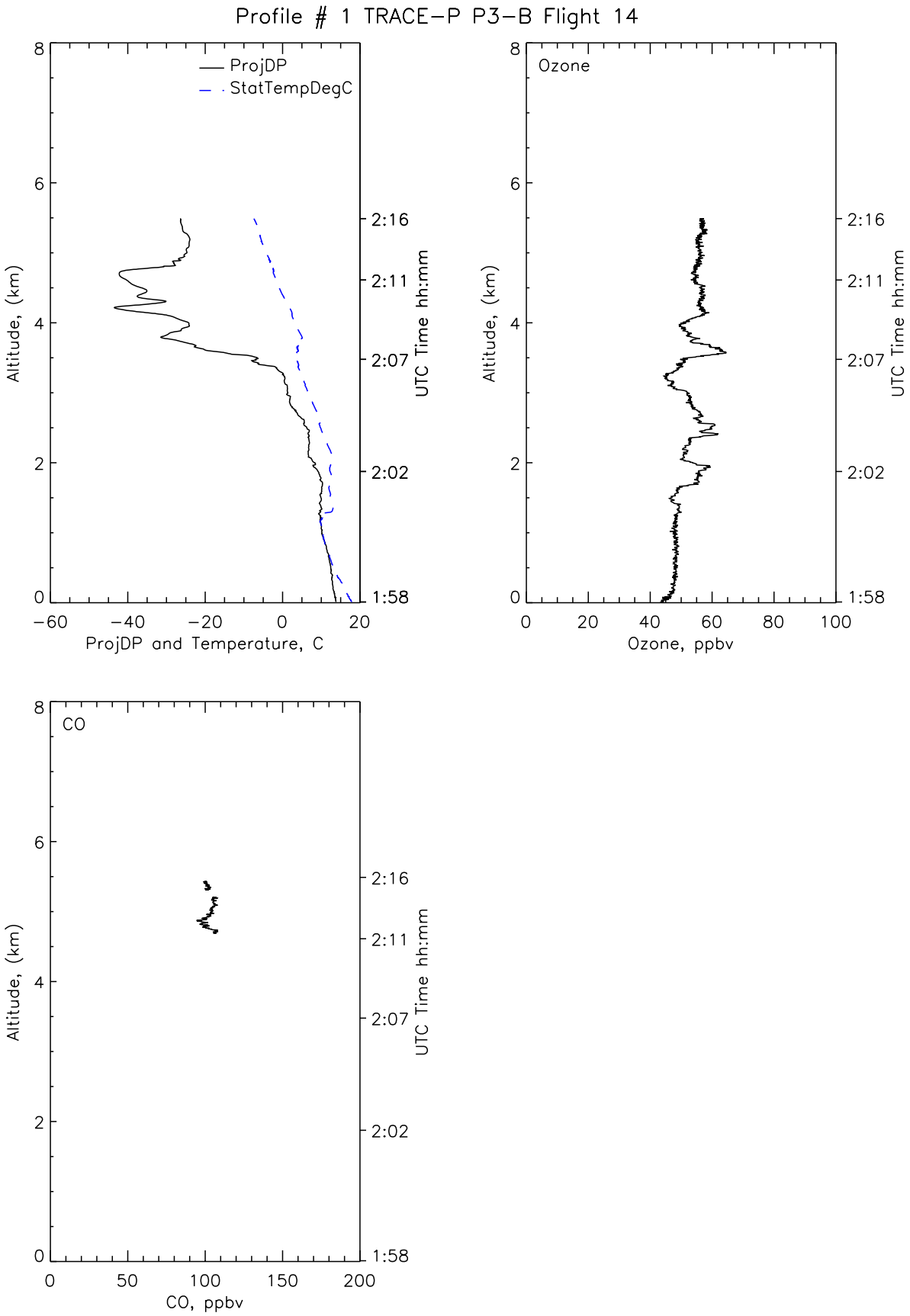

FINAL DATA: TRACE-P P3-B Flight 14
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 14
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

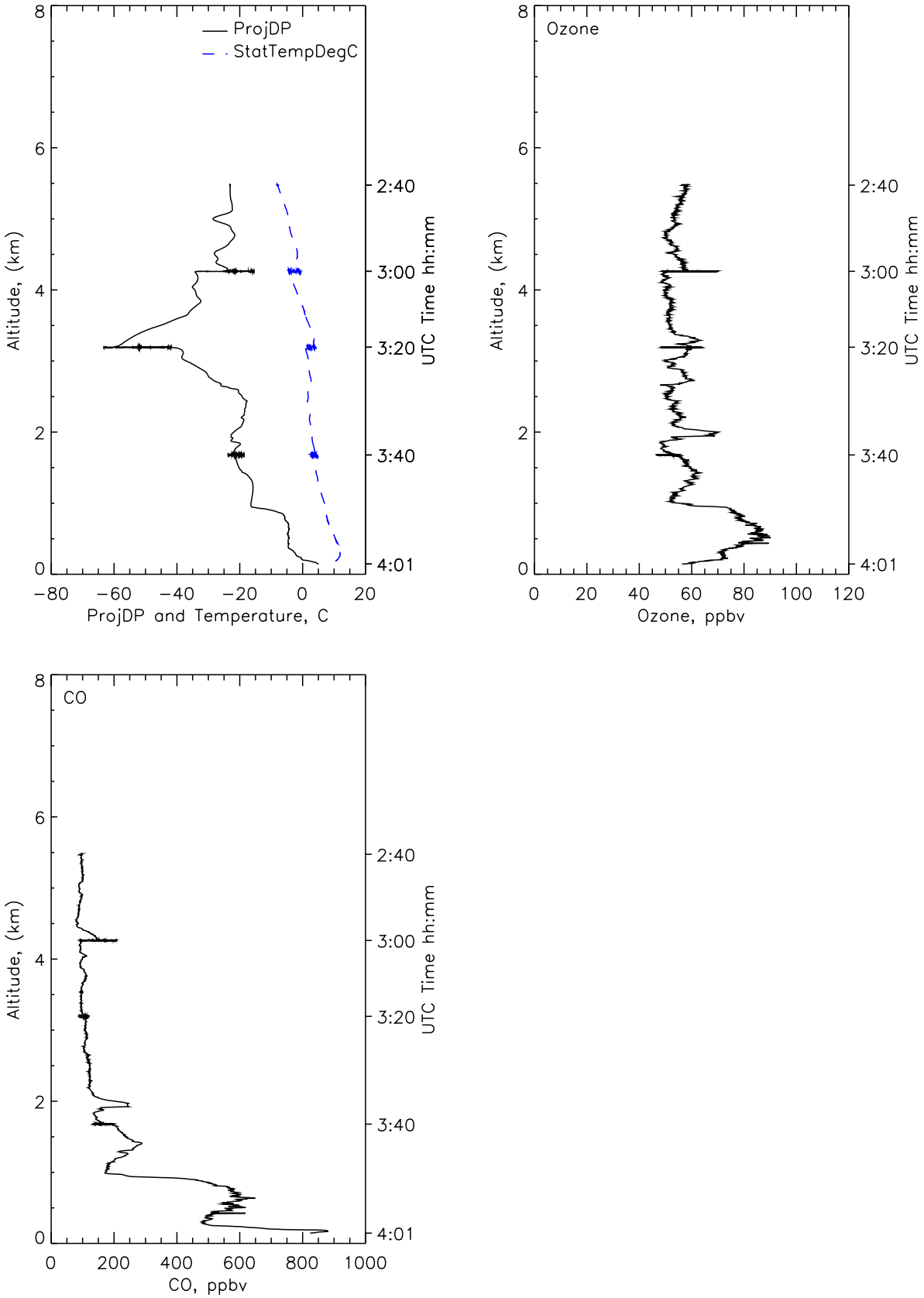
LEFT BLANK


FINAL DATA: TRACE-P P3-B Flight 14
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time

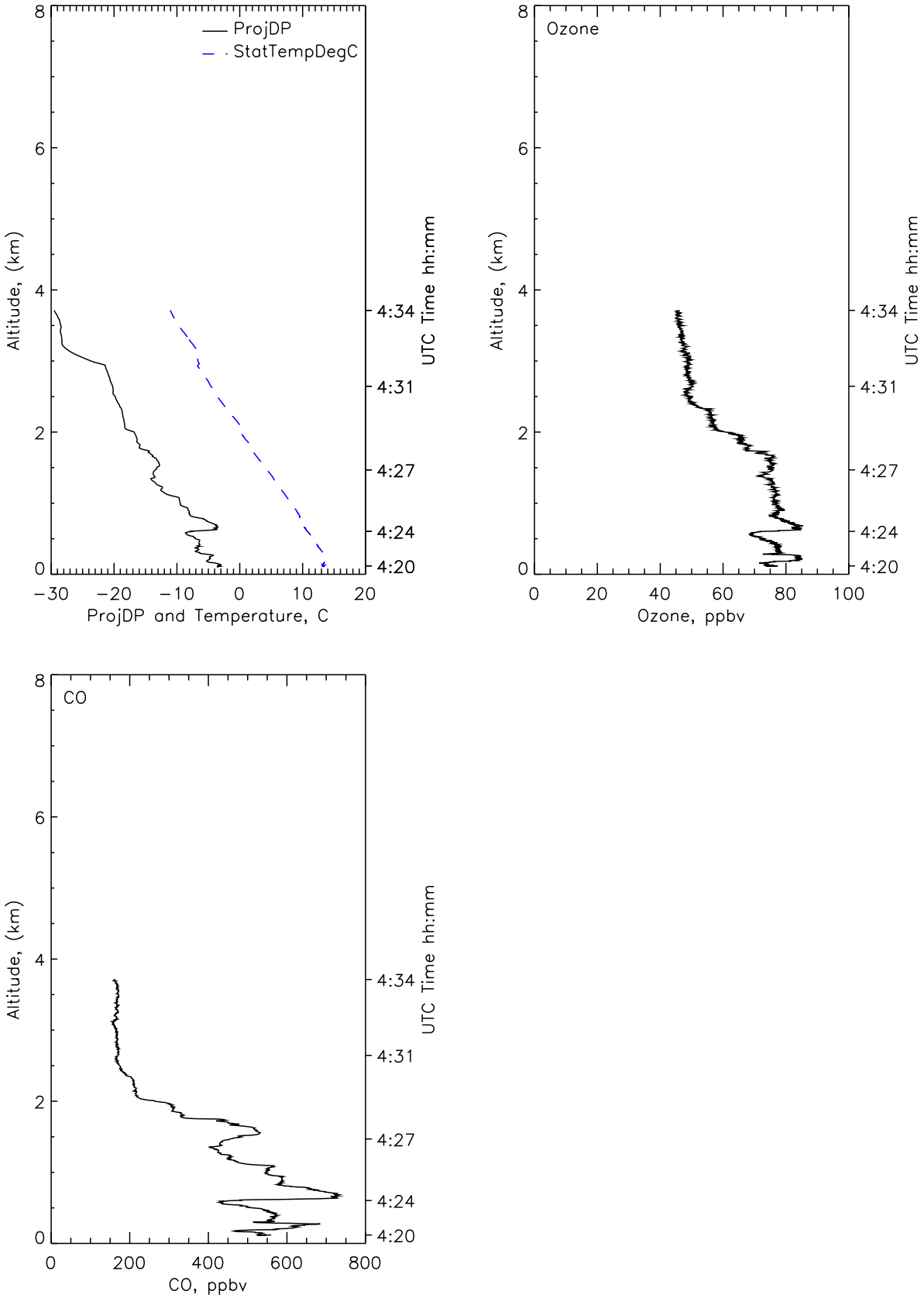

FINAL DATA: TRACE-P P3-B Flight 14
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
5000
4000
3000
2000
1000
0
−1000
UTC Time
1
2
3
4
5
6
7
8
9
10

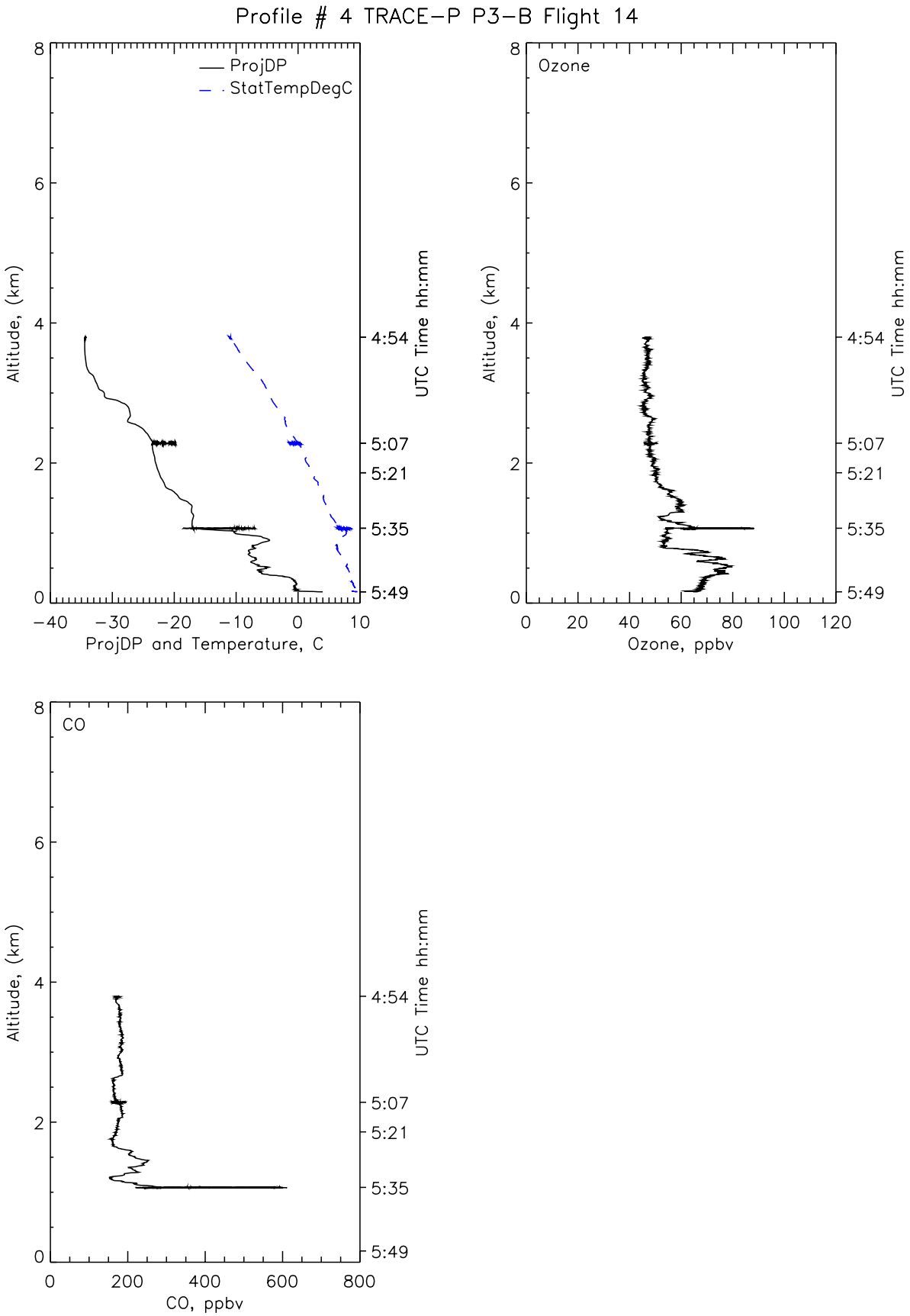

Profile # 1 TRACE-P P3-B Flight 14
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 2 TRACE-P P3-B Flight 14

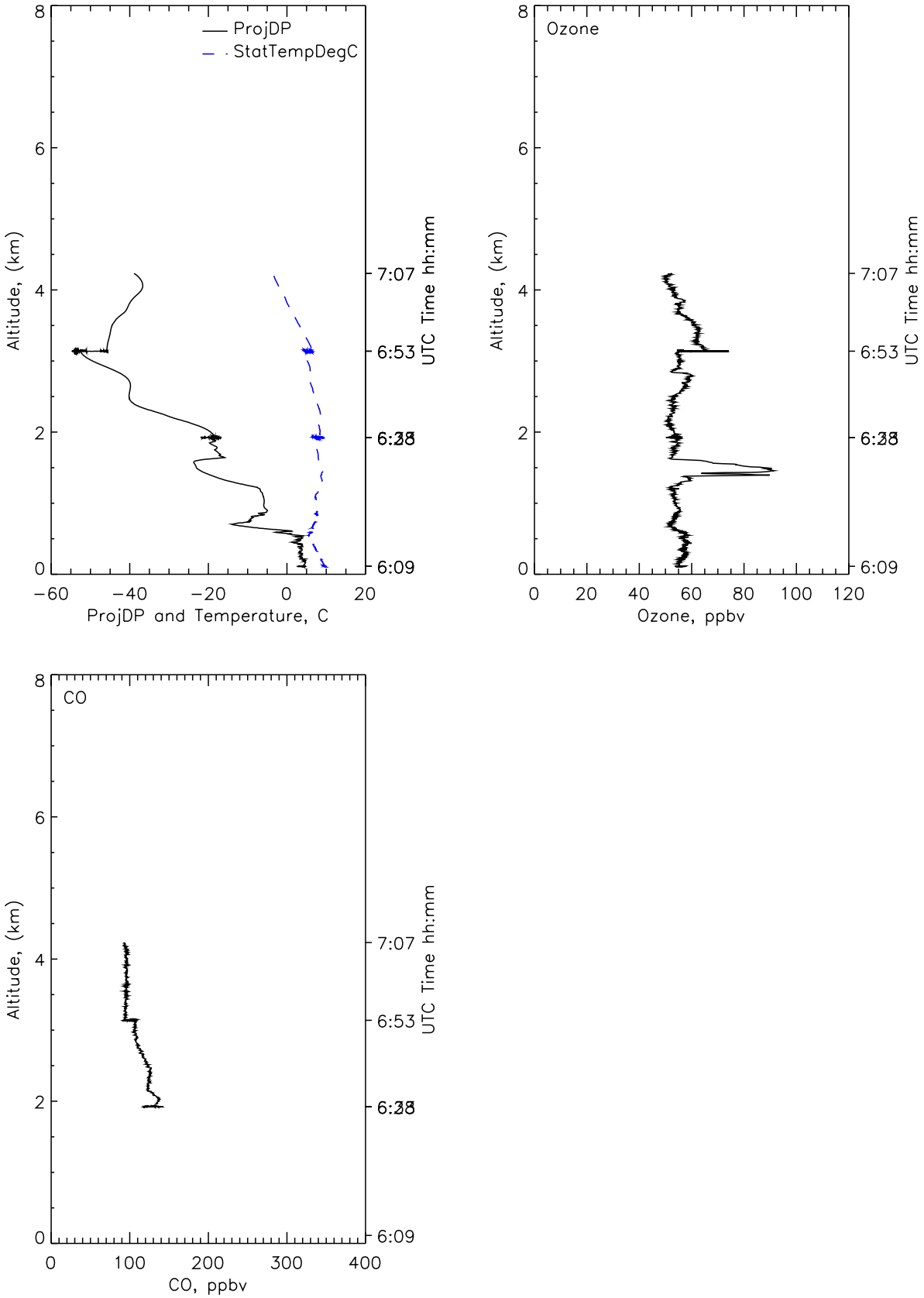


Profile # 3 TRACE-P P3-B Flight 14

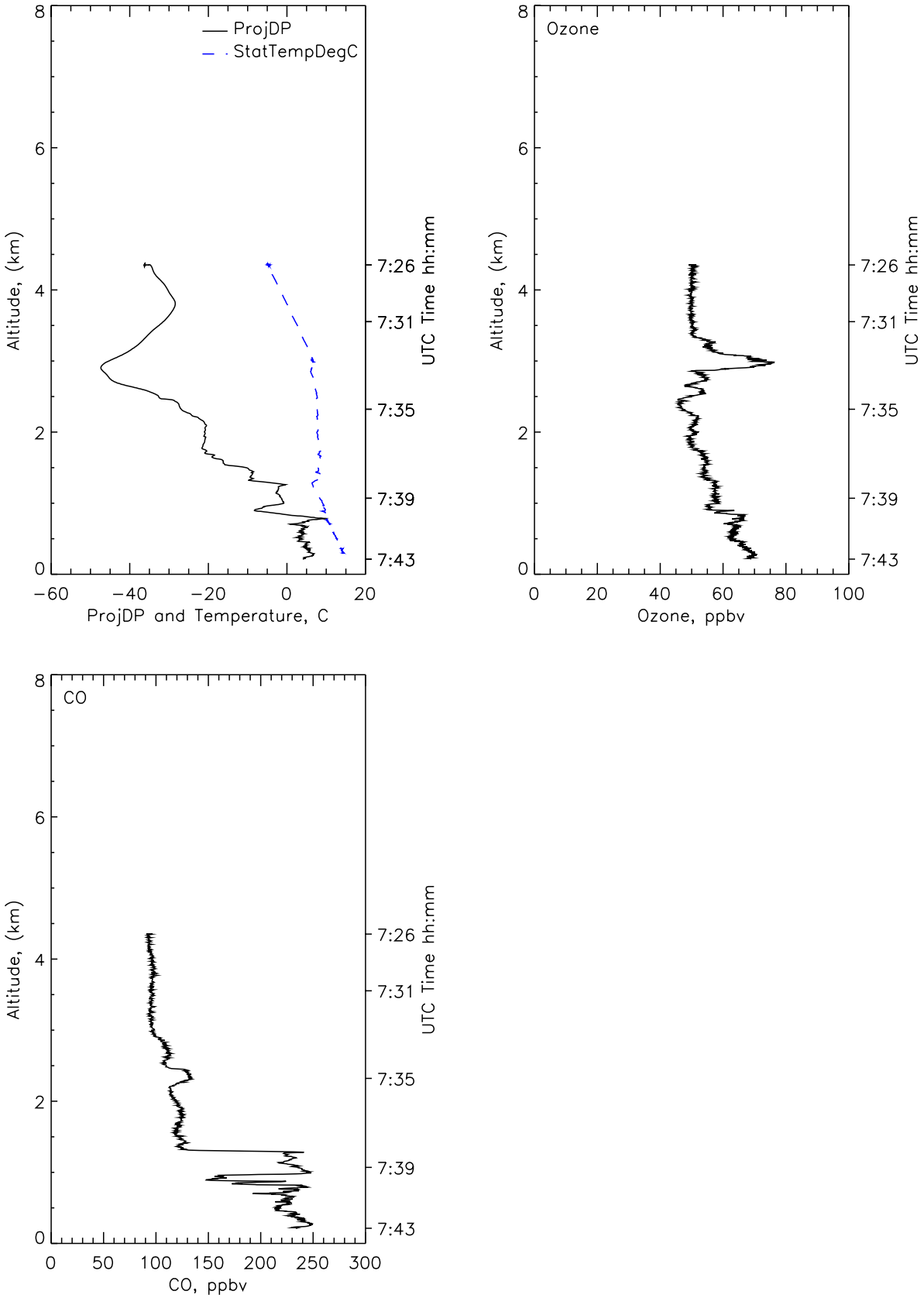


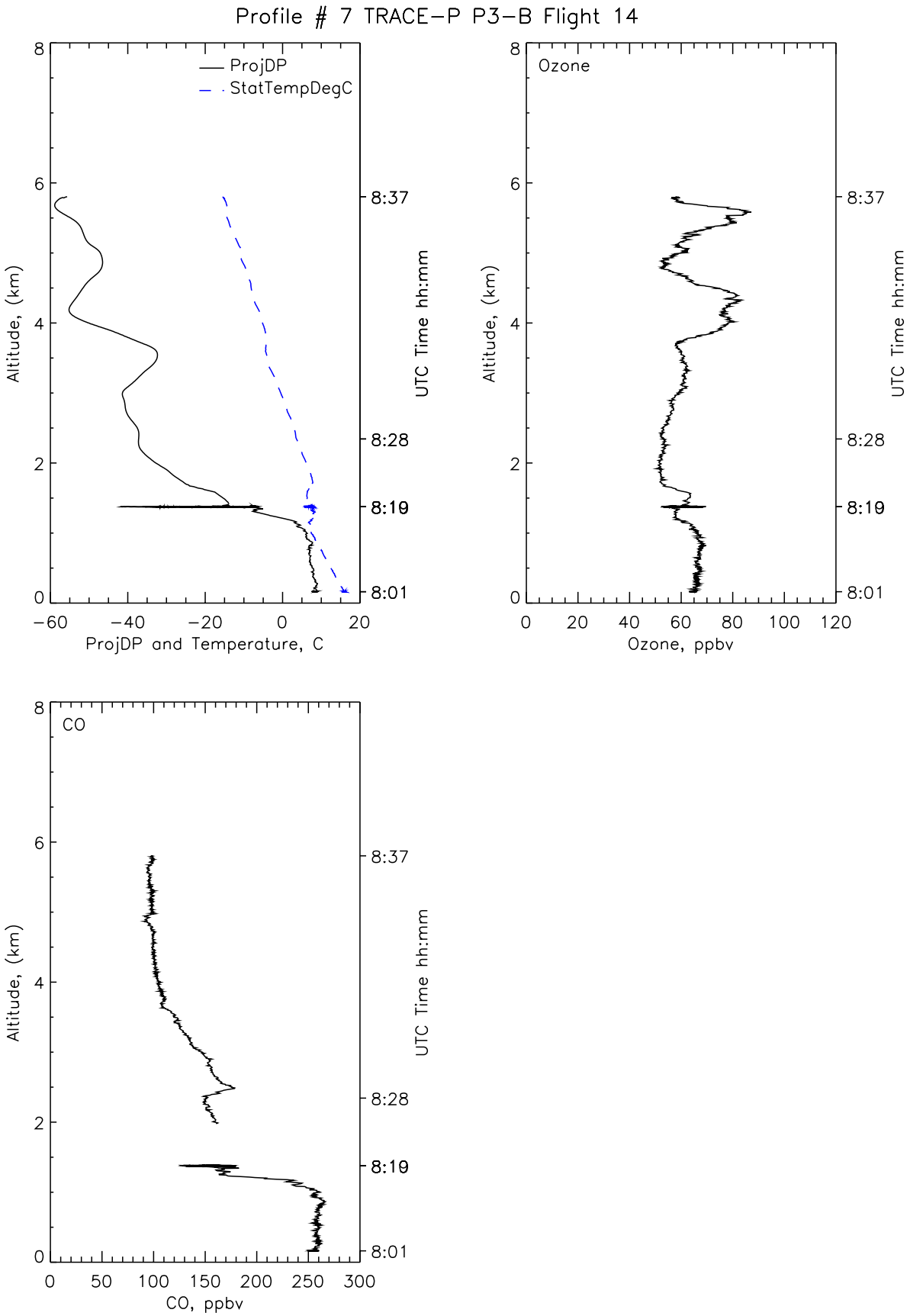

Profile # 4 TRACE-P P3-B Flight 14
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
4:54
5:07
5:21
5:35
5:49
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

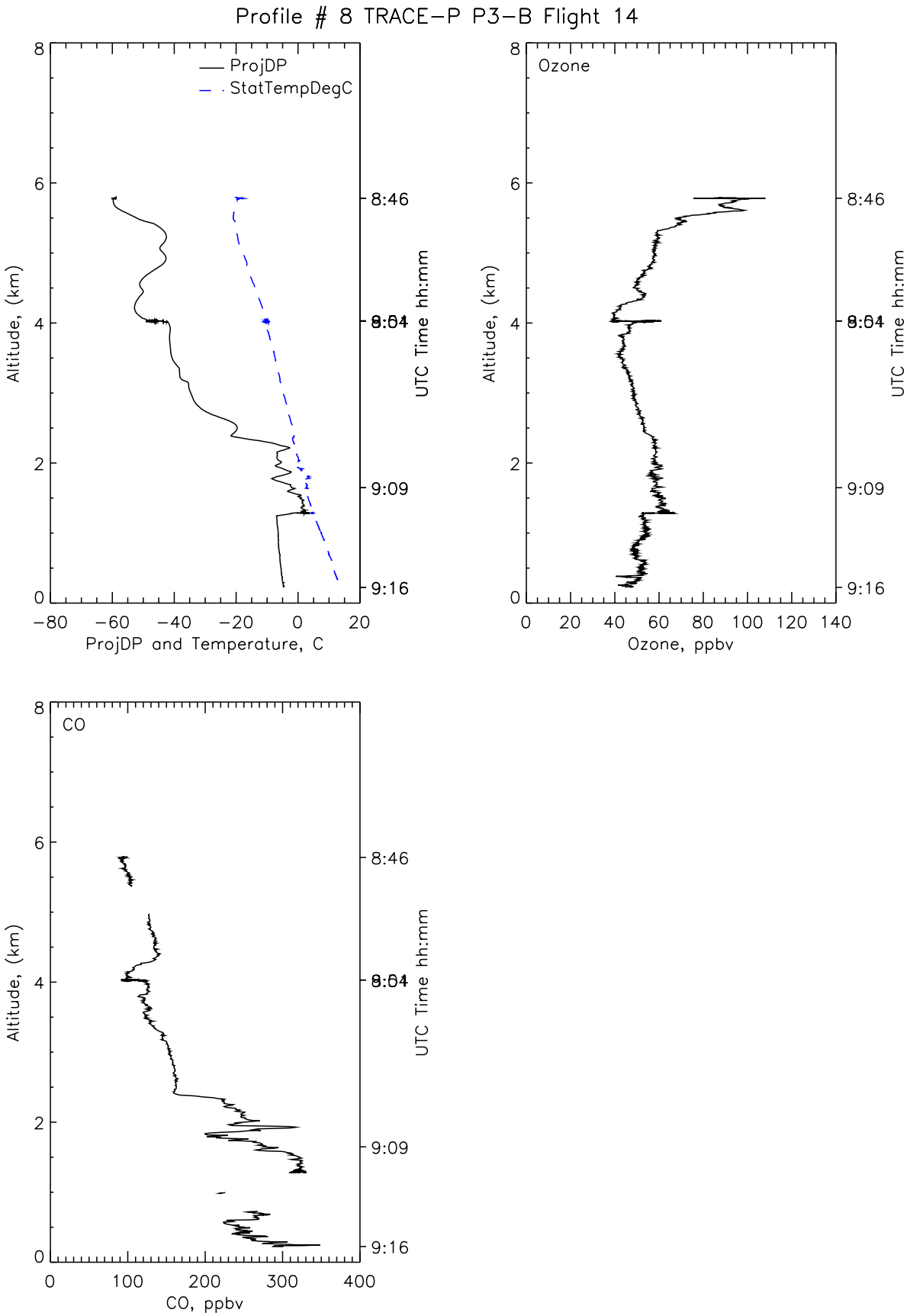
Profile # 5 TRACE-P P3-B Flight 14



Profile # 6 TRACE-P P3-B Flight 14




Profile # 7 TRACE-P P3-B Flight 14
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
8:37
8:28
8:19
8:01
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 8 TRACE-P P3-B Flight 14
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
8:46
8:54
9:09
9:16
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

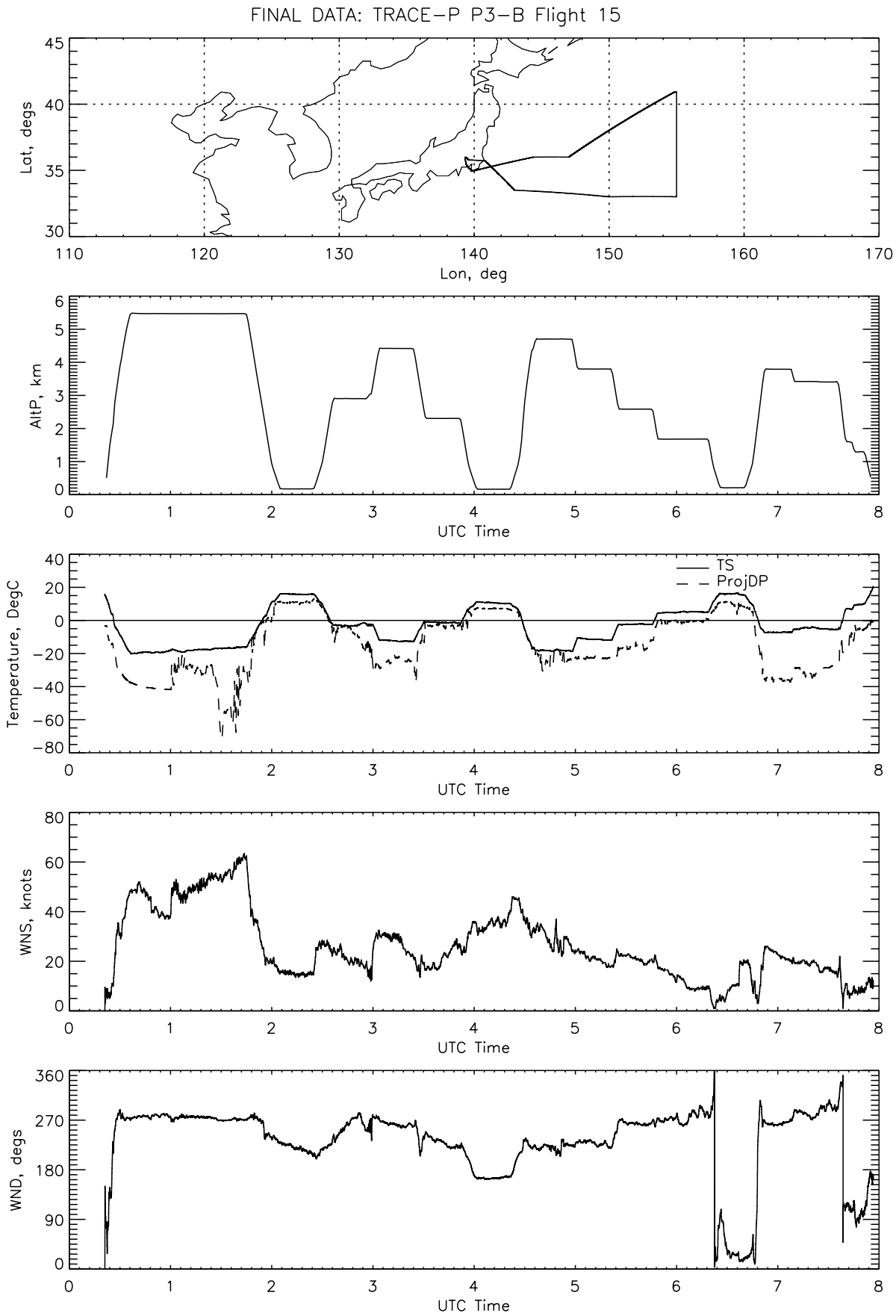
TRACE-P

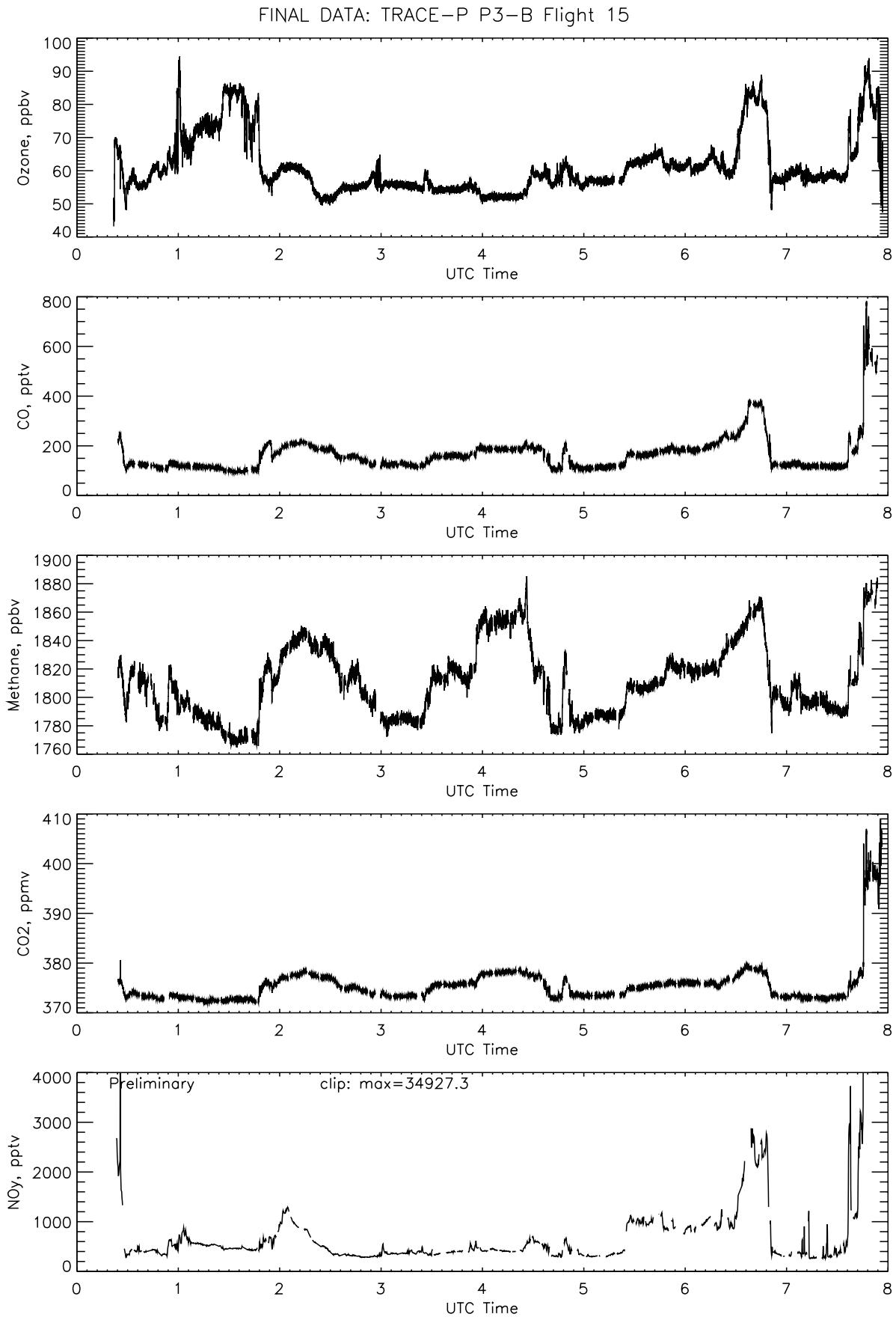
Flight 15P

Local: Yokota No. 1

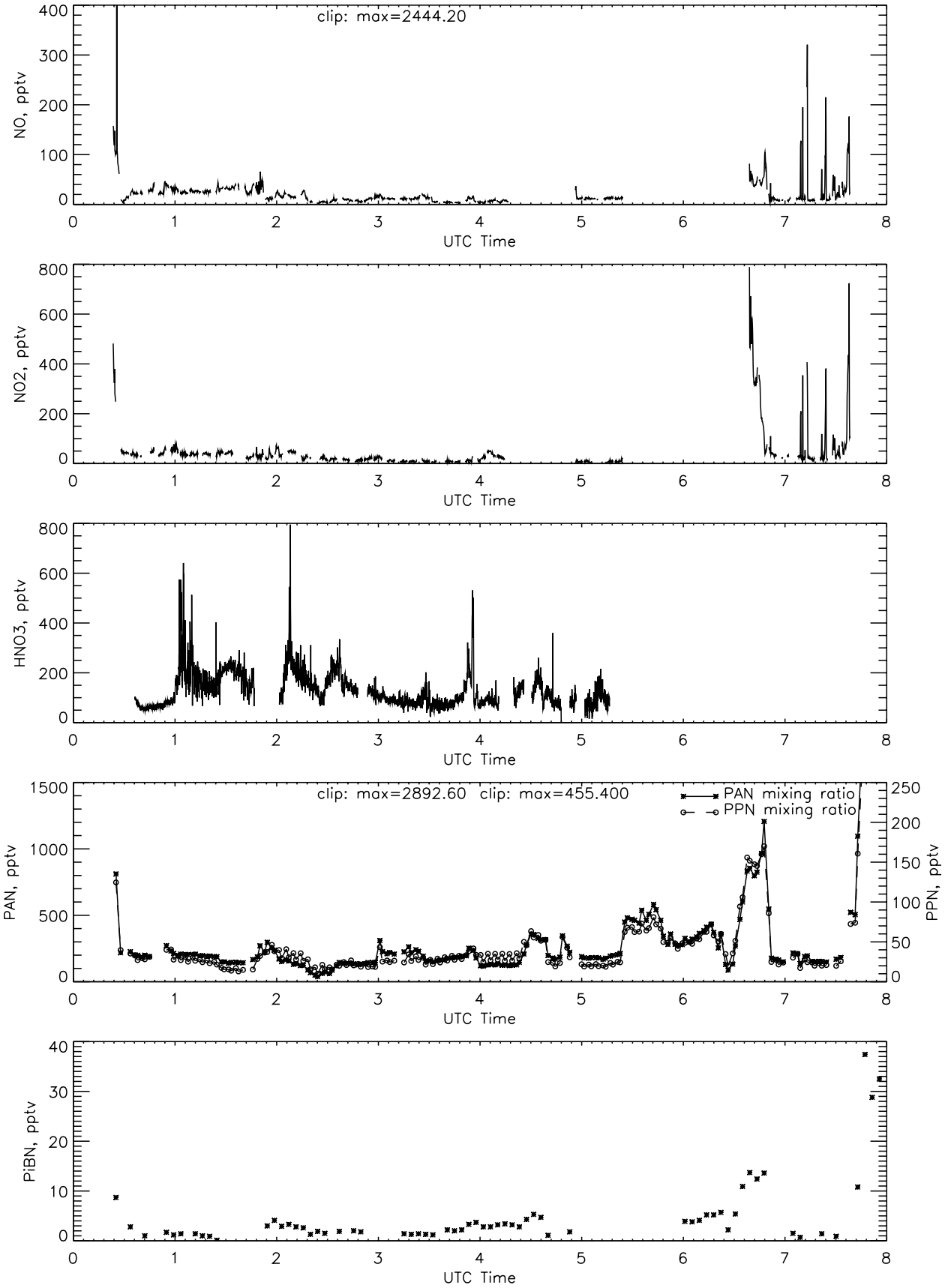
Frontal Boundary Profile

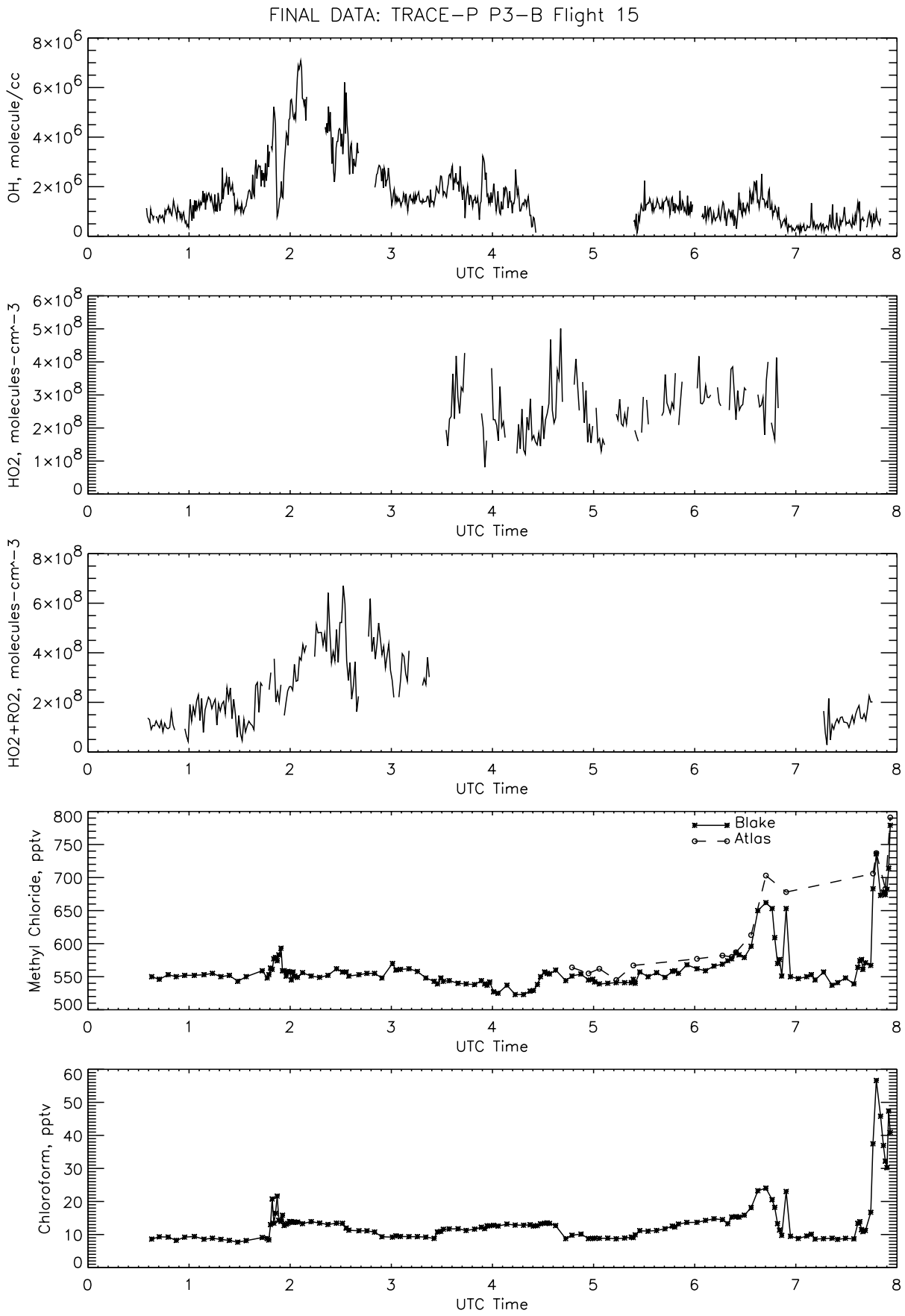
March 21, 2001


FINAL DATA: TRACE-P P3-B Flight 15
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

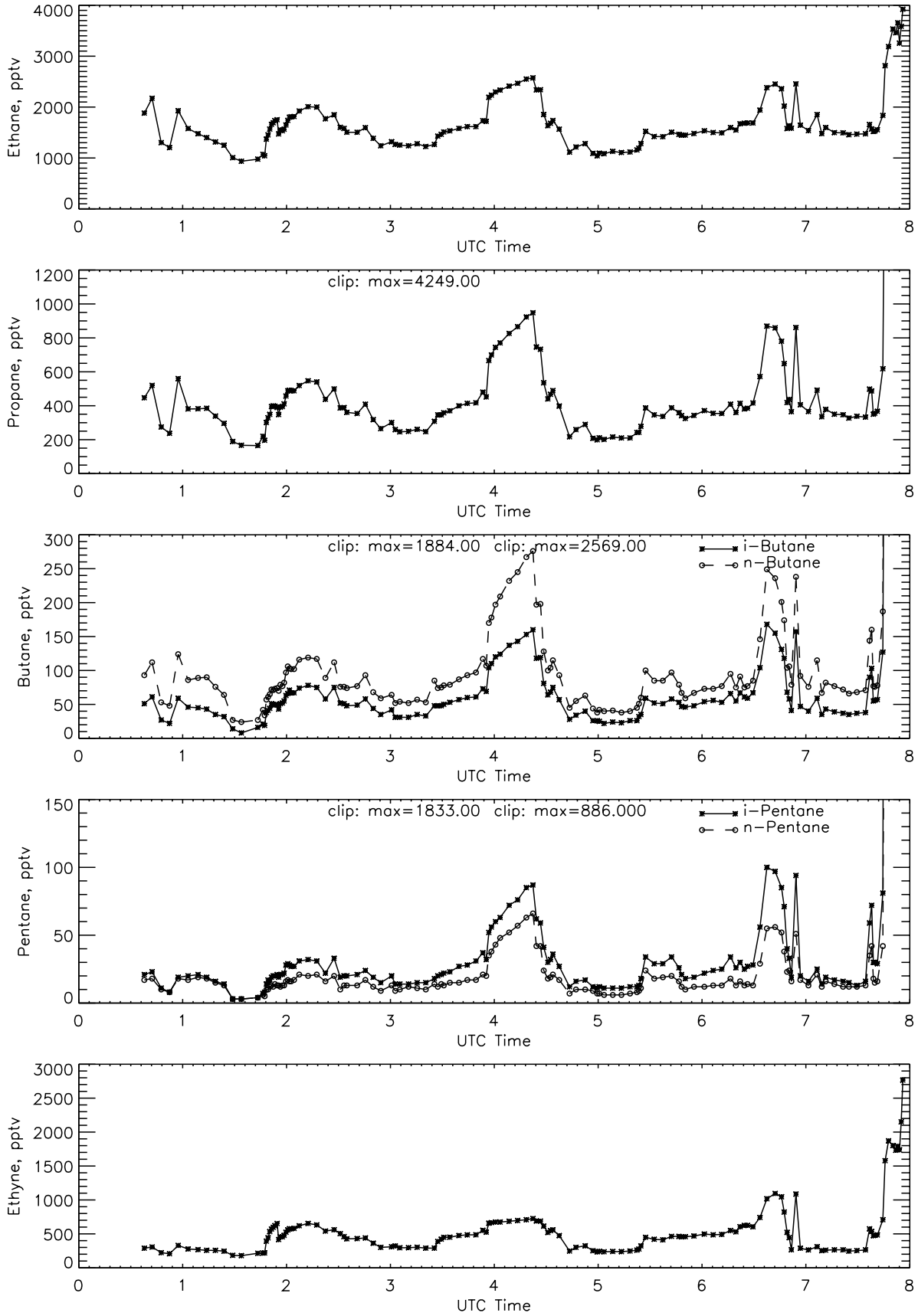

FINAL DATA: TRACE-P P3-B Flight 15
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
UTC Time
Preliminary
clip: max=34927.3

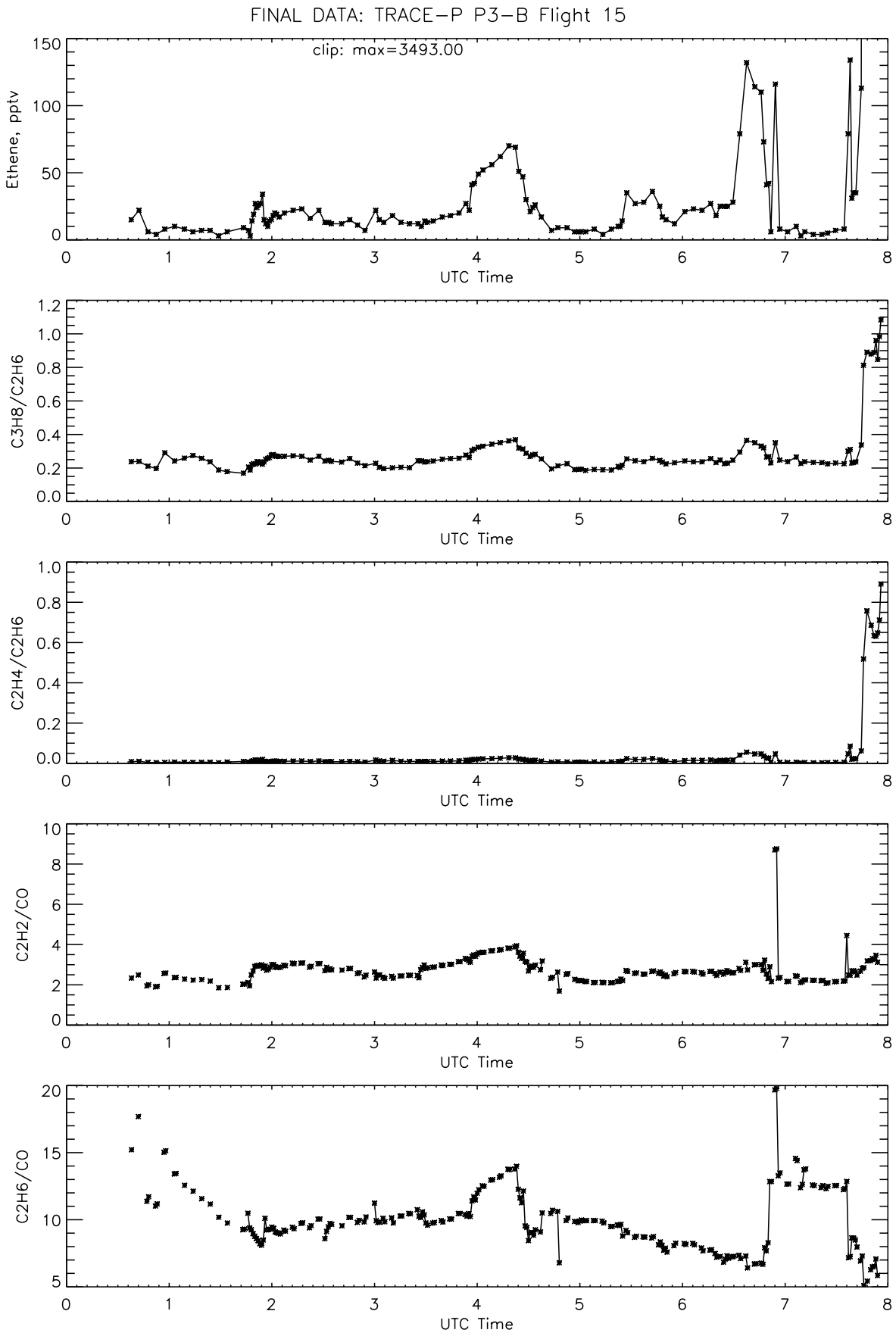
FINAL DATA: TRACE-P P3-B Flight 15

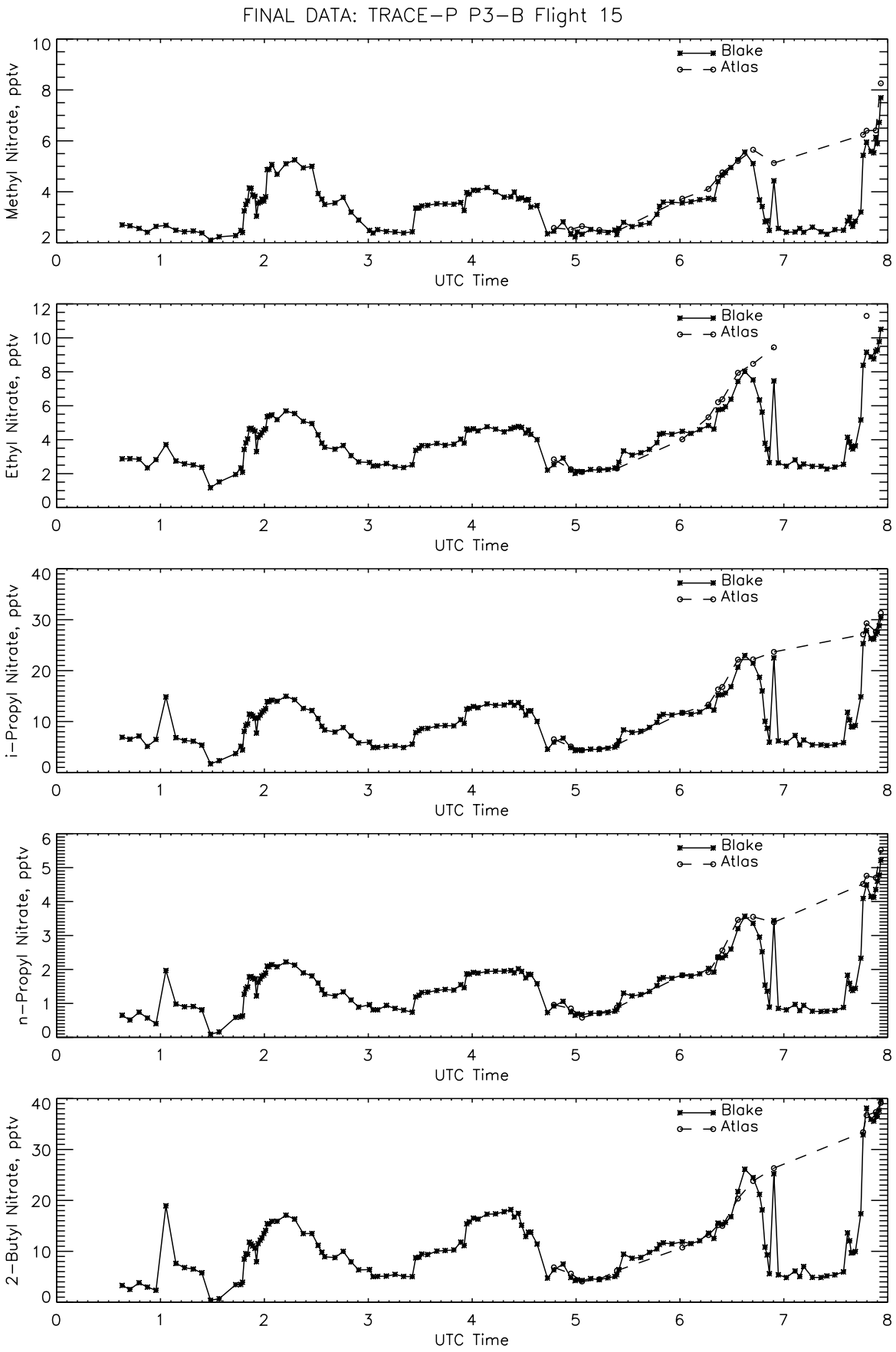



FINAL DATA: TRACE-P P3-B Flight 15
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

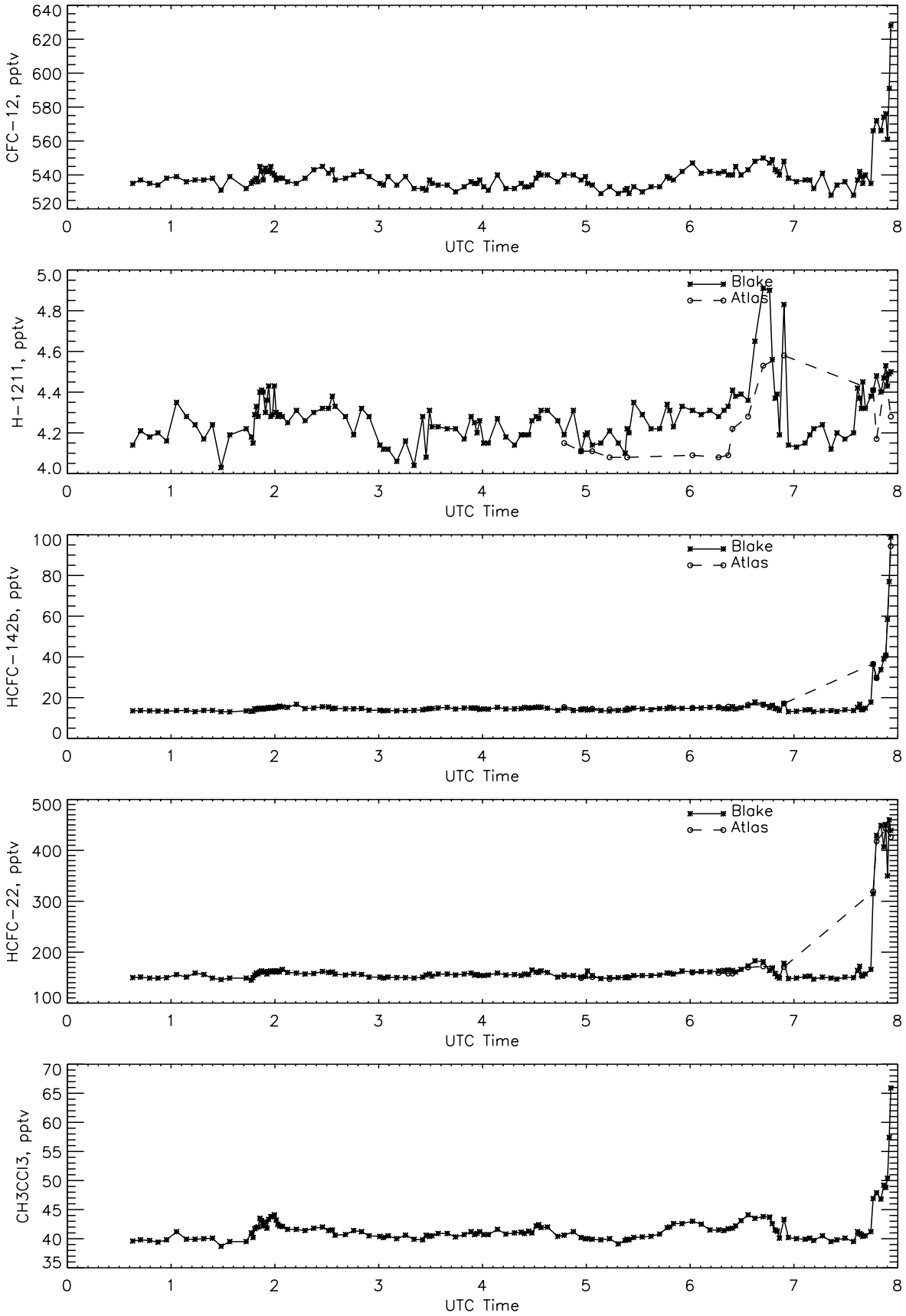
FINAL DATA: TRACE-P P3-B Flight 15



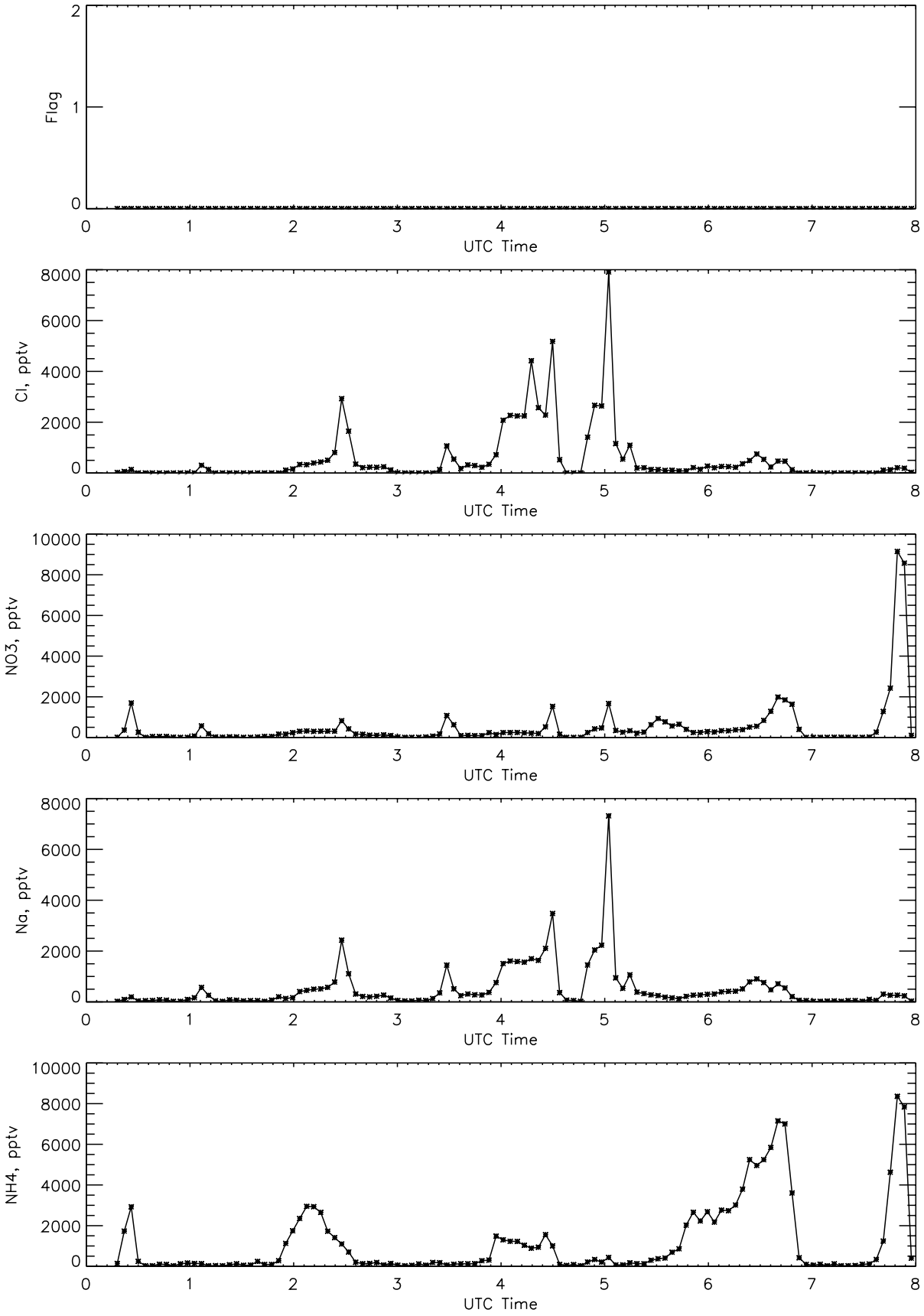

FINAL DATA: TRACE-P P3-B Flight 15
clip: max=3493.00
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

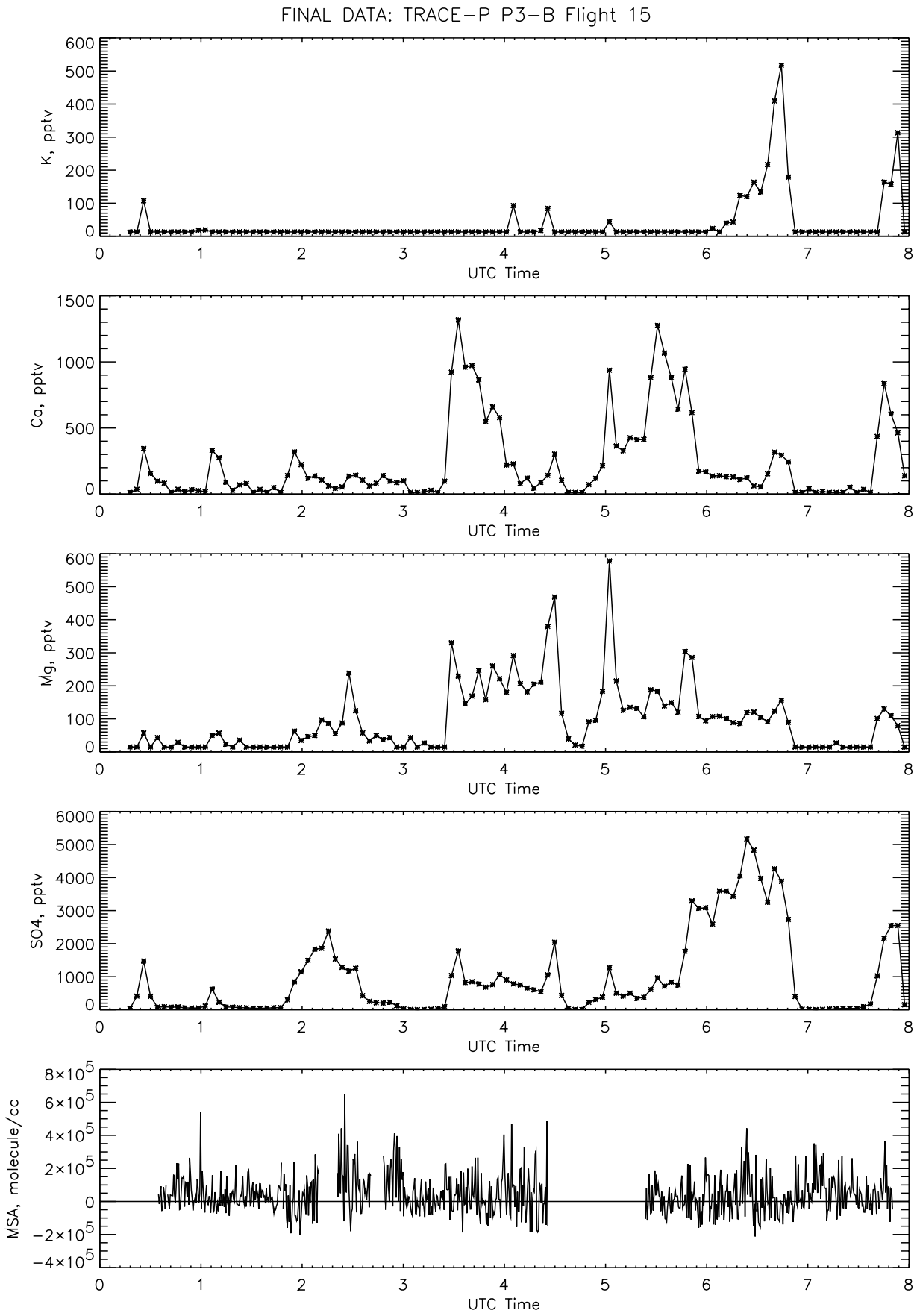

FINAL DATA: TRACE-P P3-B Flight 15
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas

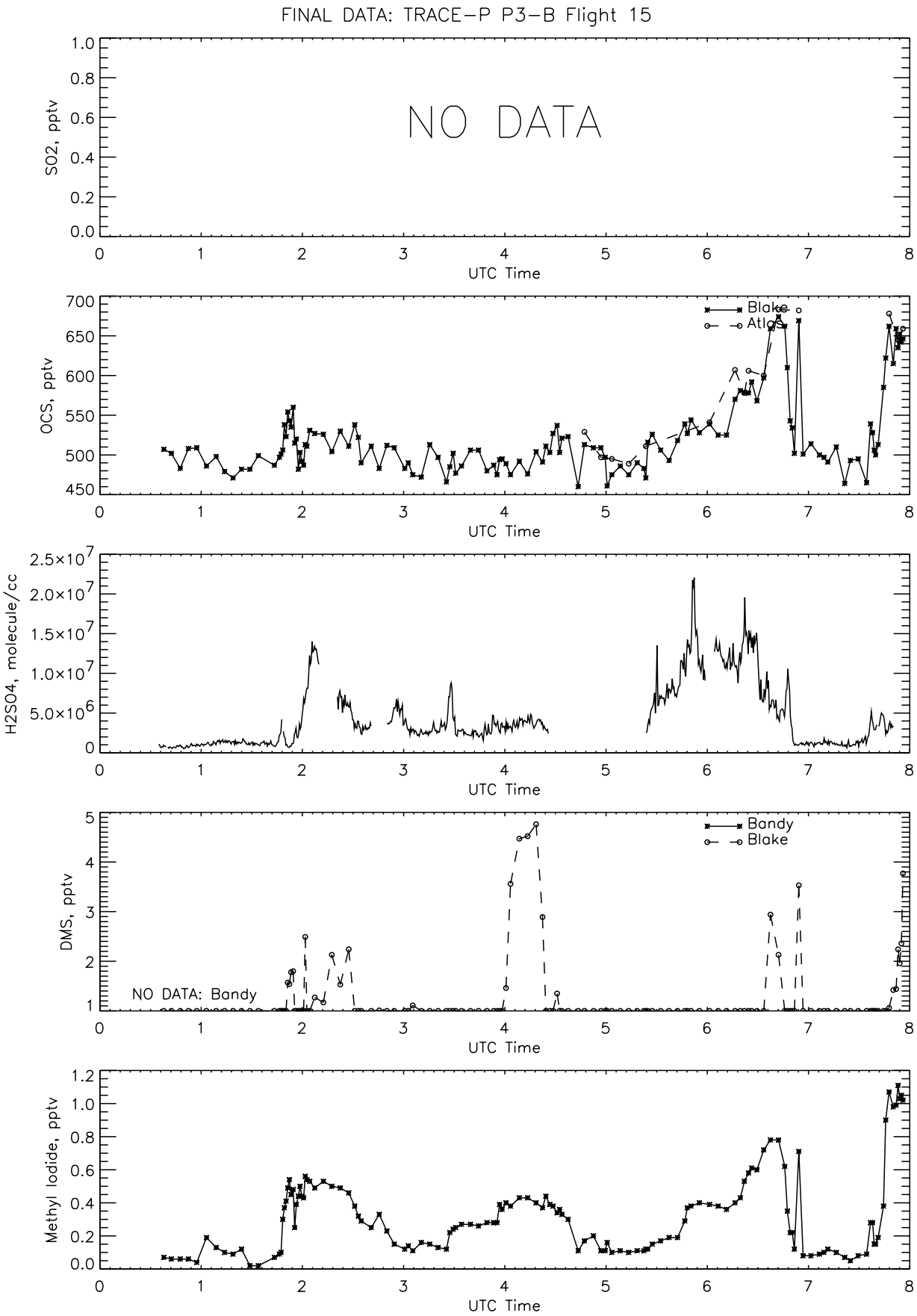
FINAL DATA: TRACE-P P3-B Flight 15

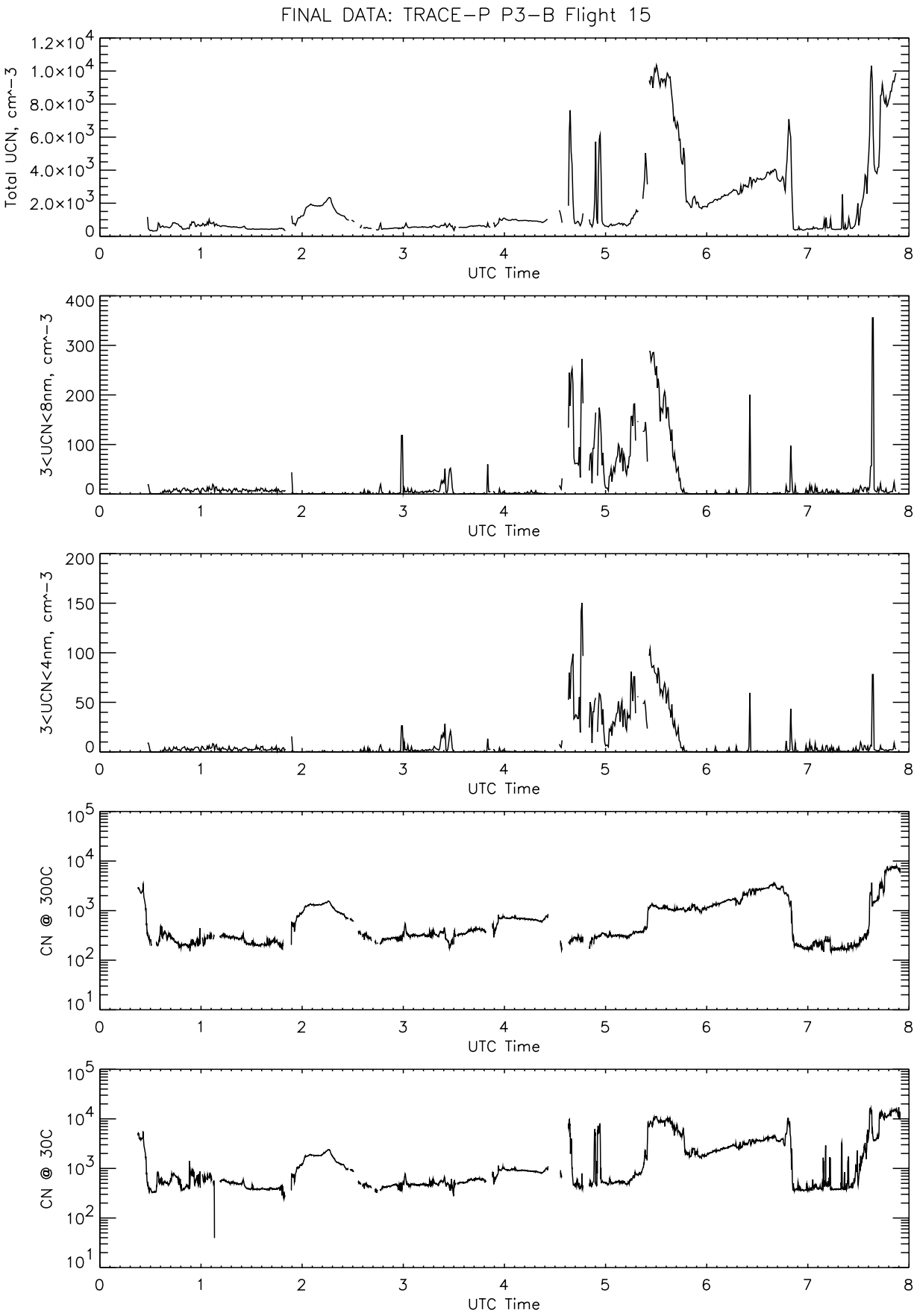


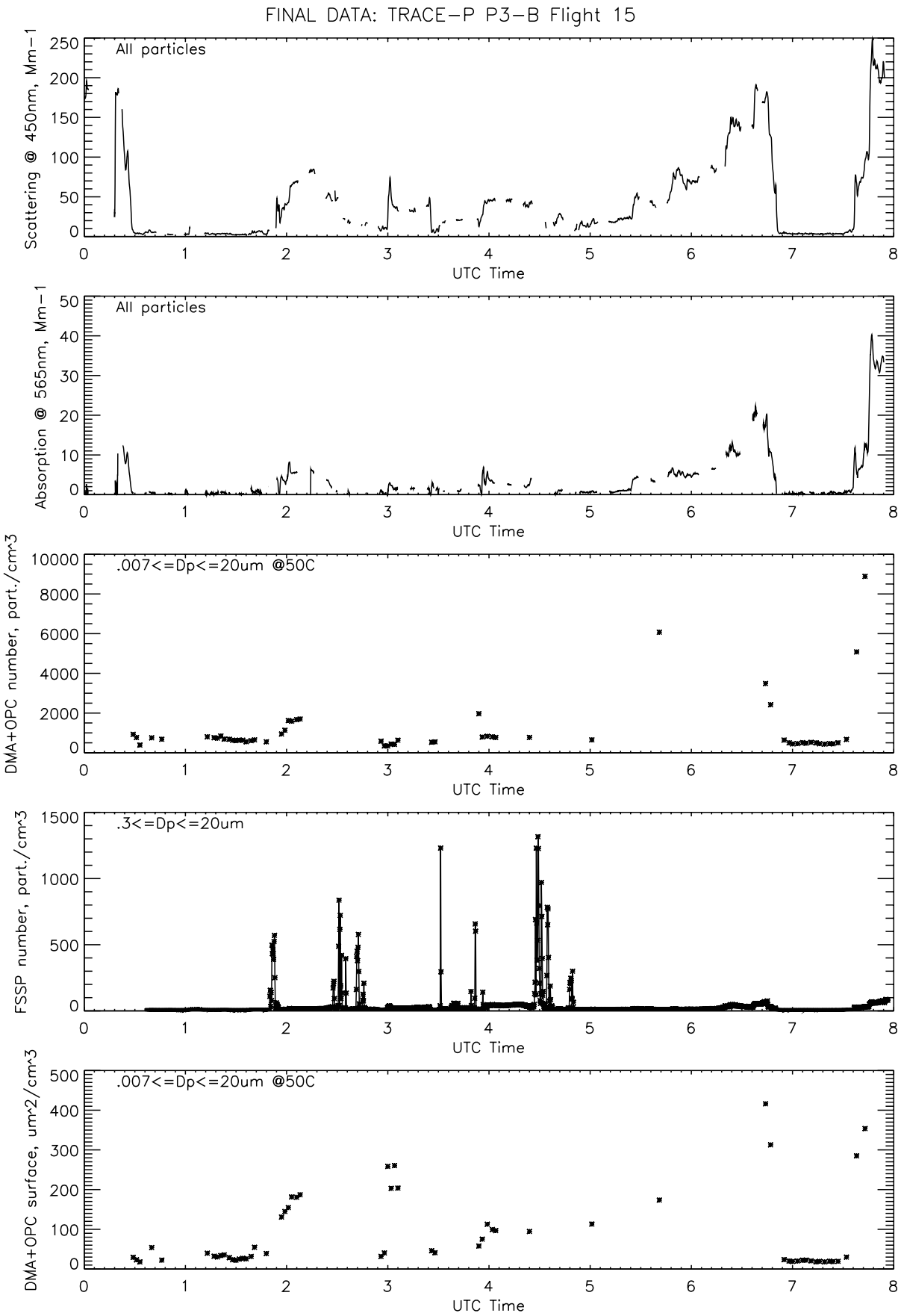
FINAL DATA: TRACE-P P3-B Flight 15

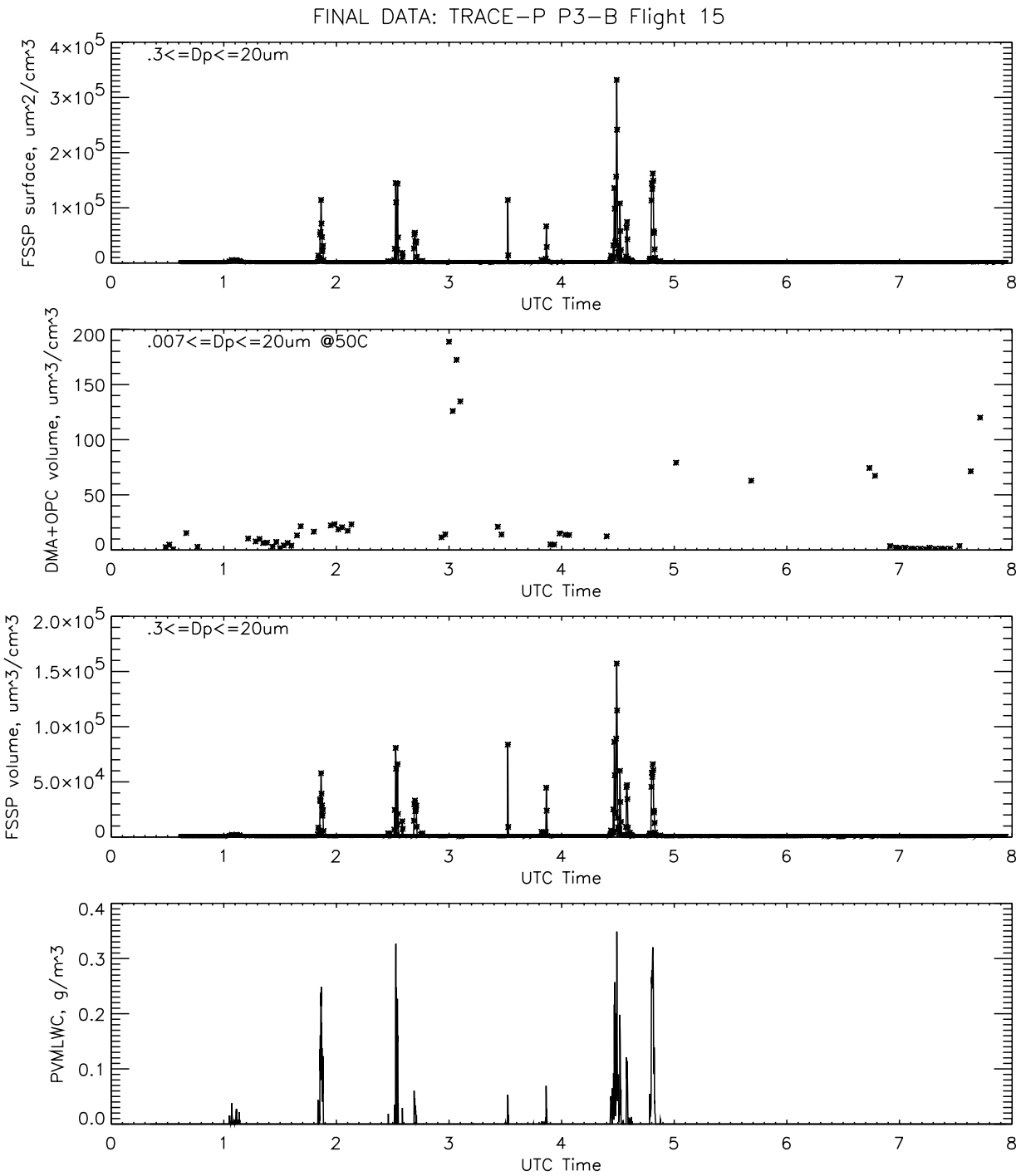



FINAL DATA: TRACE-P P3-B Flight 15
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

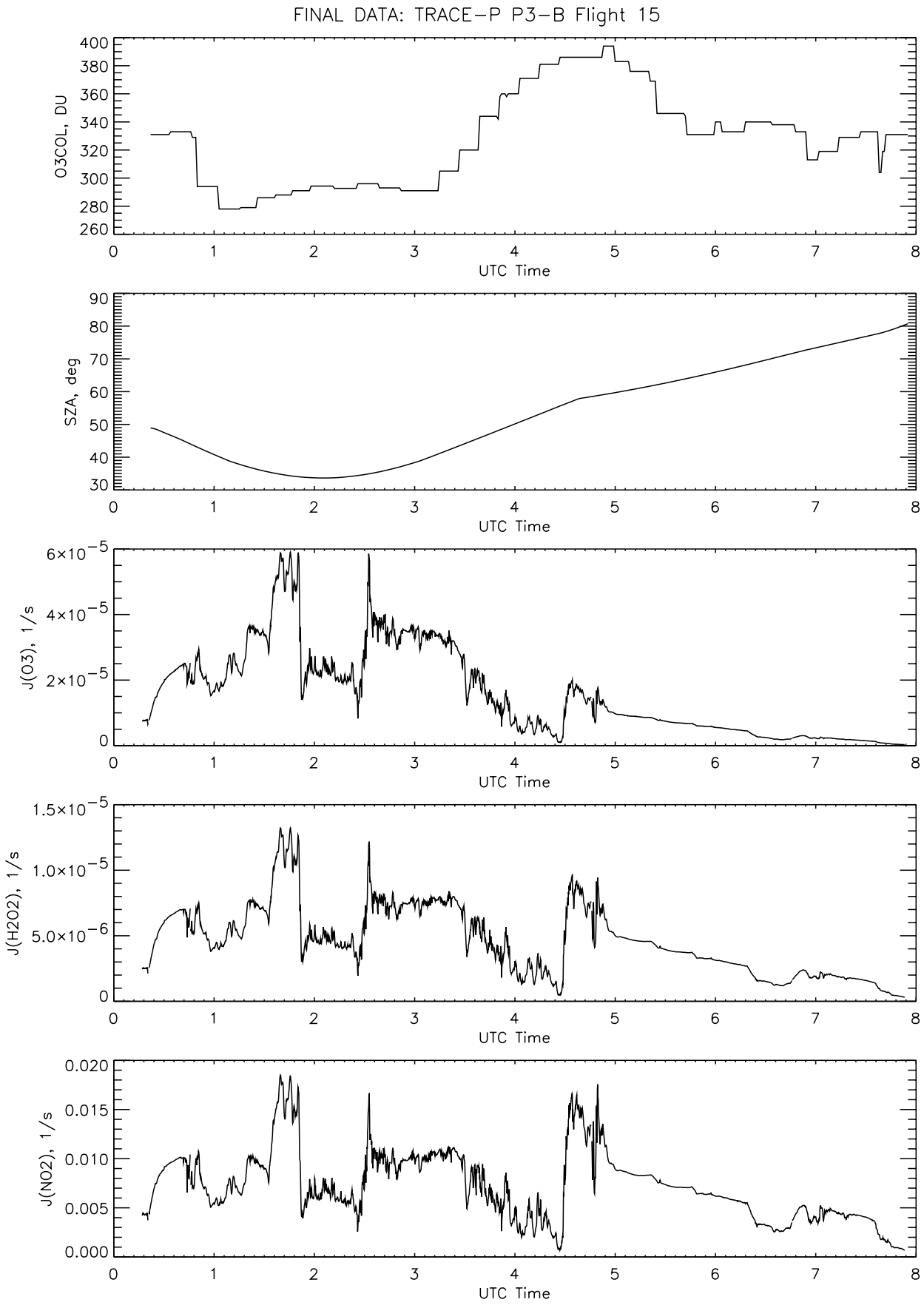

FINAL DATA: TRACE-P P3-B Flight 15
NO DATA
SO2, pptv
UTC Time
Blake
Atlas
OCS, pptv
UTC Time
H2SO4, molecule/cc
UTC Time
Bandy
Blake
NO DATA: Bandy
DMS, pptv
UTC Time
Methyl Iodide, pptv
UTC Time

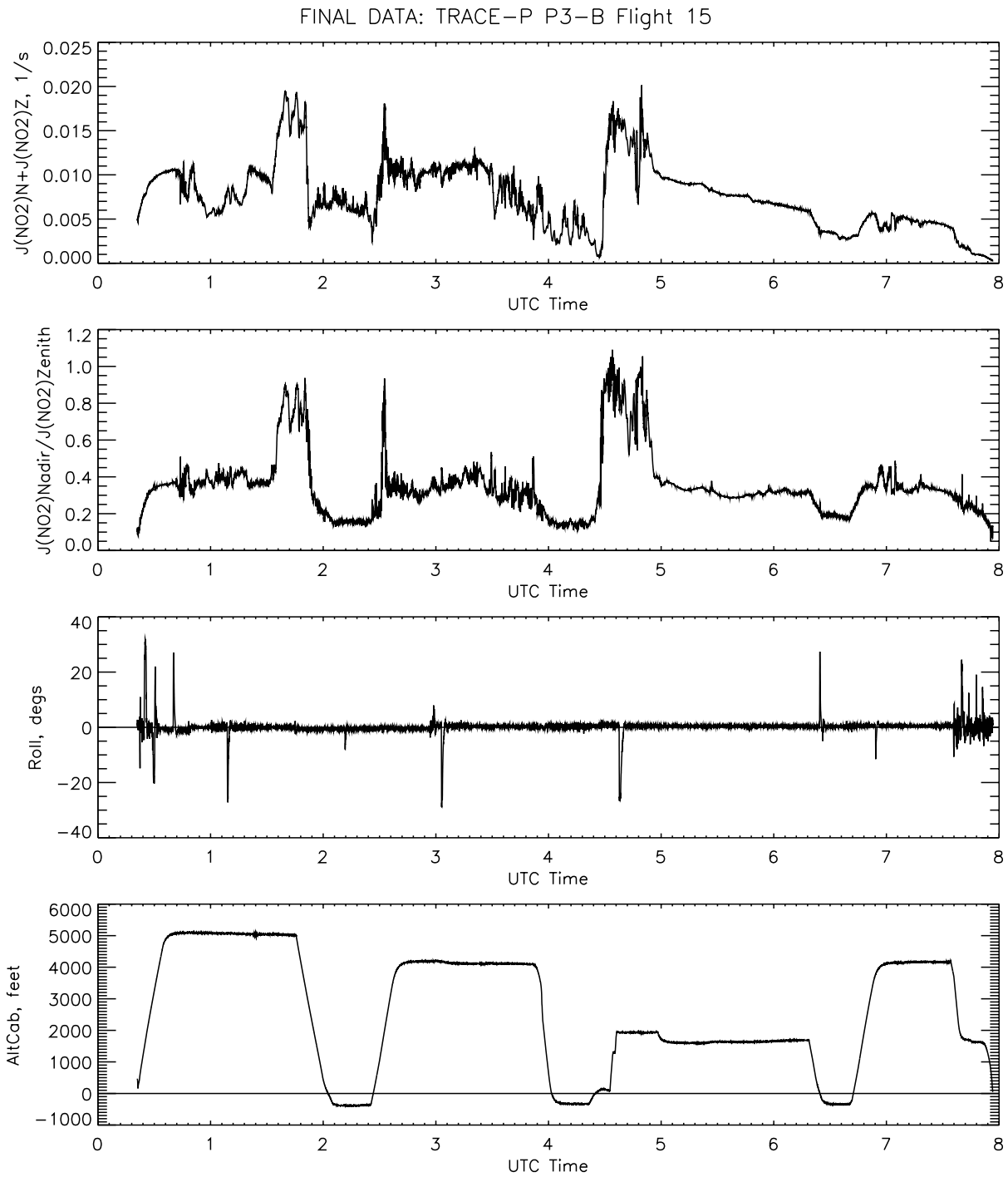

FINAL DATA: TRACE-P P3-B Flight 15
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time


FINAL DATA: TRACE-P P3-B Flight 15
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

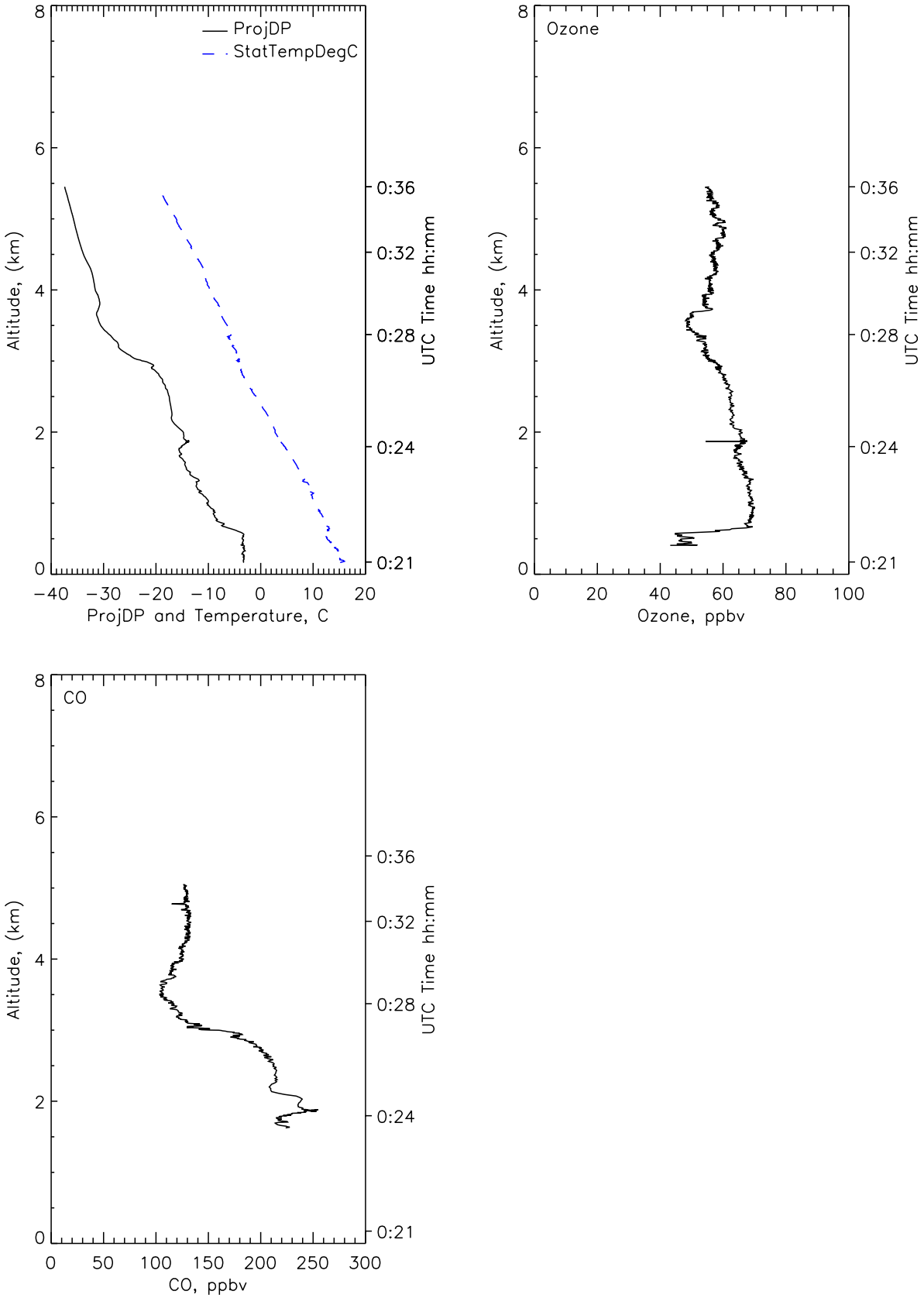

FINAL DATA: TRACE-P P3-B Flight 15
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

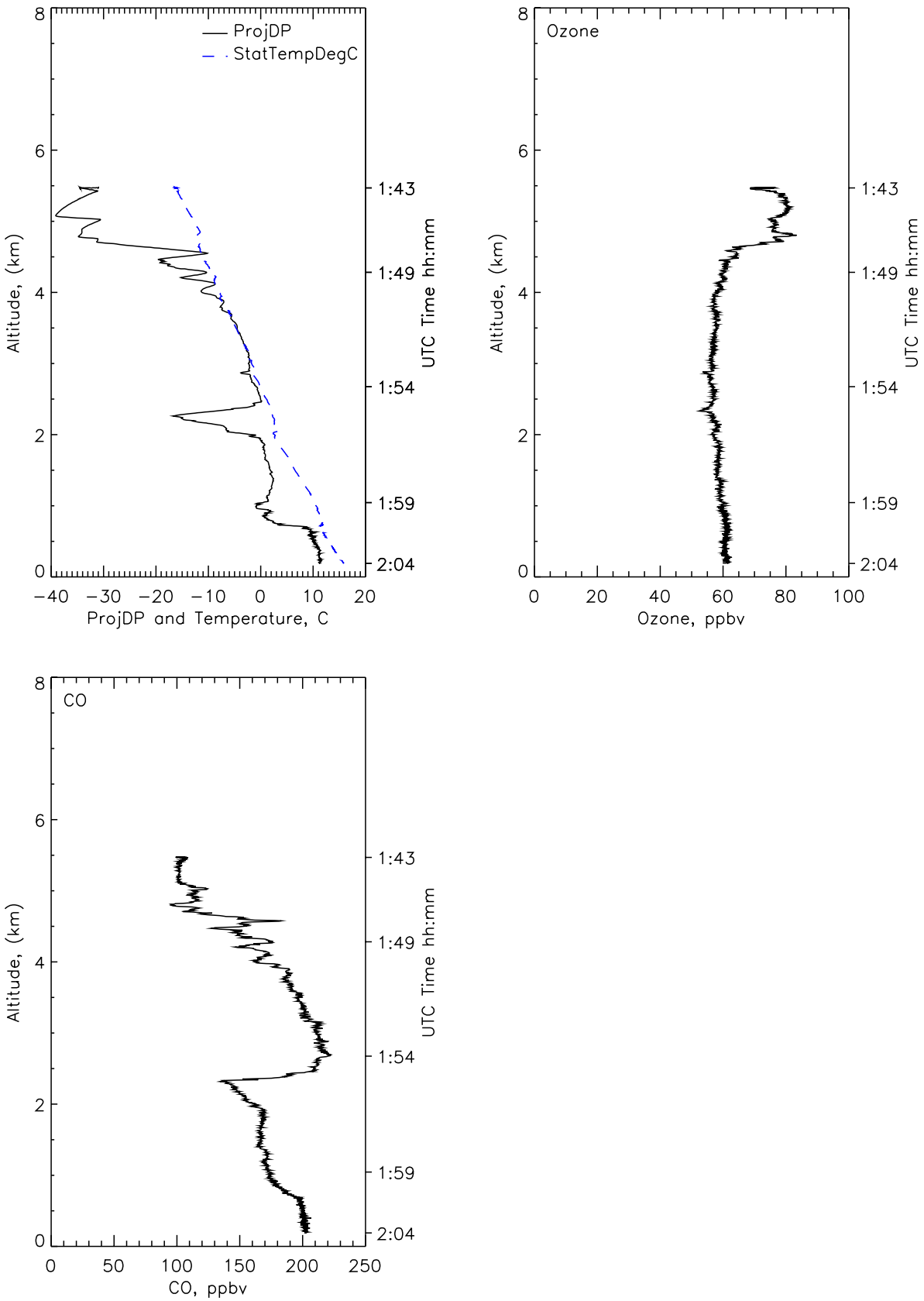

FINAL DATA: TRACE-P P3-B Flight 15
O3COL, DU
UTC Time
SZA, deg
UTC Time
J(O3), 1/s
UTC Time
J(H2O2), 1/s
UTC Time
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 15
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
0
1
2
3
4
5
6
7
8
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
5000
4000
3000
2000
1000
0
−1000
UTC Time

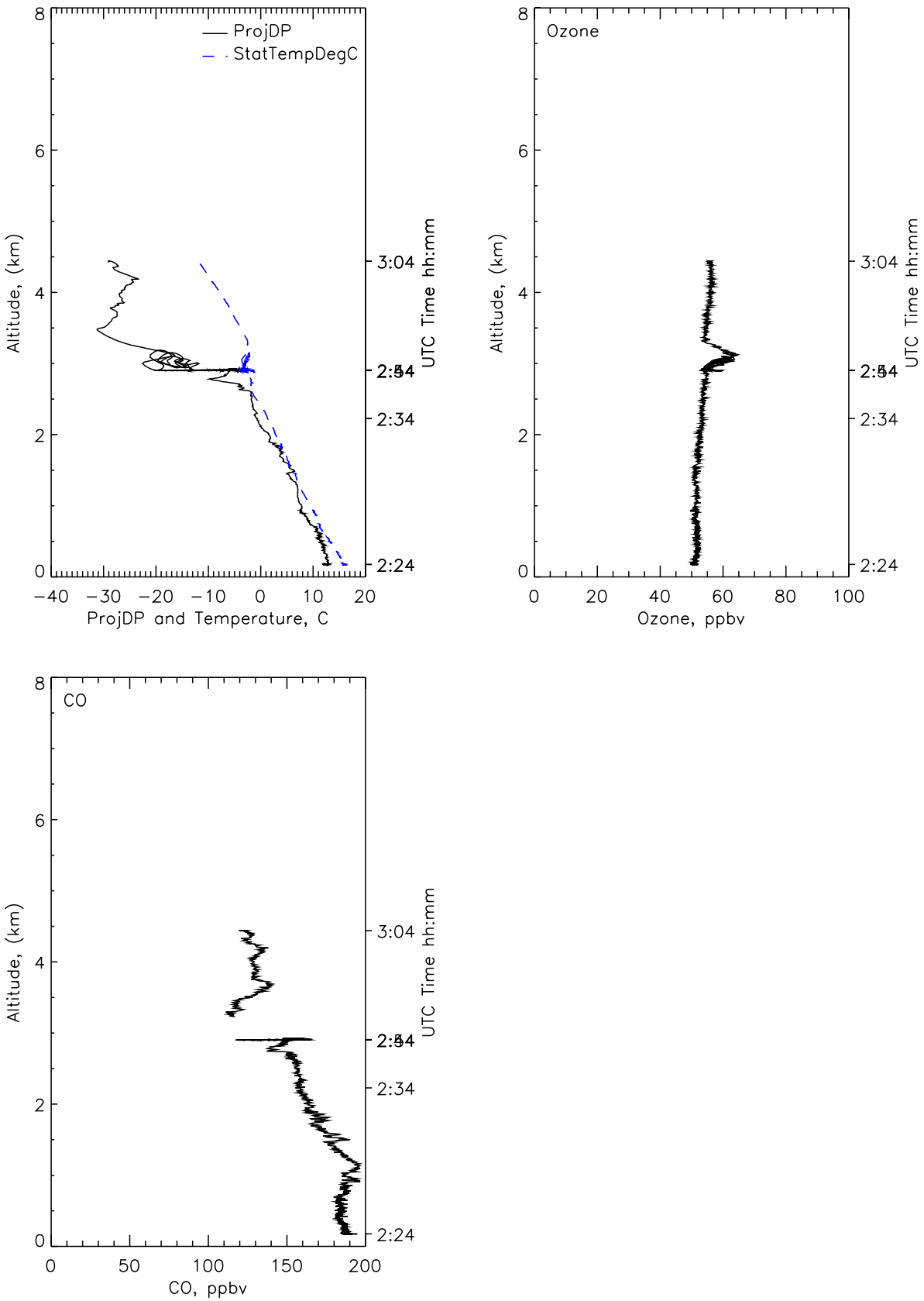
Profile # 1 TRACE-P P3-B Flight 15



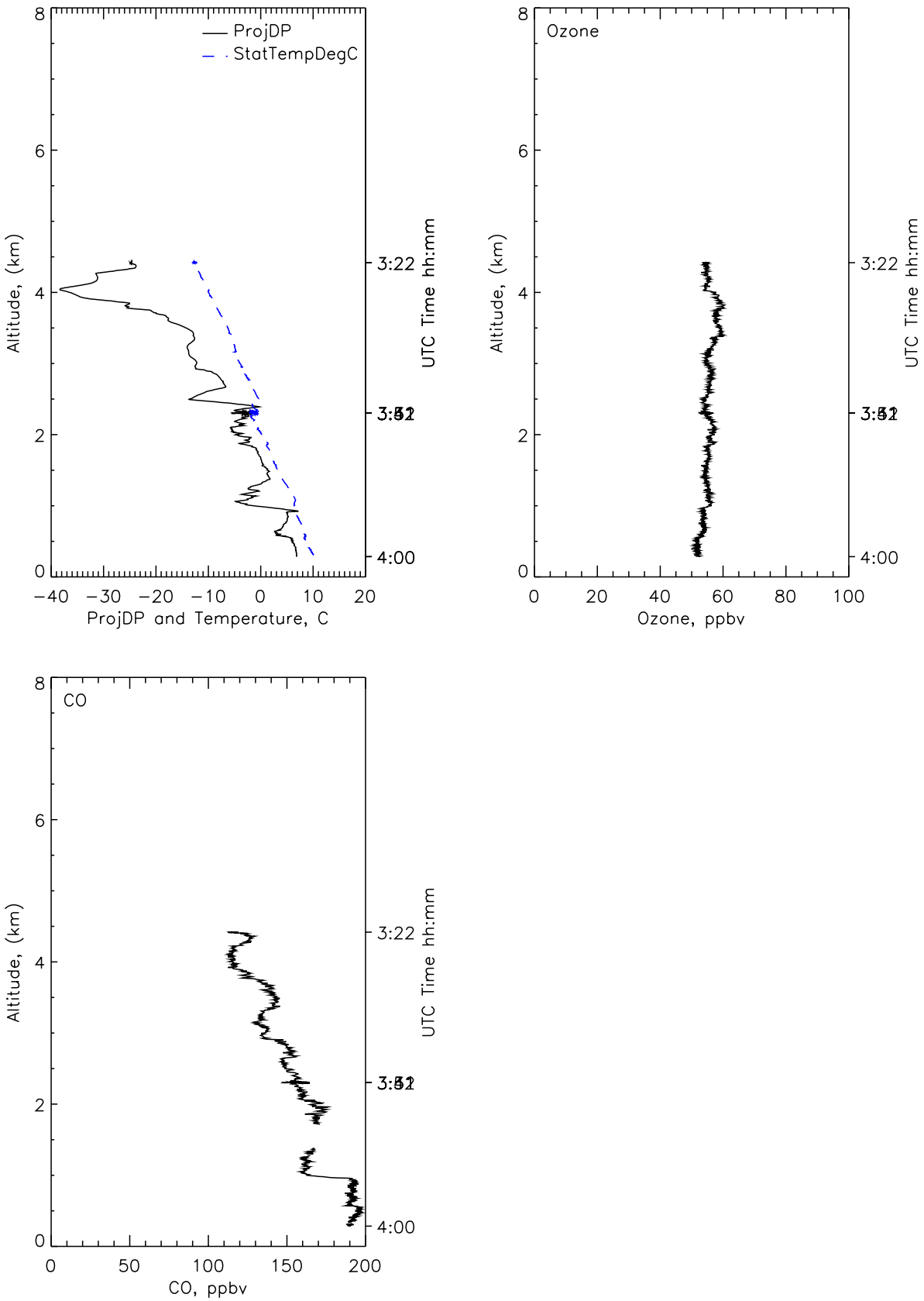
Profile # 2 TRACE-P P3-B Flight 15

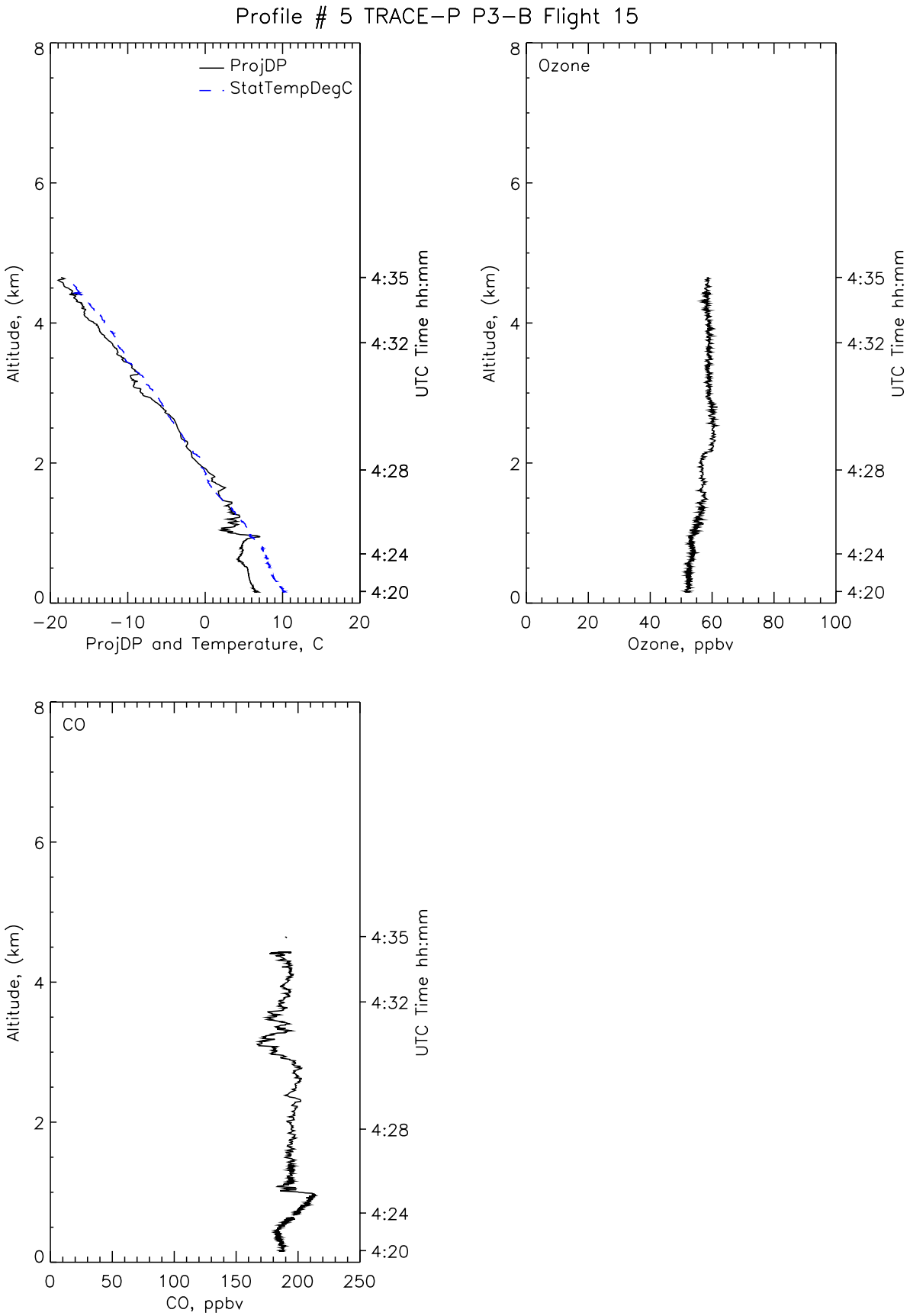


Profile # 3 TRACE−P P3−B Flight 15

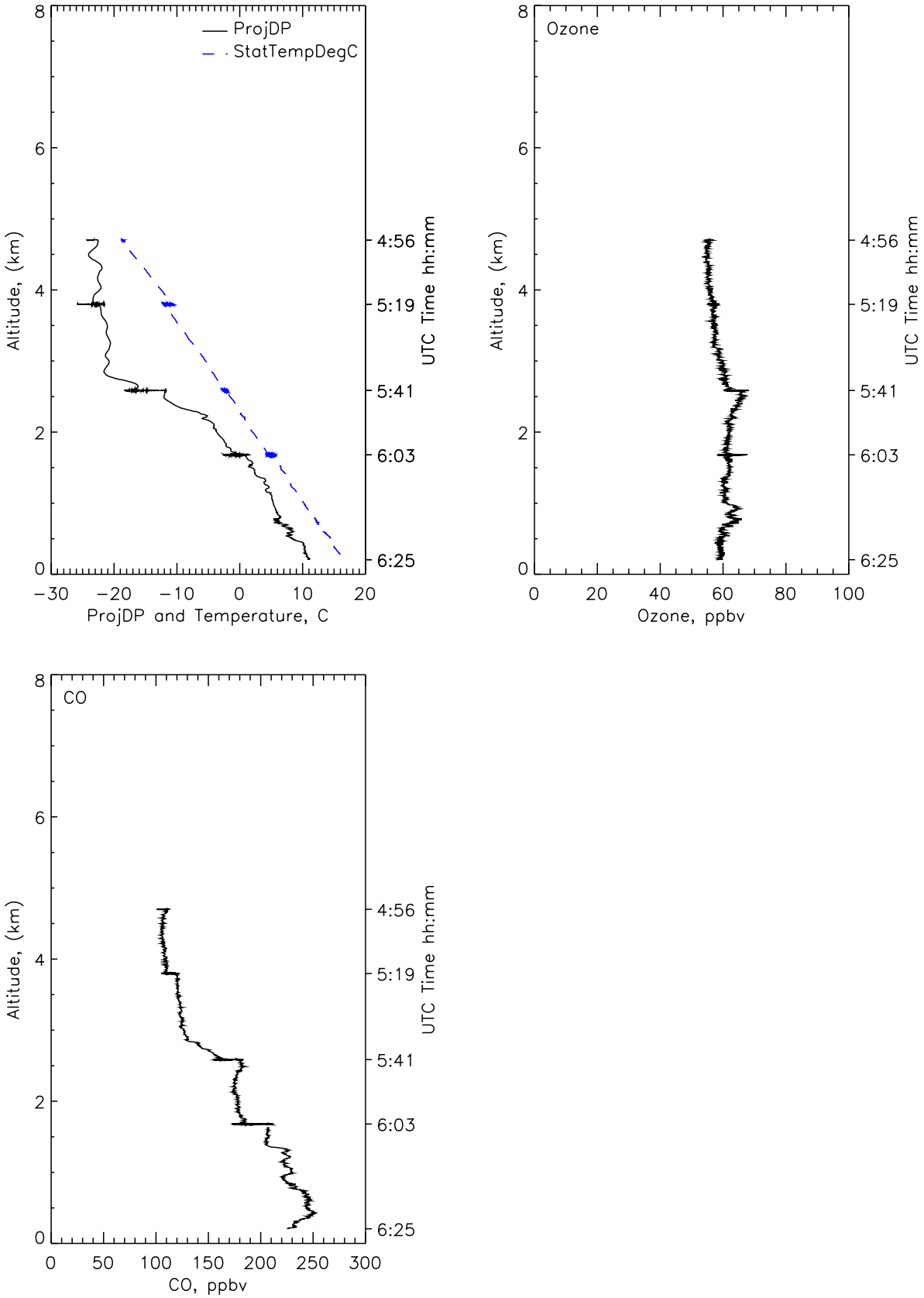


Profile # 4 TRACE-P P3-B Flight 15

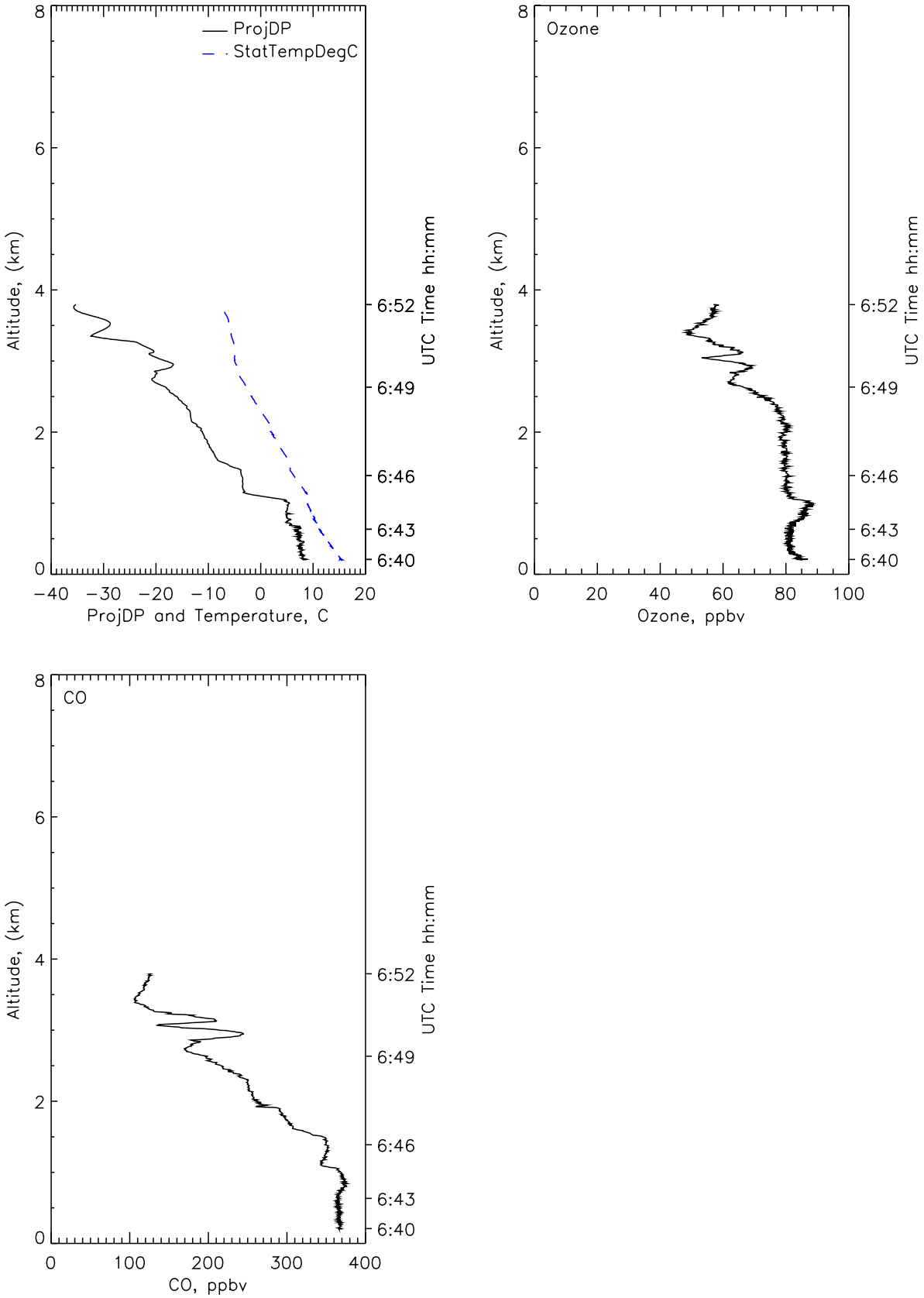



Profile # 5 TRACE-P P3-B Flight 15
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
Ozone
Ozone, ppbv
CO
CO, ppbv

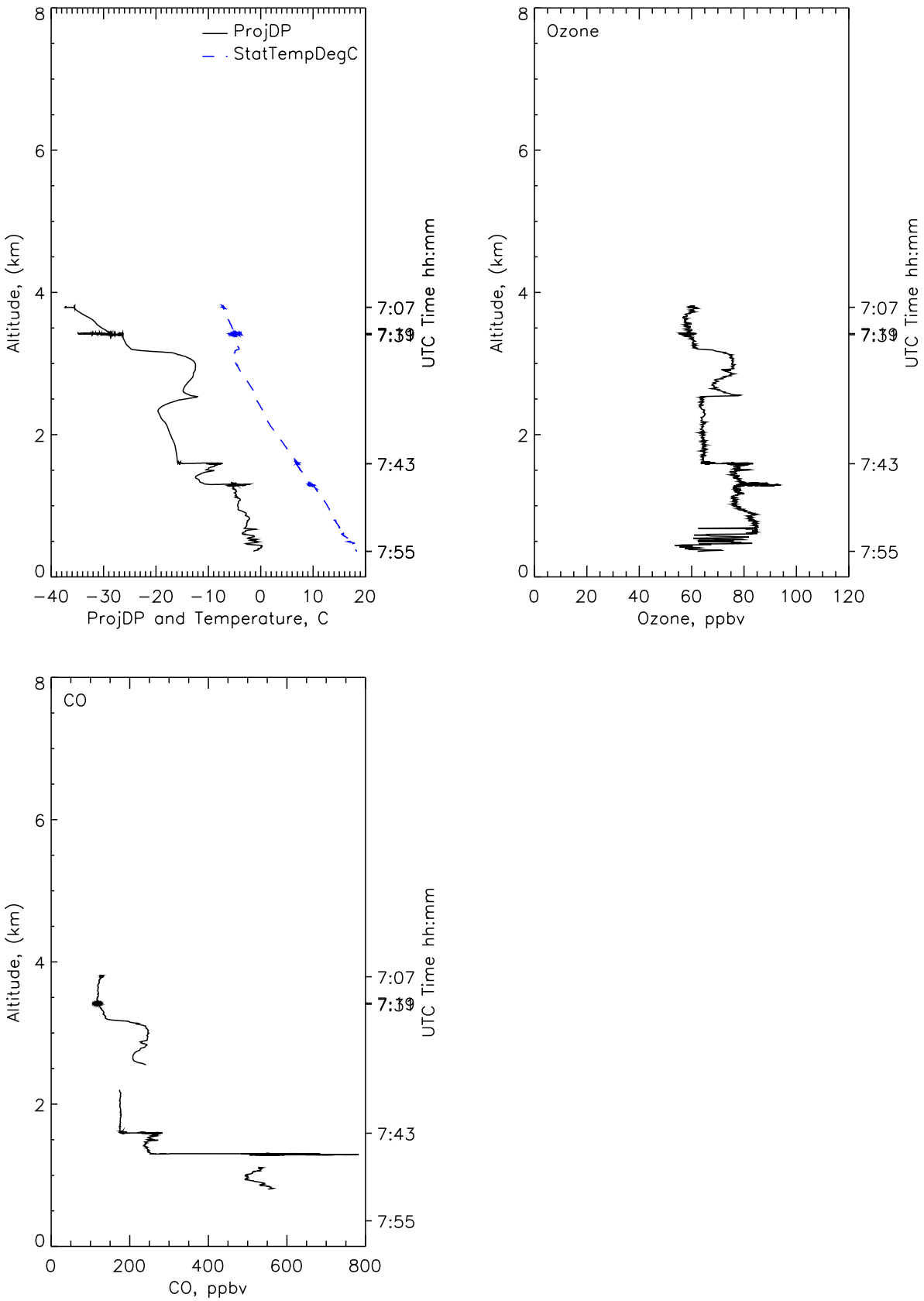
Profile # 6 TRACE-P P3-B Flight 15



Profile # 7 TRACE-P P3-B Flight 15



Profile # 8 TRACE−P P3−B Flight 15



CHEMICAL and METEOROLOGICAL DATA

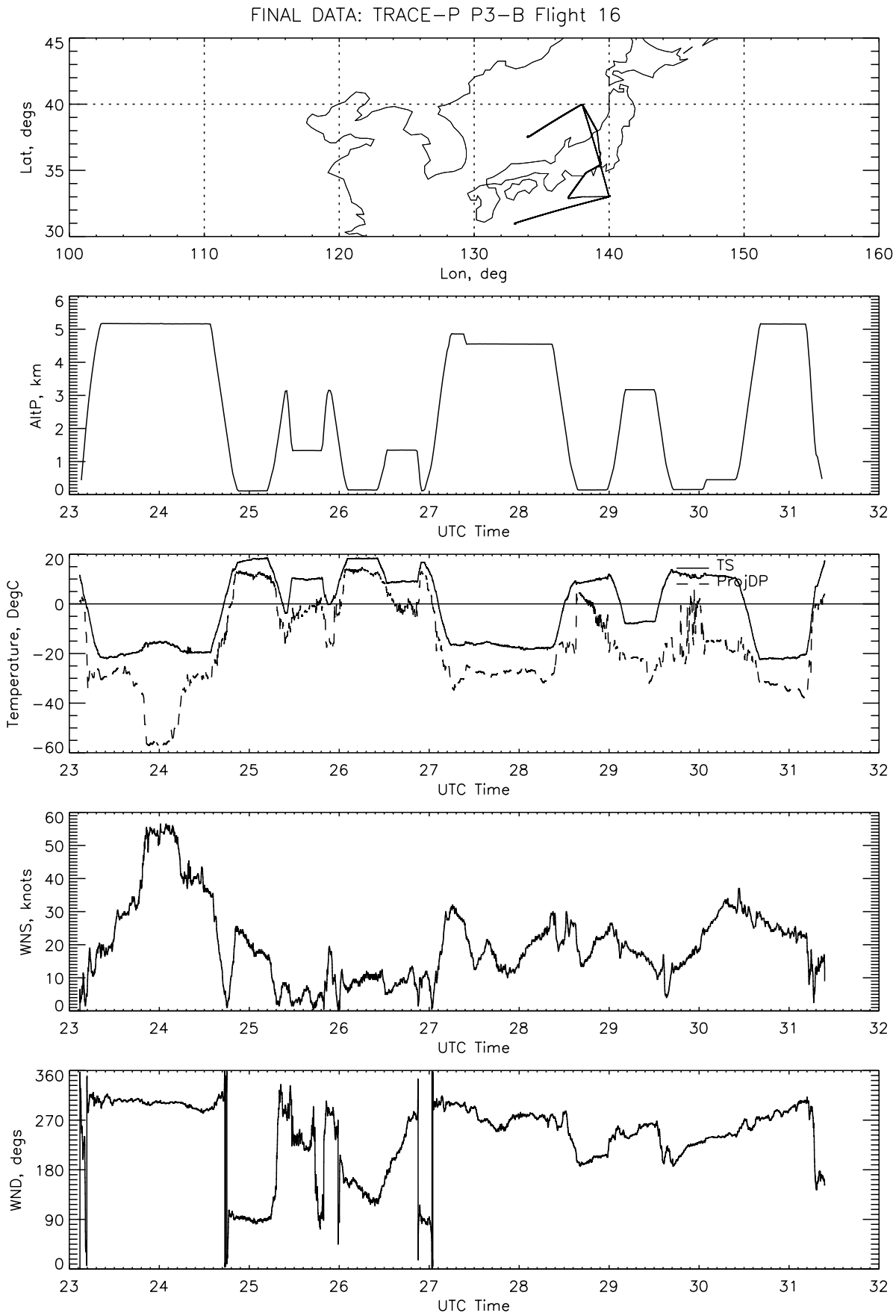
TRACE-P

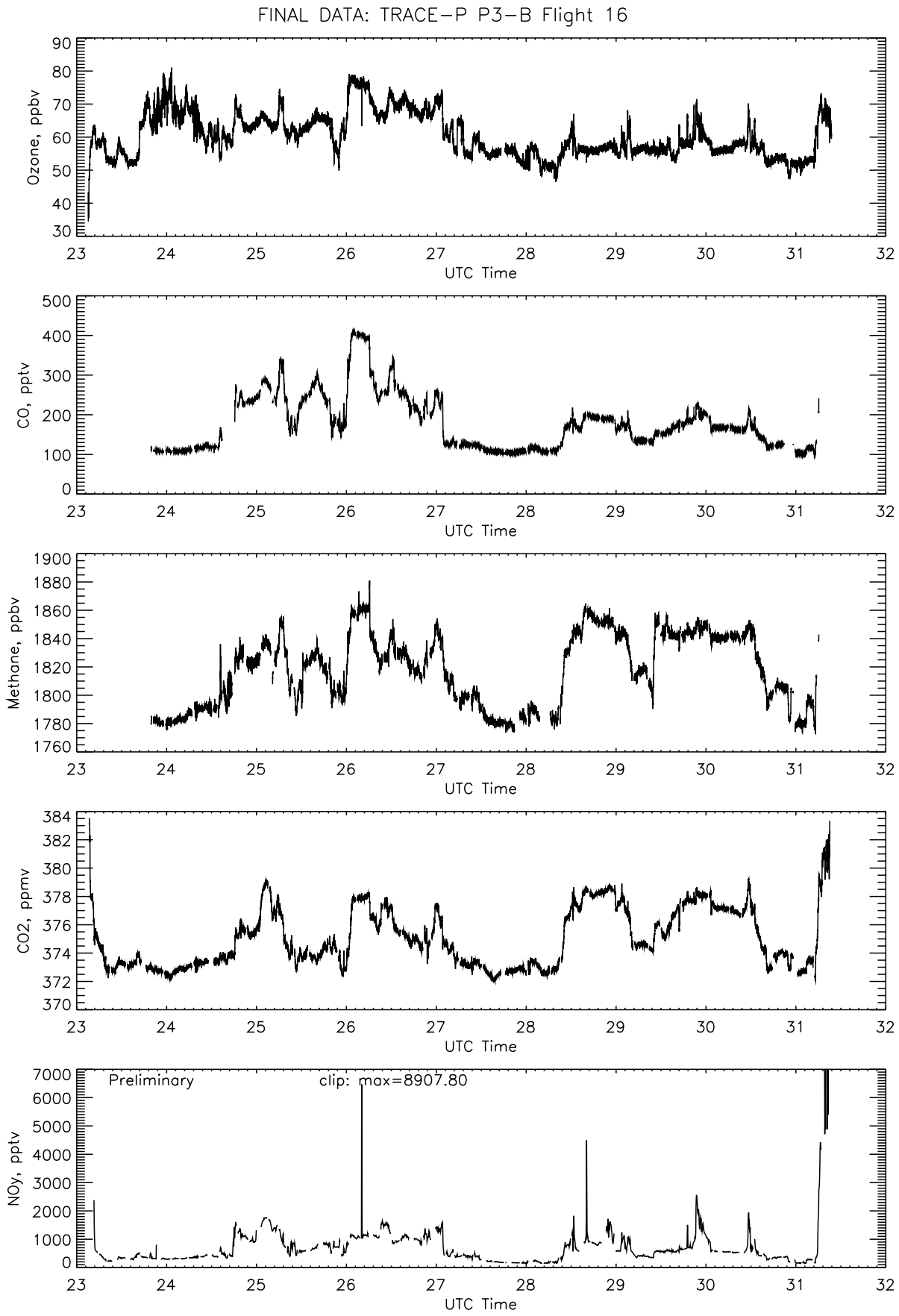
Flight 16P

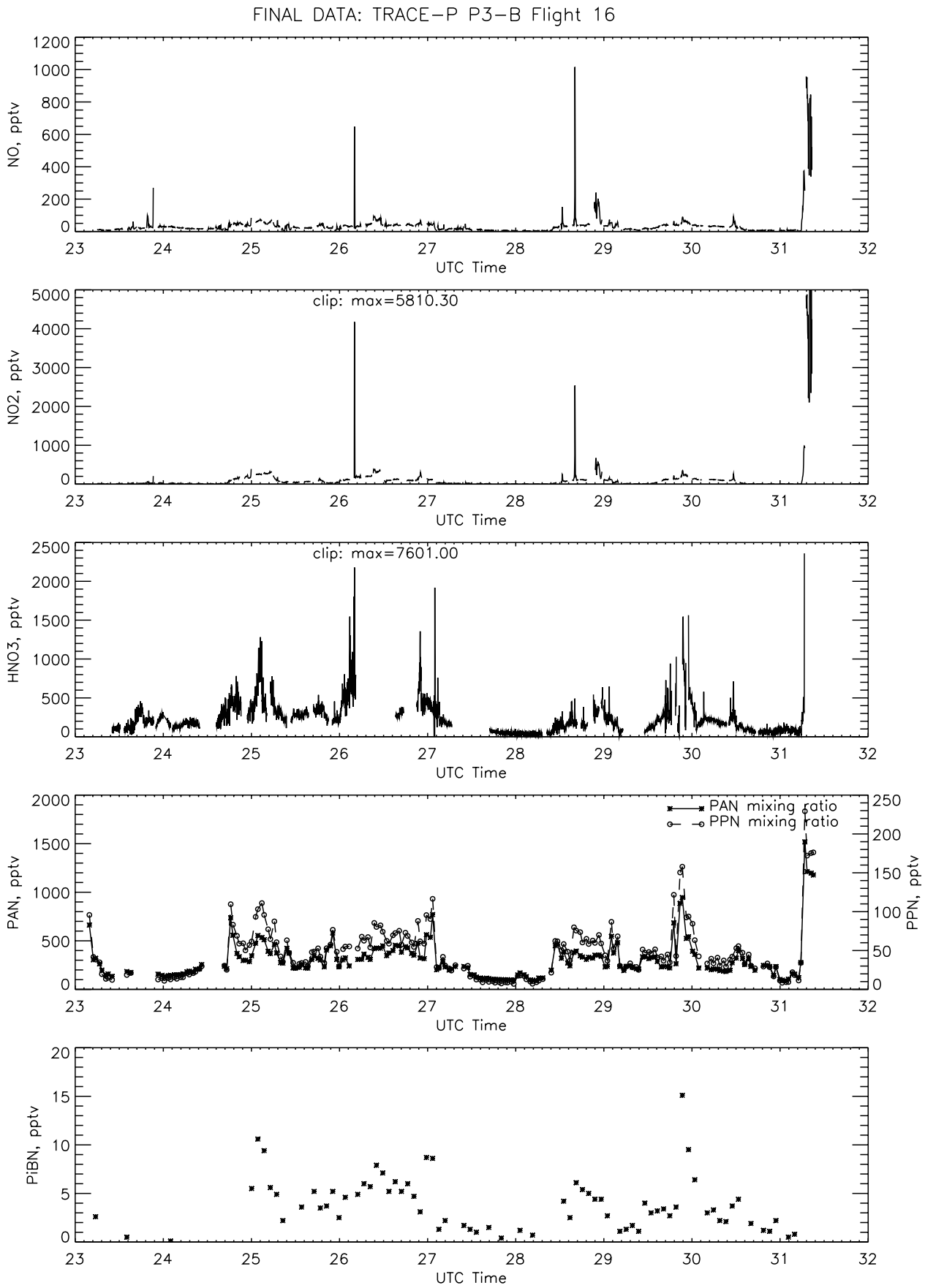
Local: Yokota No. 2

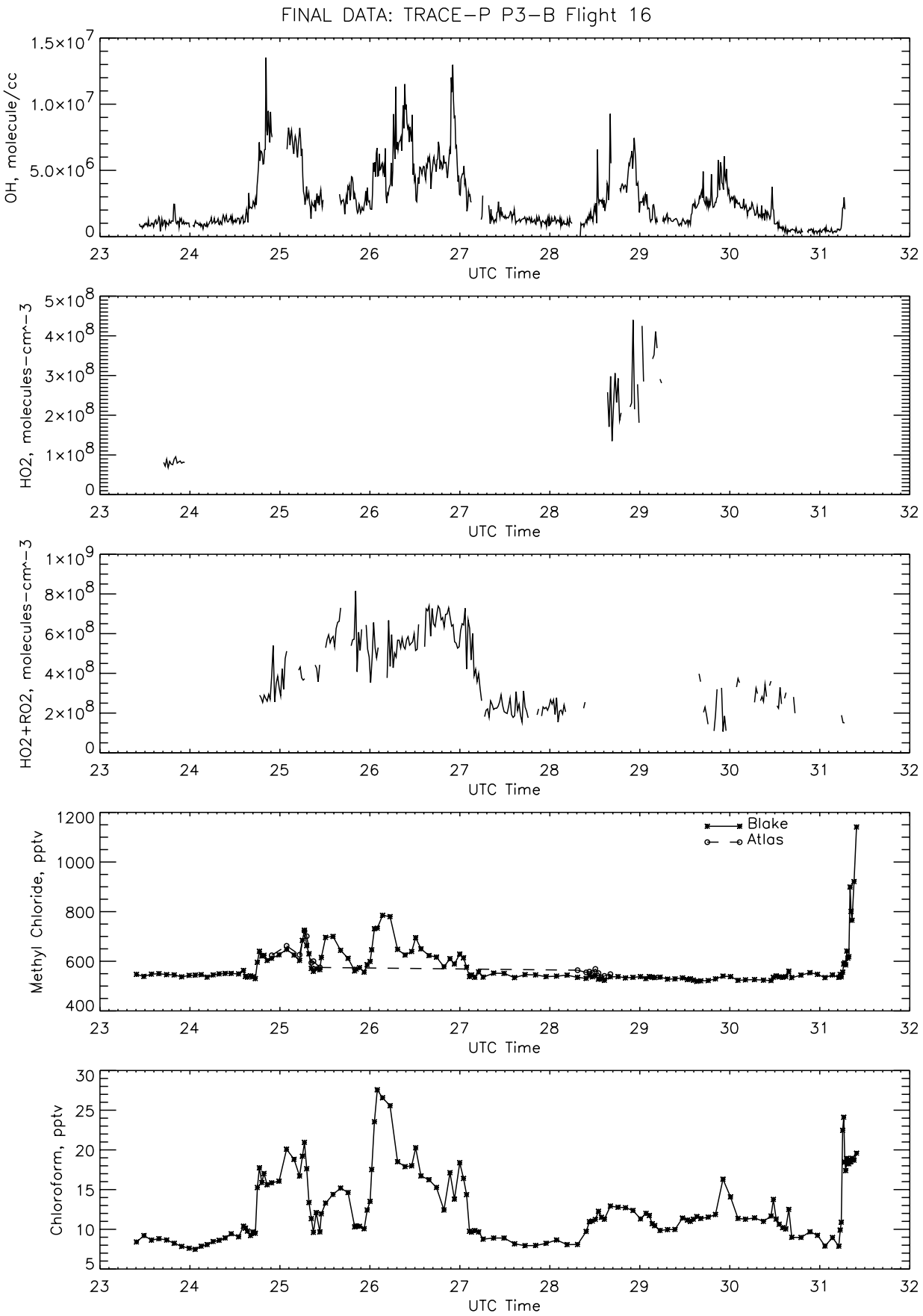
Aircraft Intercomparison;
Japan North/South

March 23, 2001

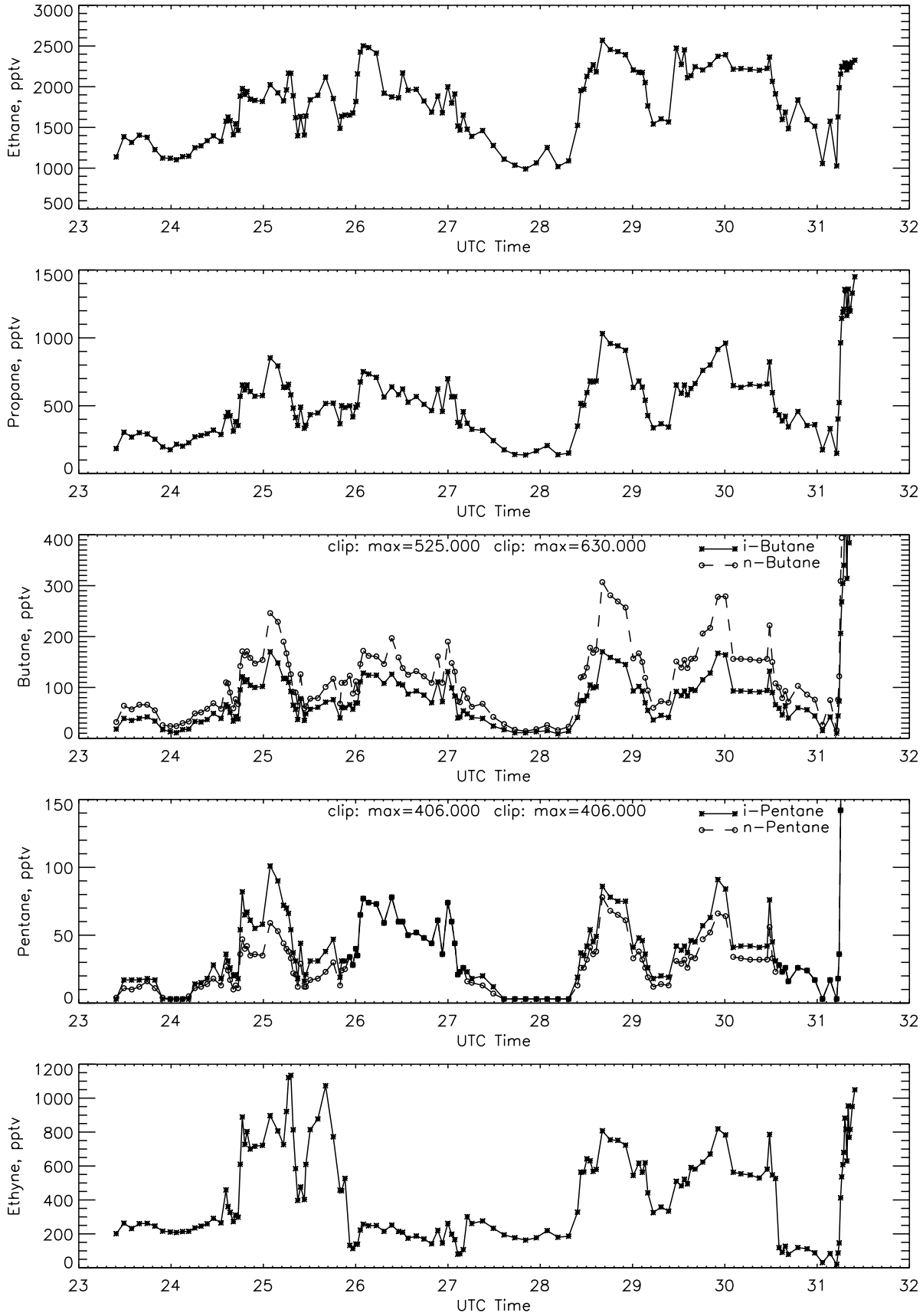

FINAL DATA: TRACE-P P3-B Flight 16
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

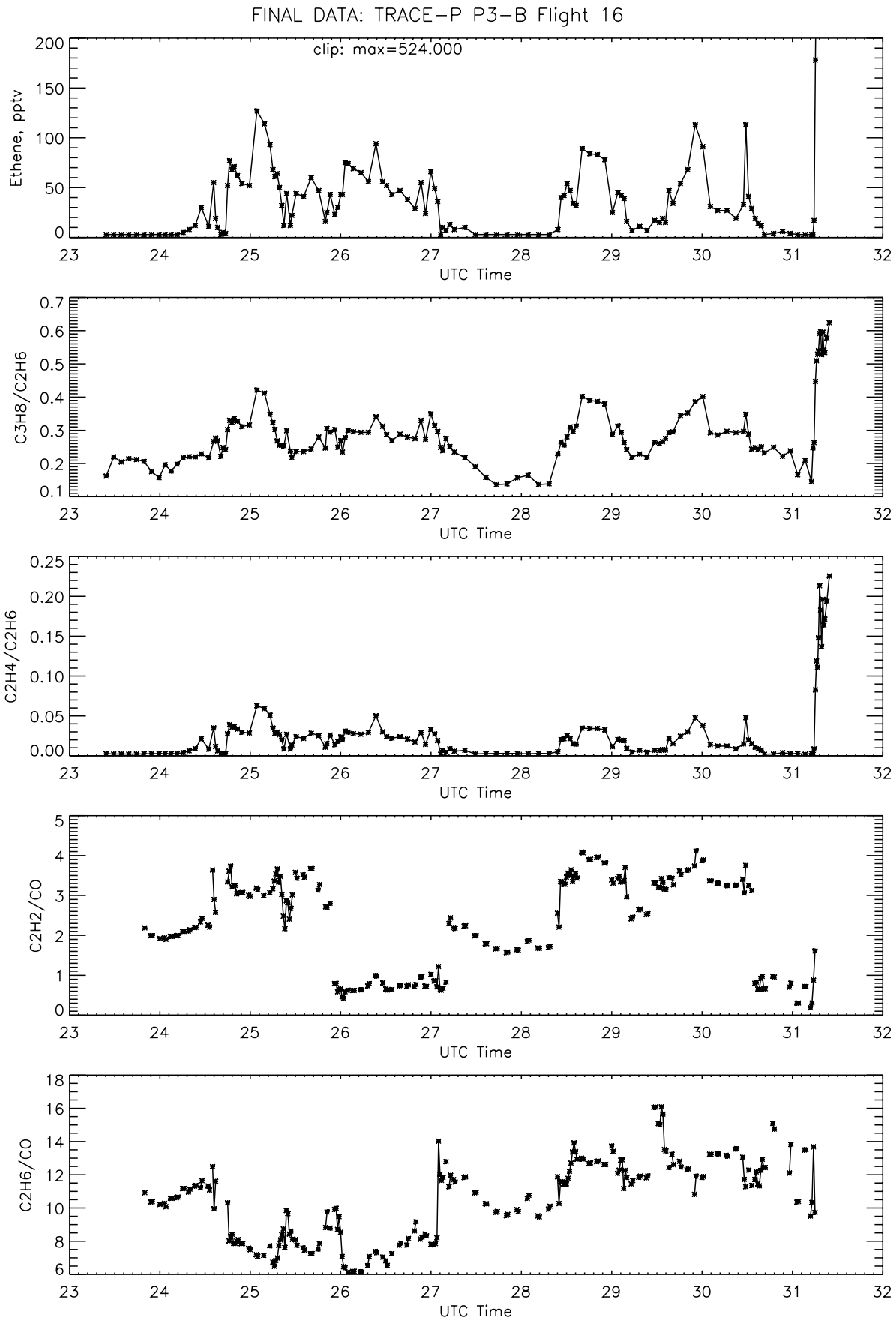

FINAL DATA: TRACE-P P3-B Flight 16
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
Preliminary
clip: max=8907.80
UTC Time


FINAL DATA: TRACE-P P3-B Flight 16
NO, pptv
NO2, pptv
clip: max=5810.30
HNO3, pptv
clip: max=7601.00
PAN, pptv
PPN, pptv
PAN mixing ratio
PPN mixing ratio
PiBN, pptv
UTC Time

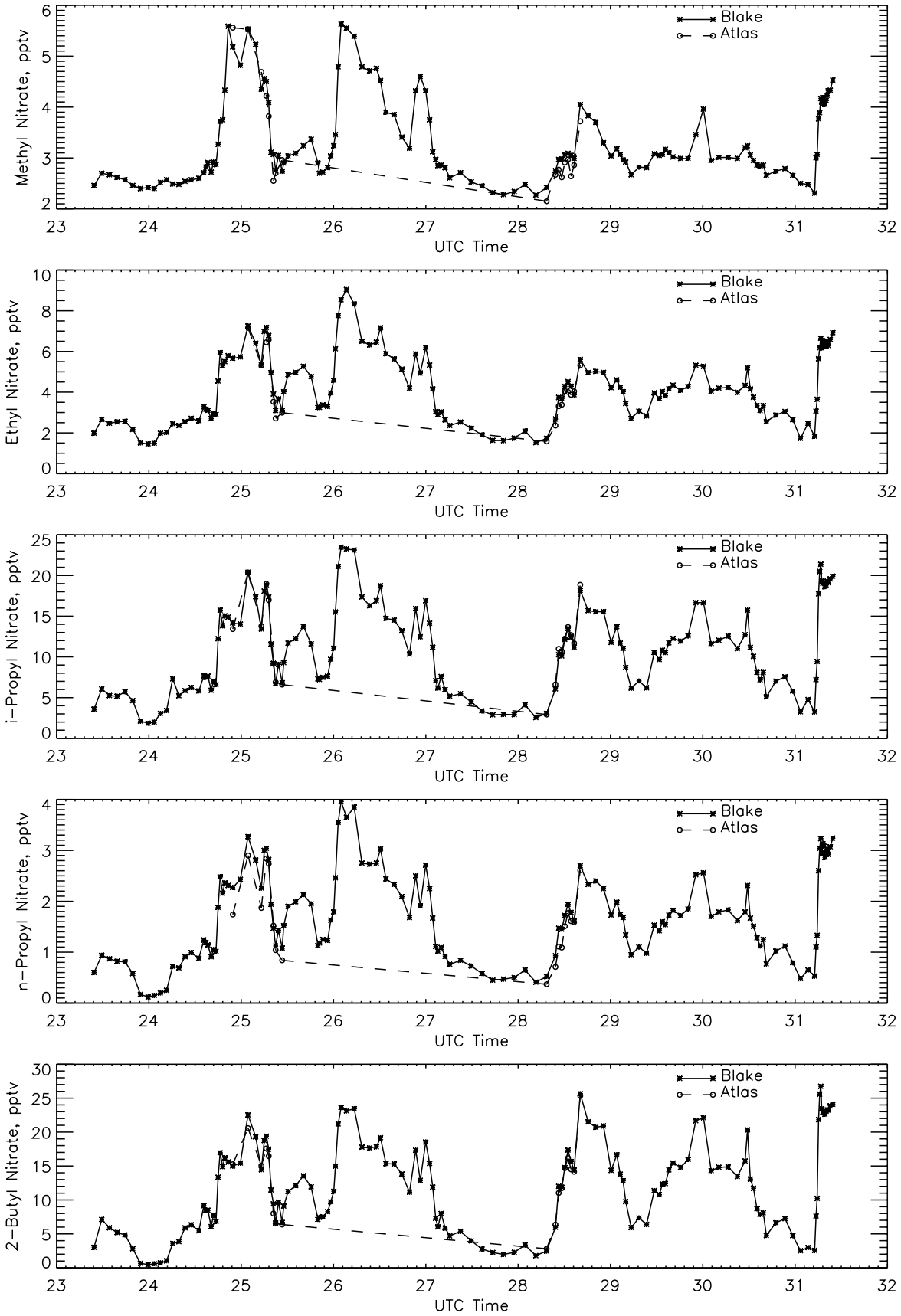

FINAL DATA: TRACE-P P3-B Flight 16
OH, molecule/cc
HO2, molecules-cm^-3
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

FINAL DATA: TRACE-P P3-B Flight 16

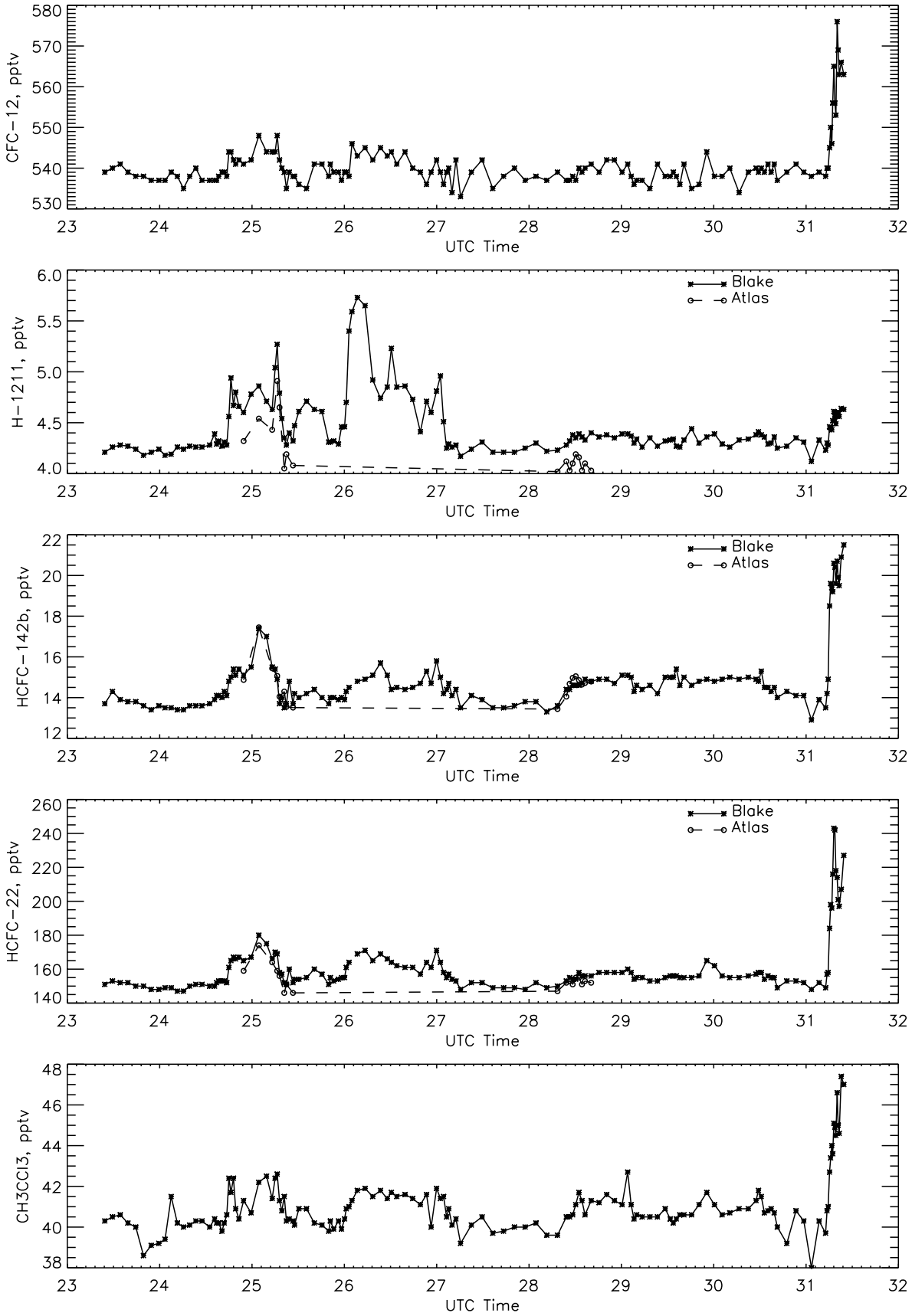



FINAL DATA: TRACE-P P3-B Flight 16
clip: max=524.000
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

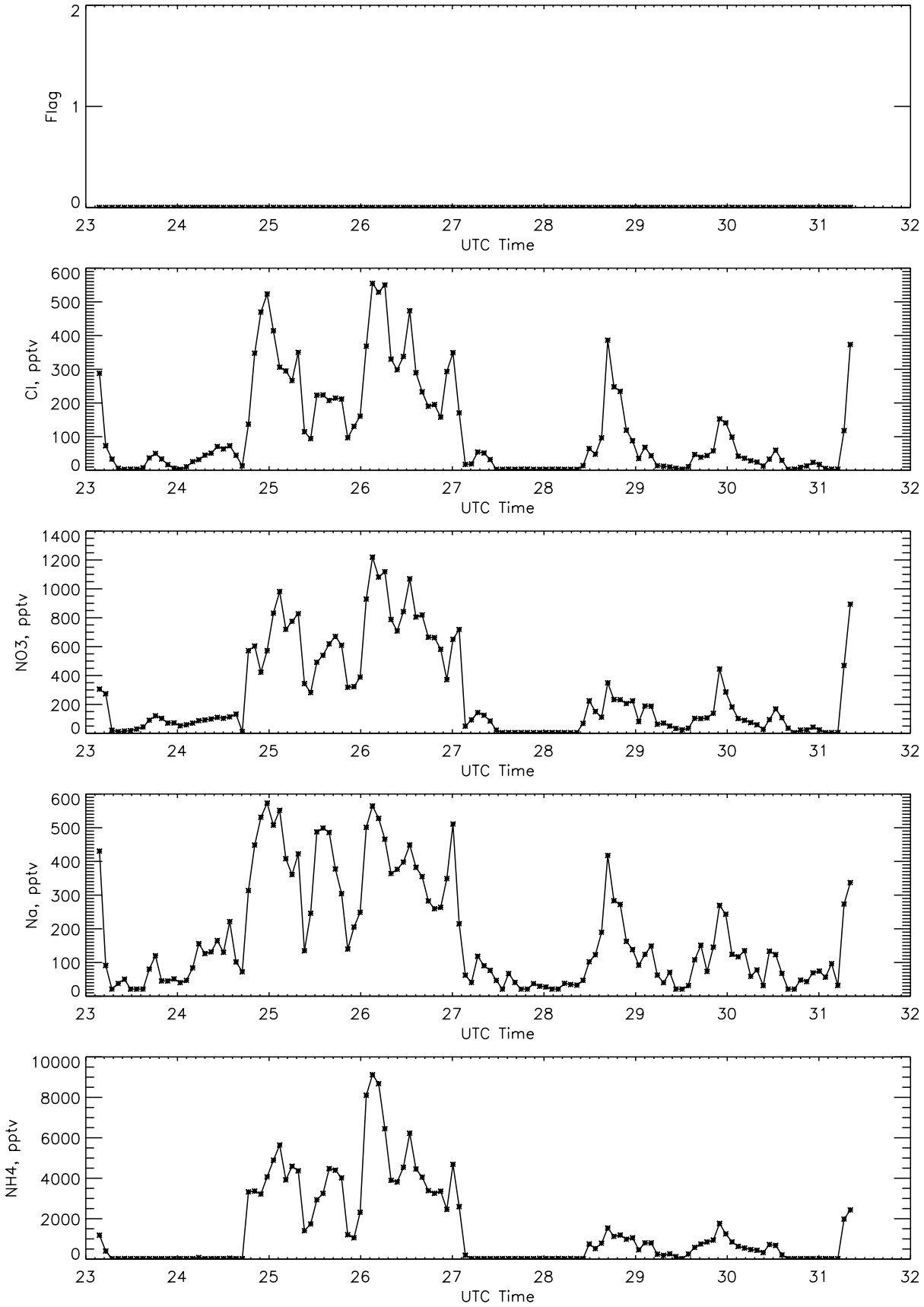
FINAL DATA: TRACE-P P3-B Flight 16

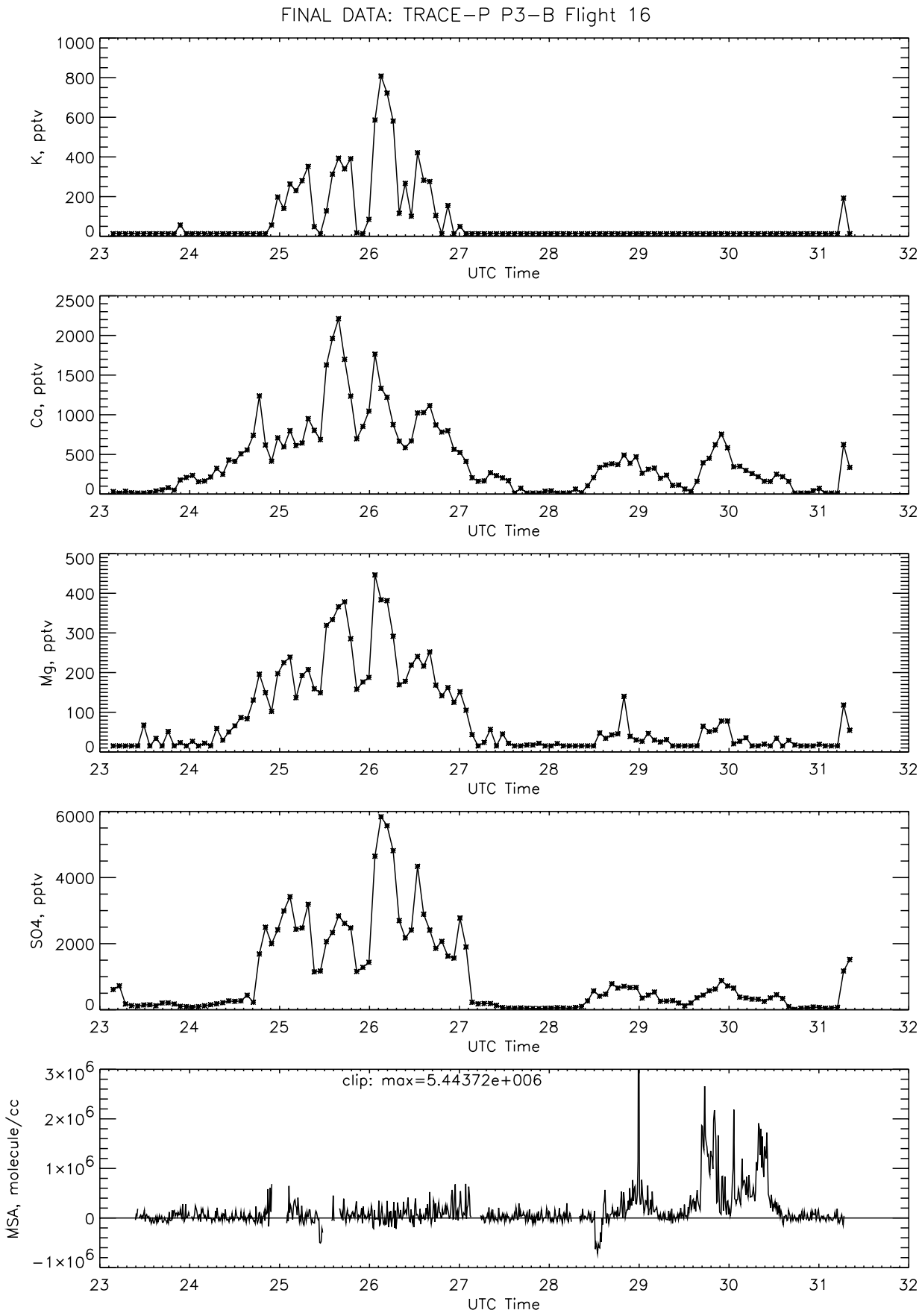


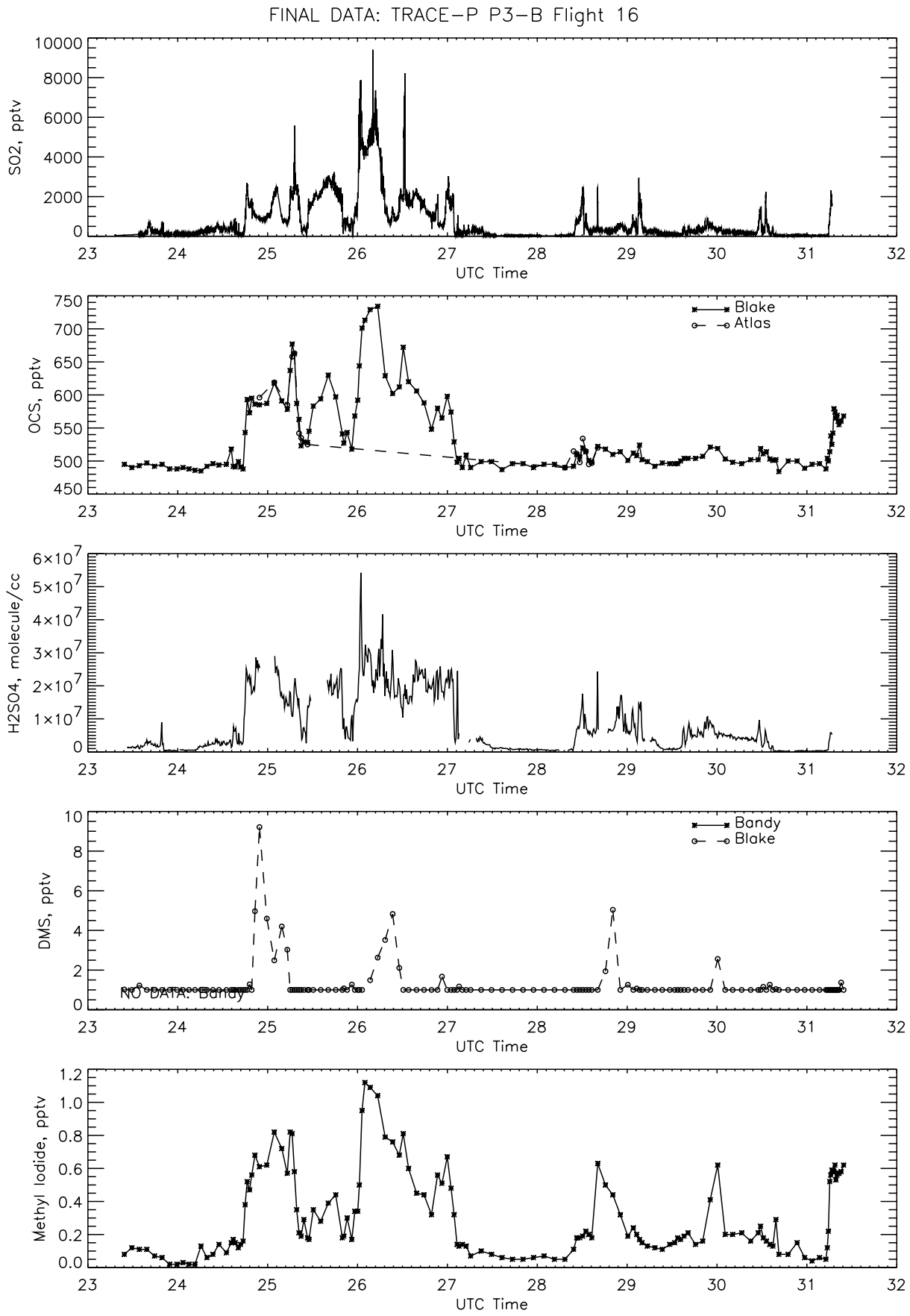
FINAL DATA: TRACE-P P3-B Flight 16

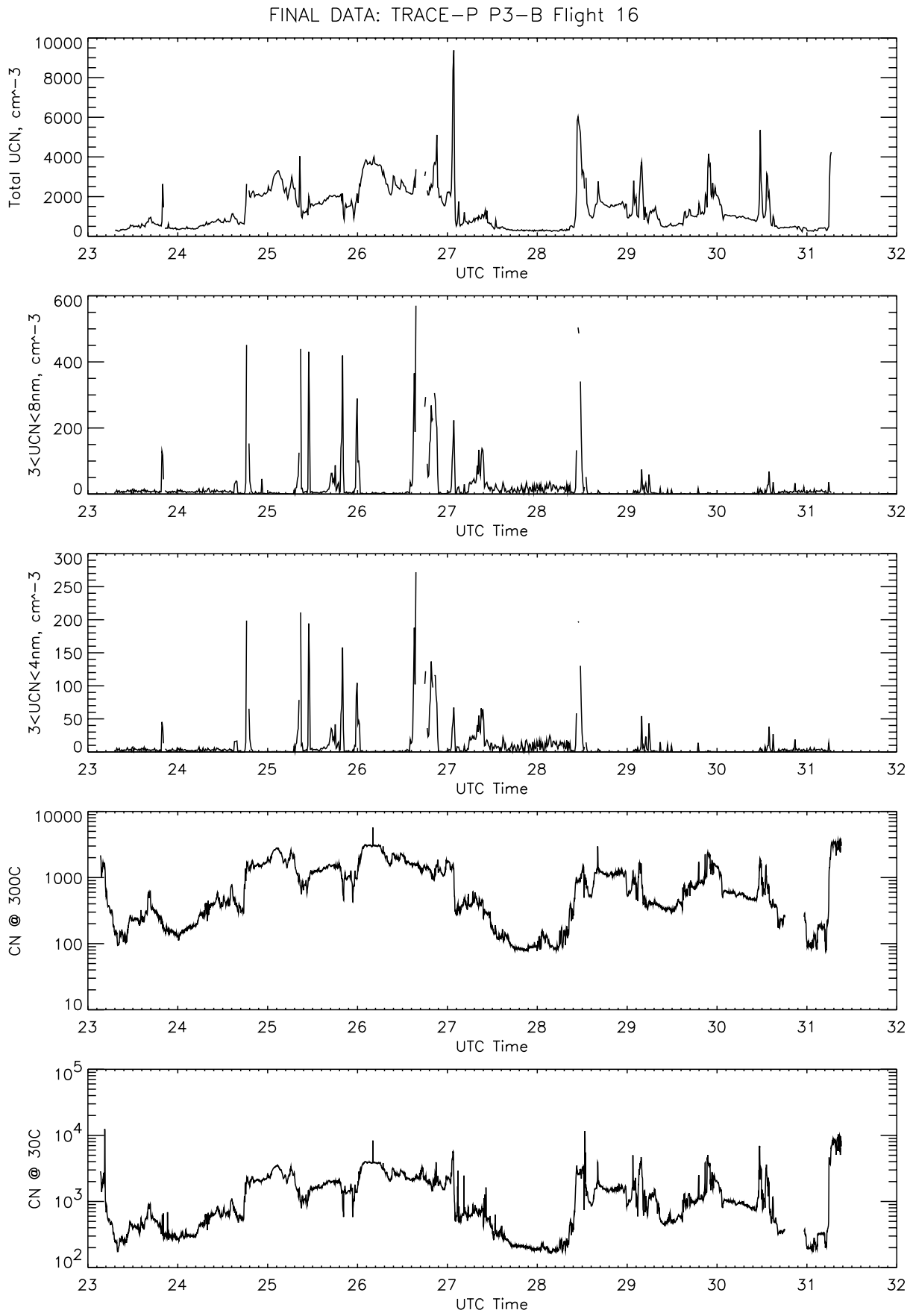


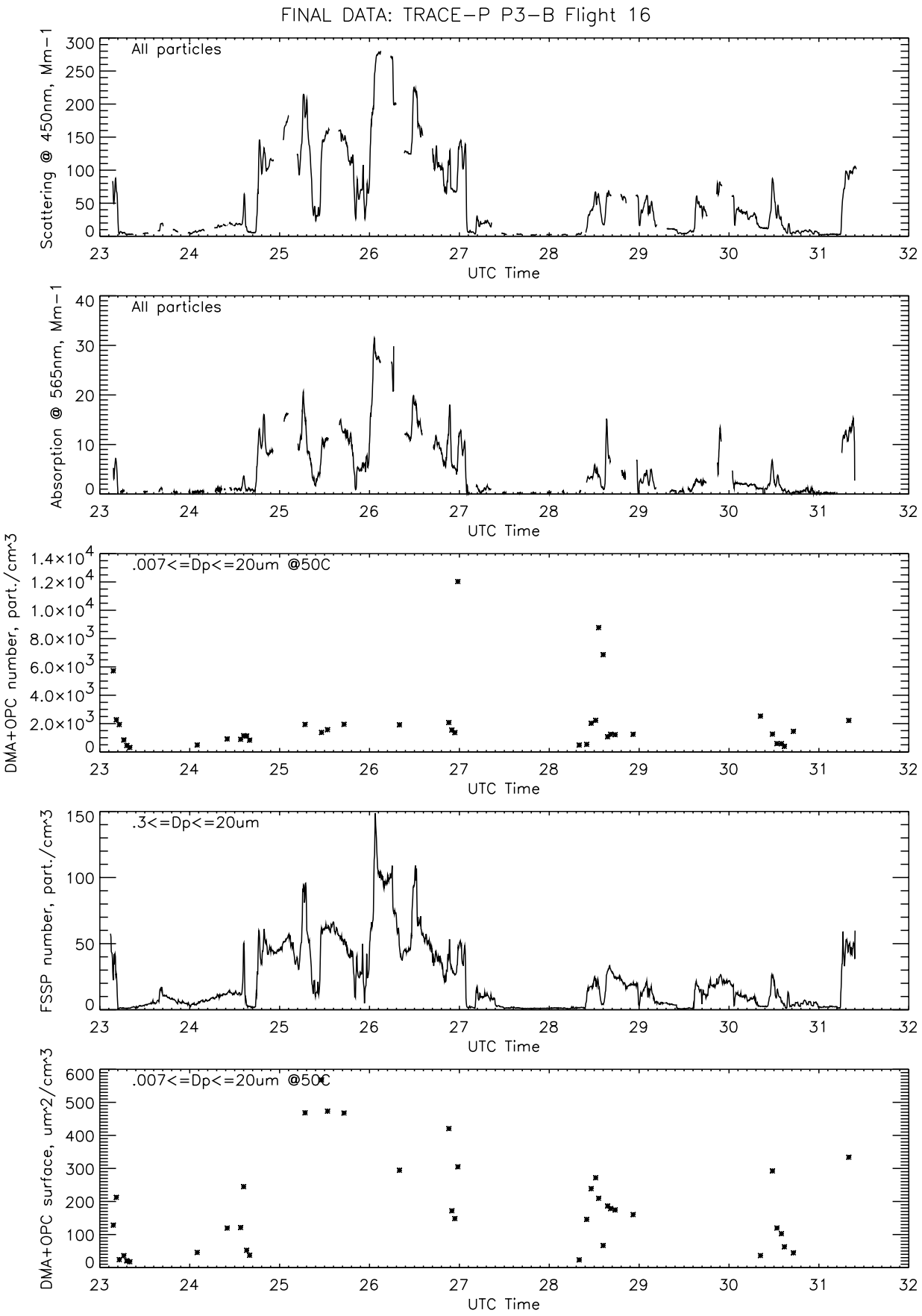
FINAL DATA: TRACE-P P3-B Flight 16

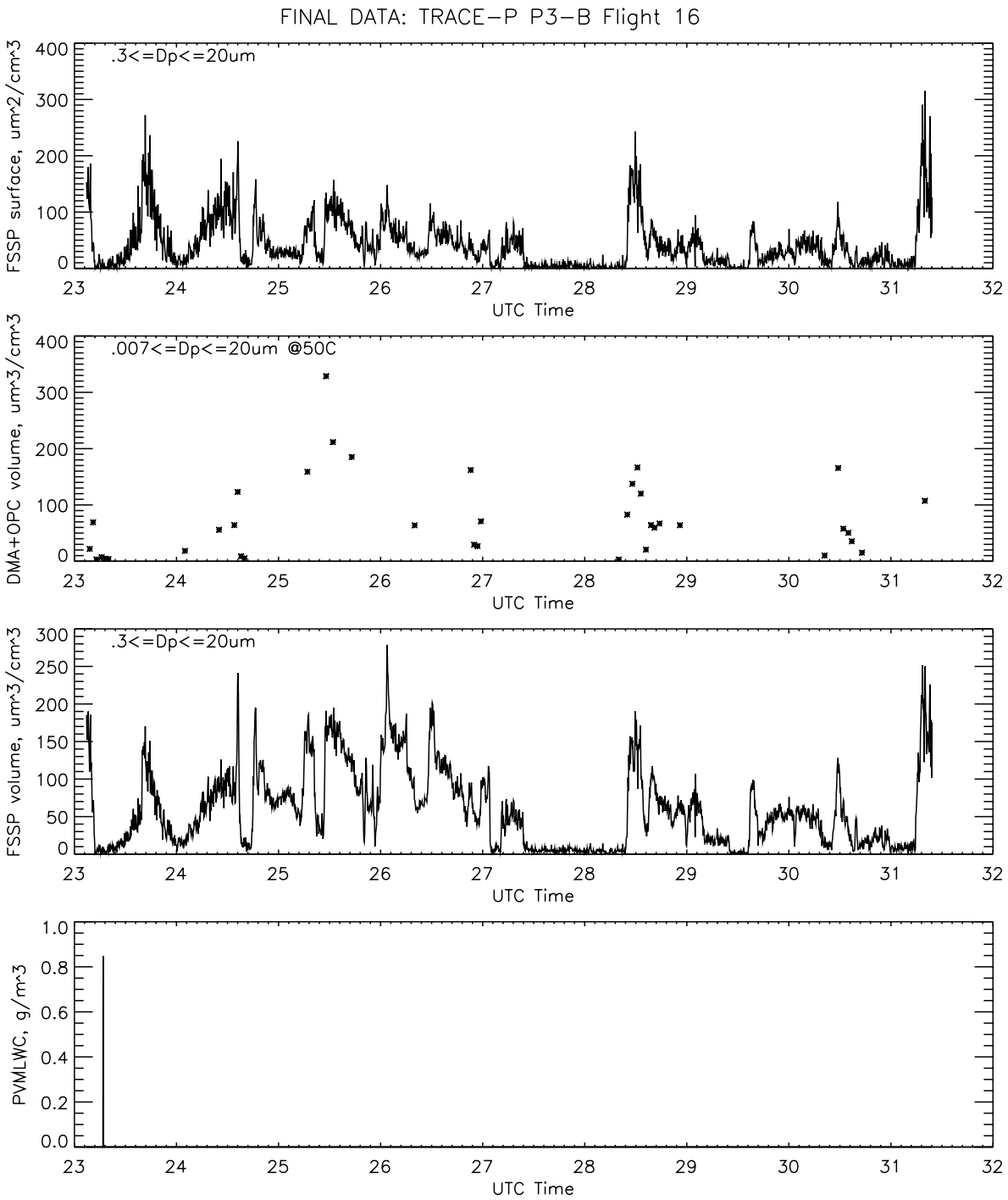



FINAL DATA: TRACE-P P3-B Flight 16
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
clip: max=5.44372e+006
UTC Time

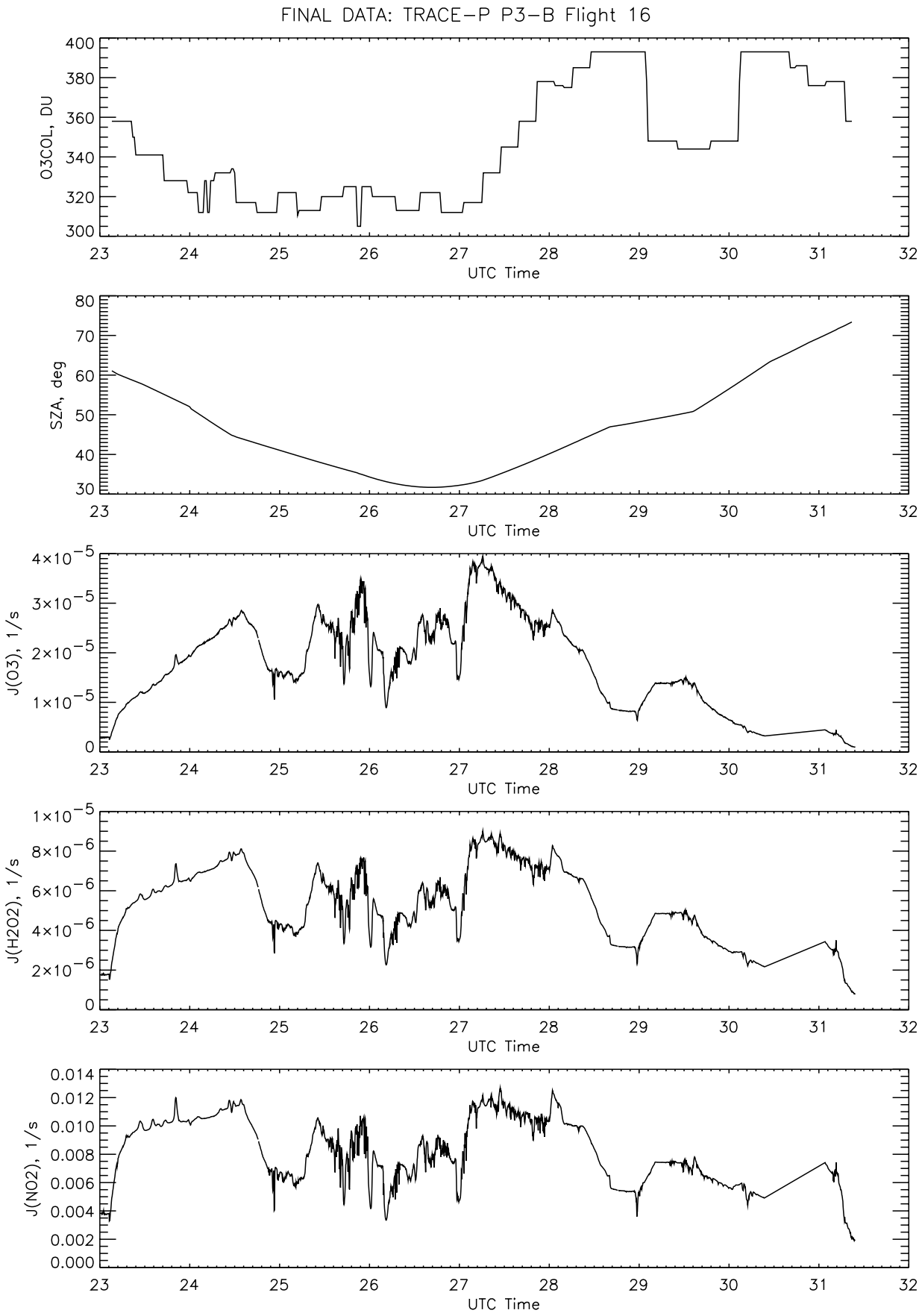

FINAL DATA: TRACE-P P3-B Flight 16
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

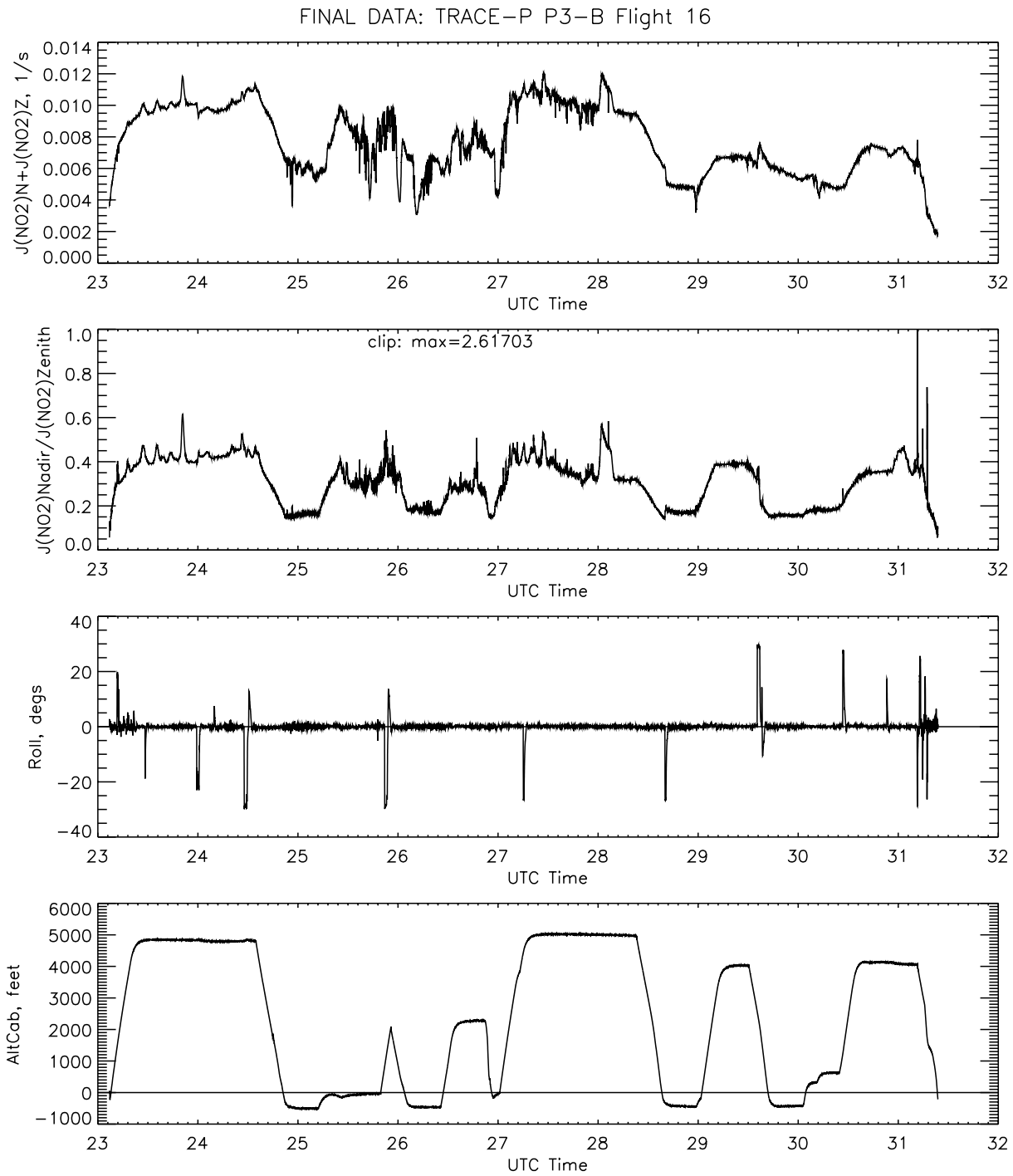

FINAL DATA: TRACE-P P3-B Flight 16
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time


FINAL DATA: TRACE-P P3-B Flight 16
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

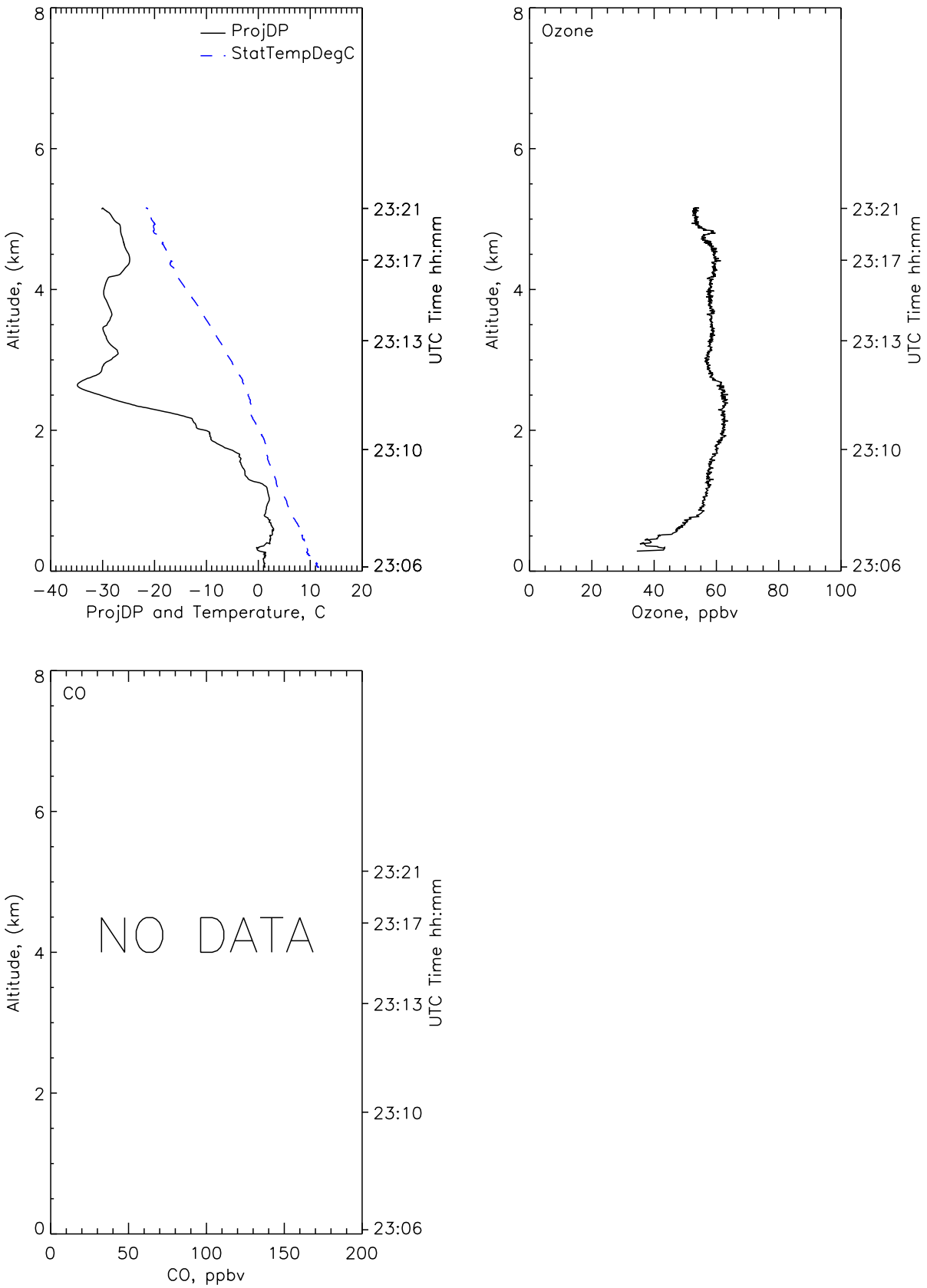

FINAL DATA: TRACE-P P3-B Flight 16
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

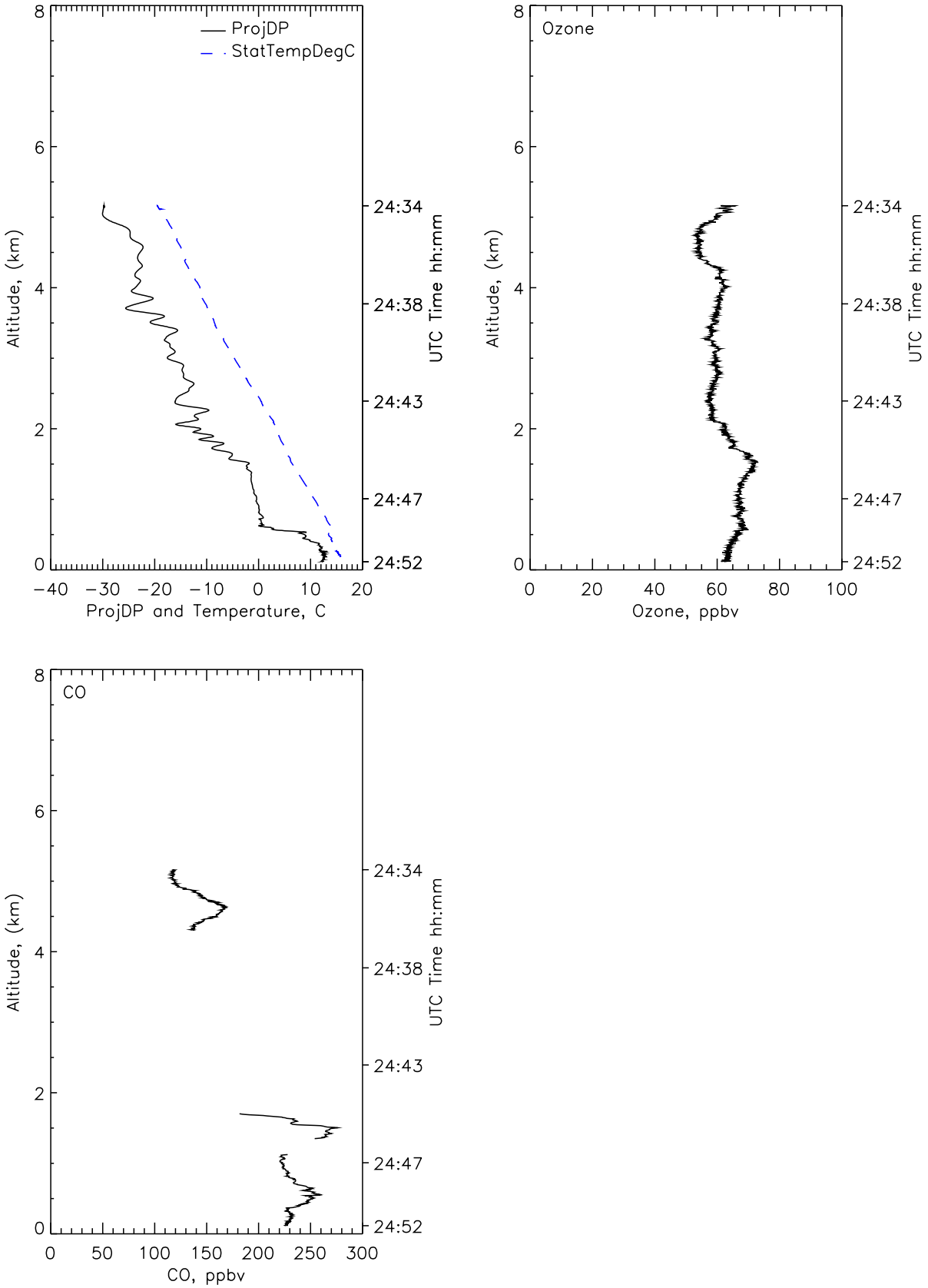

FINAL DATA: TRACE-P P3-B Flight 16
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 16
J(NO2)N+J(NO2)Z, 1/s
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
23 24 25 26 27 28 29 30 31 32
UTC Time
J(NO2)Nadir/J(NO2)Zenith
clip: max=2.61703
1.0
0.8
0.6
0.4
0.2
0.0
23 24 25 26 27 28 29 30 31 32
UTC Time
Roll, degs
40
20
0
−20
−40
23 24 25 26 27 28 29 30 31 32
UTC Time
AltCab, feet
6000
5000
4000
3000
2000
1000
0
−1000
23 24 25 26 27 28 29 30 31 32
UTC Time

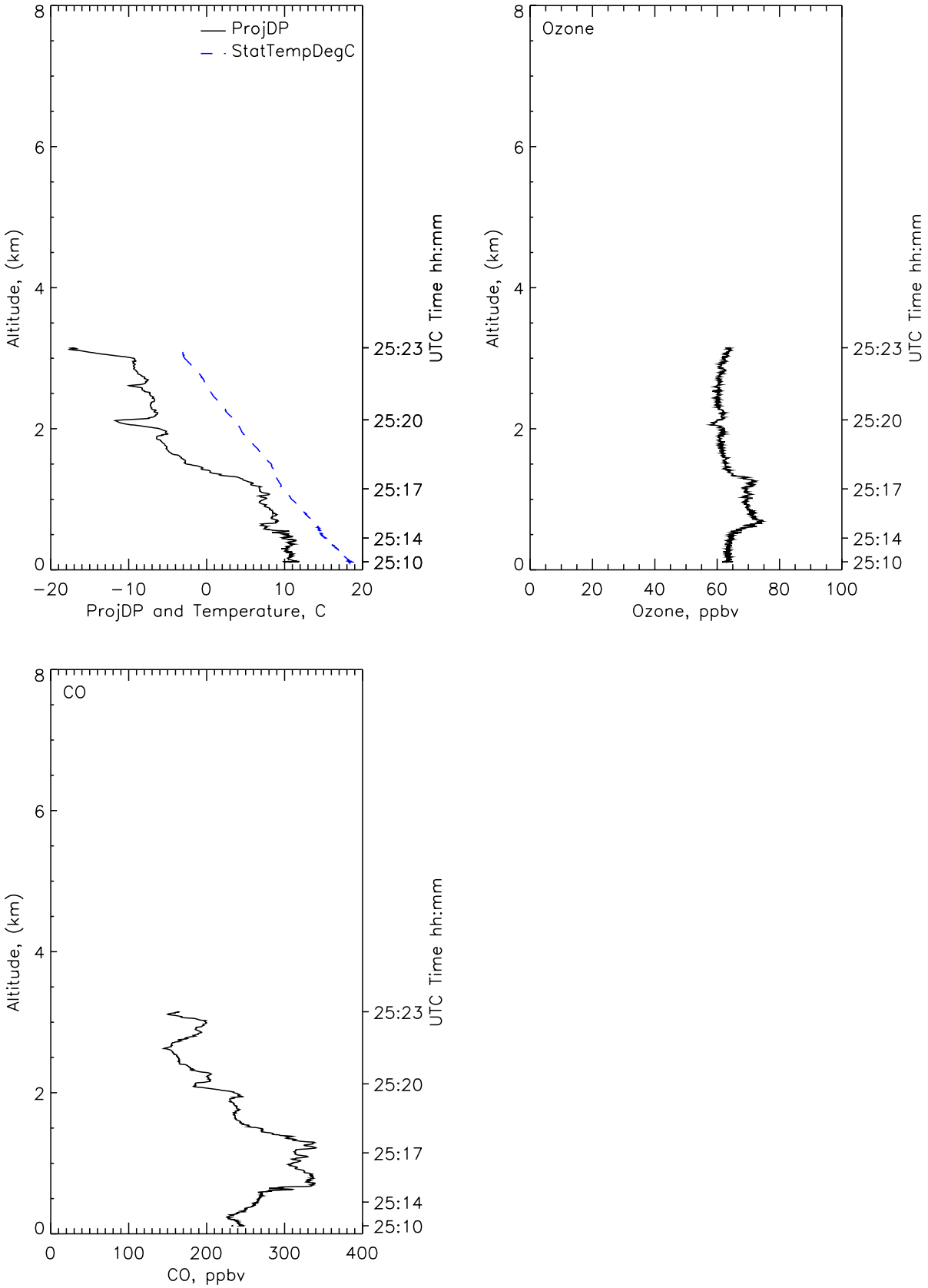
Profile # 1 TRACE−P P3−B Flight 16



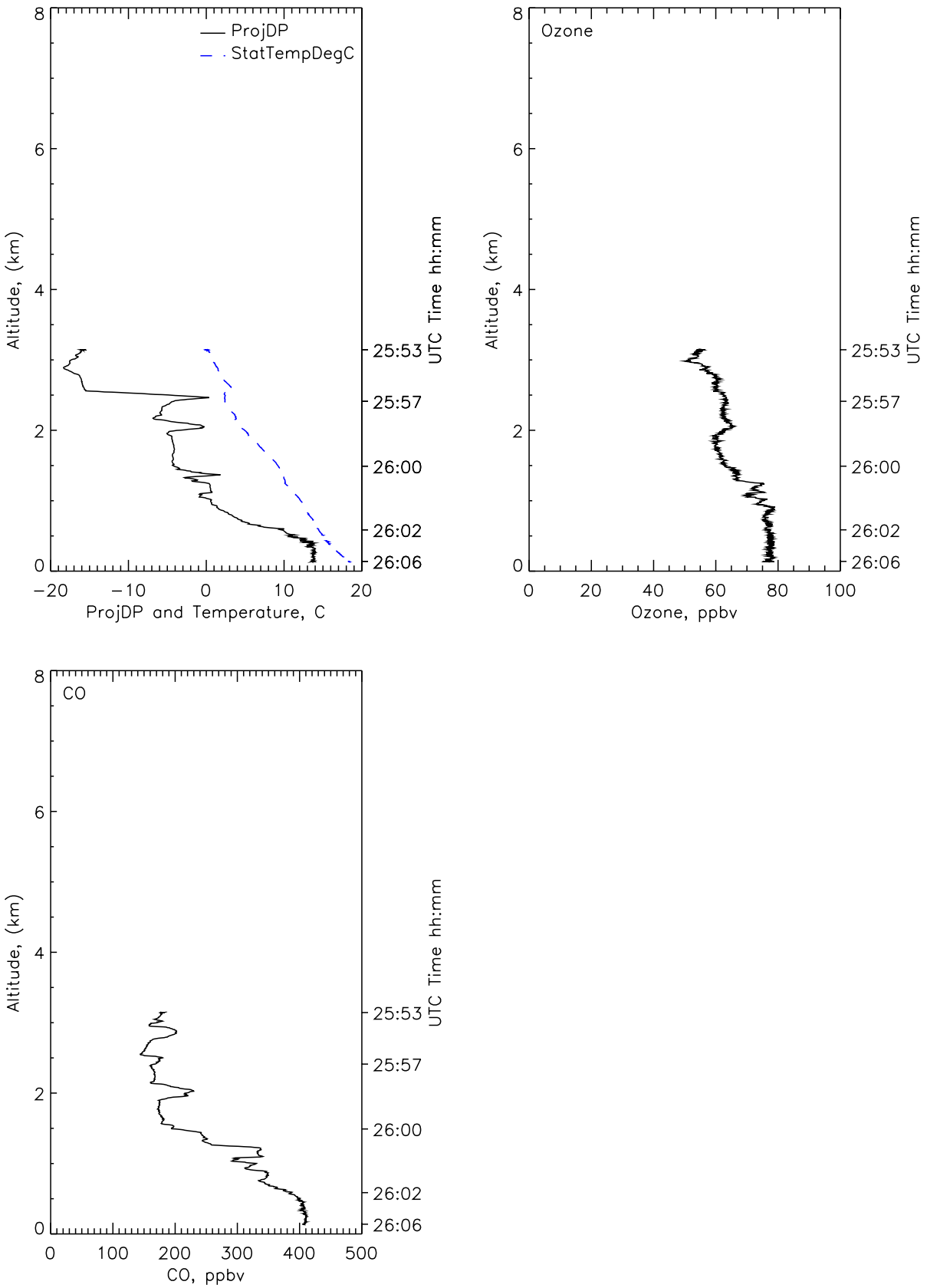
Profile # 2 TRACE-P P3-B Flight 16



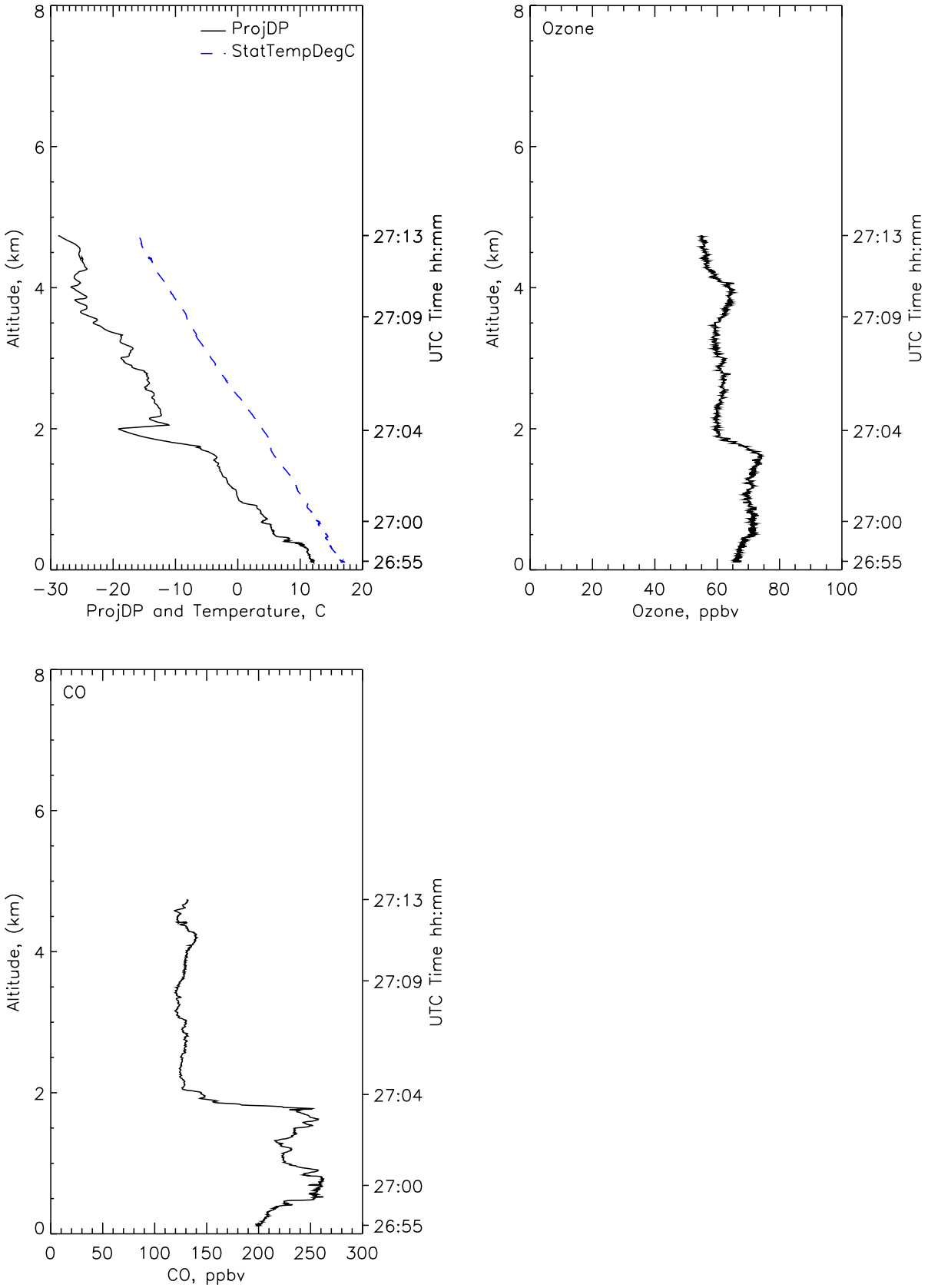
Profile # 3 TRACE-P P3-B Flight 16



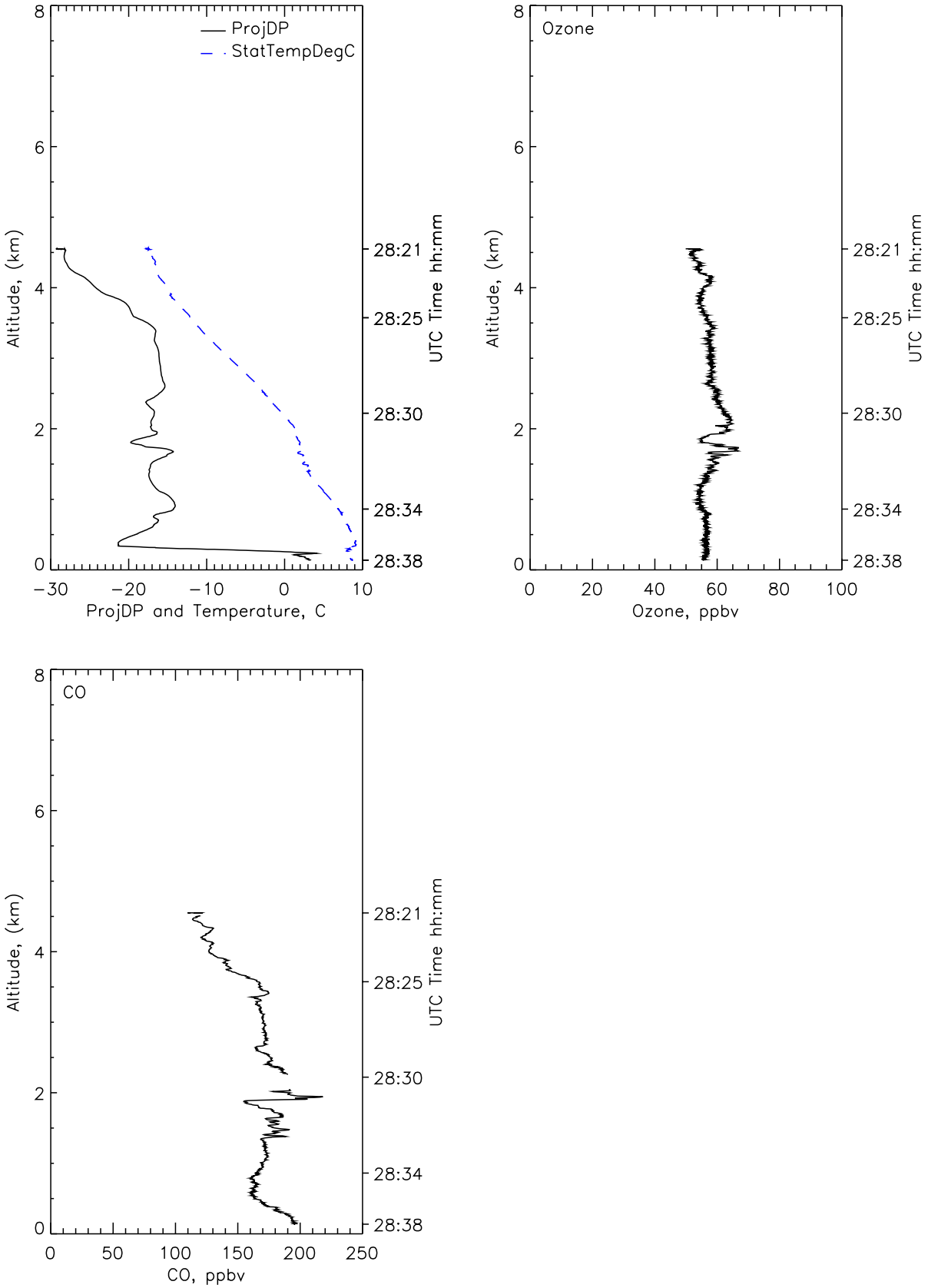
Profile # 4 TRACE-P P3-B Flight 16



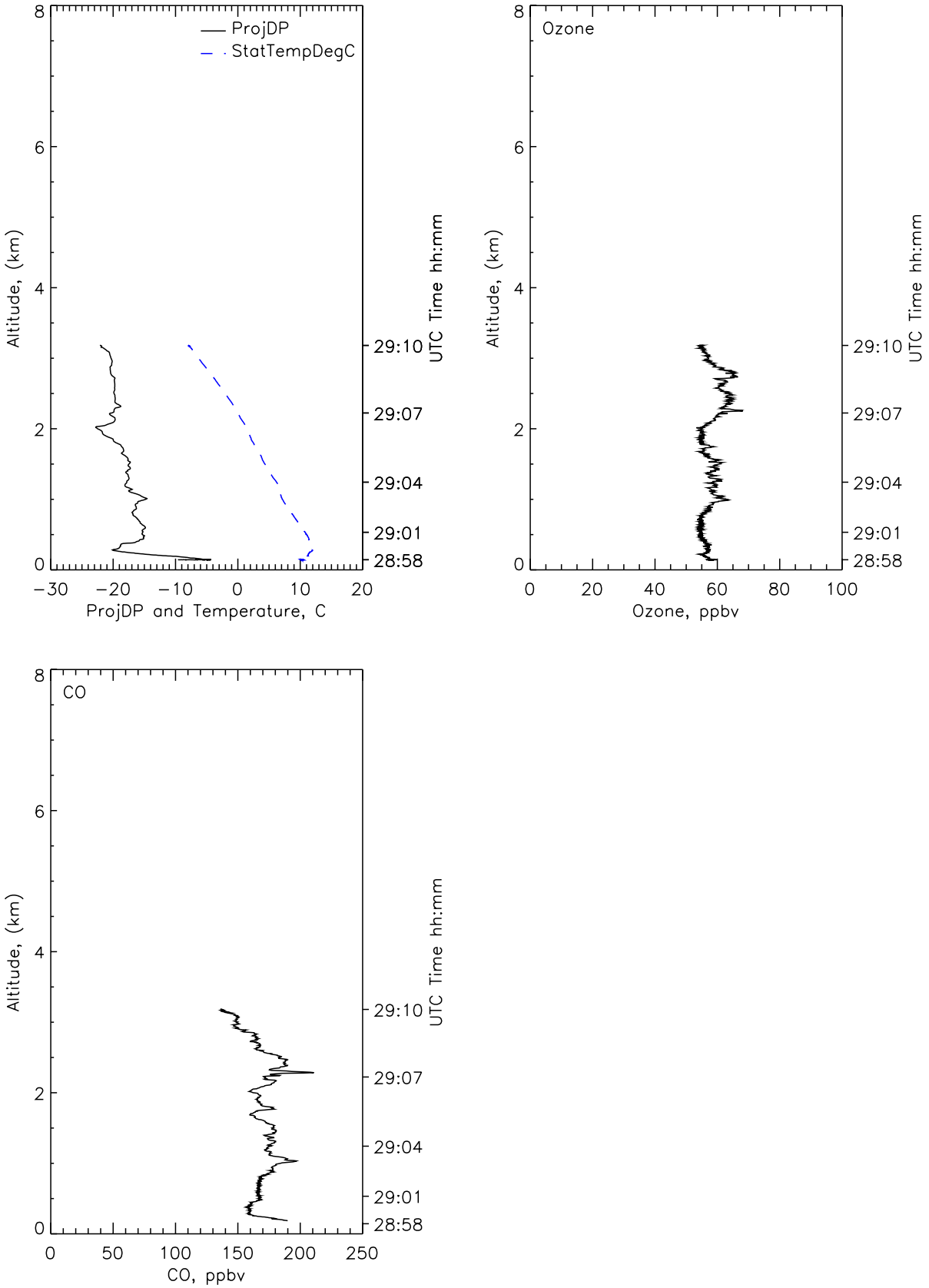
Profile # 5 TRACE-P P3-B Flight 16



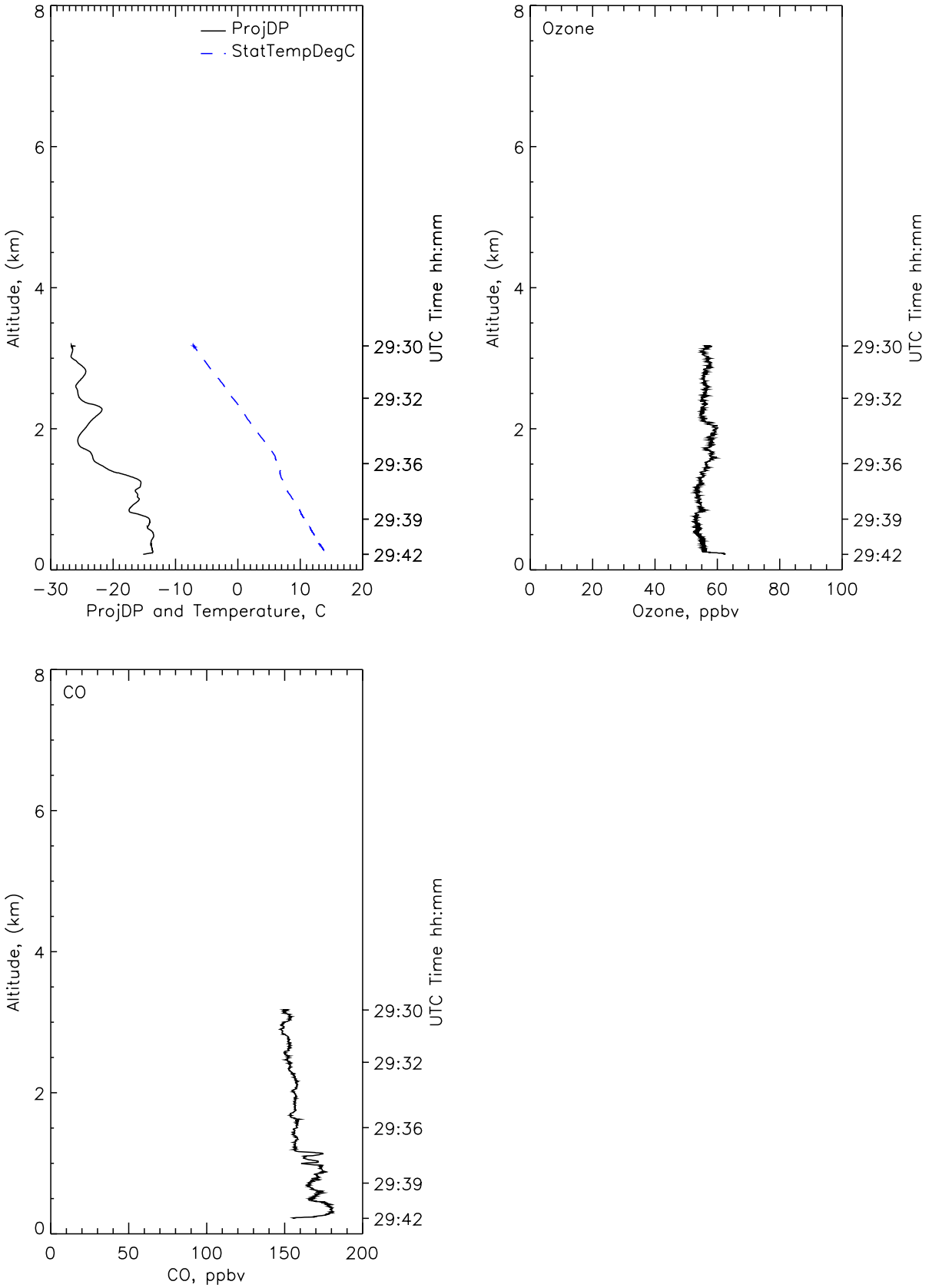
Profile # 6 TRACE−P P3−B Flight 16

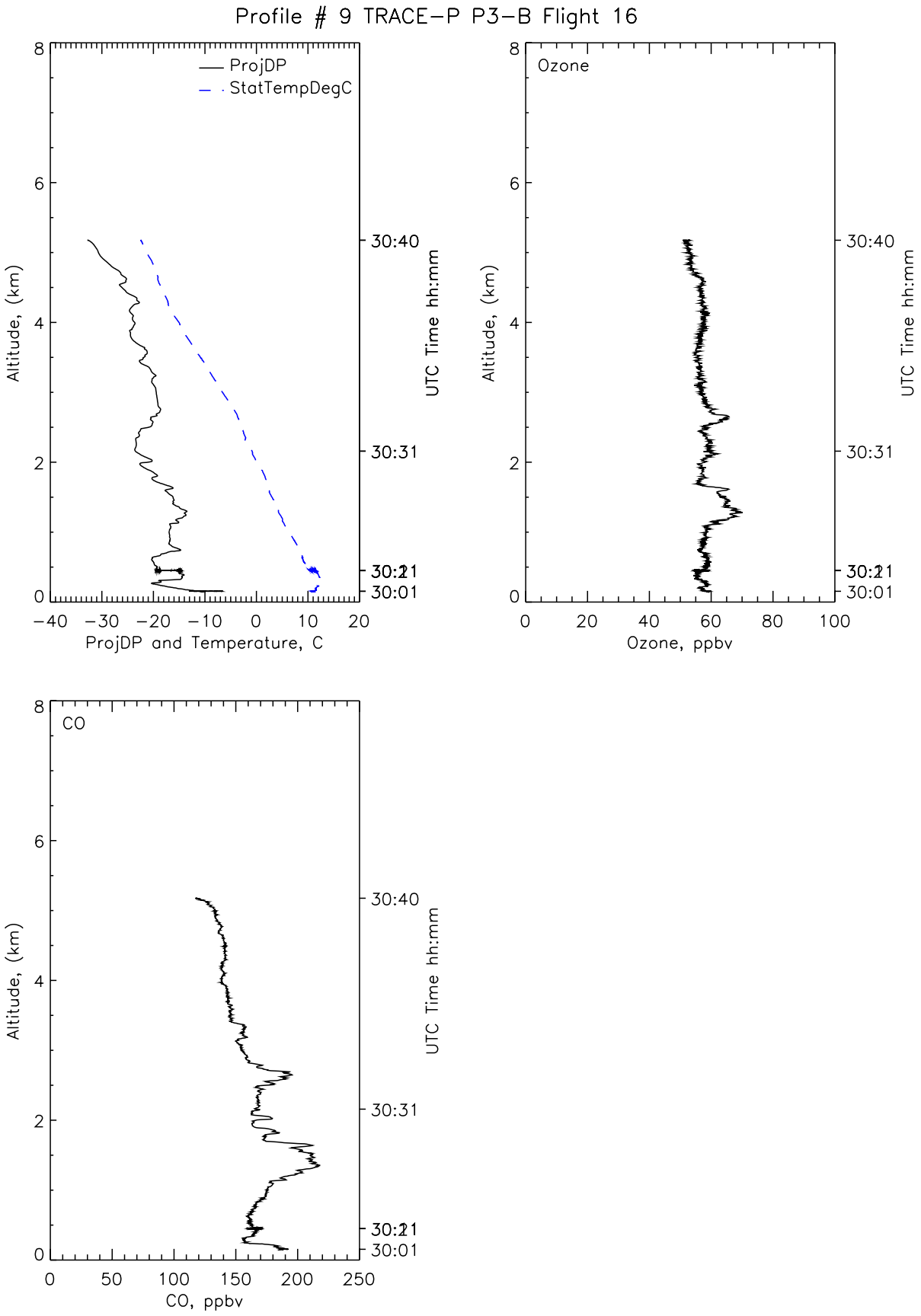


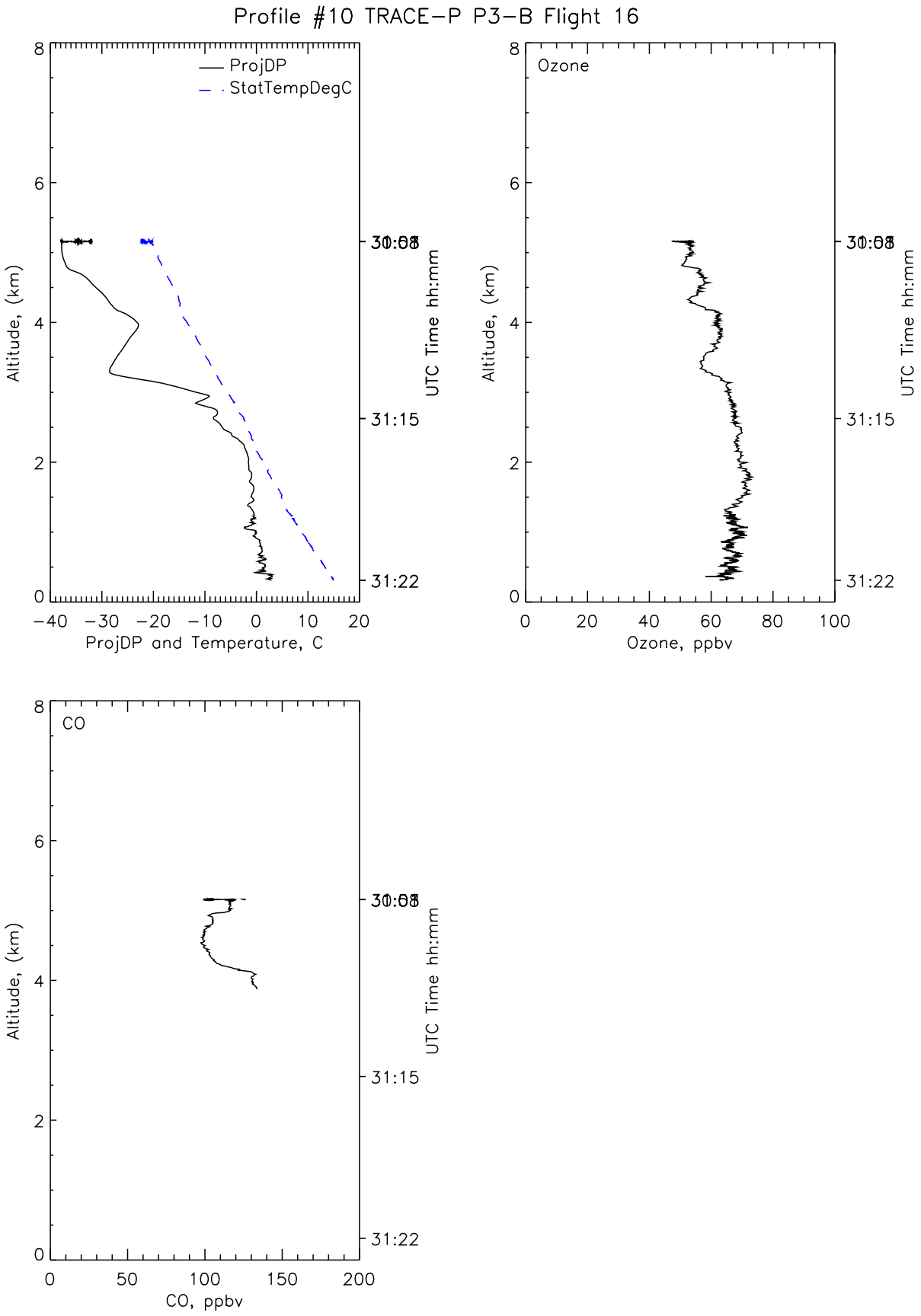
Profile # 7 TRACE-P P3-B Flight 16



Profile # 8 TRACE-P P3-B Flight 16




Profile # 9 TRACE-P P3-B Flight 16
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
30:40
30:31
30:21
30:01
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile #10 TRACE-P P3-B Flight 16
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
31:15
31:22
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

TRACE-P

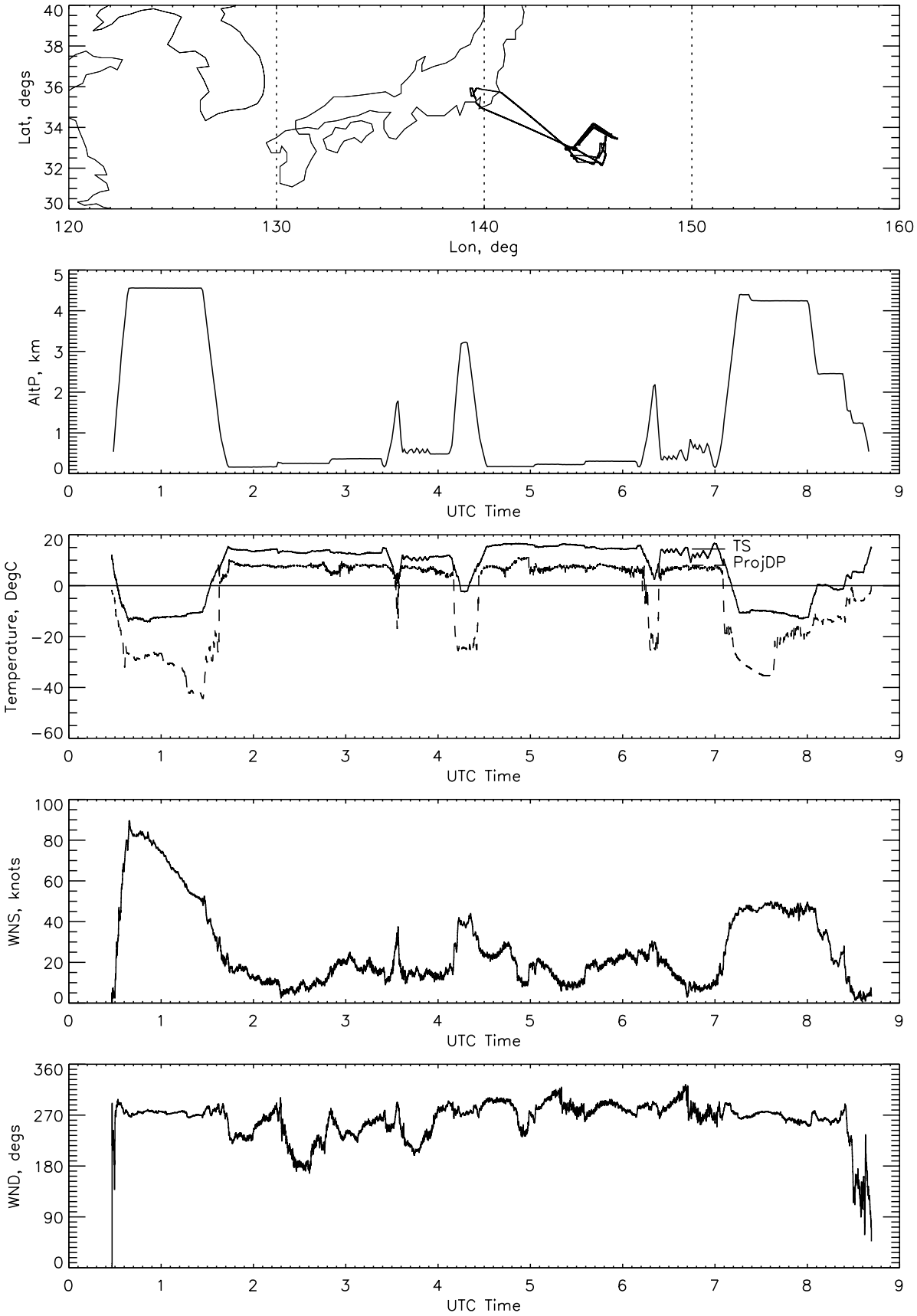
Flight 17P

Local: Yokota No. 3

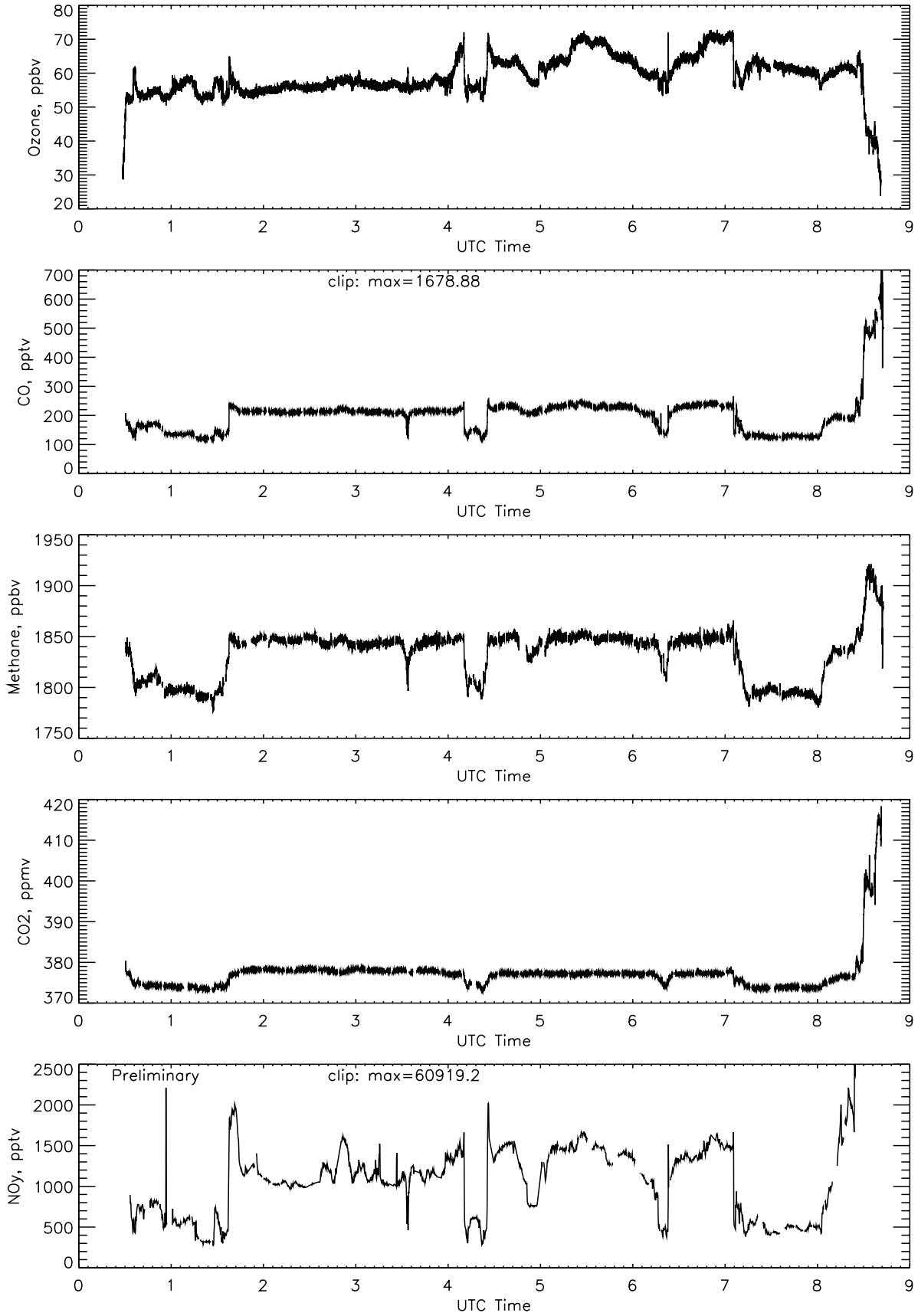
Air-Sea Exchange; Volcanic Plume; TERRA Underpass

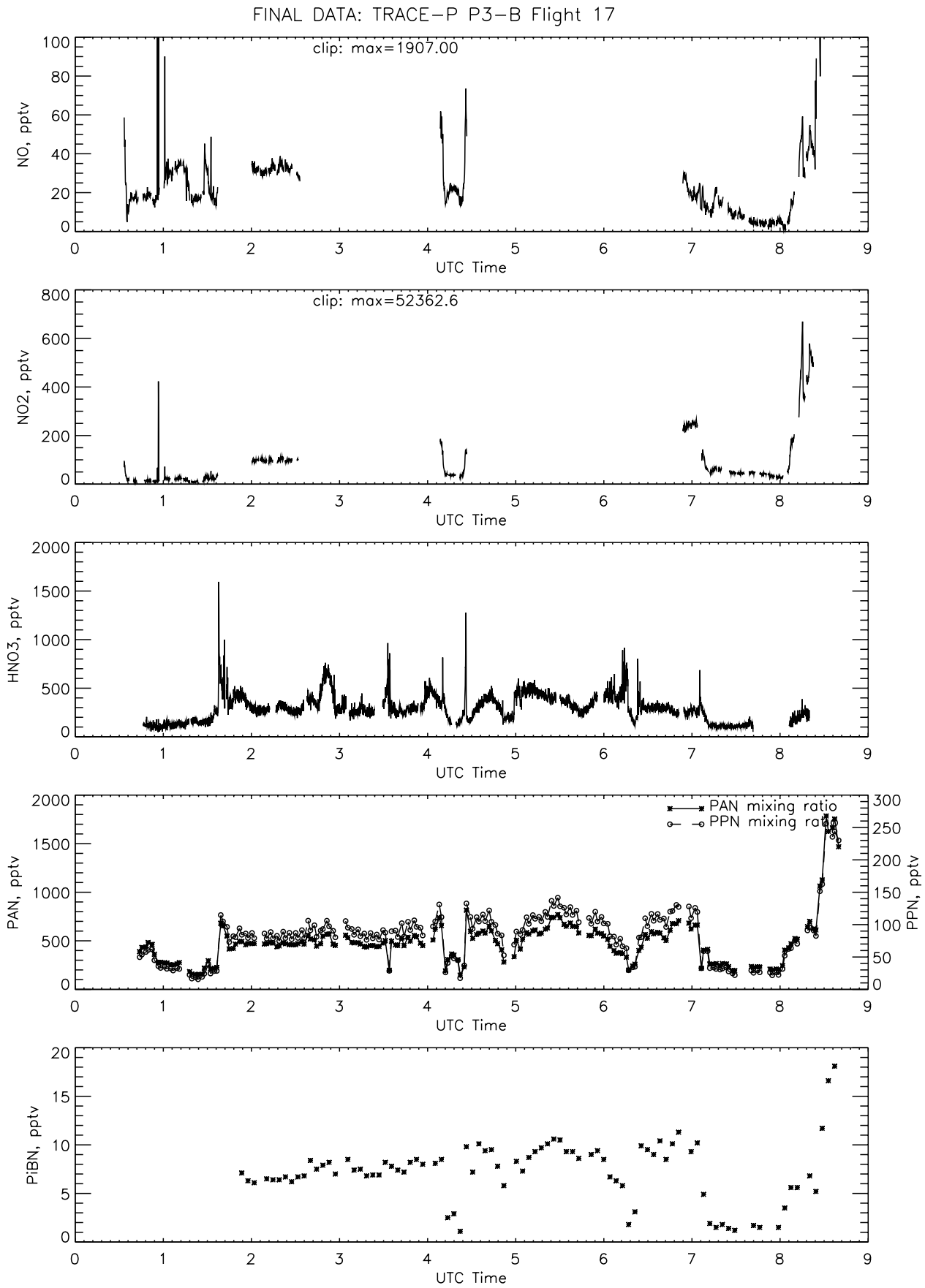
March 27, 2001

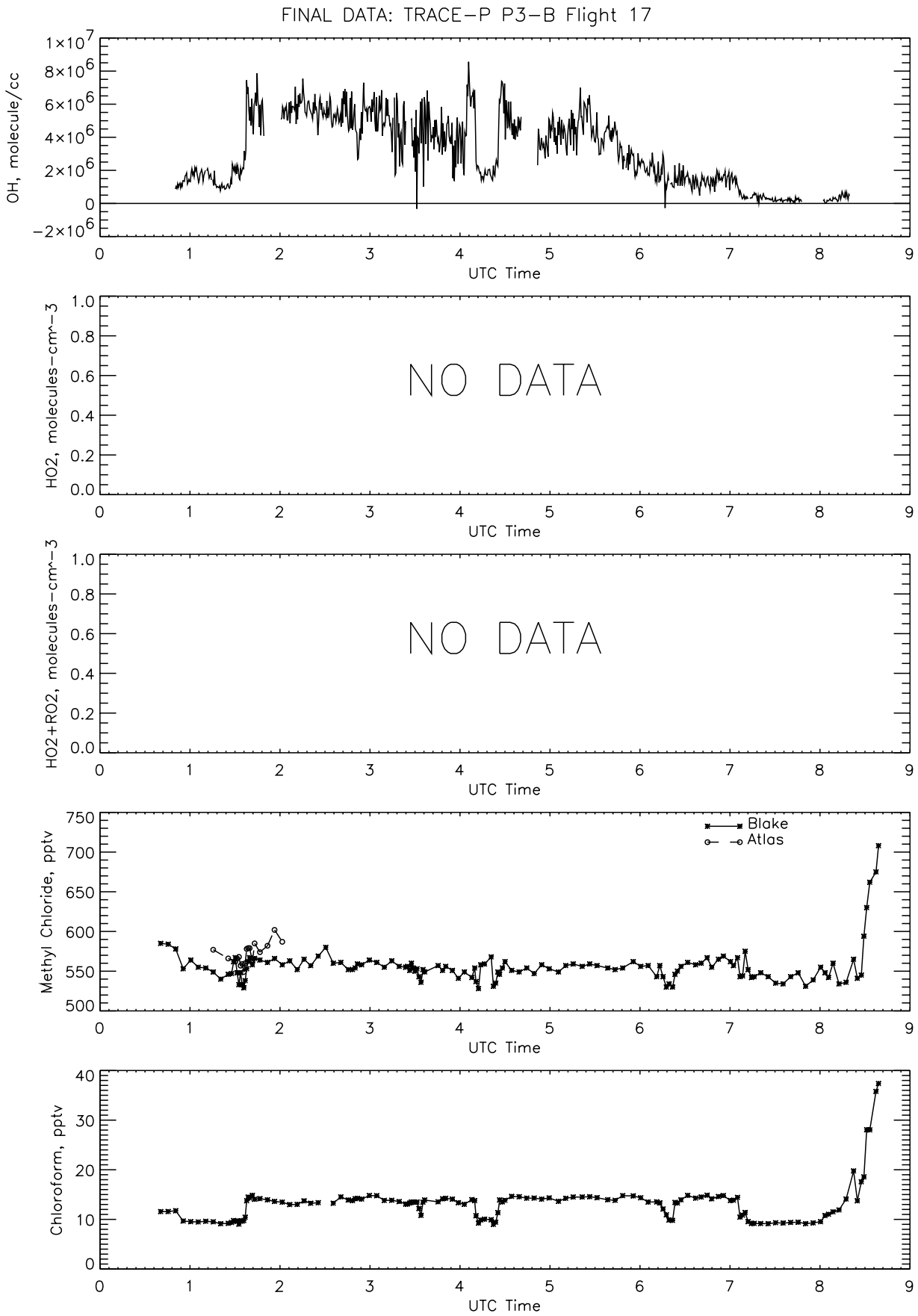
FINAL DATA: TRACE-P P3-B Flight 17



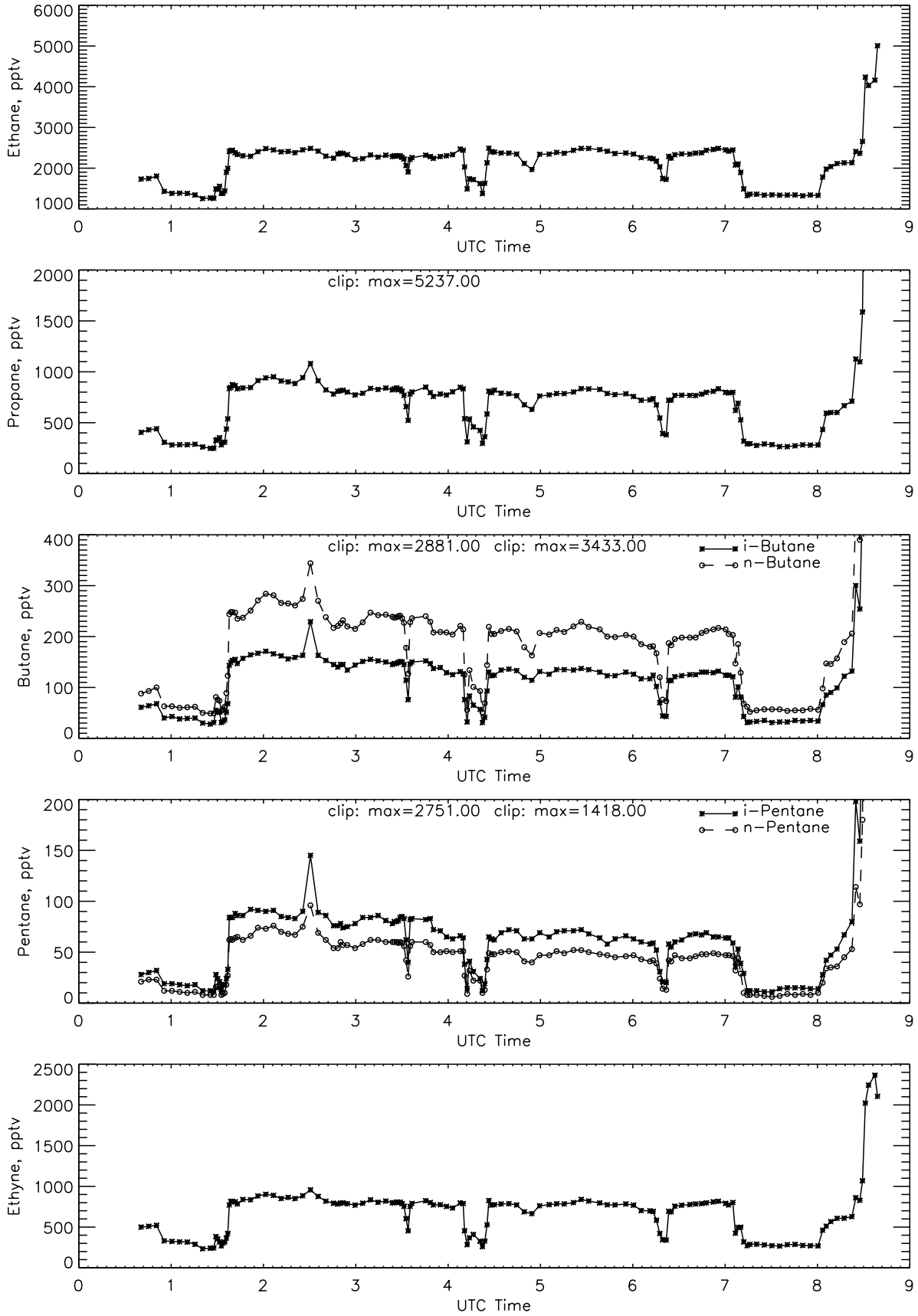
FINAL DATA: TRACE-P P3-B Flight 17

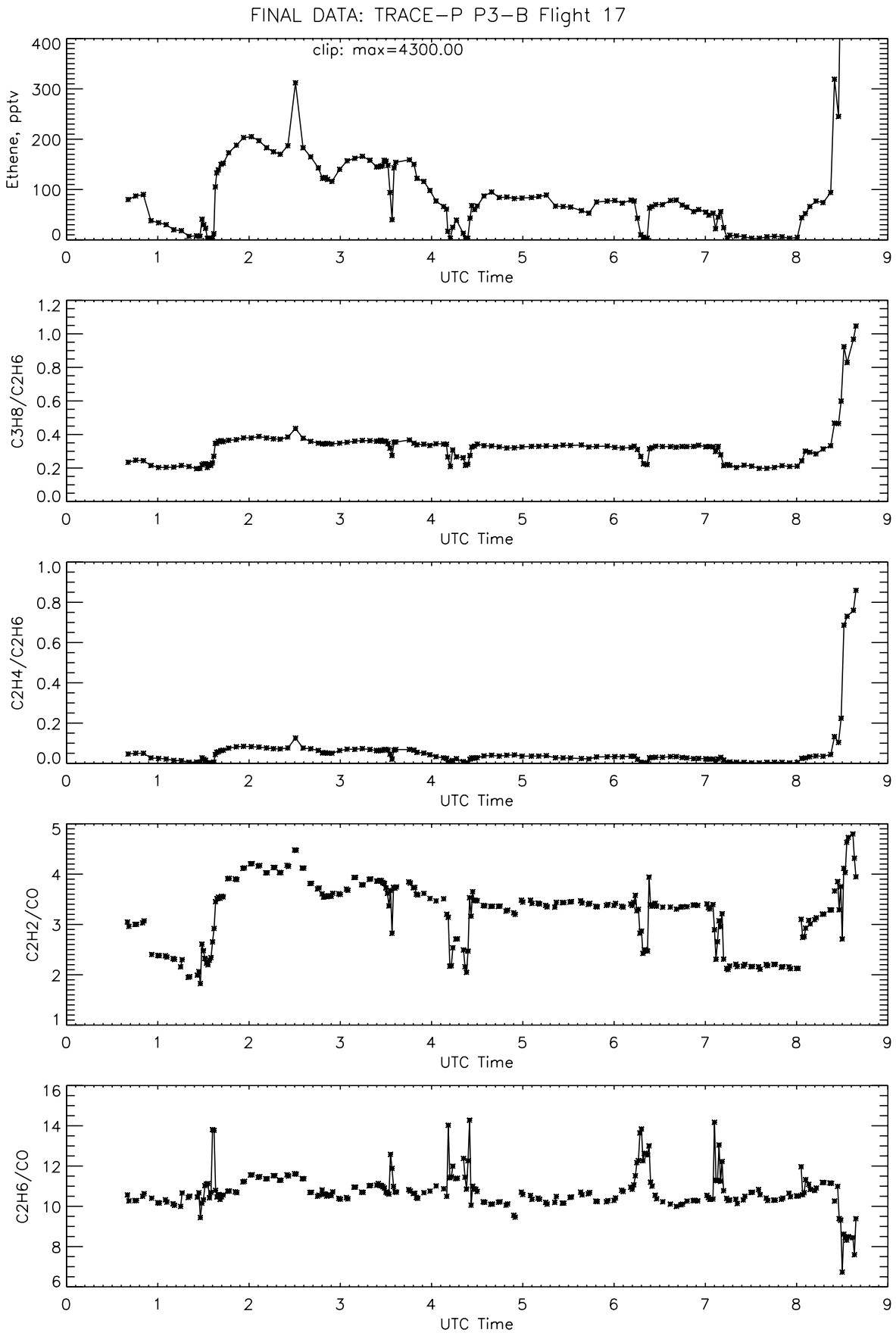



FINAL DATA: TRACE-P P3-B Flight 17
clip: max=1907.00
NO, pptv
UTC Time
clip: max=52362.6
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

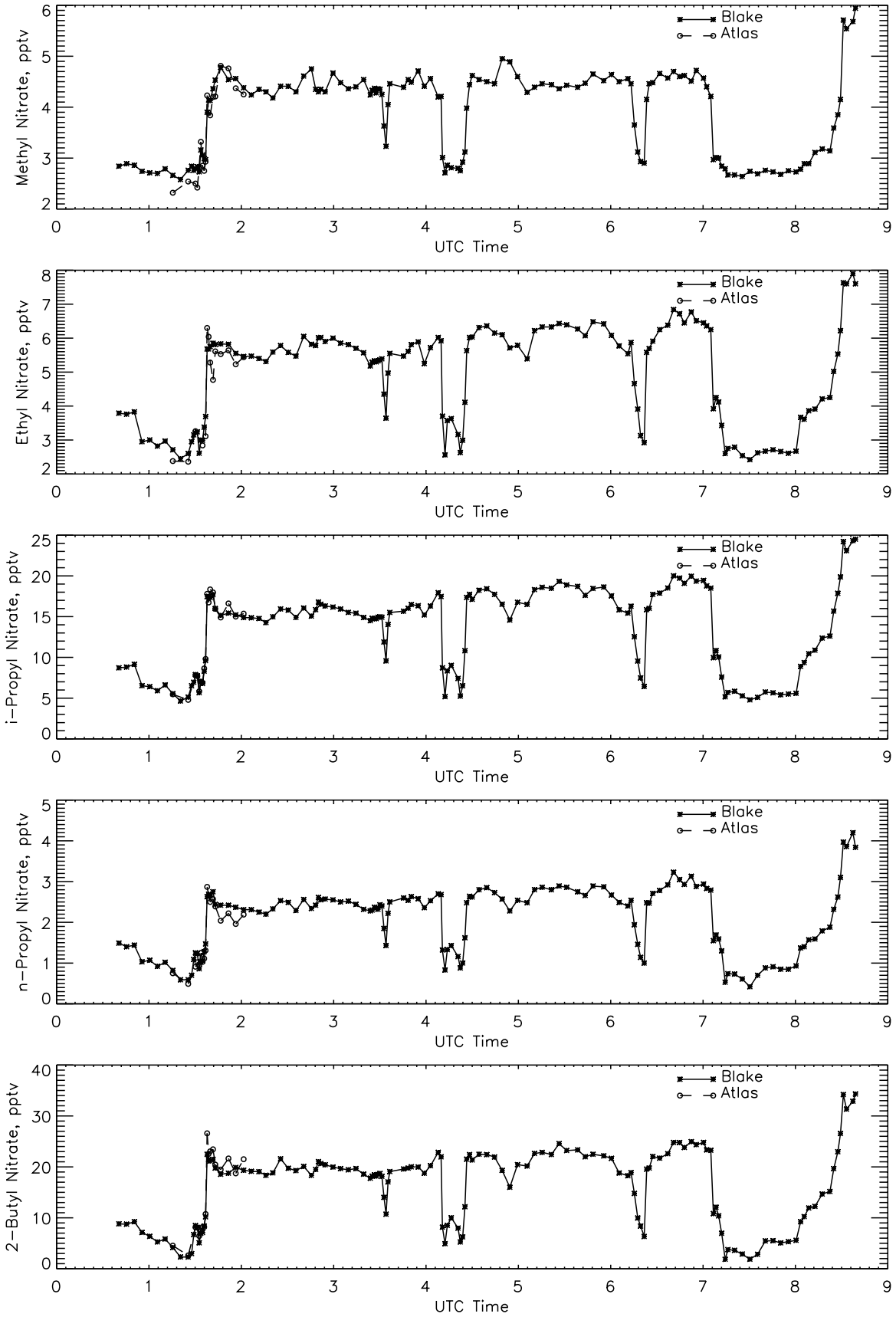

FINAL DATA: TRACE-P P3-B Flight 17
OH, molecule/cc
UTC Time
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
NO DATA
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv

FINAL DATA: TRACE-P P3-B Flight 17

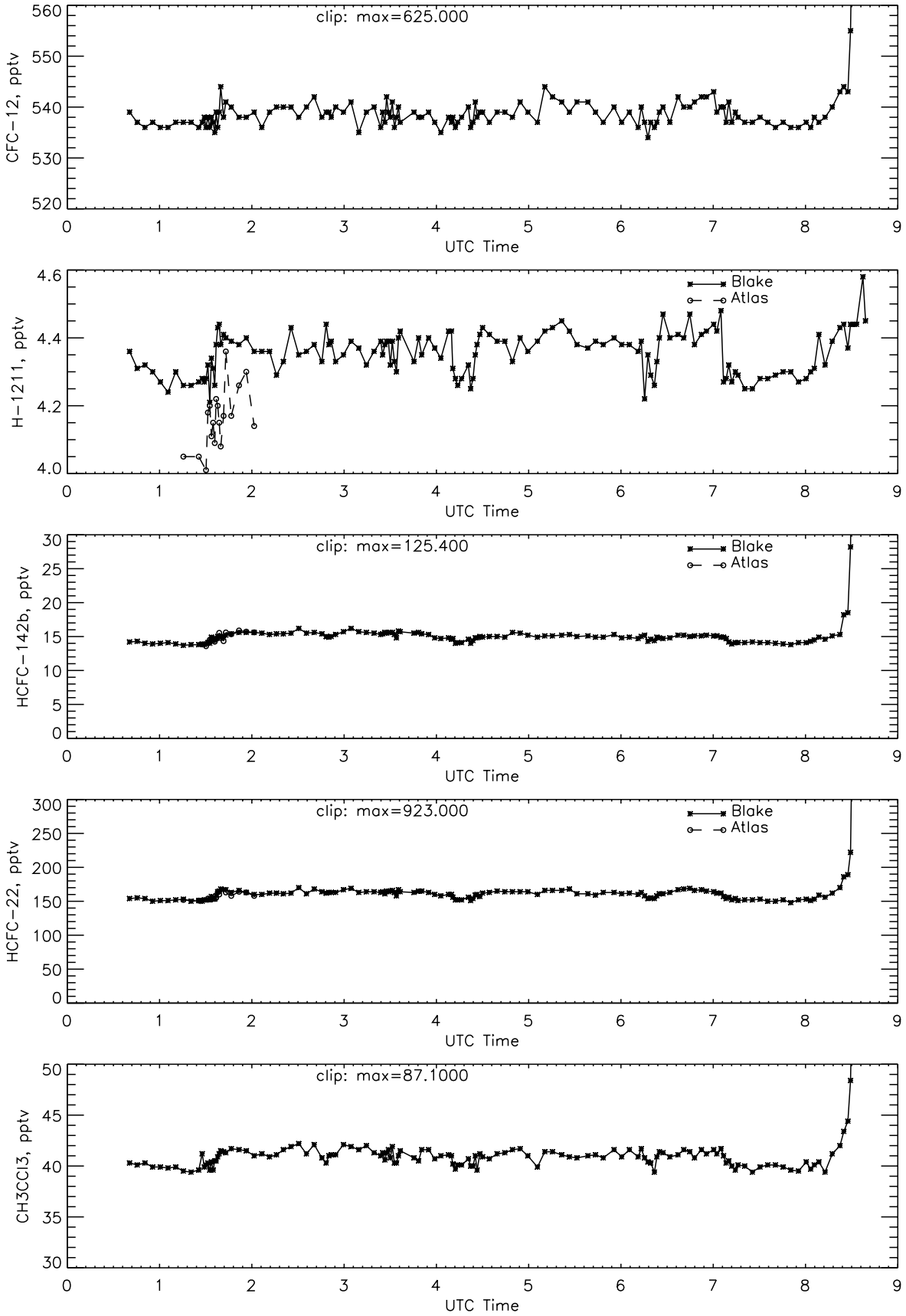



FINAL DATA: TRACE-P P3-B Flight 17
clip: max=4300.00
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

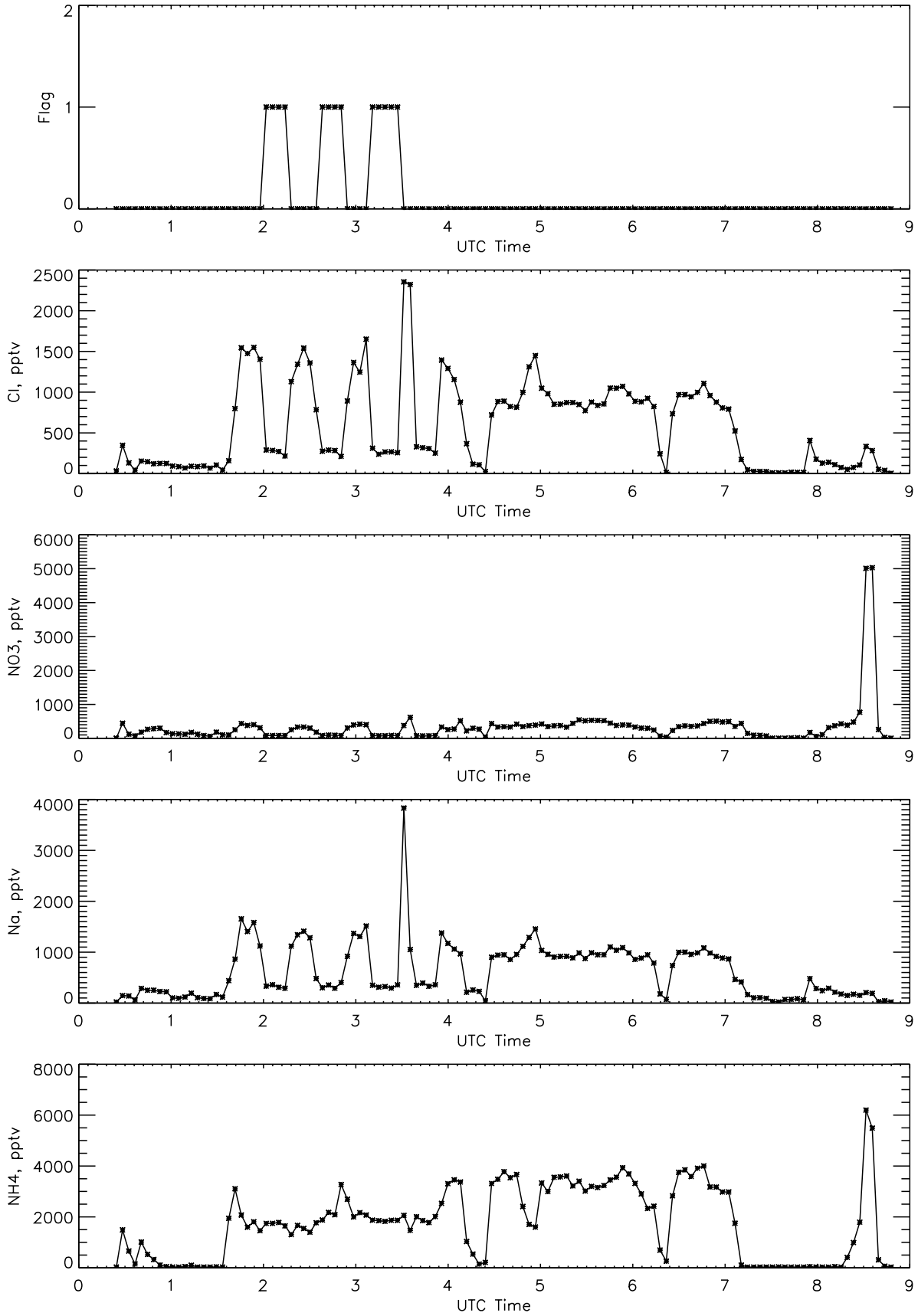
FINAL DATA: TRACE-P P3-B Flight 17



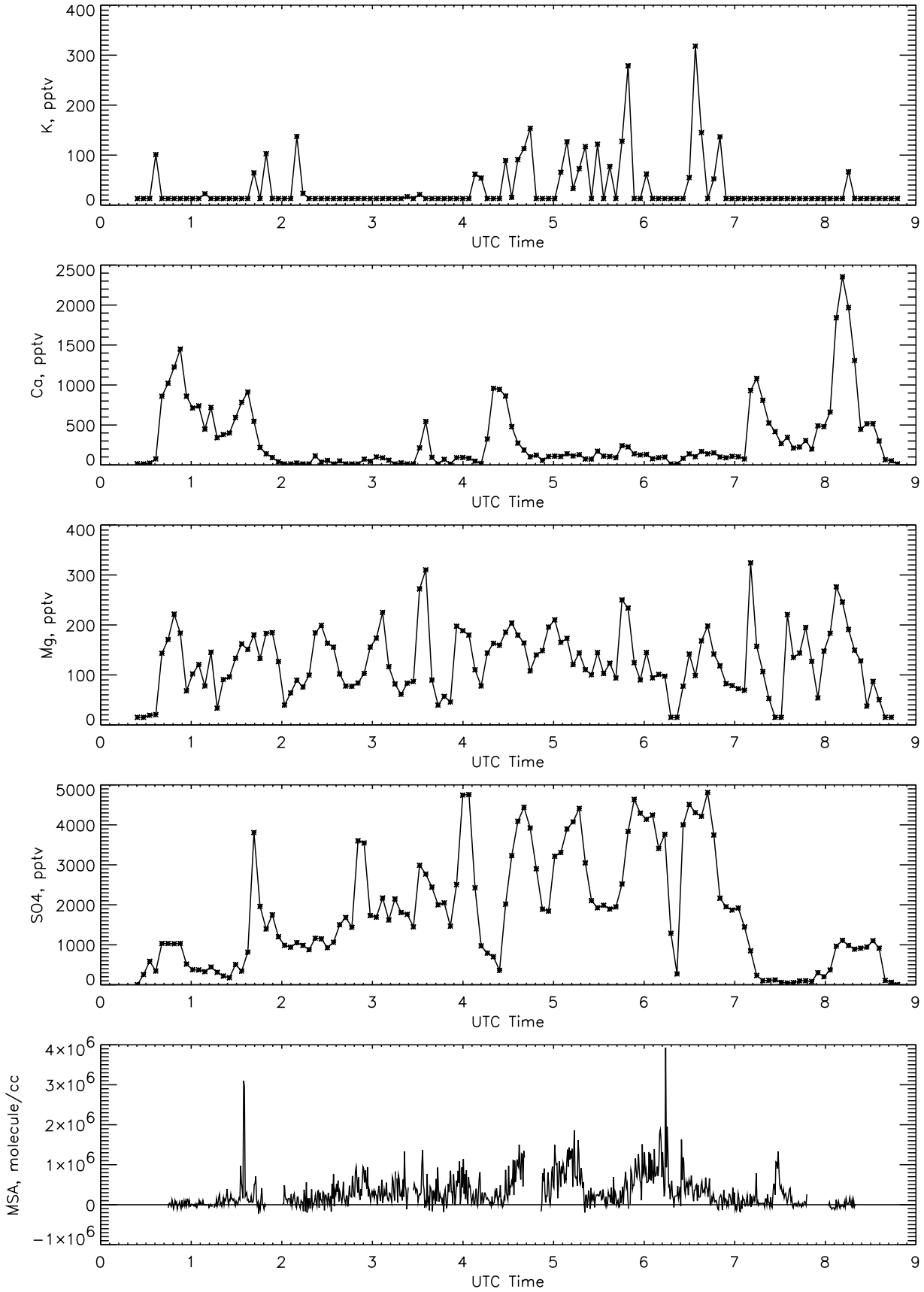
FINAL DATA: TRACE-P P3-B Flight 17

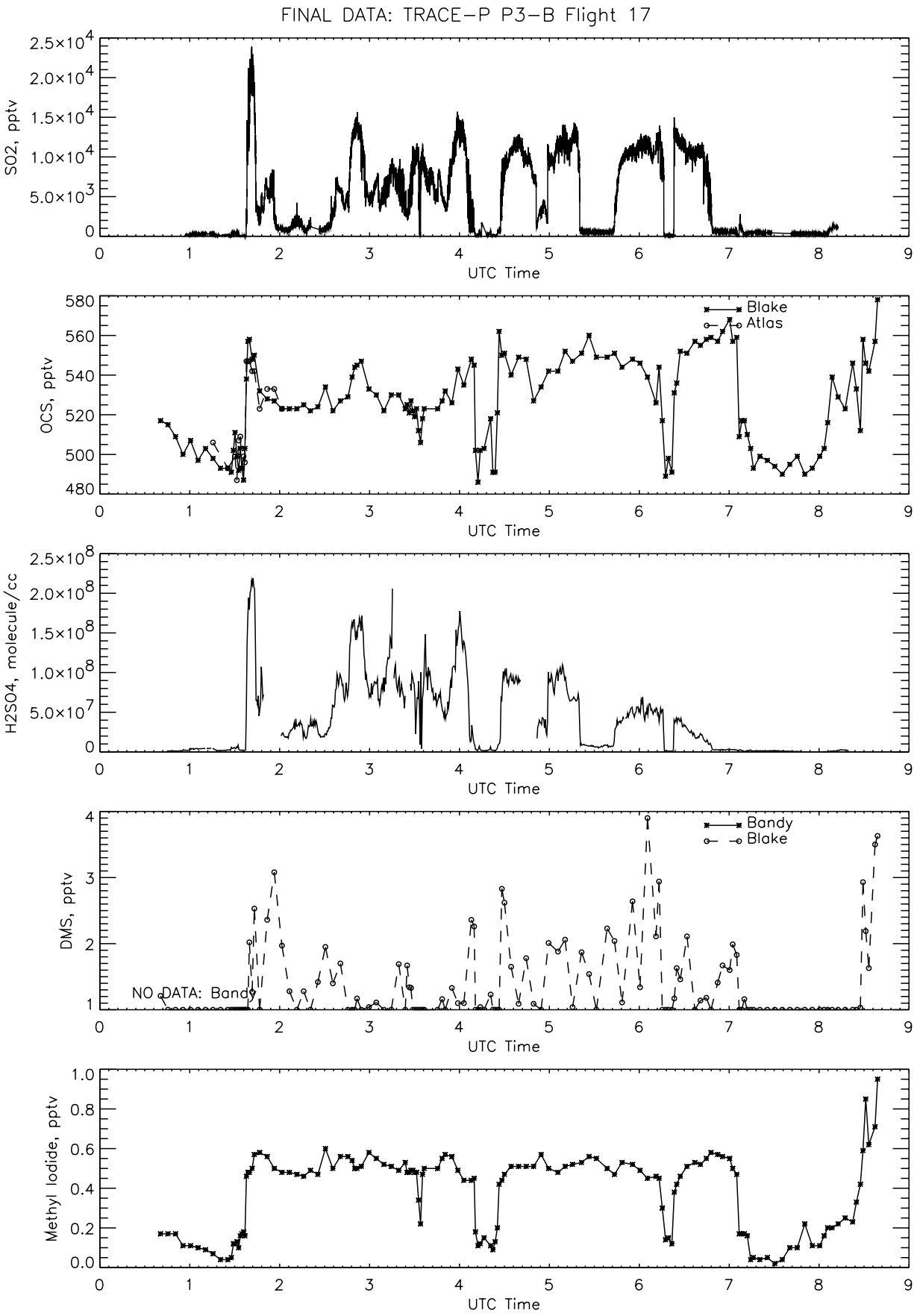


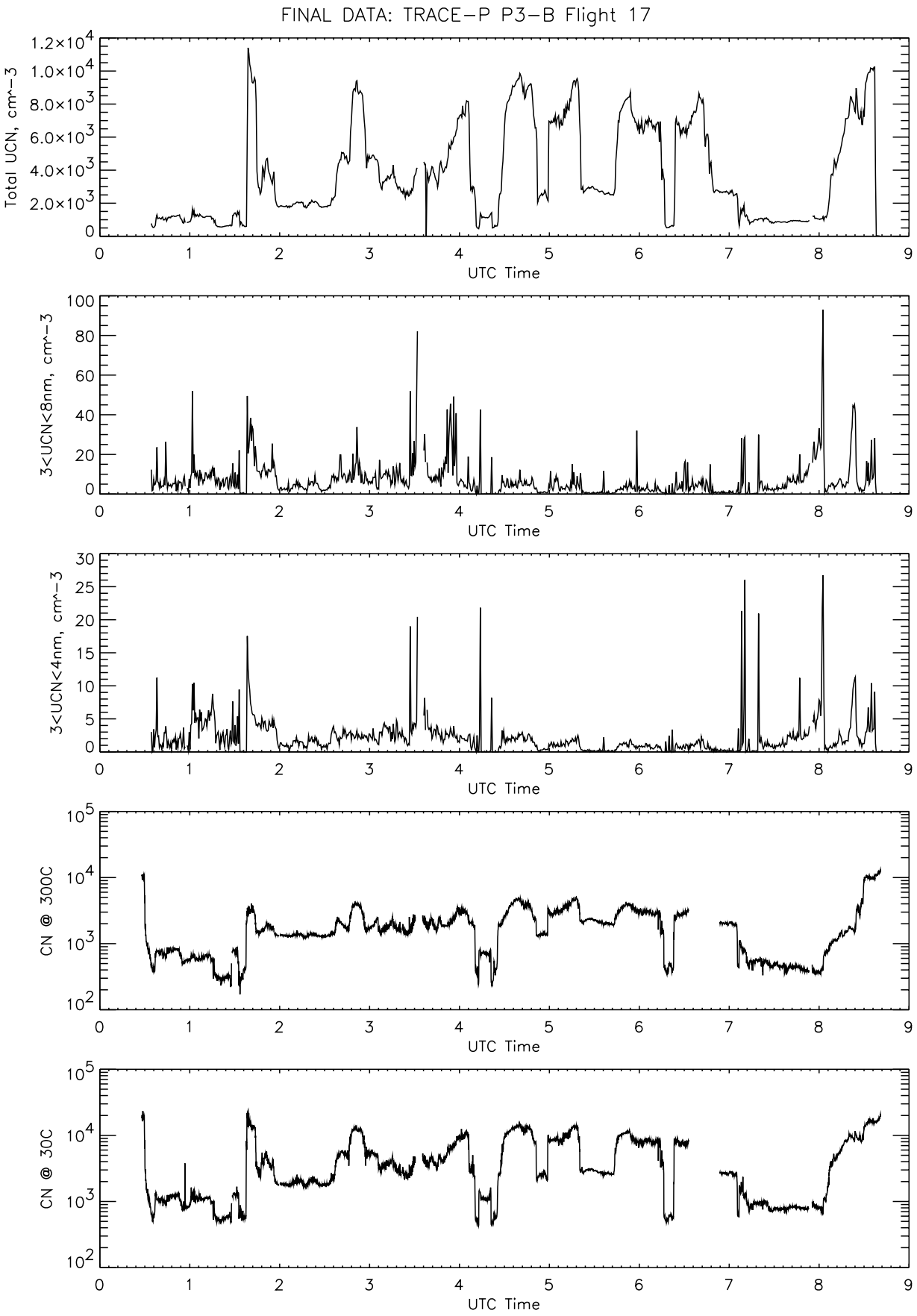
FINAL DATA: TRACE-P P3-B Flight 17

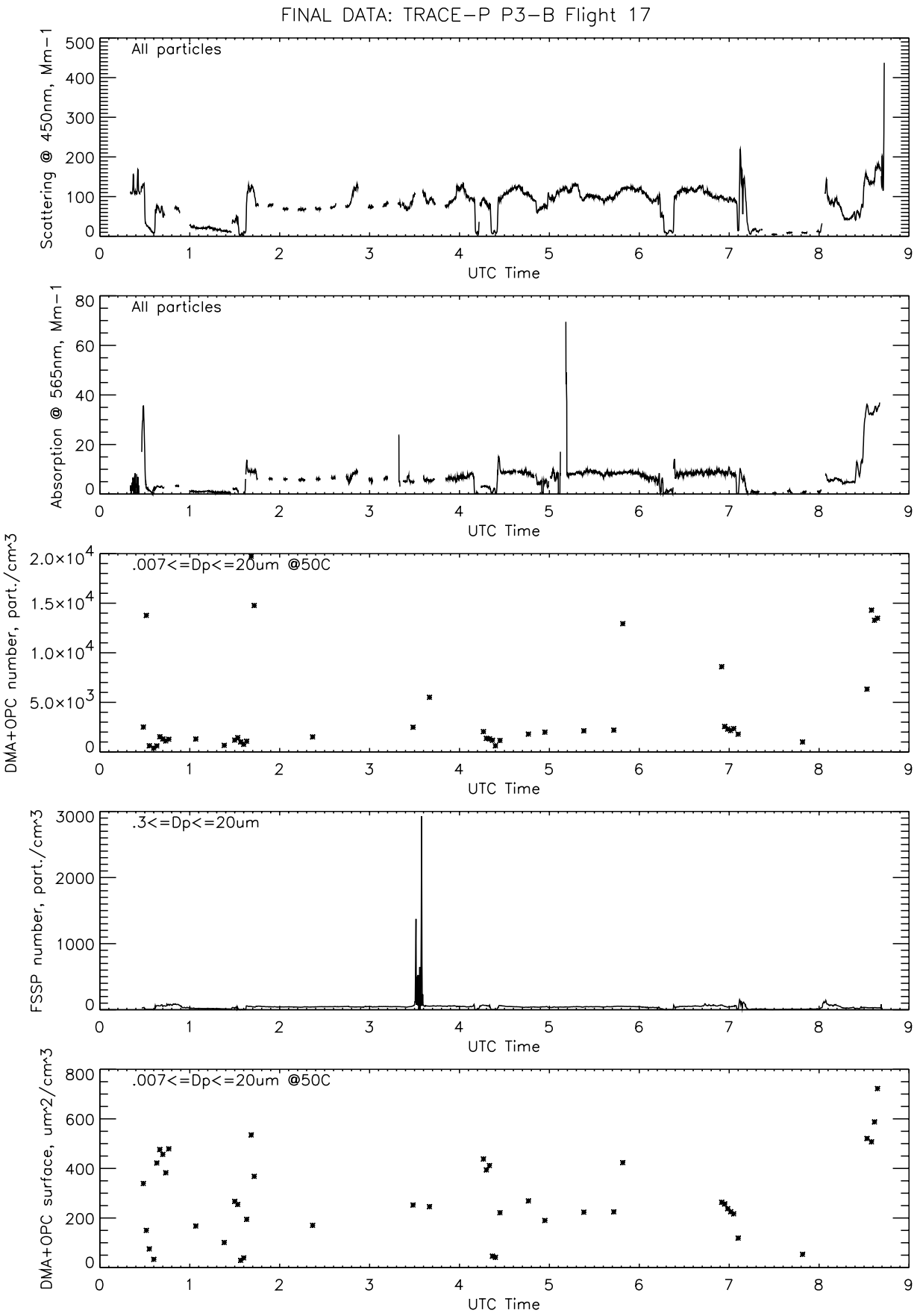


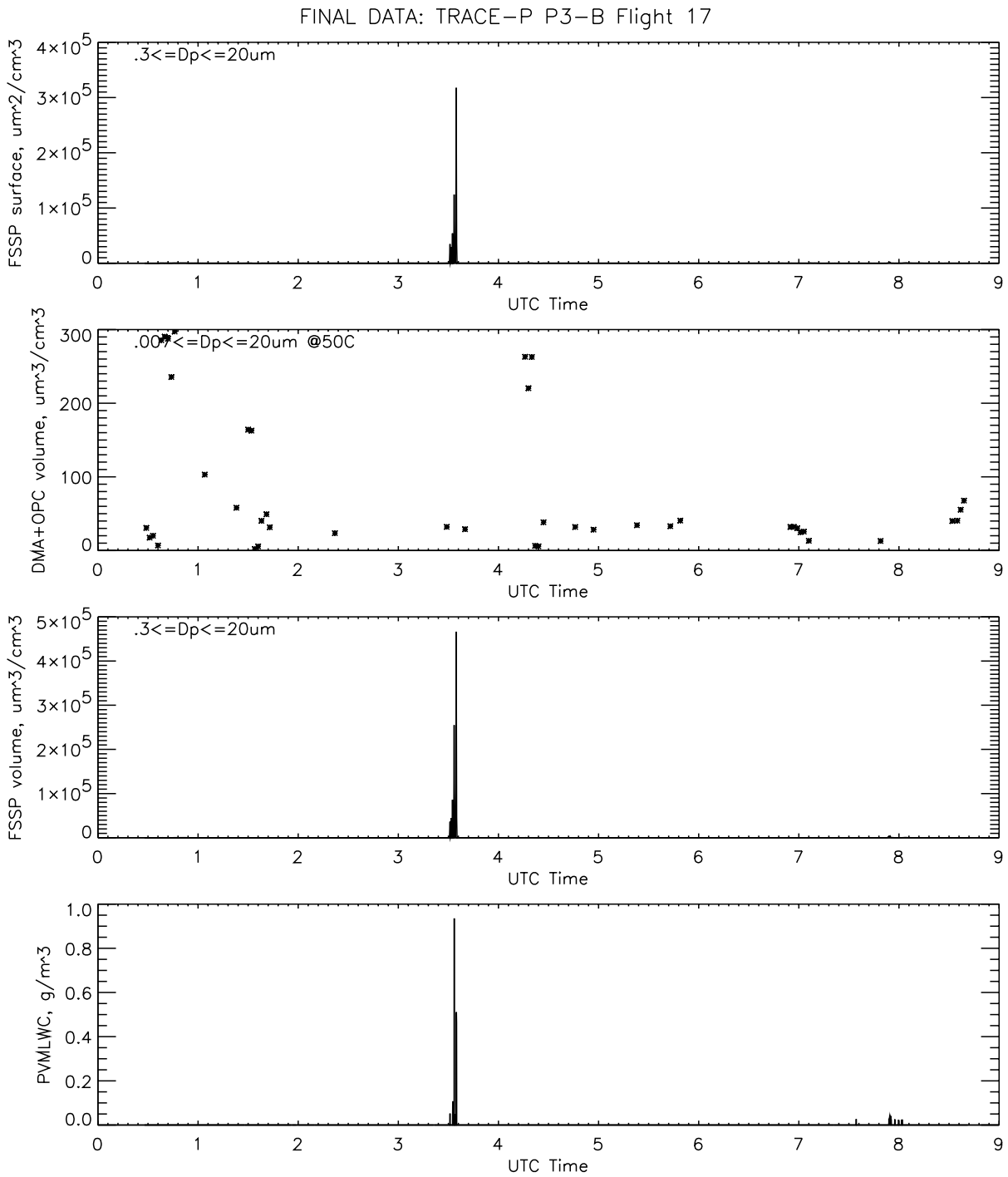
FINAL DATA: TRACE-P P3-B Flight 17



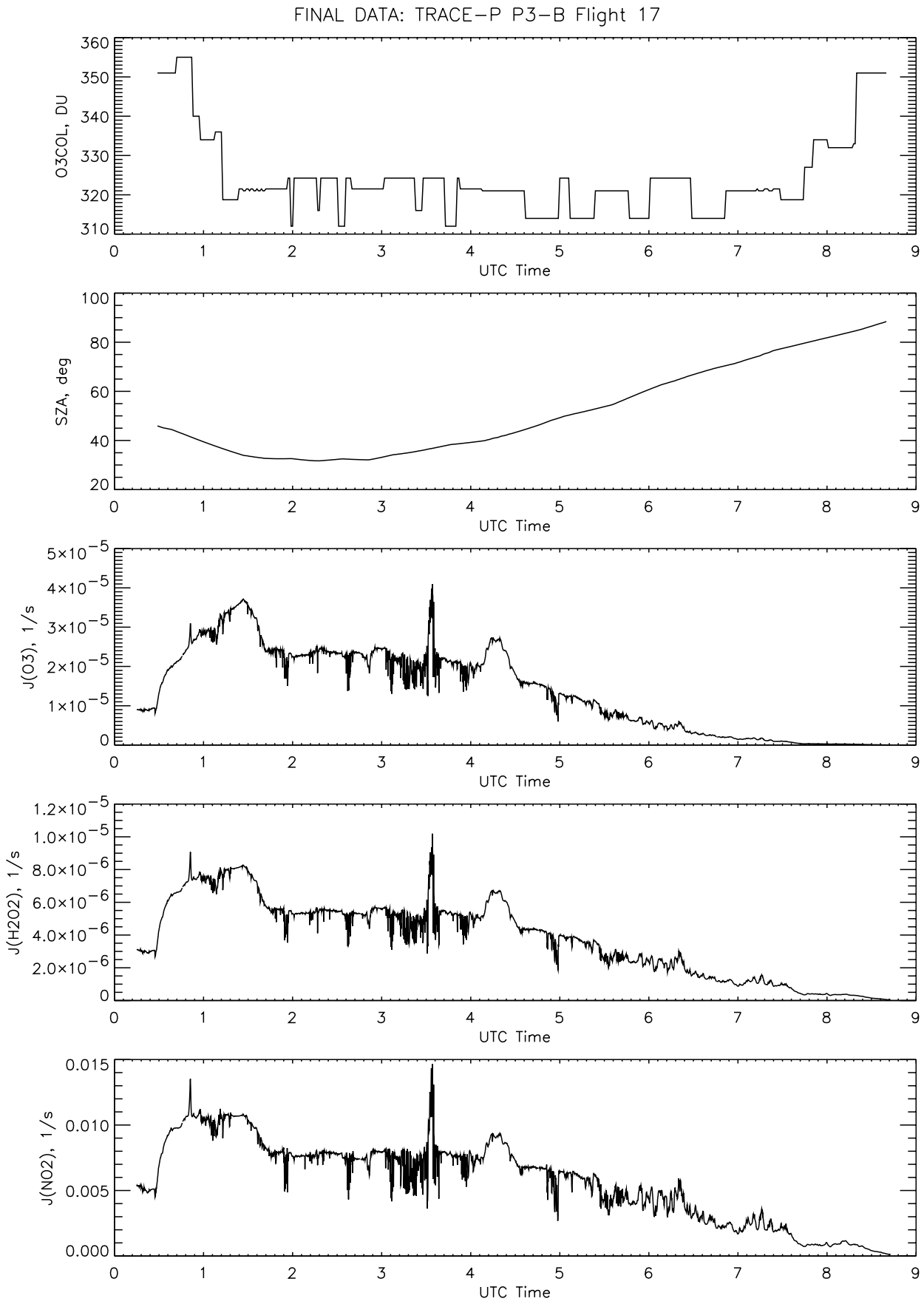

FINAL DATA: TRACE-P P3-B Flight 17
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

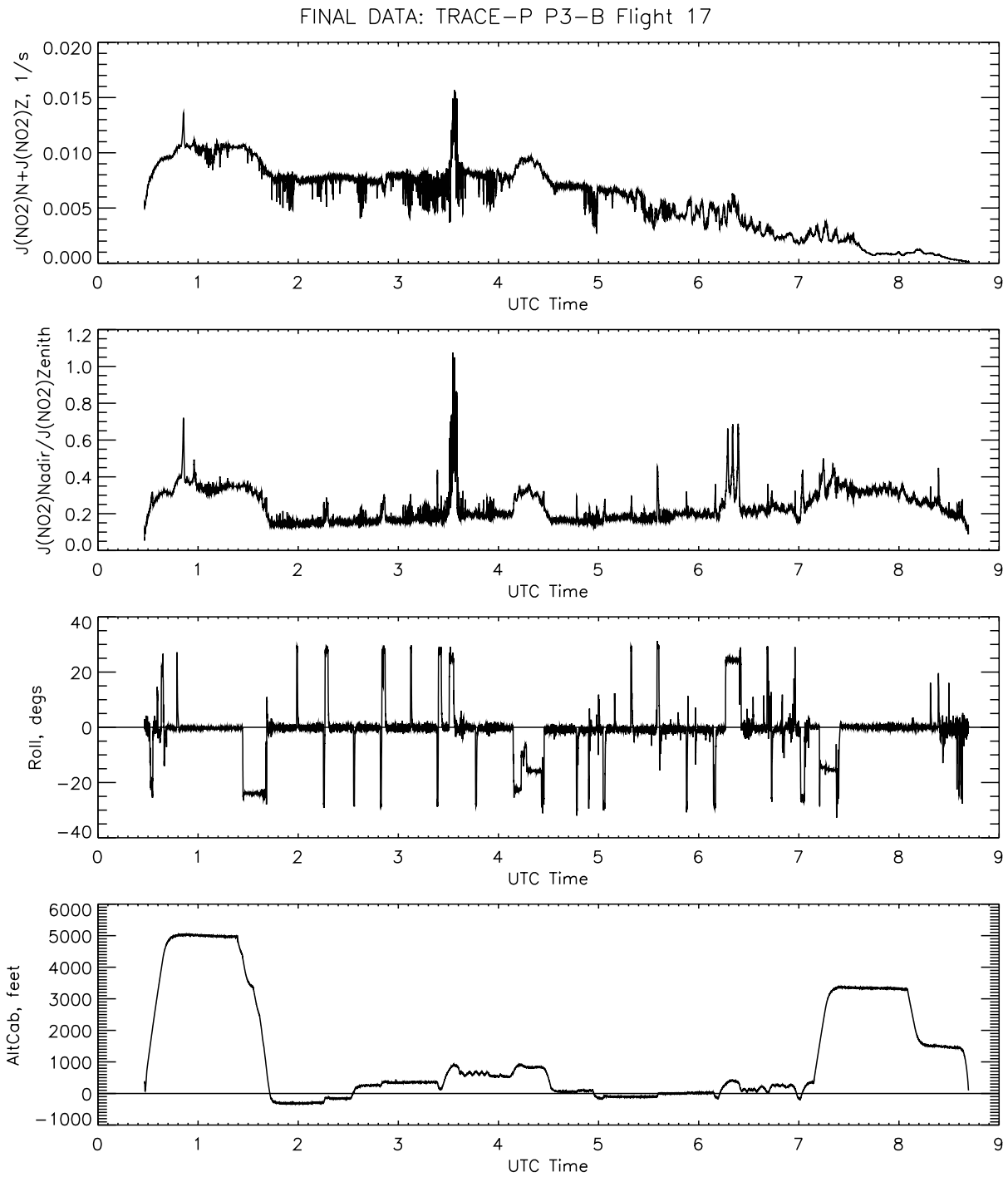

FINAL DATA: TRACE-P P3-B Flight 17
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

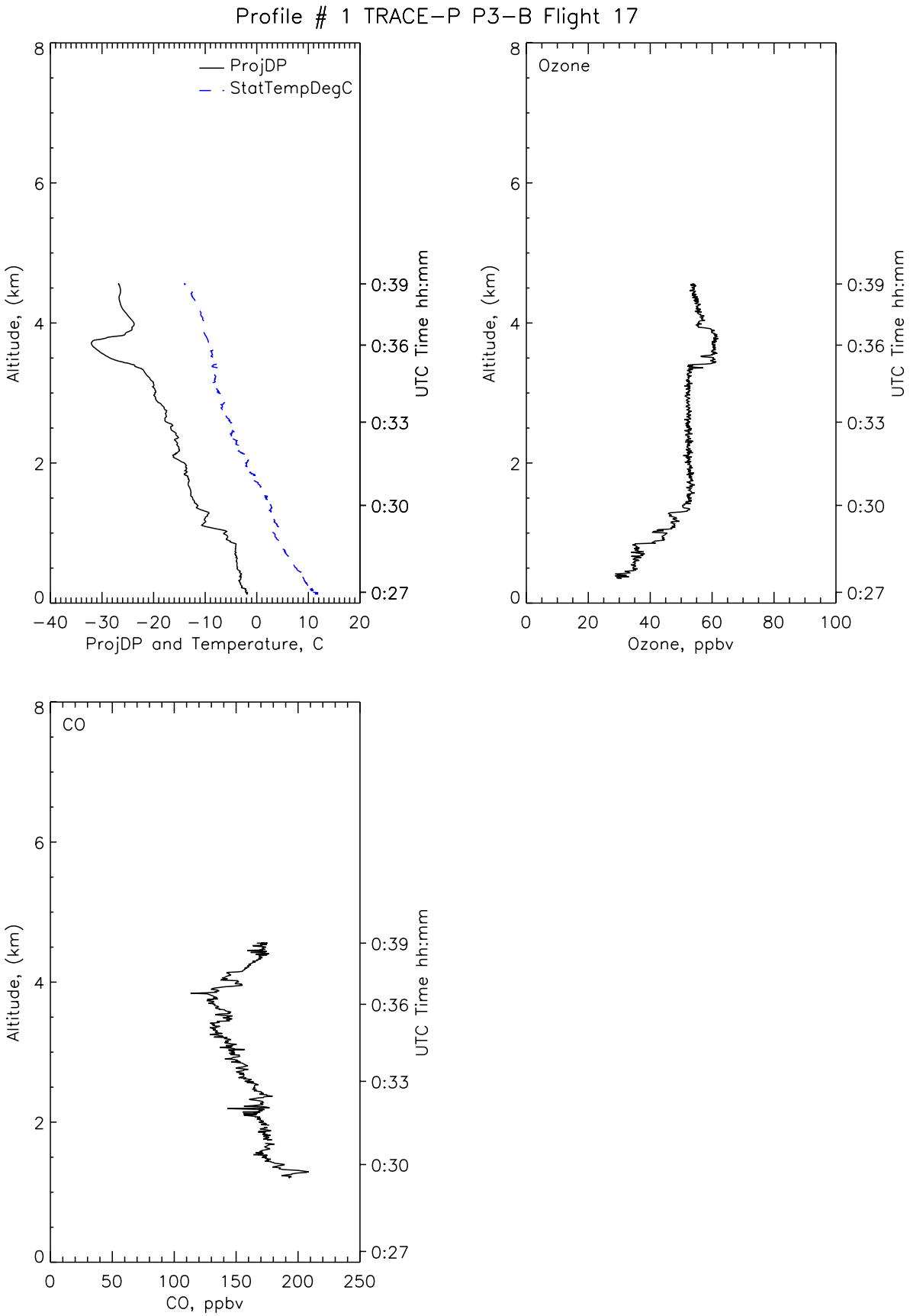

FINAL DATA: TRACE-P P3-B Flight 17
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 17
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

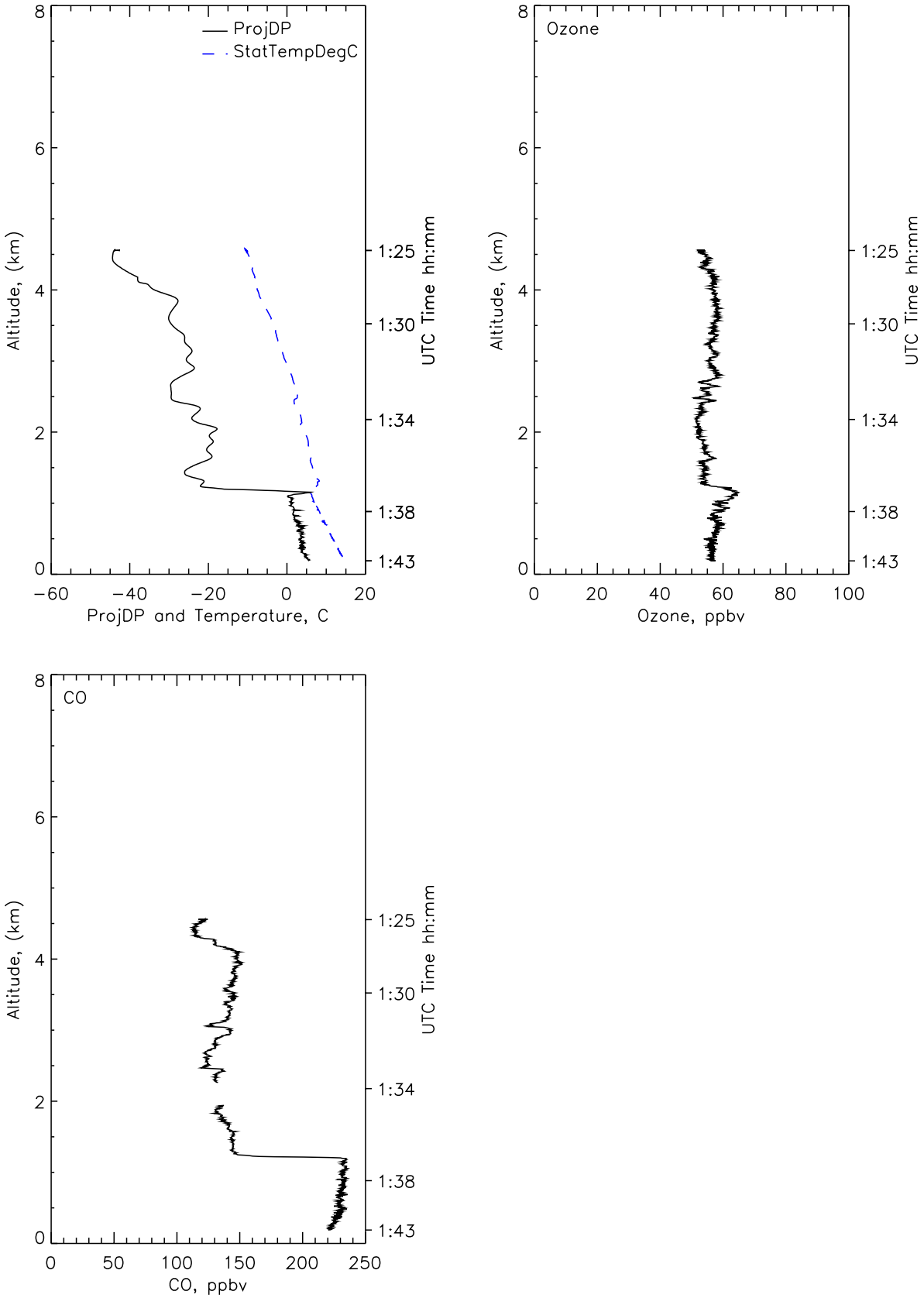
LEFT BLANK

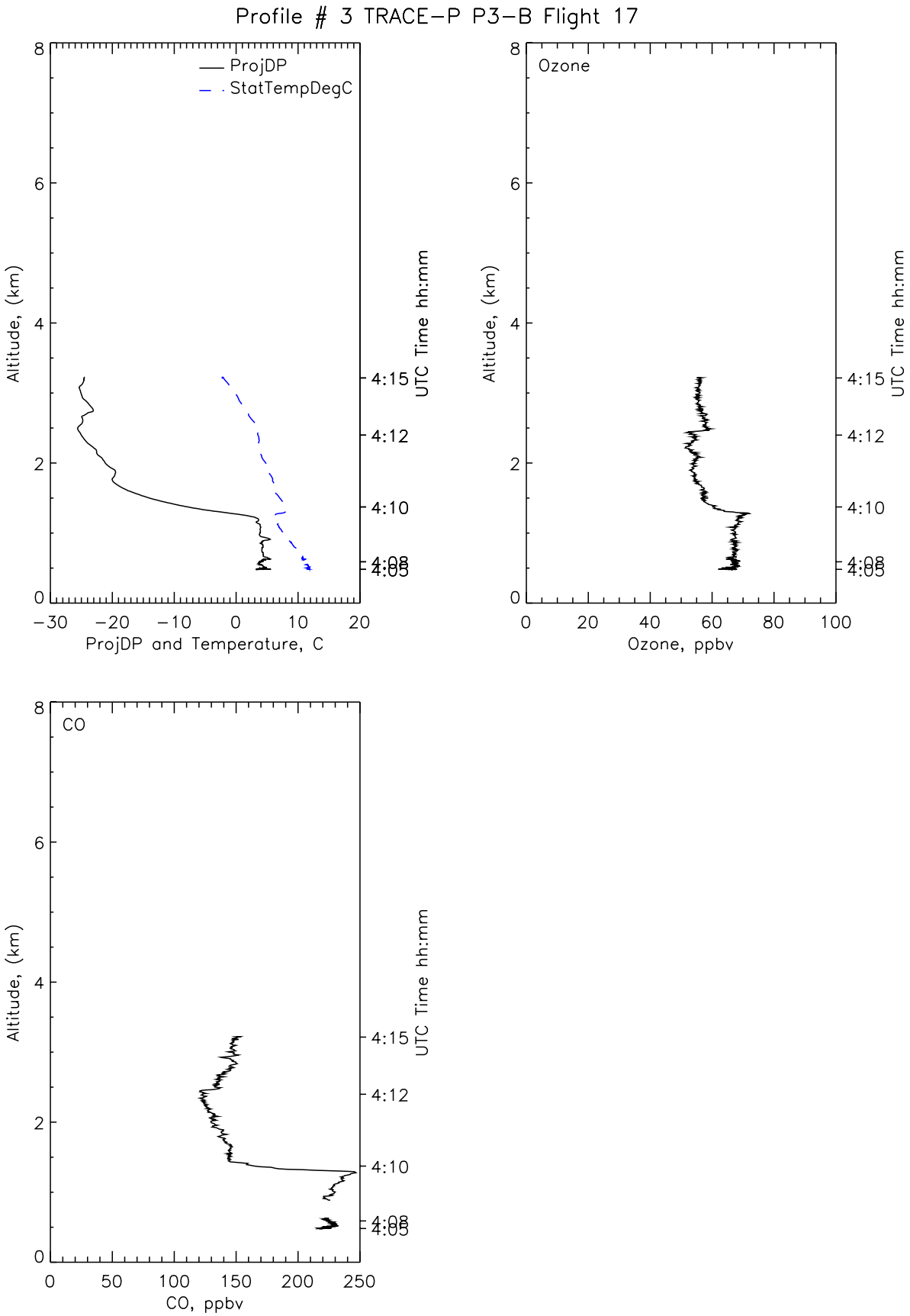

FINAL DATA: TRACE-P P3-B Flight 17
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time


FINAL DATA: TRACE-P P3-B Flight 17
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
5000
4000
3000
2000
1000
0
−1000
UTC Time
0
1
2
3
4
5
6
7
8
9

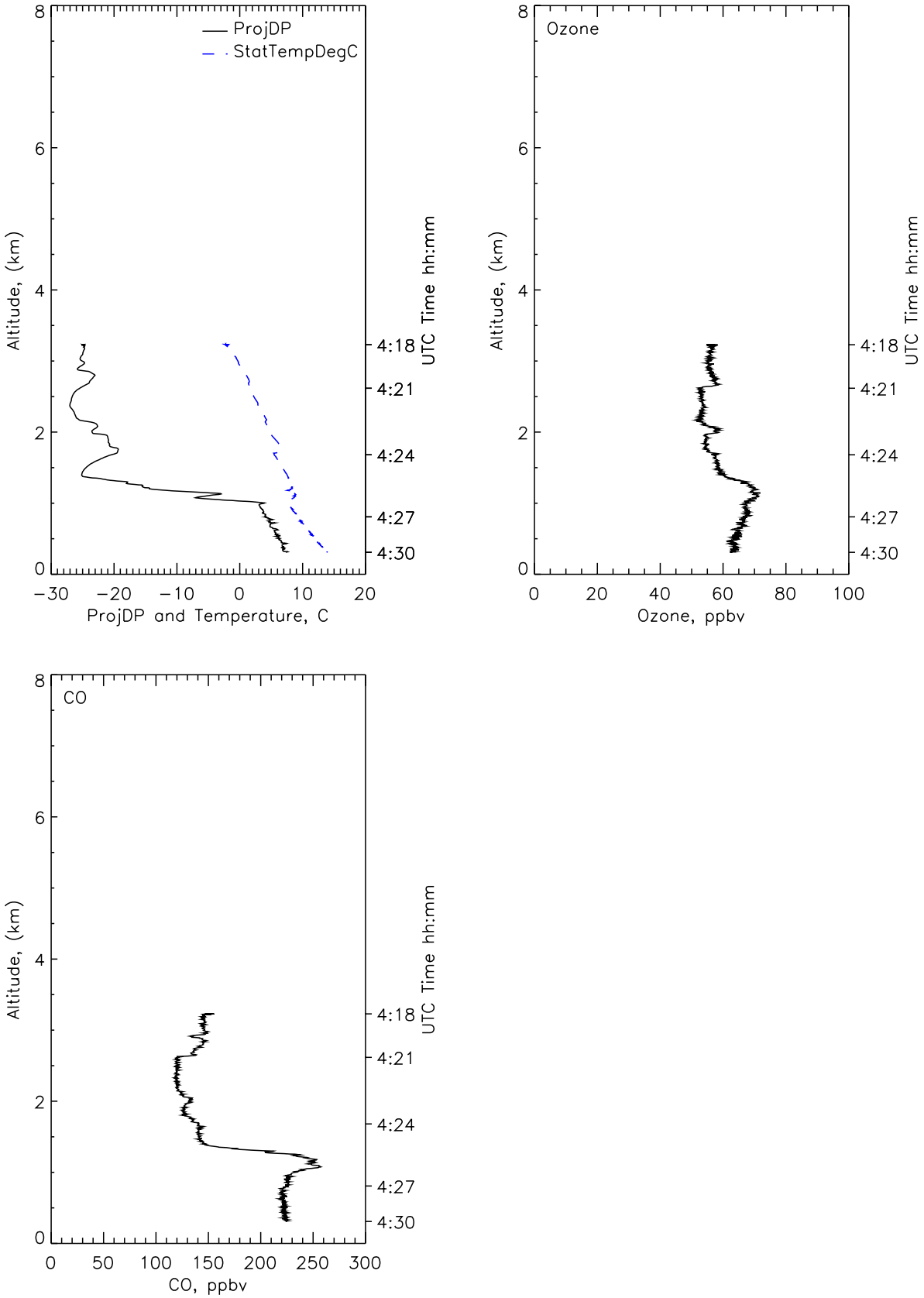

Profile # 1 TRACE-P P3-B Flight 17
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 2 TRACE-P P3-B Flight 17

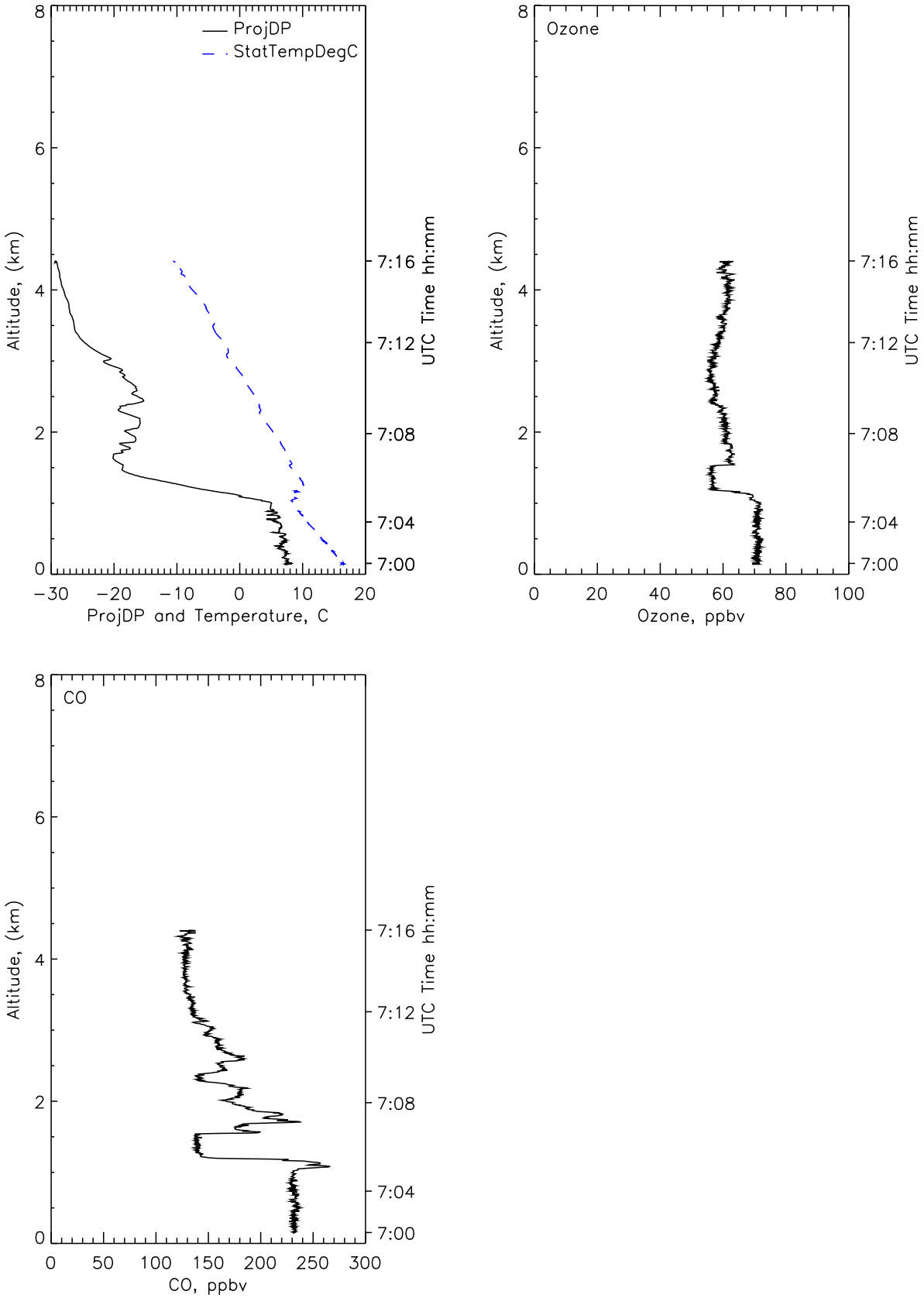



Profile # 3 TRACE-P P3-B Flight 17
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

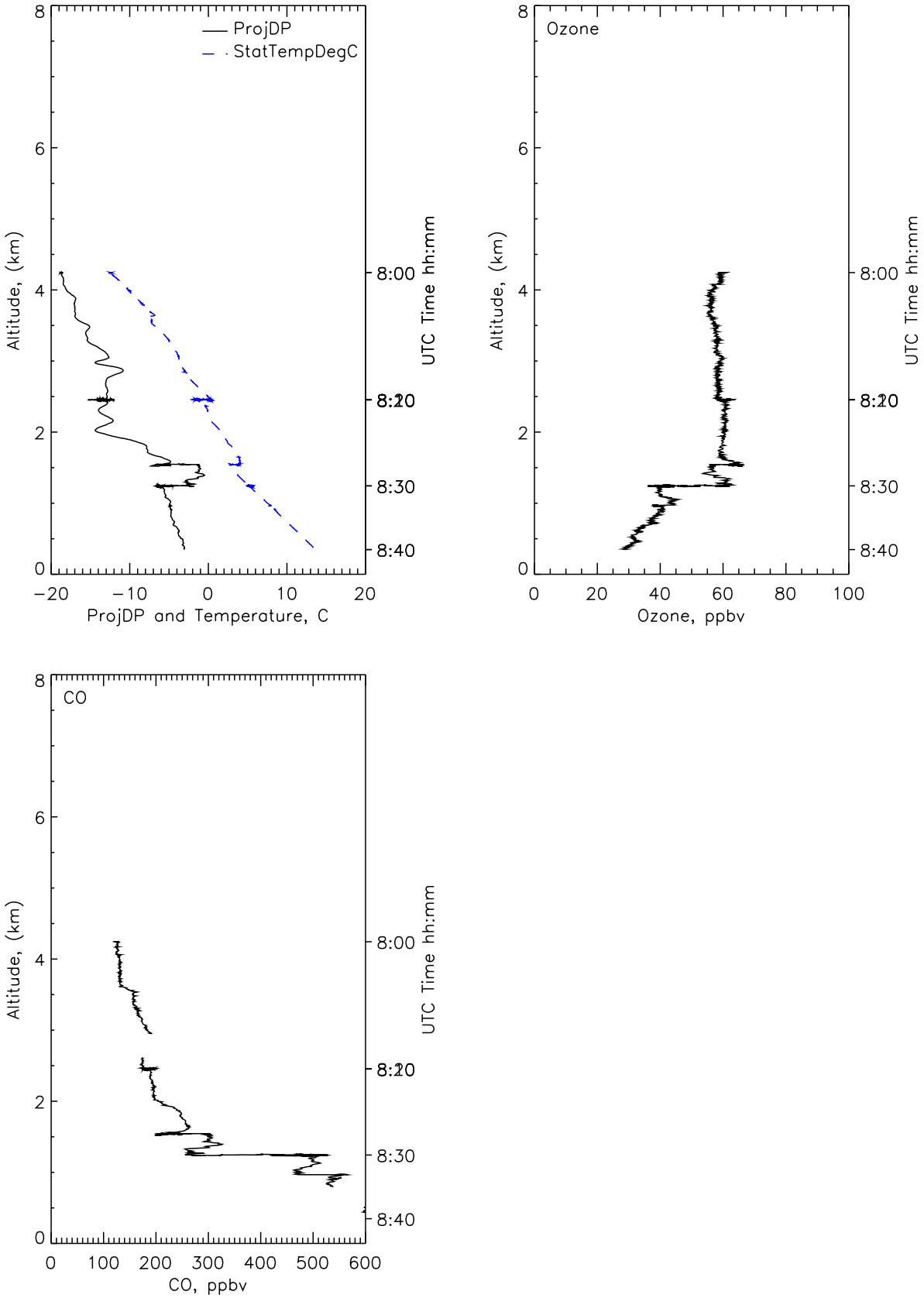
Profile # 4 TRACE-P P3-B Flight 17



Profile # 5 TRACE-P P3-B Flight 17



Profile # 6 TRACE-P P3-B Flight 17



CHEMICAL and METEOROLOGICAL DATA

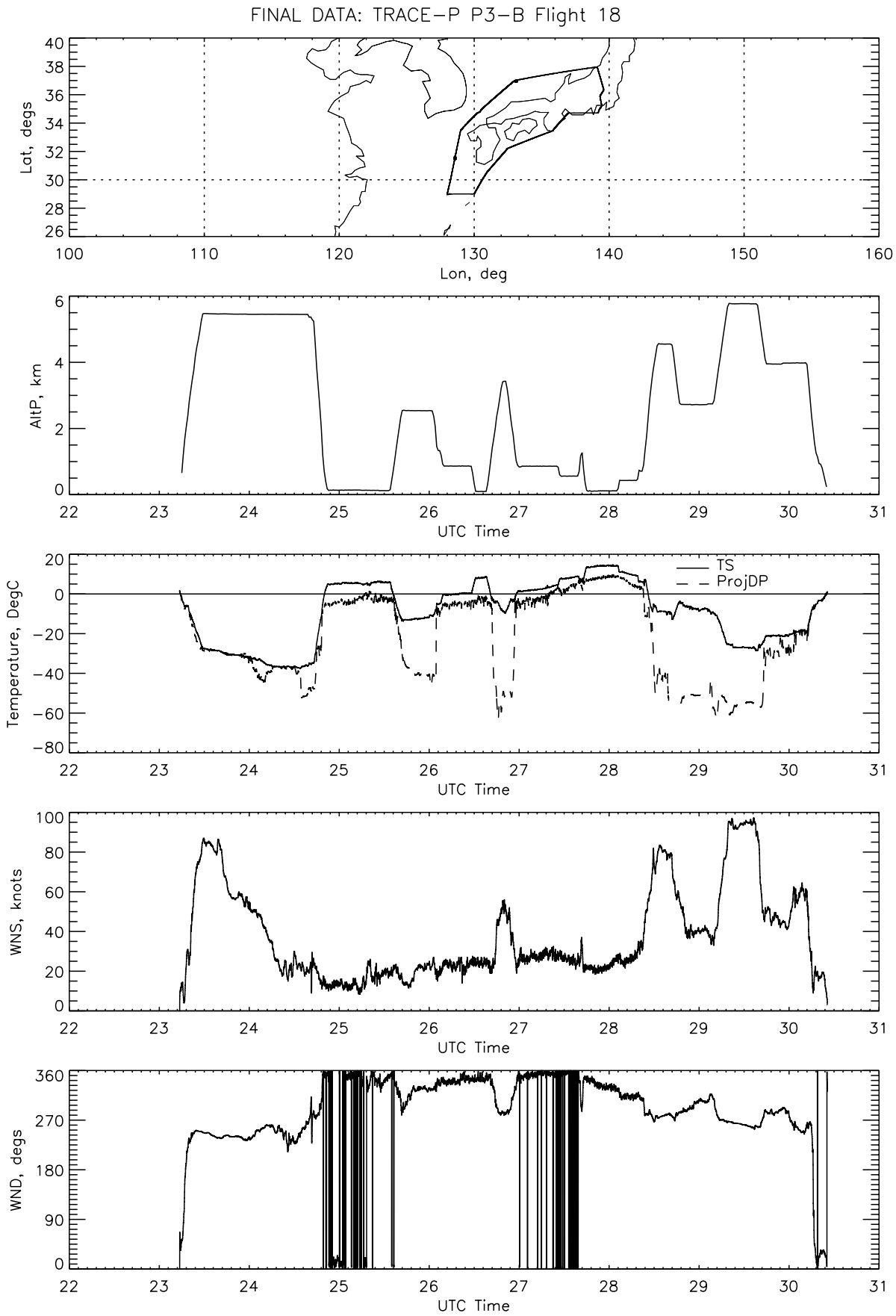
TRACE-P

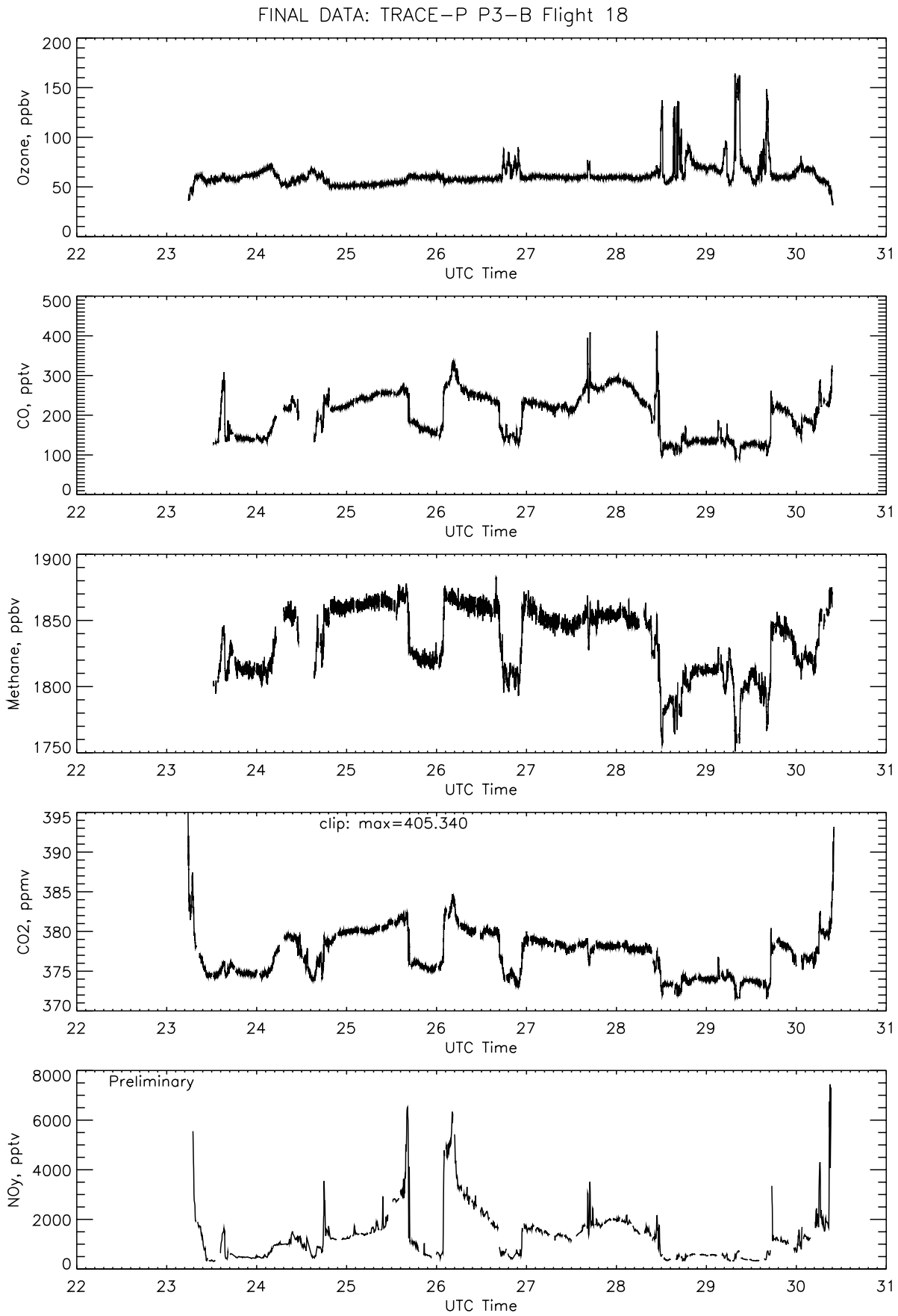
Flight 18P

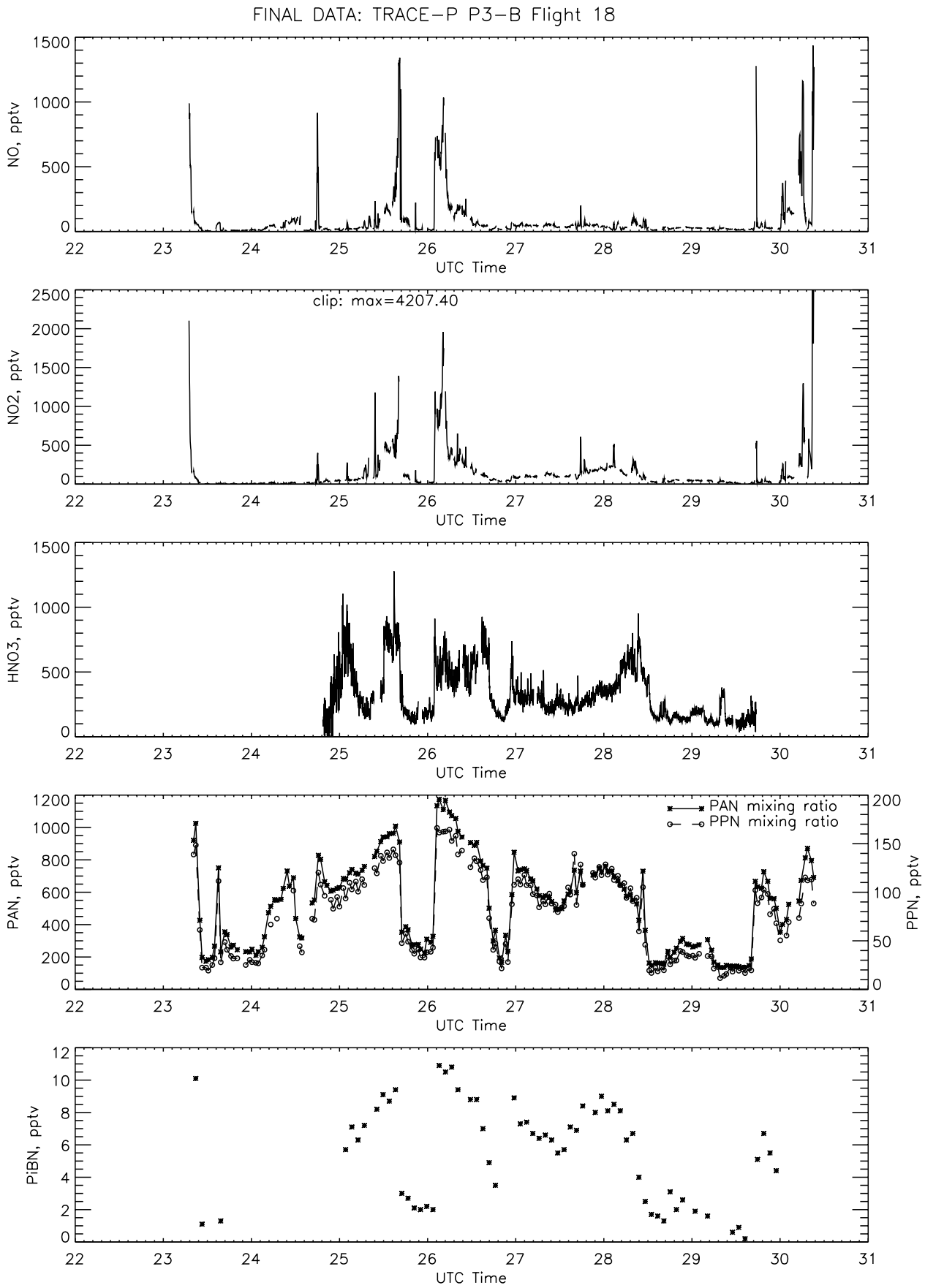
Local: Yokota No. 4

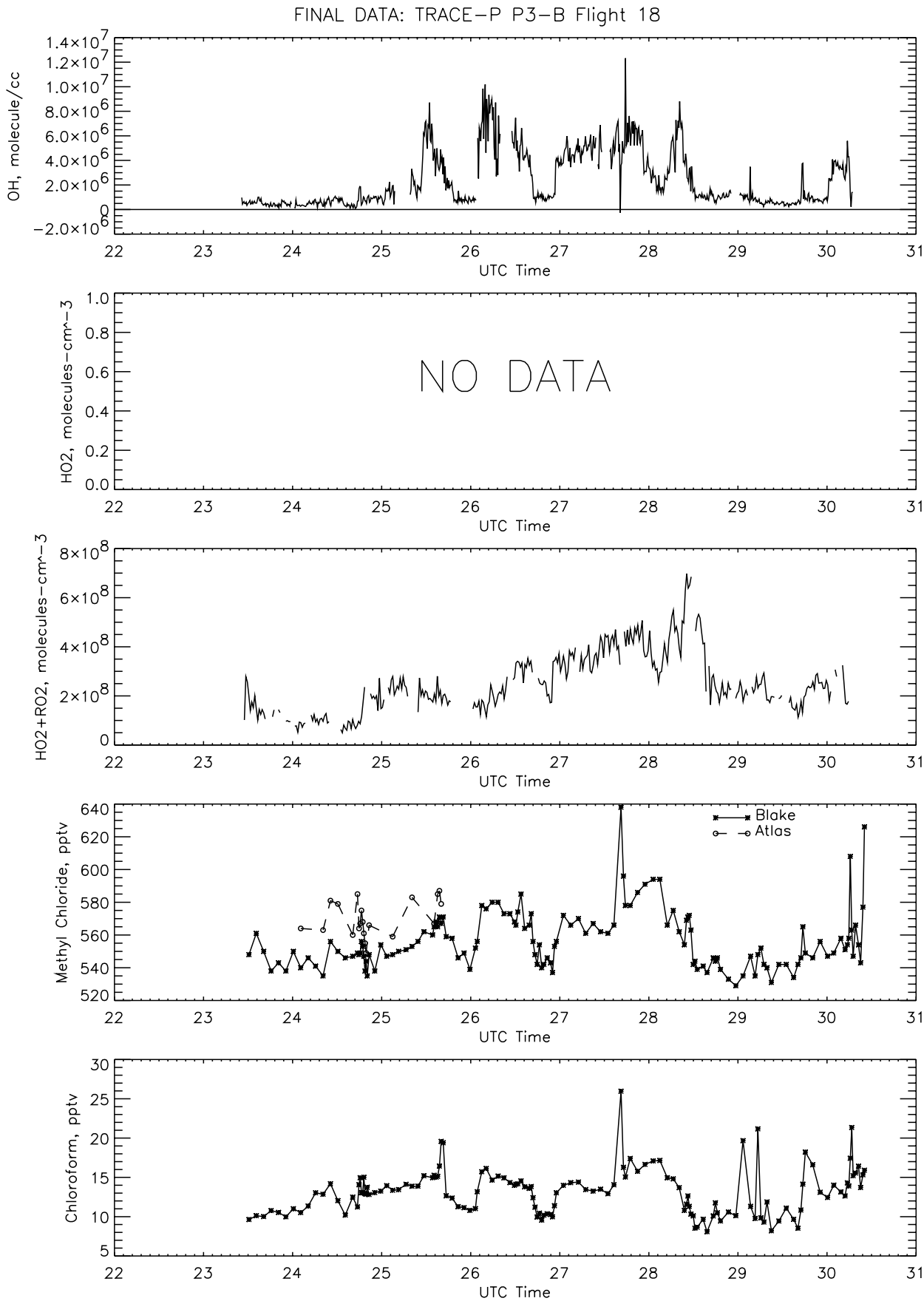
ACE-Asia; Asian Outflow to Sea of Japan; TERRA Underpass

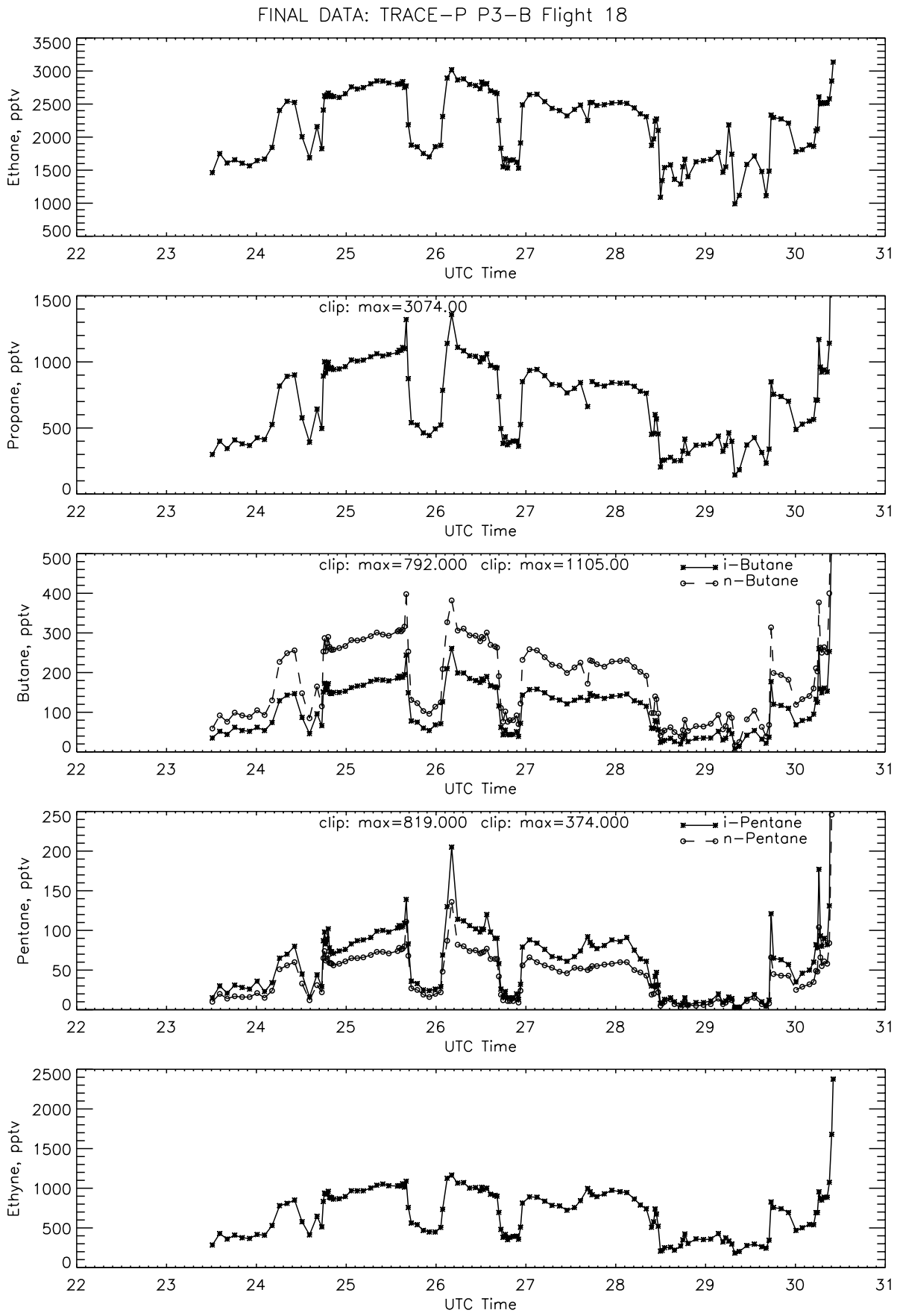
March 30, 2001

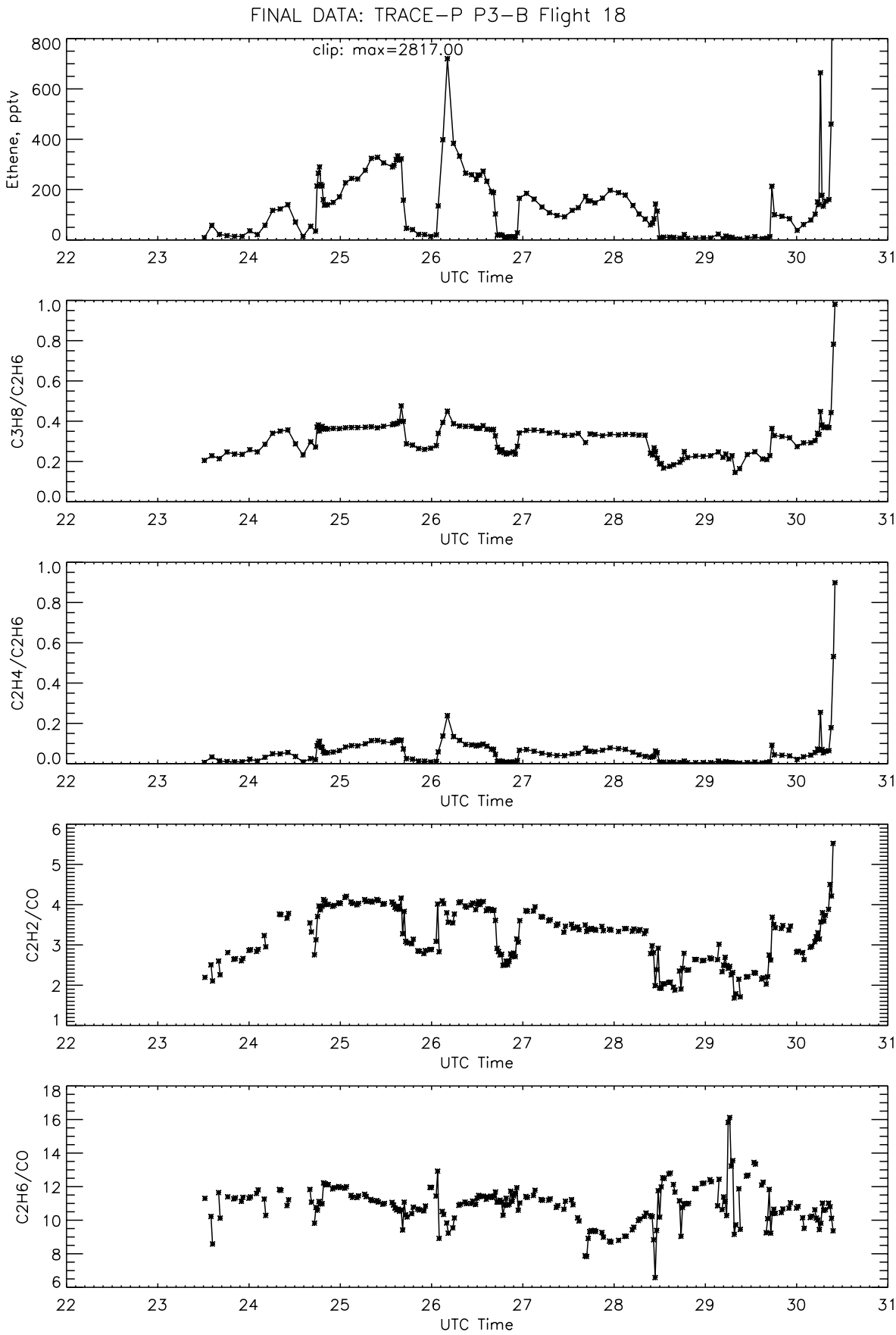

FINAL DATA: TRACE-P P3-B Flight 18
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 18
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
clip: max=405.340
NOy, pptv
Preliminary
UTC Time

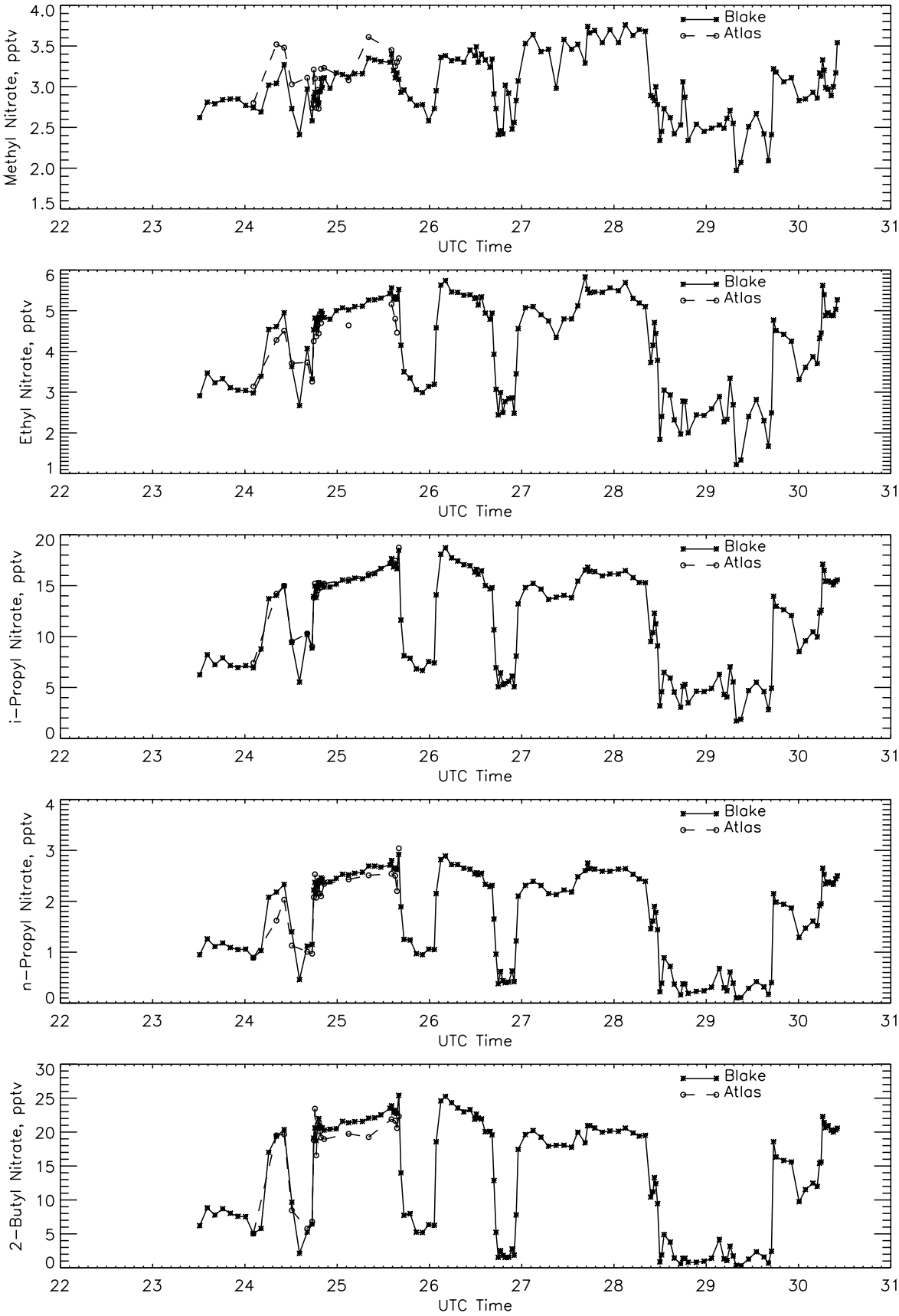

FINAL DATA: TRACE-P P3-B Flight 18
NO, pptv
NO2, pptv
clip: max=4207.40
HNO3, pptv
PAN, pptv
PPN, pptv
PAN mixing ratio
PPN mixing ratio
PiBN, pptv
UTC Time

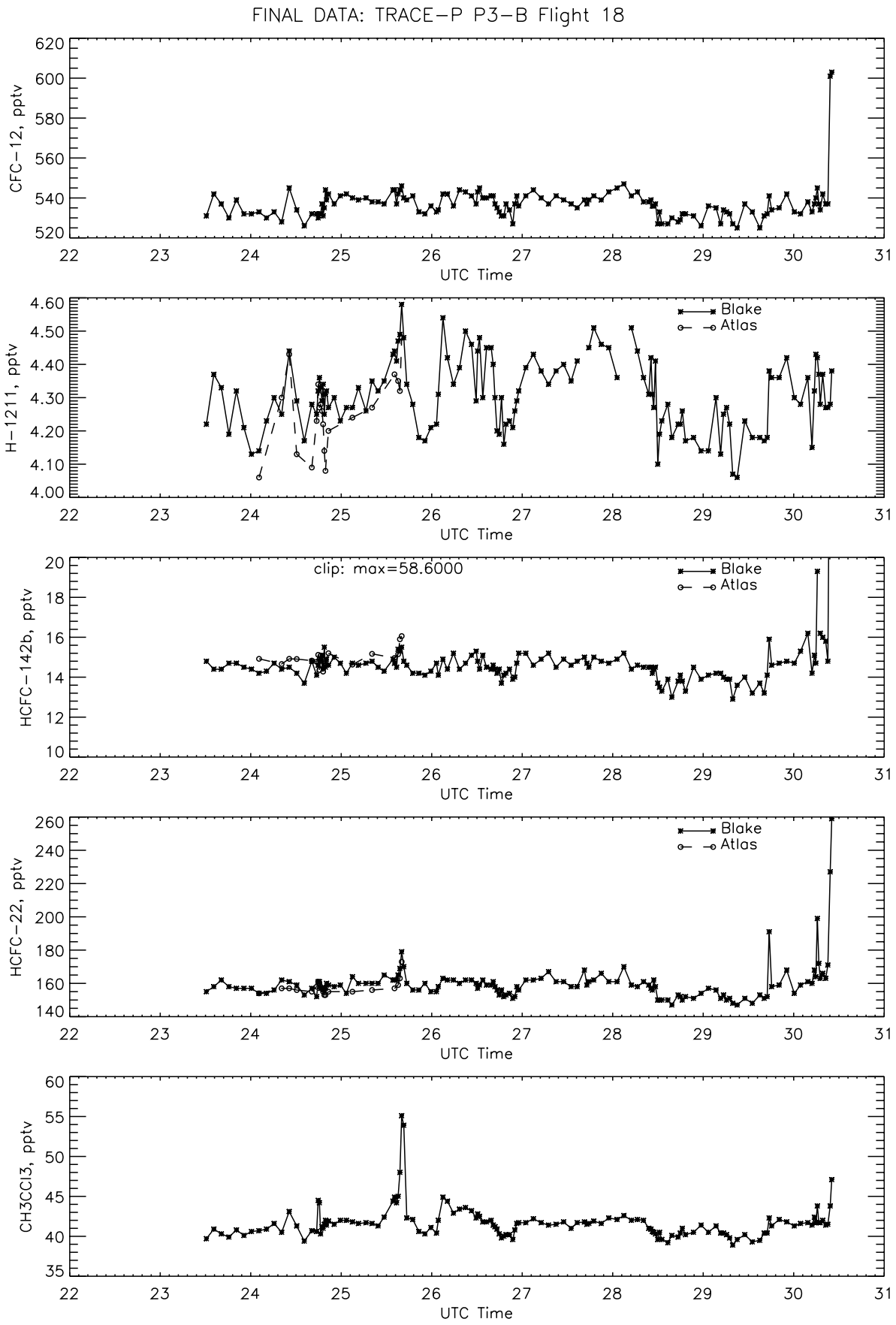

FINAL DATA: TRACE-P P3-B Flight 18
OH, molecule/cc
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 18
Ethane, pptv
UTC Time
Propane, pptv
clip: max=3074.00
Butane, pptv
clip: max=792.000 clip: max=1105.00
i-Butane
n-Butane
Pentane, pptv
clip: max=819.000 clip: max=374.000
i-Pentane
n-Pentane
Ethyne, pptv

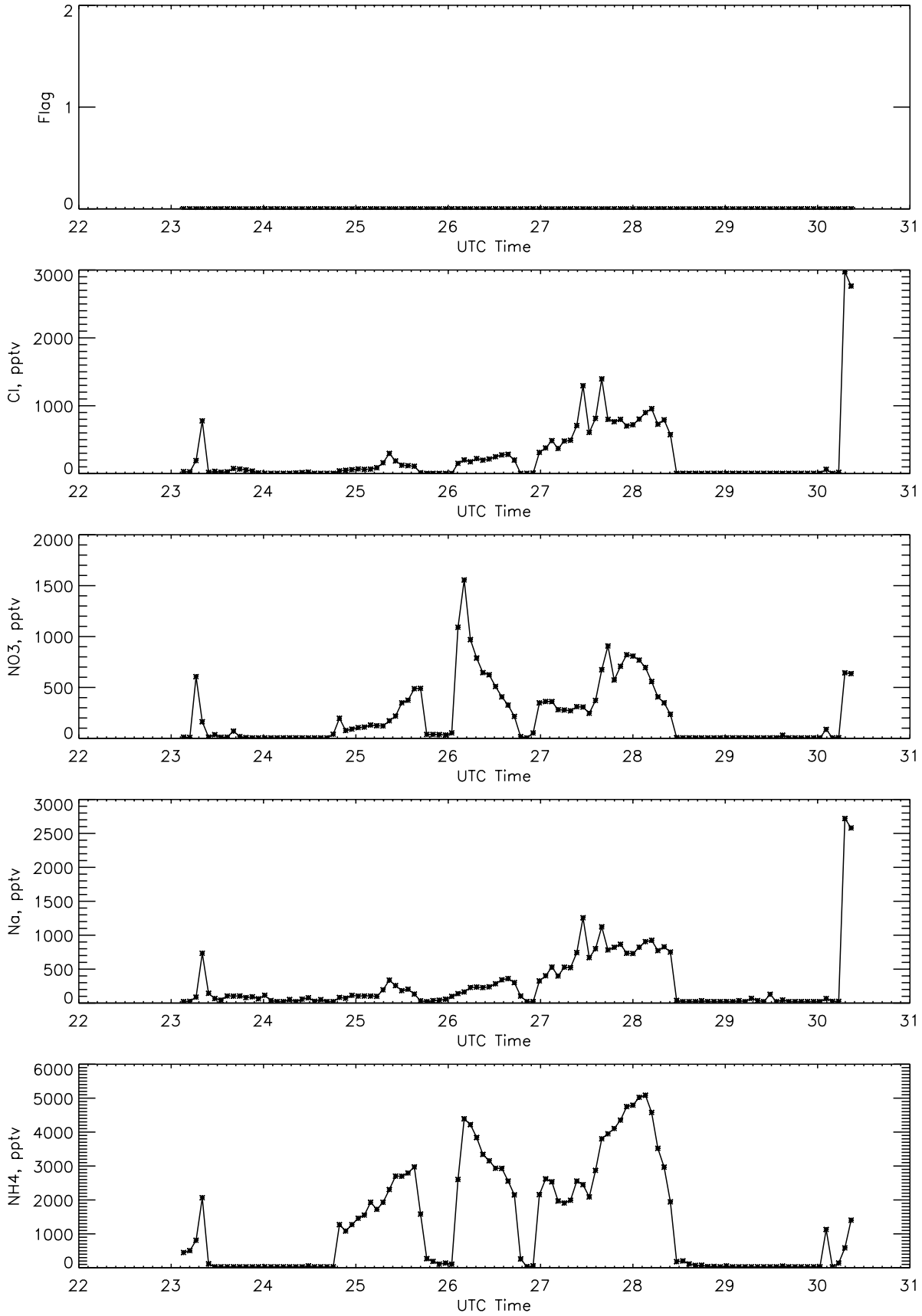

FINAL DATA: TRACE-P P3-B Flight 18
clip: max=2817.00
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

FINAL DATA: TRACE-P P3-B Flight 18

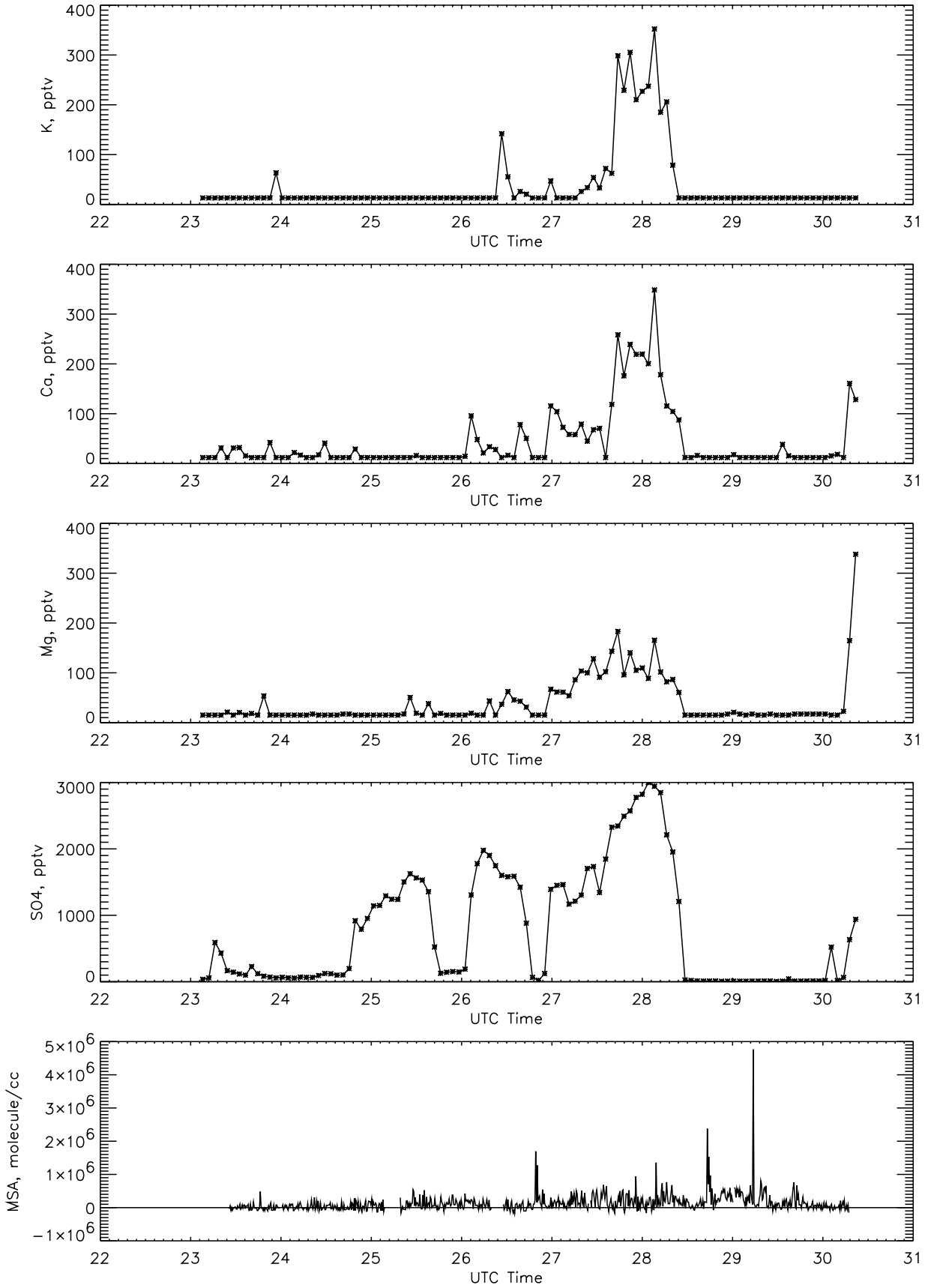


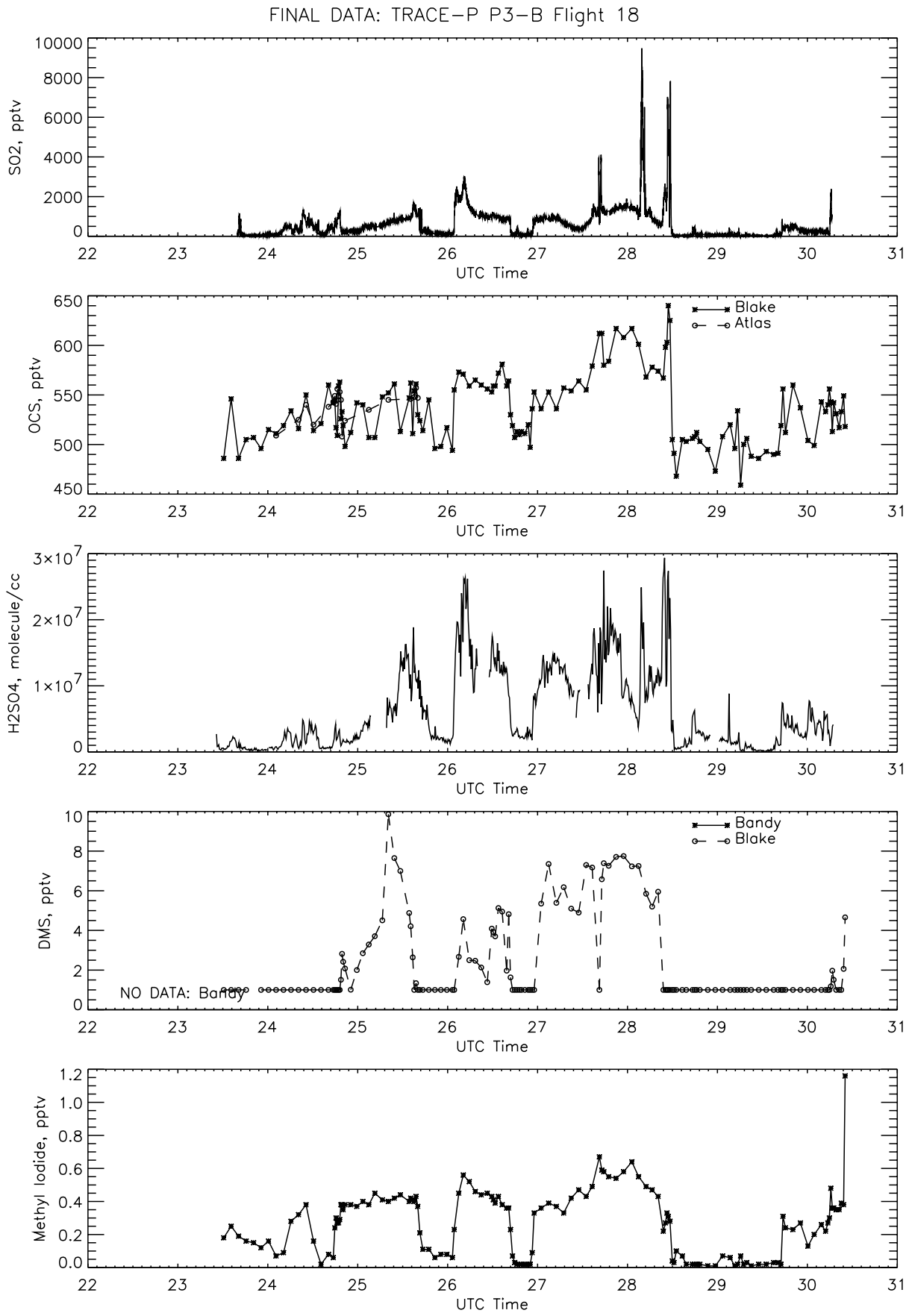

FINAL DATA: TRACE-P P3-B Flight 18
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas
clip: max=58.6000

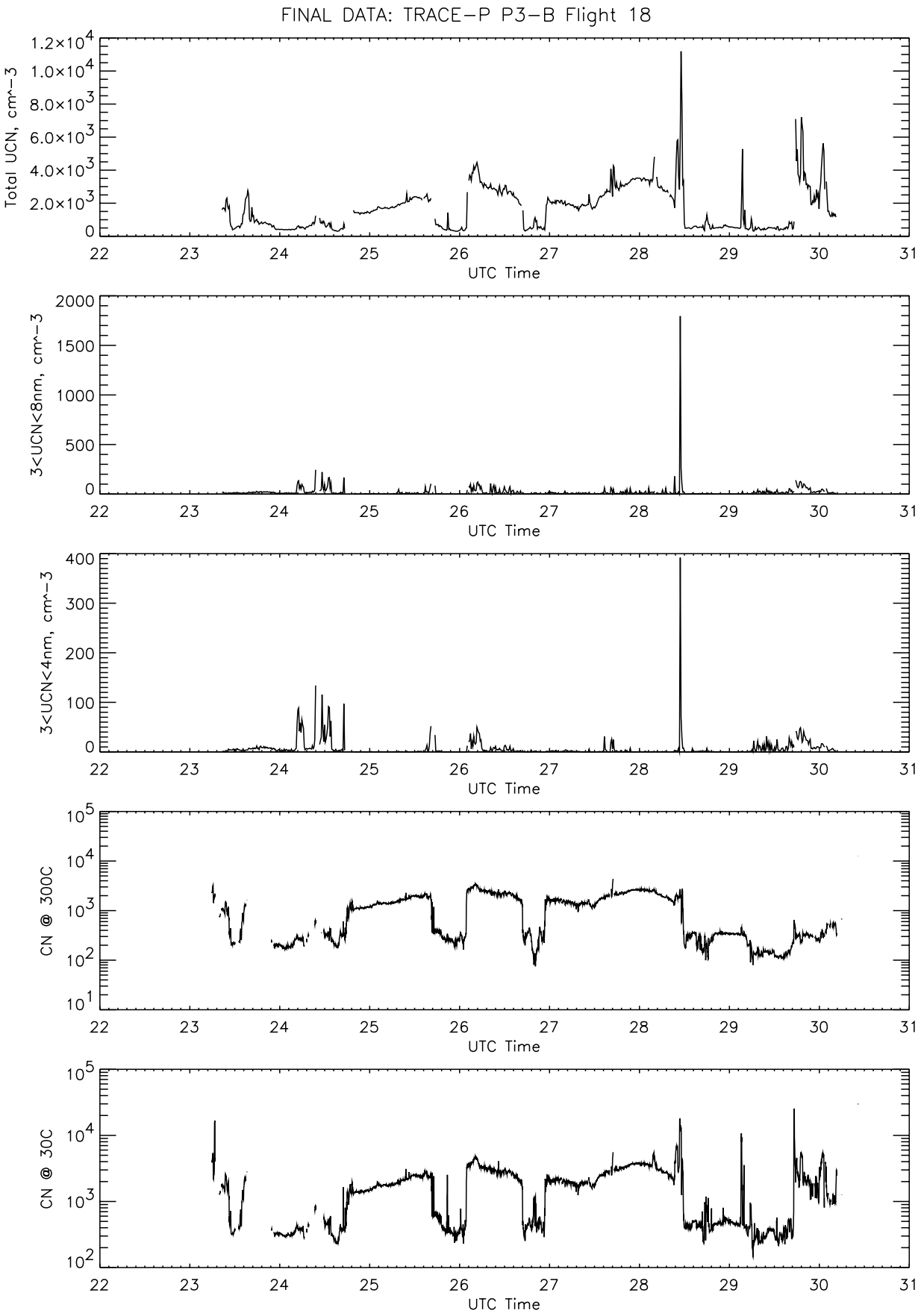
FINAL DATA: TRACE-P P3-B Flight 18

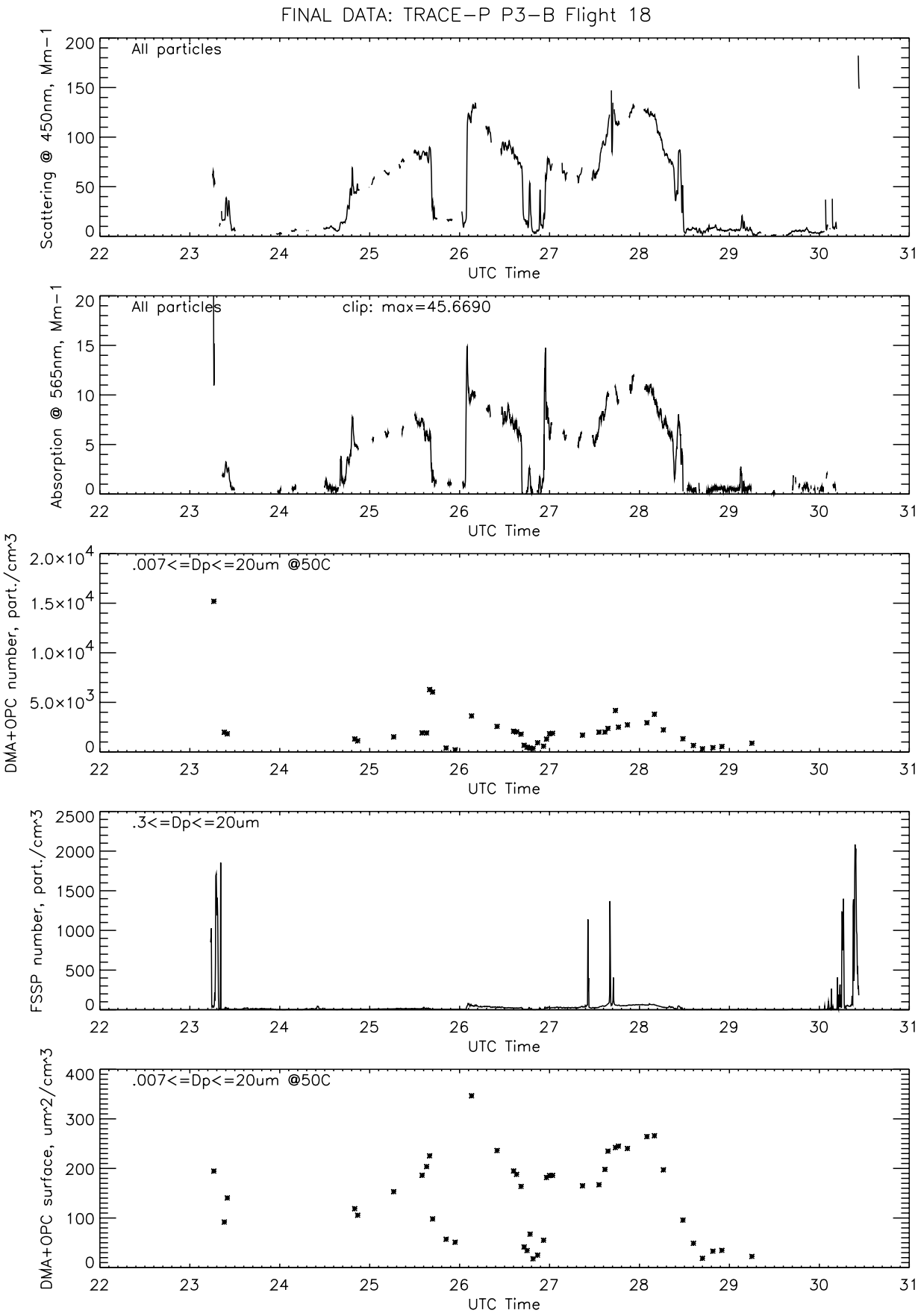


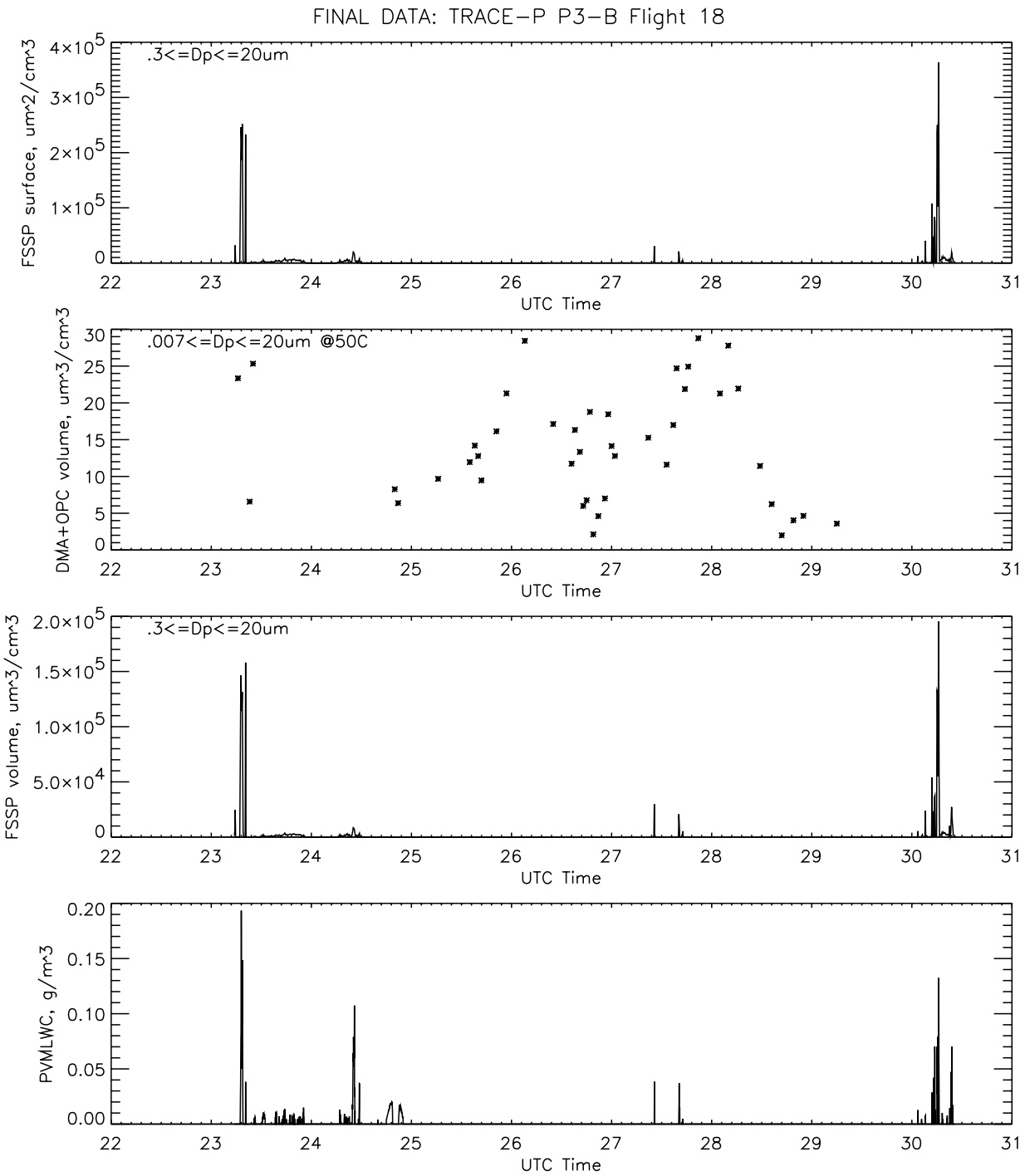
FINAL DATA: TRACE-P P3-B Flight 18



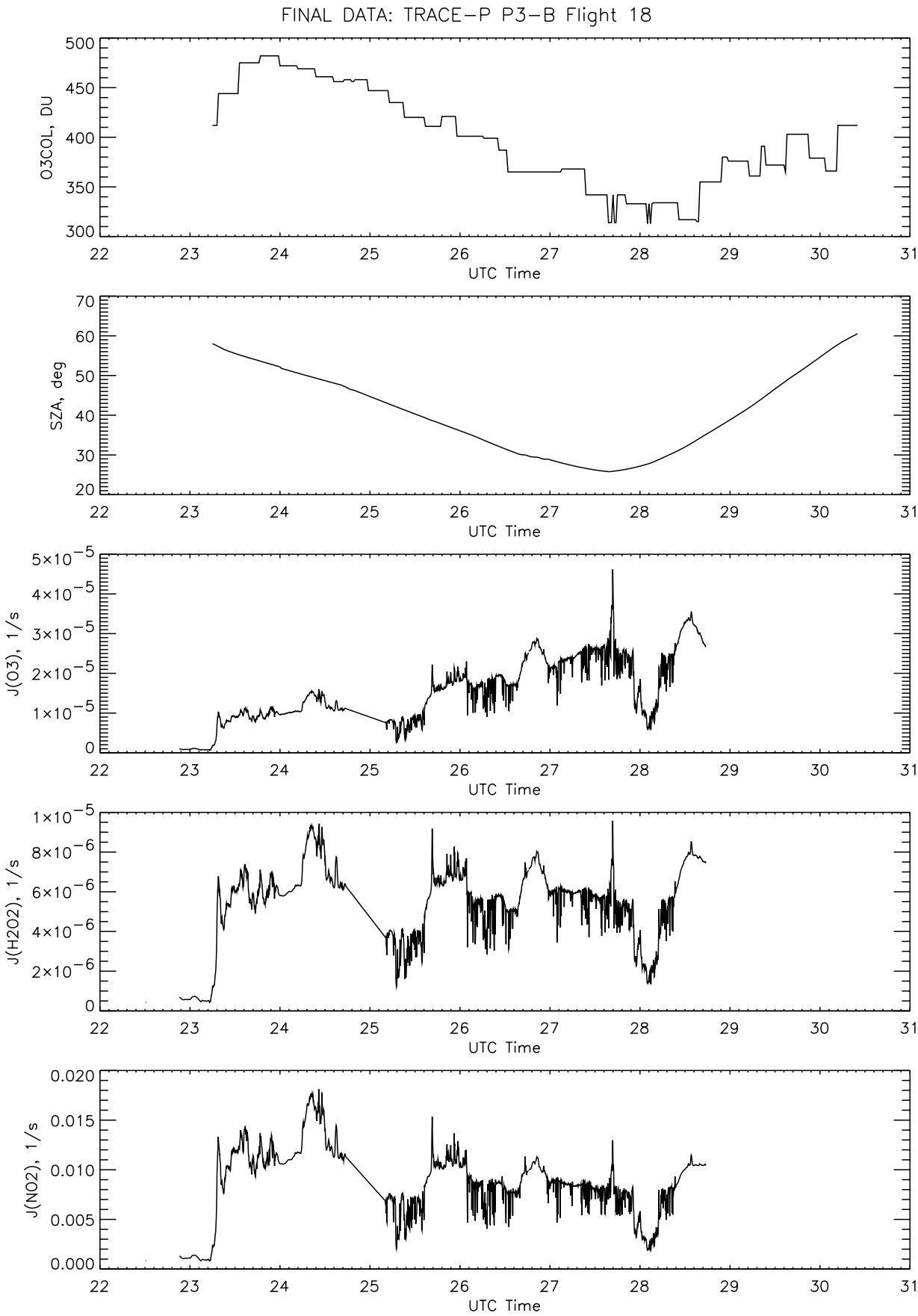

FINAL DATA: TRACE-P P3-B Flight 18
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

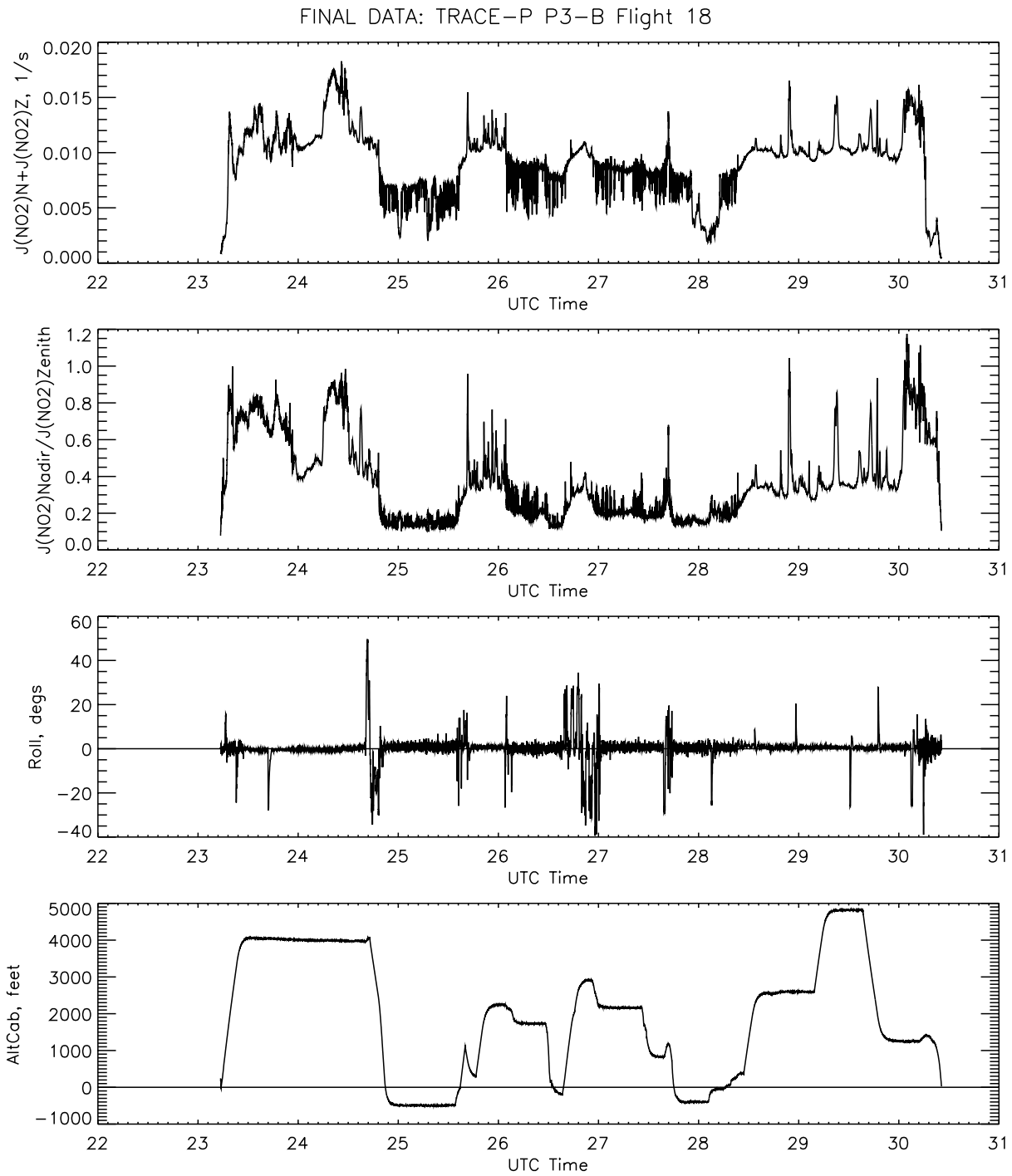

FINAL DATA: TRACE-P P3-B Flight 18
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

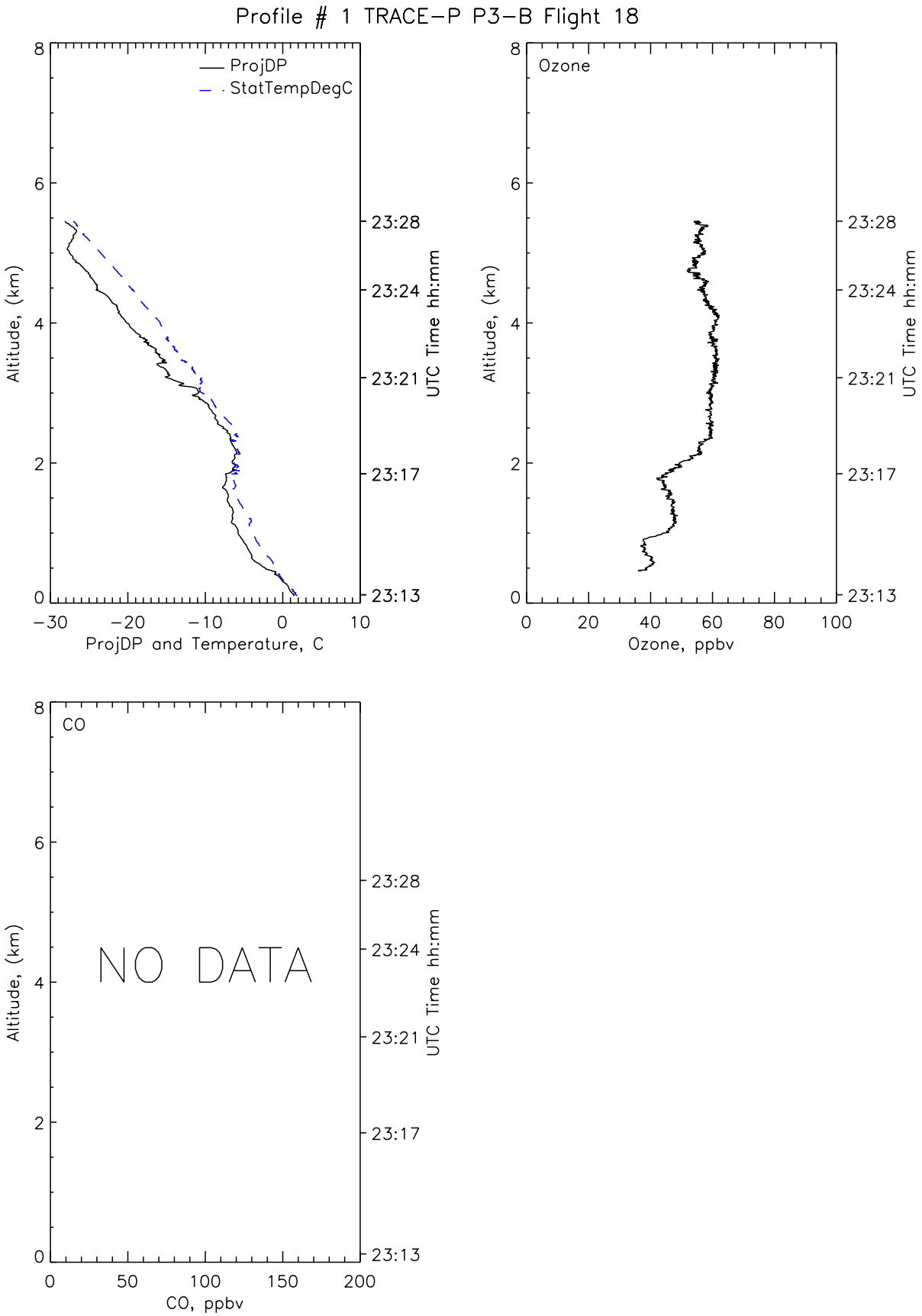

FINAL DATA: TRACE-P P3-B Flight 18
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=45.6690
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 18
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

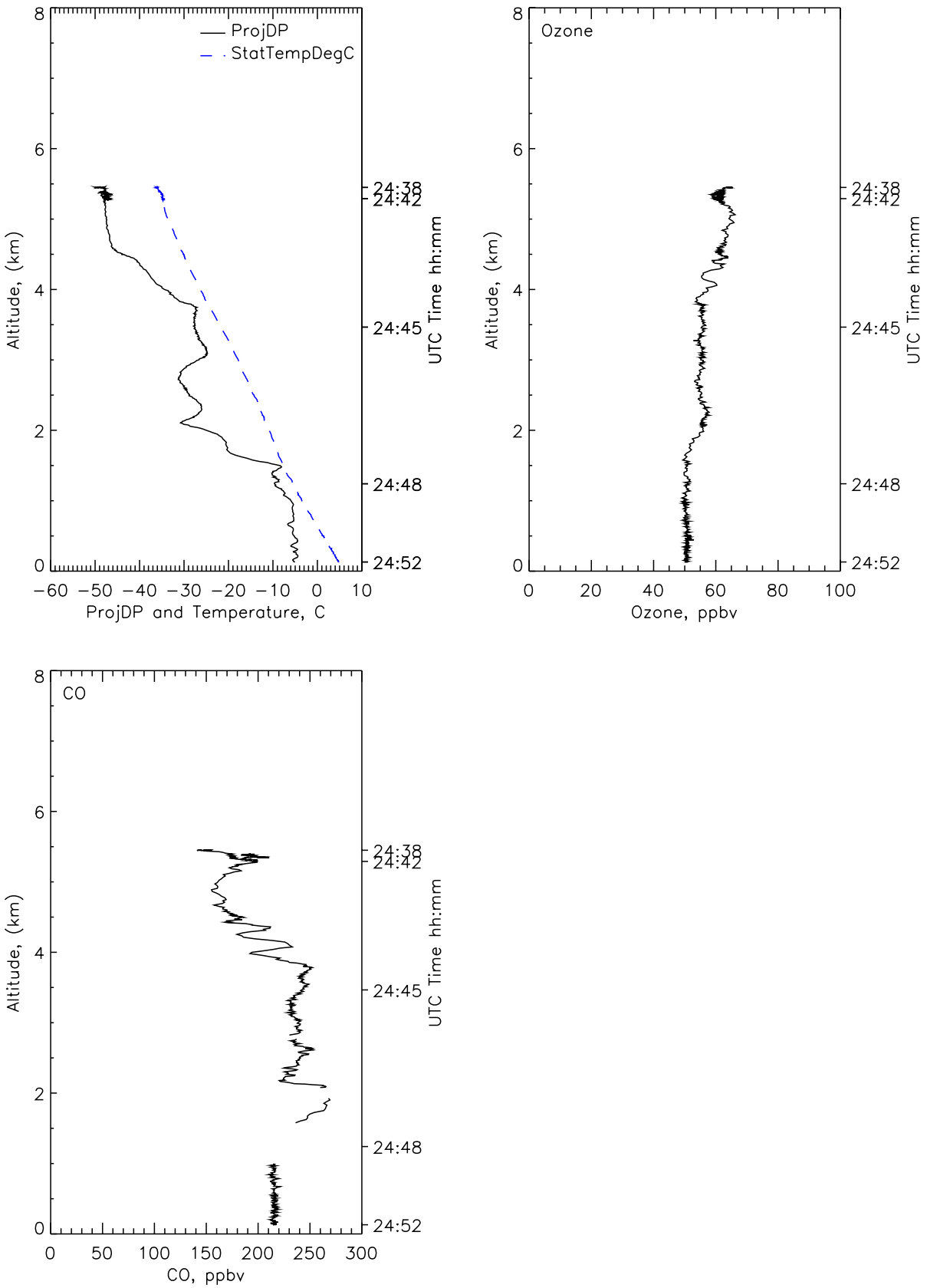
LEFT BLANK

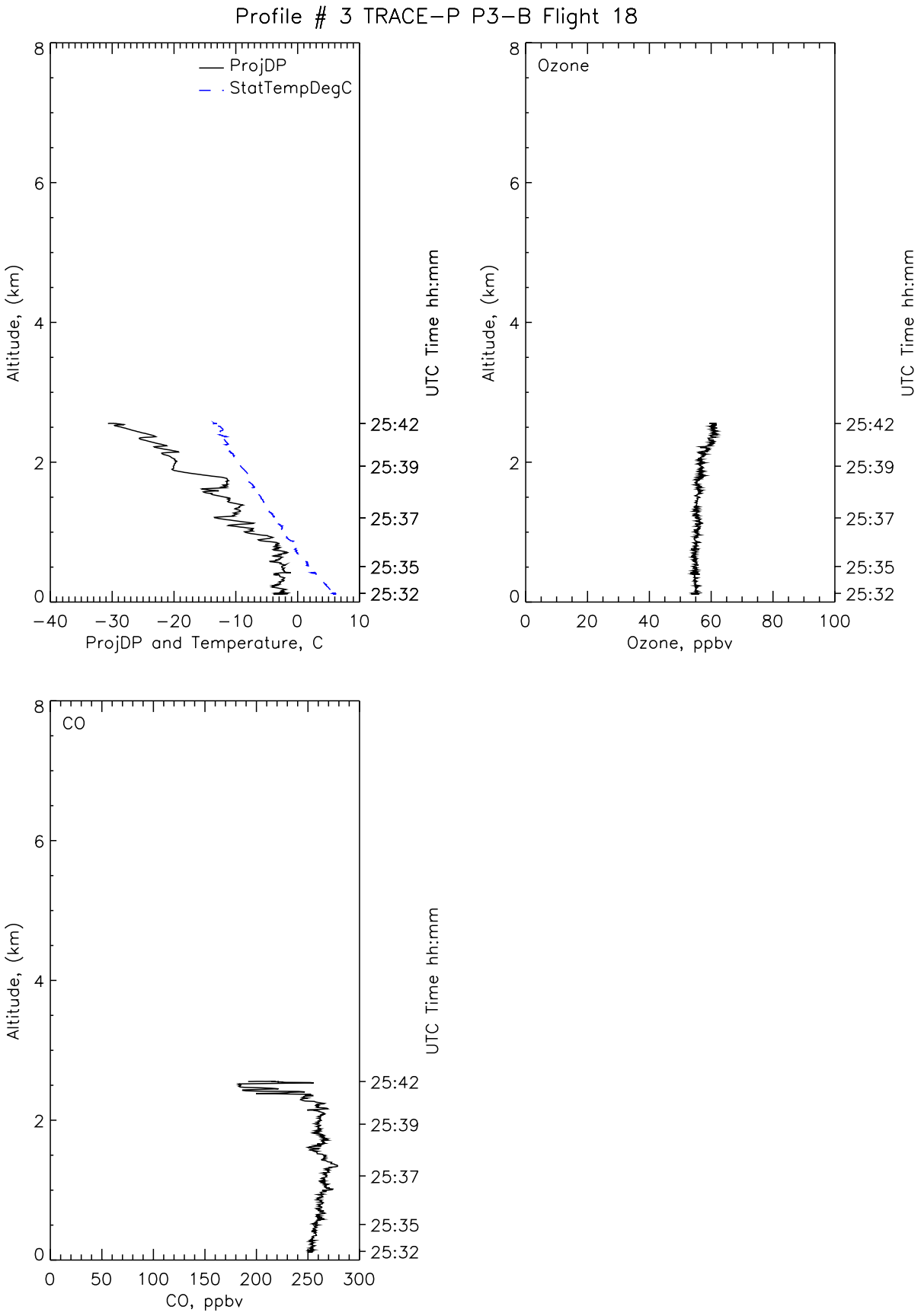

FINAL DATA: TRACE-P P3-B Flight 18
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
UTC Time

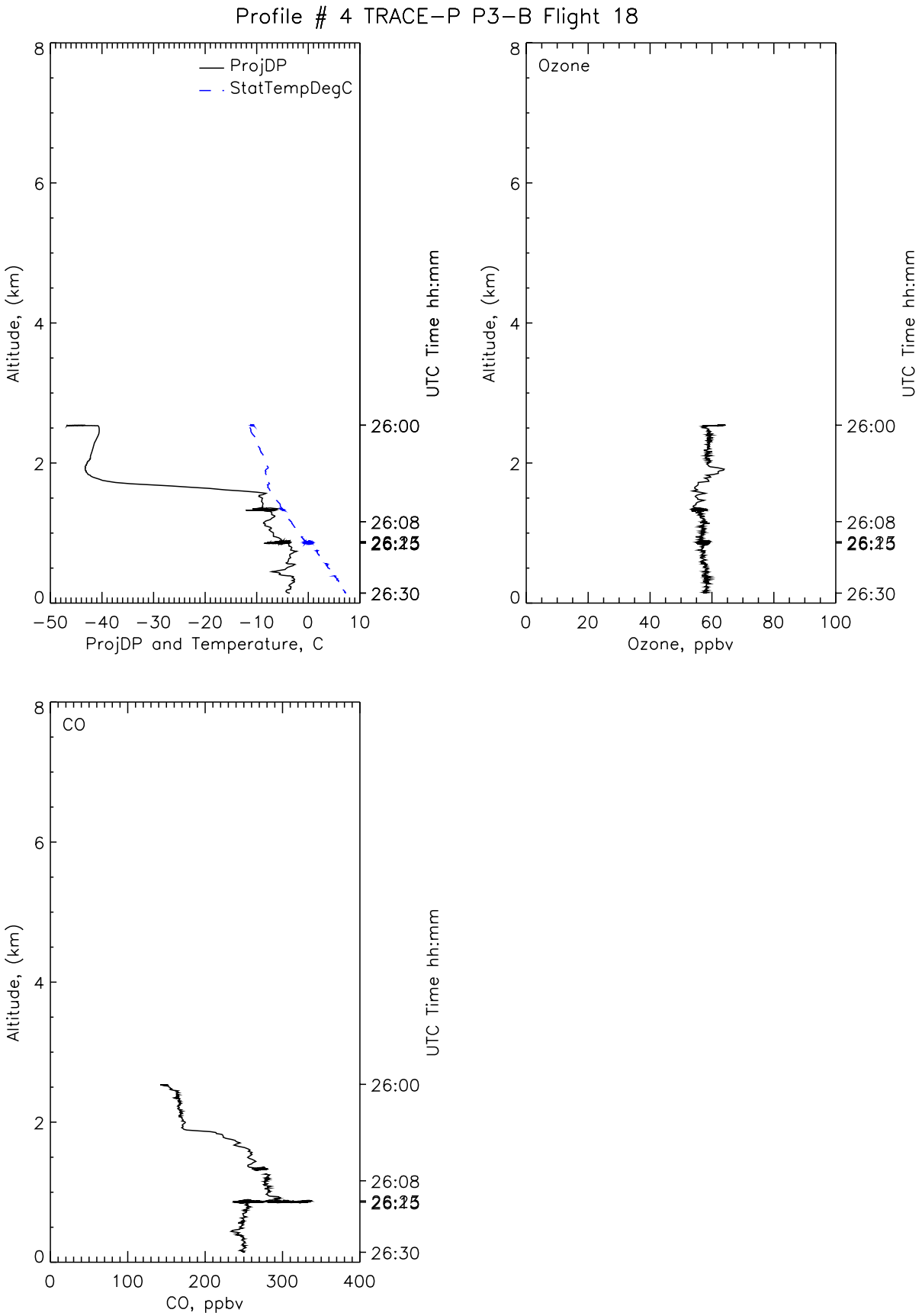

FINAL DATA: TRACE-P P3-B Flight 18
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
22
23
24
25
26
27
28
29
30
31
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
60
40
20
0
−20
−40
UTC Time
AltCab, feet
5000
4000
3000
2000
1000
0
−1000
UTC Time


Profile # 1 TRACE-P P3-B Flight 18
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
23:28
23:24
23:21
23:17
23:13
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
NO DATA
CO, ppbv

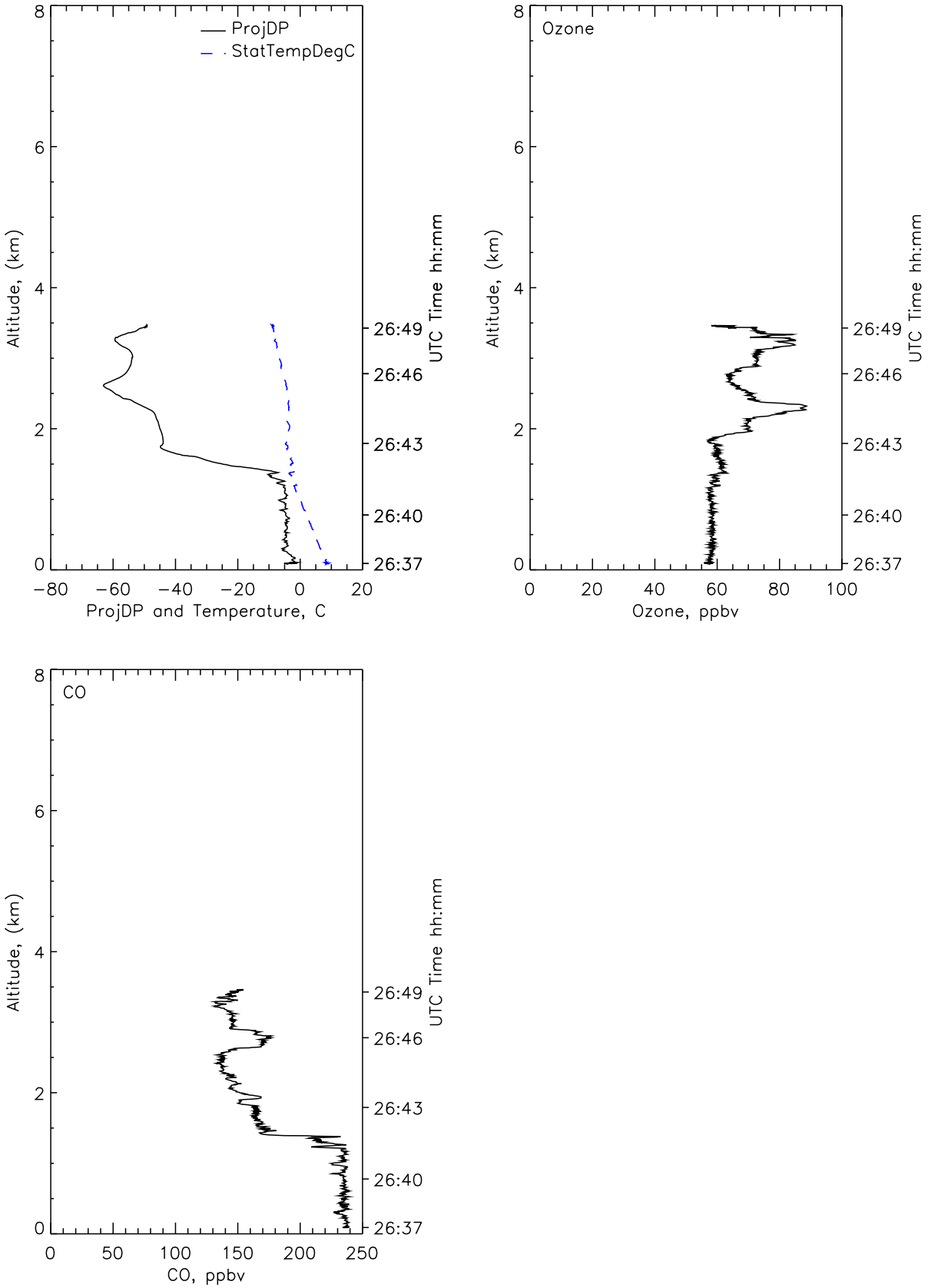
Profile # 2 TRACE-P P3-B Flight 18



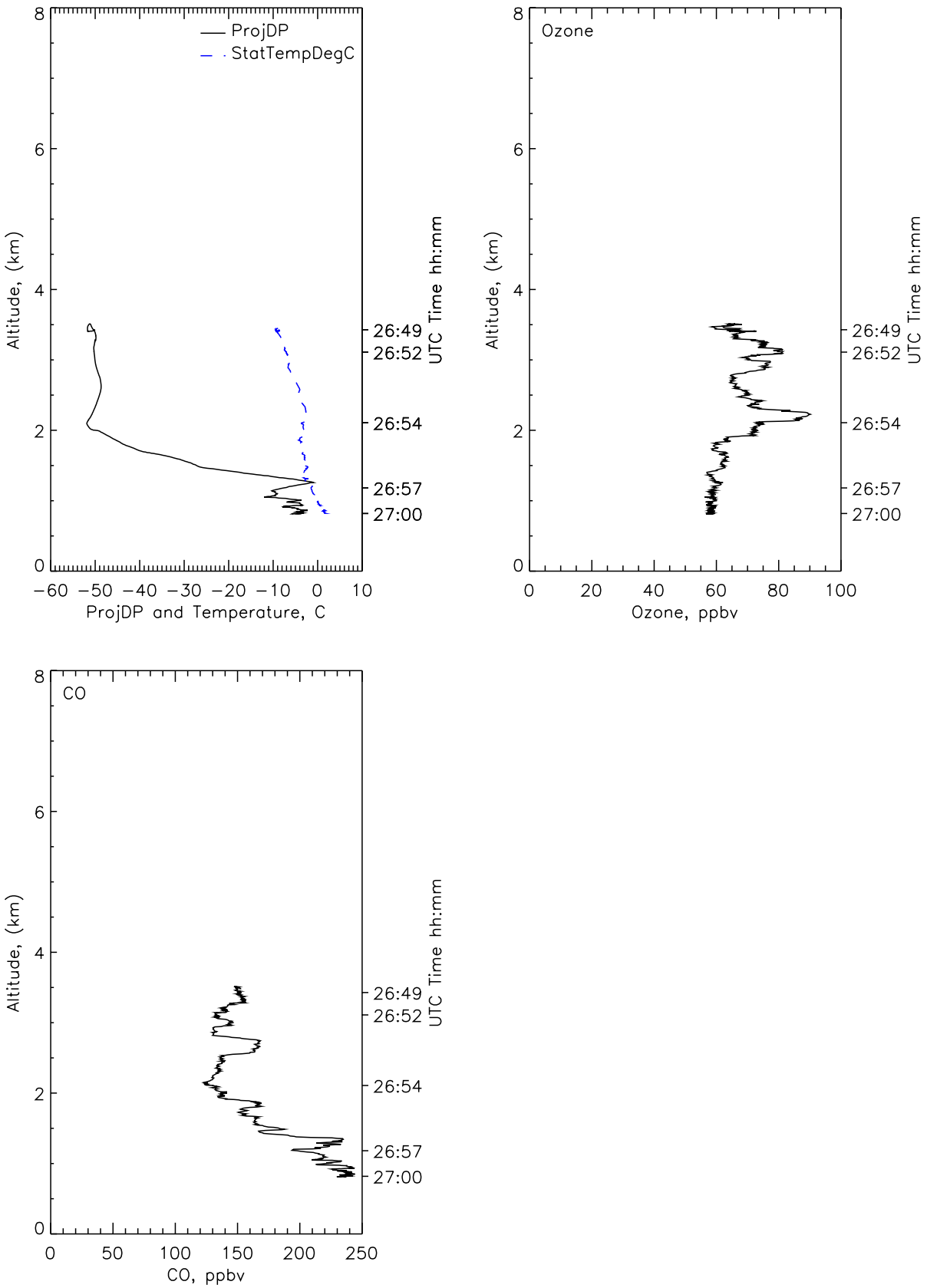

Profile # 3 TRACE-P P3-B Flight 18
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
25:42
25:39
25:37
25:35
25:32
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

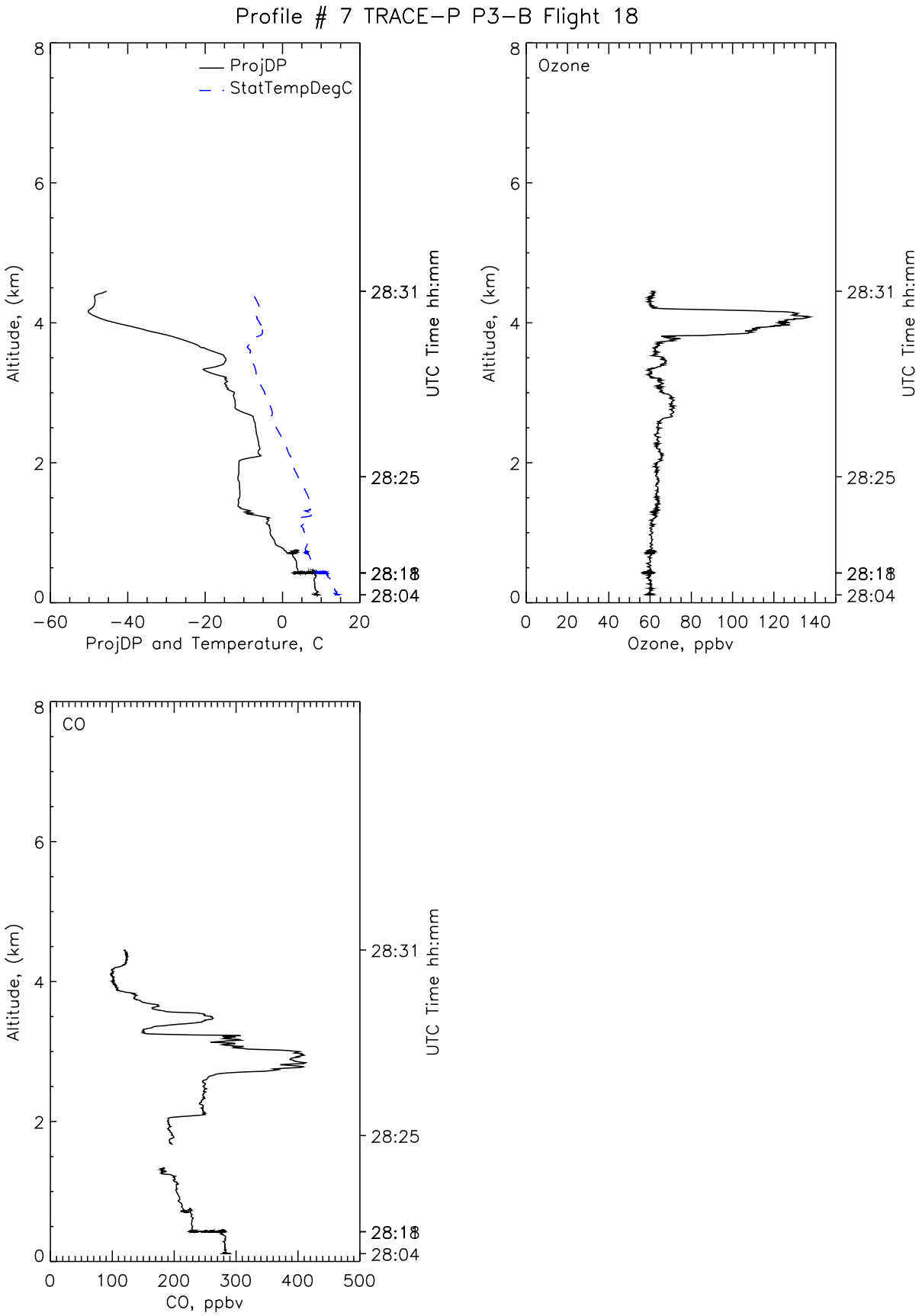

Profile # 4 TRACE-P P3-B Flight 18
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
26:00
26:08
26:15
26:30
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 5 TRACE-P P3-B Flight 18

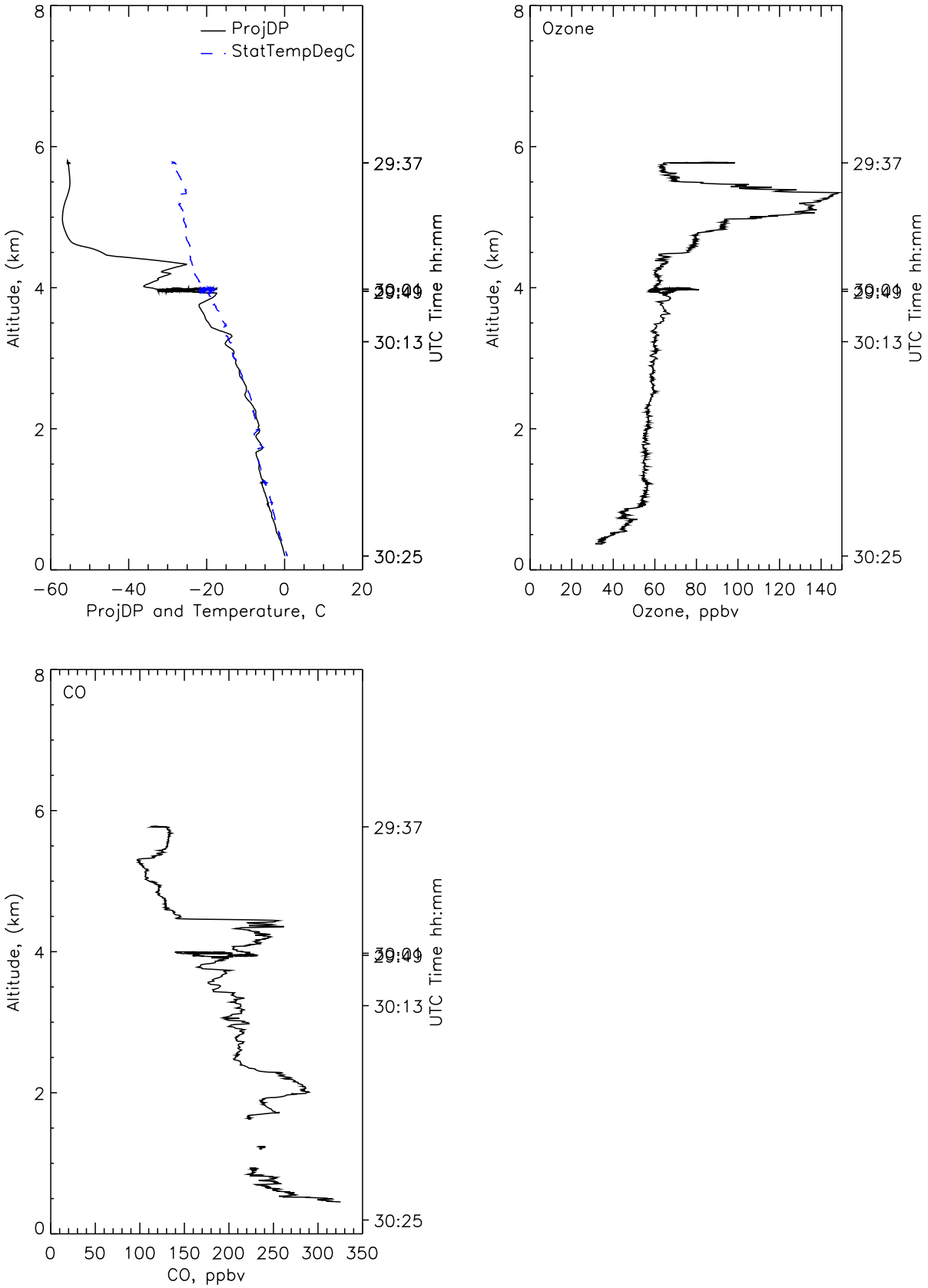


Profile # 6 TRACE-P P3-B Flight 18




Profile # 7 TRACE-P P3-B Flight 18
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
28:31
28:25
28:18
28:04
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 8 TRACE−P P3−B Flight 18



CHEMICAL and METEOROLOGICAL DATA

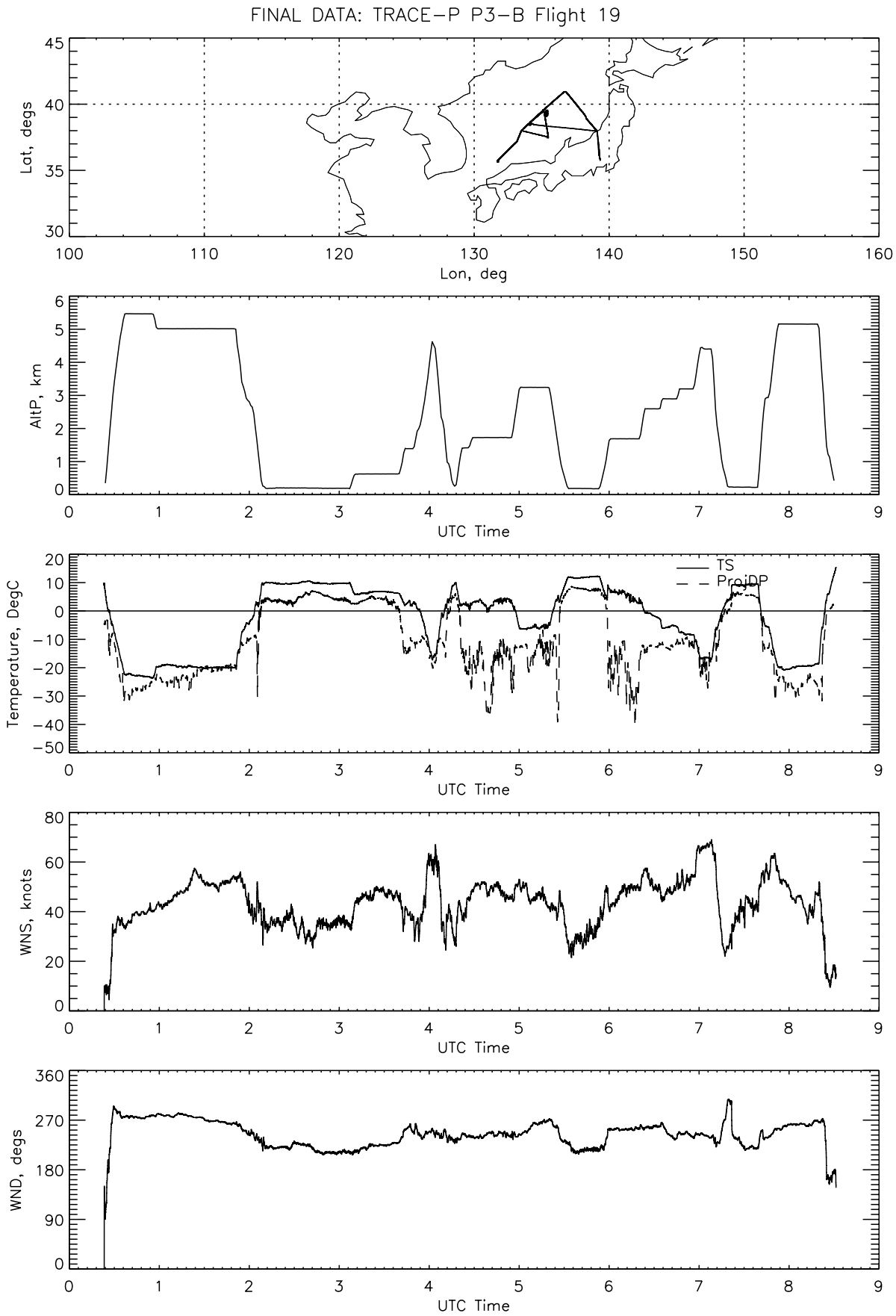
TRACE-P

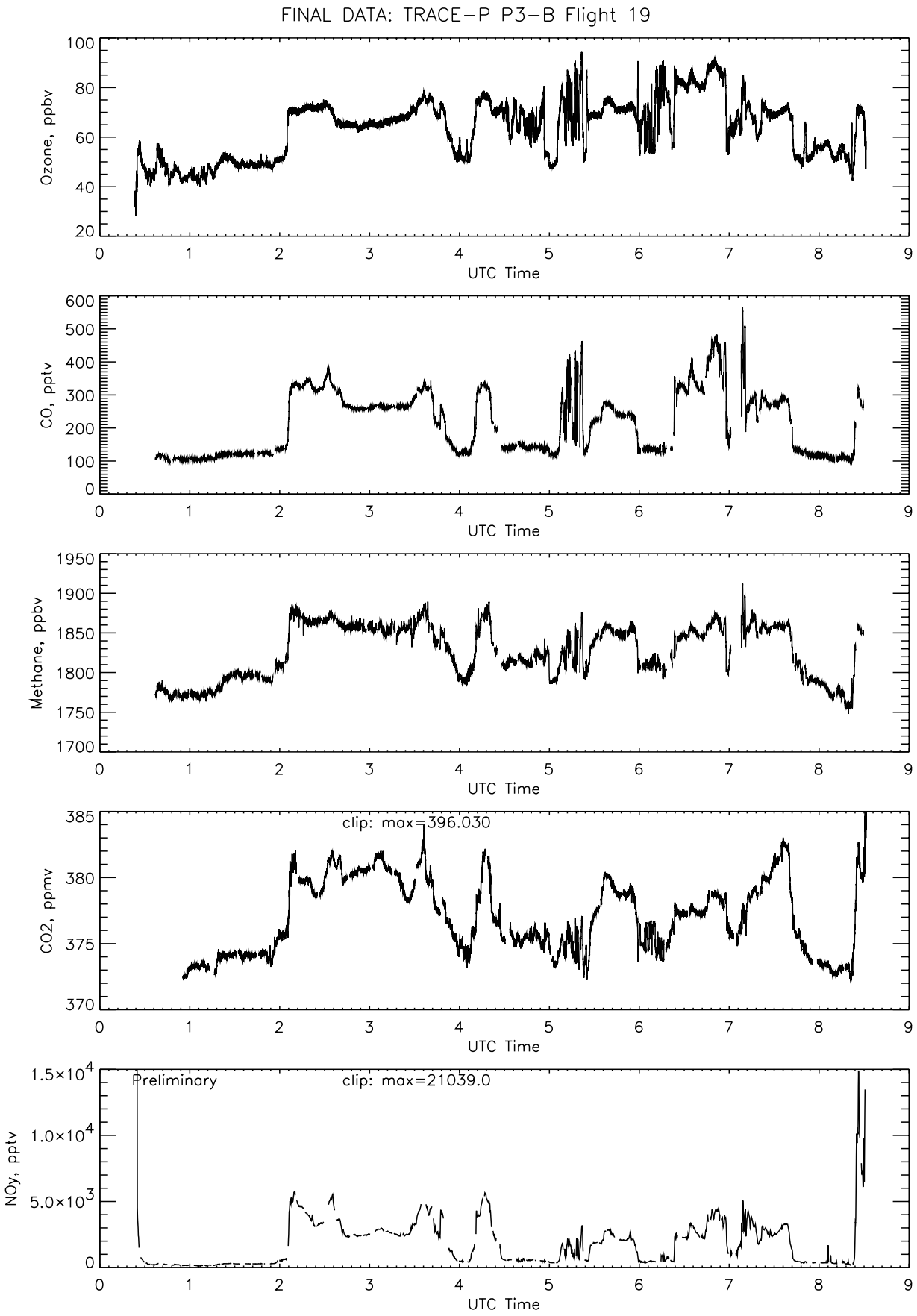
Flight 19P

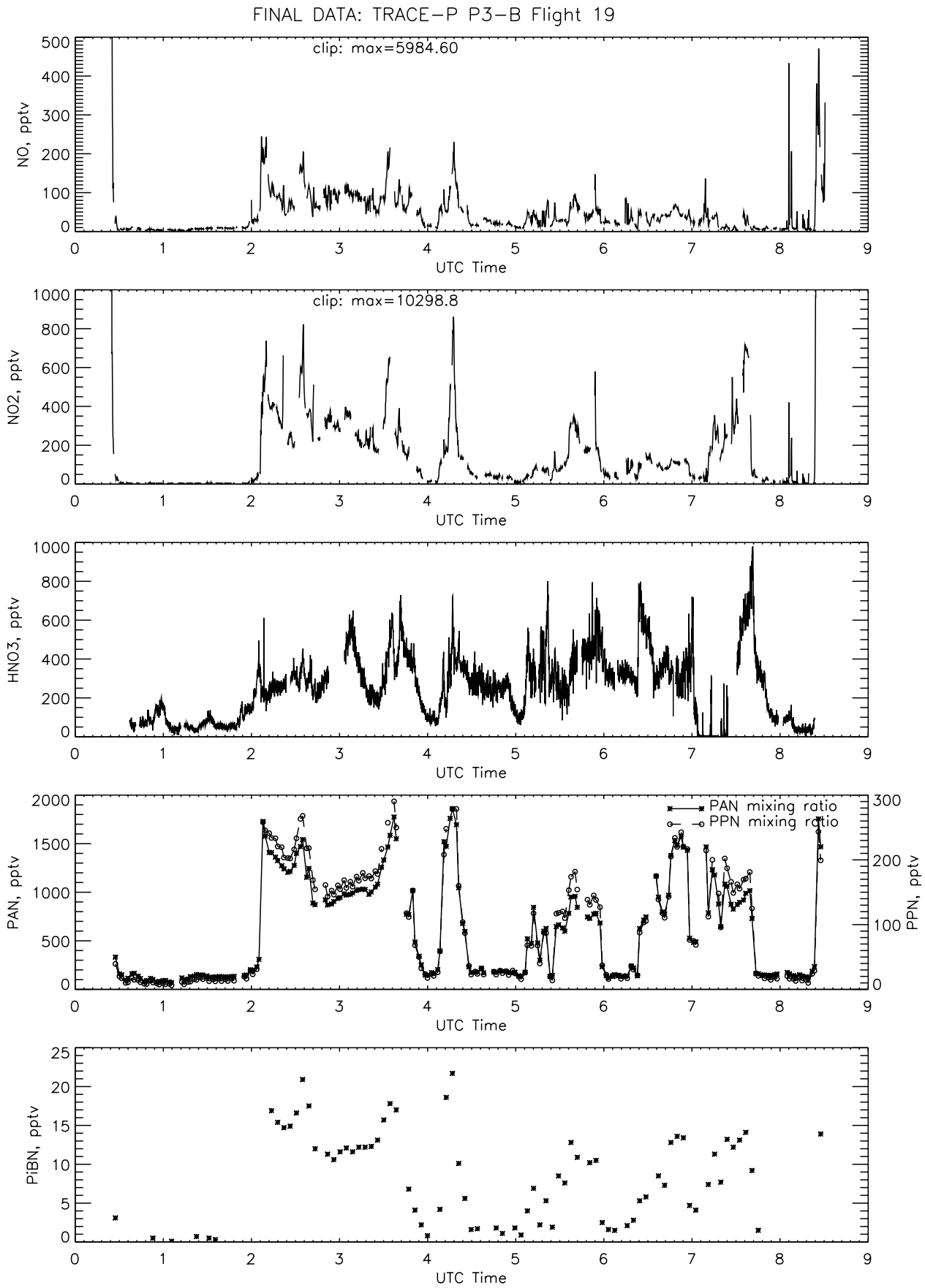
Local: Yokota No. 5

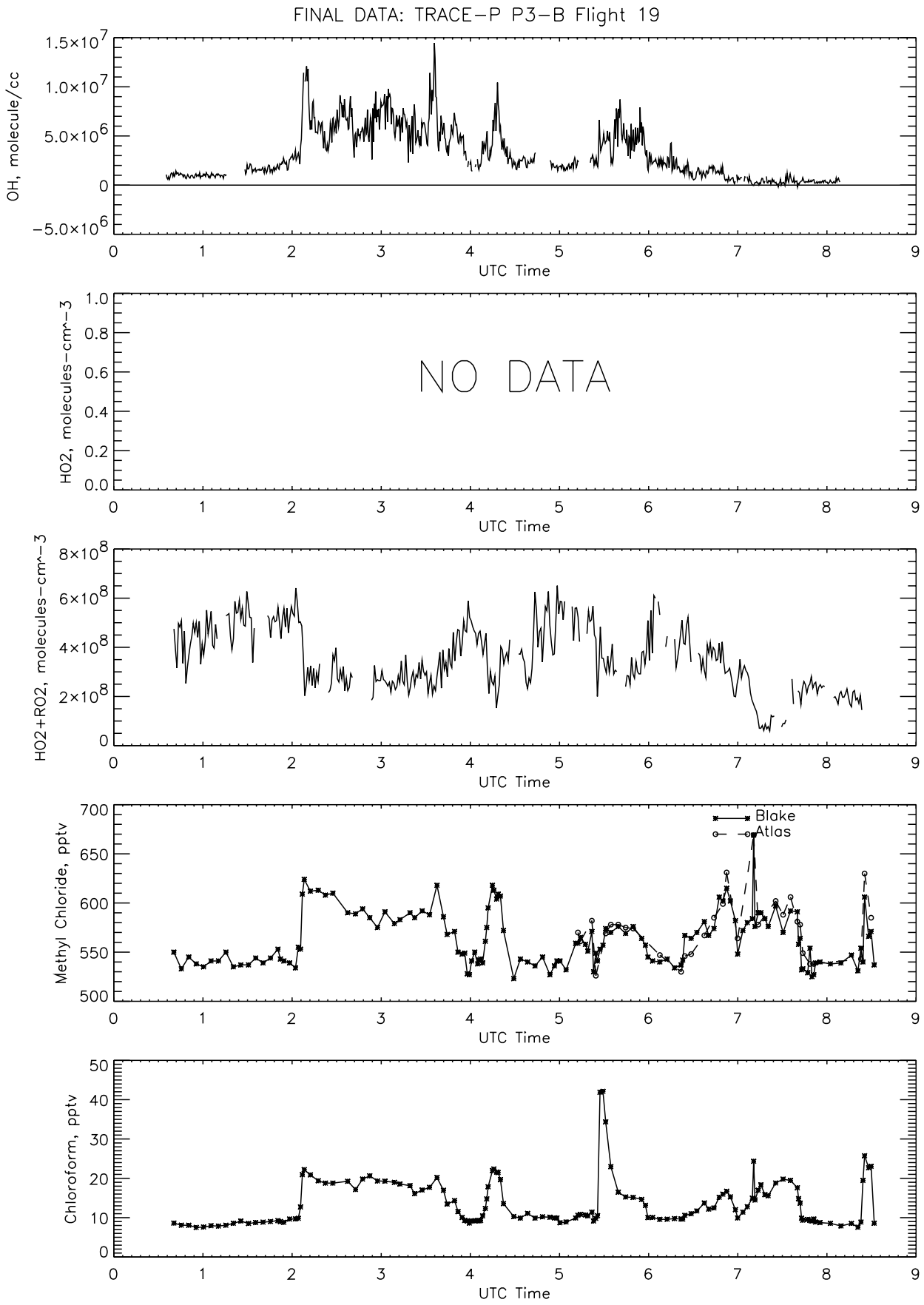
ACE-Asia; Moist Conveyor Belt;
TERRA Underpass

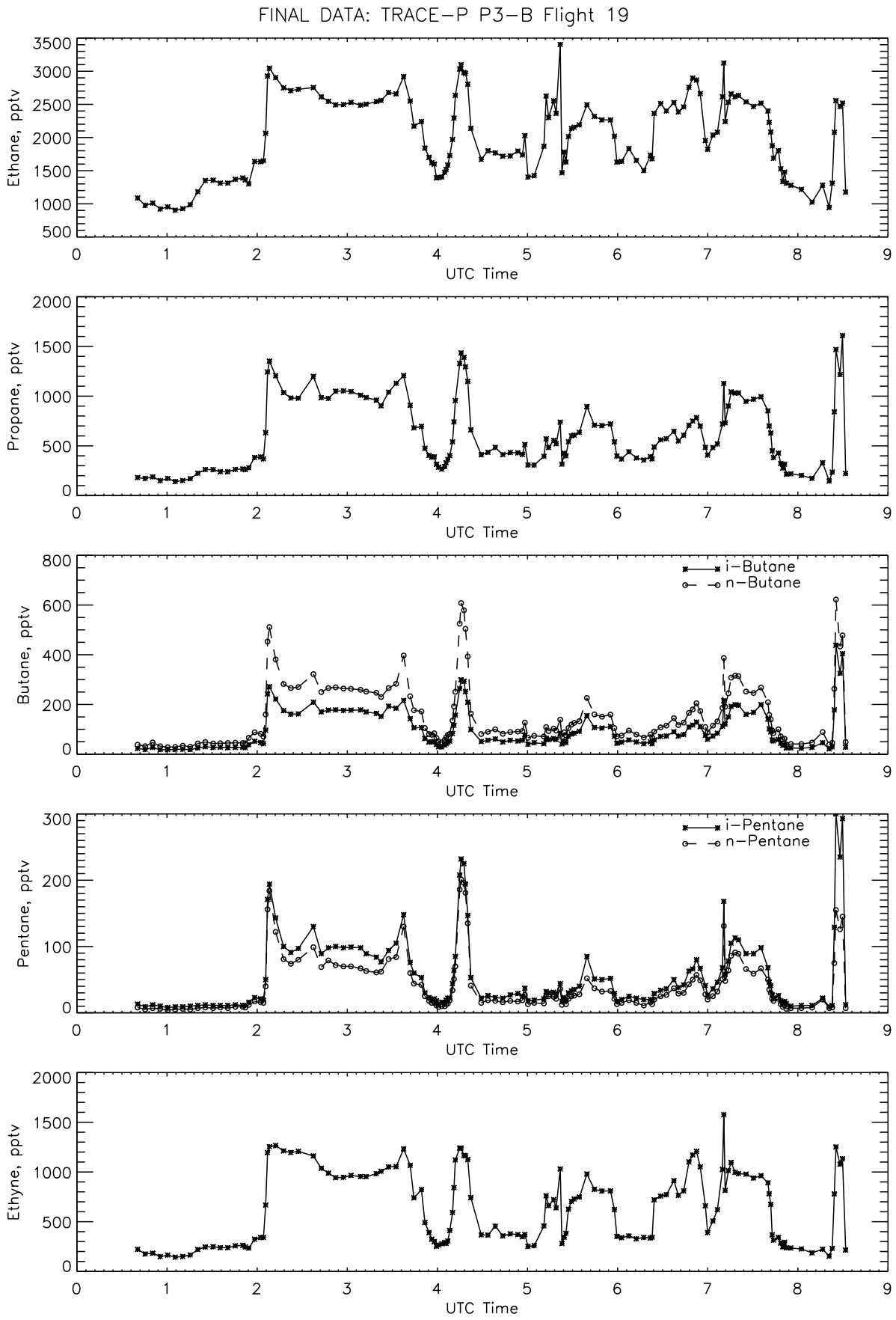
April 2, 2001

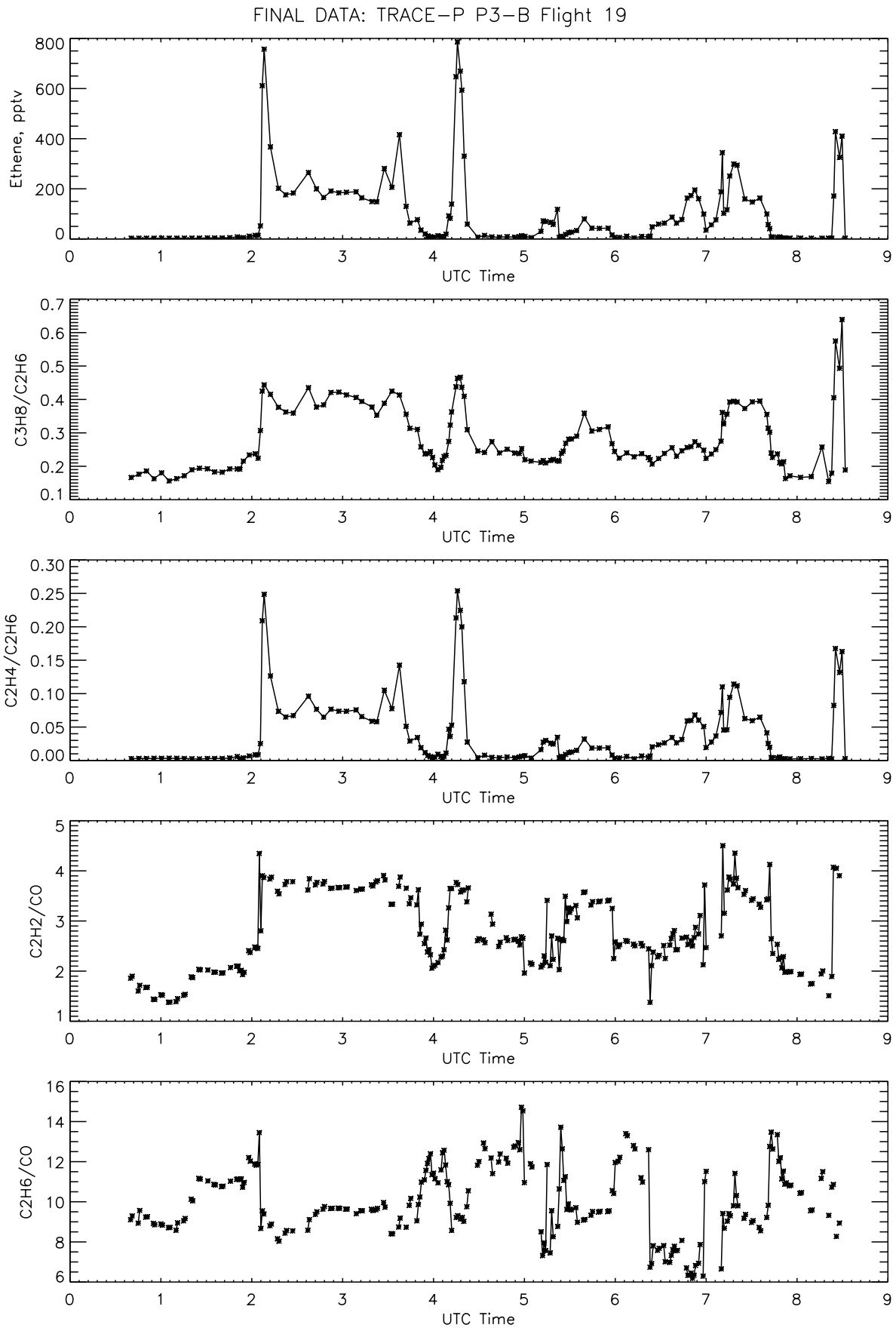

FINAL DATA: TRACE-P P3-B Flight 19
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 19
Ozone, ppbv
UTC Time
CO, pptv
UTC Time
Methane, ppbv
UTC Time
CO2, ppmv
clip: max=396.030
UTC Time
NOy, pptv
Preliminary
clip: max=21039.0
UTC Time

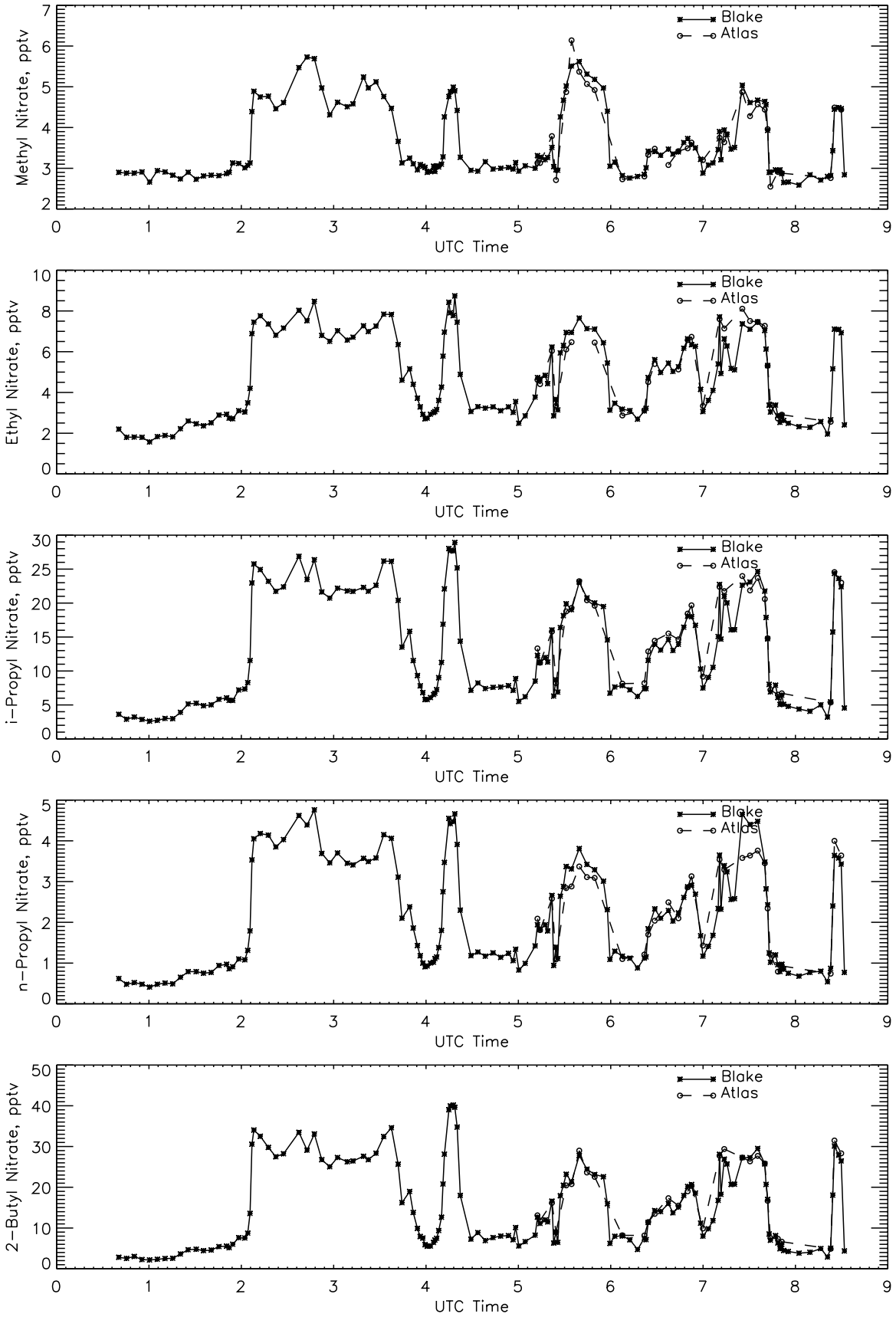

FINAL DATA: TRACE-P P3-B Flight 19
clip: max=5984.60
NO, pptv
UTC Time
clip: max=10298.8
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

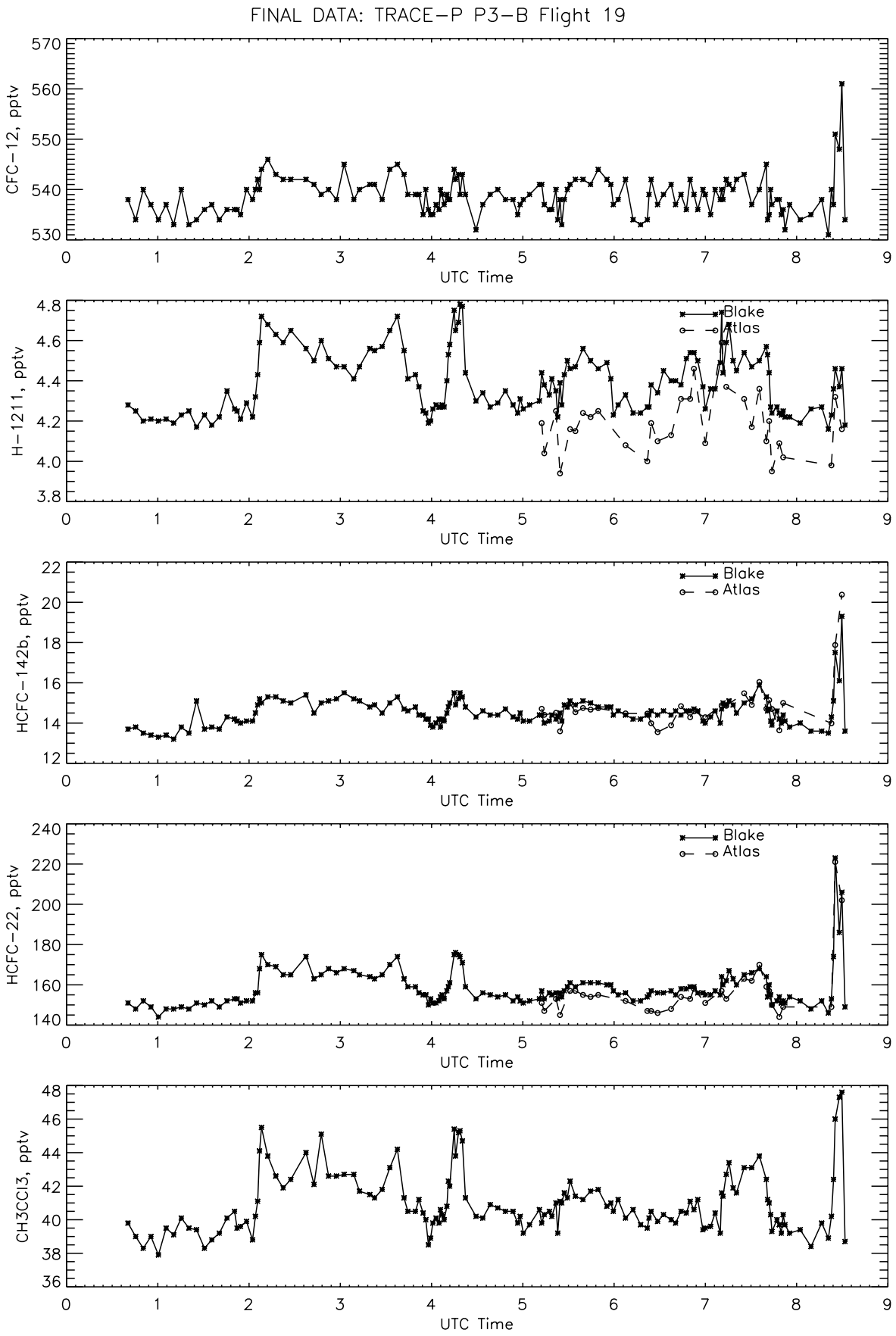

FINAL DATA: TRACE-P P3-B Flight 19
OH, molecule/cc
UTC Time
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv


FINAL DATA: TRACE-P P3-B Flight 19
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

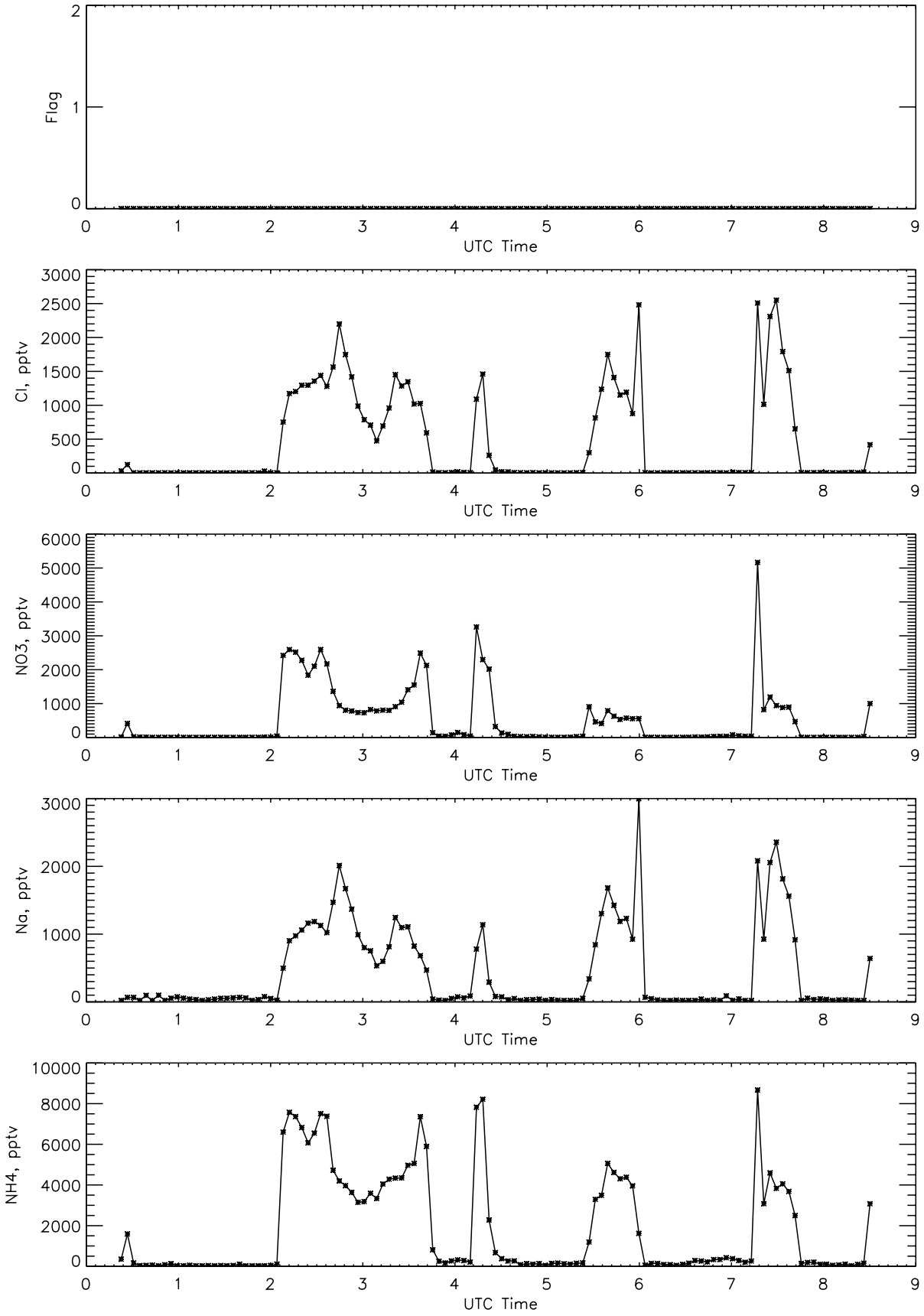

FINAL DATA: TRACE-P P3-B Flight 19
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

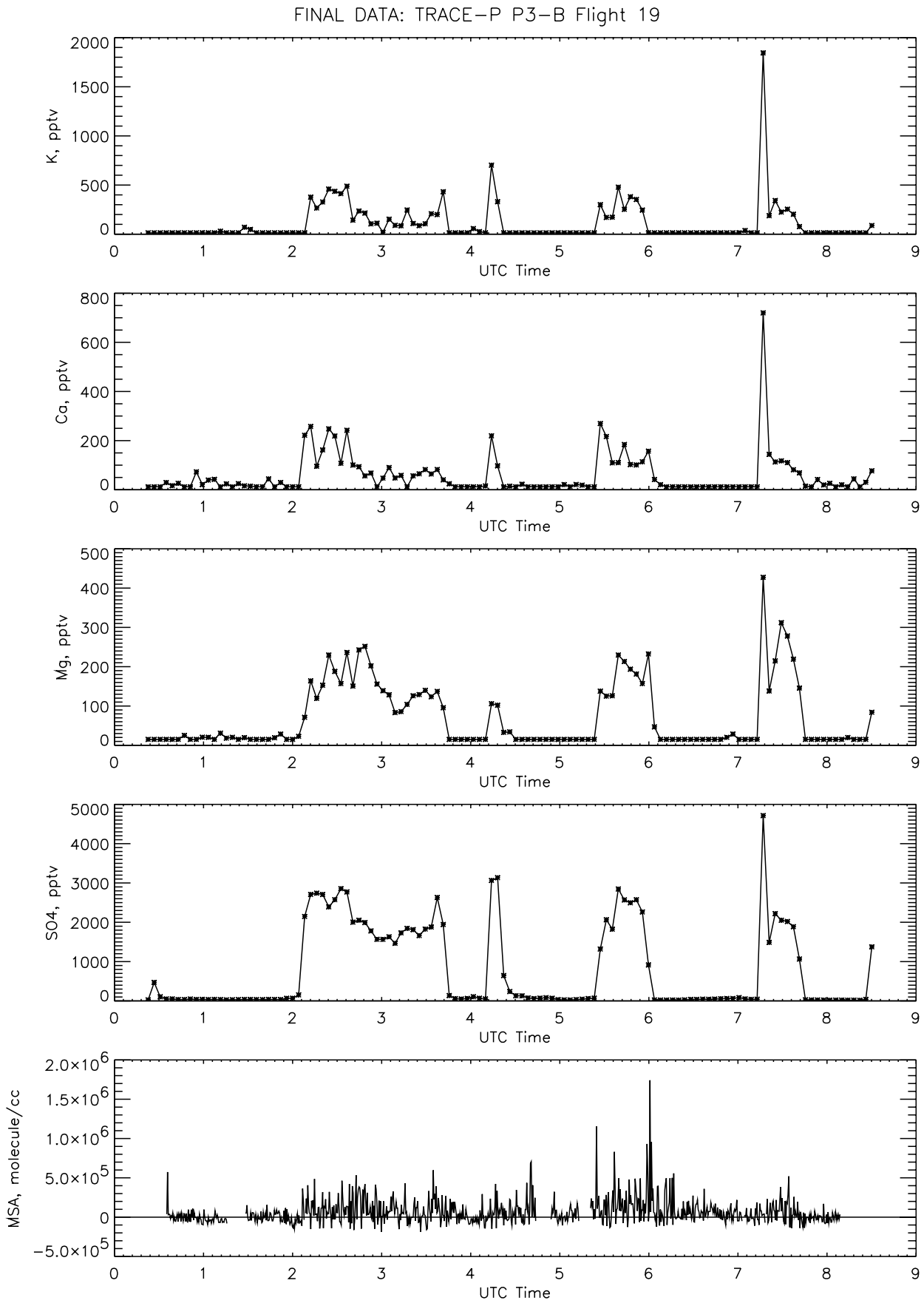
FINAL DATA: TRACE-P P3-B Flight 19

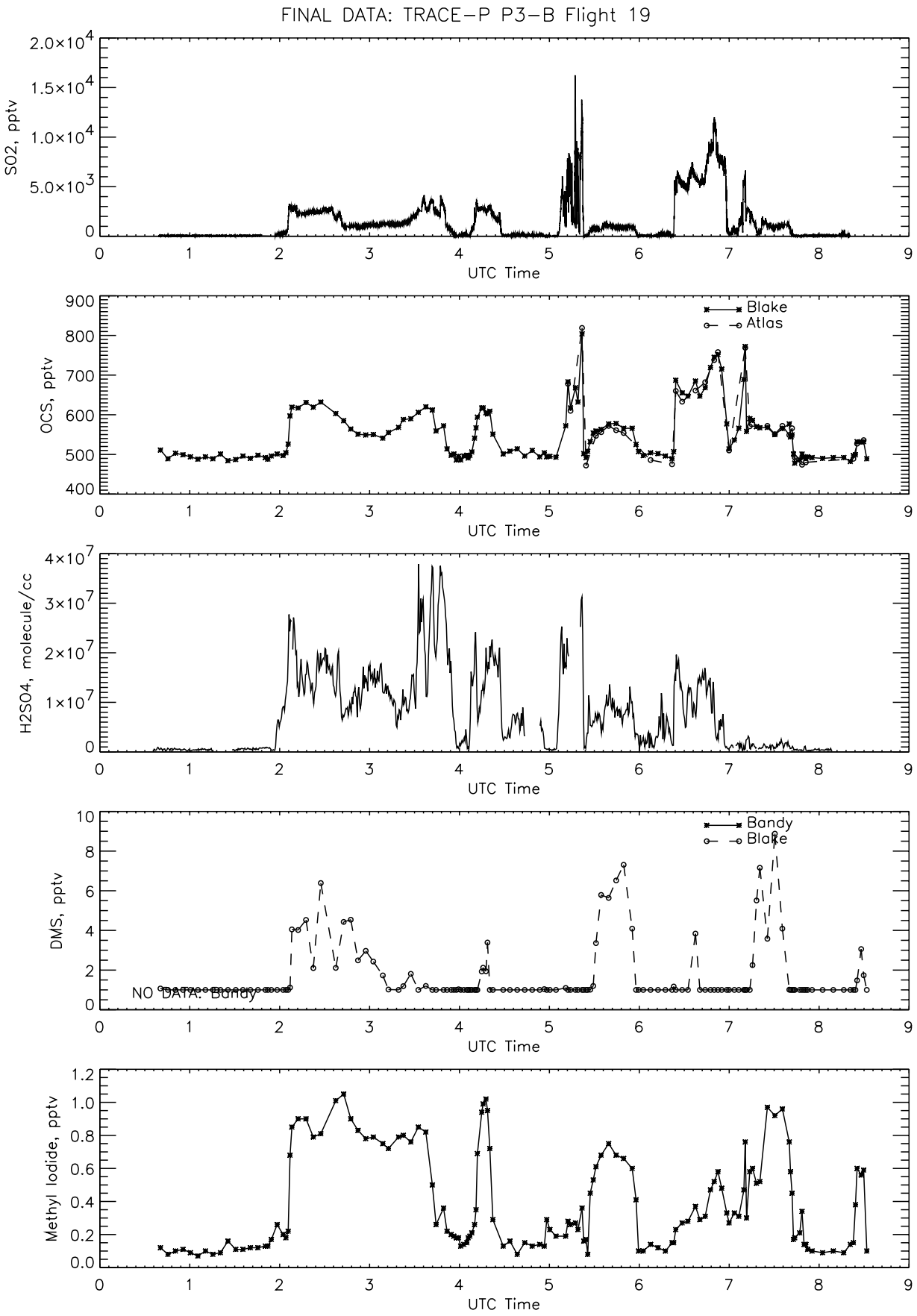


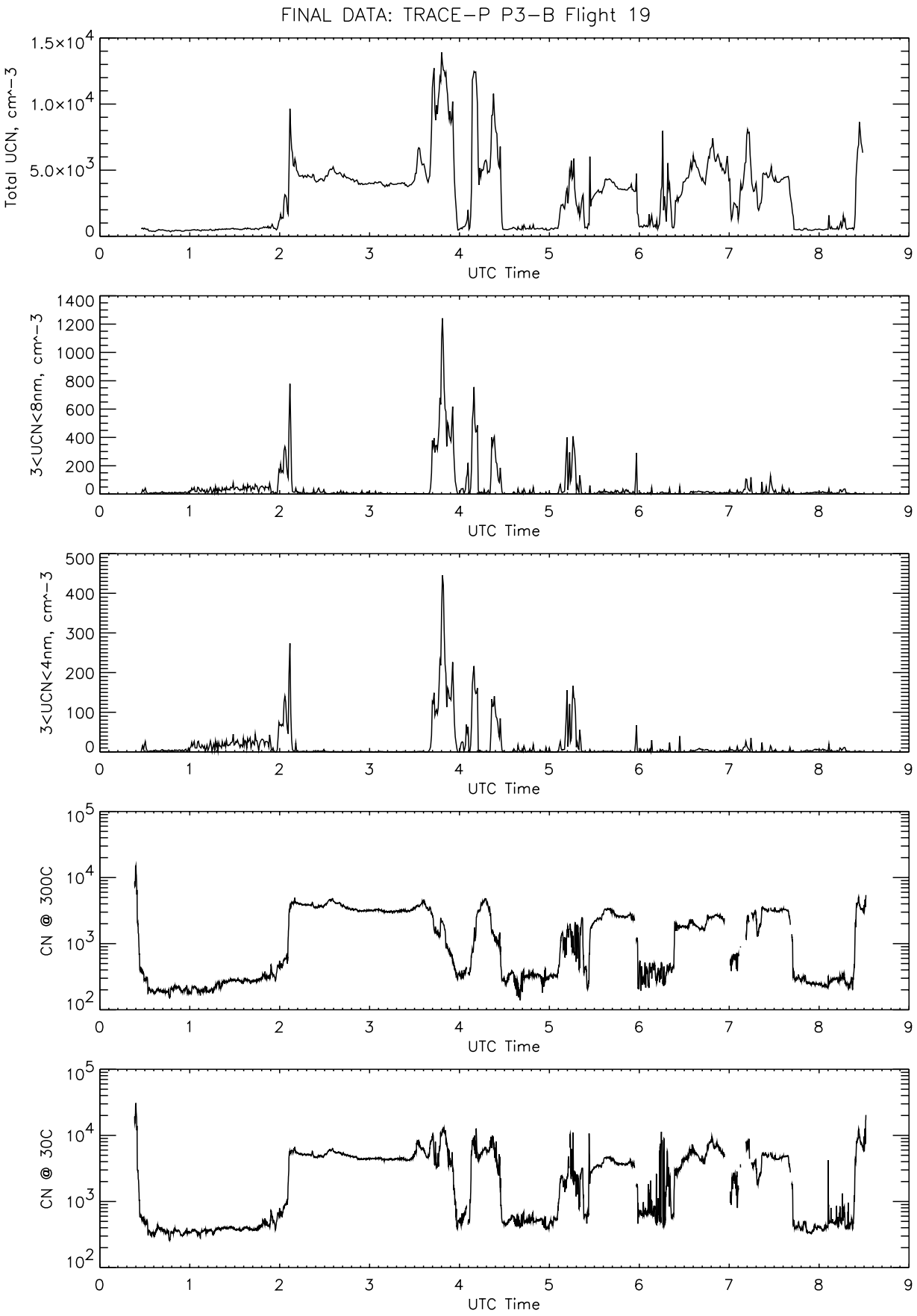

FINAL DATA: TRACE-P P3-B Flight 19
CFC-12, pptv
UTC Time
H-1211, pptv
Blake
Atlas
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv

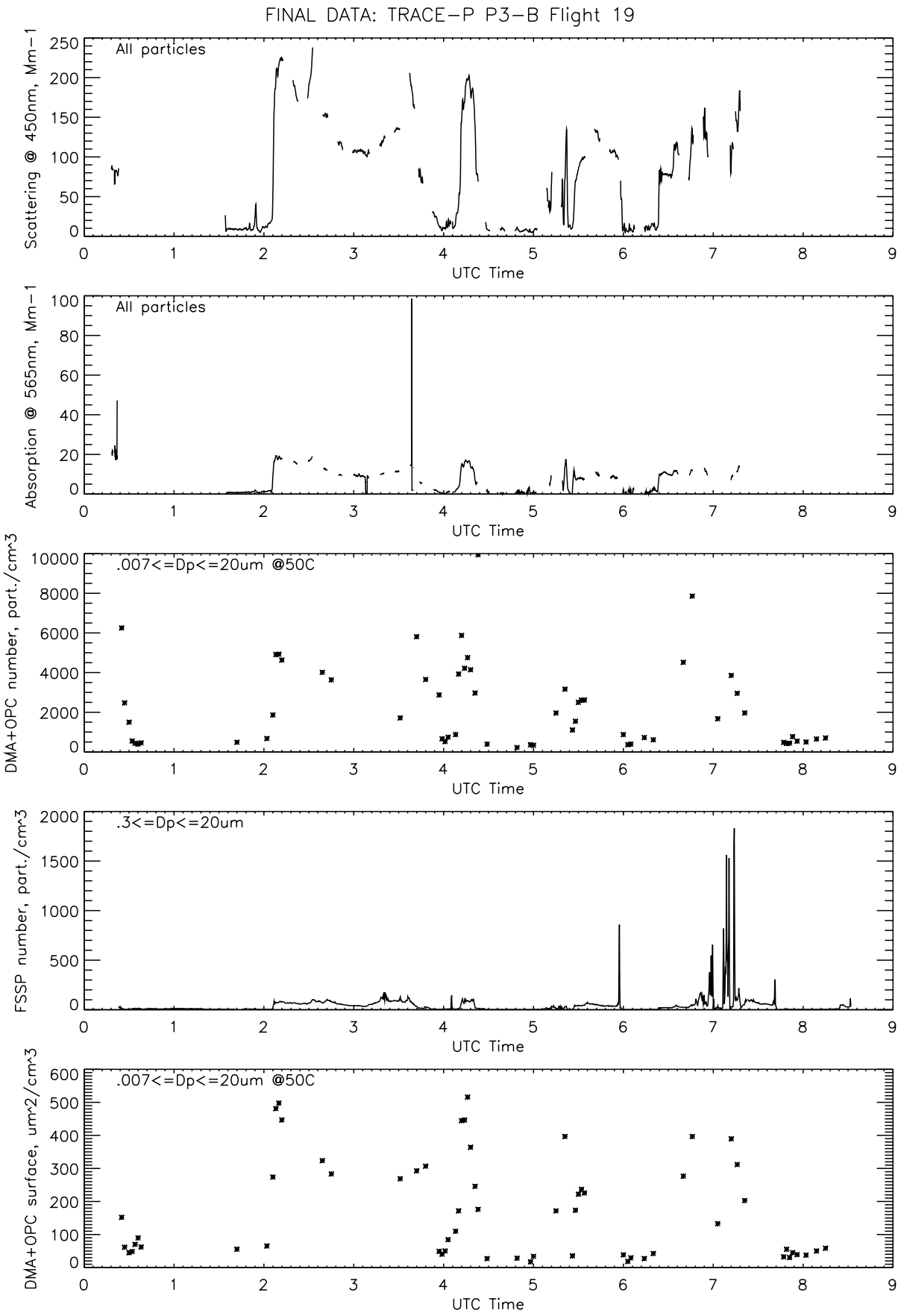
FINAL DATA: TRACE-P P3-B Flight 19

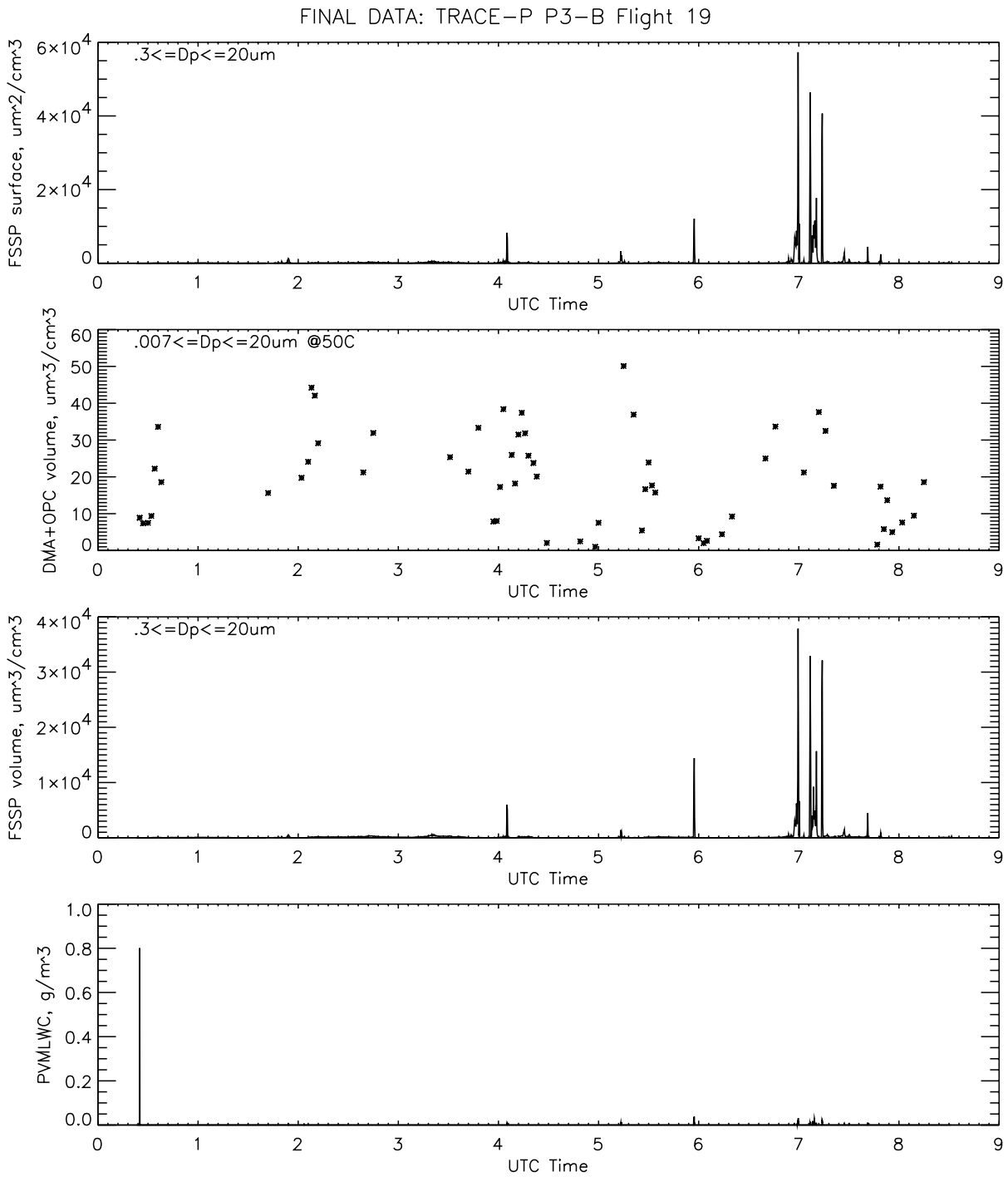



FINAL DATA: TRACE-P P3-B Flight 19
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time


FINAL DATA: TRACE-P P3-B Flight 19
SO2, pptv
UTC Time
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv

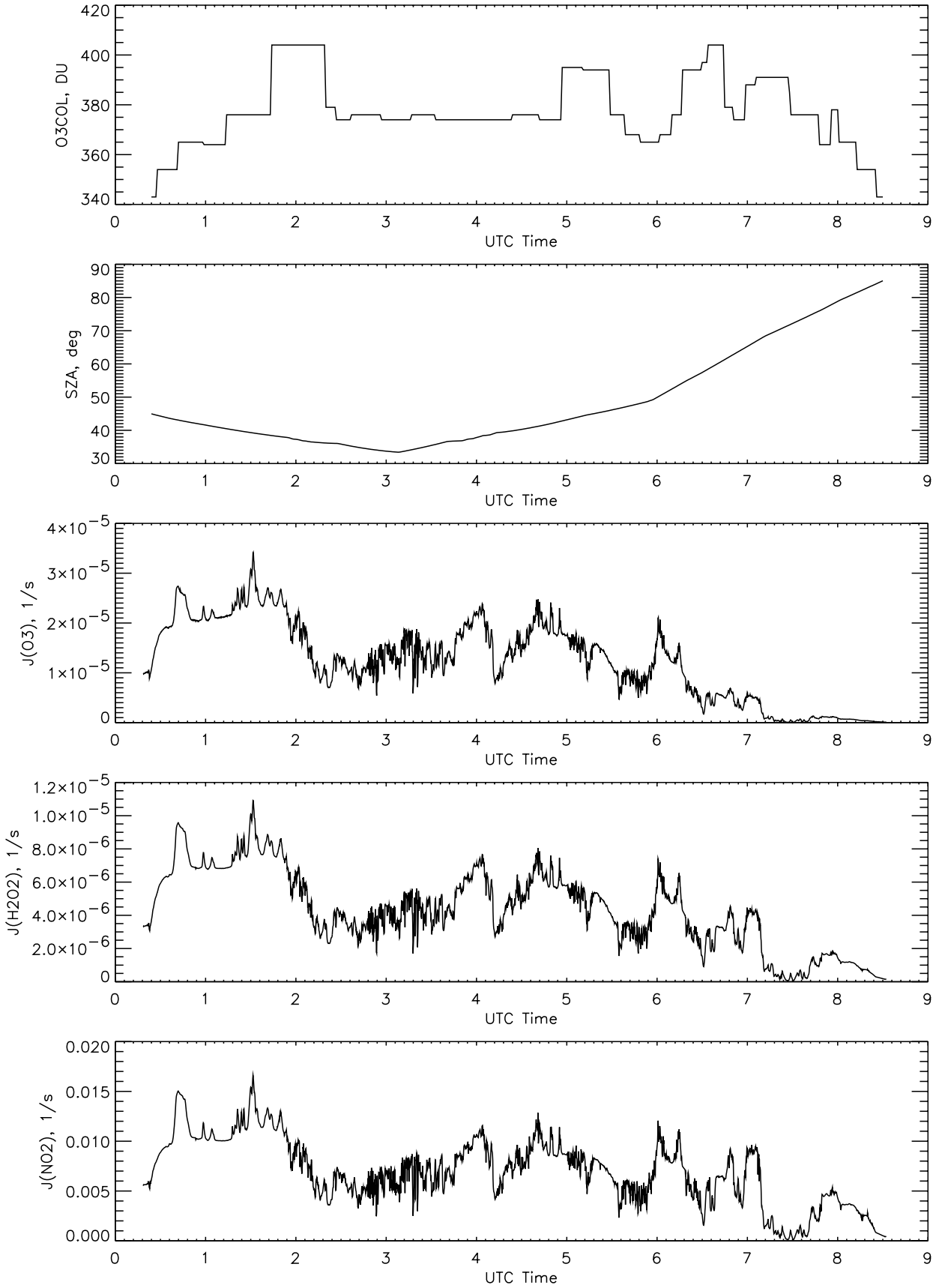

FINAL DATA: TRACE-P P3-B Flight 19
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

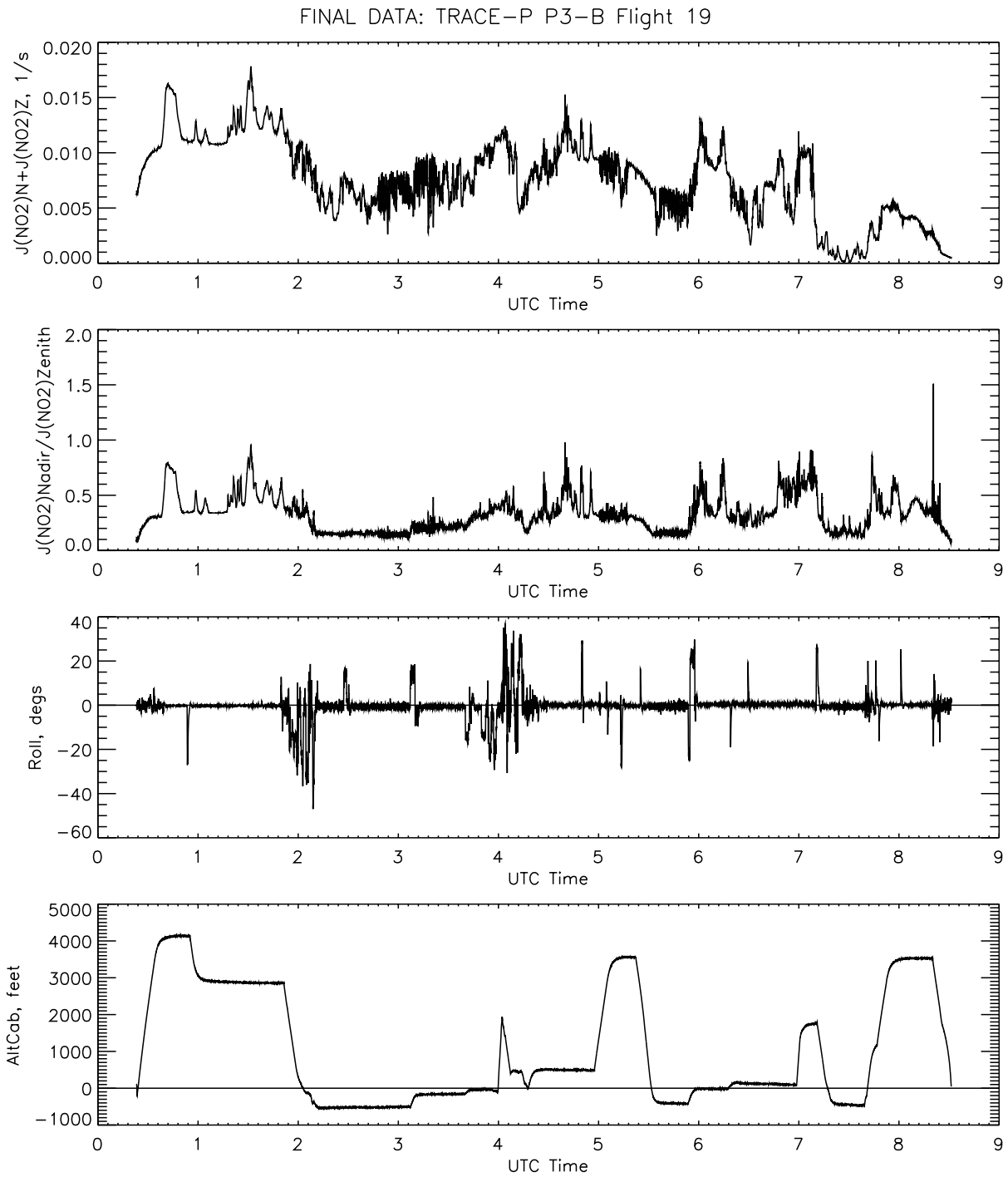

FINAL DATA: TRACE-P P3-B Flight 19
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

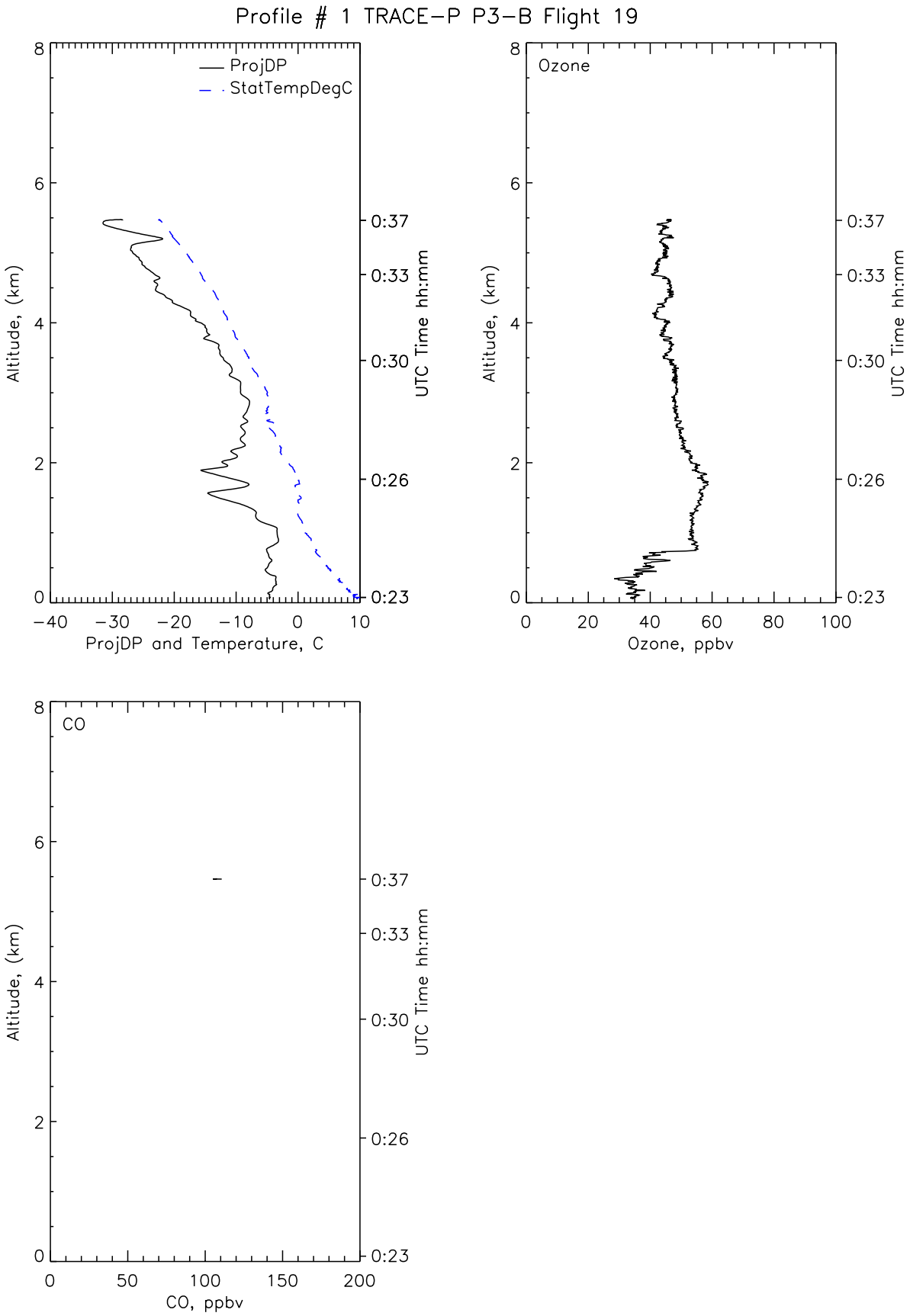

FINAL DATA: TRACE-P P3-B Flight 19
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

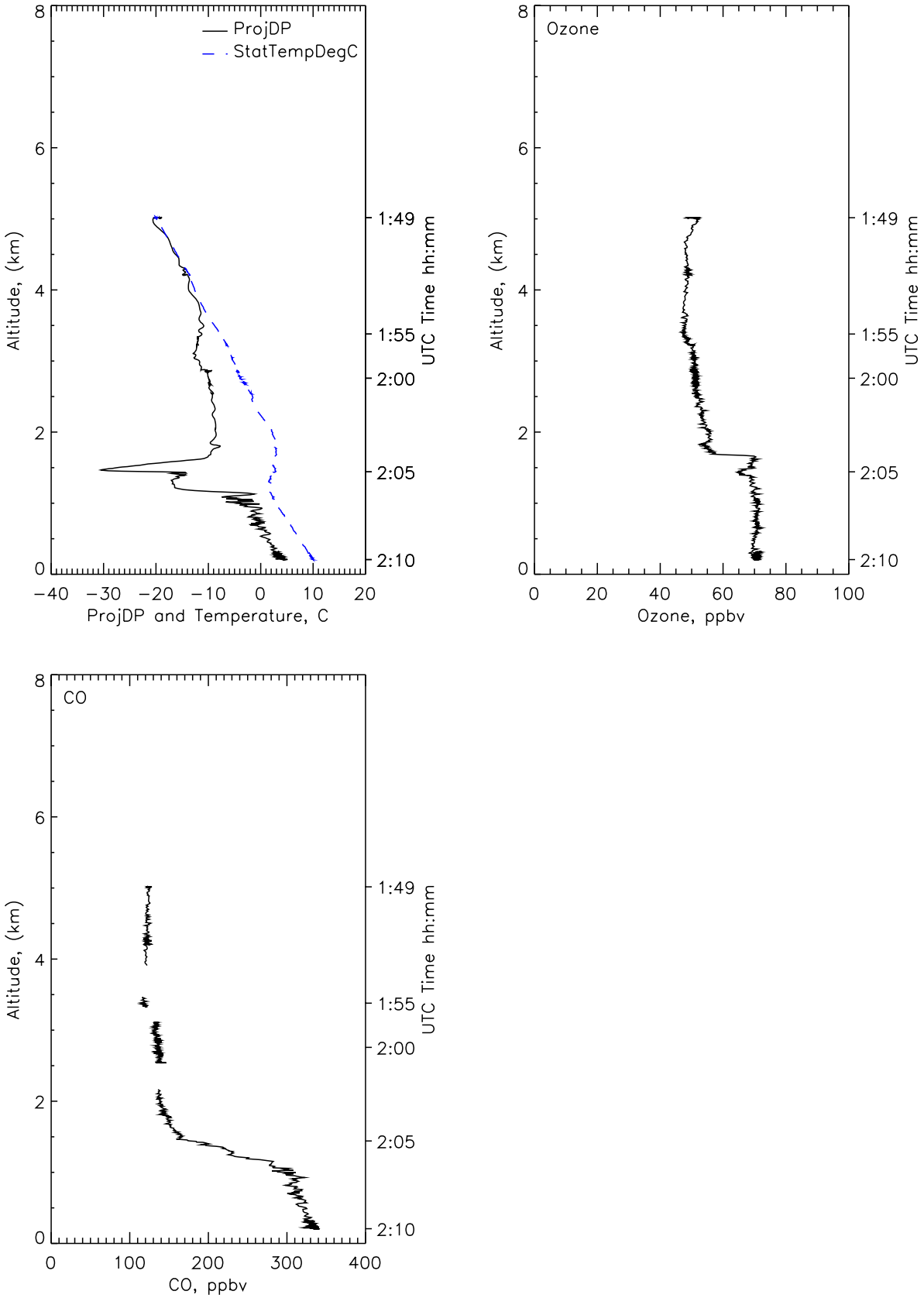
FINAL DATA: TRACE-P P3-B Flight 19



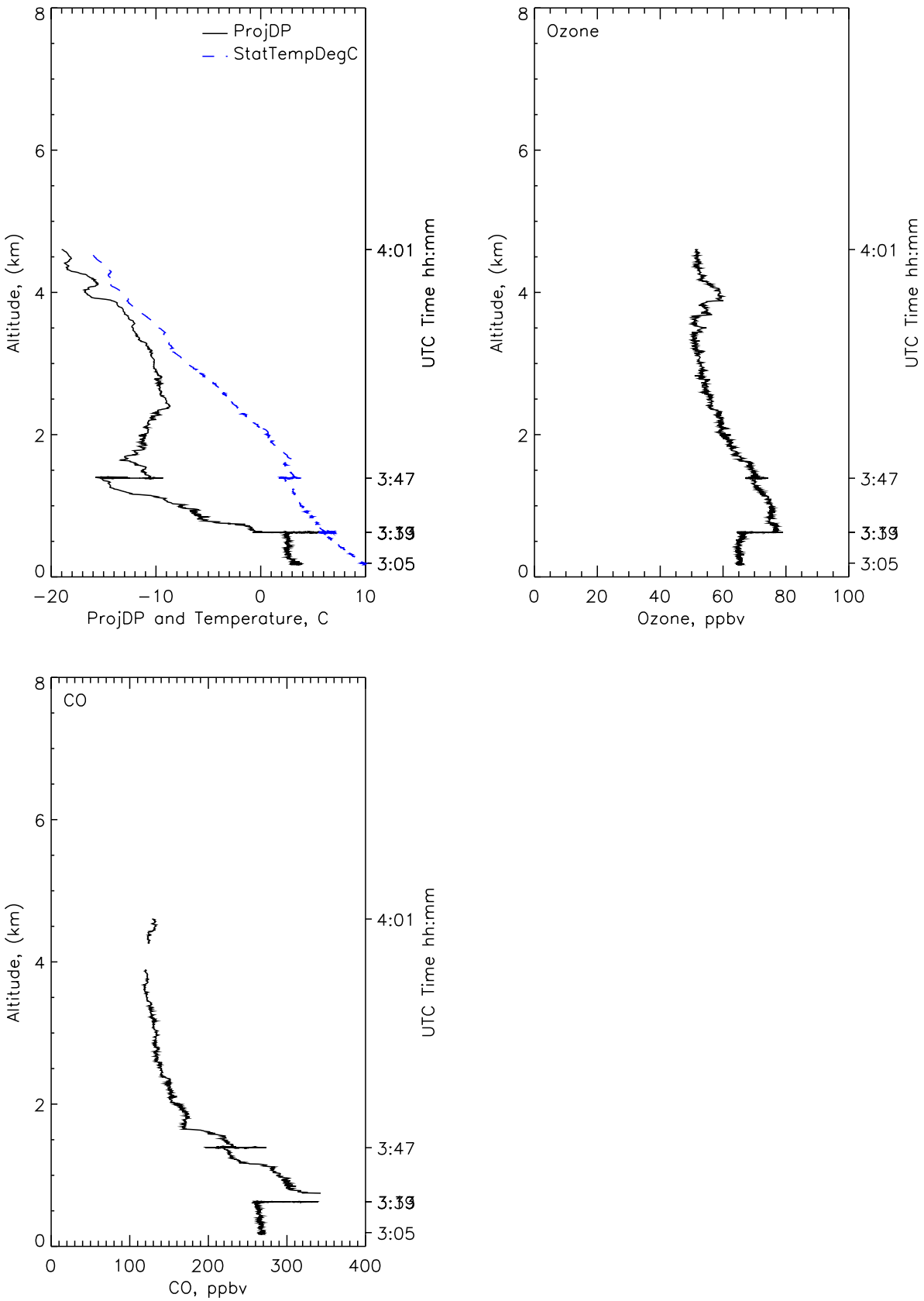

FINAL DATA: TRACE-P P3-B Flight 19
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
UTC Time
J(NO2)Nadir/J(NO2)Zenith
2.0
1.5
1.0
0.5
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
−60
UTC Time
AltCab, feet
5000
4000
3000
2000
1000
0
−1000
UTC Time
0
1
2
3
4
5
6
7
8
9


Profile # 1 TRACE-P P3-B Flight 19
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

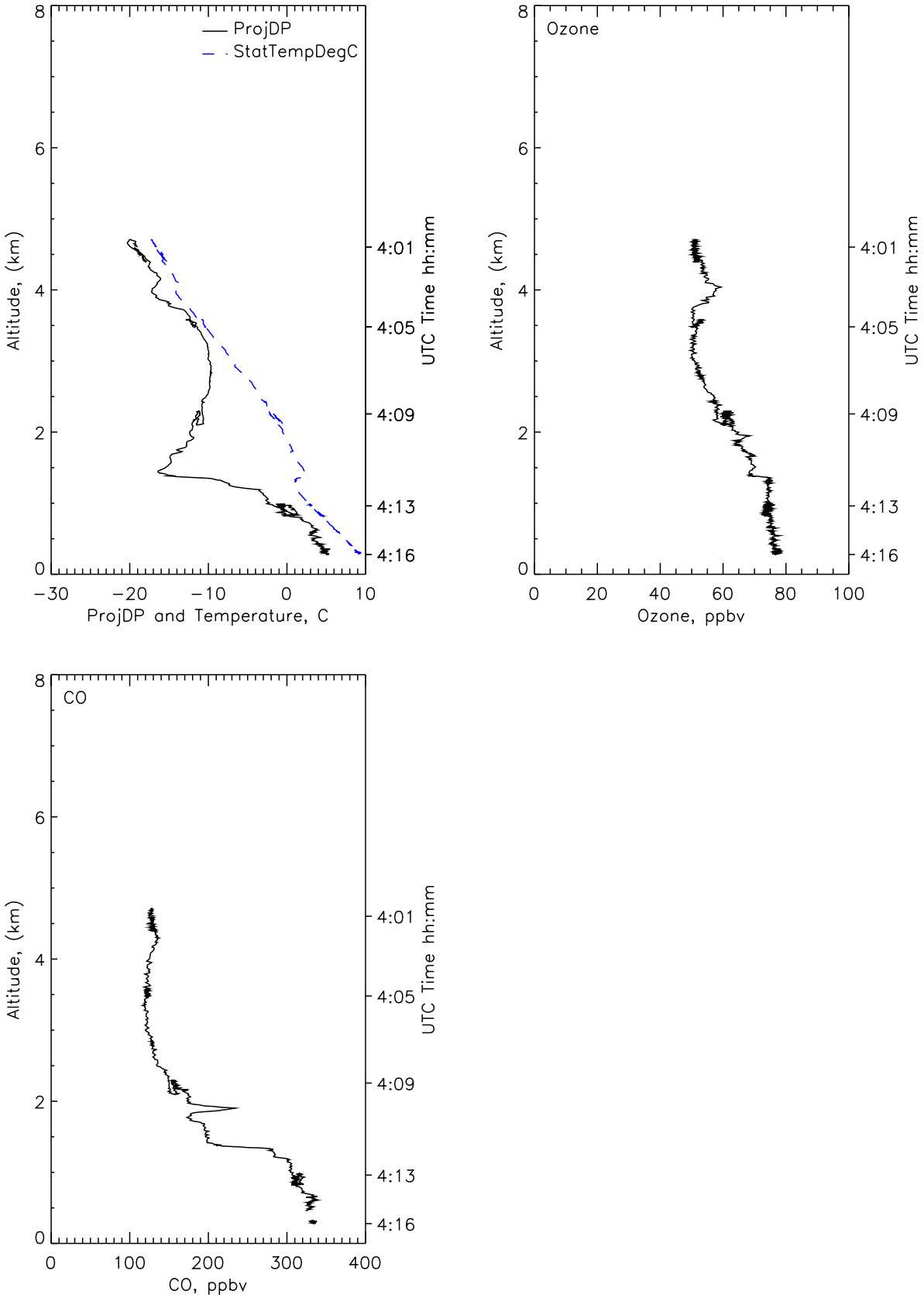
Profile # 2 TRACE-P P3-B Flight 19



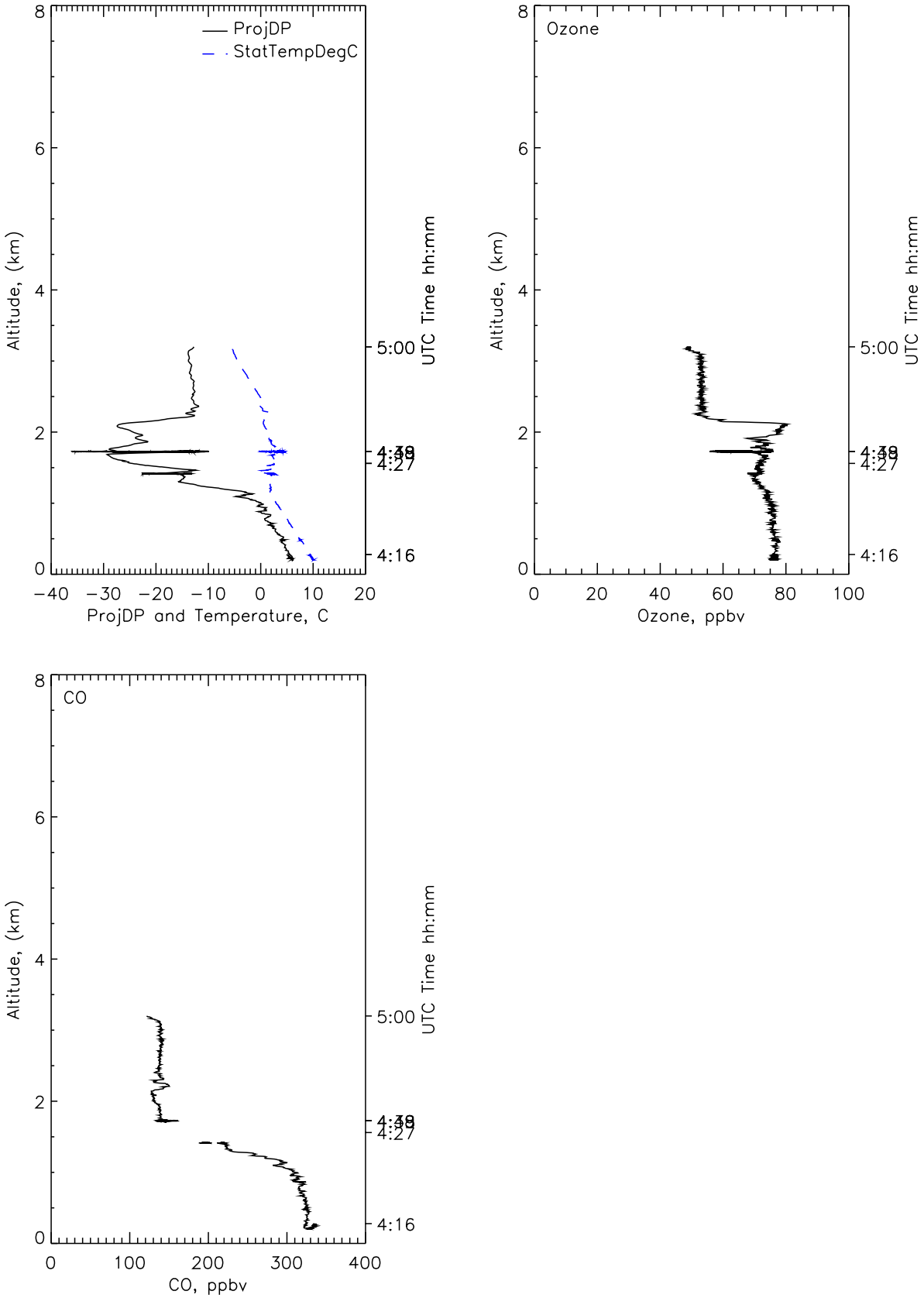
Profile # 3 TRACE-P P3-B Flight 19



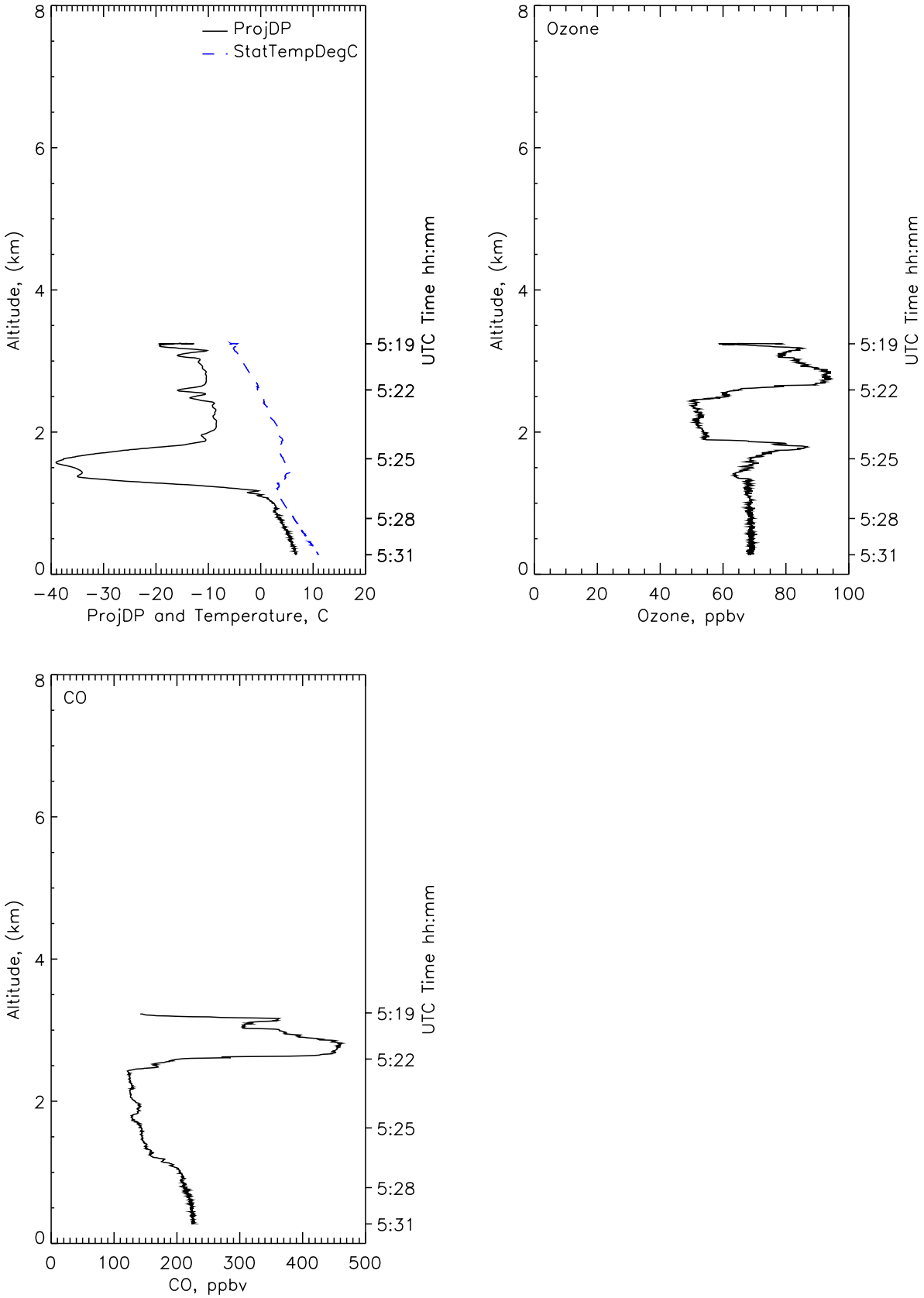
Profile # 4 TRACE-P P3-B Flight 19



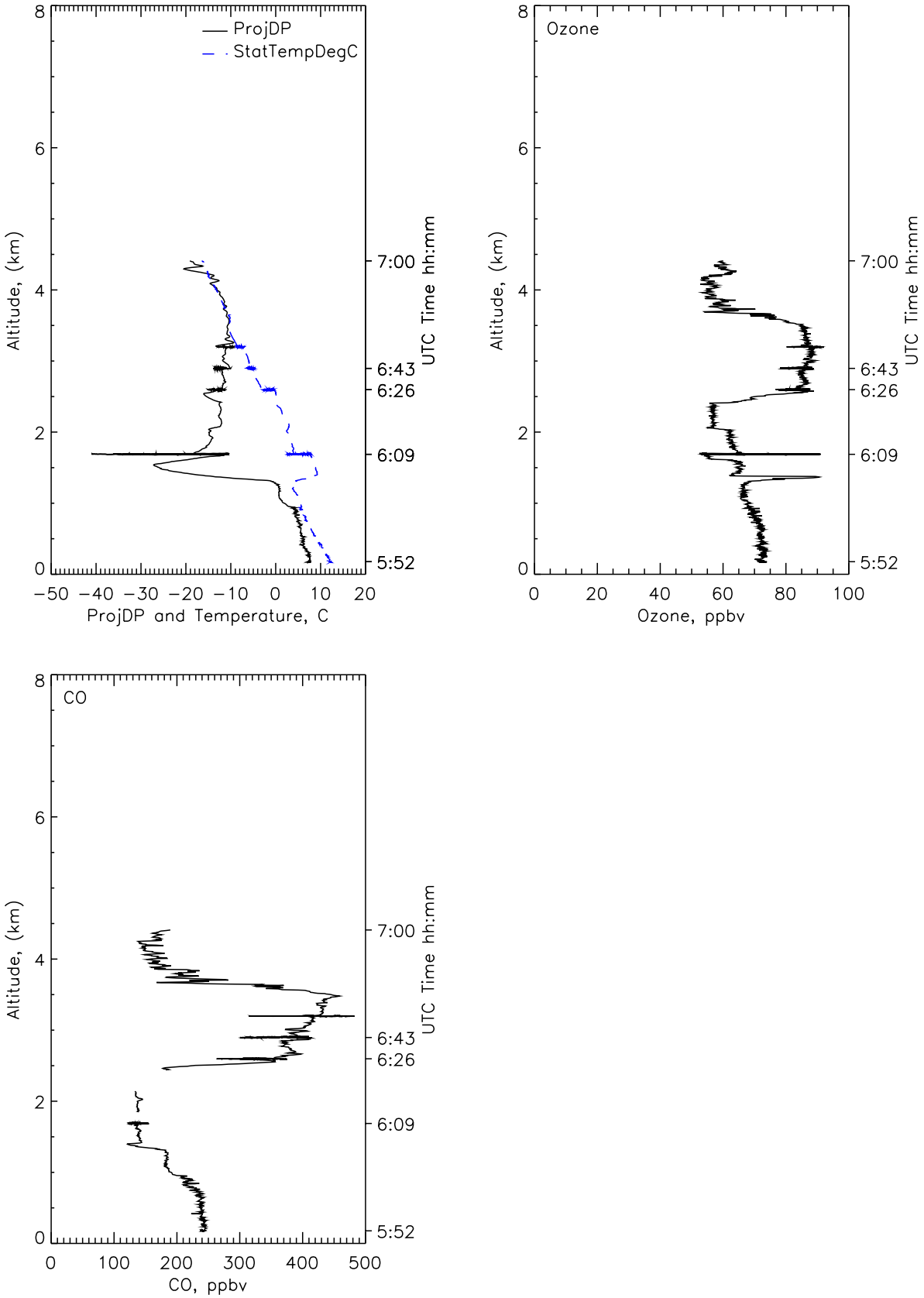
Profile # 5 TRACE-P P3-B Flight 19



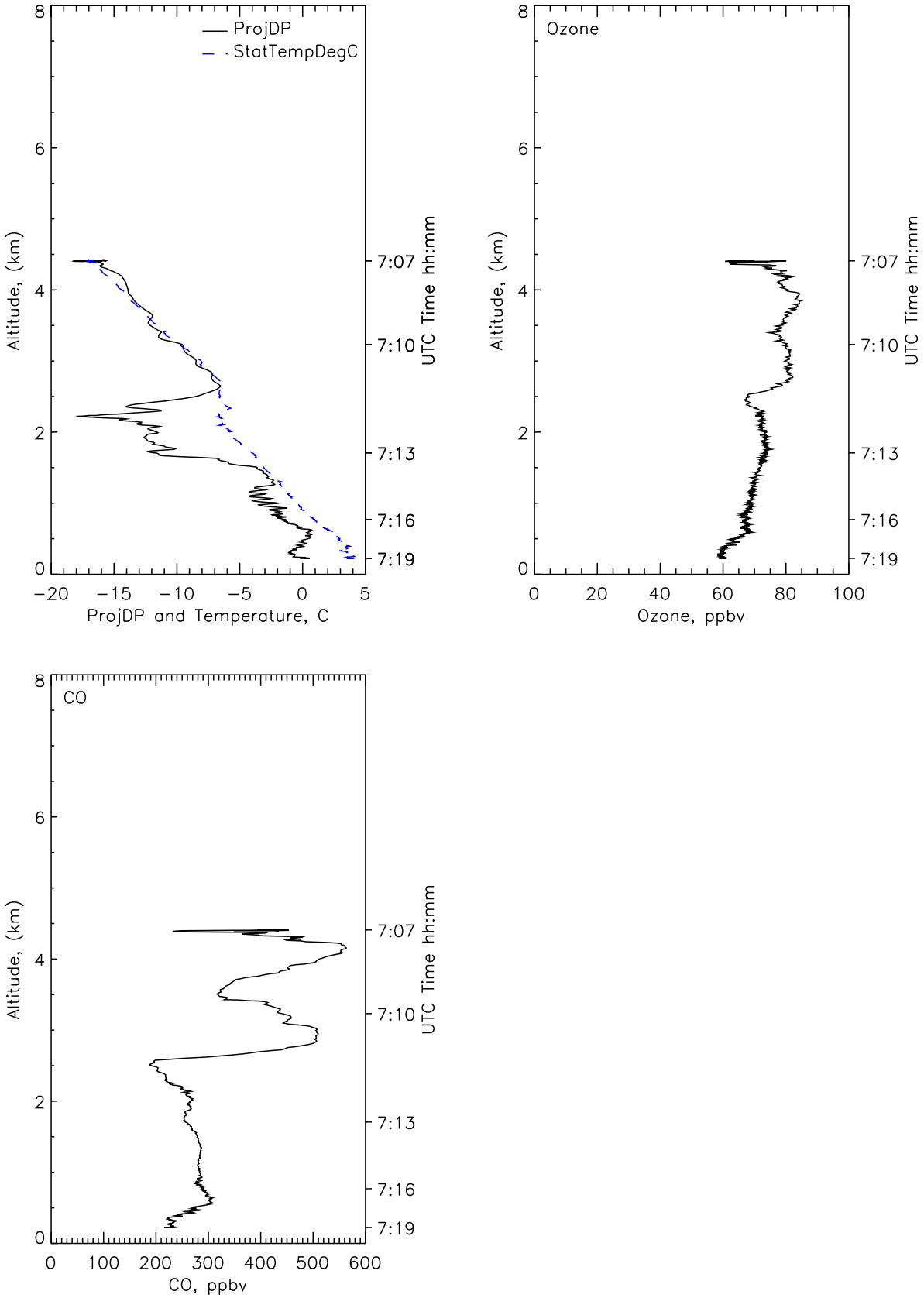
Profile # 6 TRACE-P P3-B Flight 19



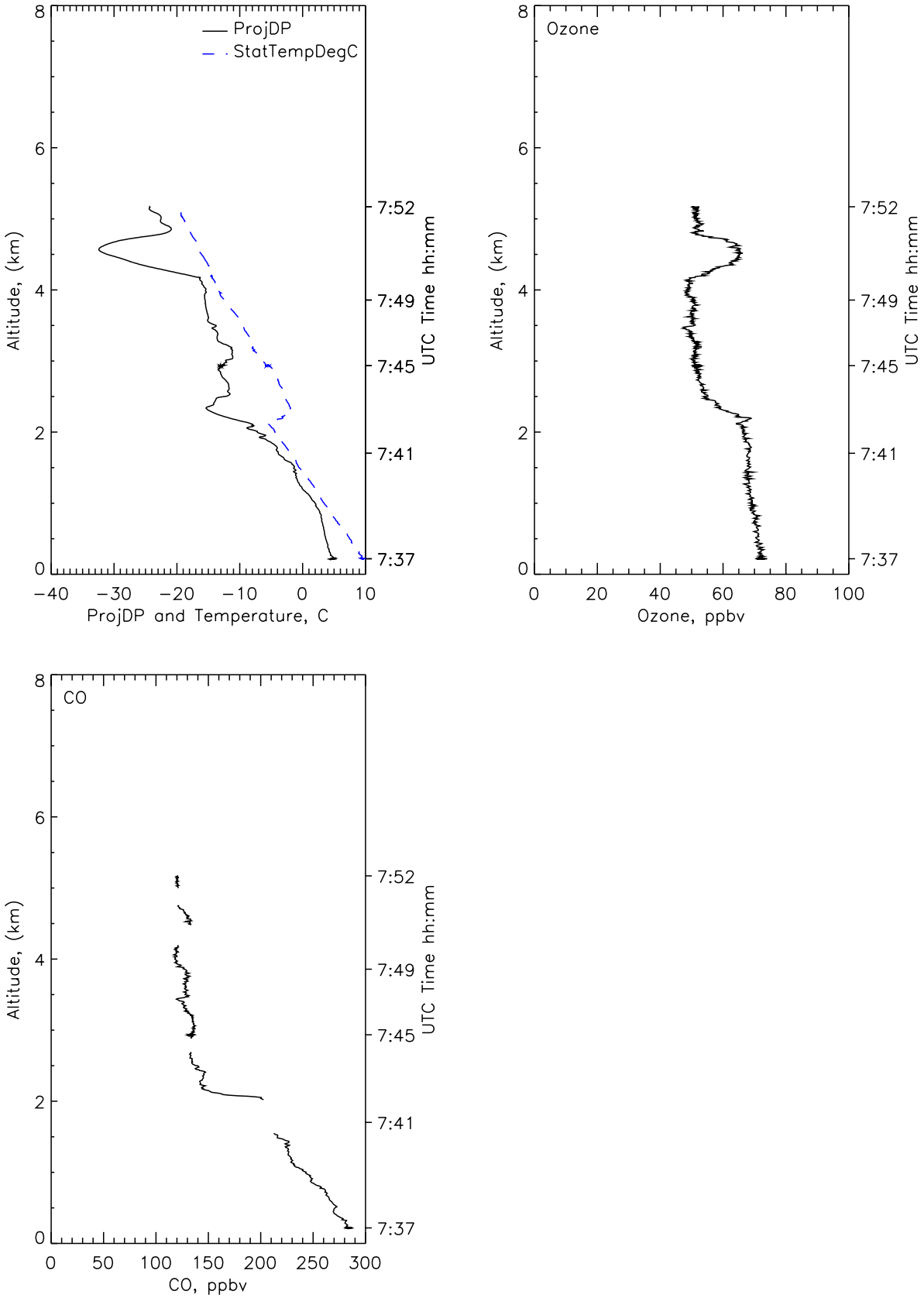
Profile # 7 TRACE-P P3-B Flight 19



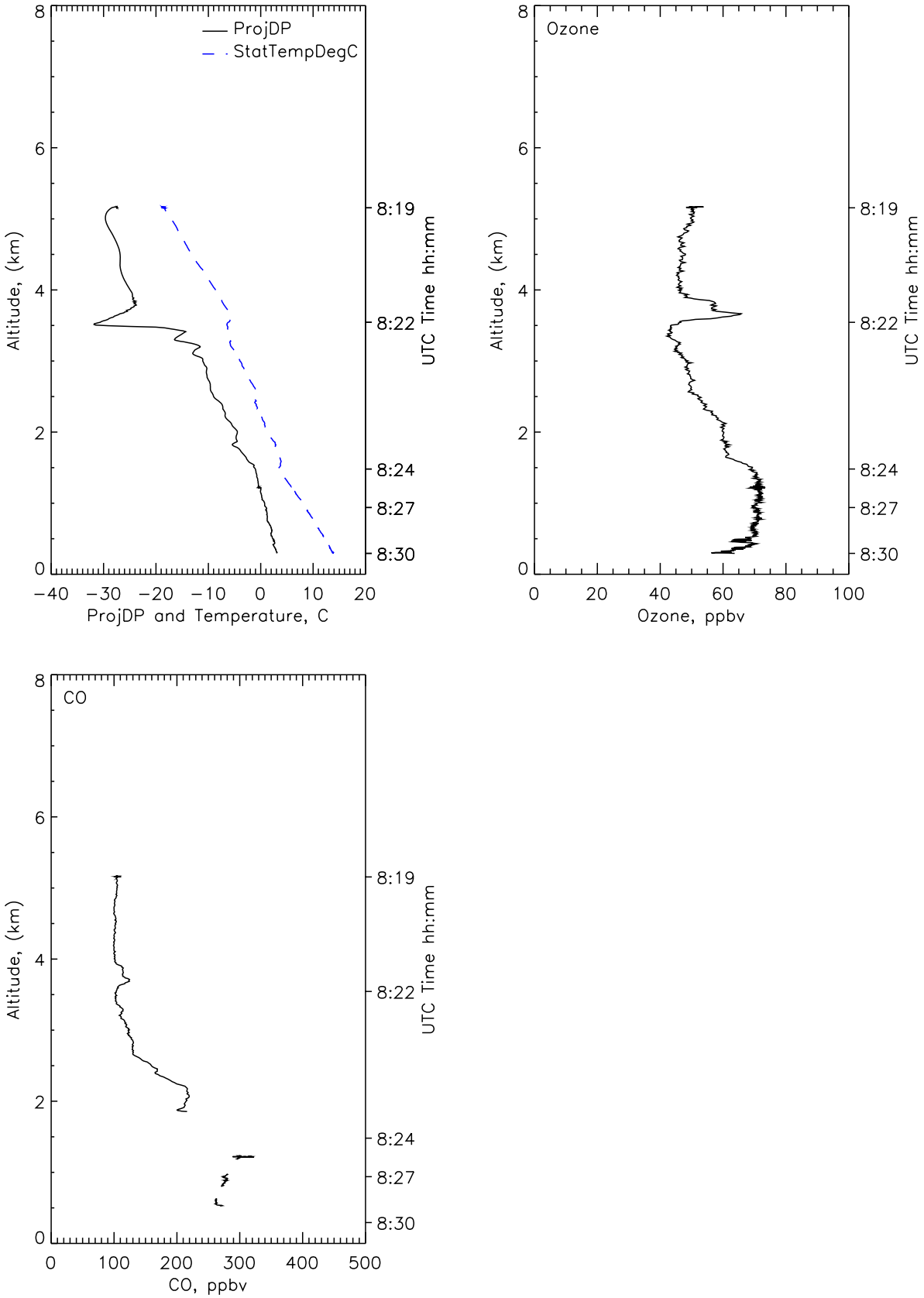
Profile # 8 TRACE-P P3-B Flight 19



Profile # 9 TRACE-P P3-B Flight 19



Profile #10 TRACE-P P3-B Flight 19



CHEMICAL and METEOROLOGICAL DATA

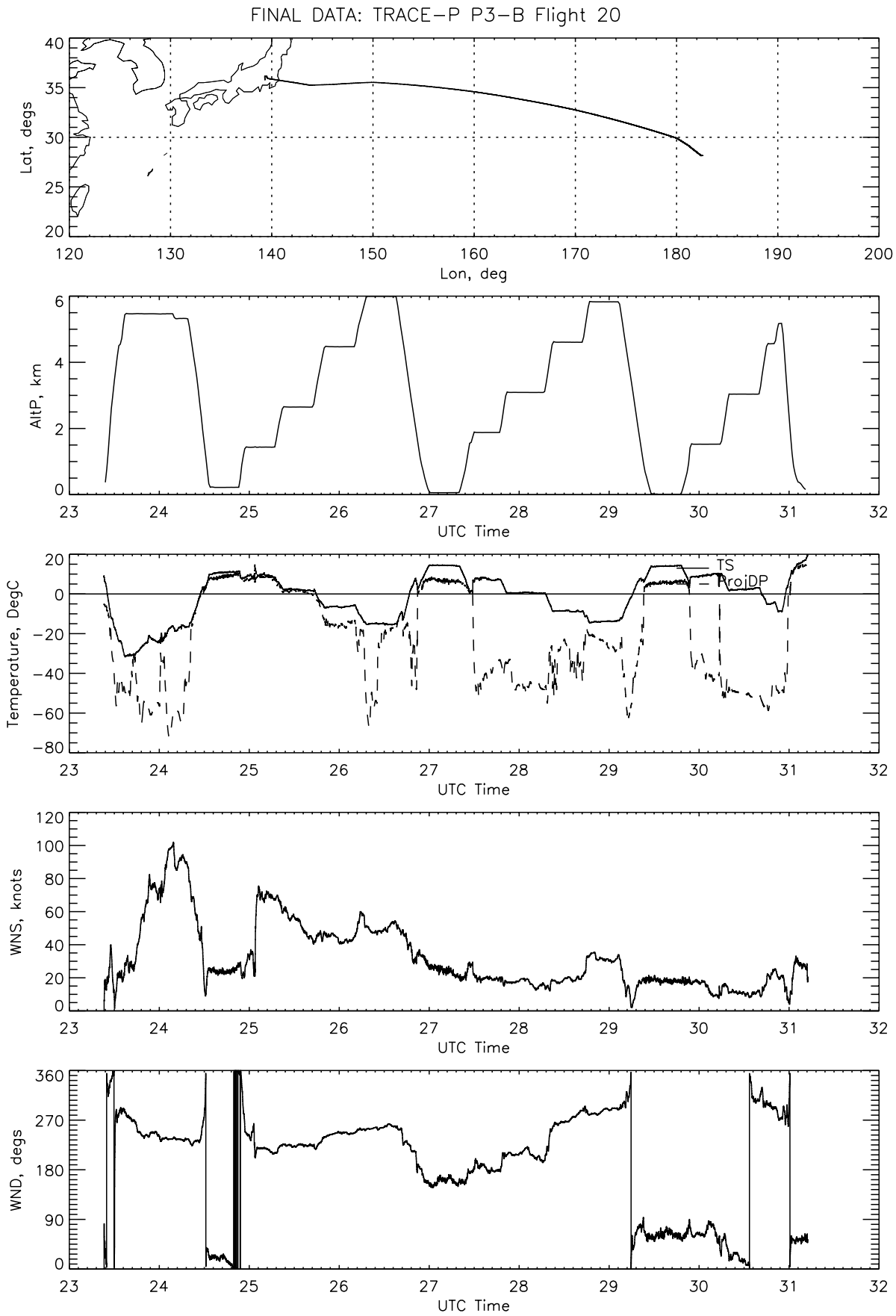
TRACE-P

Flight 20P

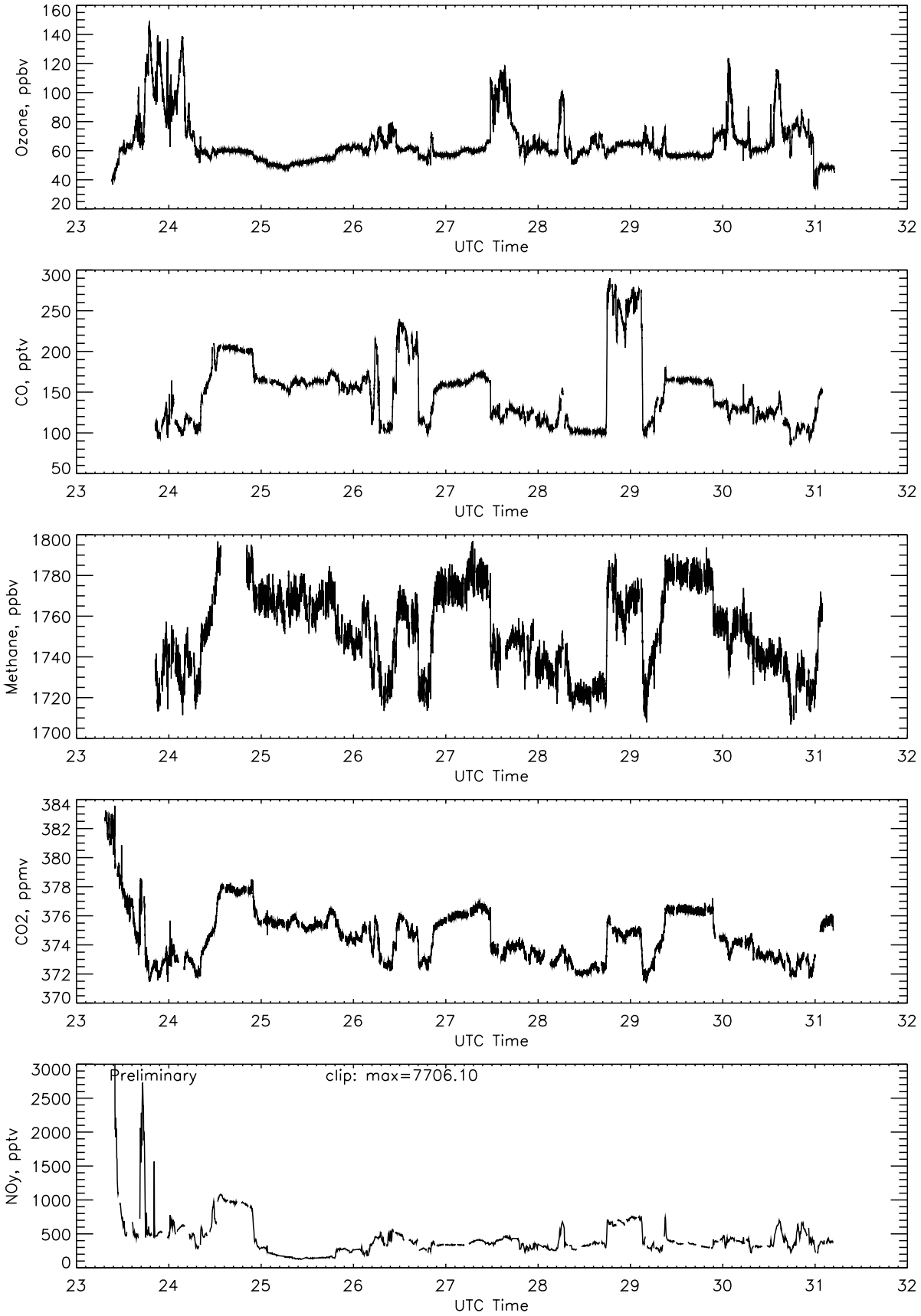
Transit: Yokota AFB, Japan to Midway Island

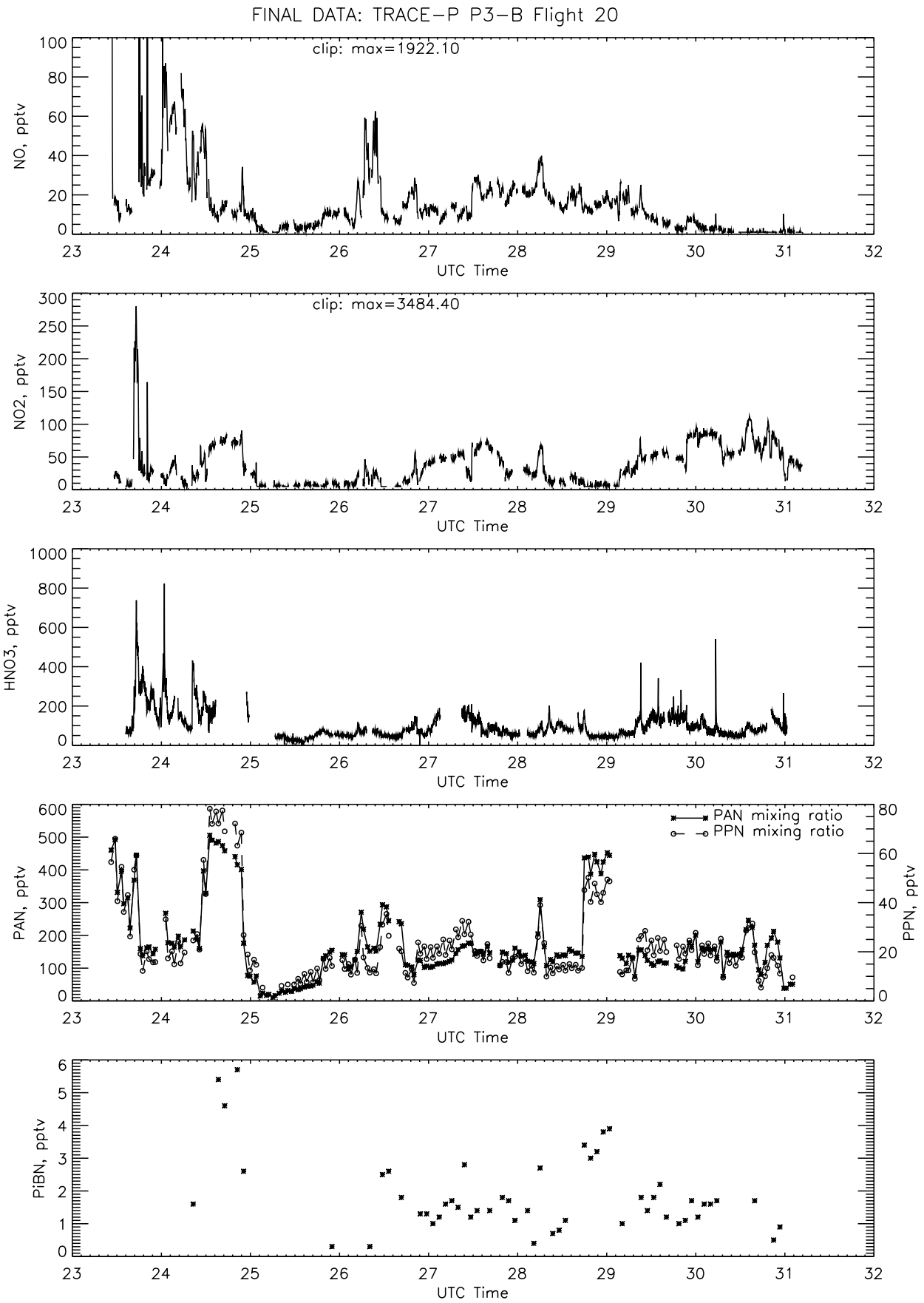
High Altitude Asian Outflow

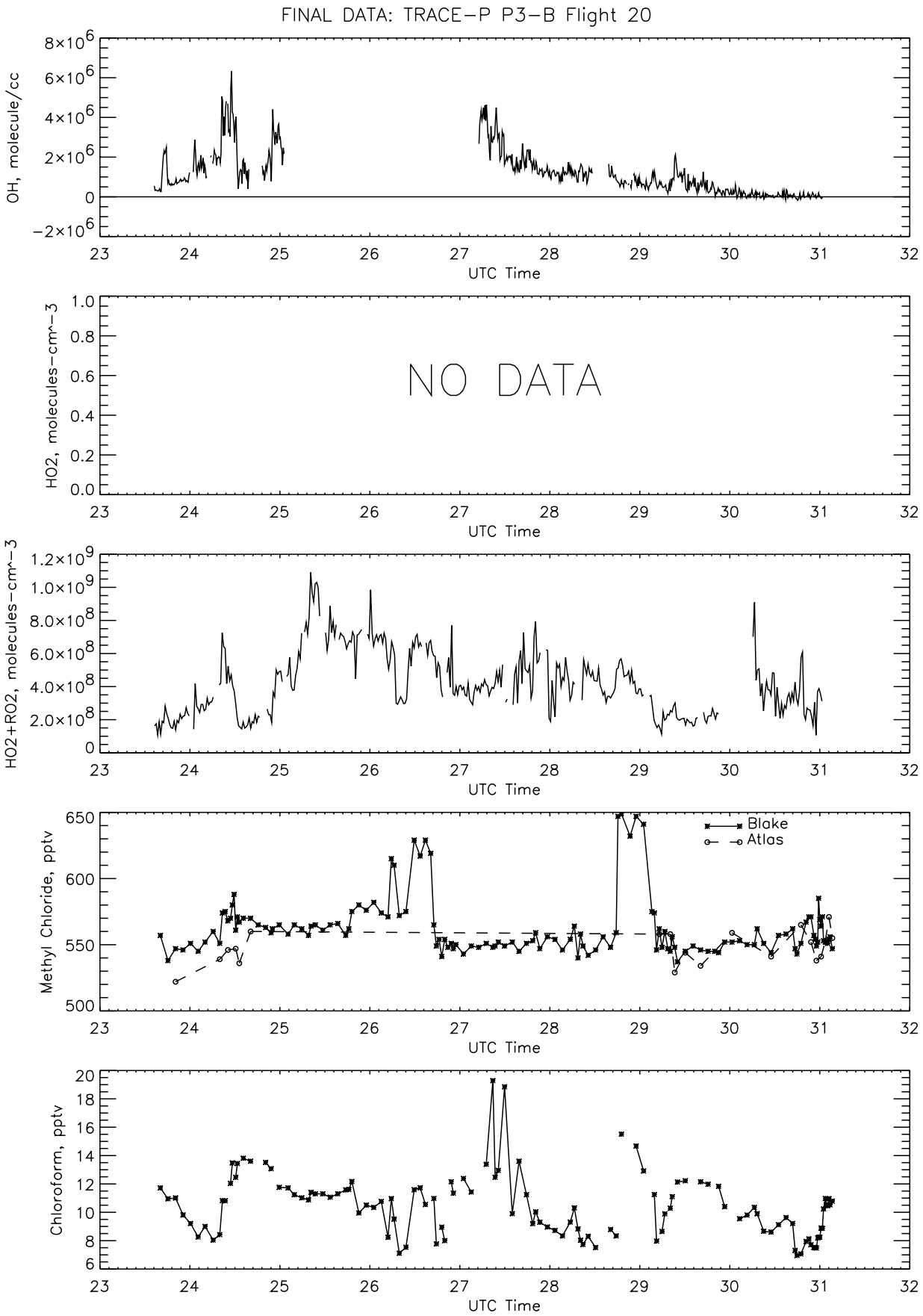
April 3, 2001

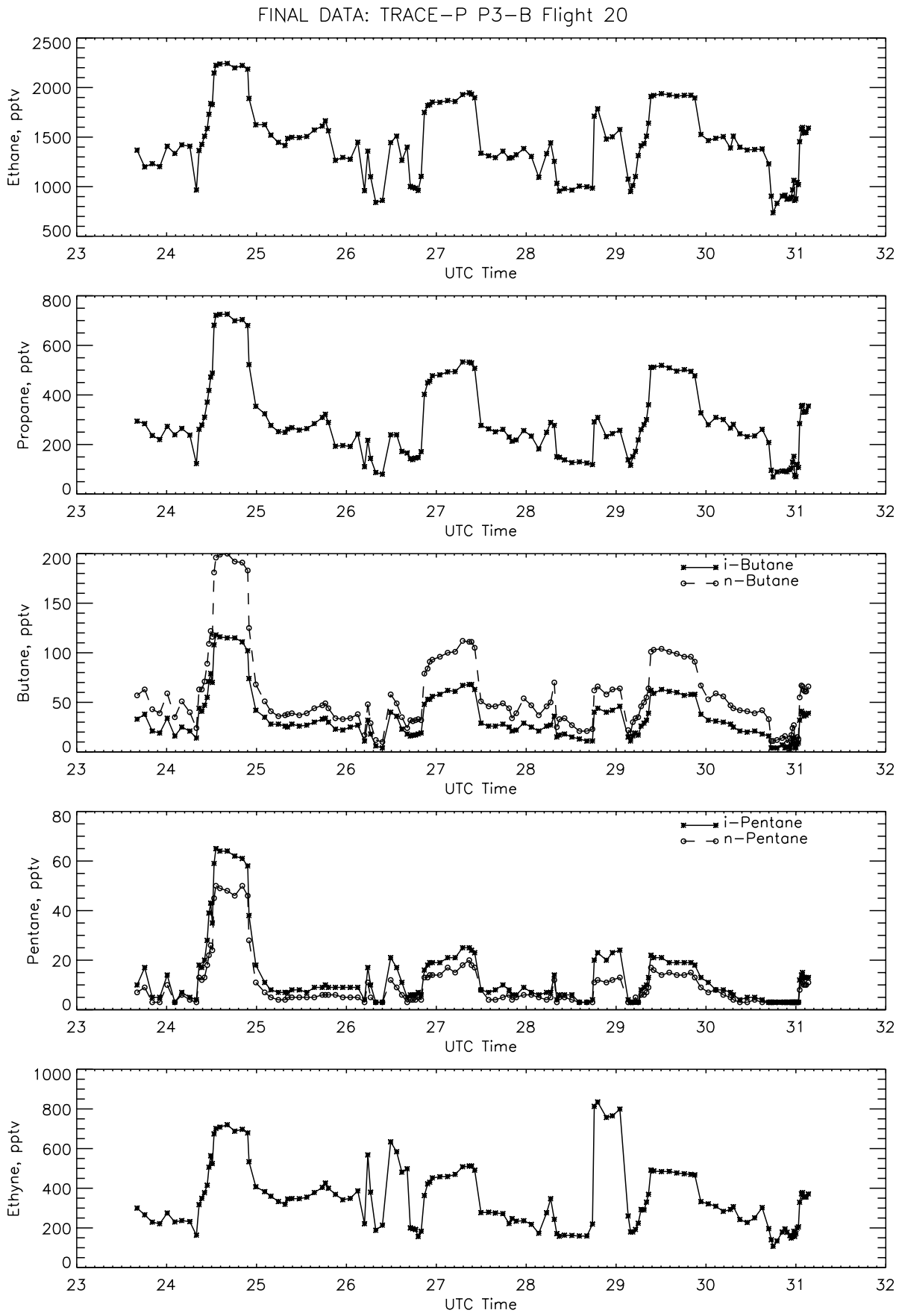

FINAL DATA: TRACE-P P3-B Flight 20
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
TprojDP
WNS, knots
WND, degs

FINAL DATA: TRACE-P P3-B Flight 20

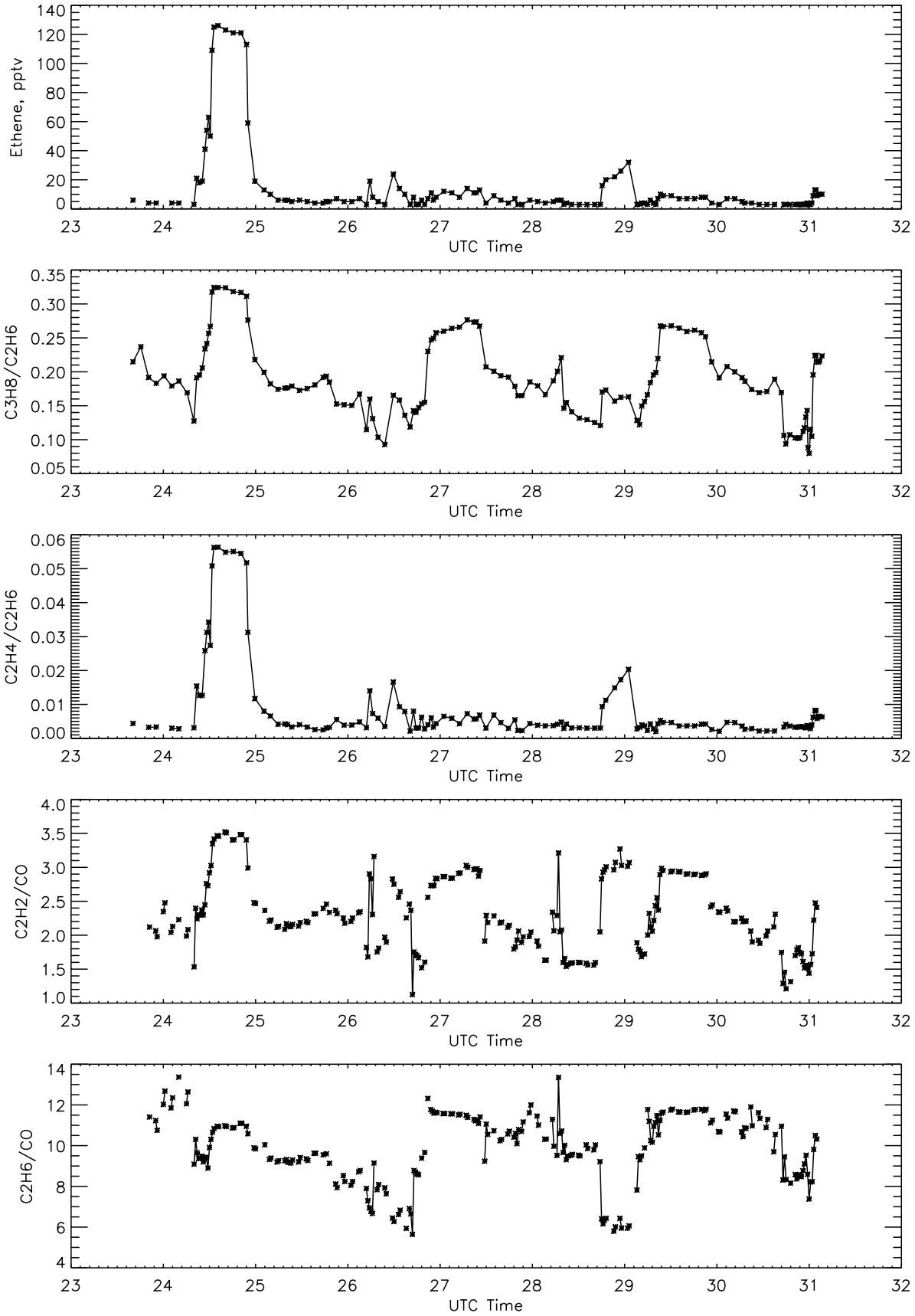



FINAL DATA: TRACE-P P3-B Flight 20
clip: max=1922.10
NO, pptv
UTC Time
clip: max=3484.40
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time

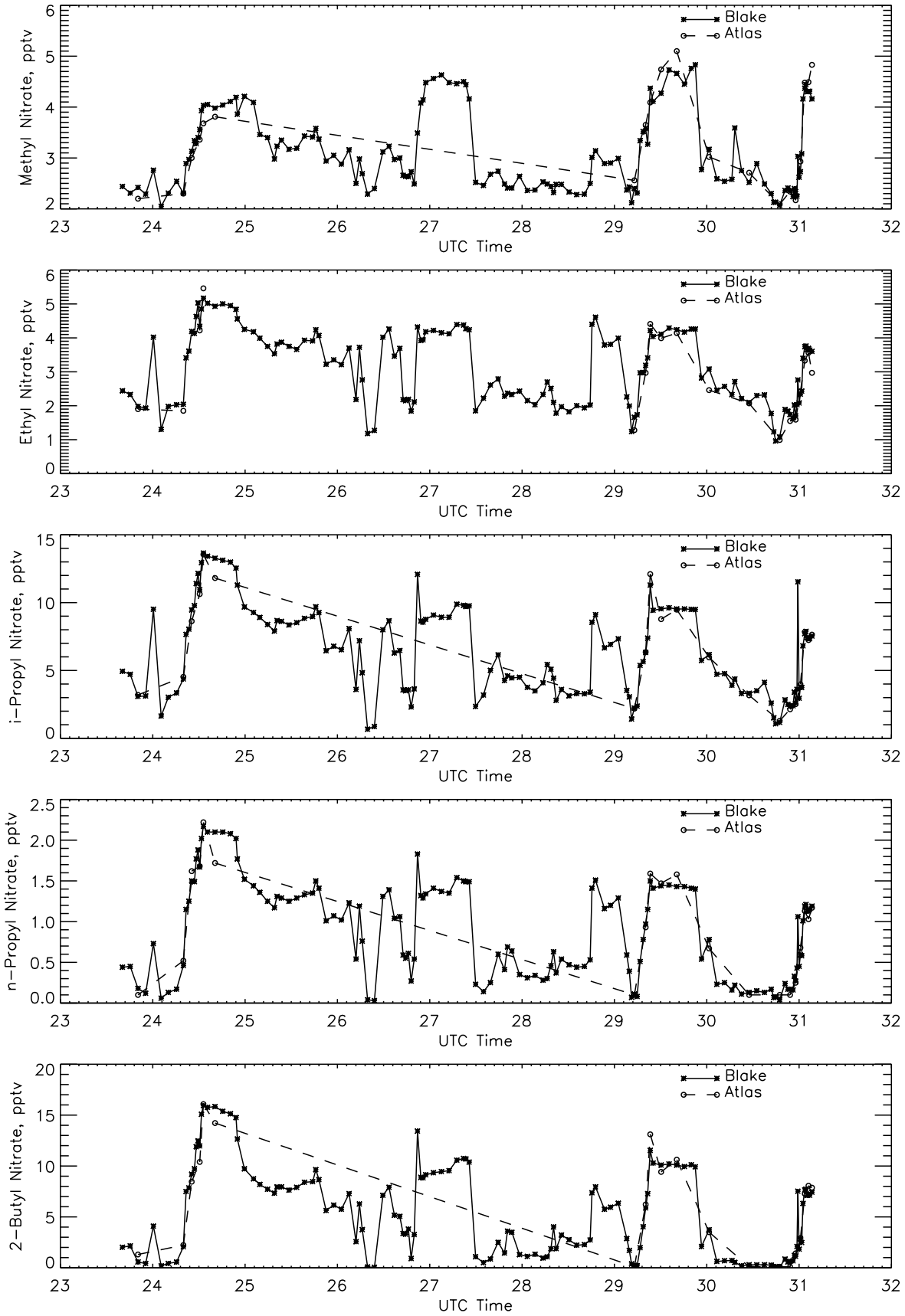

FINAL DATA: TRACE-P P3-B Flight 20
OH, molecule/cc
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

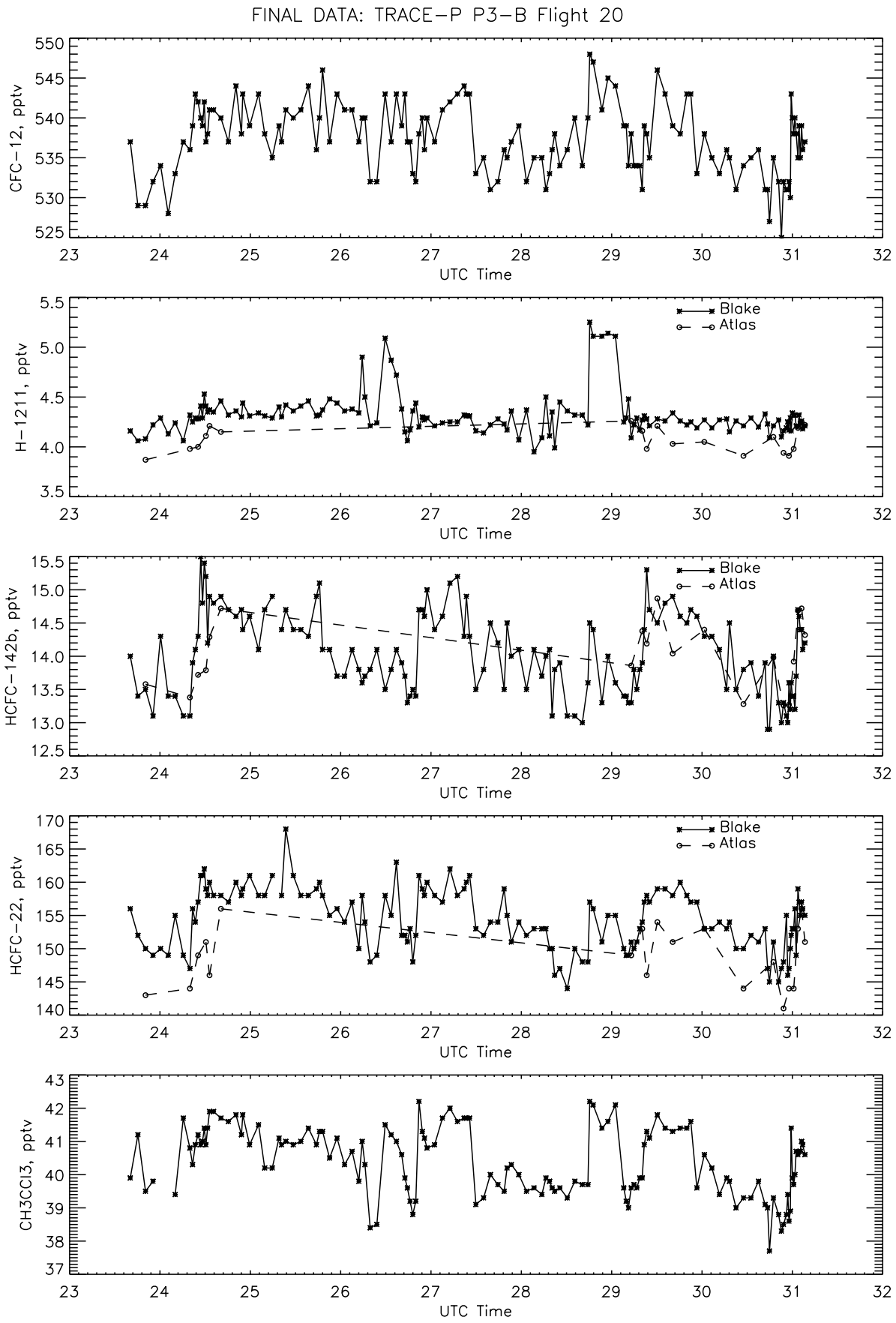

FINAL DATA: TRACE-P P3-B Flight 20
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

FINAL DATA: TRACE-P P3-B Flight 20

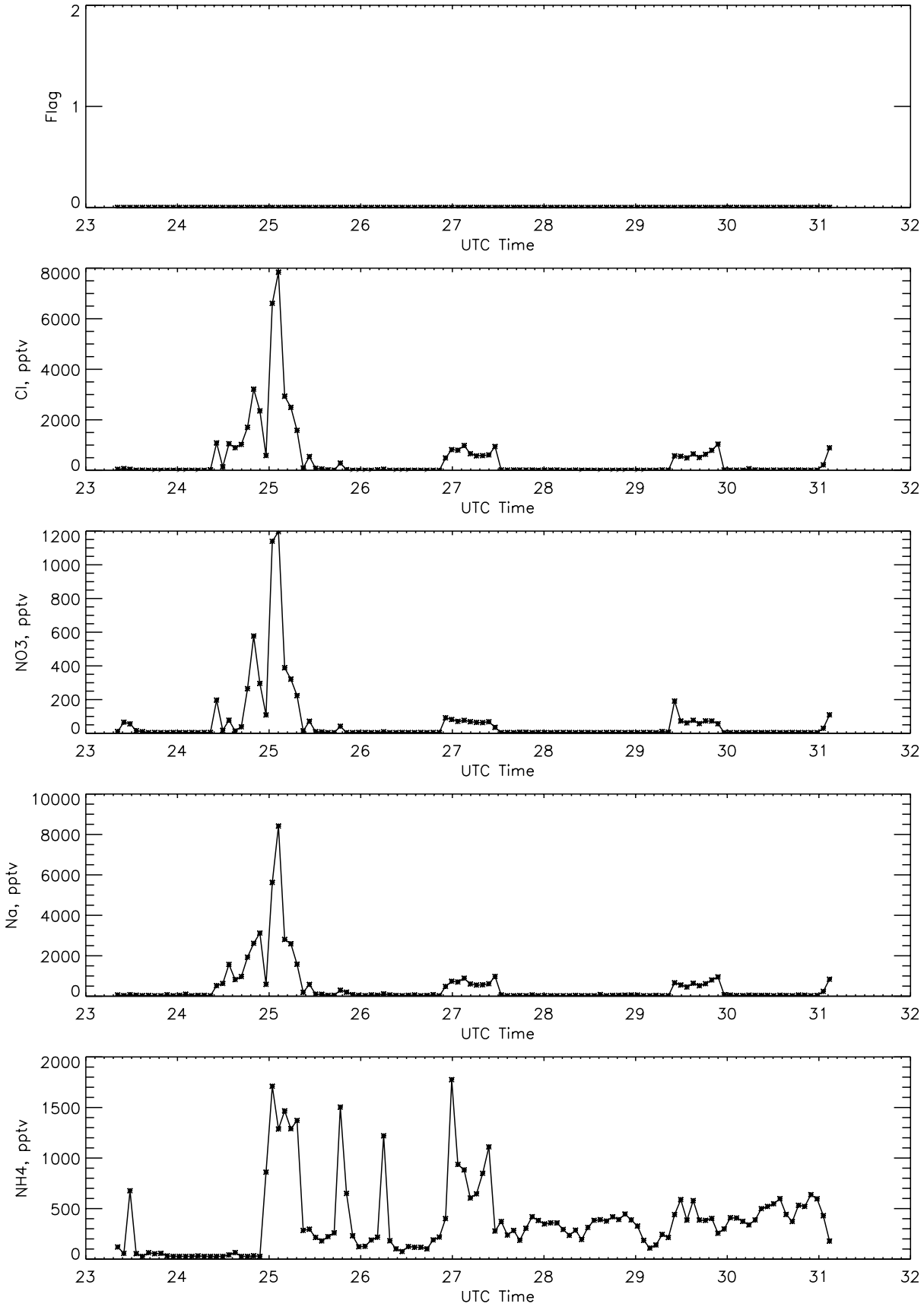


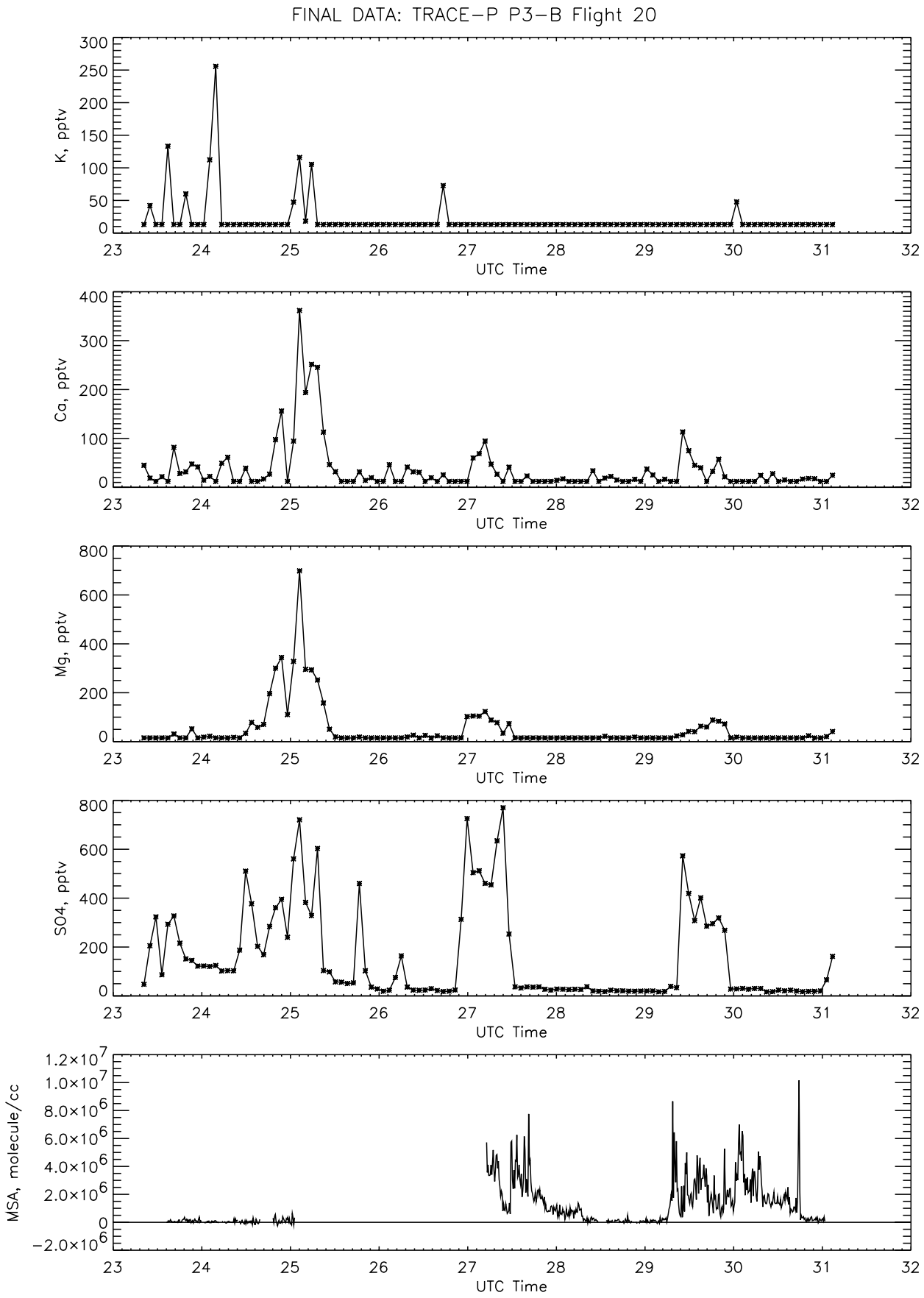
FINAL DATA: TRACE-P P3-B Flight 20

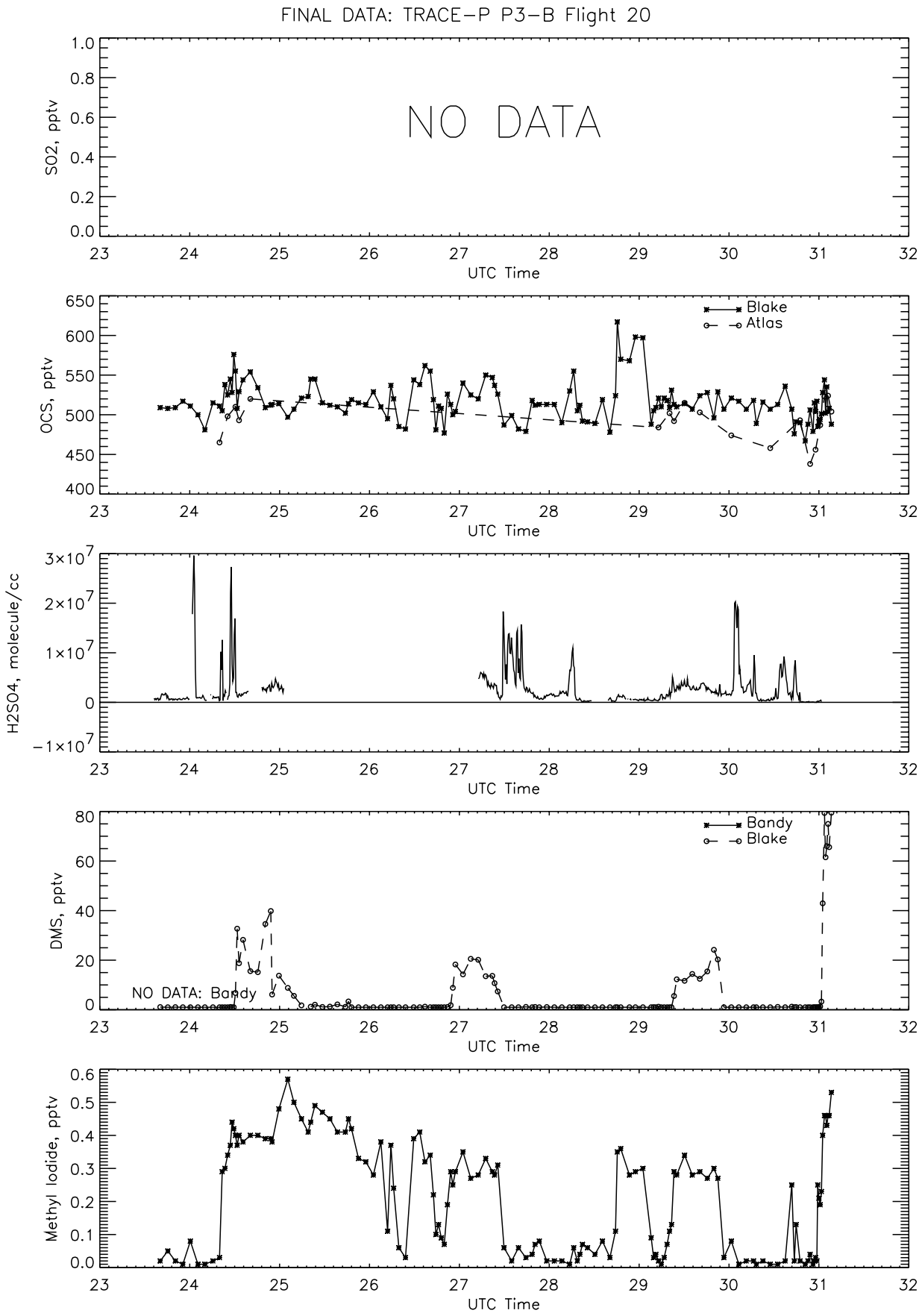


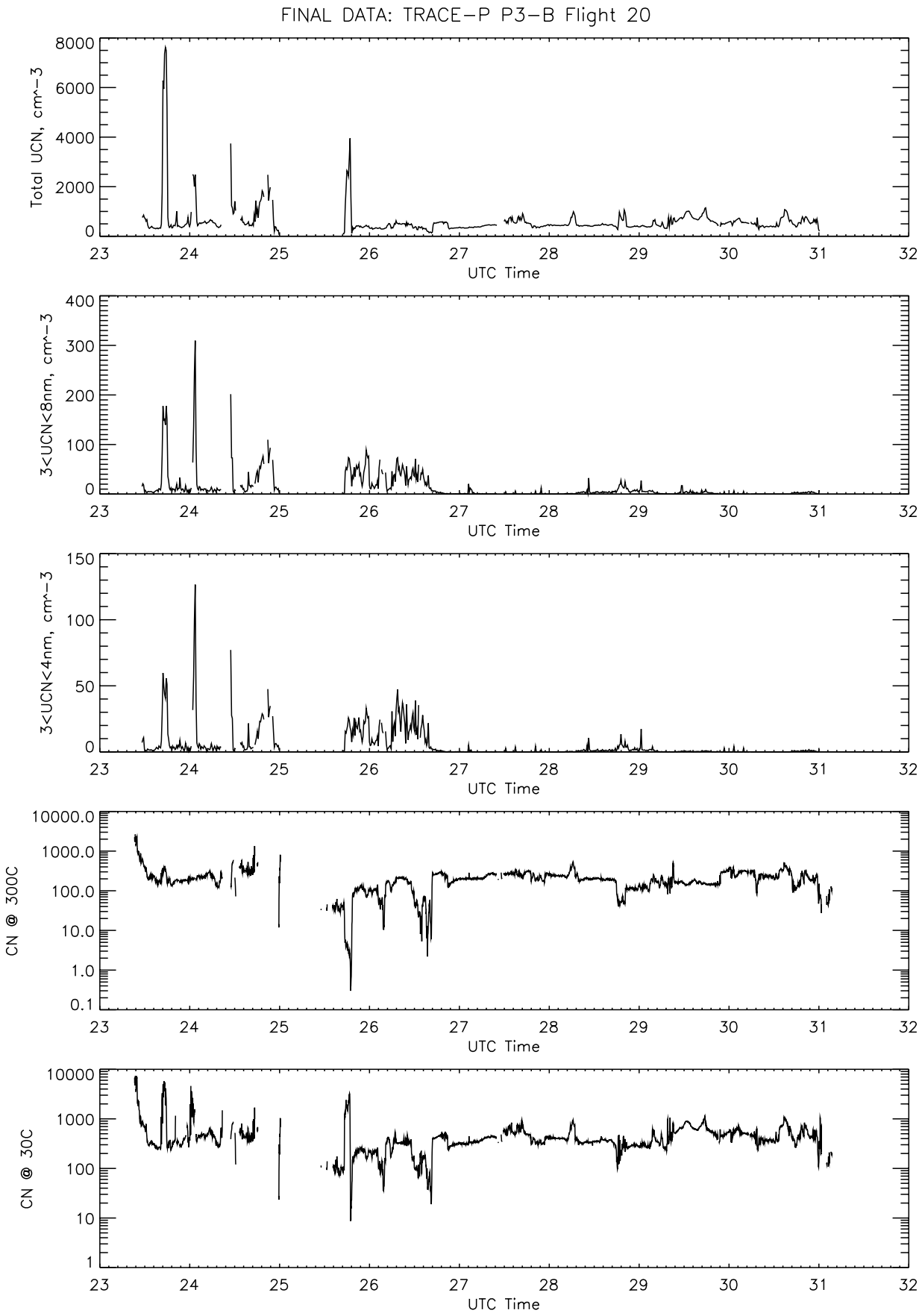

FINAL DATA: TRACE-P P3-B Flight 20
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

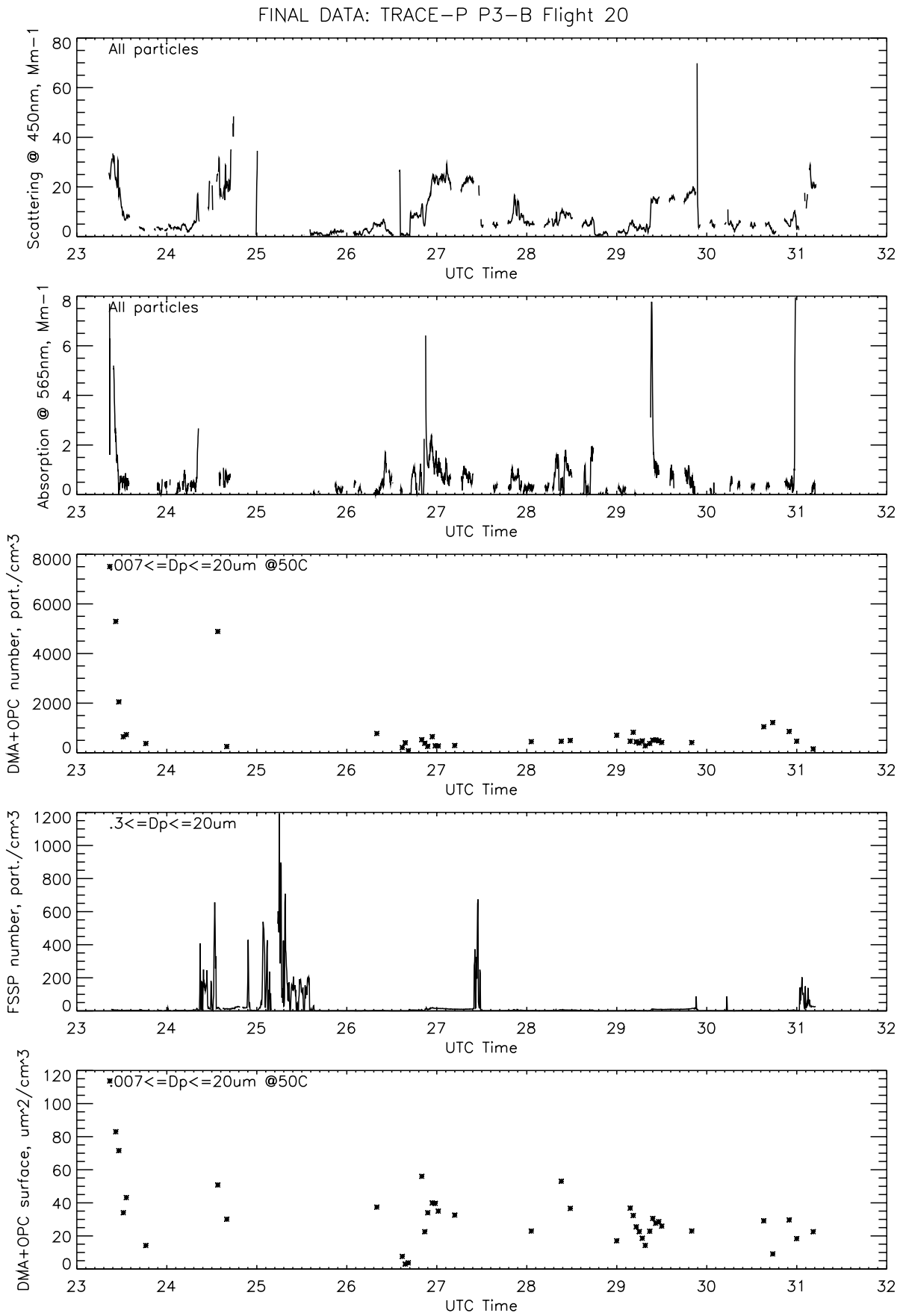
FINAL DATA: TRACE-P P3-B Flight 20

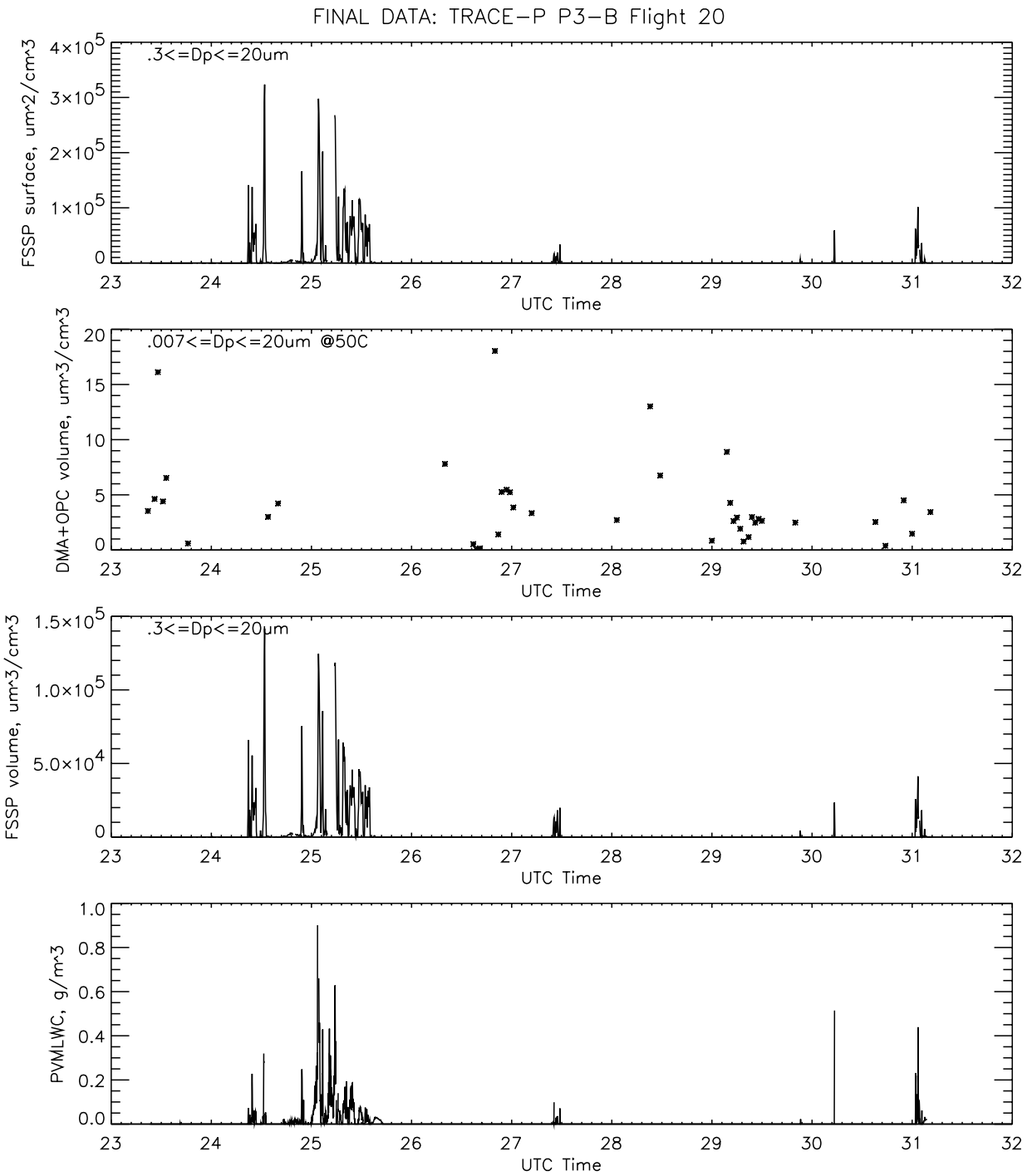



FINAL DATA: TRACE-P P3-B Flight 20
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time


FINAL DATA: TRACE-P P3-B Flight 20
NO DATA
SO2, pptv
OCS, pptv
Blake
Atlas
H2SO4, molecule/cc
DMS, pptv
Bandy
Blake
NO DATA: Bandy
Methyl Iodide, pptv
UTC Time

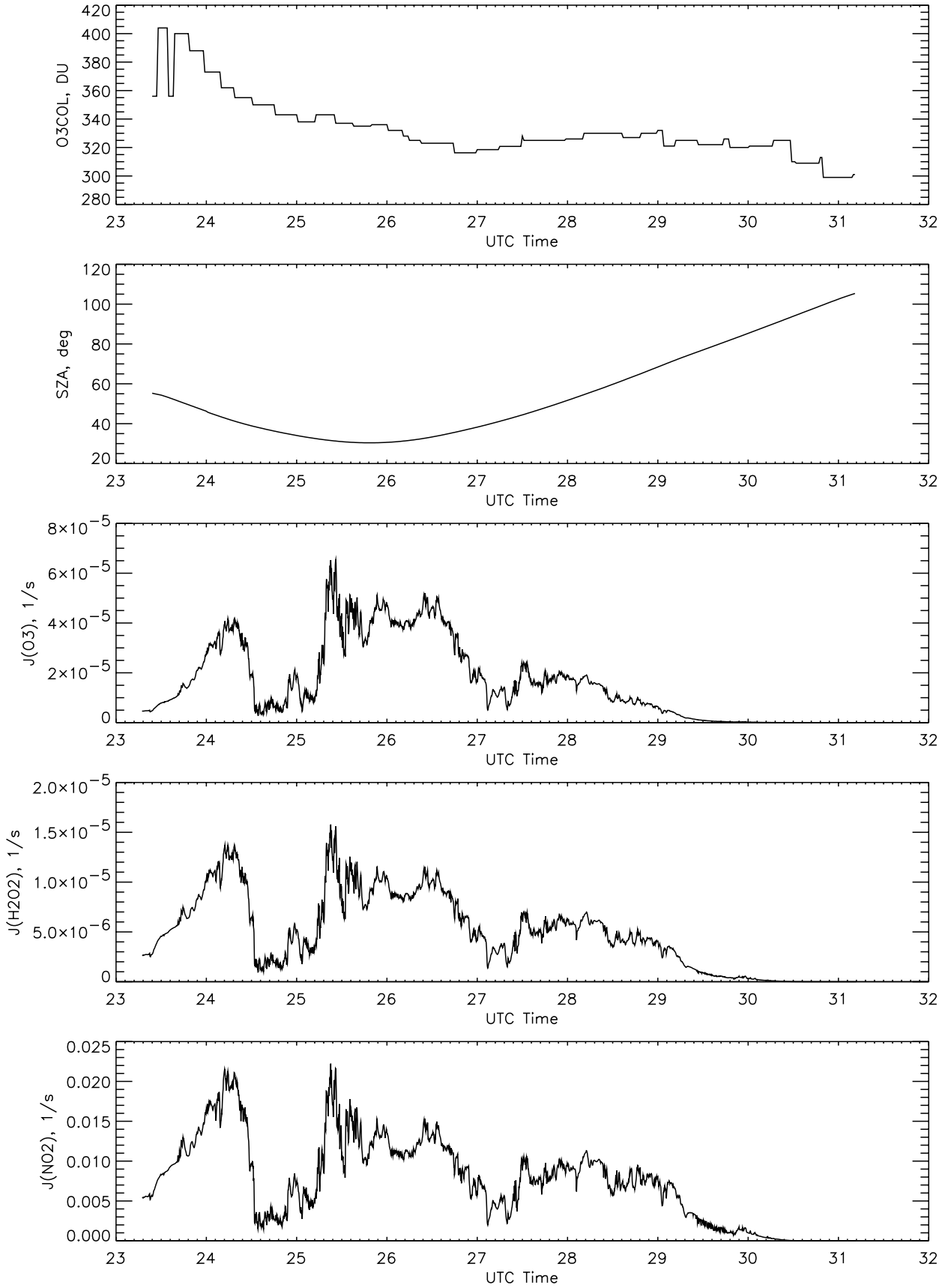

FINAL DATA: TRACE-P P3-B Flight 20
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

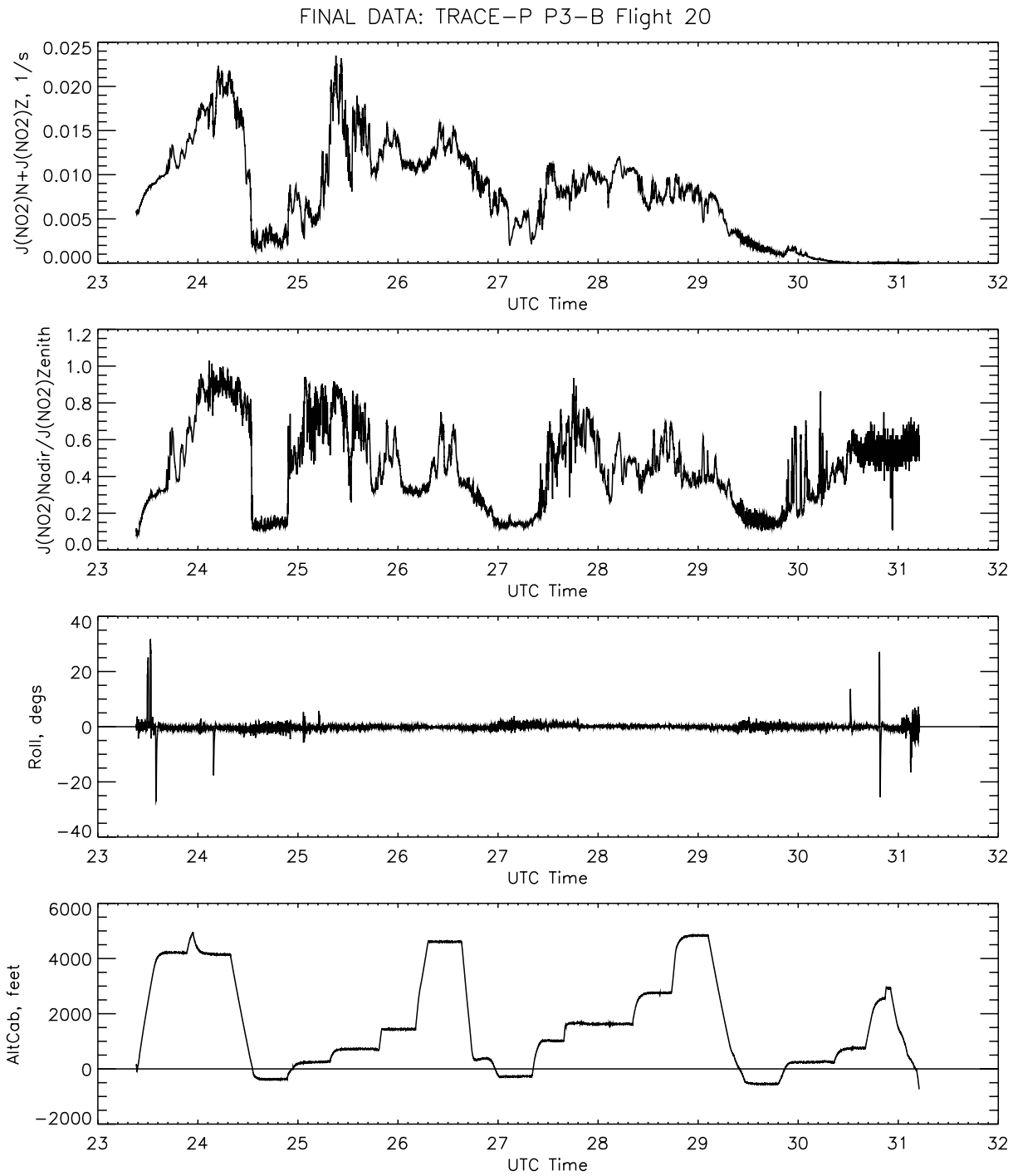

FINAL DATA: TRACE-P P3-B Flight 20
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
*007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
*007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

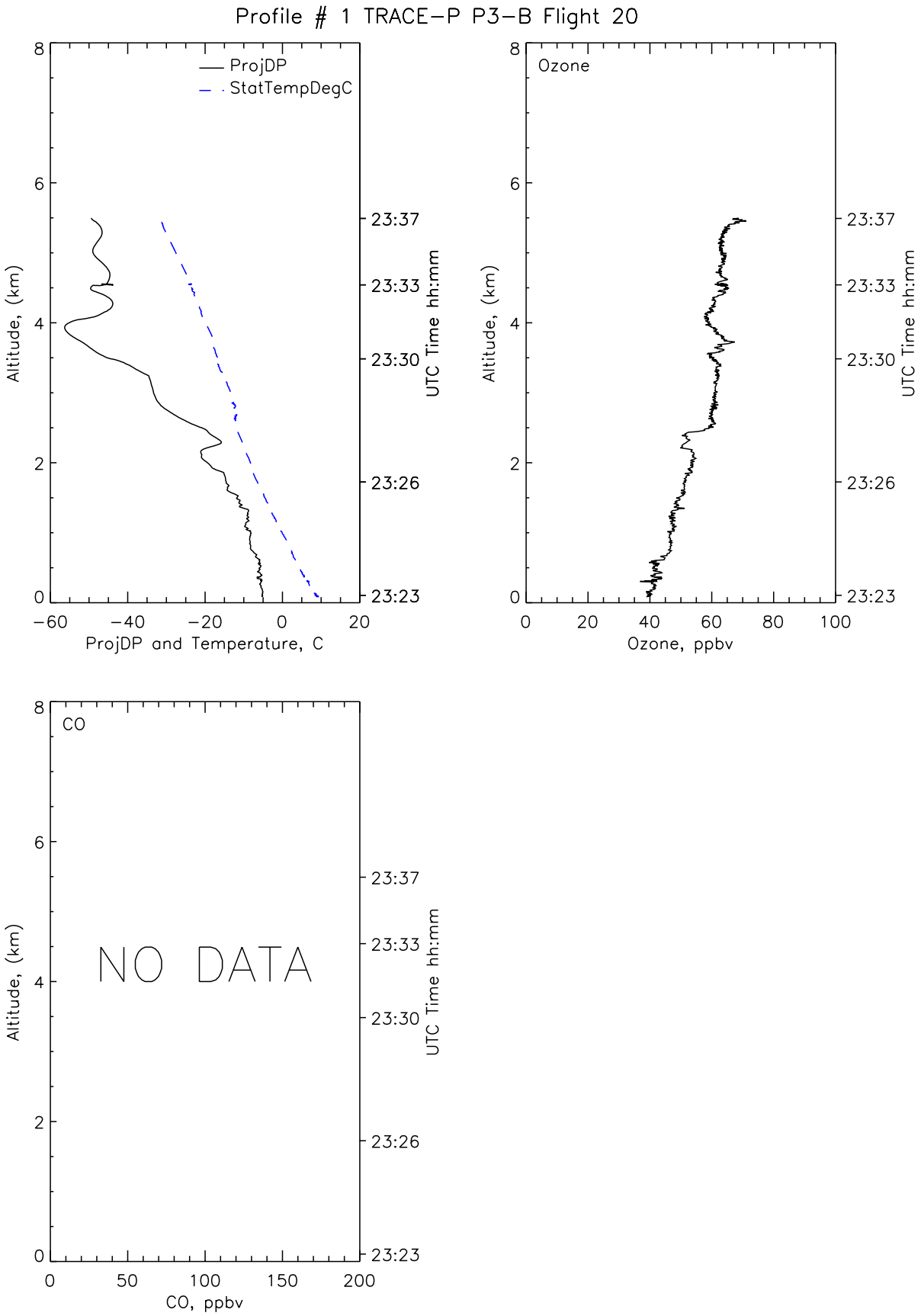

FINAL DATA: TRACE-P P3-B Flight 20
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

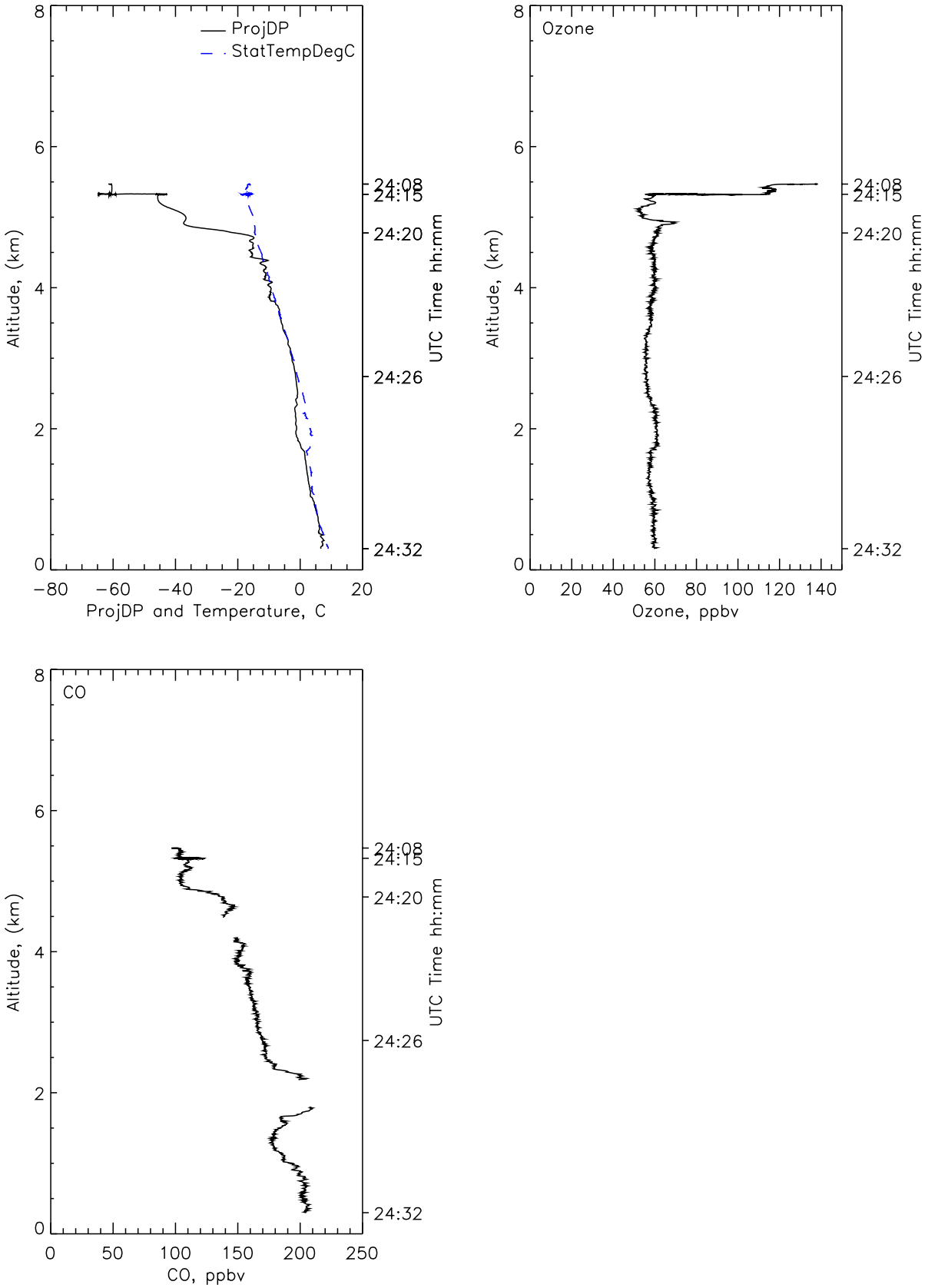
FINAL DATA: TRACE-P P3-B Flight 20



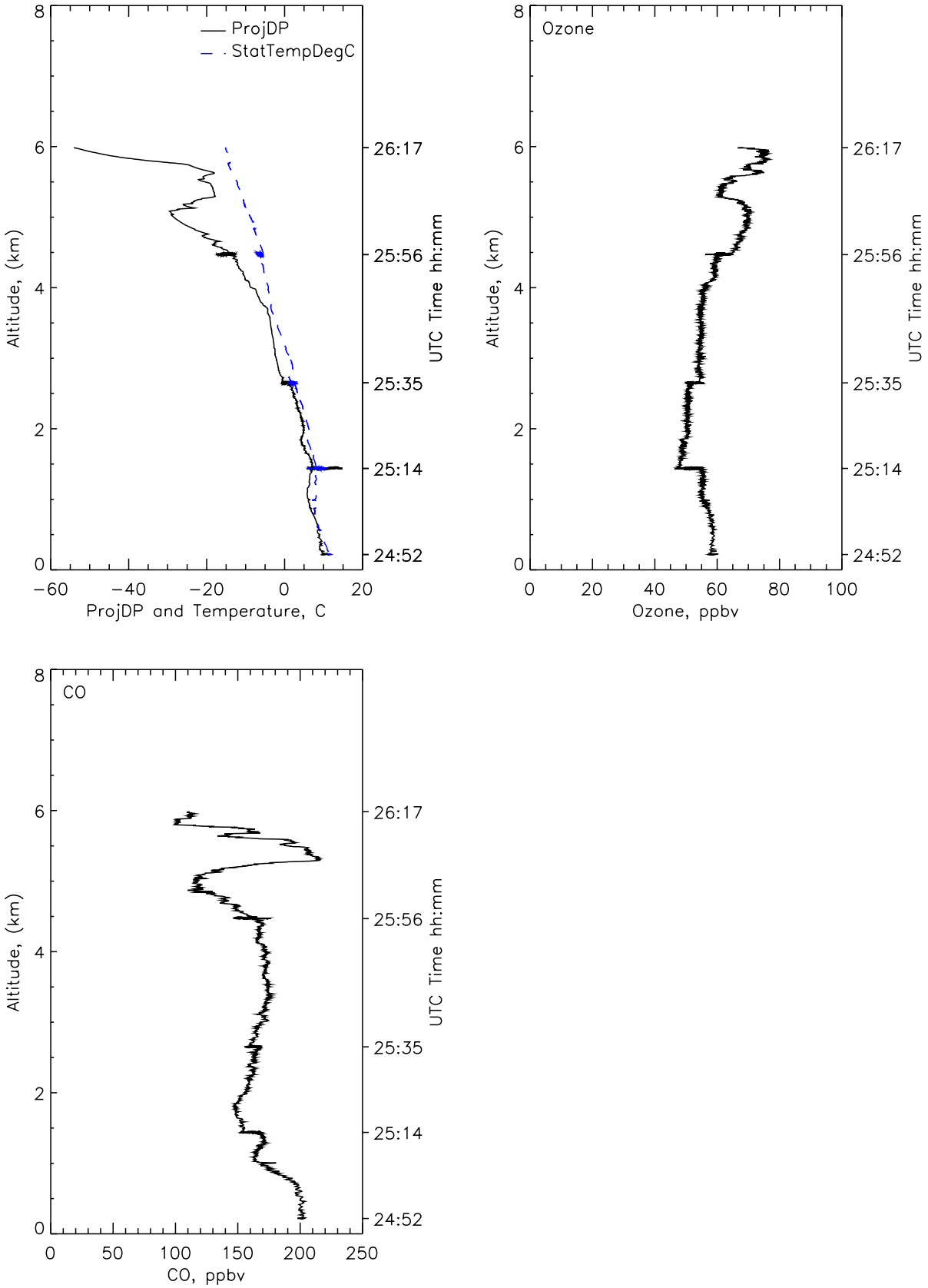

FINAL DATA: TRACE-P P3-B Flight 20
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
23
24
25
26
27
28
29
30
31
32
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
4000
2000
0
−2000
UTC Time

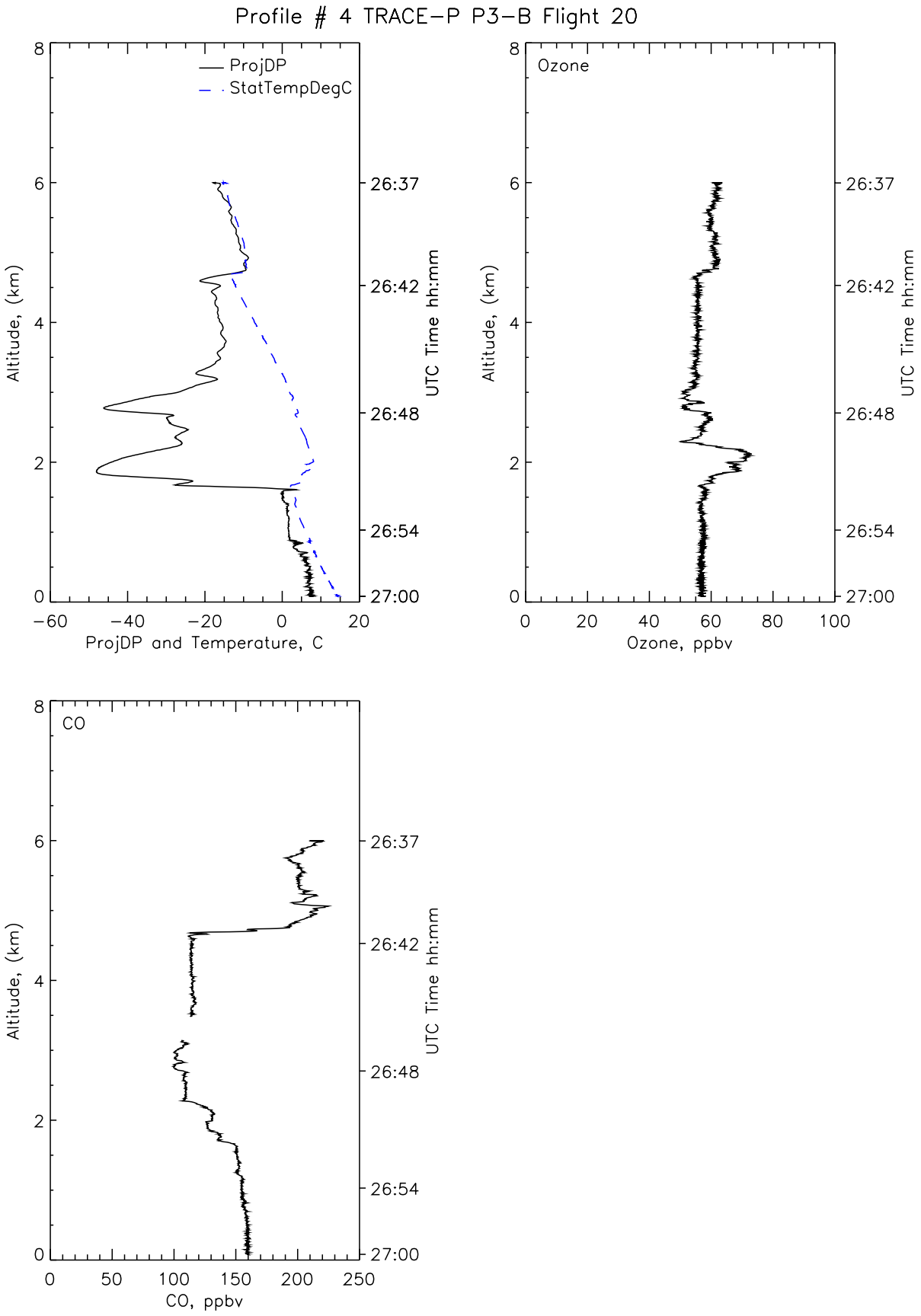

Profile # 1 TRACE-P P3-B Flight 20
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
NO DATA
CO, ppbv

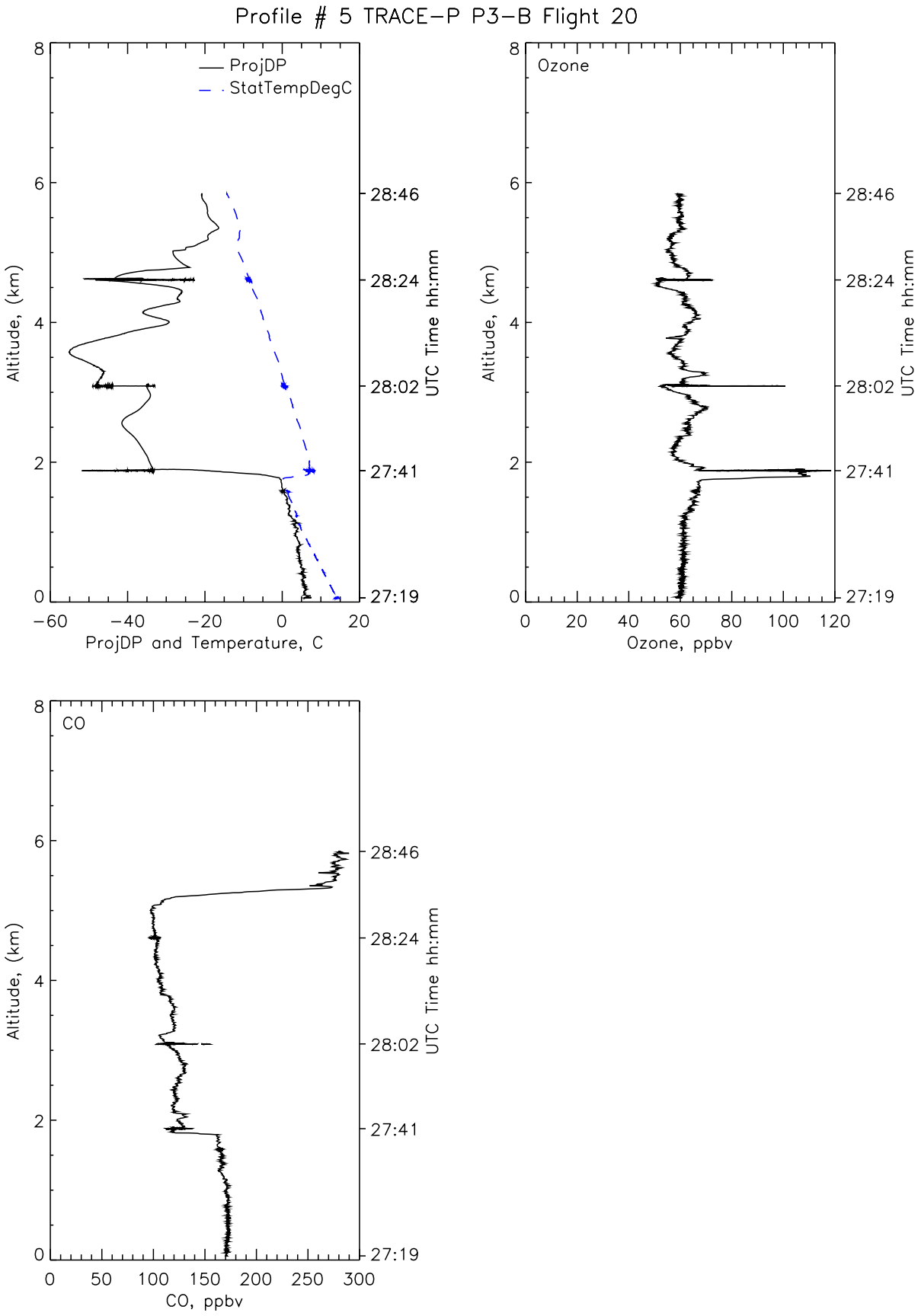
Profile # 2 TRACE-P P3-B Flight 20



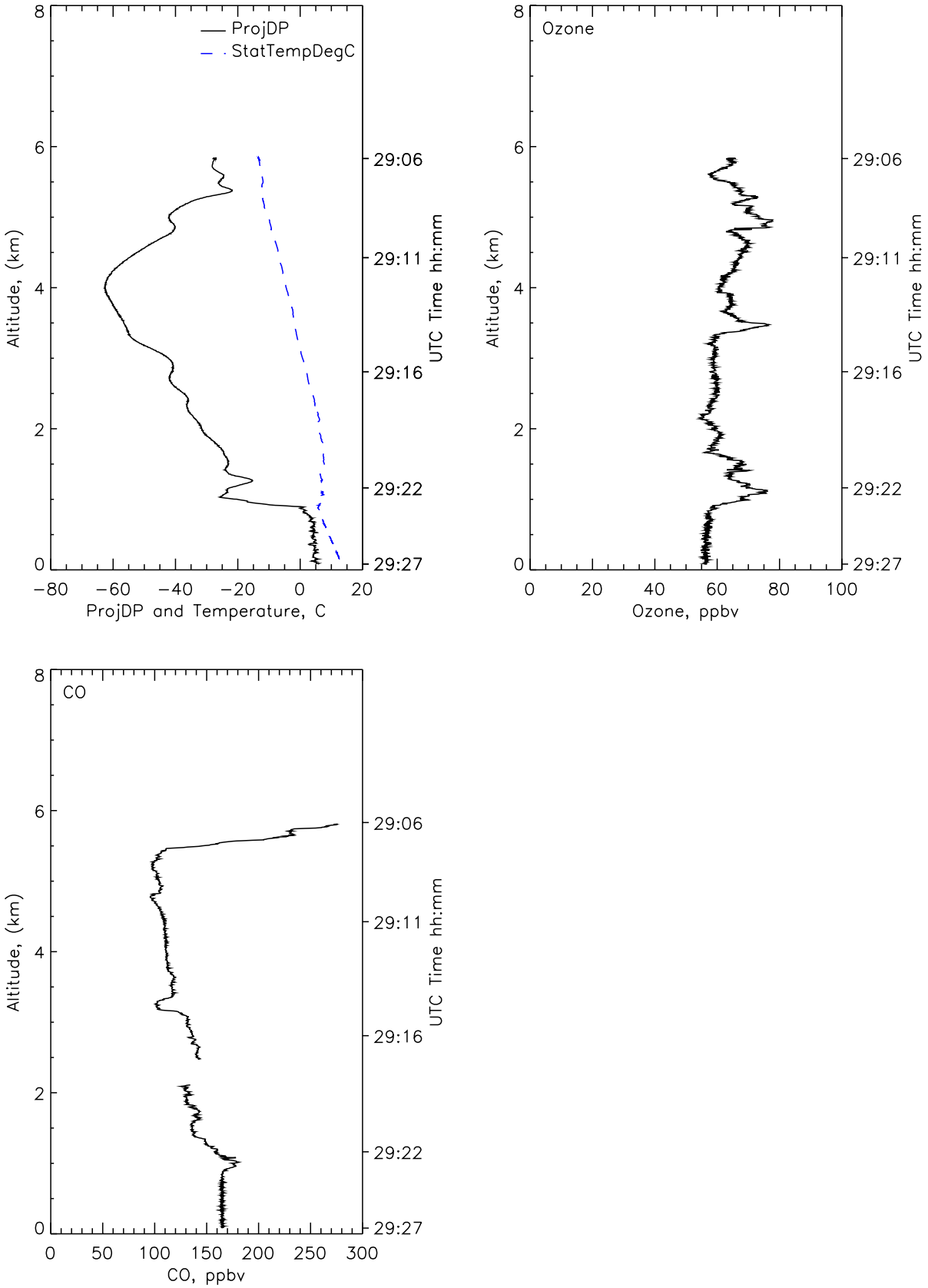
Profile # 3 TRACE-P P3-B Flight 20

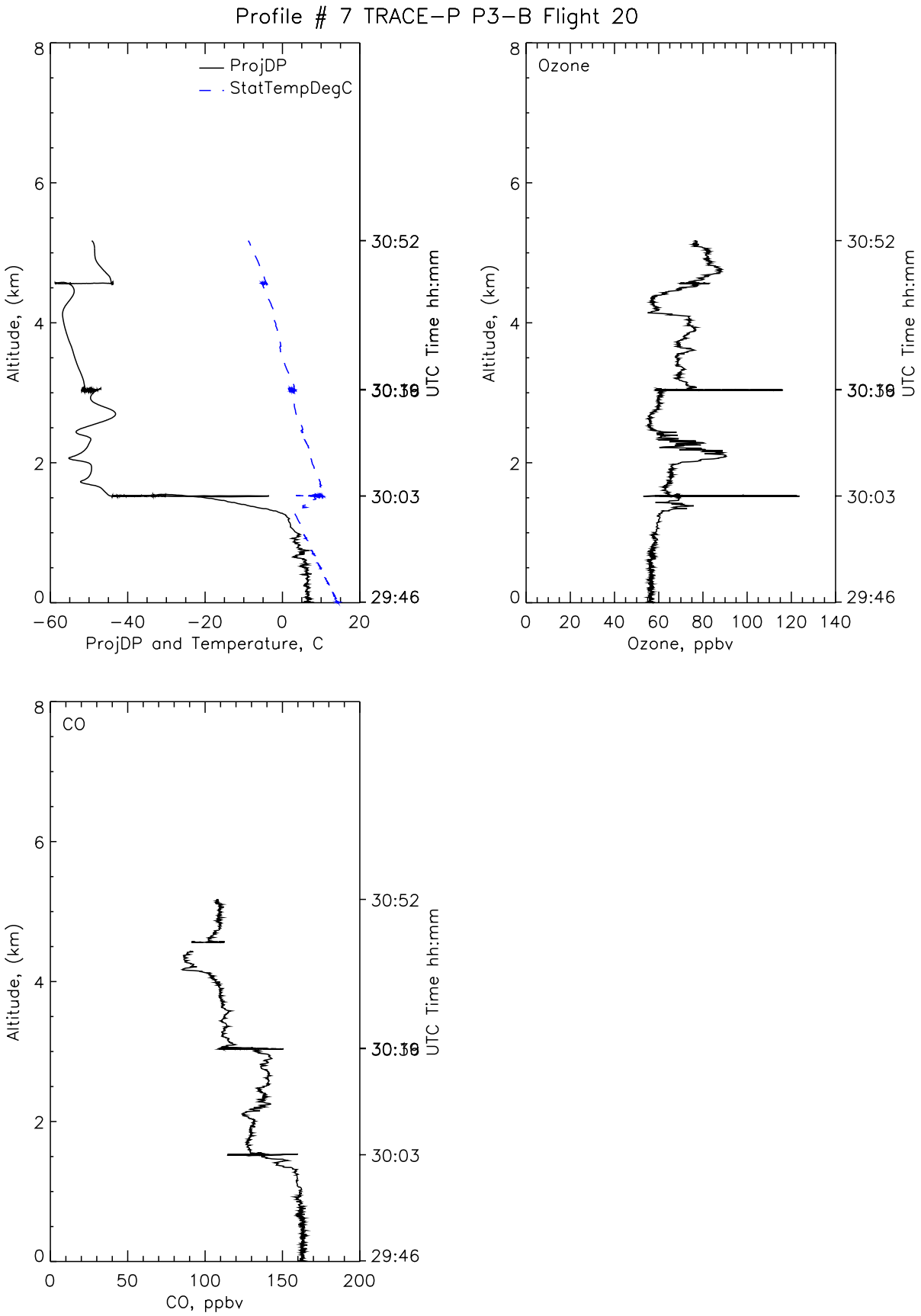


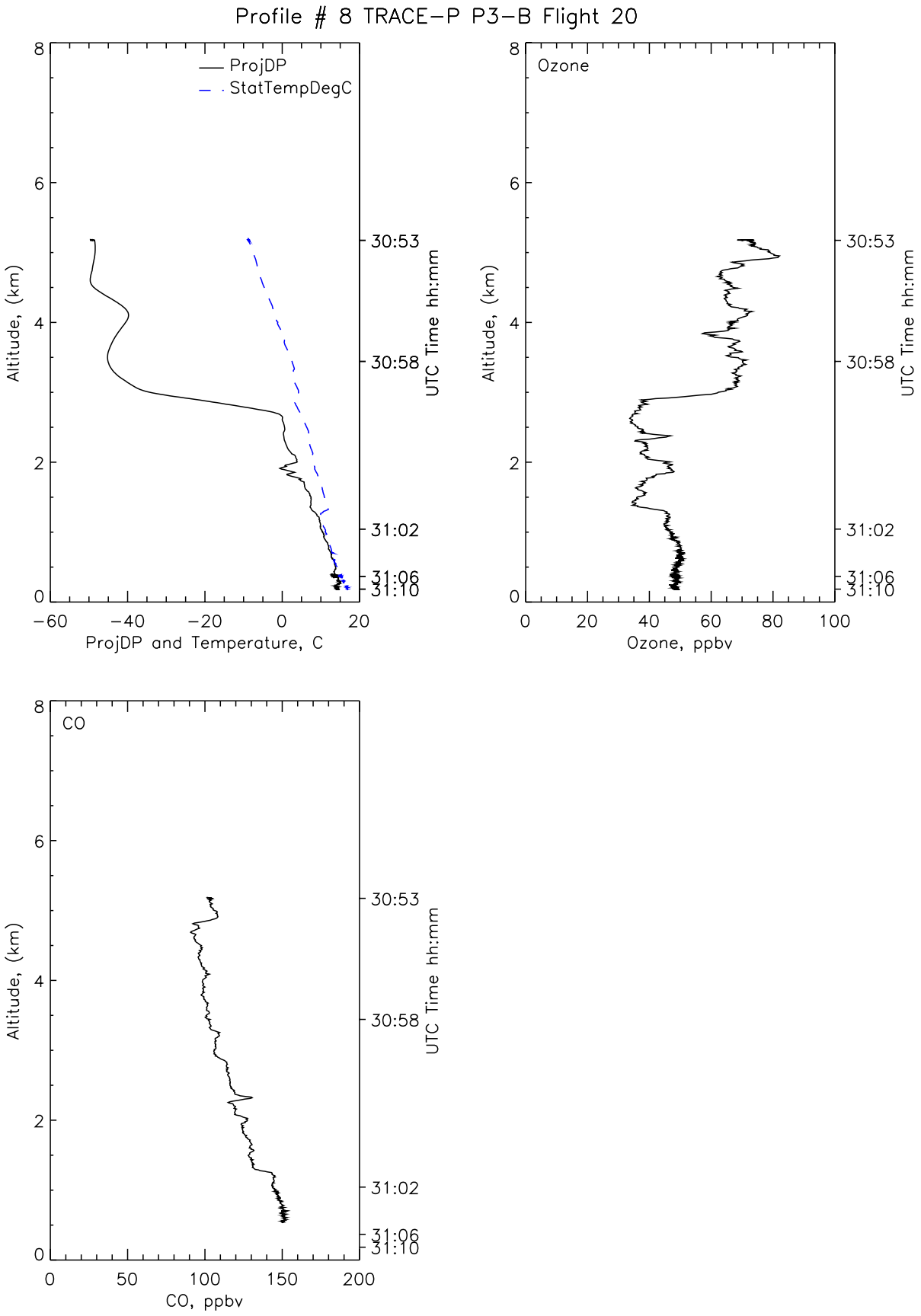

Profile # 4 TRACE-P P3-B Flight 20
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 5 TRACE-P P3-B Flight 20
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
28:46
28:24
28:02
27:41
27:19
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 6 TRACE-P P3-B Flight 20




Profile # 7 TRACE-P P3-B Flight 20
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
30:52
30:10
30:03
29:46
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 8 TRACE-P P3-B Flight 20
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
30:53
30:58
31:02
31:06
31:10
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

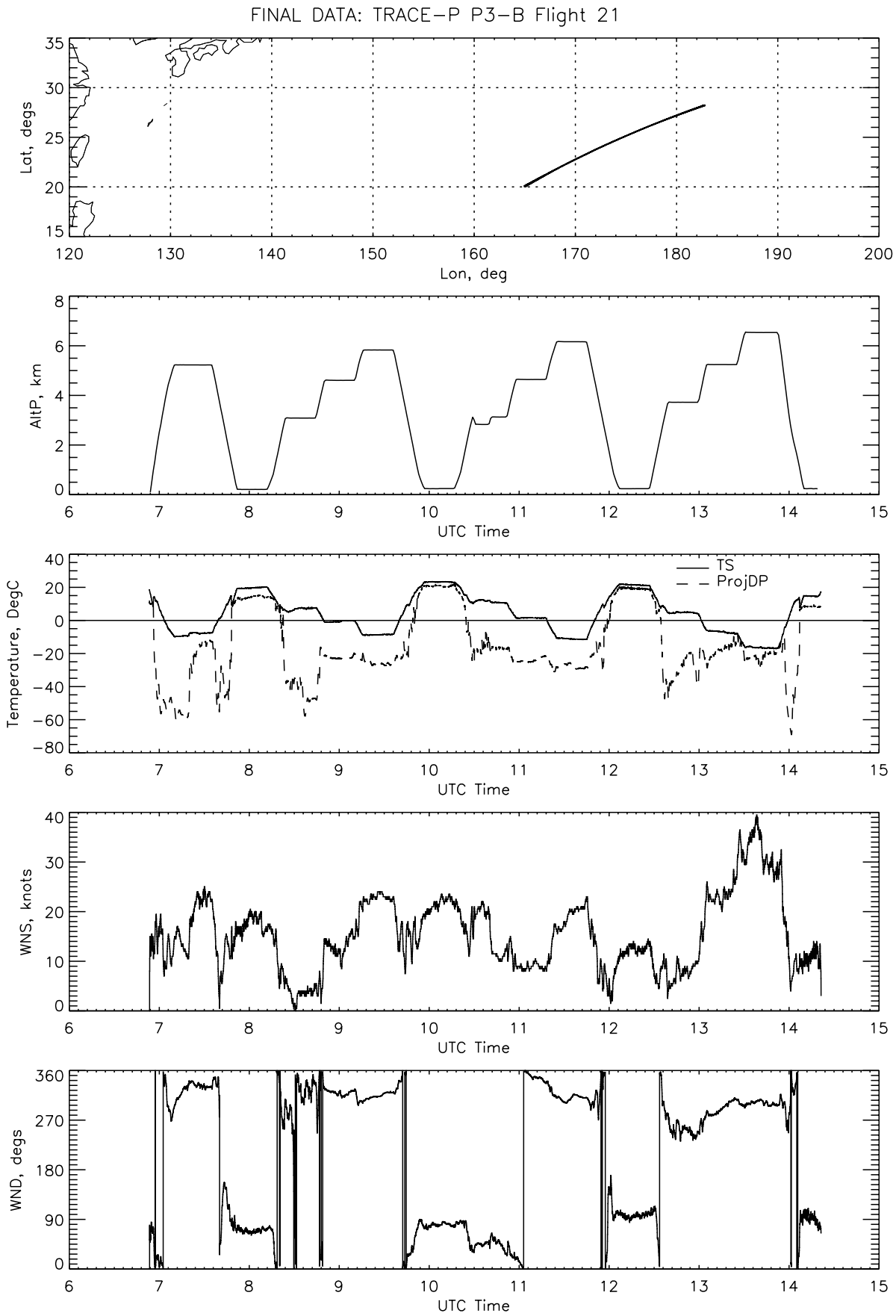
TRACE-P

Flight 21P

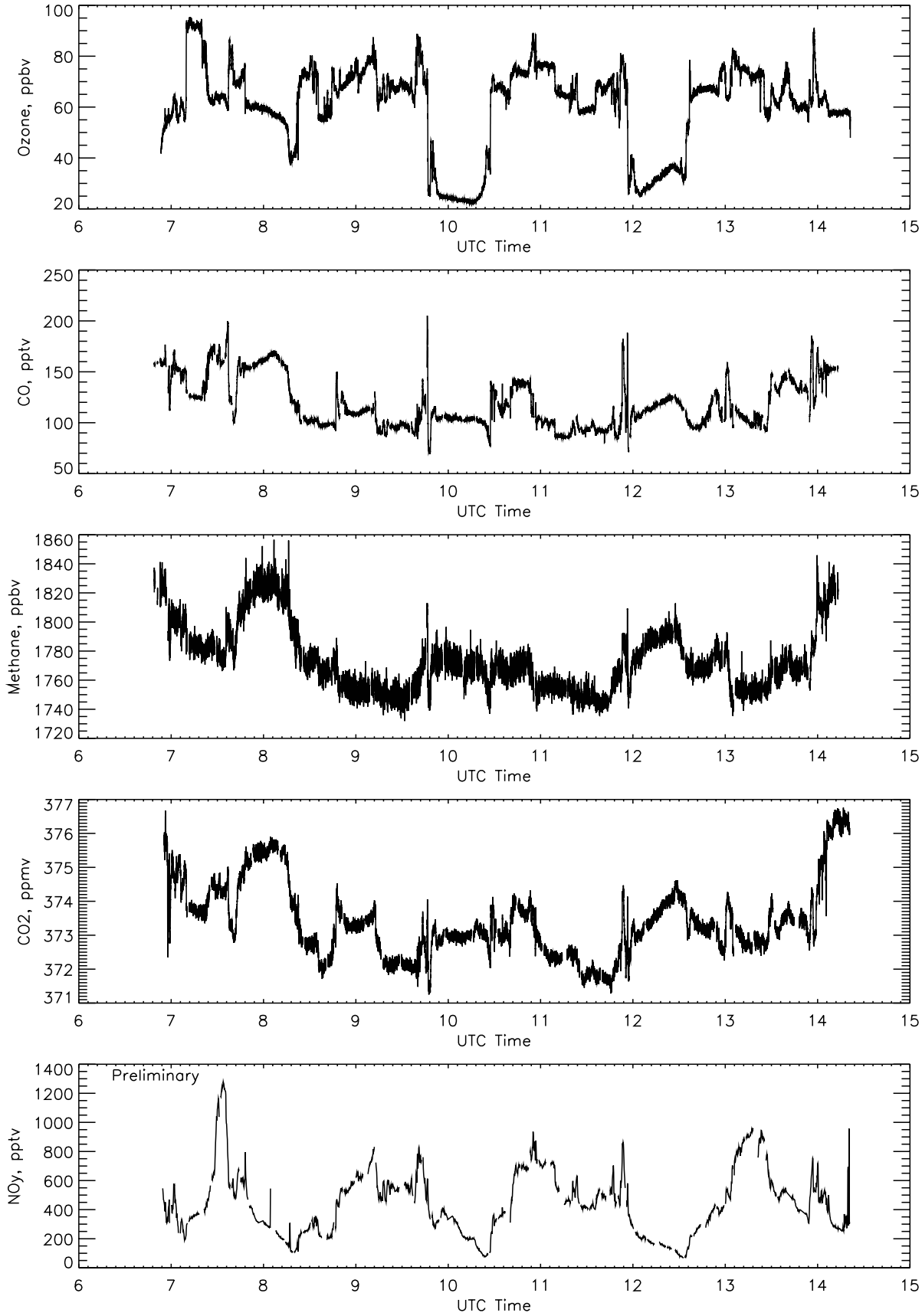
Local: Midway No. 1

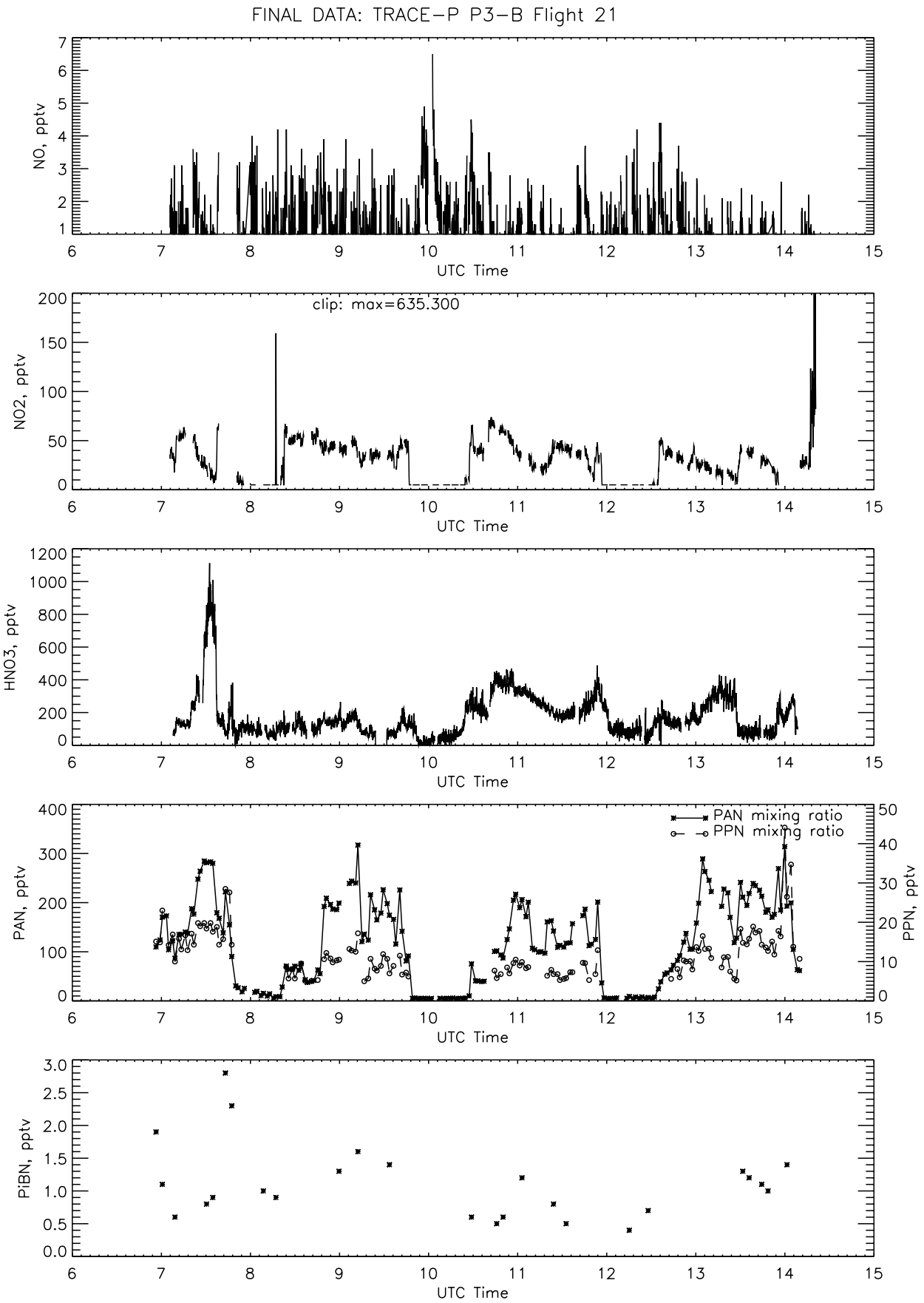
Aged Asian Pollution;
Stratospheric Influence

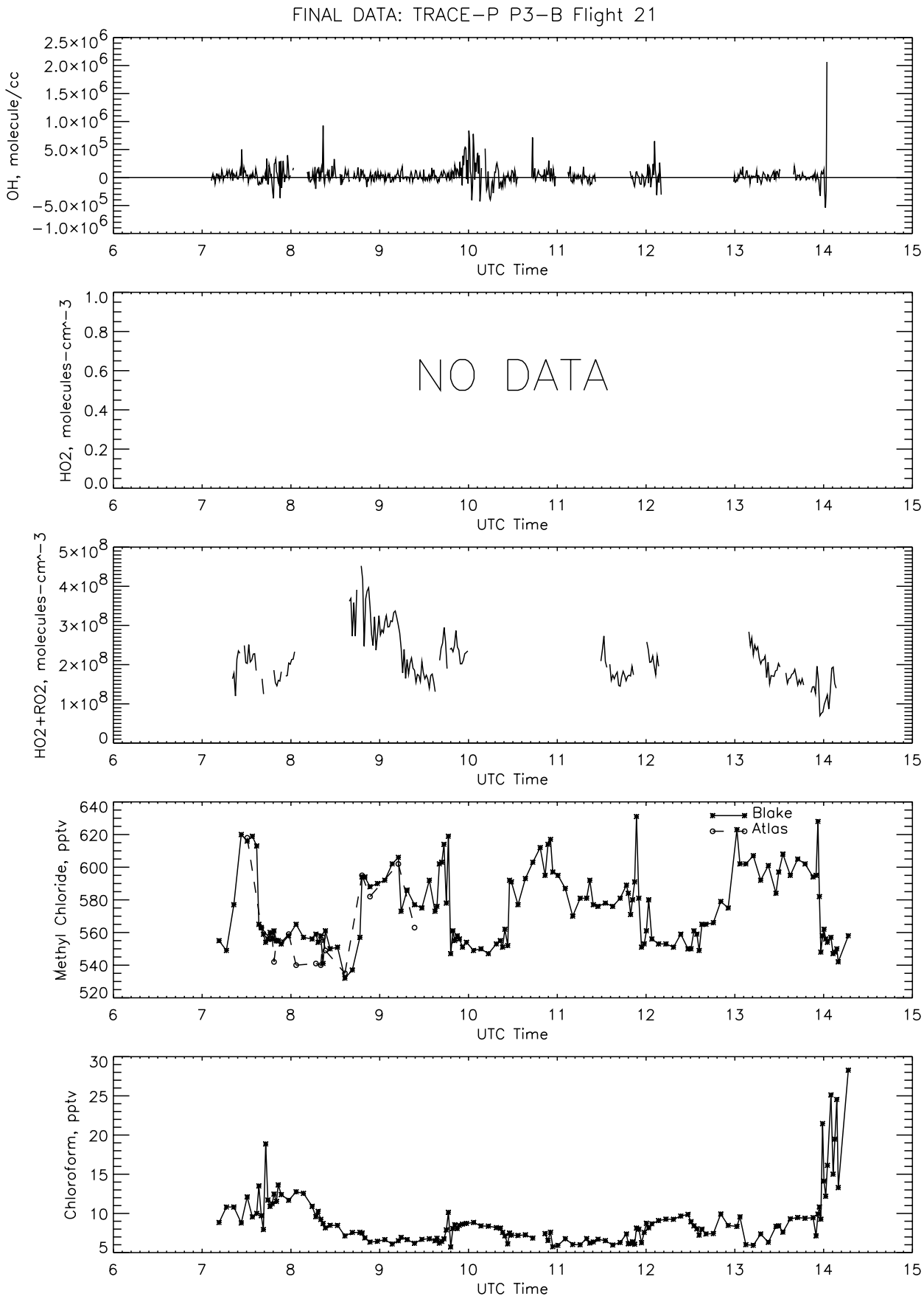
April 6, 2001


FINAL DATA: TRACE-P P3-B Flight 21
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

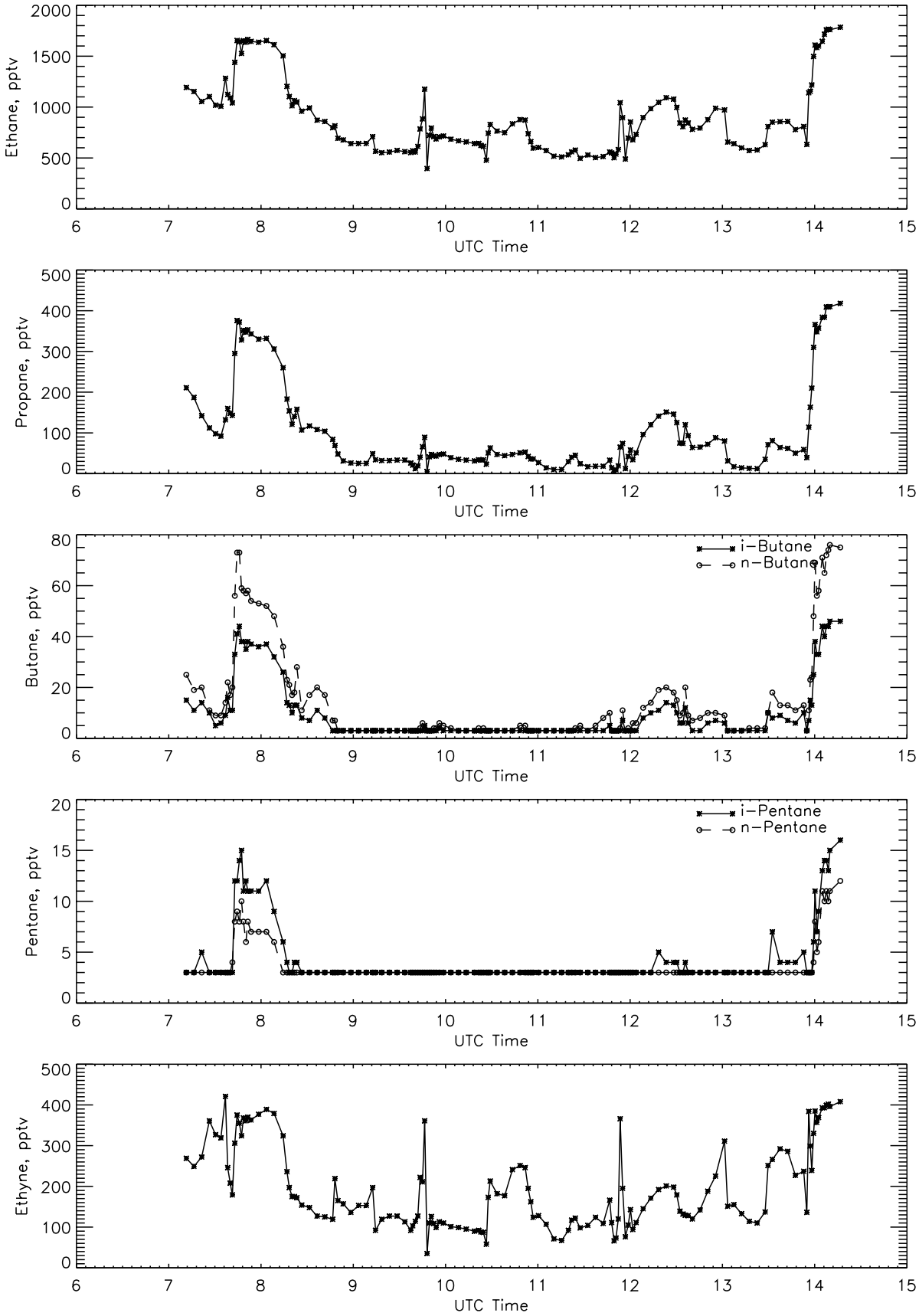
FINAL DATA: TRACE-P P3-B Flight 21



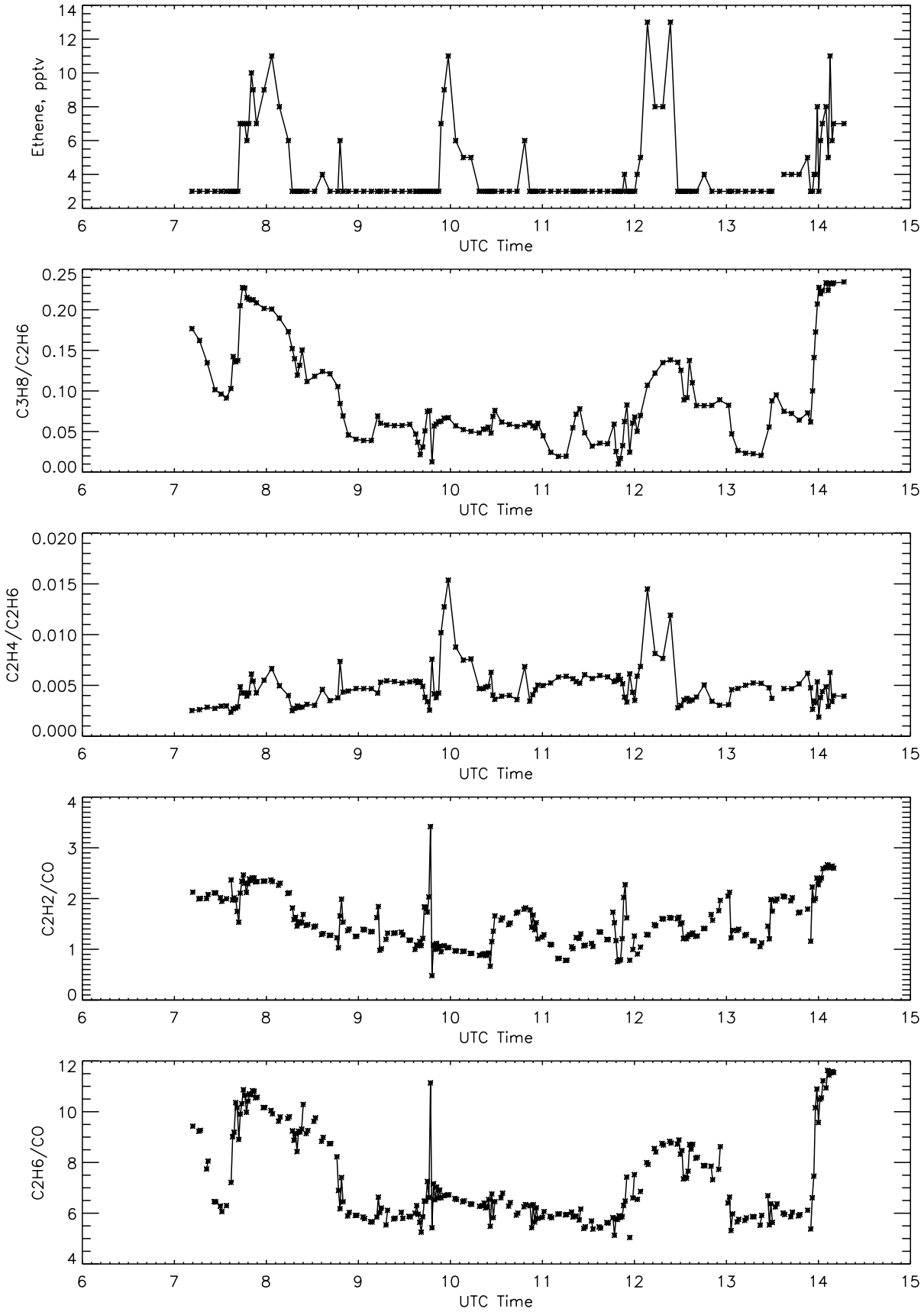

FINAL DATA: TRACE-P P3-B Flight 21
NO, pptv
UTC Time
NO2, pptv
clip: max=635.300
UTC Time
HNO3, pptv
UTC Time
PAN, pptv
PPN, pptv
PAN mixing ratio
PPN mixing ratio
UTC Time
PiBN, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 21
OH, molecule/cc
UTC Time
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv

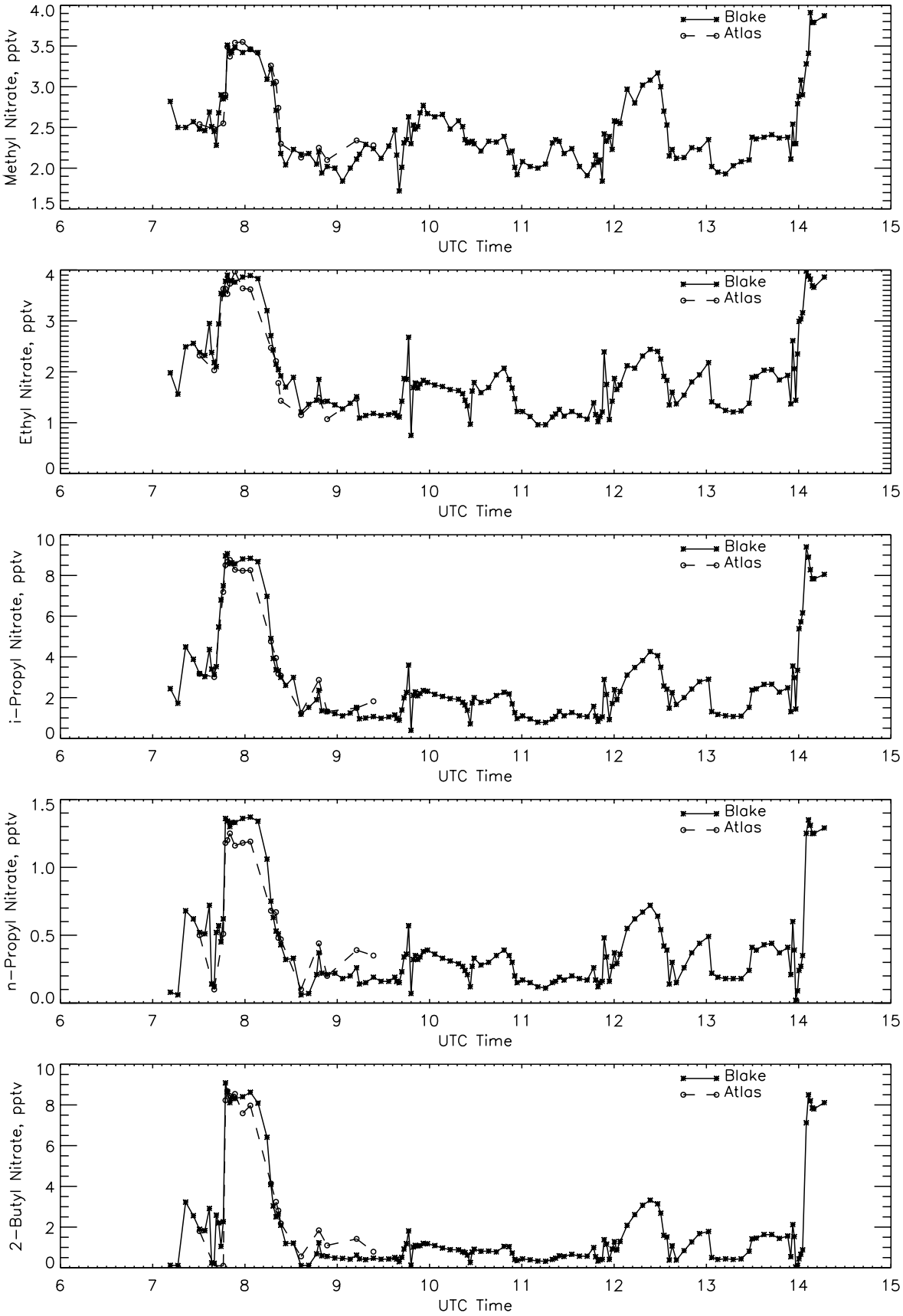
FINAL DATA: TRACE-P P3-B Flight 21

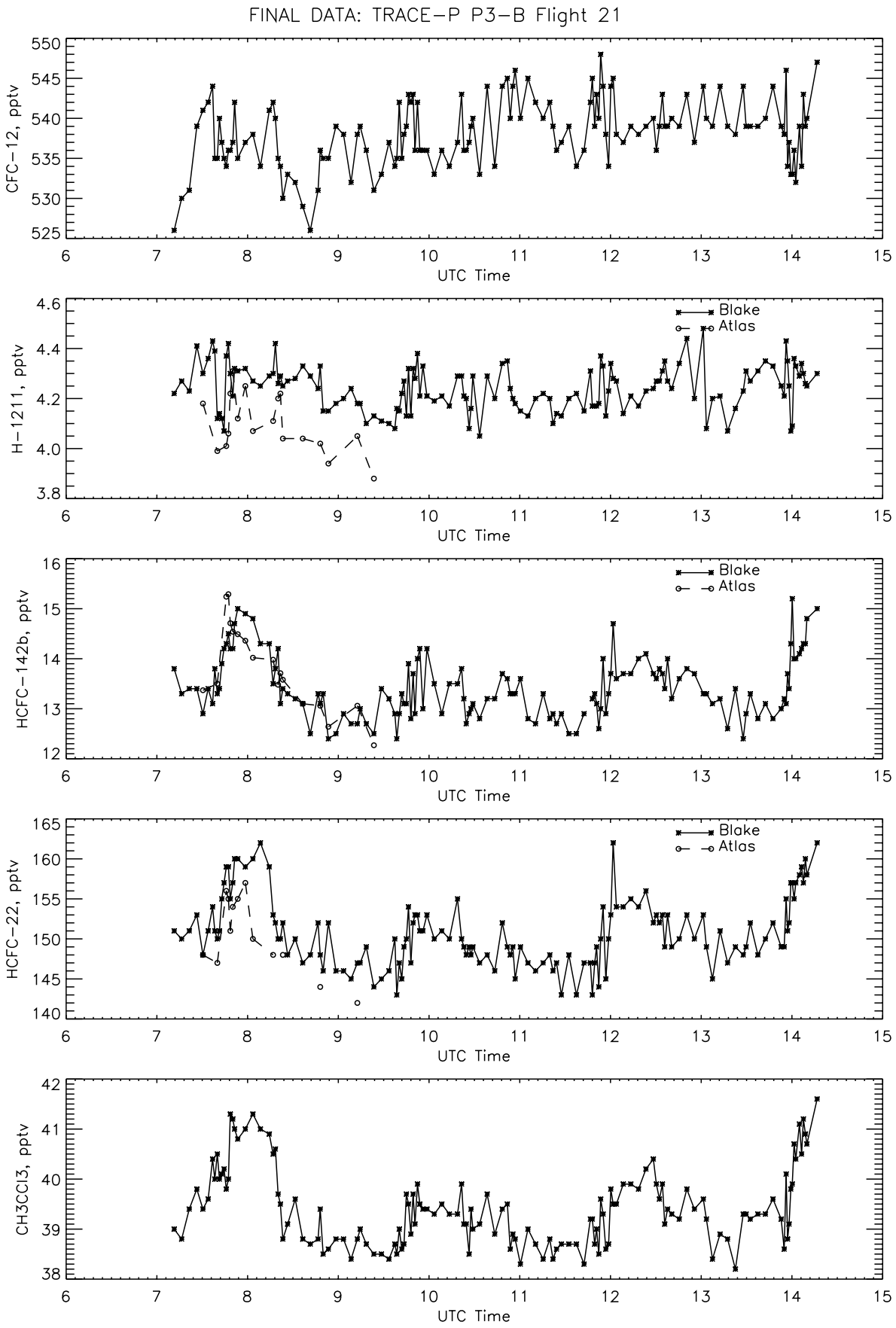


FINAL DATA: TRACE-P P3-B Flight 21

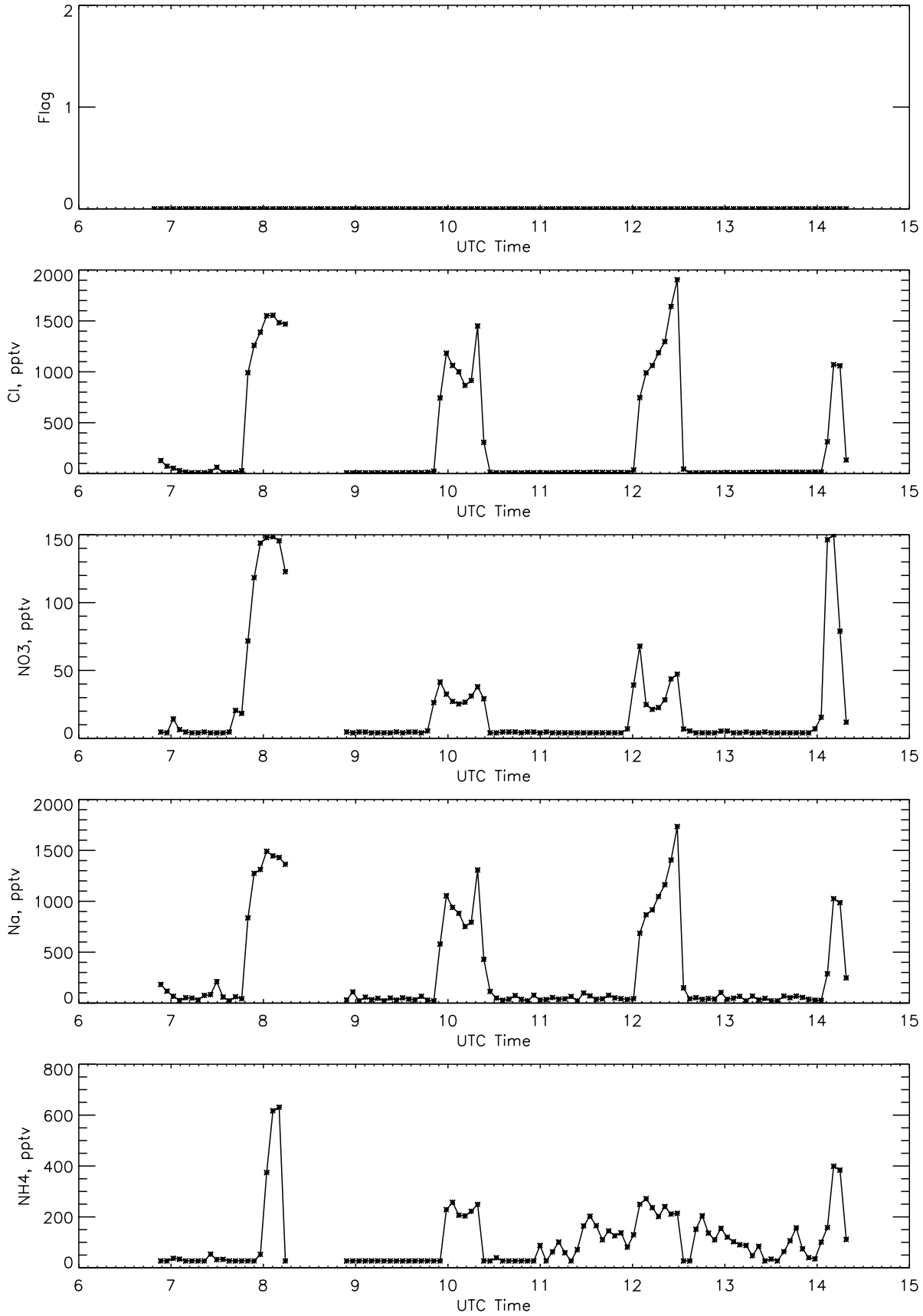


FINAL DATA: TRACE-P P3-B Flight 21

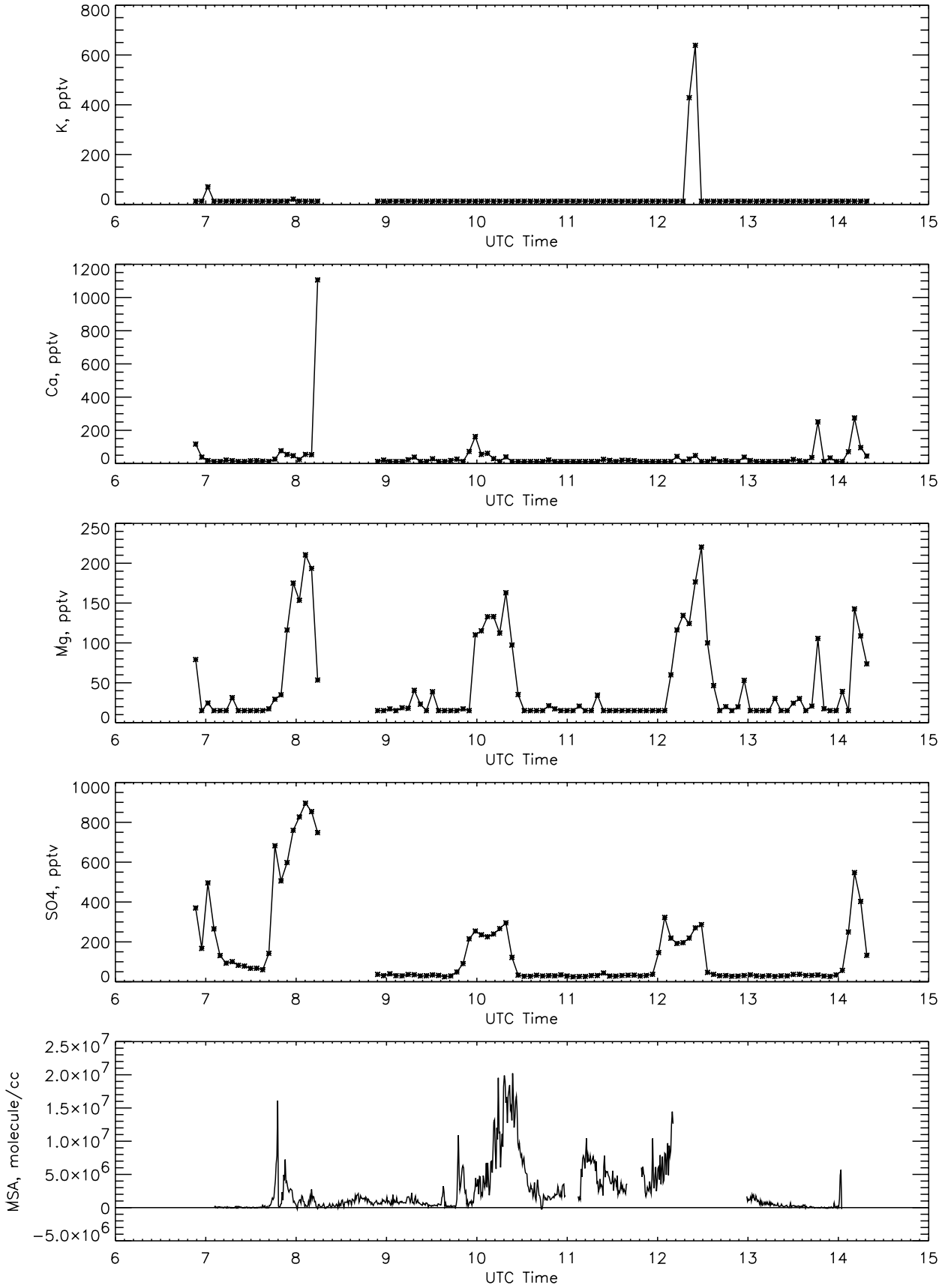


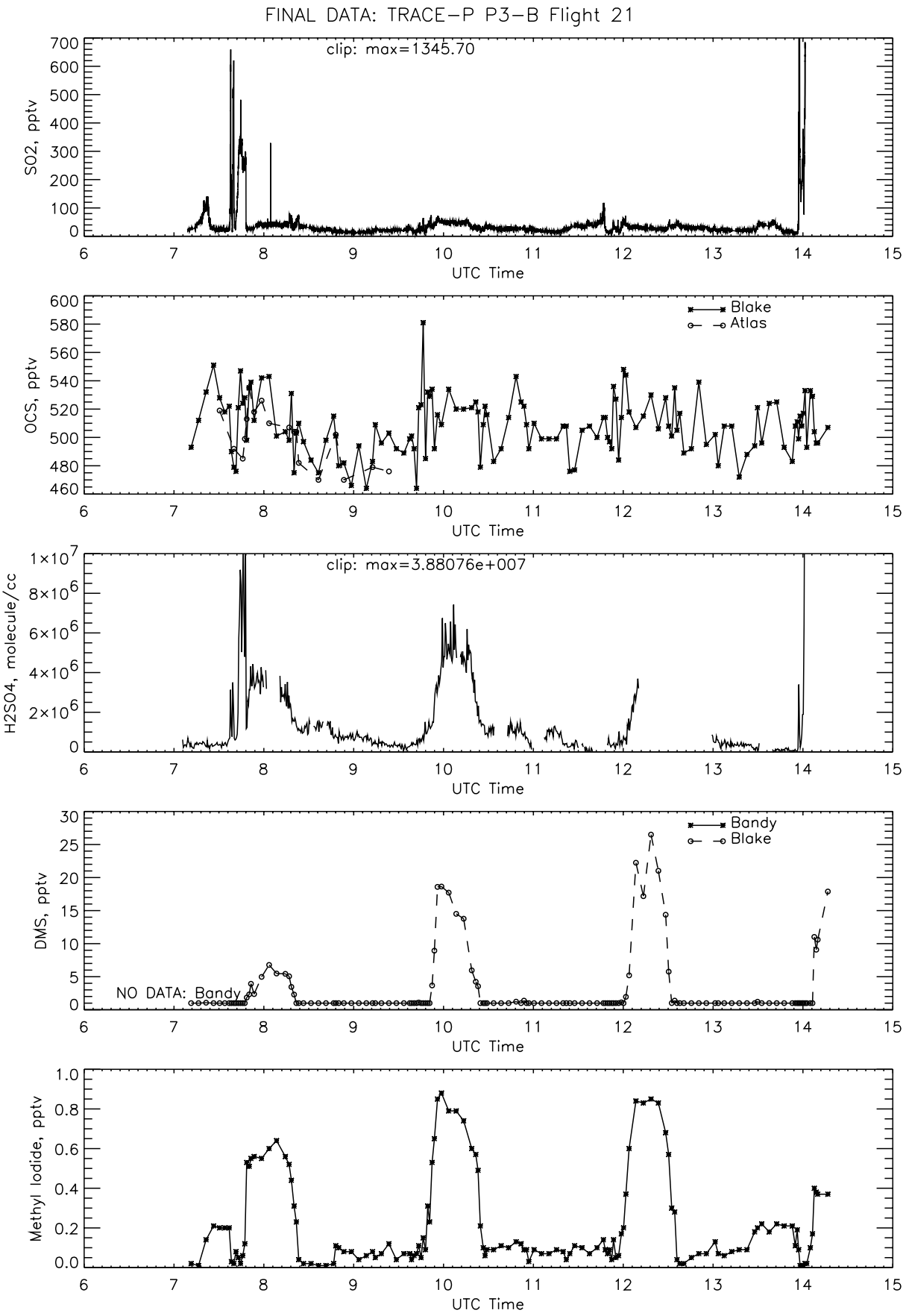

FINAL DATA: TRACE-P P3-B Flight 21
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

FINAL DATA: TRACE-P P3-B Flight 21

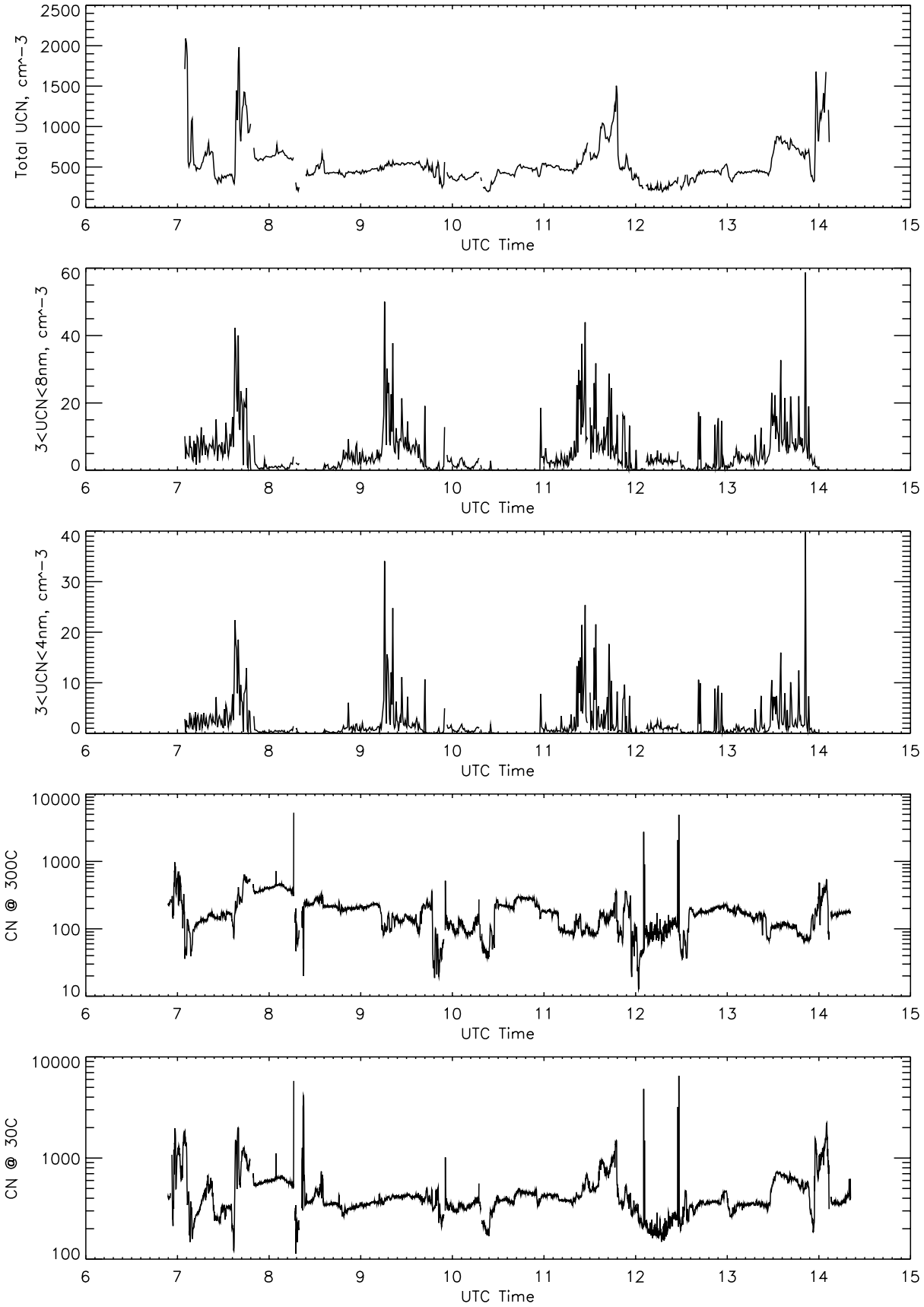


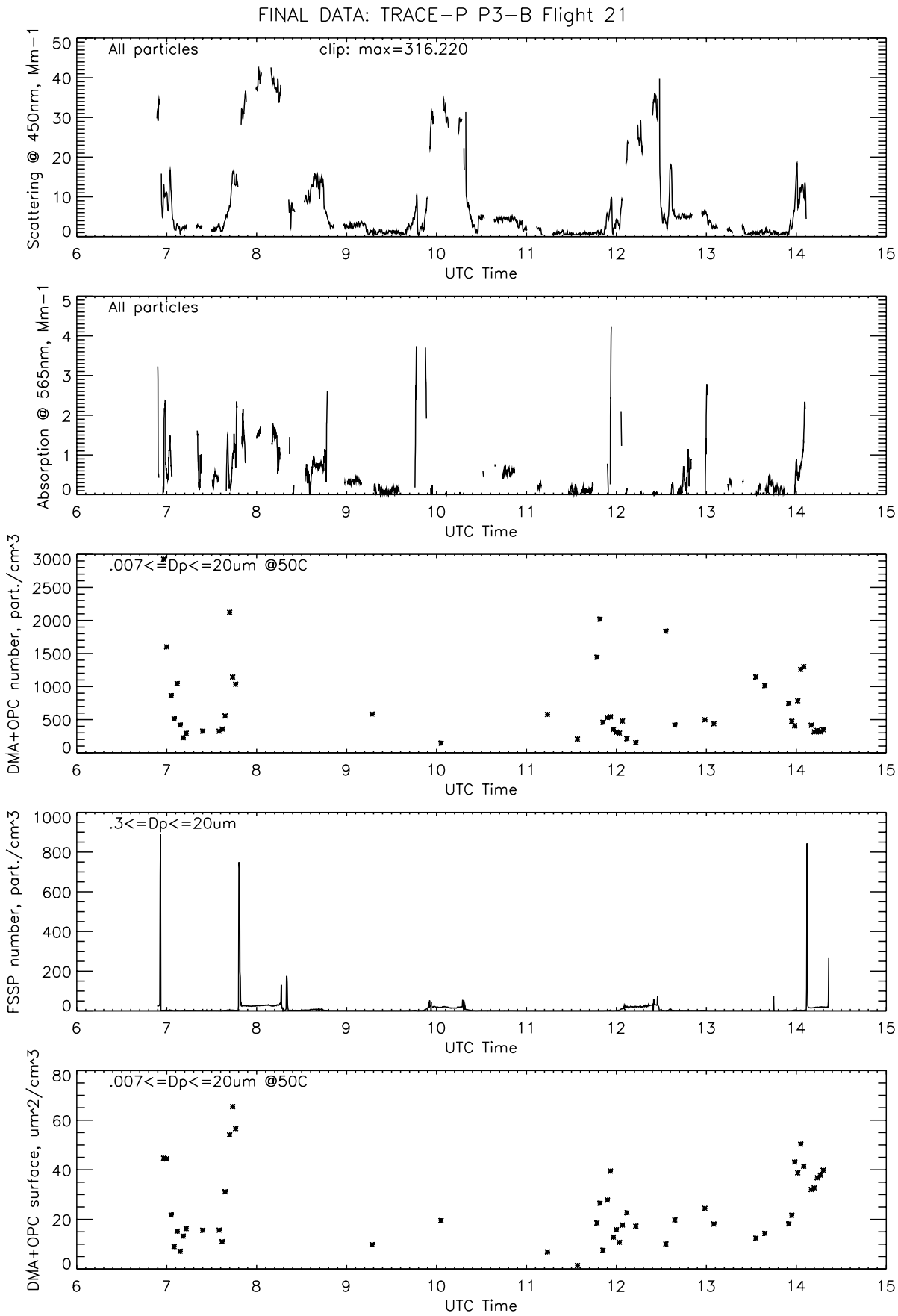
FINAL DATA: TRACE-P P3-B Flight 21

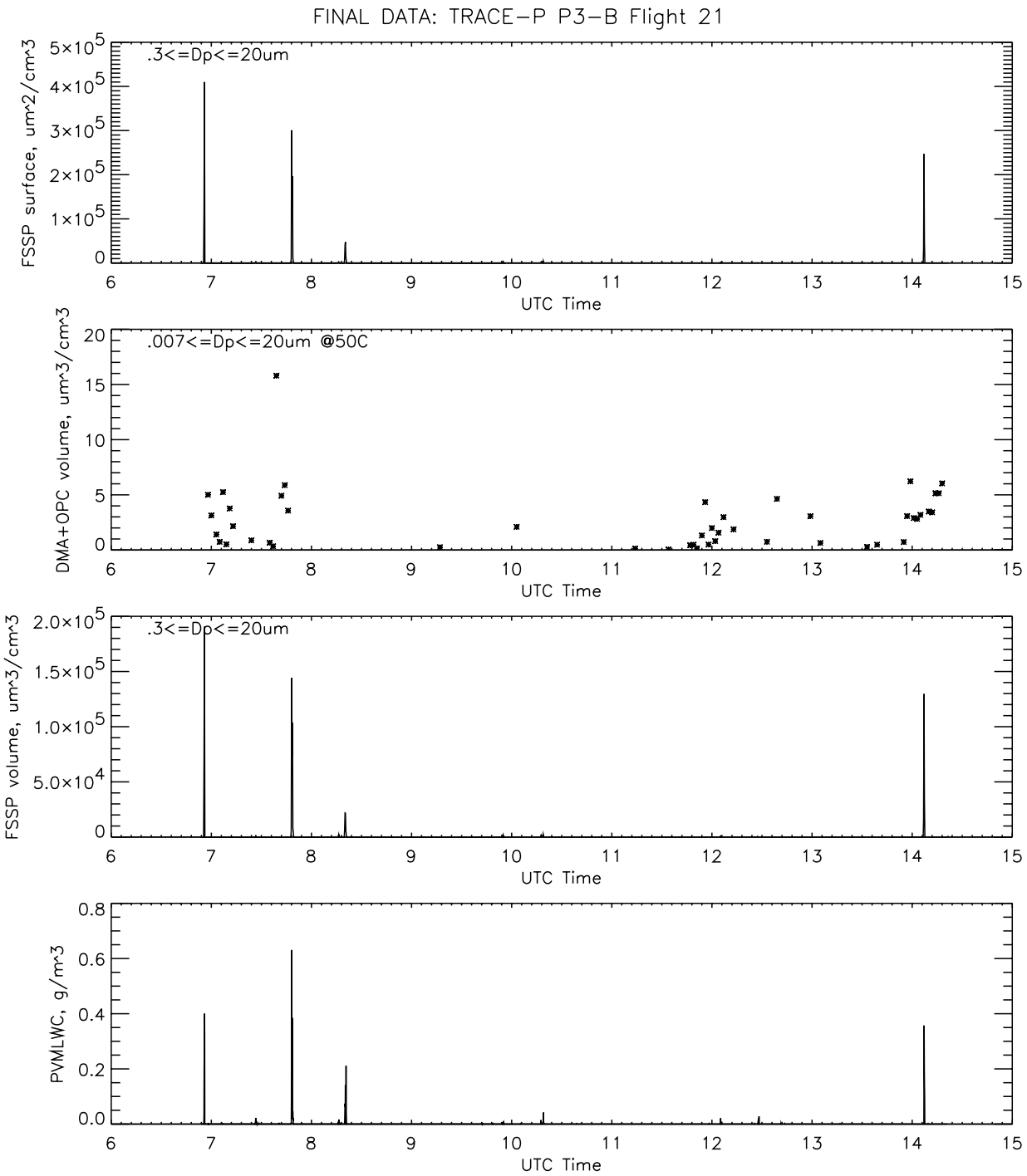



FINAL DATA: TRACE-P P3-B Flight 21
clip: max=1345.70
SO2, pptv
UTC Time
Blake
Atlas
OCS, pptv
UTC Time
clip: max=3.88076e+007
H2SO4, molecule/cc
UTC Time
Bandy
Blake
NO DATA: Bandy
DMS, pptv
UTC Time
Methyl Iodide, pptv
UTC Time

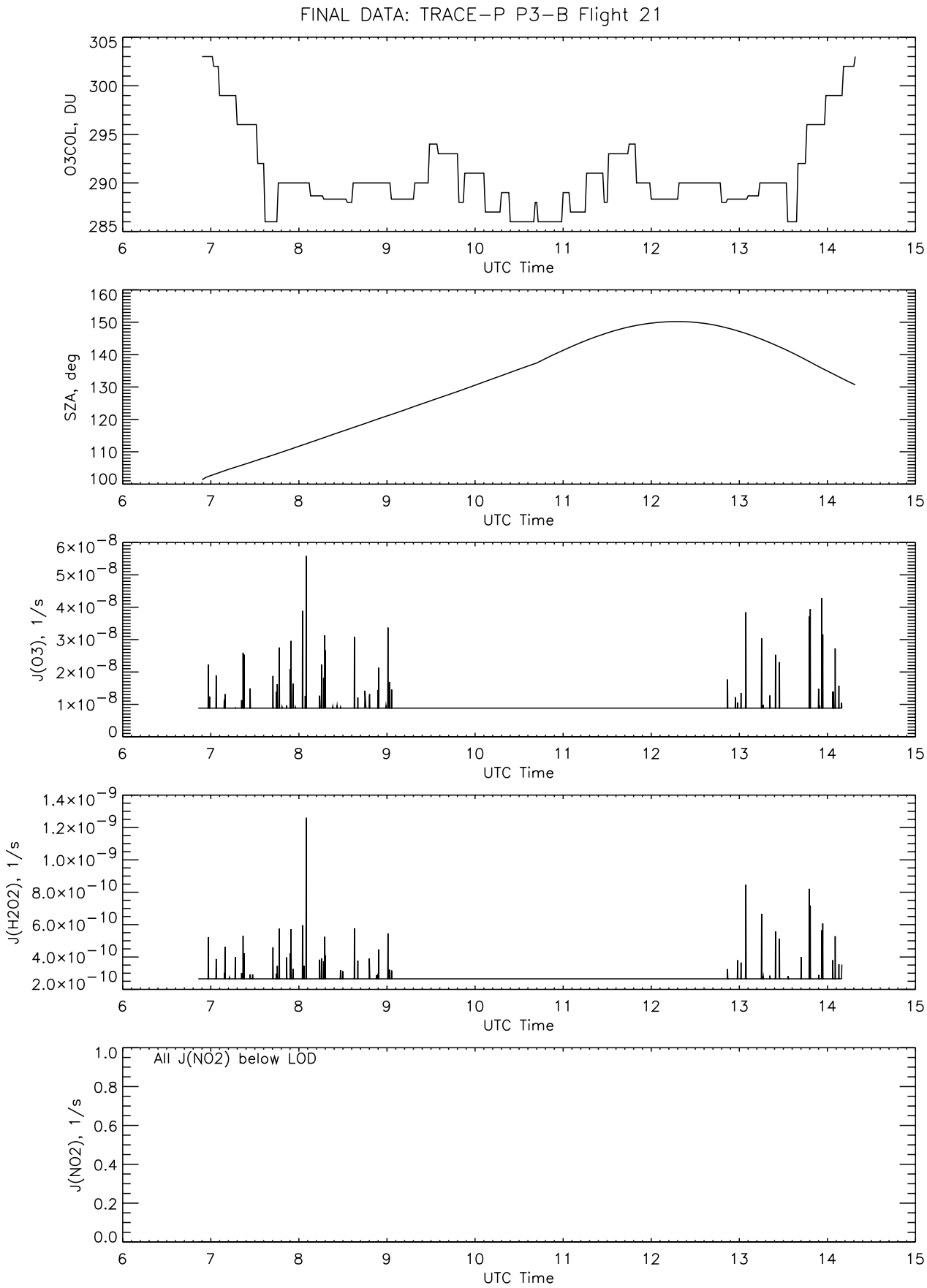
FINAL DATA: TRACE-P P3-B Flight 21

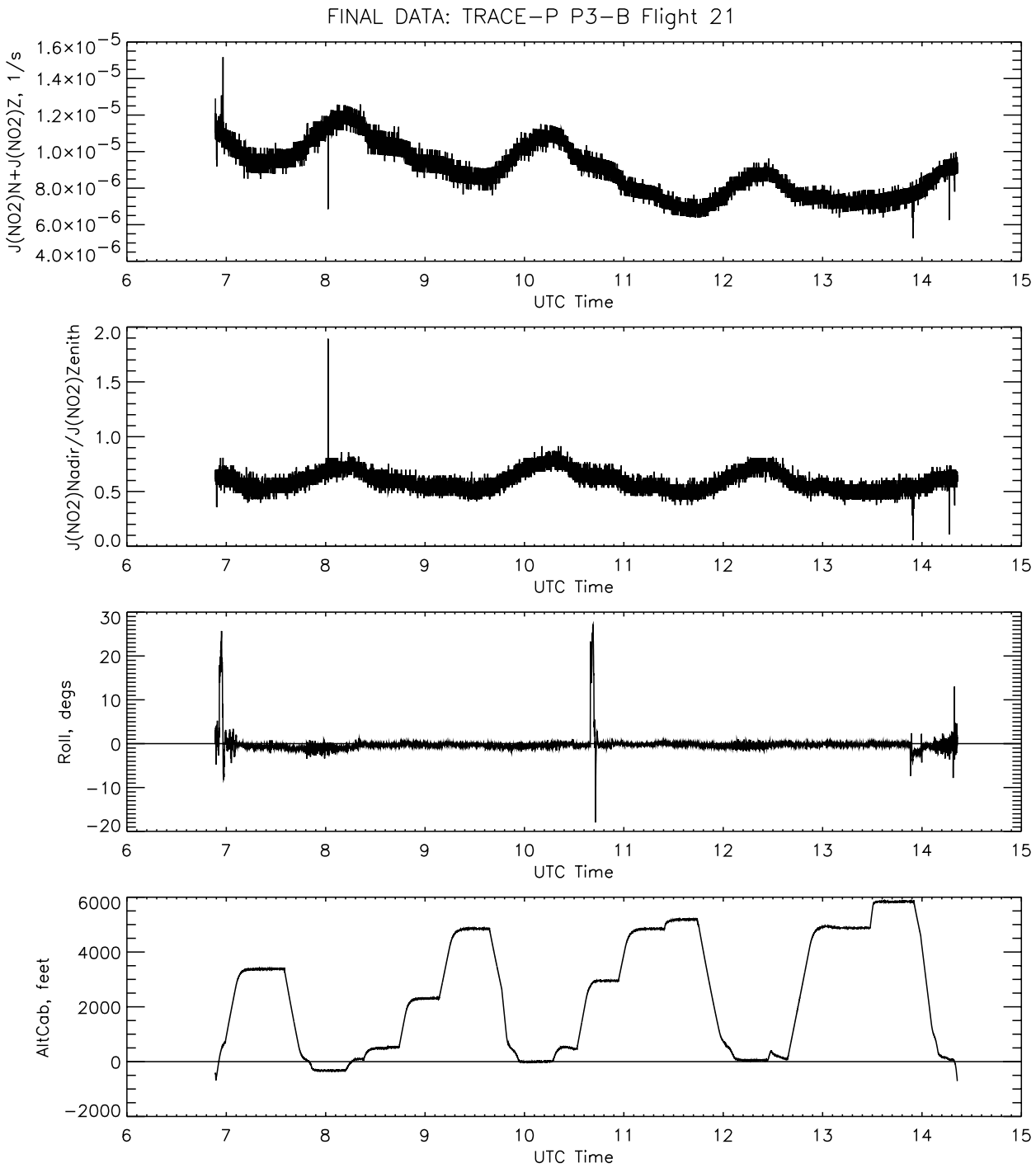


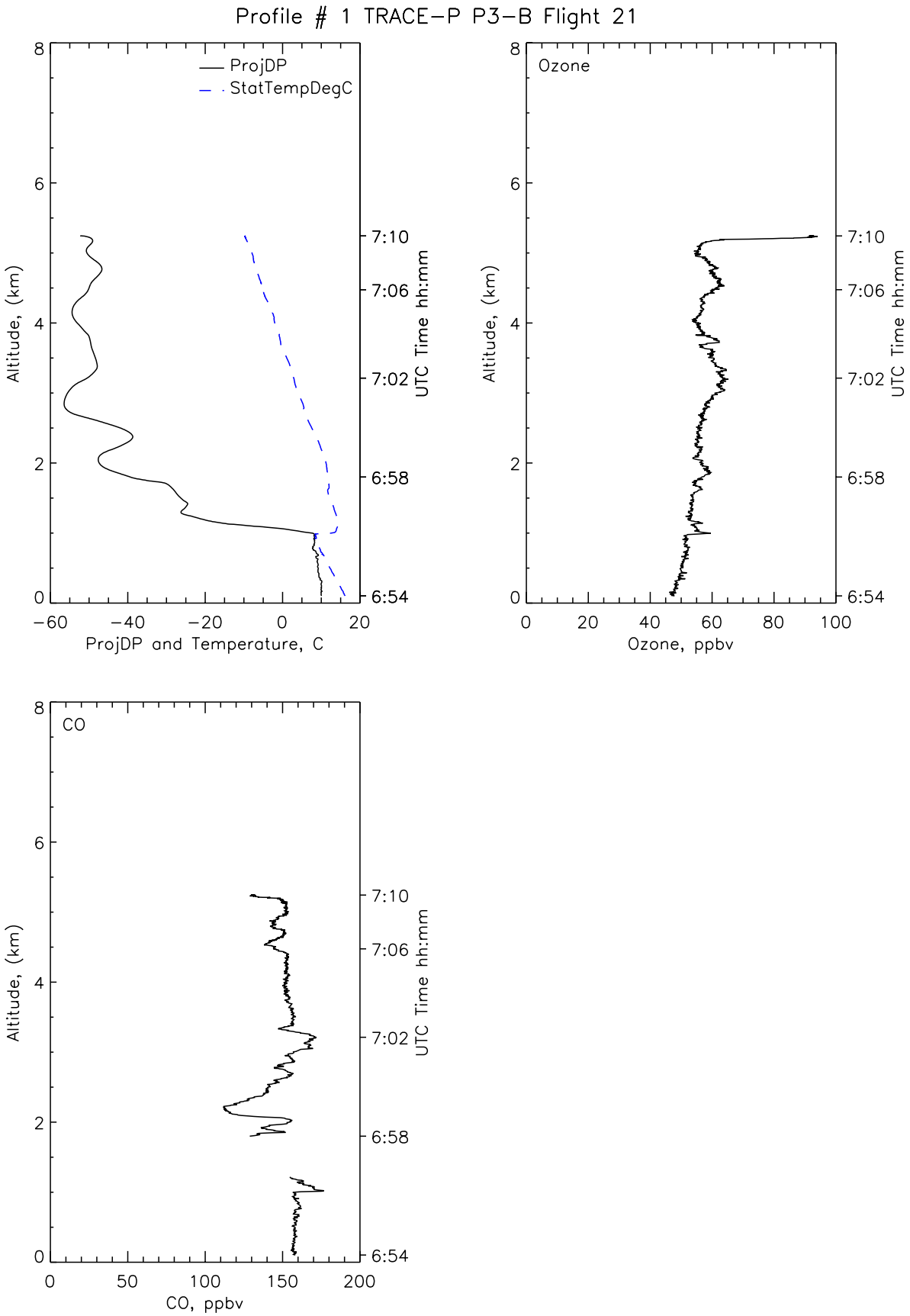

FINAL DATA: TRACE-P P3-B Flight 21
All particles
clip: max=316.220
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time


FINAL DATA: TRACE-P P3-B Flight 21
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

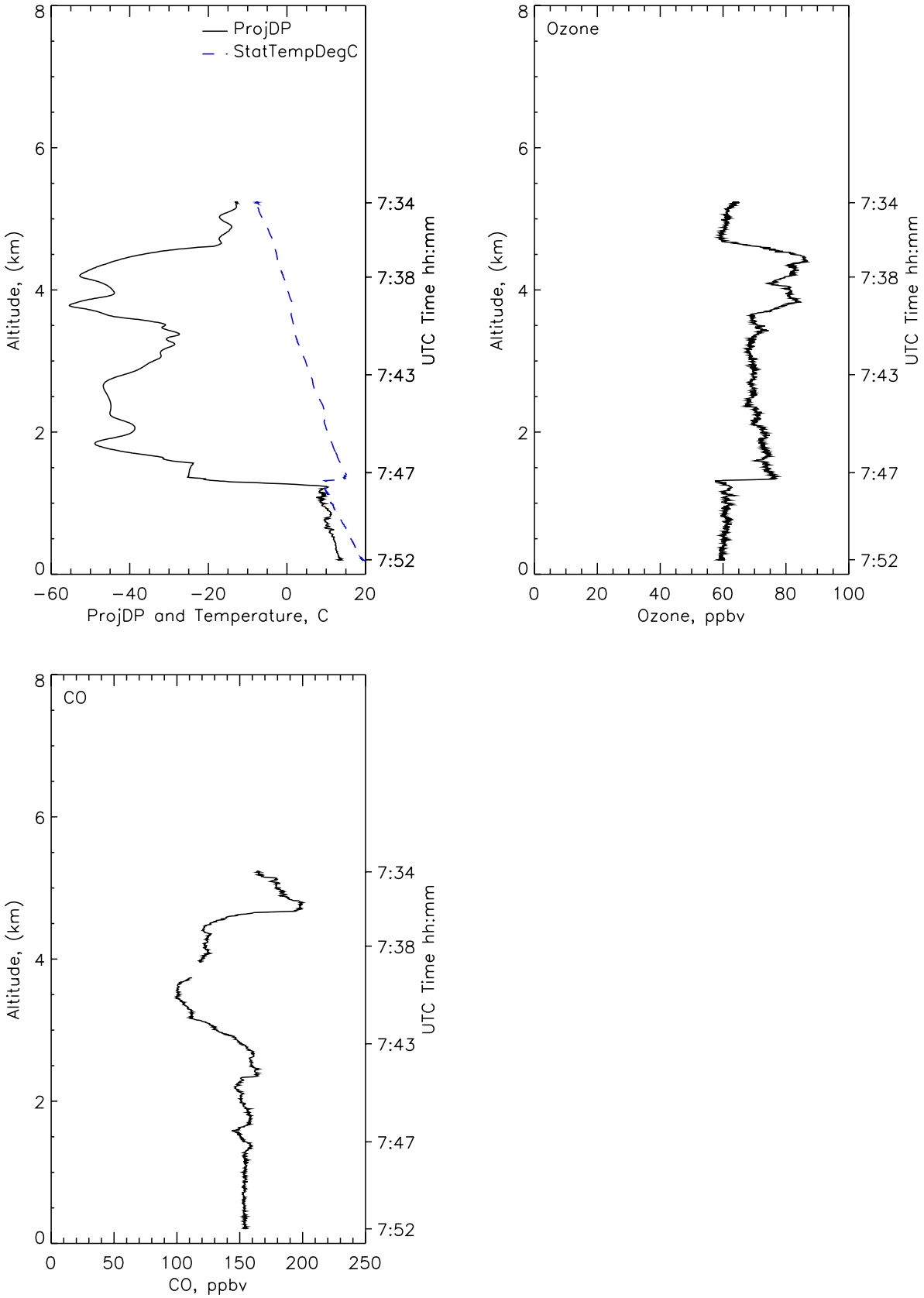
LEFT BLANK

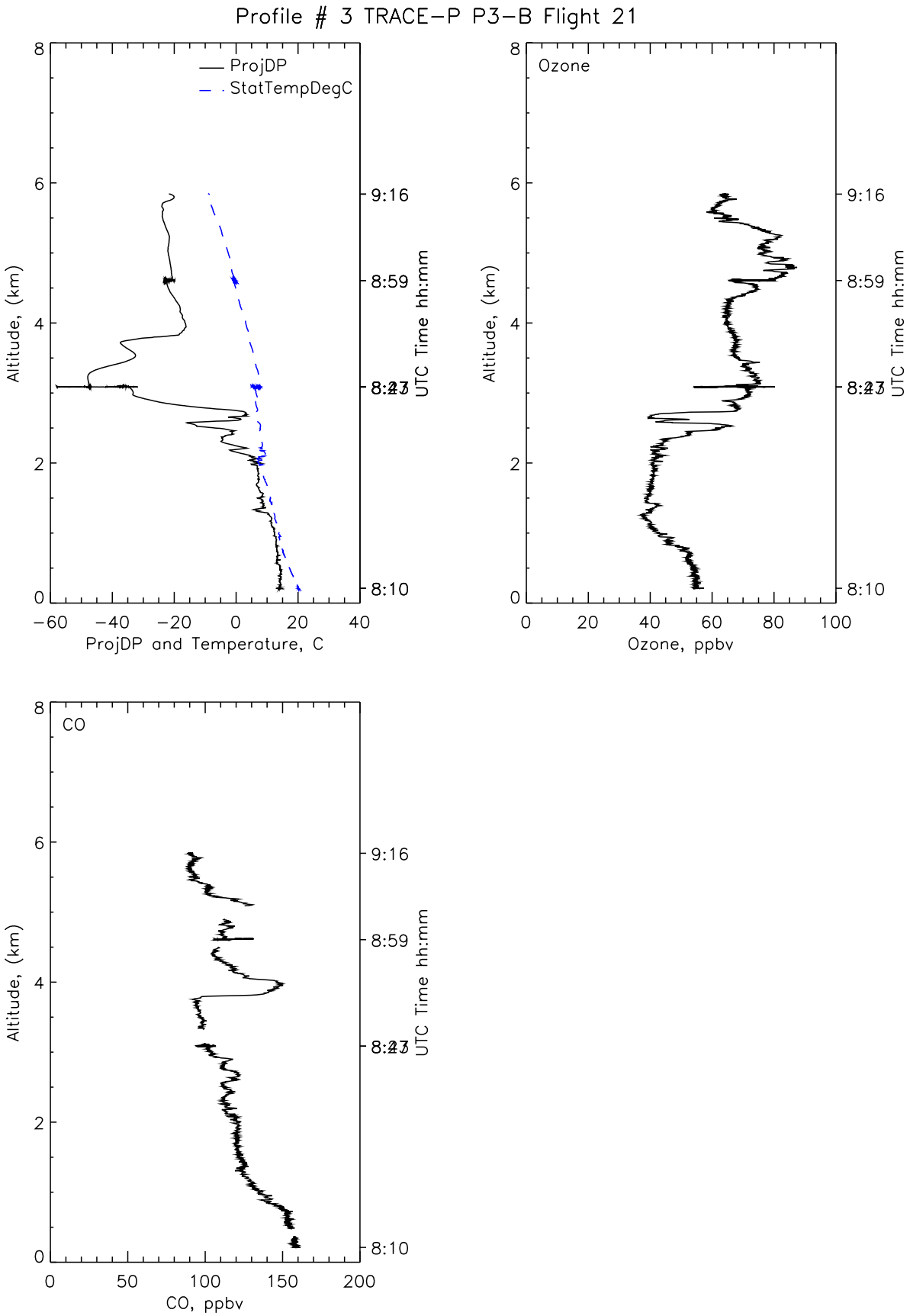

FINAL DATA: TRACE-P P3-B Flight 21
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
All J(NO2) below LOD
UTC Time


FINAL DATA: TRACE-P P3-B Flight 21
J(NO2)N+J(NO2)Z, 1/s
1.6×10^-5
1.4×10^-5
1.2×10^-5
1.0×10^-5
8.0×10^-6
6.0×10^-6
4.0×10^-6
UTC Time
J(NO2)Nadir/J(NO2)Zenith
2.0
1.5
1.0
0.5
0.0
UTC Time
Roll, degs
30
20
10
0
−10
−20
UTC Time
AltCab, feet
6000
4000
2000
0
−2000
UTC Time
6
7
8
9
10
11
12
13
14
15

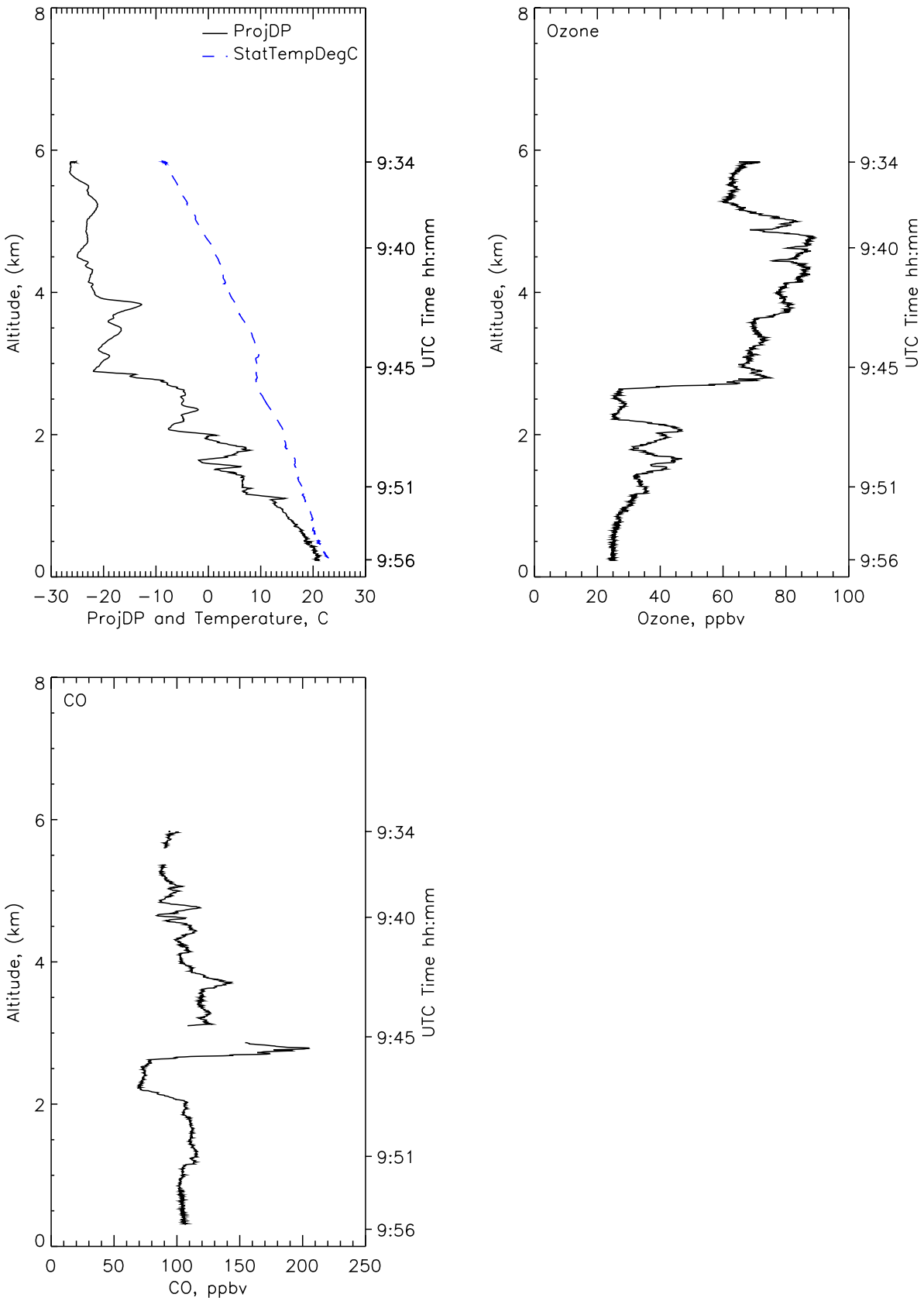

Profile # 1 TRACE-P P3-B Flight 21
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 2 TRACE-P P3-B Flight 21

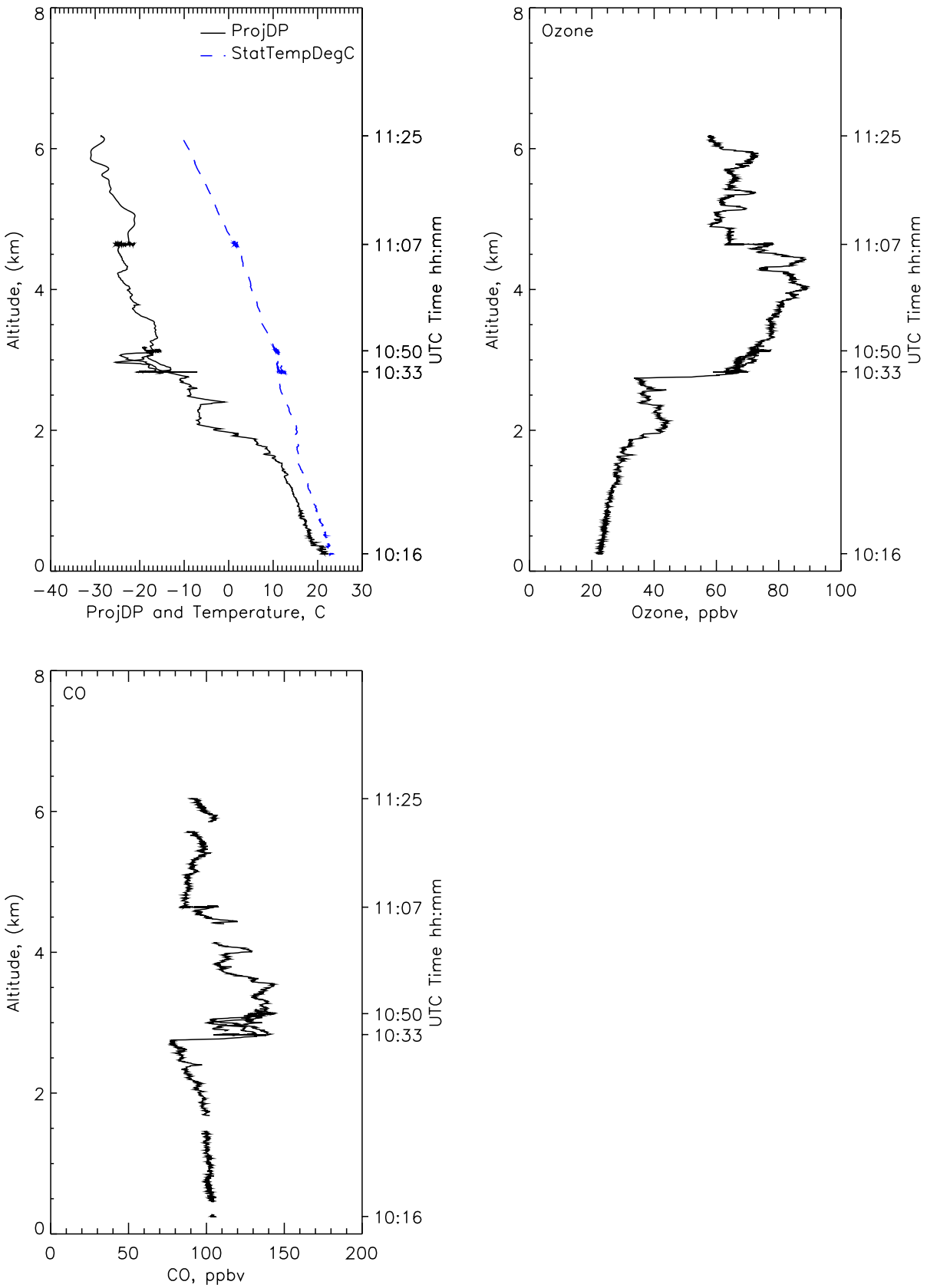


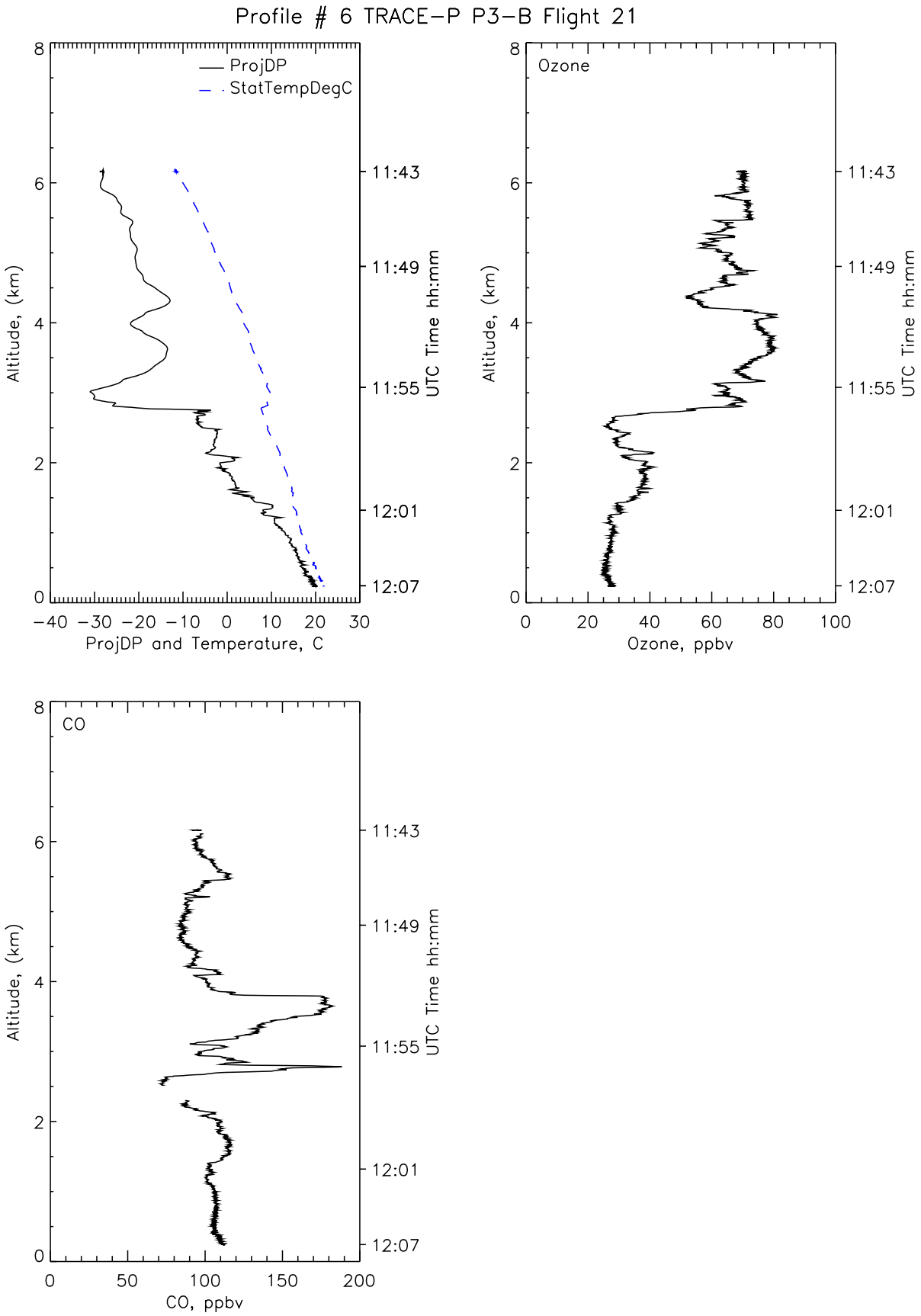

Profile # 3 TRACE-P P3-B Flight 21
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
9:16
8:59
8:23
8:10
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv

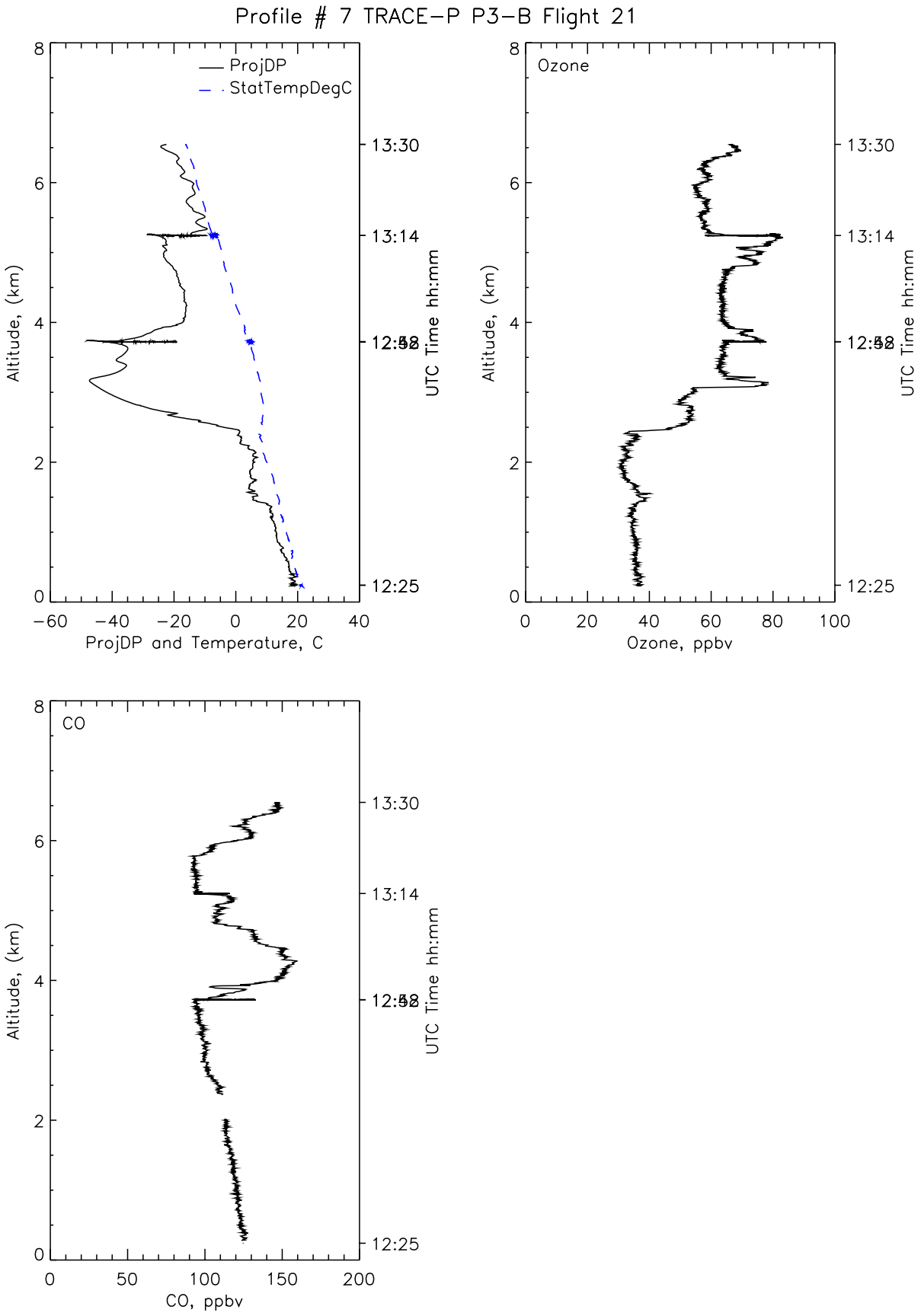
Profile # 4 TRACE-P P3-B Flight 21



Profile # 5 TRACE-P P3-B Flight 21




Profile # 6 TRACE-P P3-B Flight 21
ProjDP
StatTempDegC
Altitude, (km)
UTC Time hh:mm
11:43
11:49
11:55
12:01
12:07
ProjDP and Temperature, C
Ozone
Ozone, ppbv
CO
CO, ppbv


Profile # 7 TRACE-P P3-B Flight 21
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
13:30
13:14
12:58
12:25
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

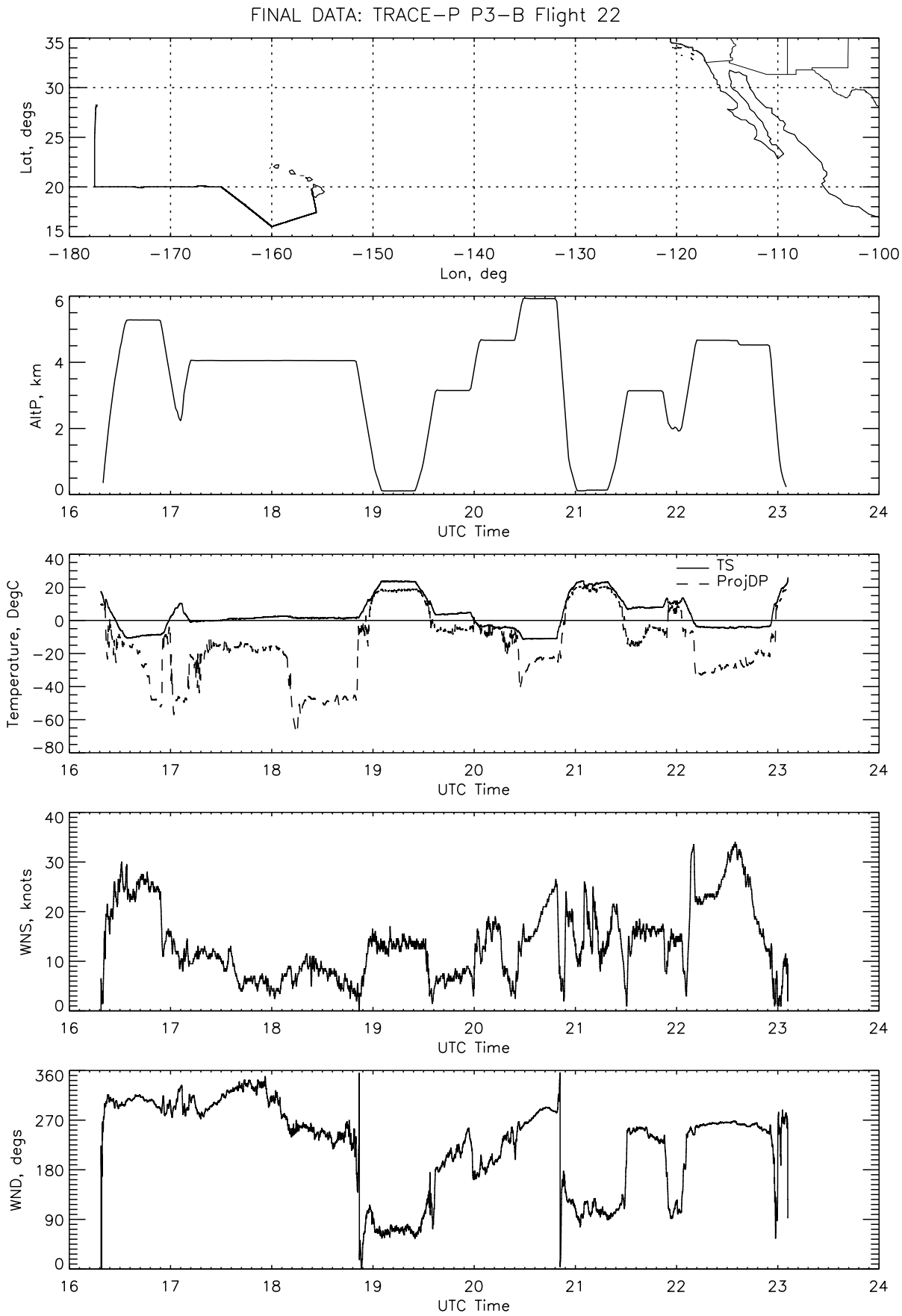
TRACE-P

Flight 22P

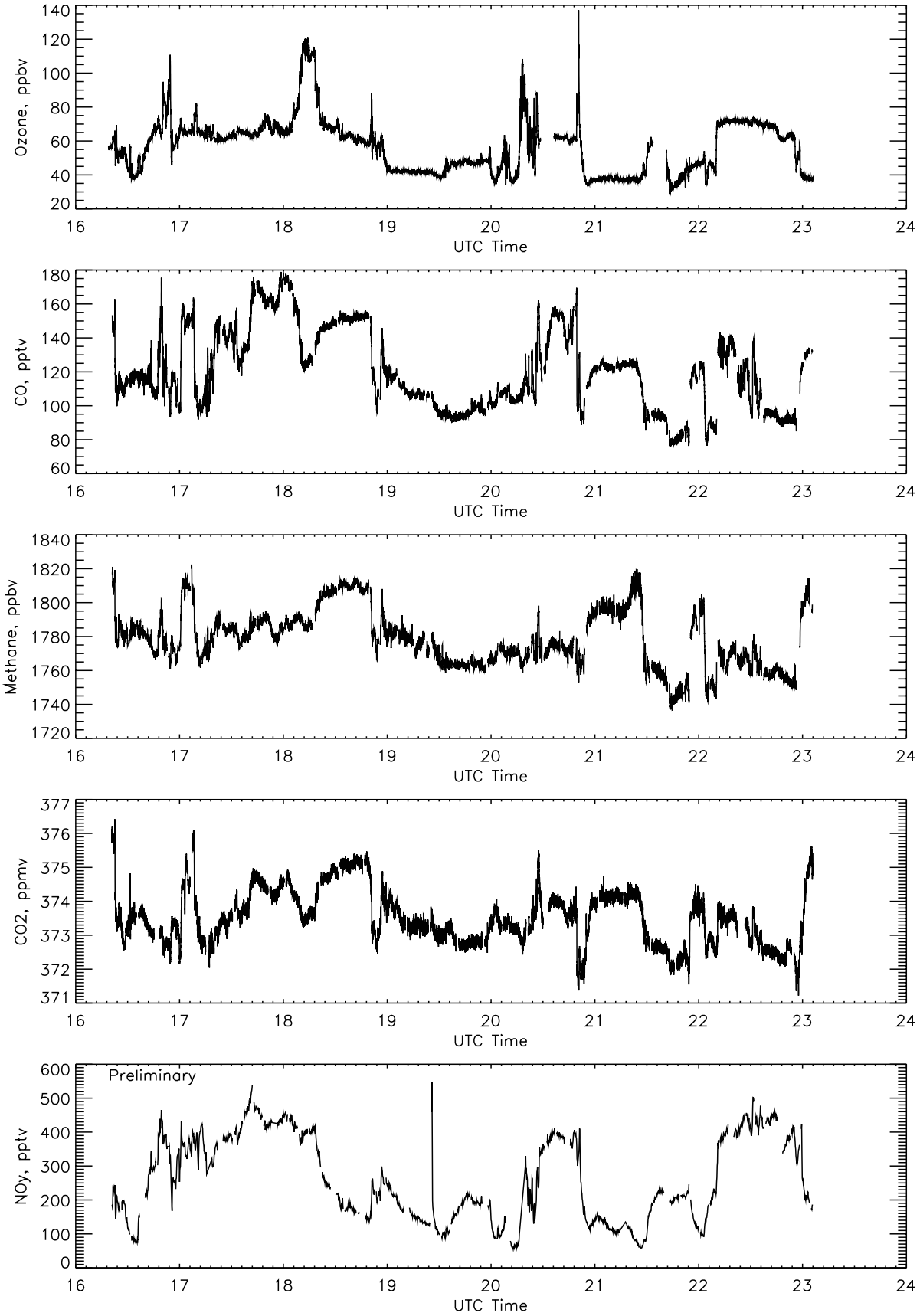
Transit: Midway Island to Kona, HI

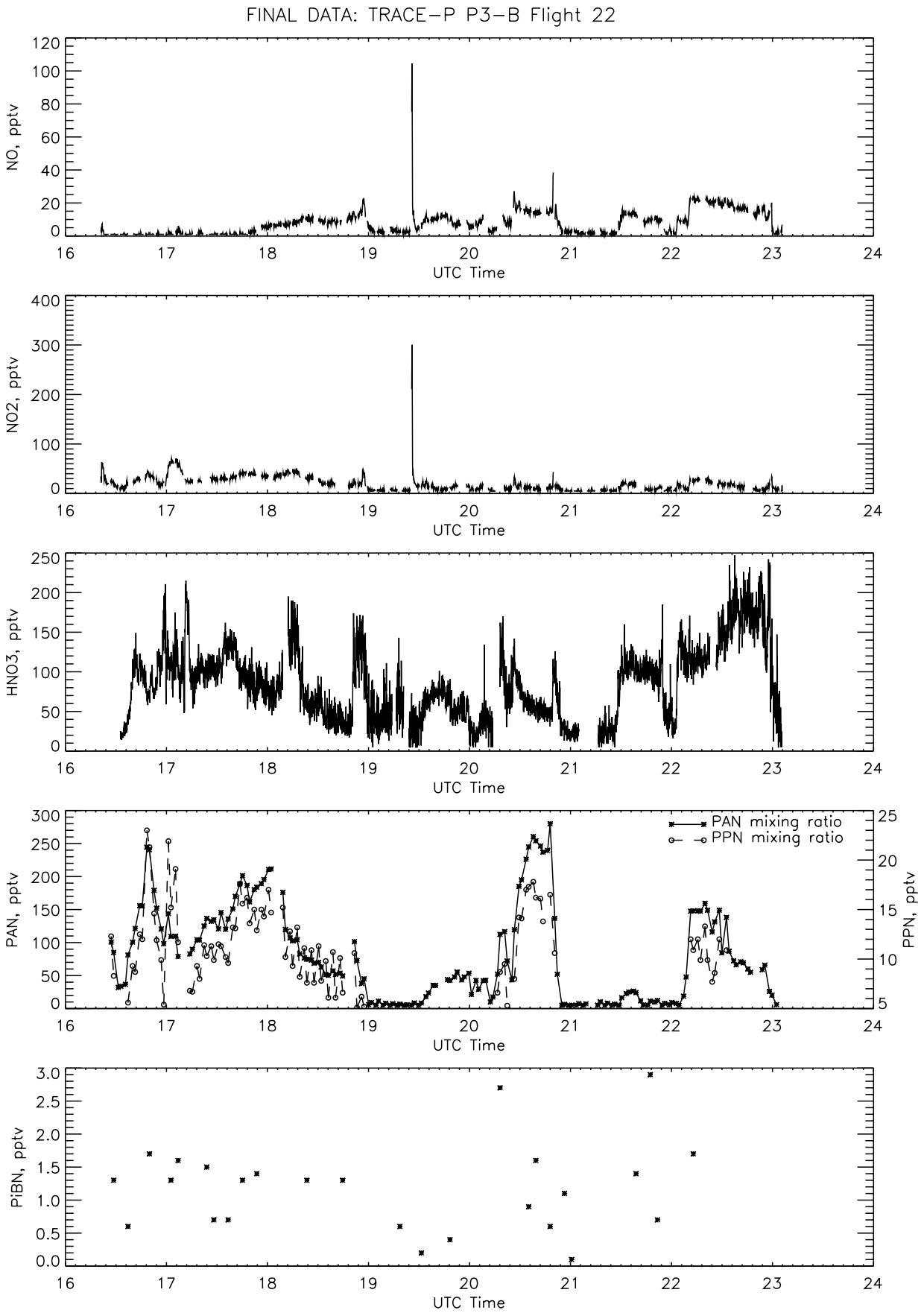
Sunrise Photochemistry;
Stratospheric Influence

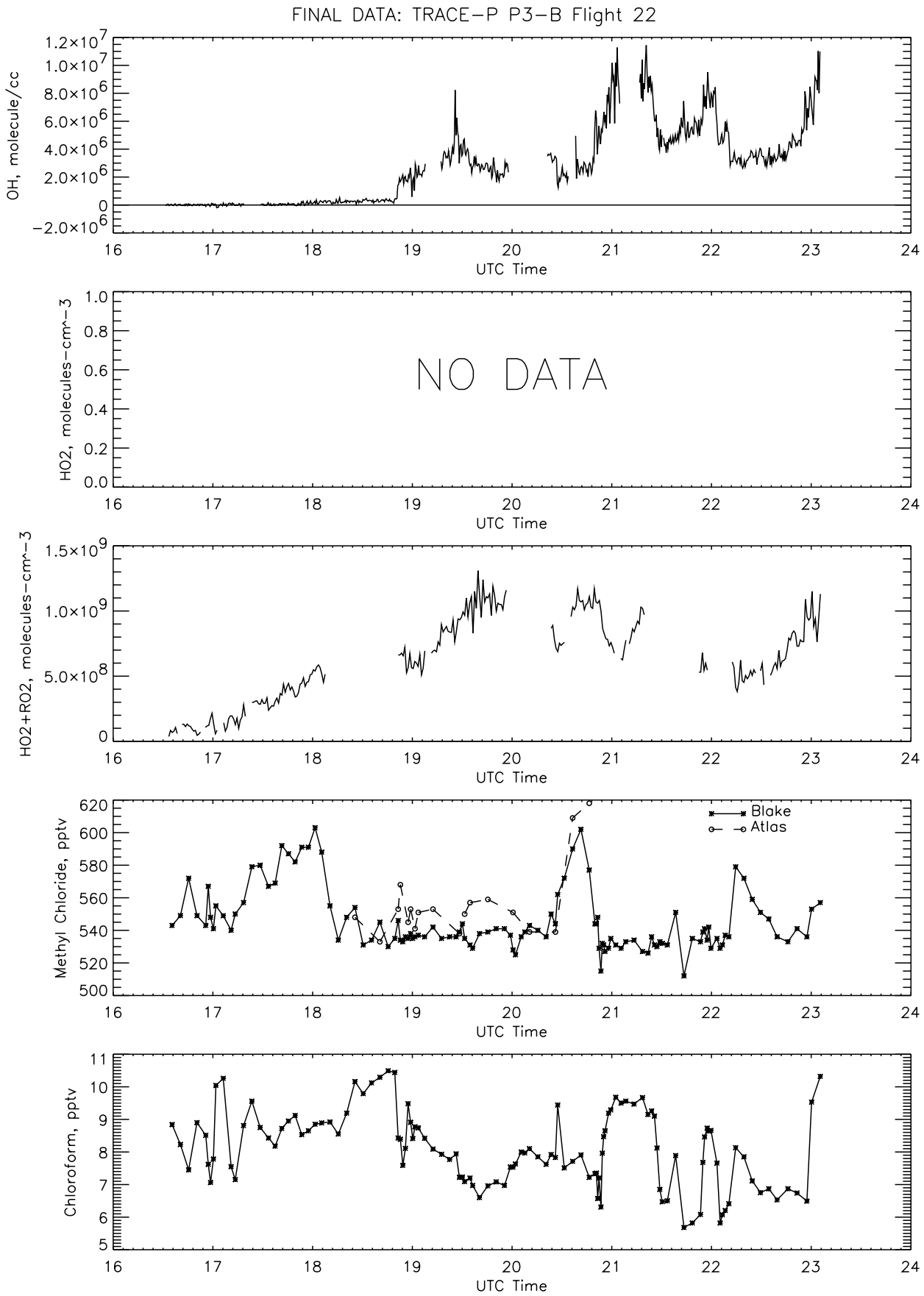
April 7, 2001

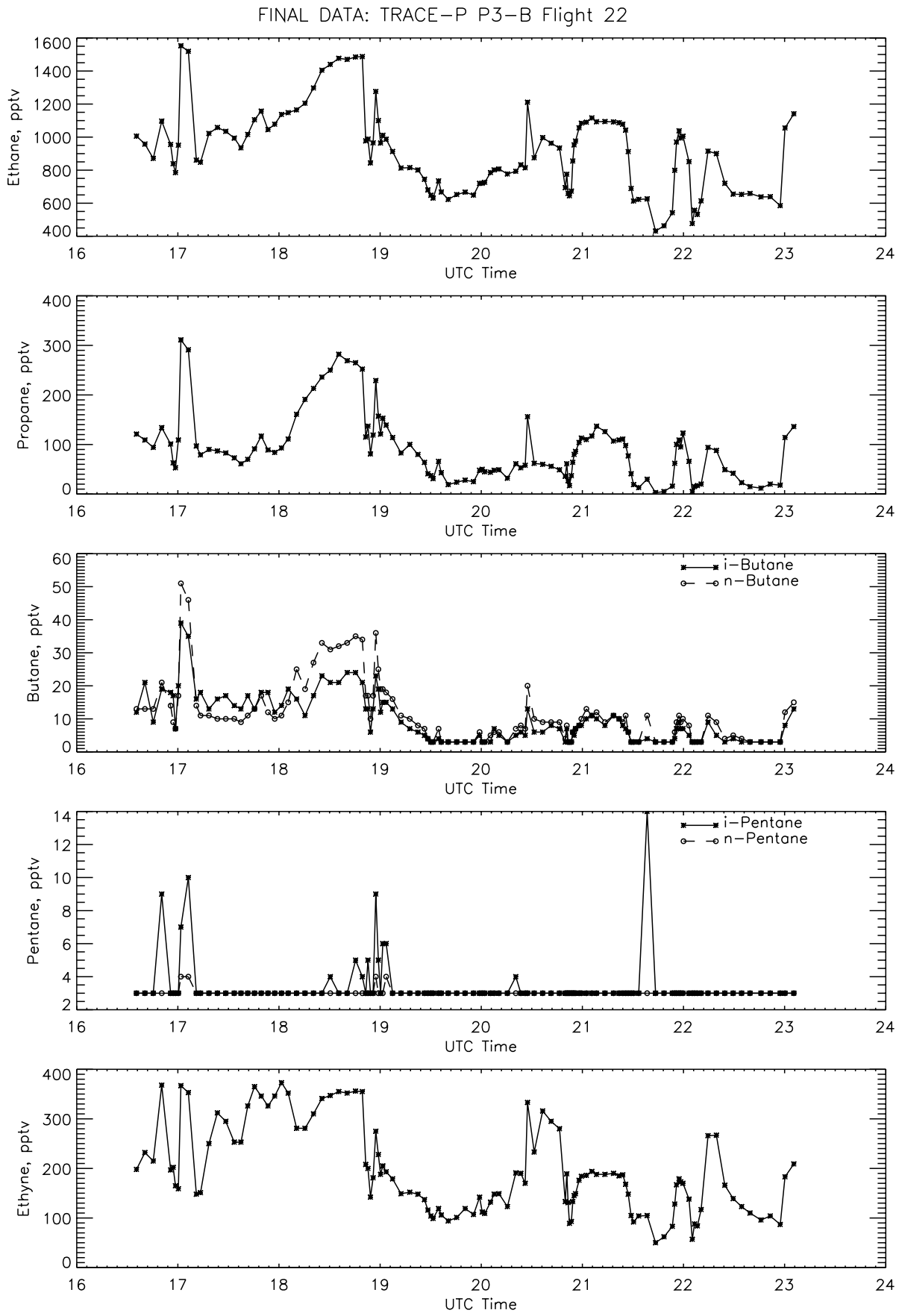

FINAL DATA: TRACE-P P3-B Flight 22
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs

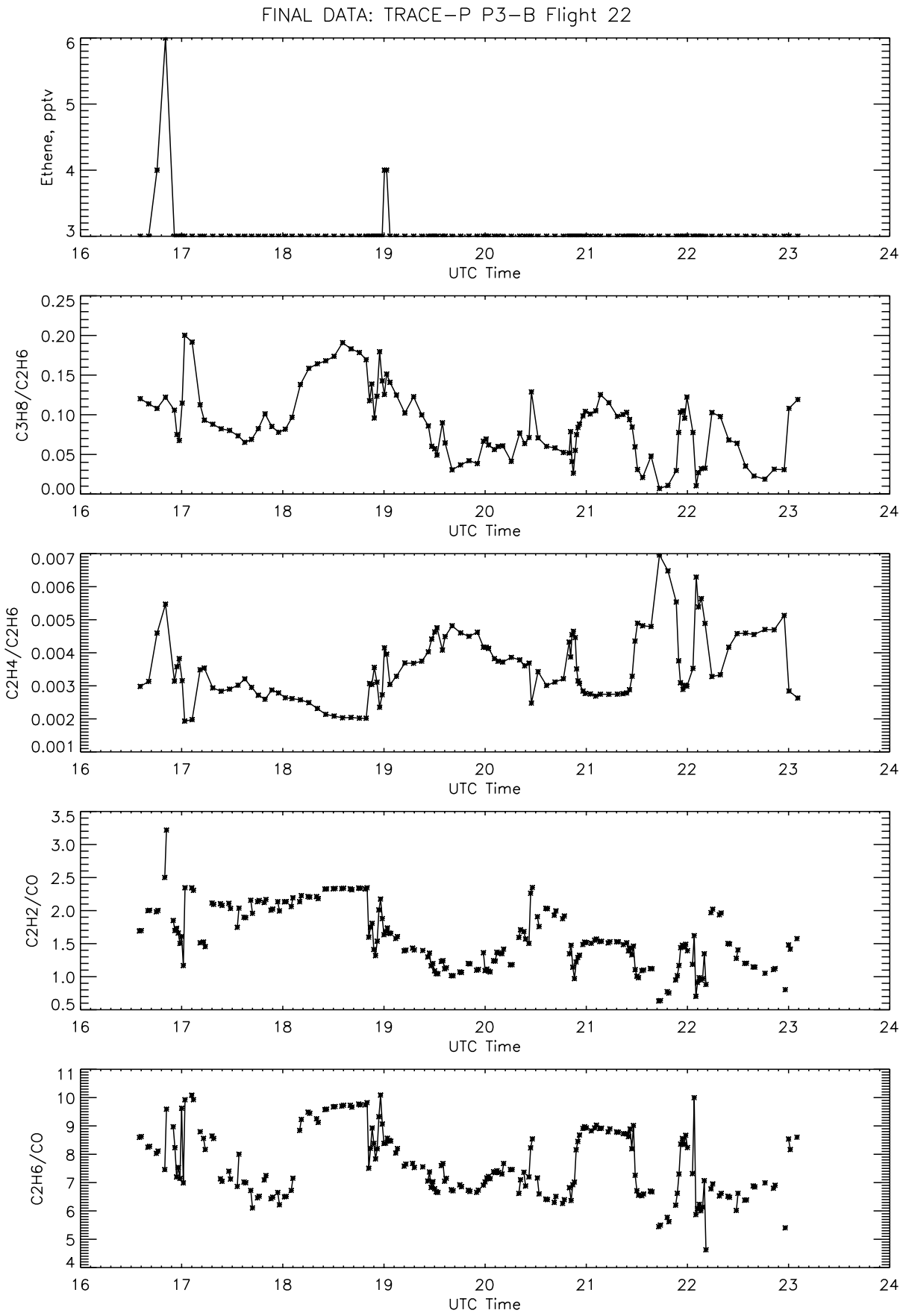
FINAL DATA: TRACE-P P3-B Flight 22

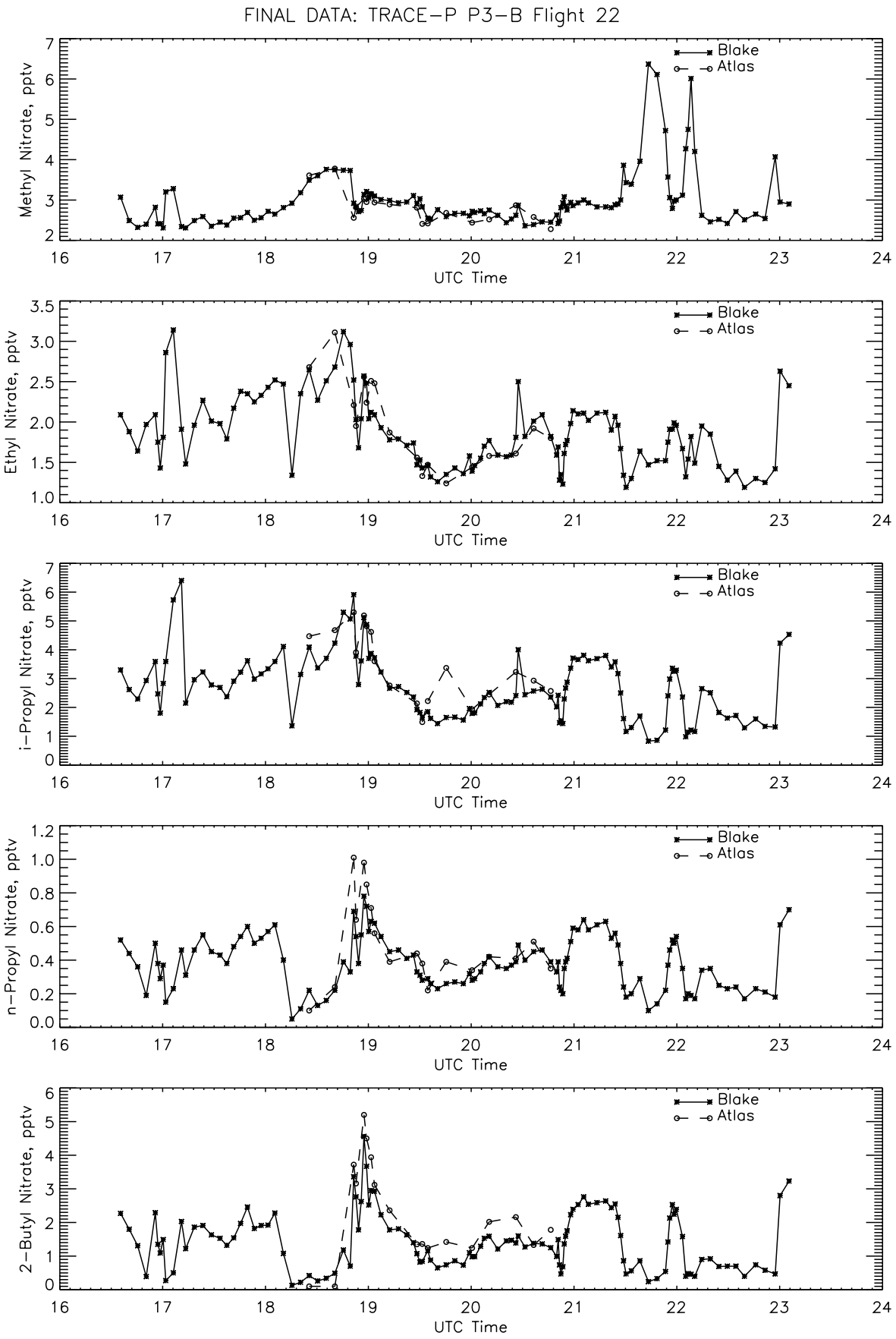


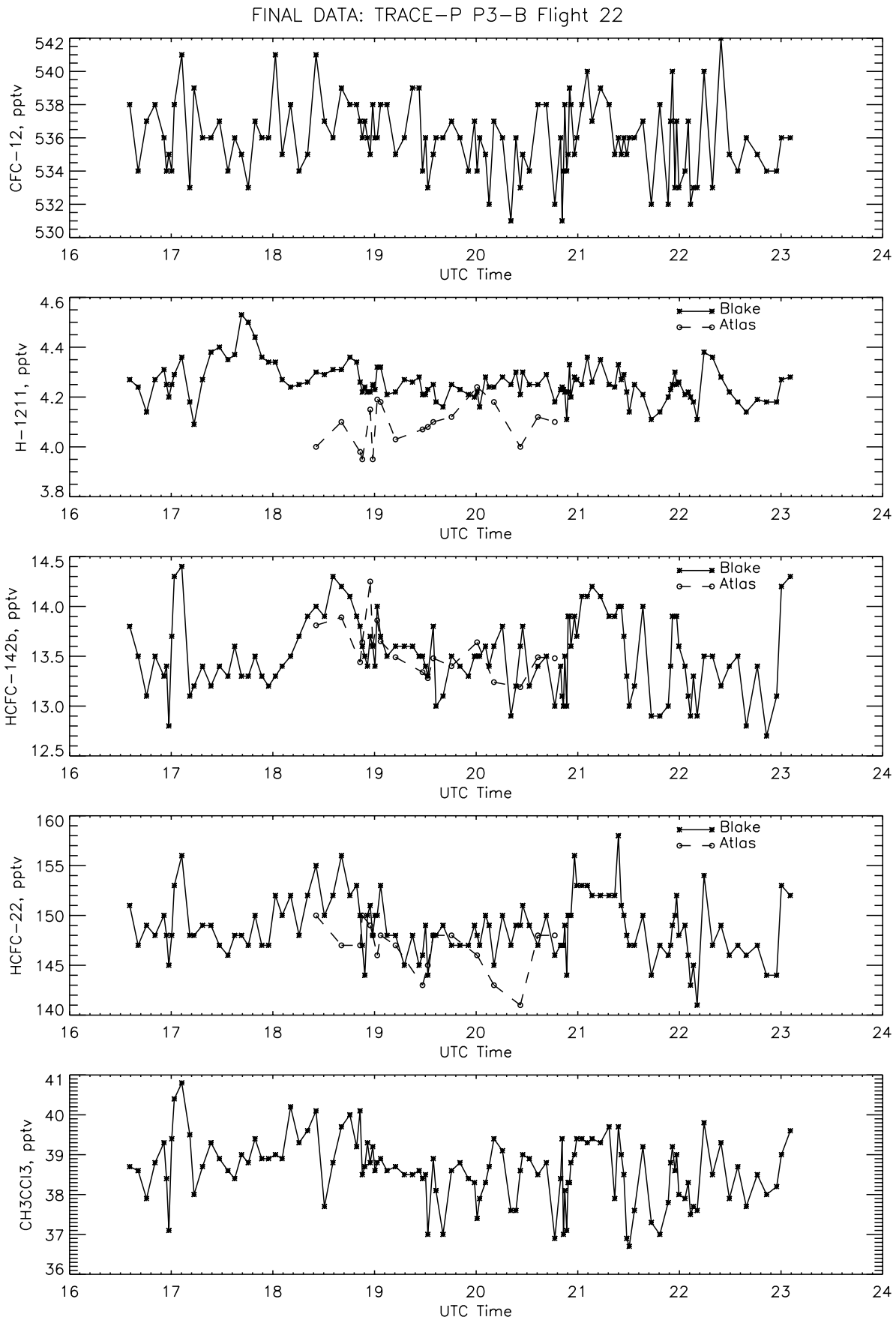

FINAL DATA: TRACE-P P3-B Flight 22
NO, pptv
NO2, pptv
HNO3, pptv
PAN, pptv
PPN, pptv
PiBN, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio

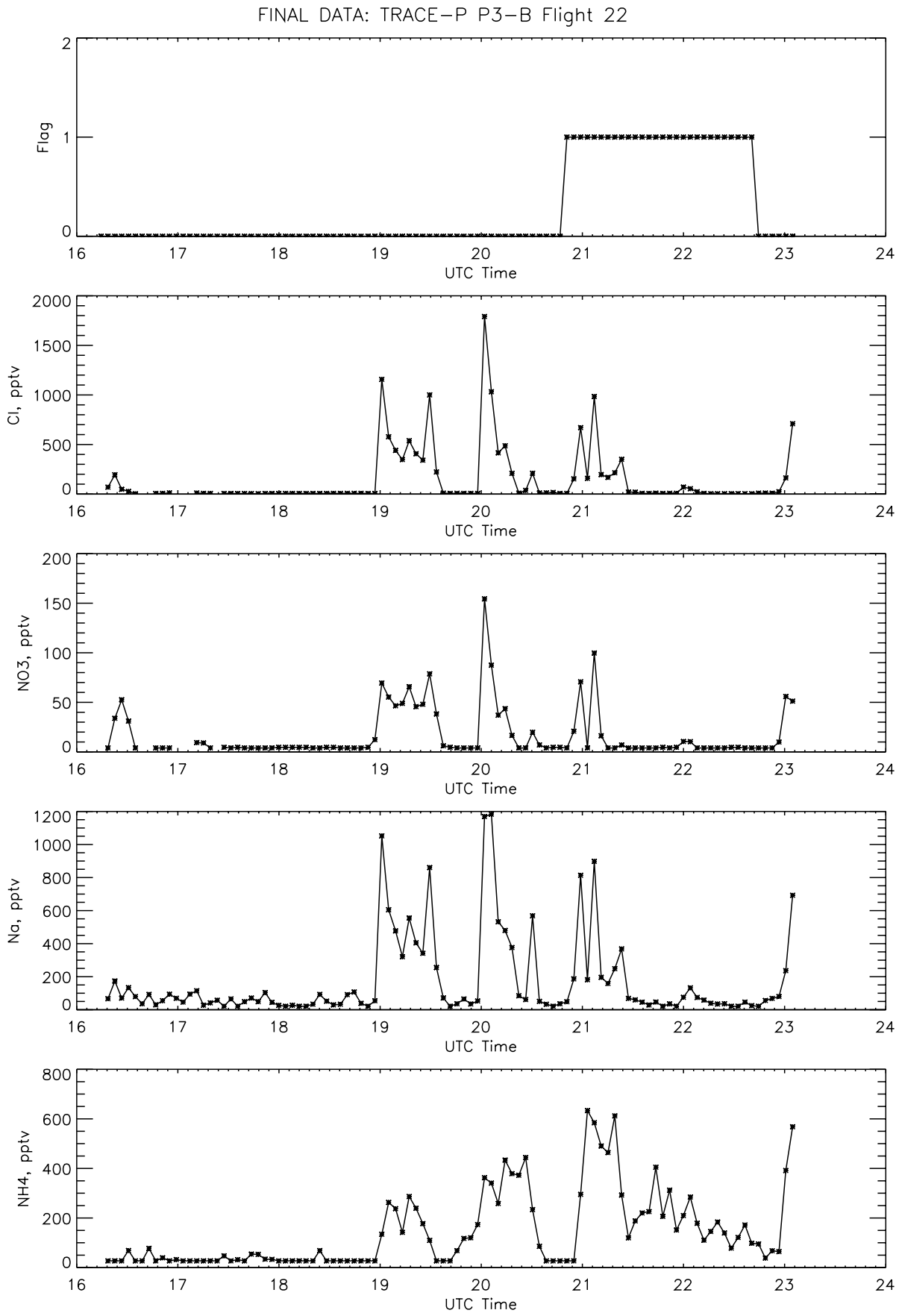

FINAL DATA: TRACE-P P3-B Flight 22
OH, molecule/cc
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

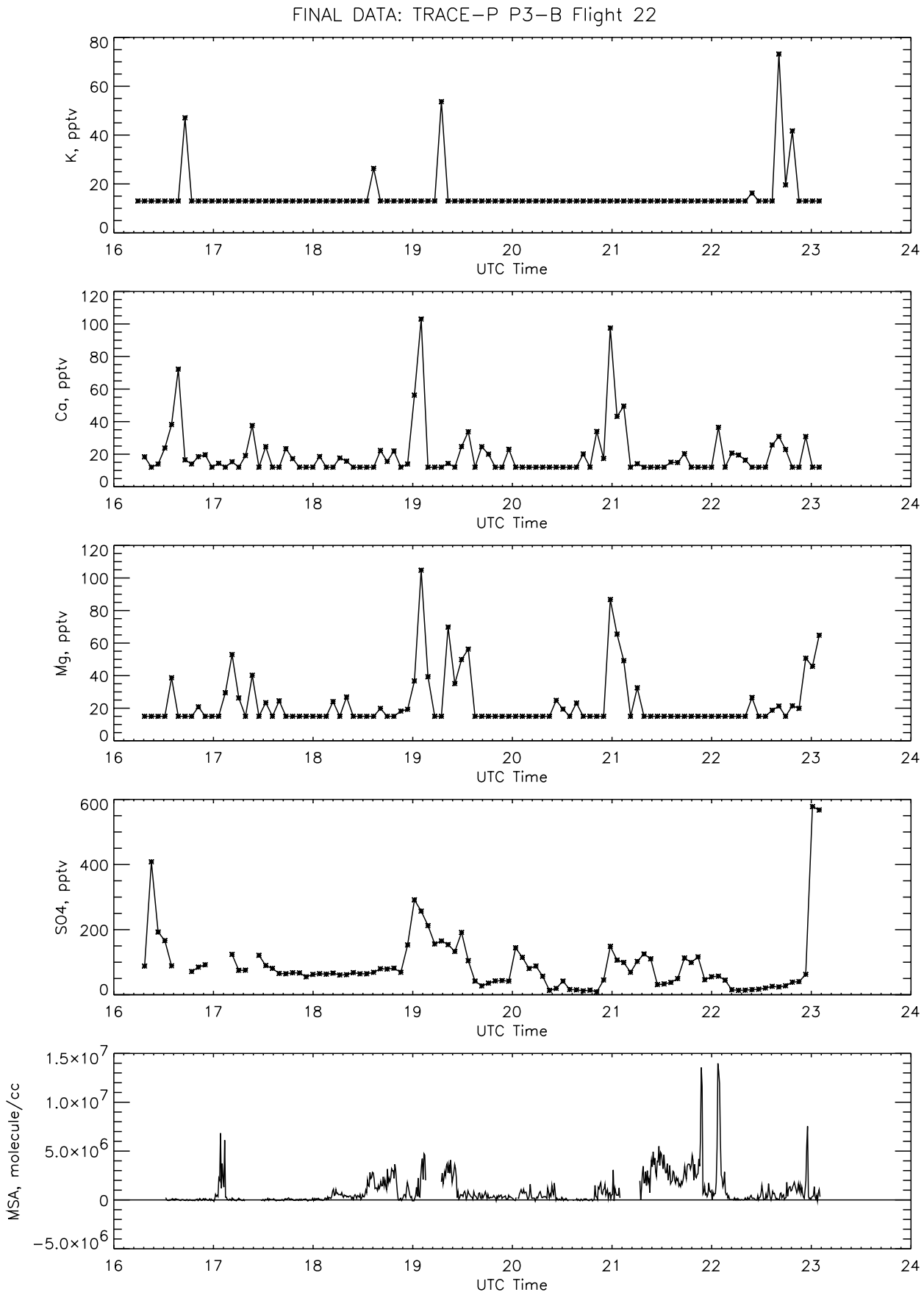

FINAL DATA: TRACE-P P3-B Flight 22
Ethane, pptv
Propane, pptv
Butane, pptv
i-Butane
n-Butane
Pentane, pptv
i-Pentane
n-Pentane
Ethyne, pptv
UTC Time

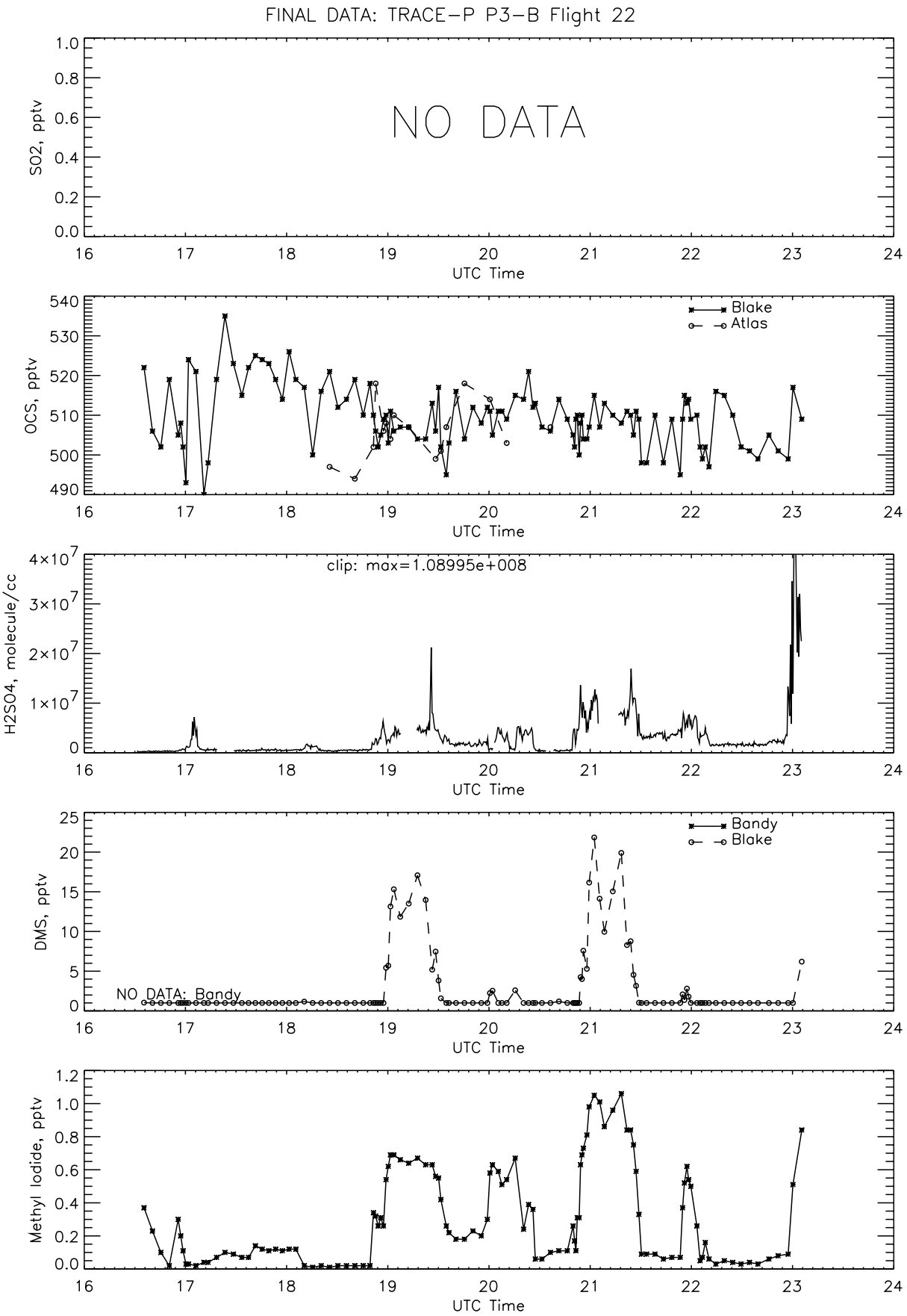

FINAL DATA: TRACE-P P3-B Flight 22
Ethene, pptv
C3H8/C2H6
C2H4/C2H6
C2H2/CO
C2H6/CO
UTC Time

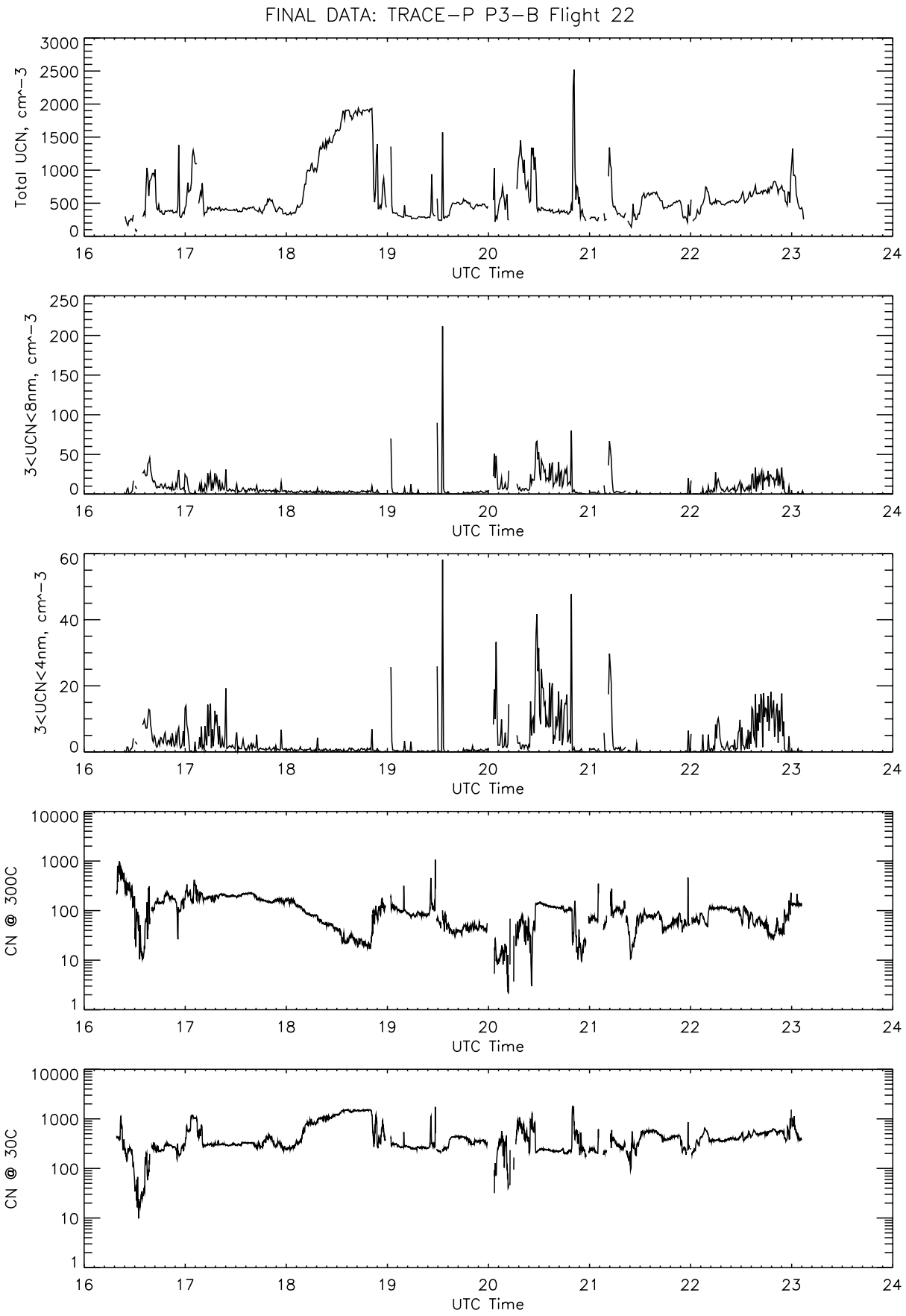

FINAL DATA: TRACE-P P3-B Flight 22
Methyl Nitrate, pptv
Ethyl Nitrate, pptv
i-Propyl Nitrate, pptv
n-Propyl Nitrate, pptv
2-Butyl Nitrate, pptv
UTC Time
Blake
Atlas

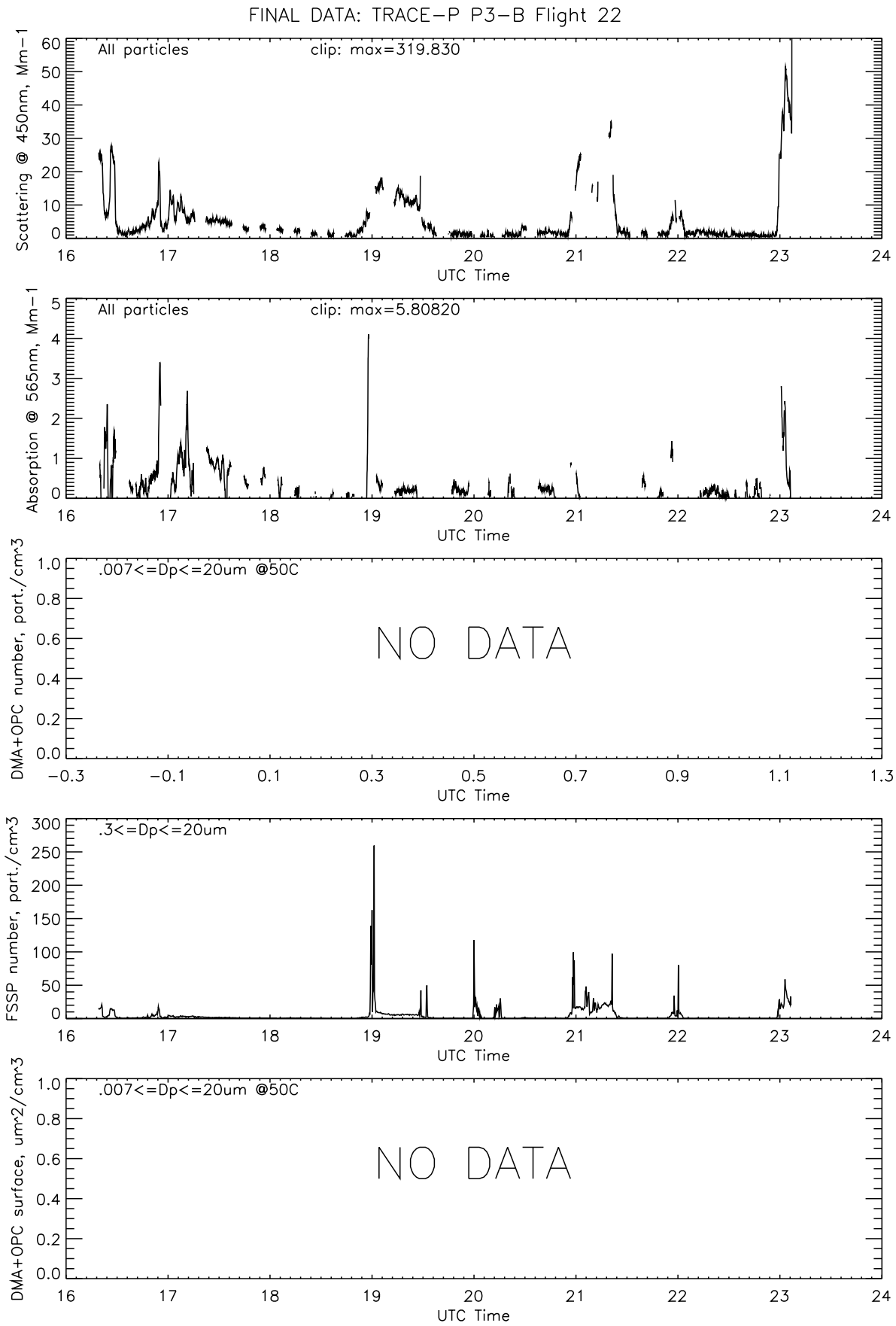

FINAL DATA: TRACE-P P3-B Flight 22
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

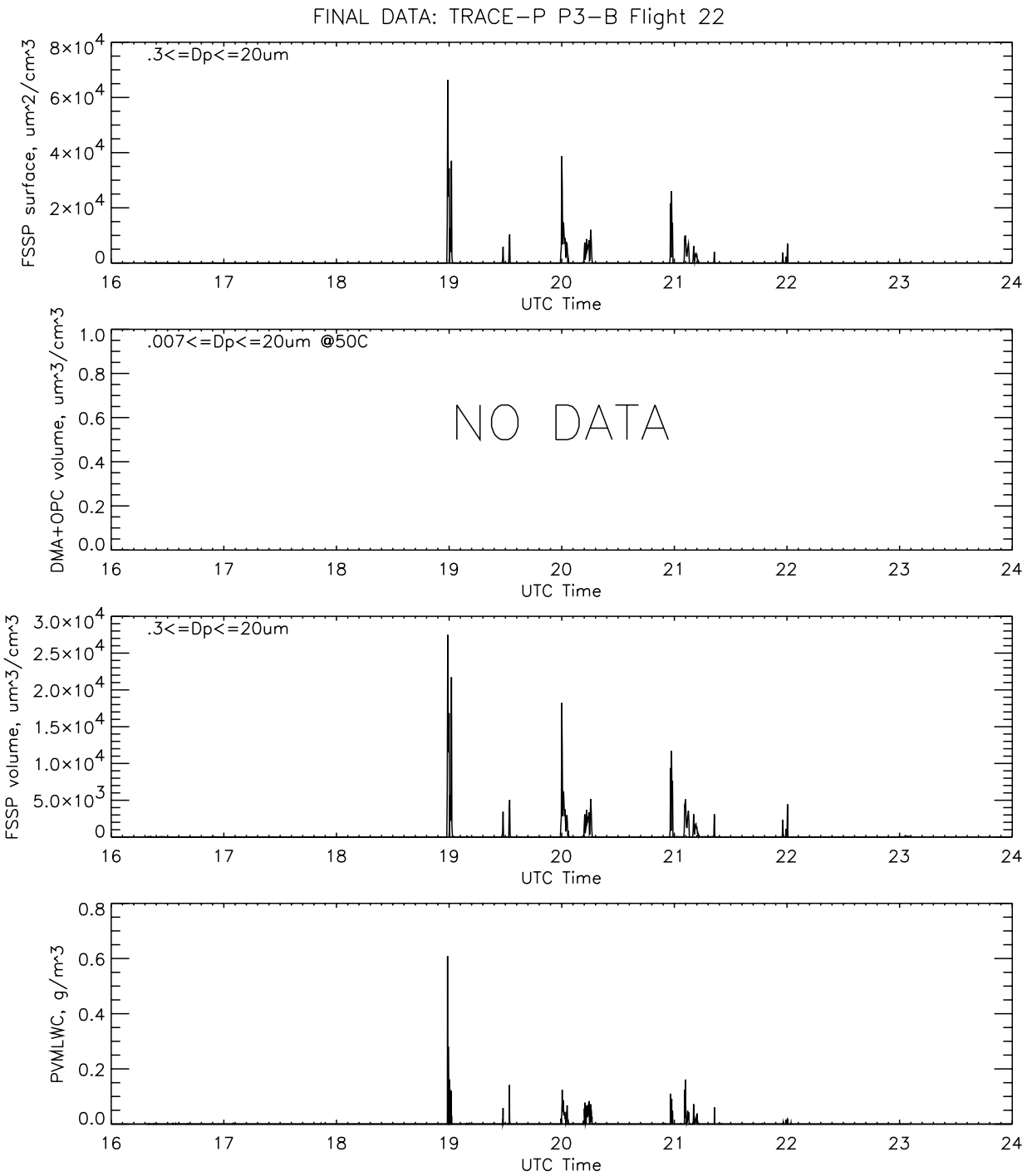

FINAL DATA: TRACE-P P3-B Flight 22
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 22
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

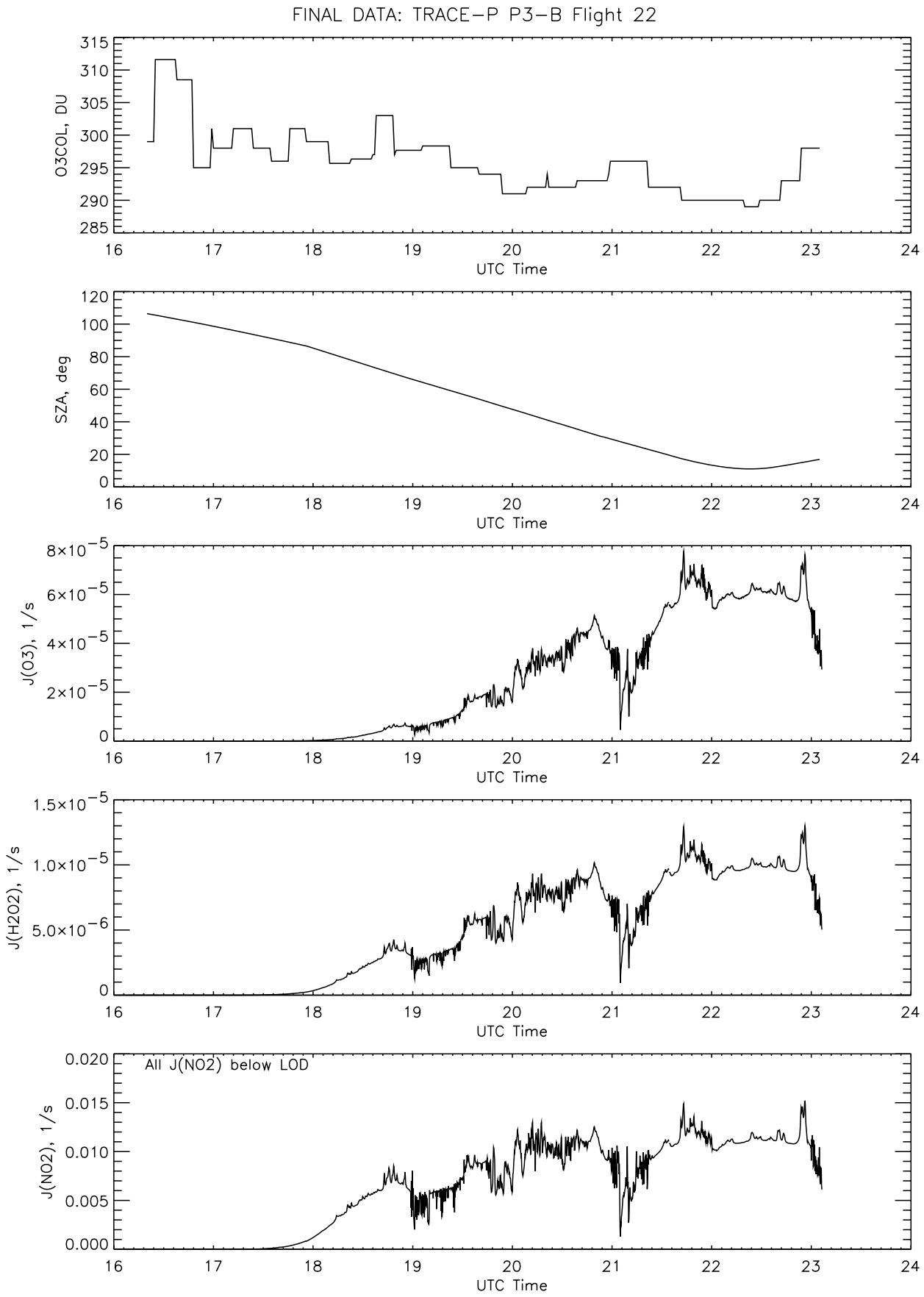

FINAL DATA: TRACE-P P3-B Flight 22
SO2, pptv
NO DATA
UTC Time
OCS, pptv
Blake
Atlas
UTC Time
H2SO4, molecule/cc
clip: max=1.08995e+008
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

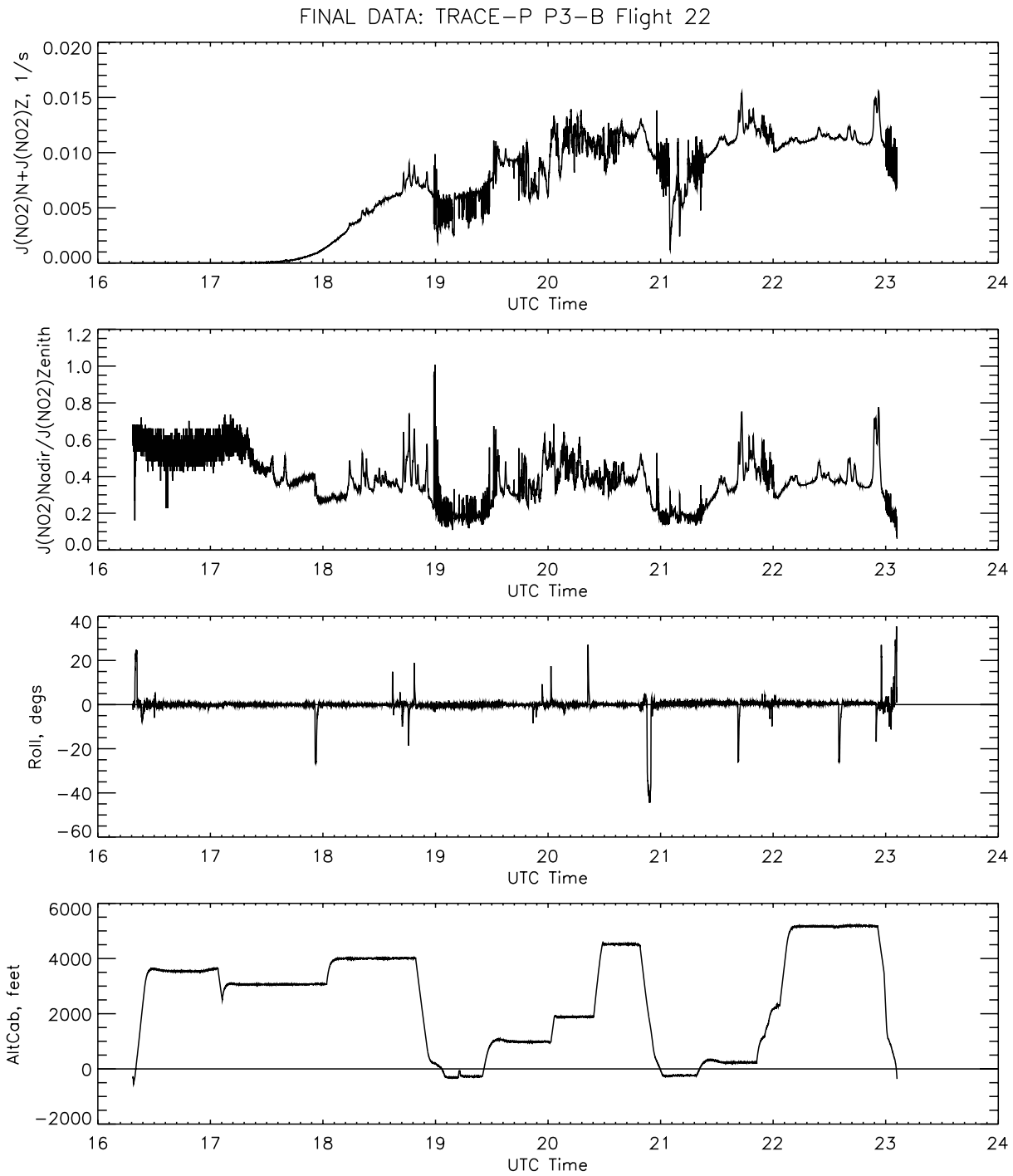

FINAL DATA: TRACE-P P3-B Flight 22
Total UCN, cm^-3
3<UCN<8nm, cm^-3
3<UCN<4nm, cm^-3
CN @ 300C
CN @ 30C
UTC Time

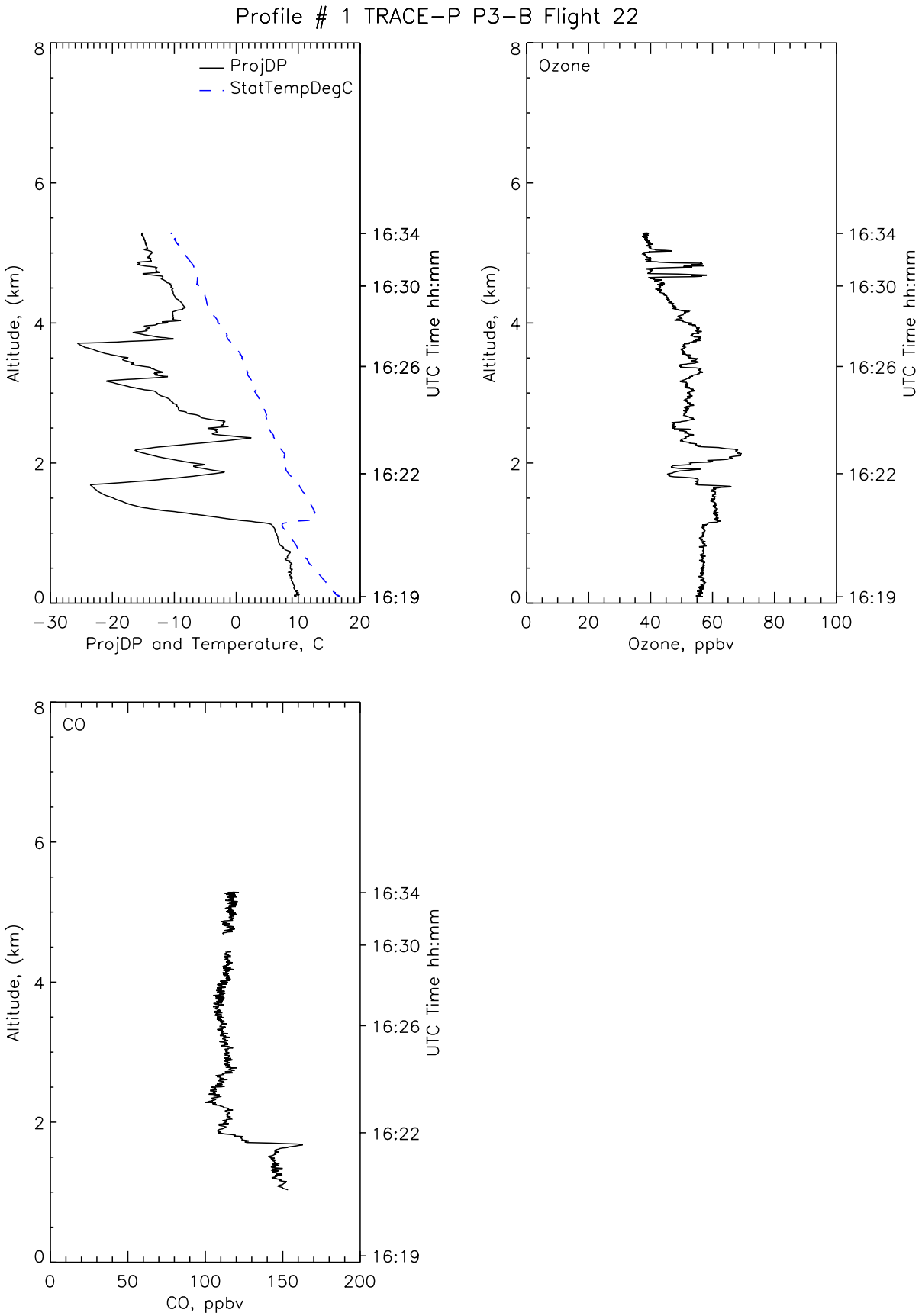

FINAL DATA: TRACE-P P3-B Flight 22
All particles
clip: max=319.830
Scattering @ 450nm, Mm-1
UTC Time
All particles
clip: max=5.80820
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
NO DATA
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
NO DATA
DMA+OPC surface, um^2/cm^3
UTC Time

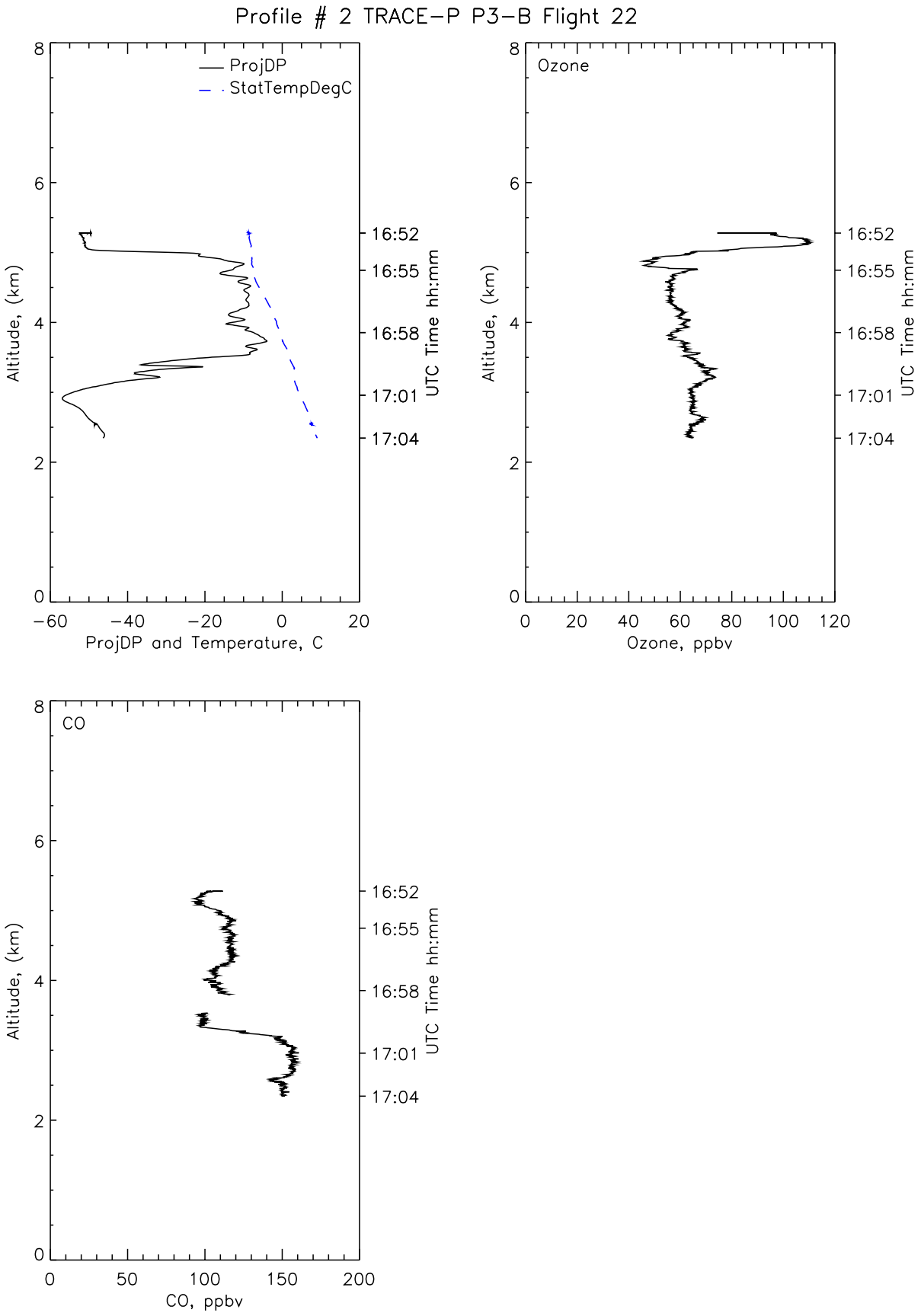

FINAL DATA: TRACE-P P3-B Flight 22
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
NO DATA
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

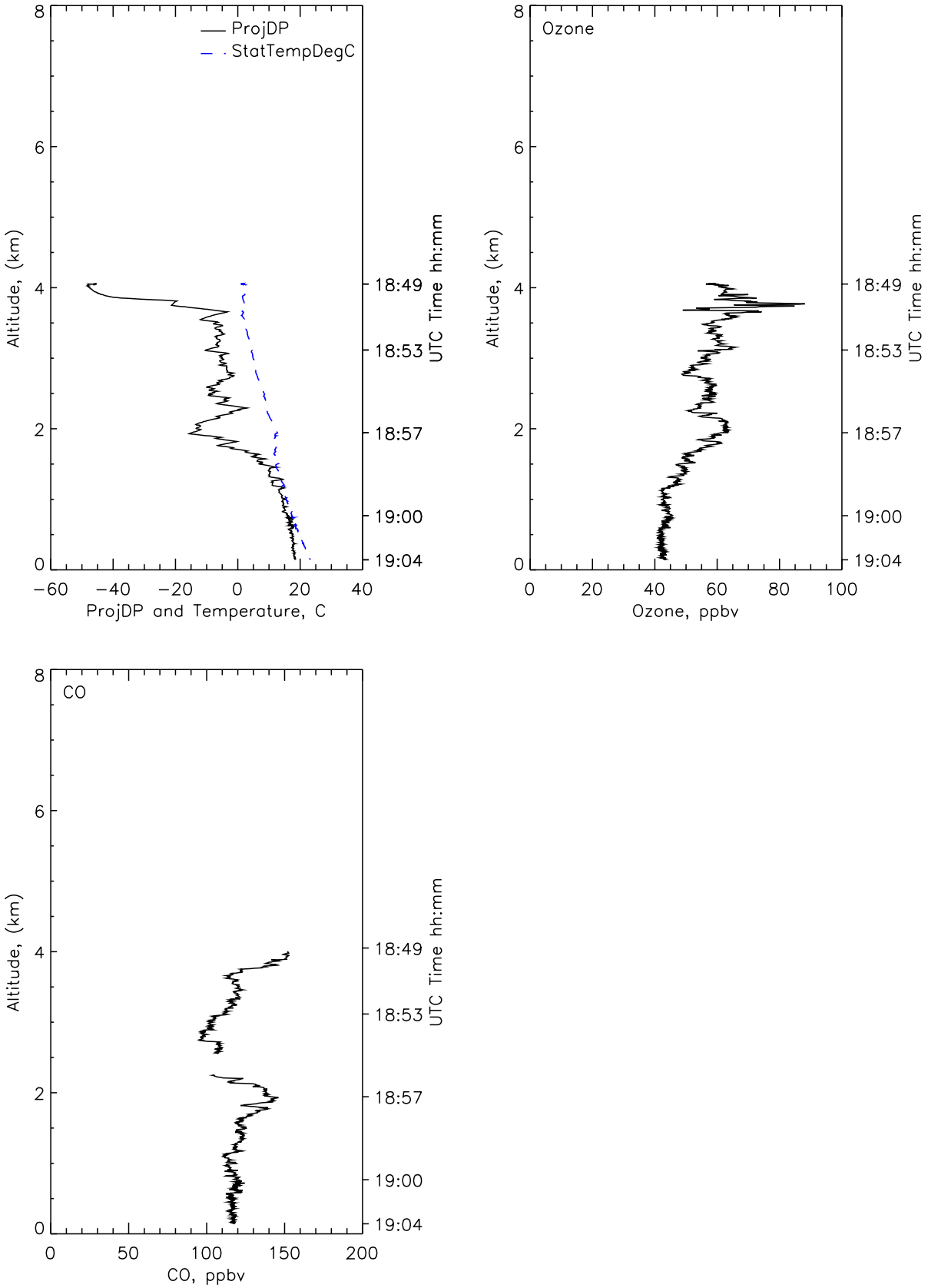

FINAL DATA: TRACE-P P3-B Flight 22
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
All J(NO2) below LOD
UTC Time


FINAL DATA: TRACE-P P3-B Flight 22
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
16
17
18
19
20
21
22
23
24
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
−60
UTC Time
AltCab, feet
6000
4000
2000
0
−2000
UTC Time

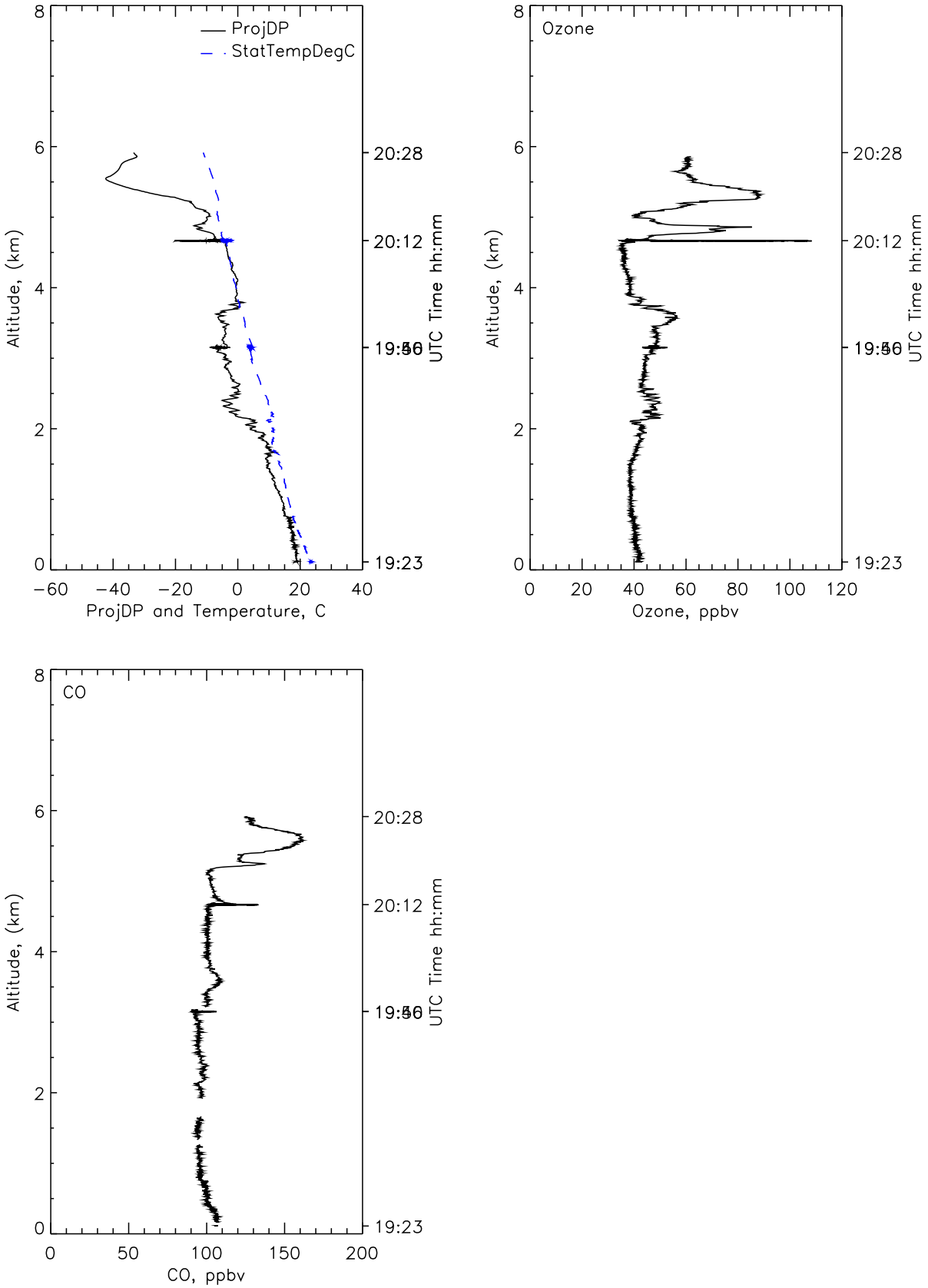

Profile # 1 TRACE-P P3-B Flight 22
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
16:19
16:22
16:26
16:30
16:34
Ozone
Ozone, ppbv
CO
CO, ppbv

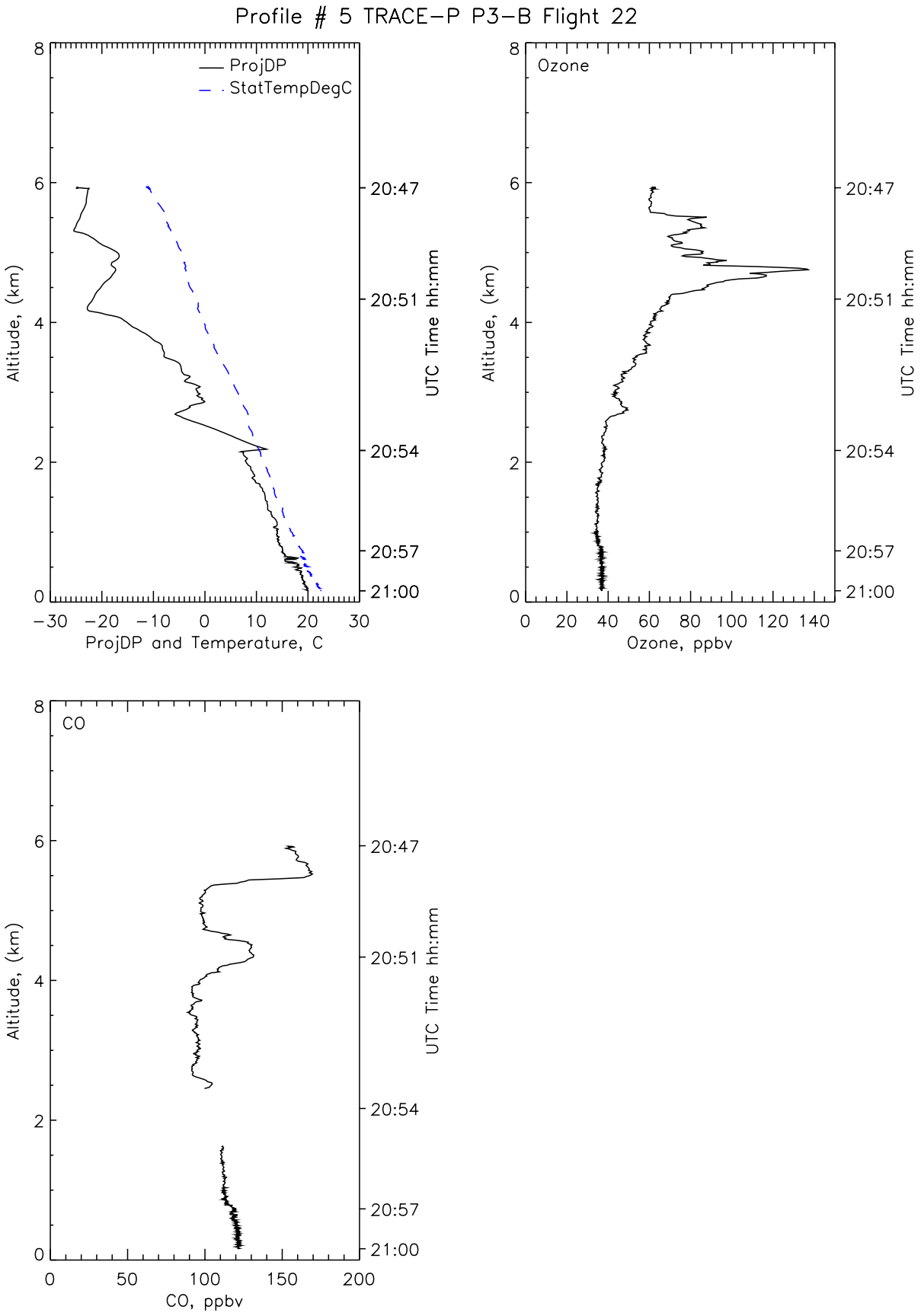

Profile # 2 TRACE-P P3-B Flight 22
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
16:52
16:55
16:58
17:01
17:04
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 3 TRACE-P P3-B Flight 22

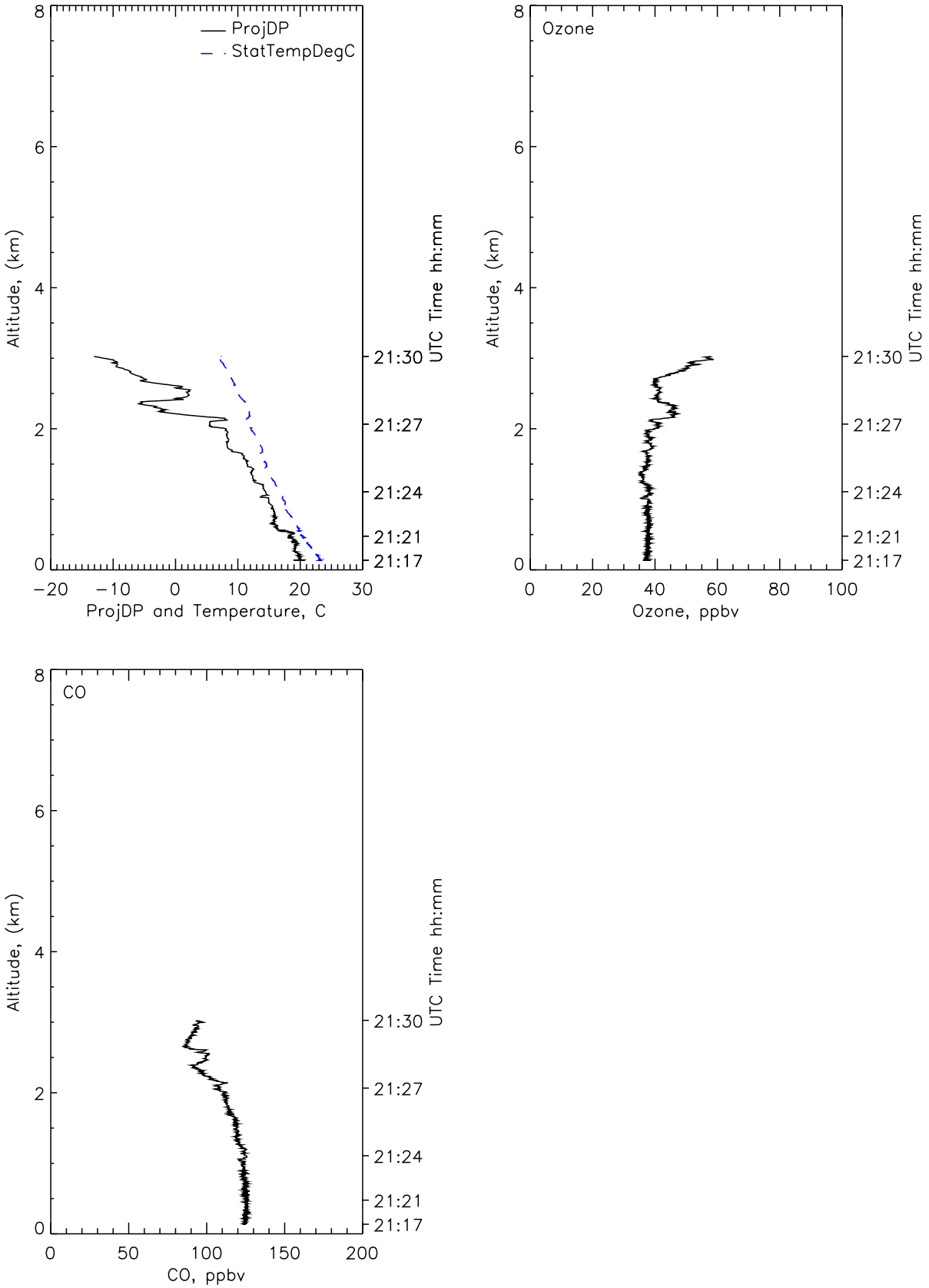


Profile # 4 TRACE-P P3-B Flight 22

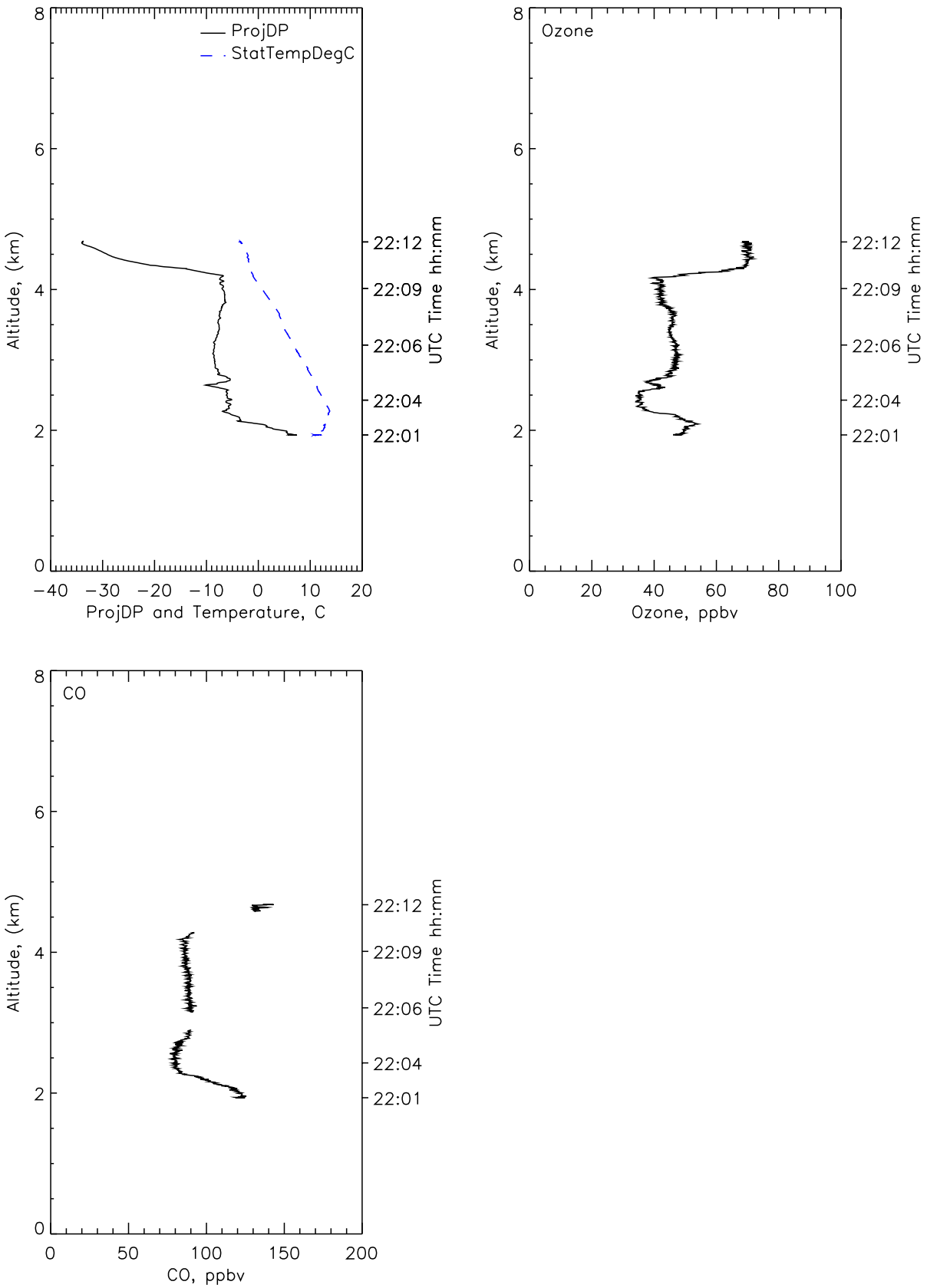


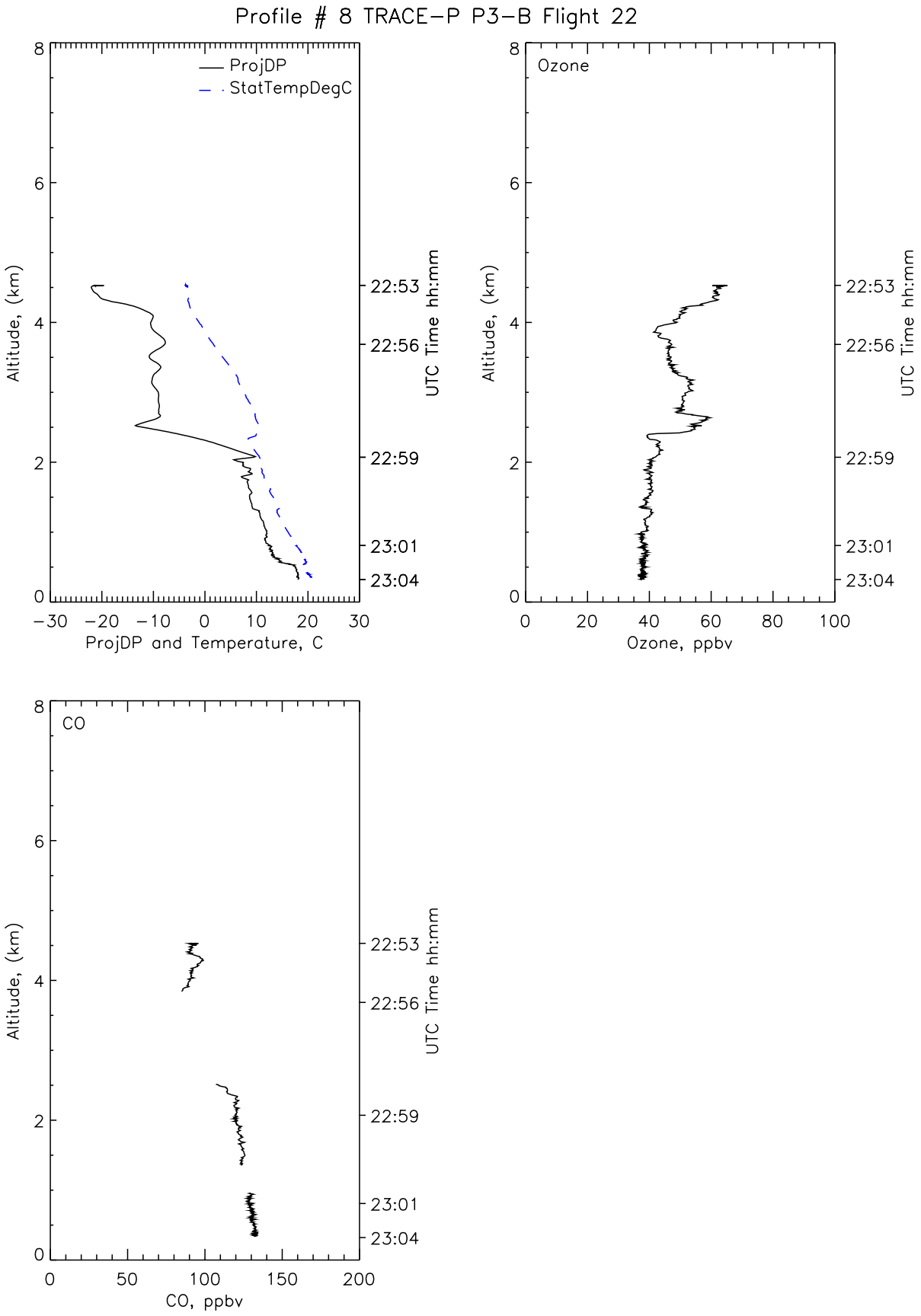

Profile # 5 TRACE-P P3-B Flight 22
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
20:47
20:51
20:54
20:57
21:00
Ozone
Ozone, ppbv
CO
CO, ppbv

Profile # 6 TRACE-P P3-B Flight 22



Profile # 7 TRACE-P P3-B Flight 22




Profile # 8 TRACE-P P3-B Flight 22
ProjDP
StatTempDegC
Altitude, (km)
ProjDP and Temperature, C
UTC Time hh:mm
22:53
22:56
22:59
23:01
23:04
Ozone
Ozone, ppbv
CO
CO, ppbv

CHEMICAL and METEOROLOGICAL DATA

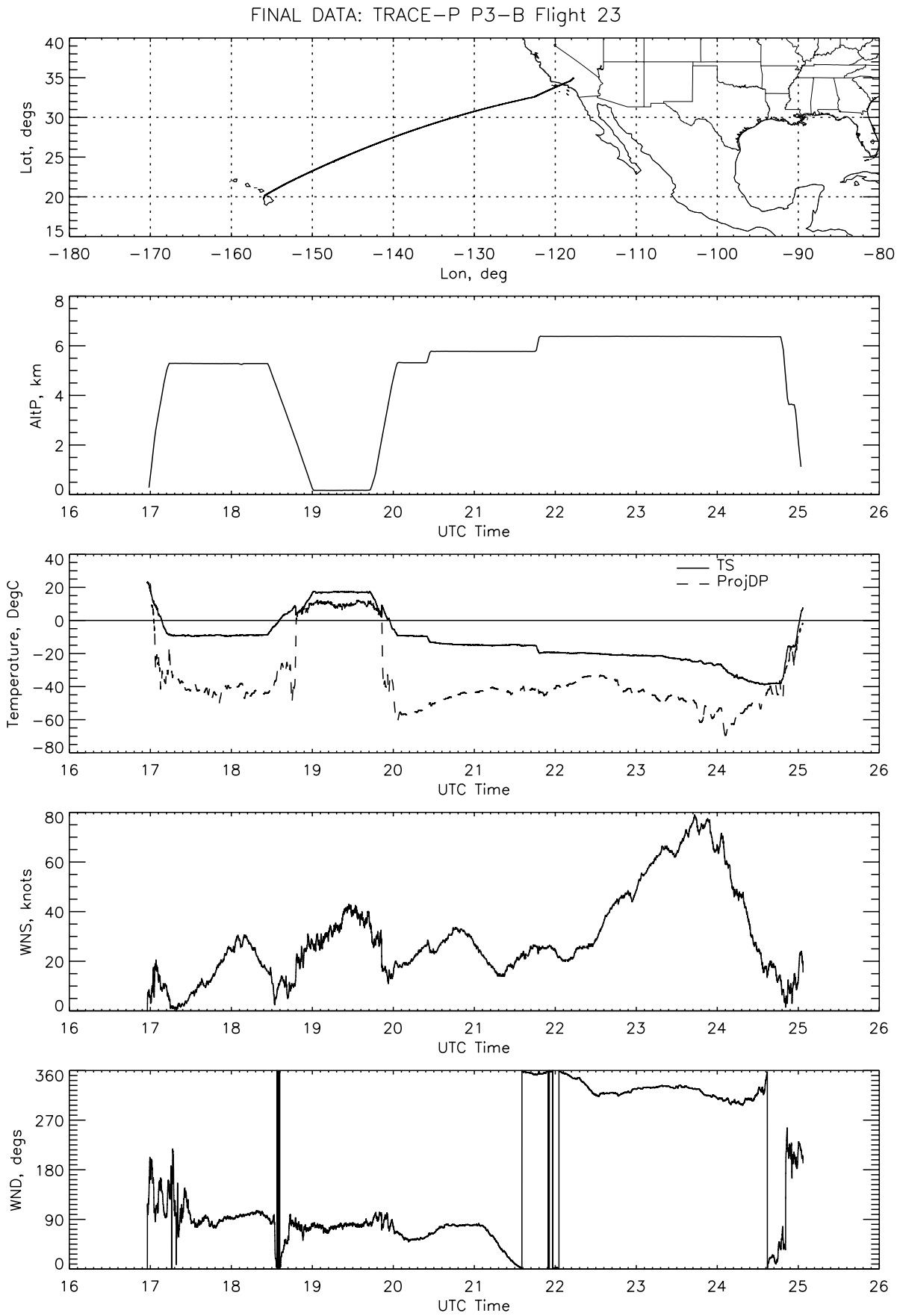
TRACE-P

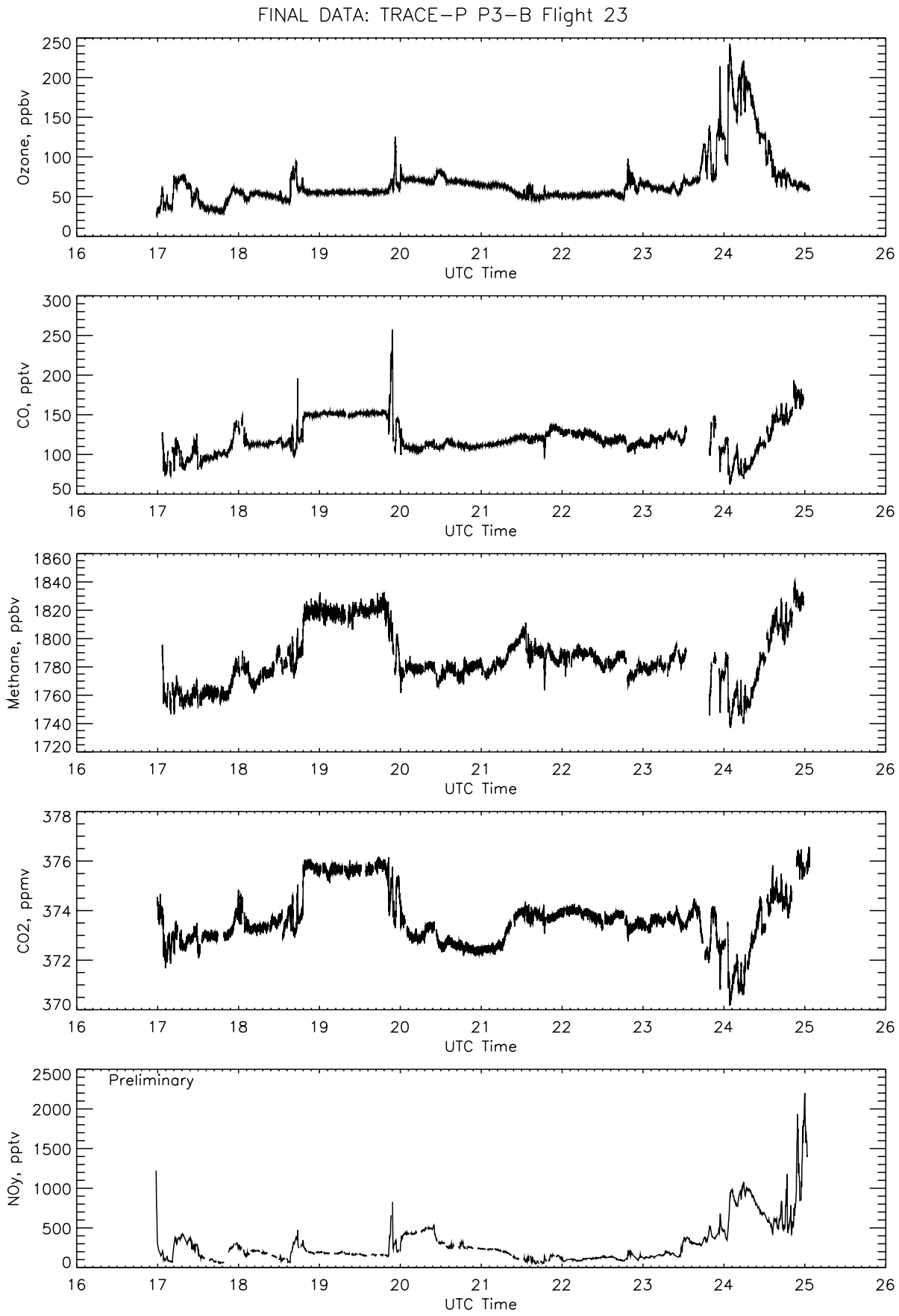
Flight 23P

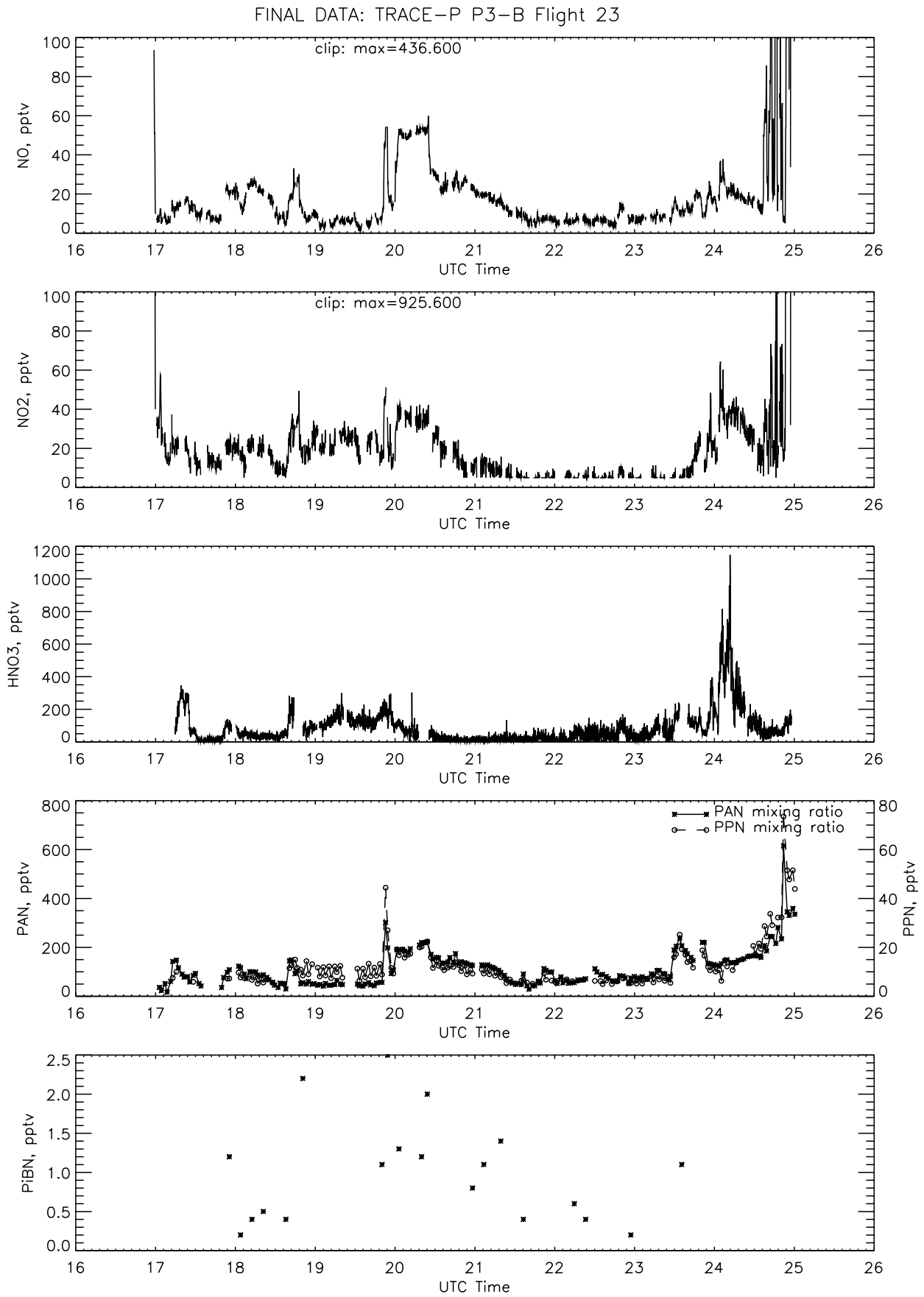
Transit: Kona, HI to NASA-DFRC

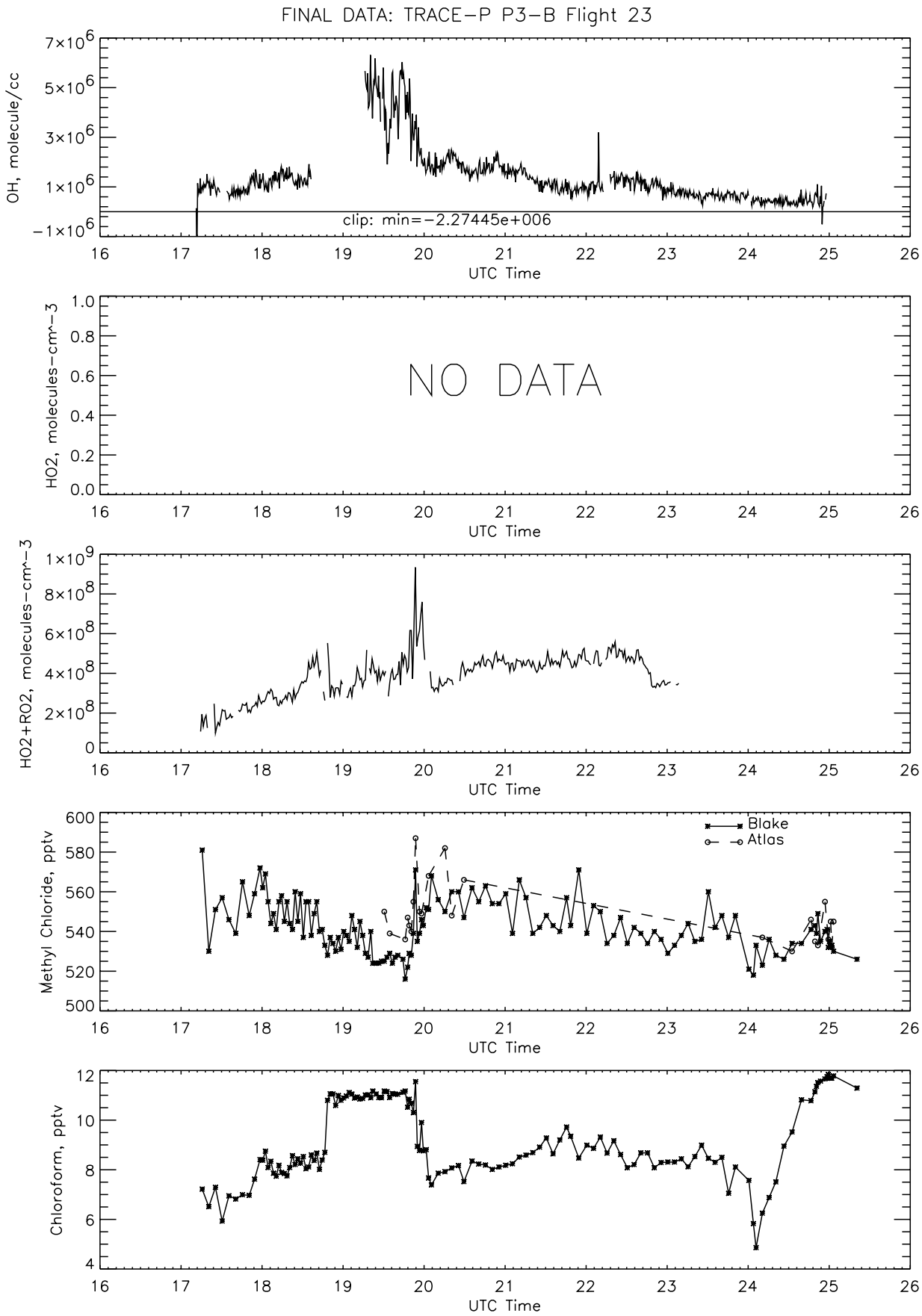
Aircraft Intercomparison

April 9, 2001

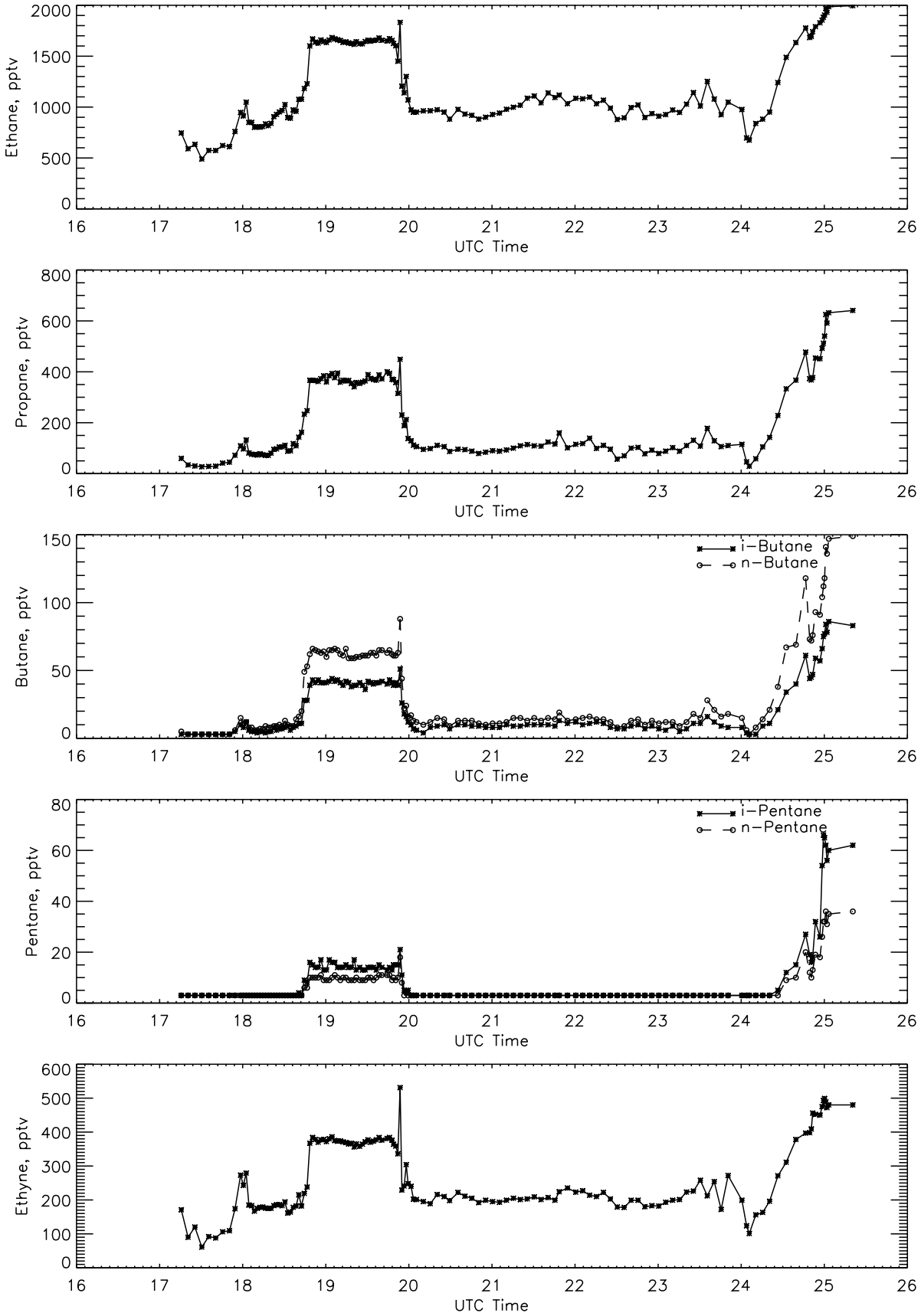

FINAL DATA: TRACE-P P3-B Flight 23
Lat, degs
Lon, deg
AltP, km
UTC Time
Temperature, DegC
TS
ProjDP
WNS, knots
WND, degs


FINAL DATA: TRACE-P P3-B Flight 23
Ozone, ppbv
CO, pptv
Methane, ppbv
CO2, ppmv
NOy, pptv
Preliminary
UTC Time

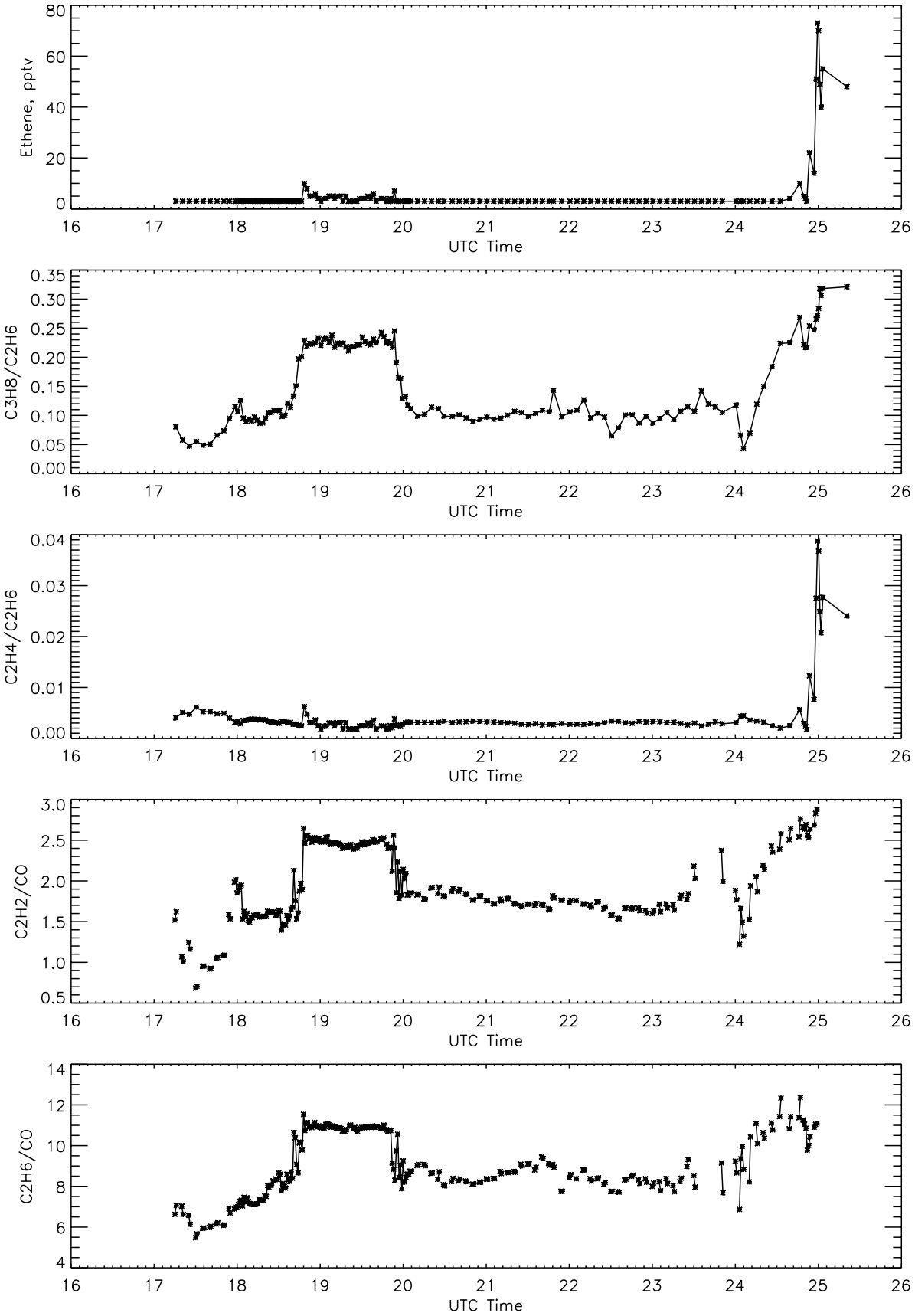

FINAL DATA: TRACE-P P3-B Flight 23
clip: max=436.600
NO, pptv
UTC Time
clip: max=925.600
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 23
OH, molecule/cc
clip: min=-2.27445e+006
UTC Time
HO2, molecules-cm^-3
NO DATA
UTC Time
HO2+RO2, molecules-cm^-3
UTC Time
Methyl Chloride, pptv
Blake
Atlas
UTC Time
Chloroform, pptv
UTC Time

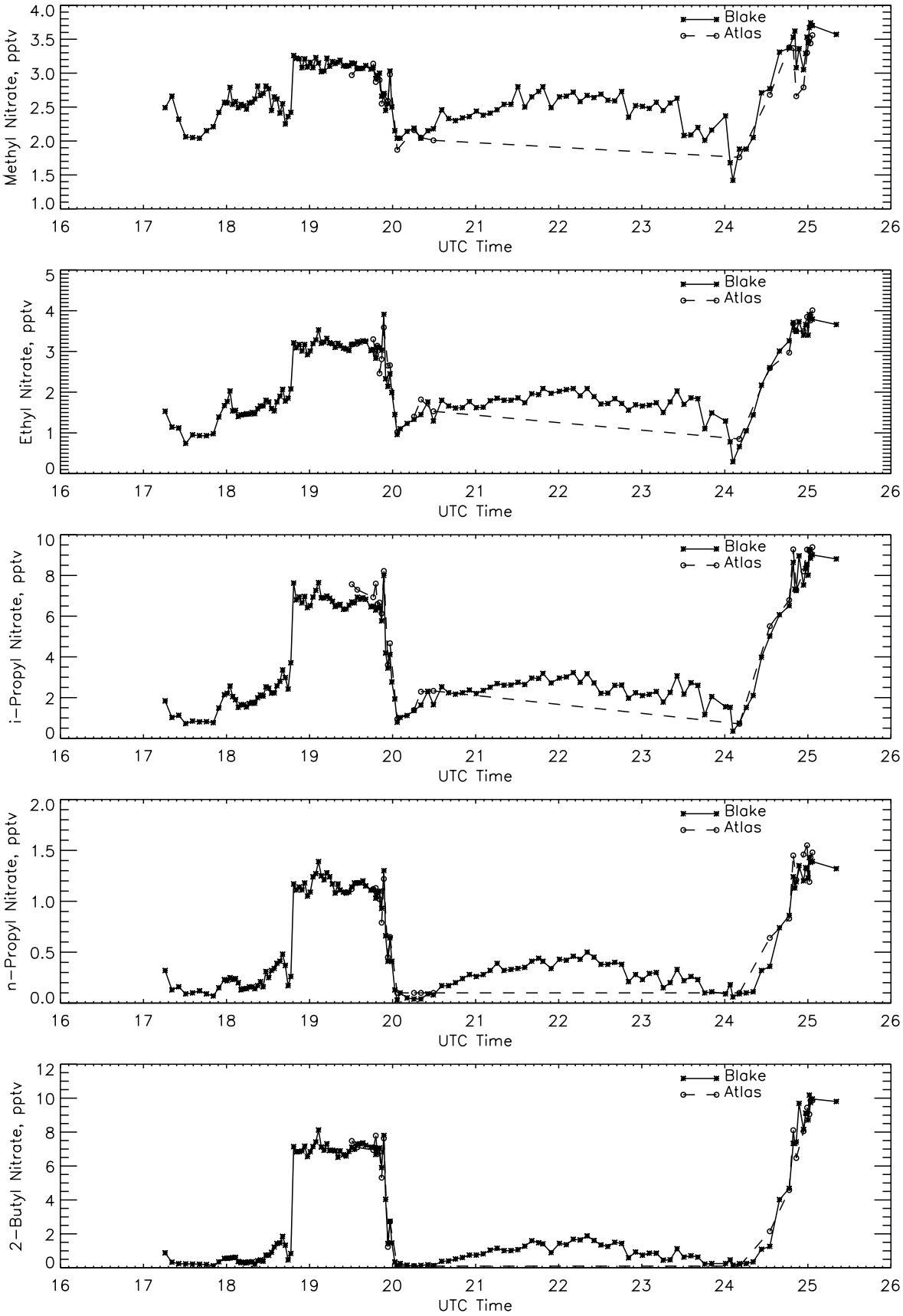
FINAL DATA: TRACE-P P3-B Flight 23

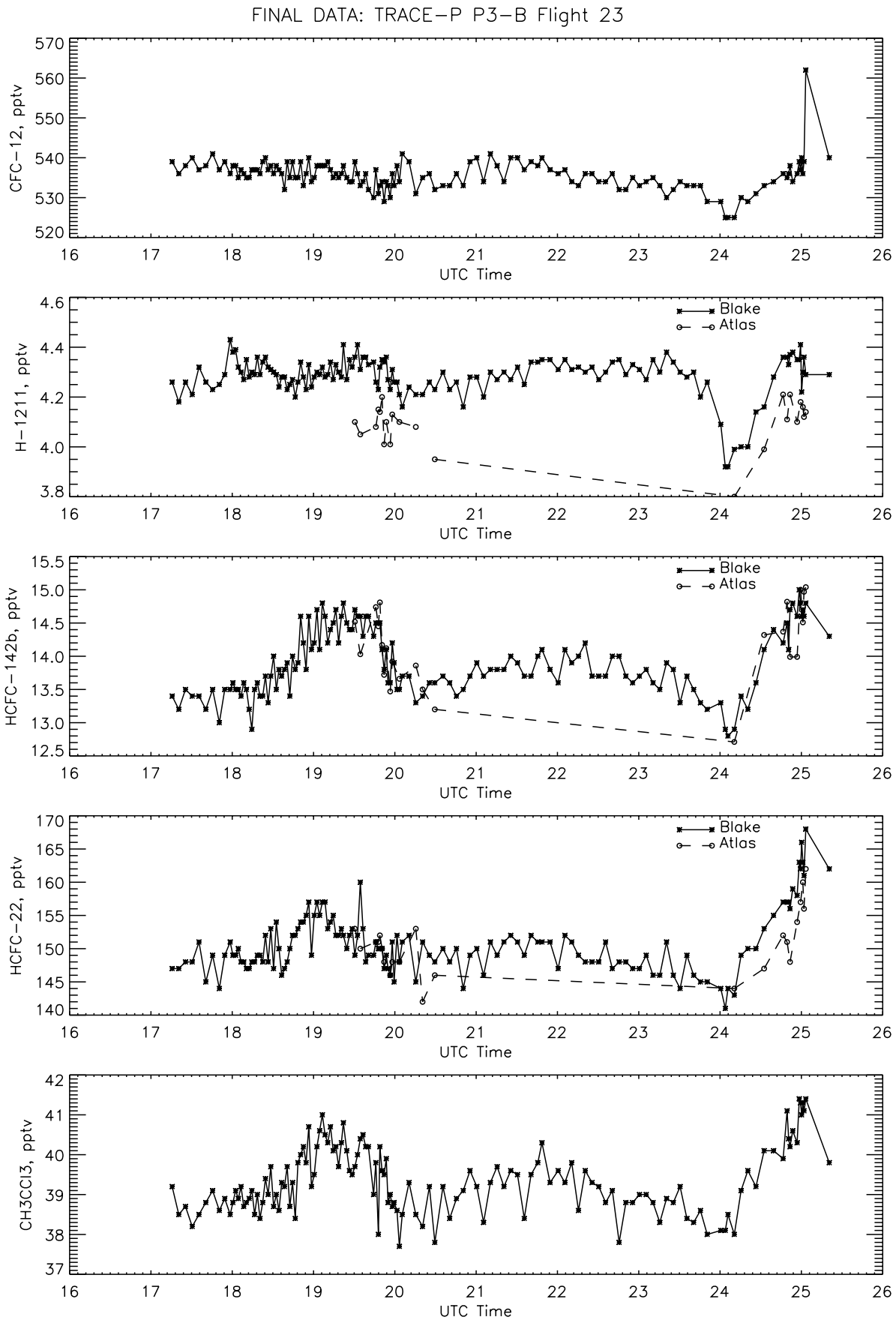


FINAL DATA: TRACE-P P3-B Flight 23

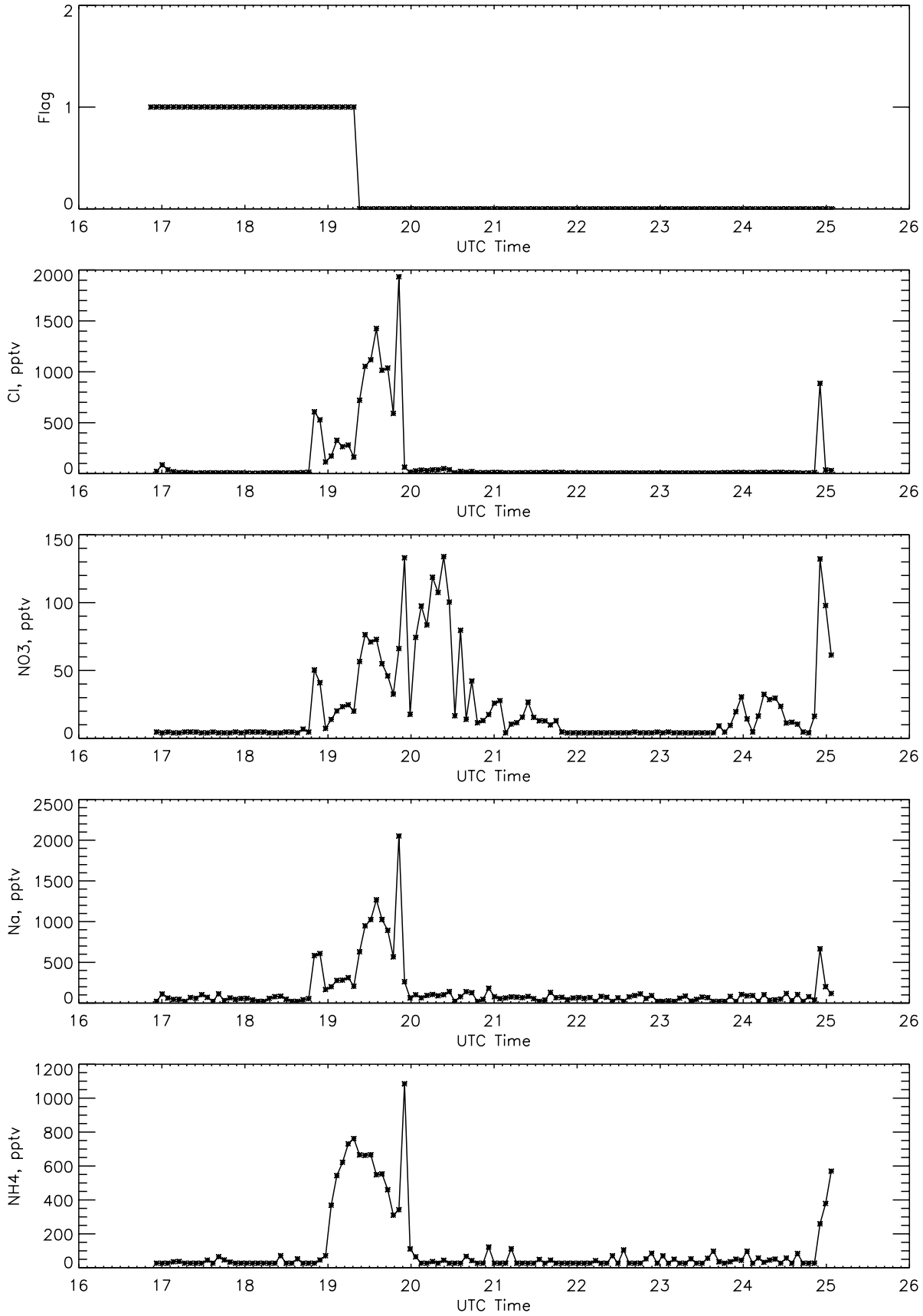


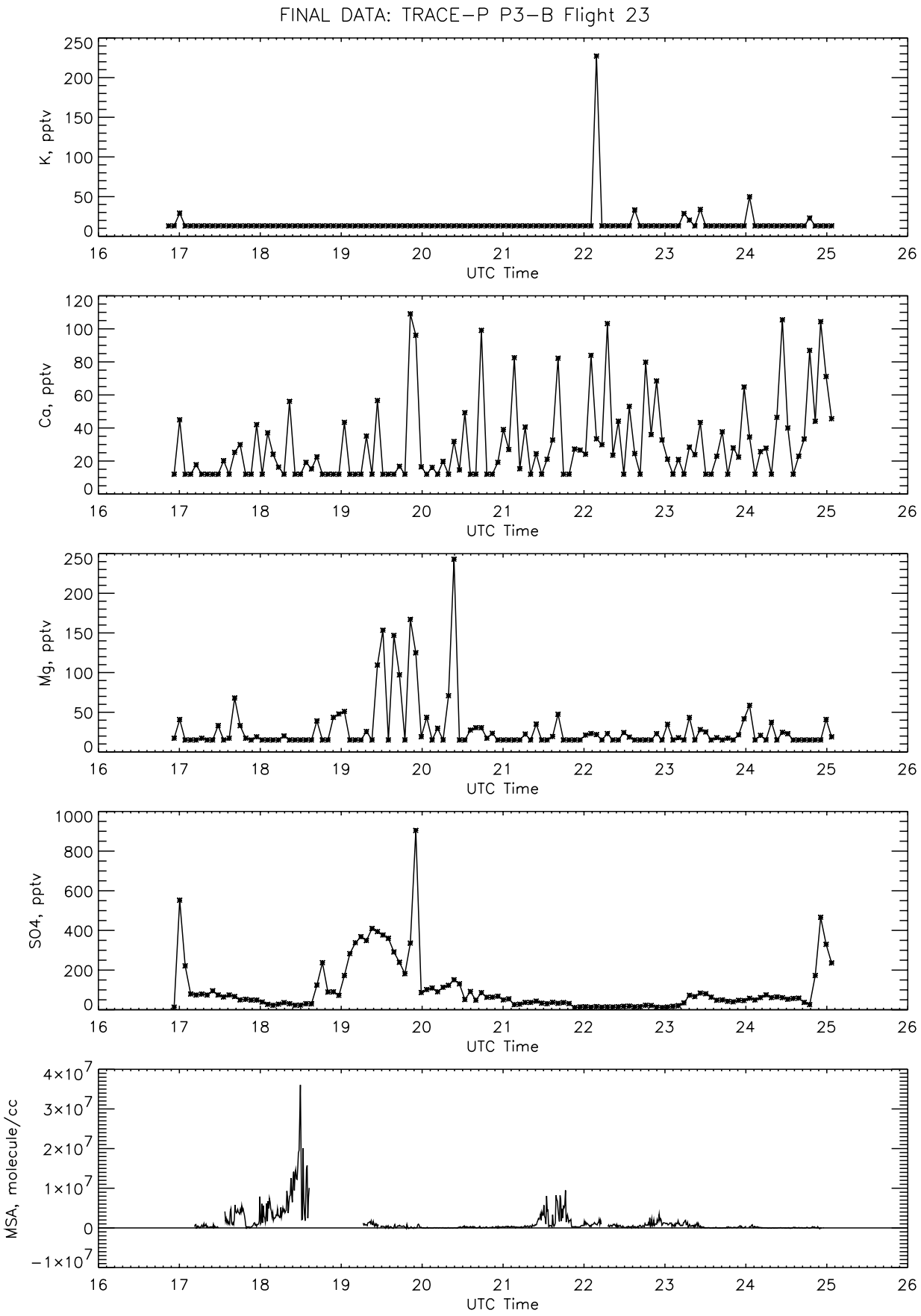
FINAL DATA: TRACE-P P3-B Flight 23

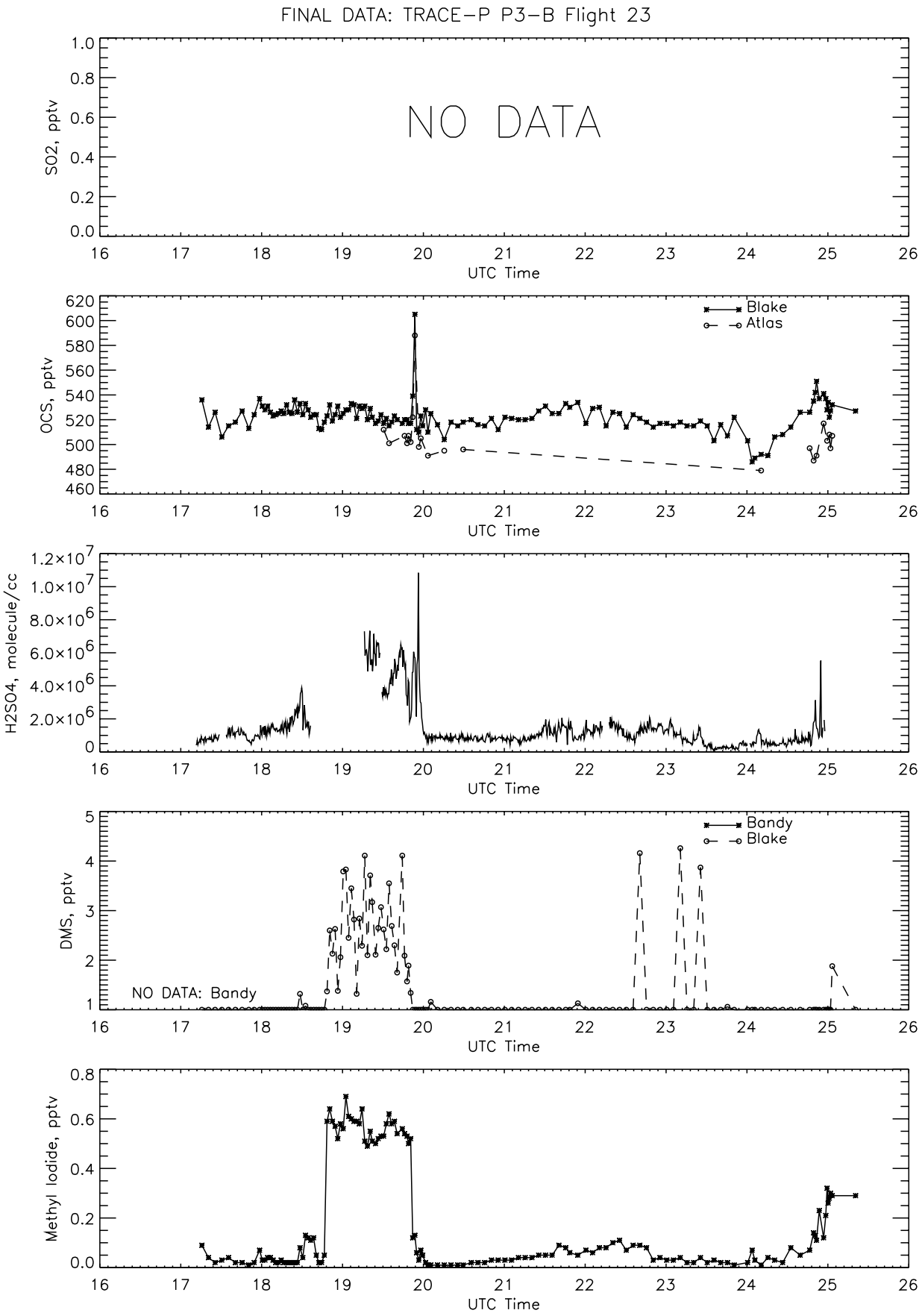



FINAL DATA: TRACE-P P3-B Flight 23
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

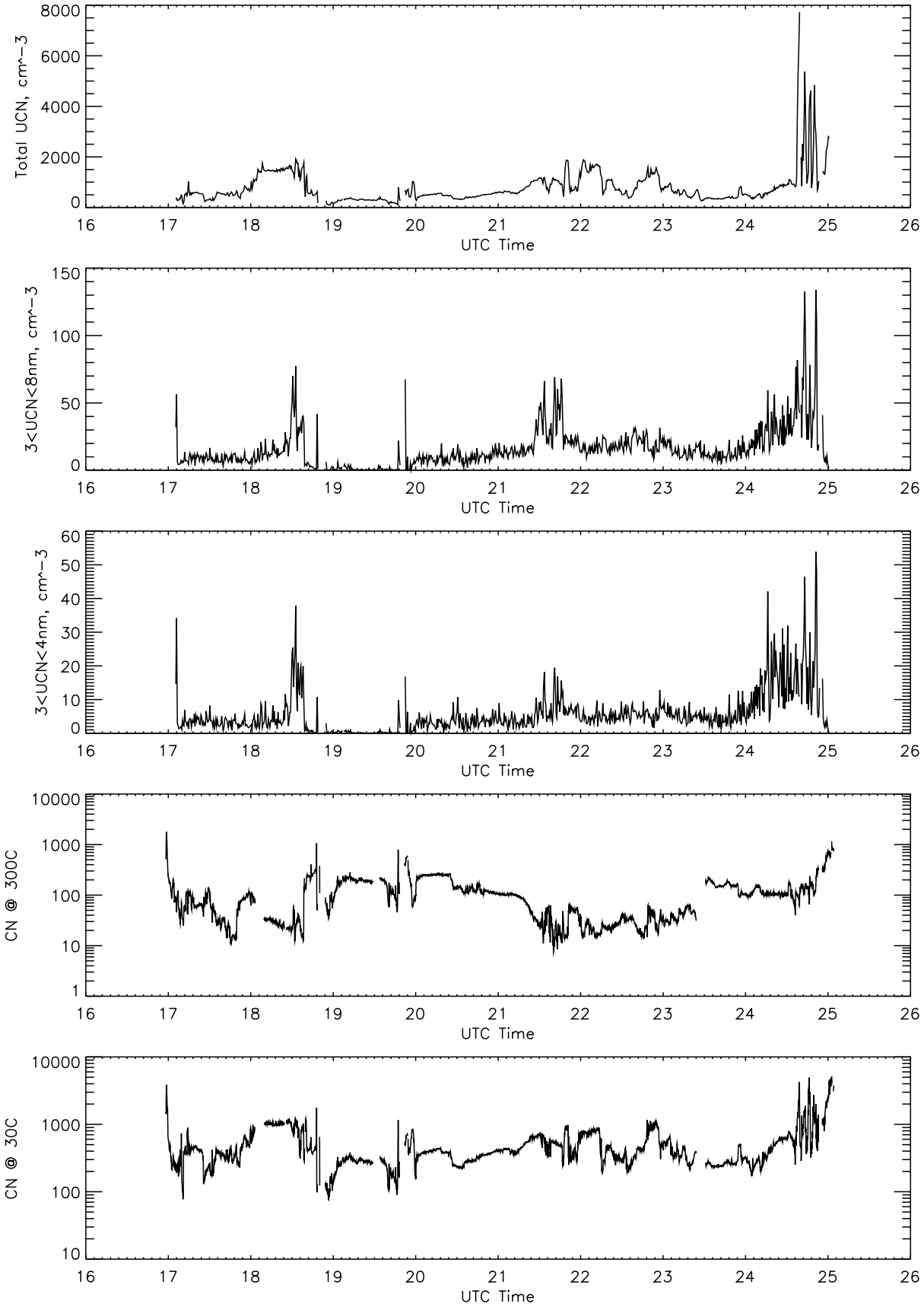
FINAL DATA: TRACE-P P3-B Flight 23

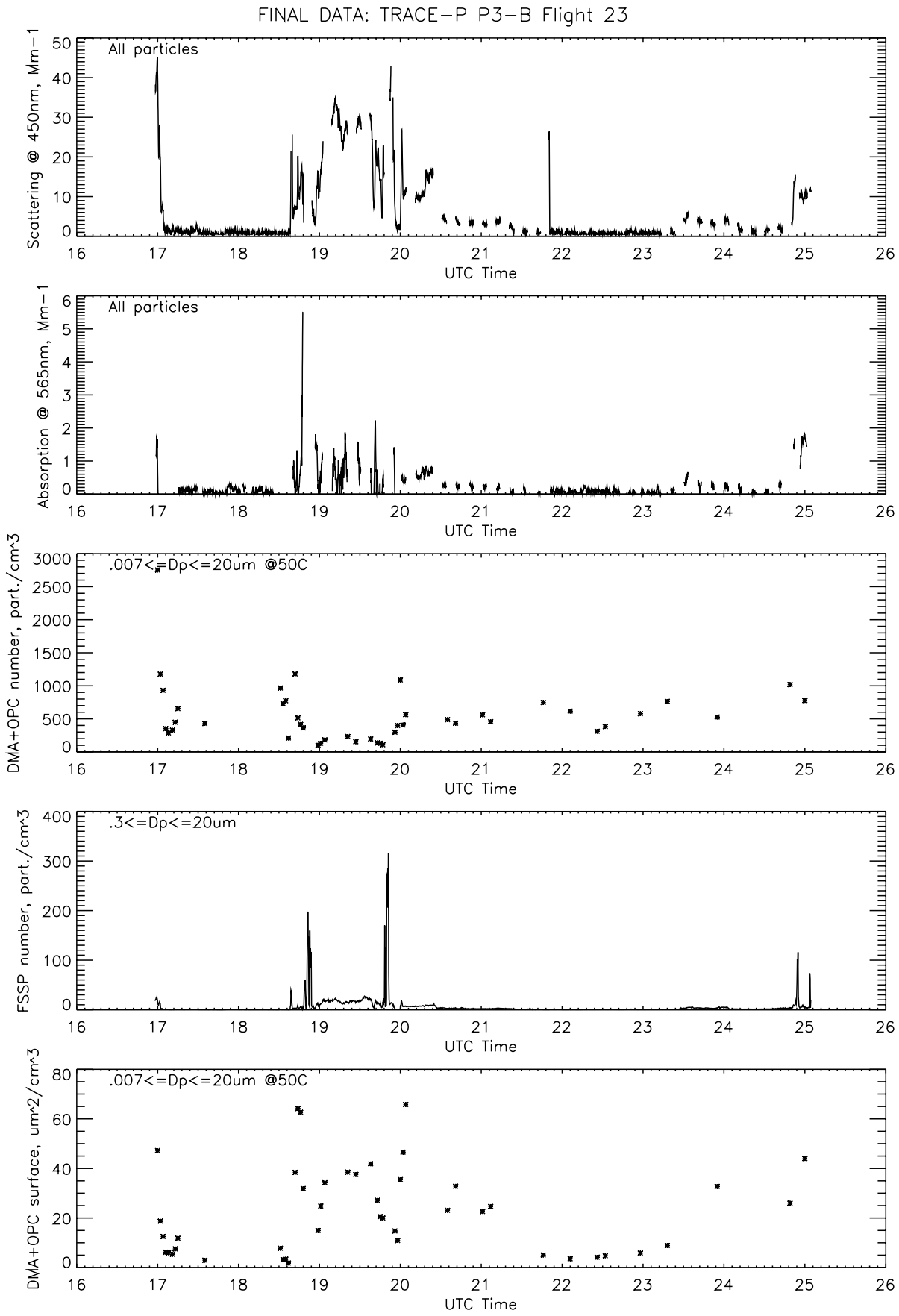


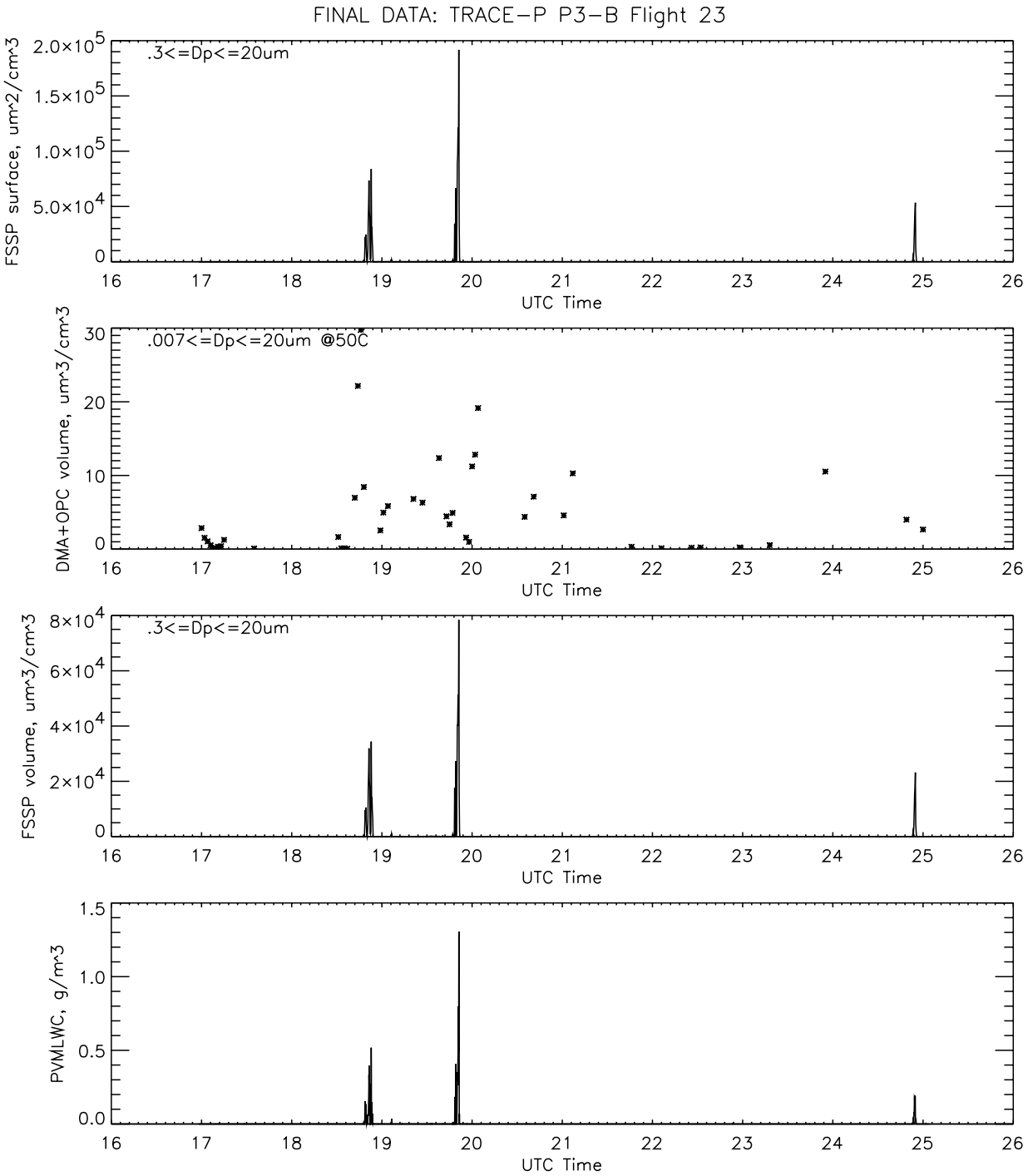

FINAL DATA: TRACE-P P3-B Flight 23
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time


FINAL DATA: TRACE-P P3-B Flight 23
SO2, pptv
NO DATA
UTC Time
OCS, pptv
Blake
Atlas
UTC Time
H2SO4, molecule/cc
UTC Time
DMS, pptv
Bandy
Blake
NO DATA: Bandy
UTC Time
Methyl Iodide, pptv
UTC Time

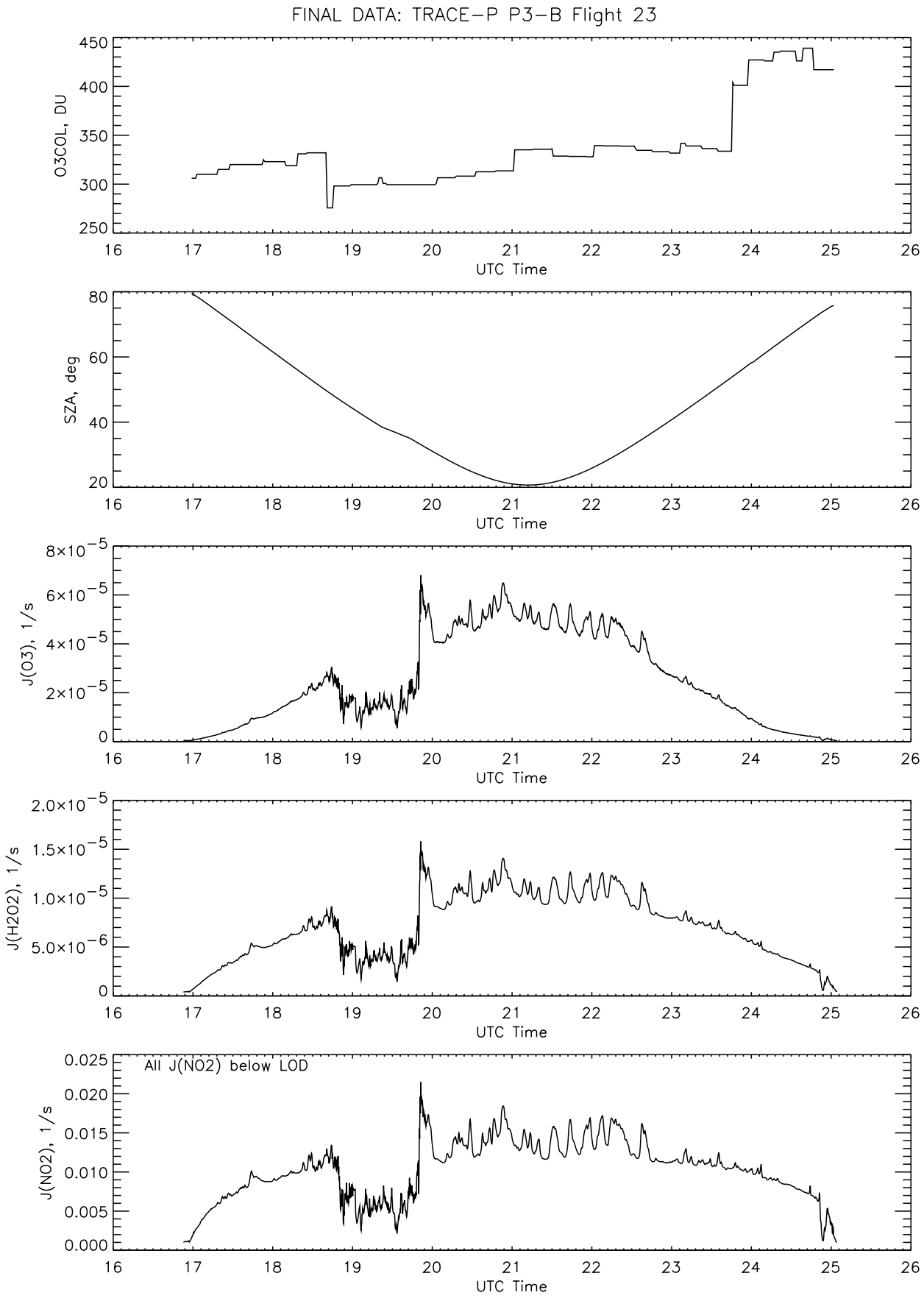
FINAL DATA: TRACE-P P3-B Flight 23

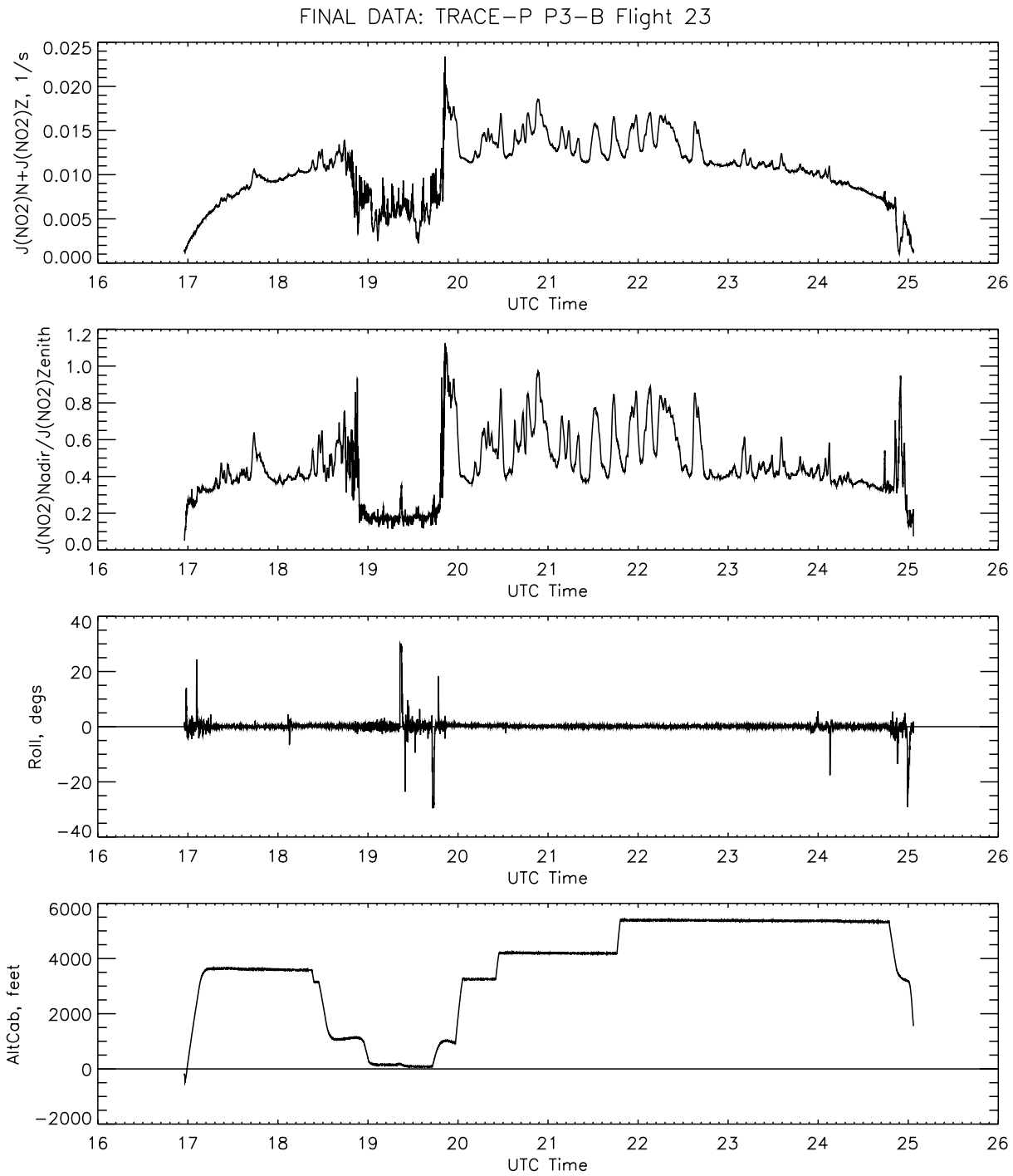



FINAL DATA: TRACE-P P3-B Flight 23
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

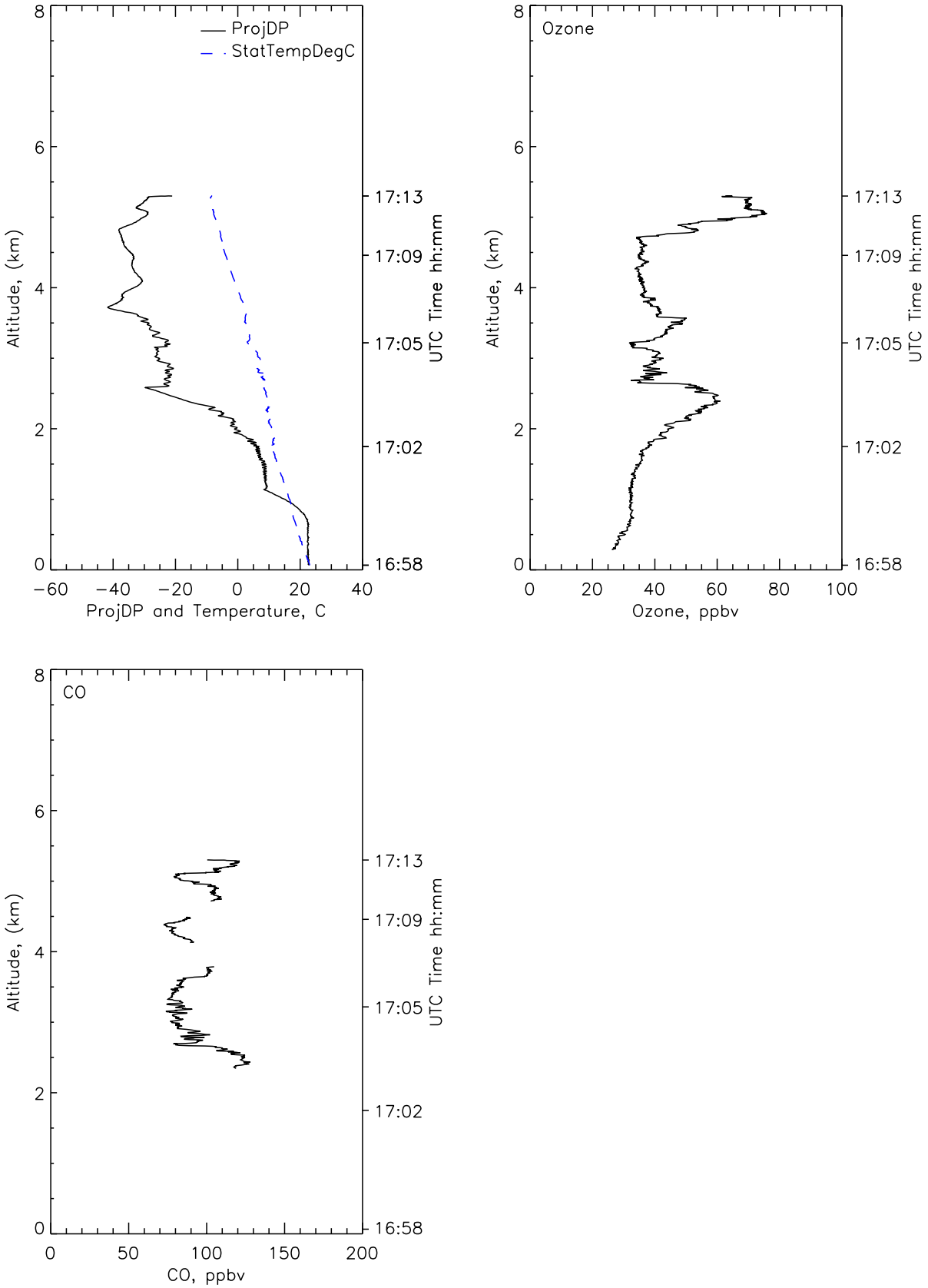

FINAL DATA: TRACE-P P3-B Flight 23
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

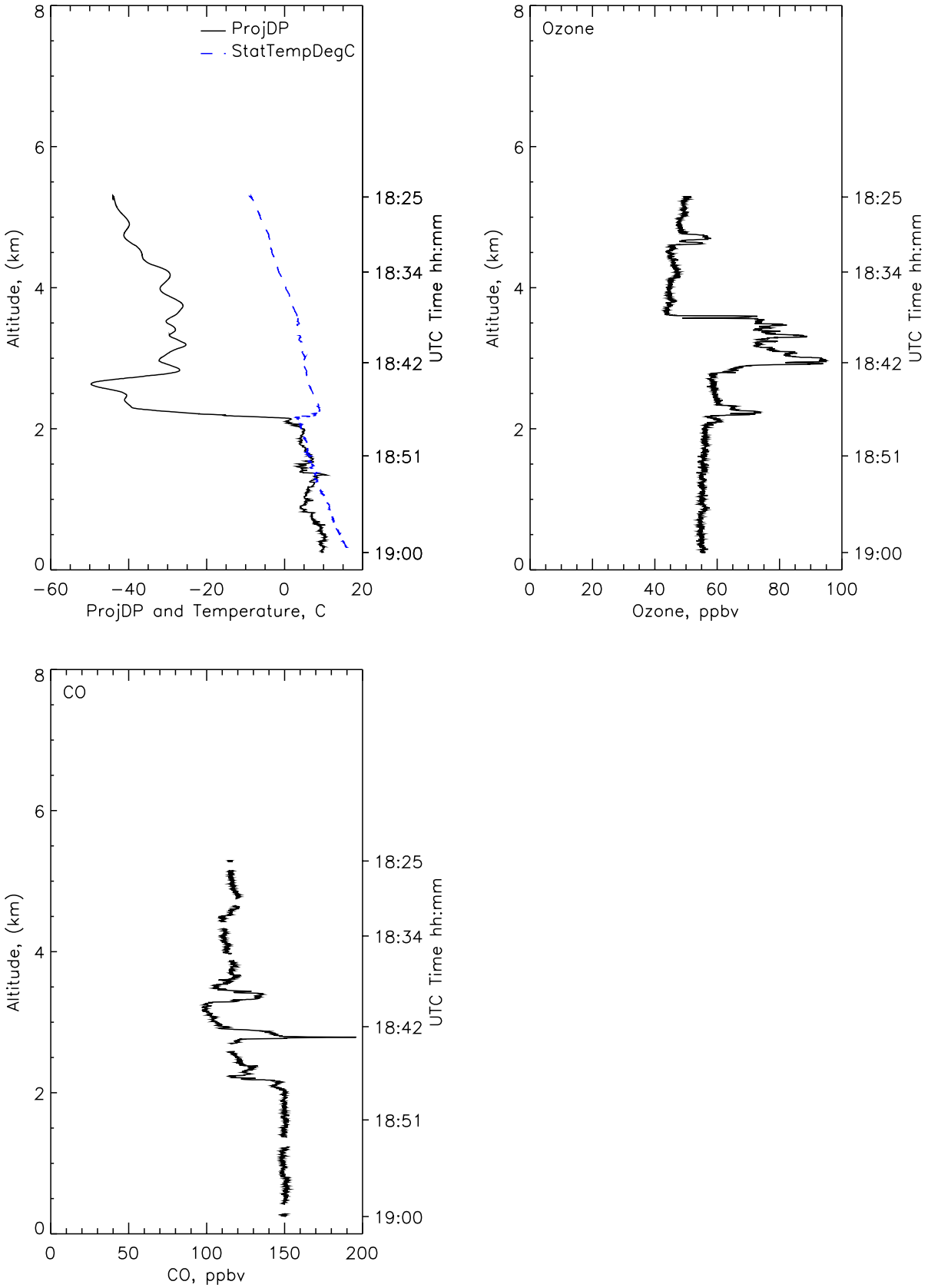

FINAL DATA: TRACE-P P3-B Flight 23
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
All J(NO2) below LOD
UTC Time


FINAL DATA: TRACE-P P3-B Flight 23
J(NO2)N+J(NO2)Z, 1/s
0.025
0.020
0.015
0.010
0.005
0.000
16
17
18
19
20
21
22
23
24
25
26
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
UTC Time
AltCab, feet
6000
4000
2000
0
−2000
UTC Time

Profile # 1 TRACE-P P3-B Flight 23



Profile # 2 TRACE-P P3-B Flight 23



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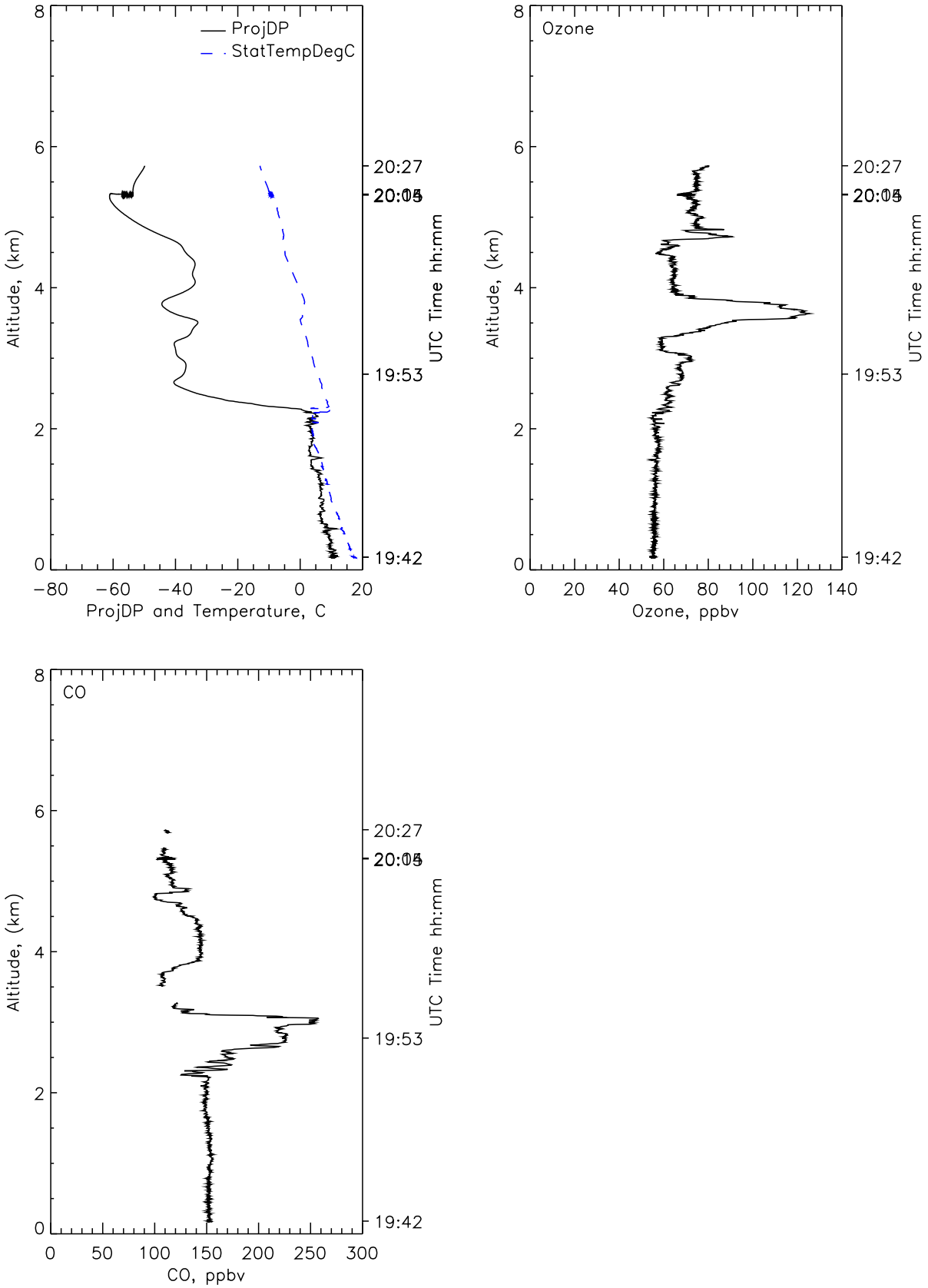
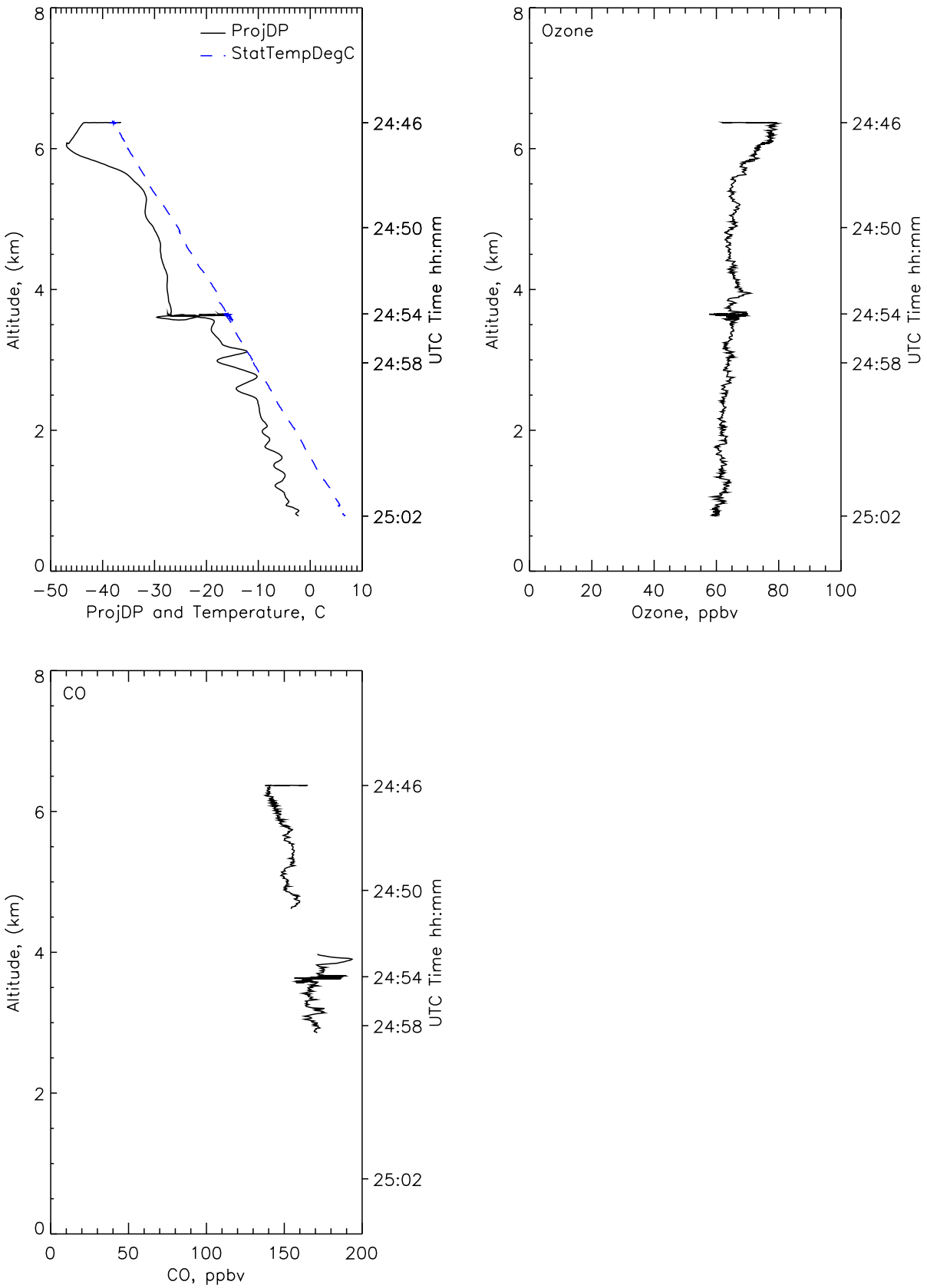


Profile # 4 TRACE−P P3−B Flight 23



CHEMICAL and METEOROLOGICAL DATA

TRACE-P

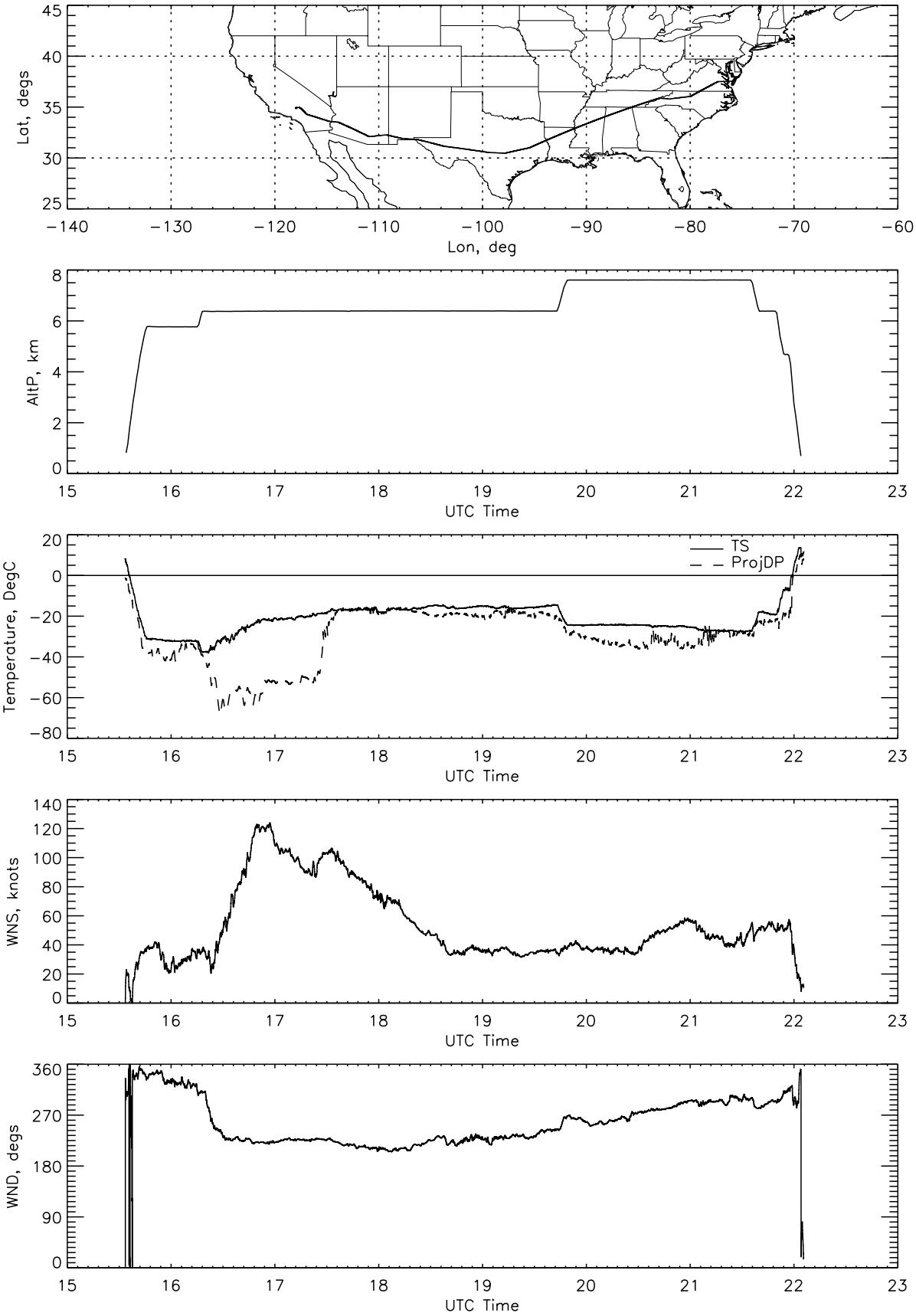
Flight 24P

Transit: NASA-DFRC to NASA-WFF

Transport of Clean Tropical Air

April 10, 2001

FINAL DATA: TRACE-P P3-B Flight 24



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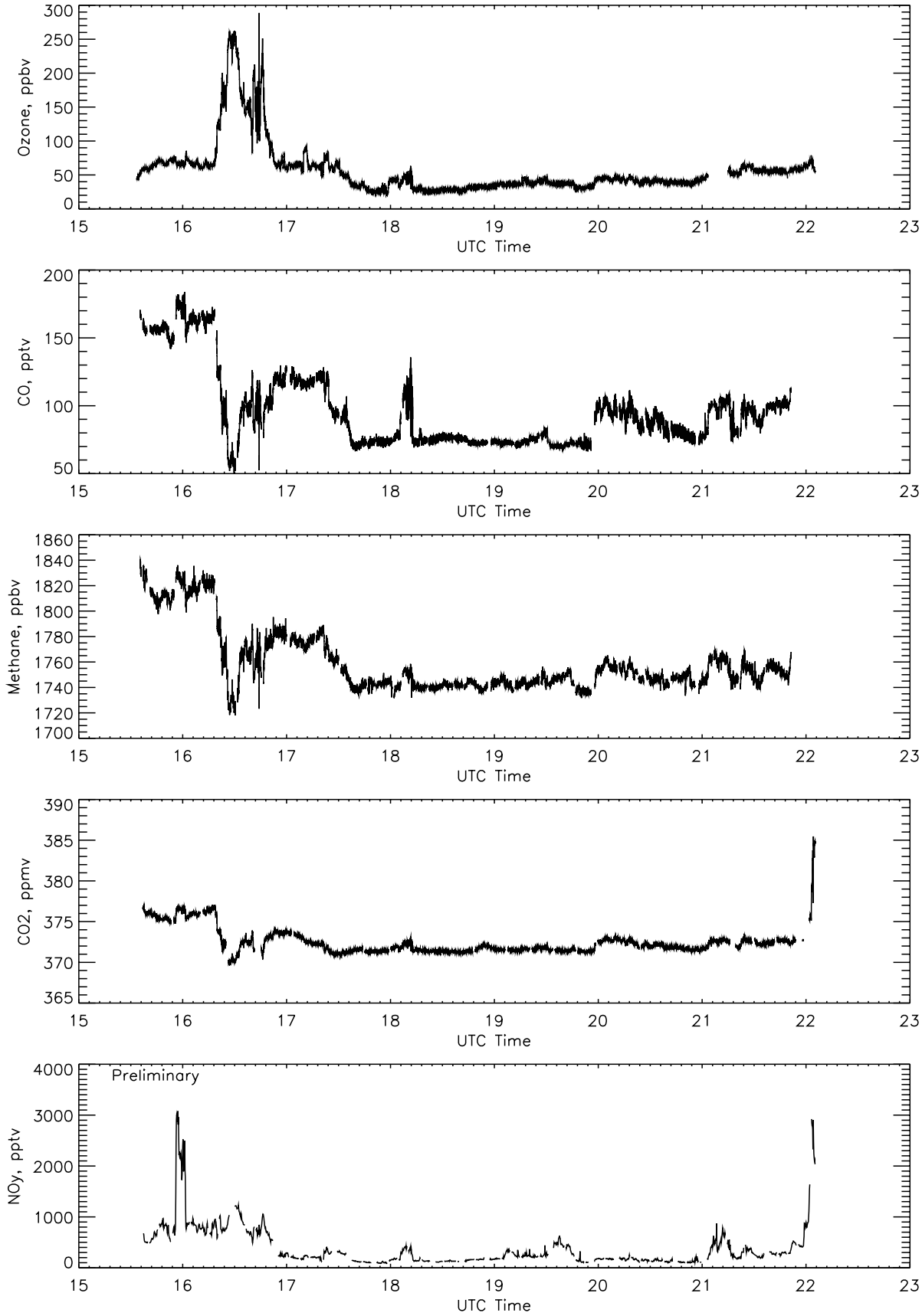
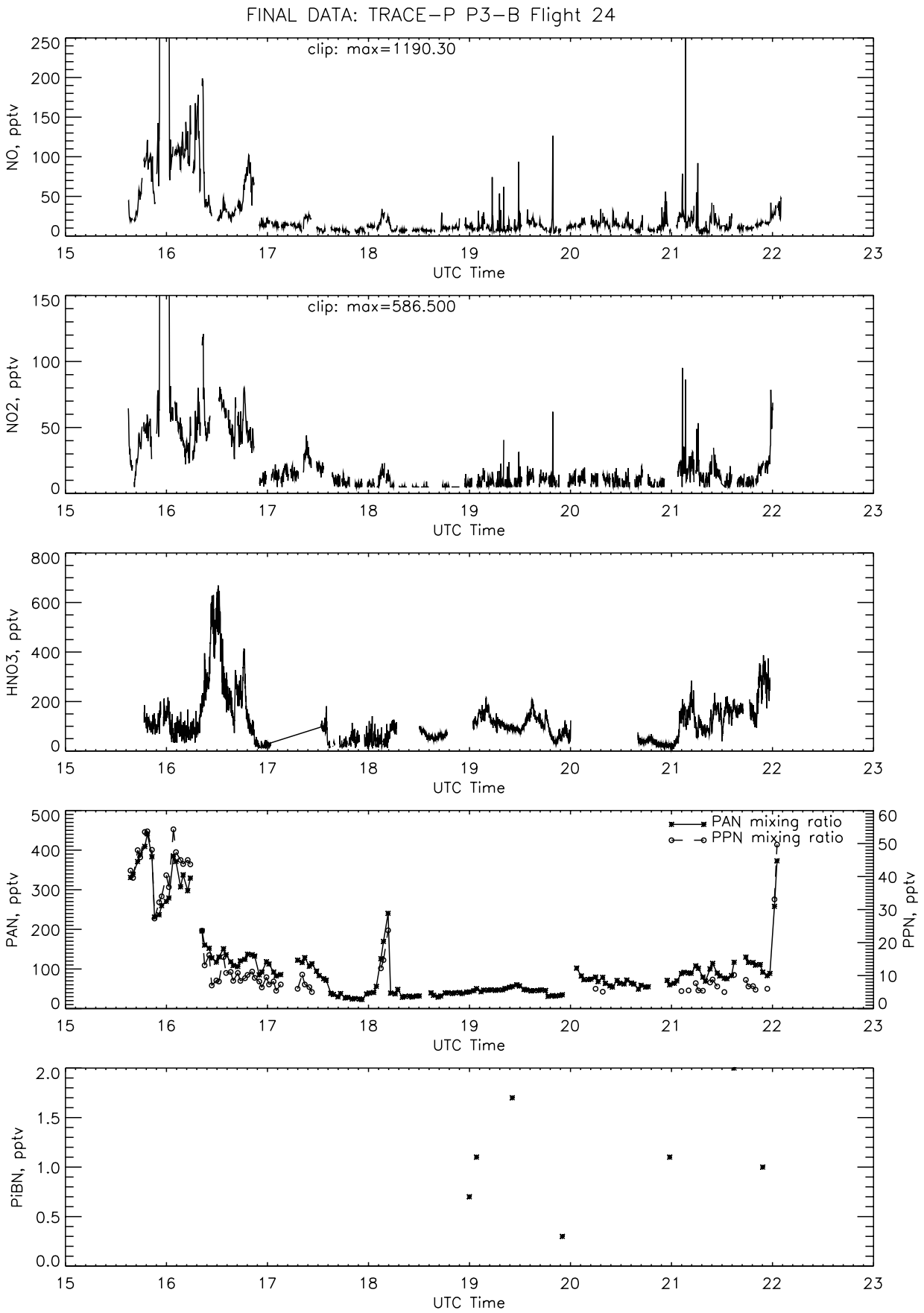
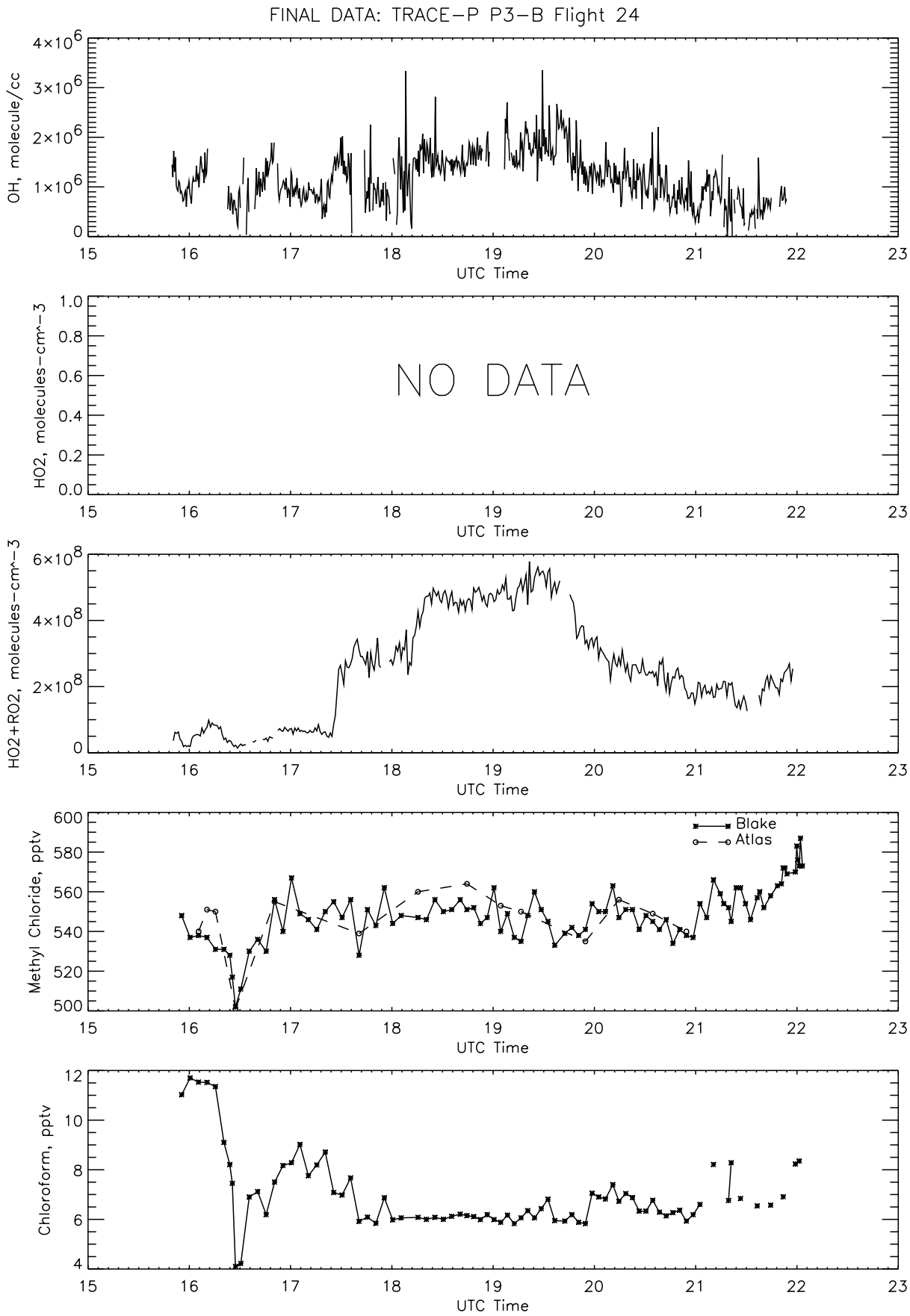
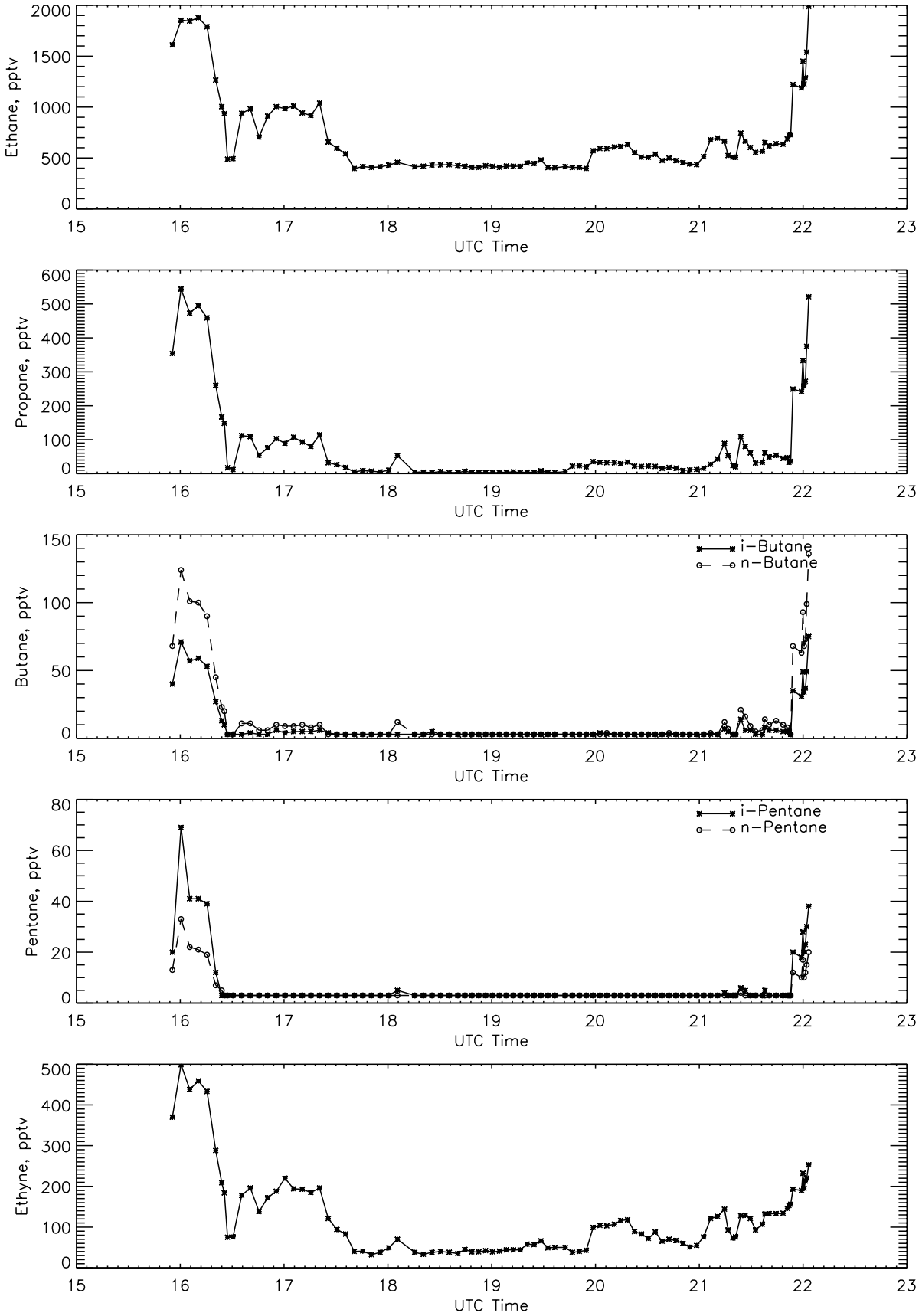



FINAL DATA: TRACE-P P3-B Flight 24
clip: max=1190.30
NO, pptv
UTC Time
clip: max=586.500
NO2, pptv
UTC Time
HNO3, pptv
UTC Time
PAN mixing ratio
PPN mixing ratio
PAN, pptv
PPN, pptv
UTC Time
PiBN, pptv
UTC Time


FINAL DATA: TRACE-P P3-B Flight 24
OH, molecule/cc
HO2, molecules-cm^-3
NO DATA
HO2+RO2, molecules-cm^-3
Methyl Chloride, pptv
Blake
Atlas
Chloroform, pptv
UTC Time

FINAL DATA: TRACE-P P3-B Flight 24



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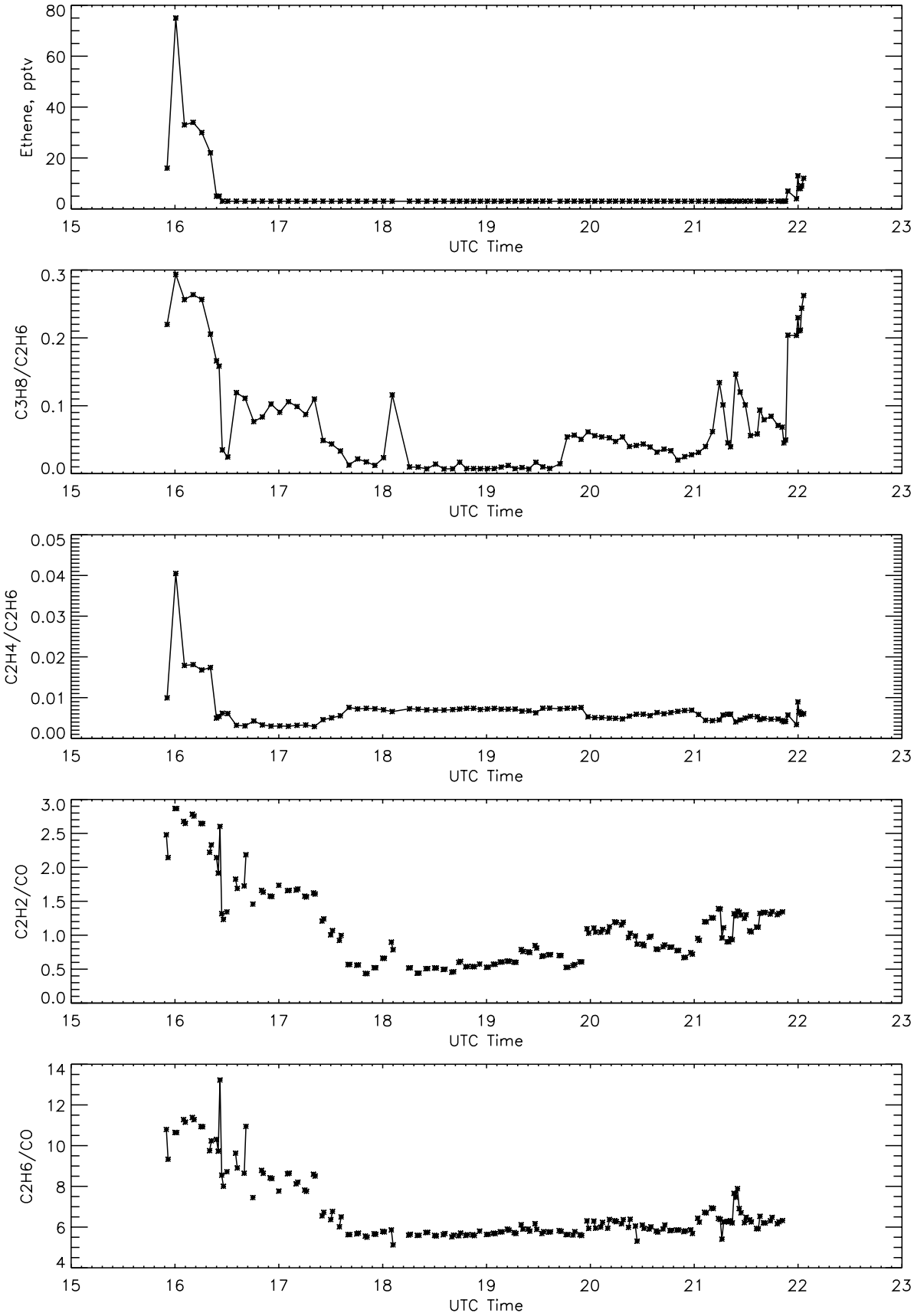
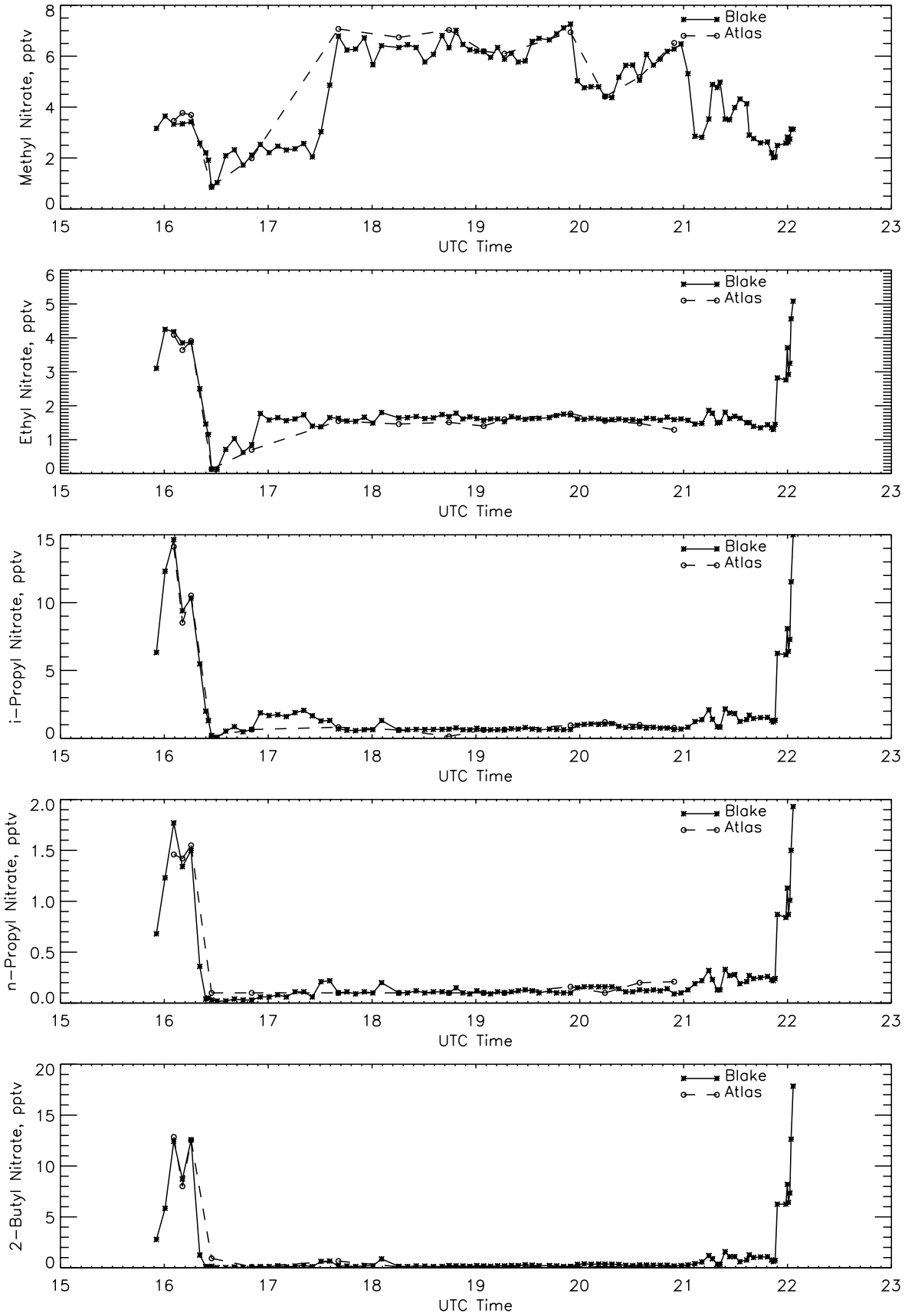
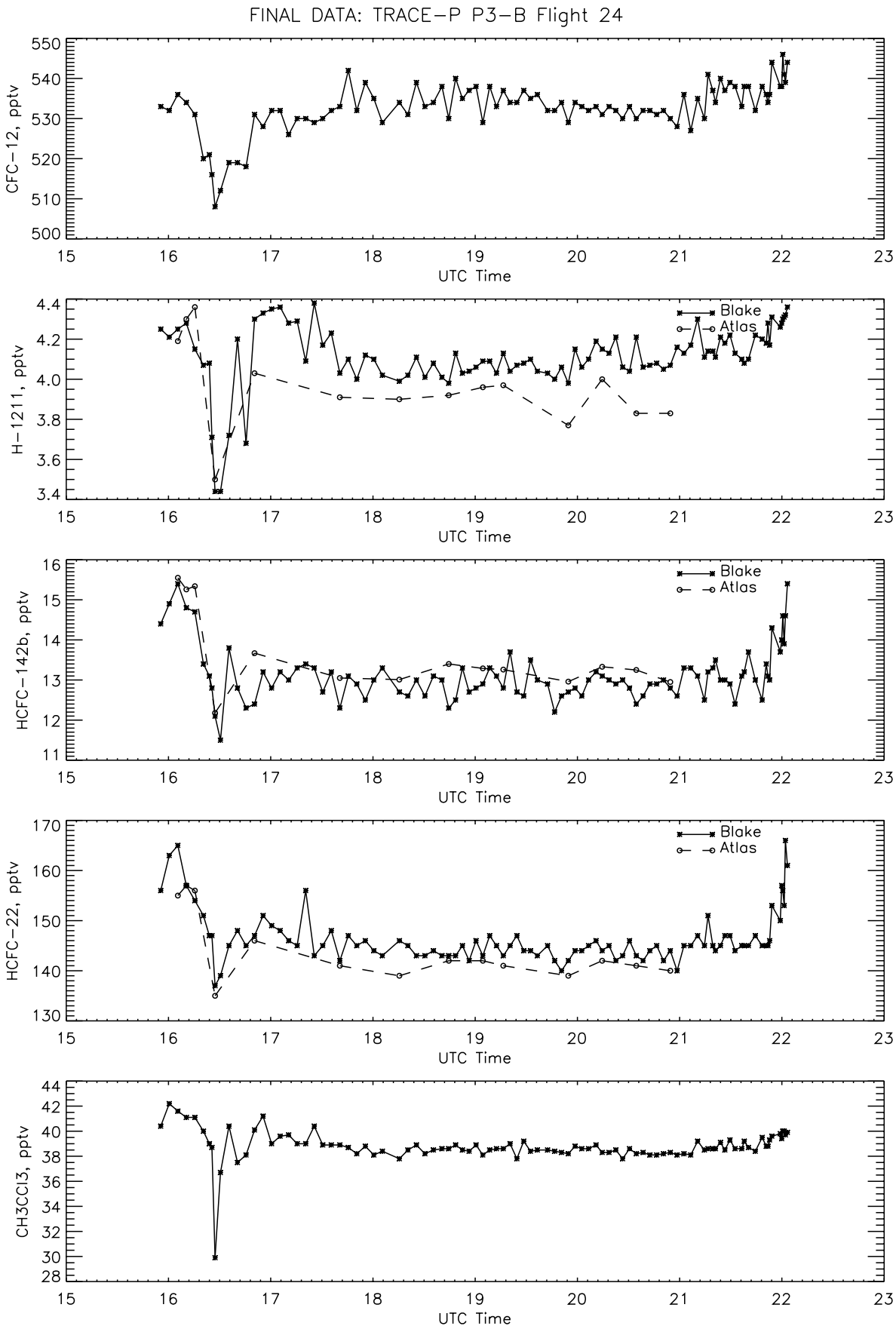
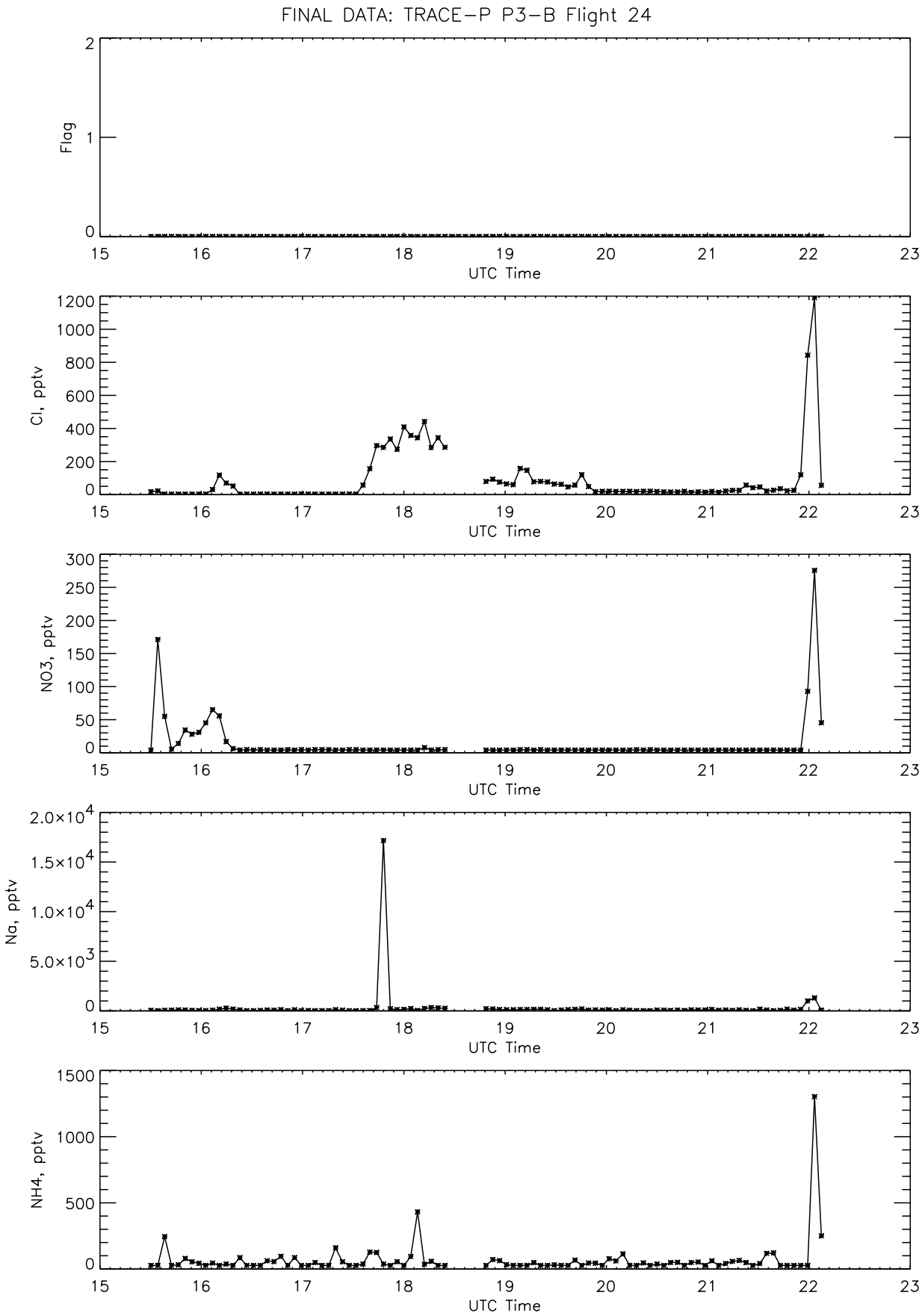
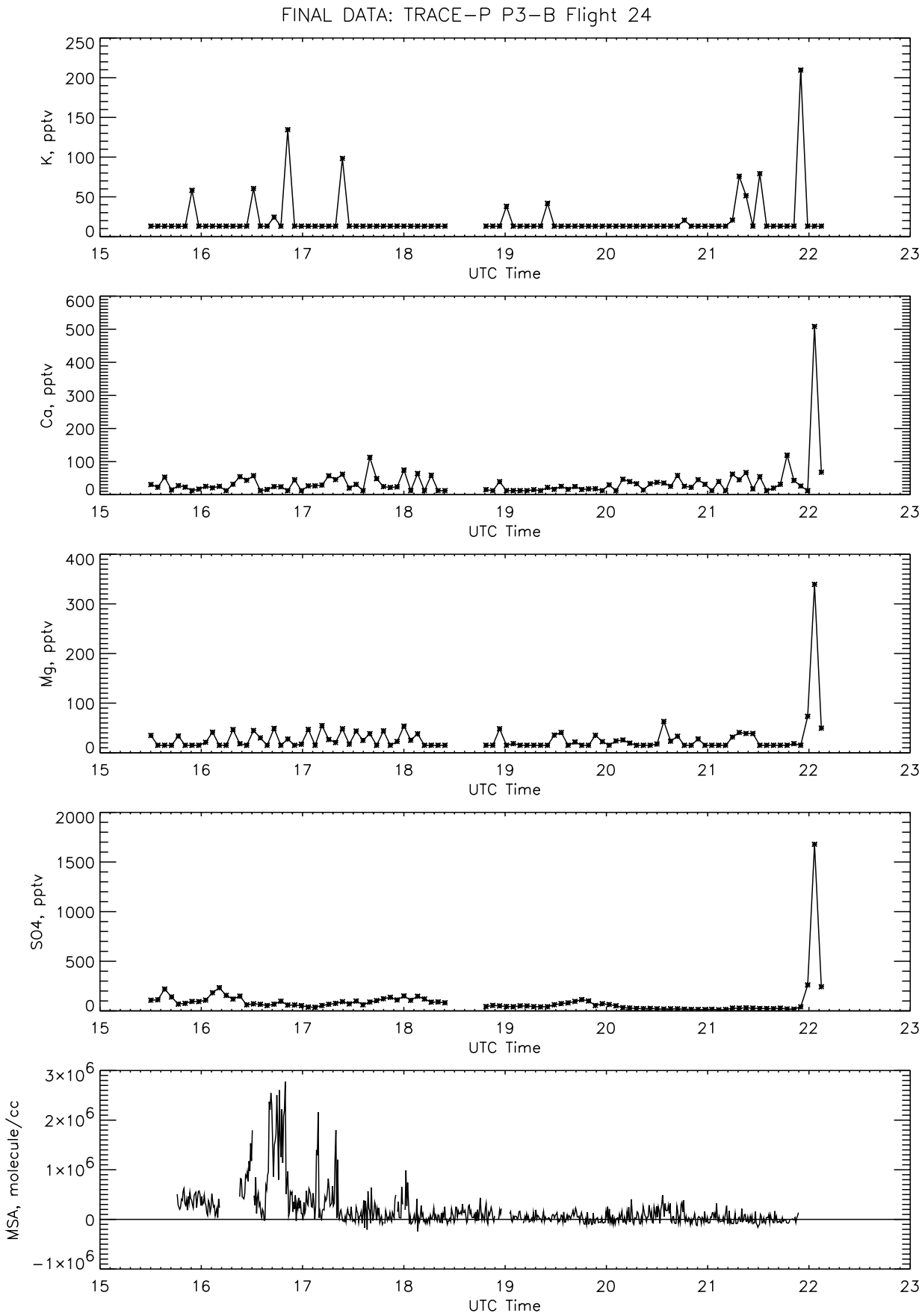


FINAL DATA: TRACE-P P3-B Flight 24

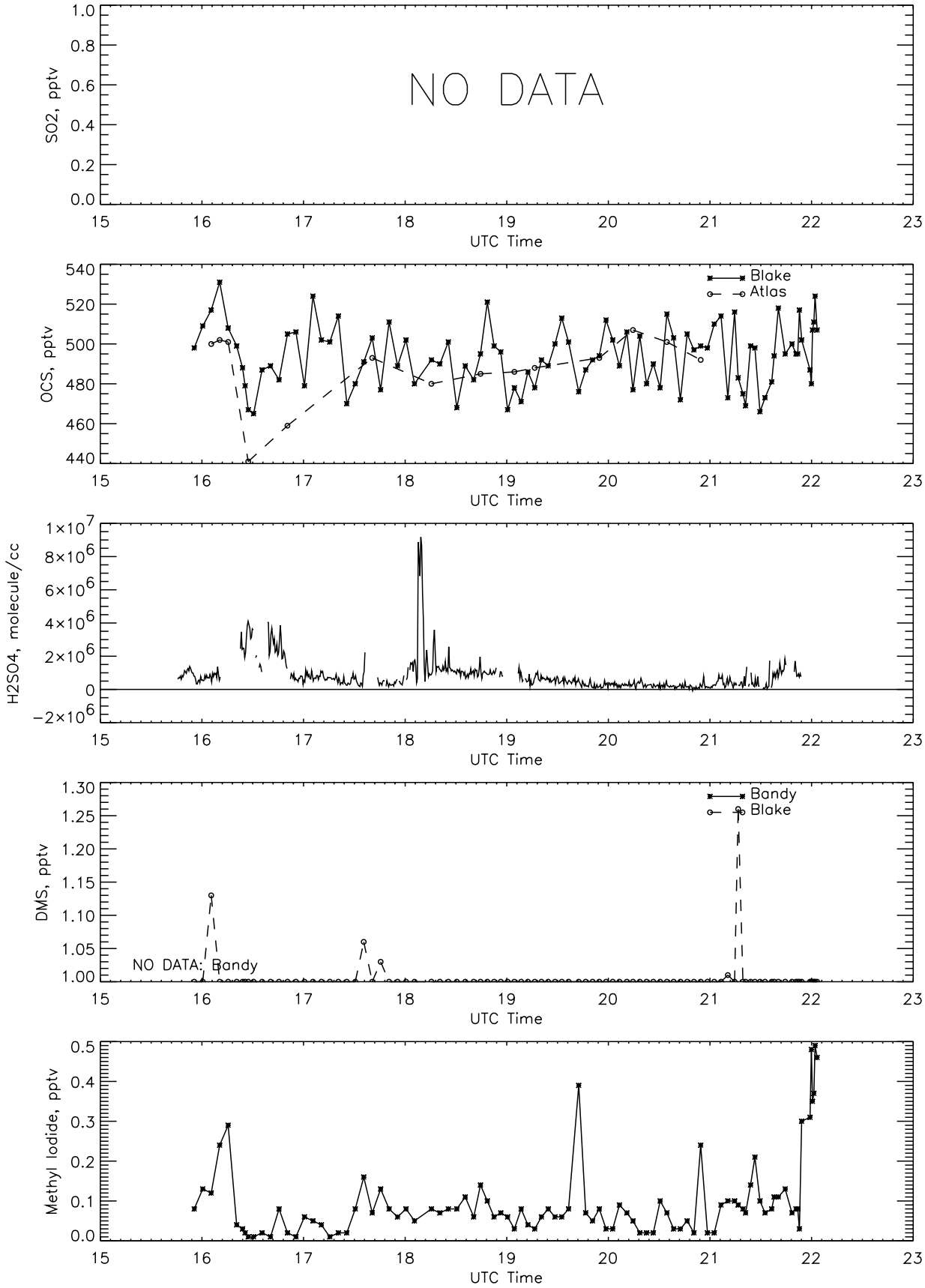



FINAL DATA: TRACE-P P3-B Flight 24
CFC-12, pptv
H-1211, pptv
HCFC-142b, pptv
HCFC-22, pptv
CH3CCl3, pptv
UTC Time
Blake
Atlas

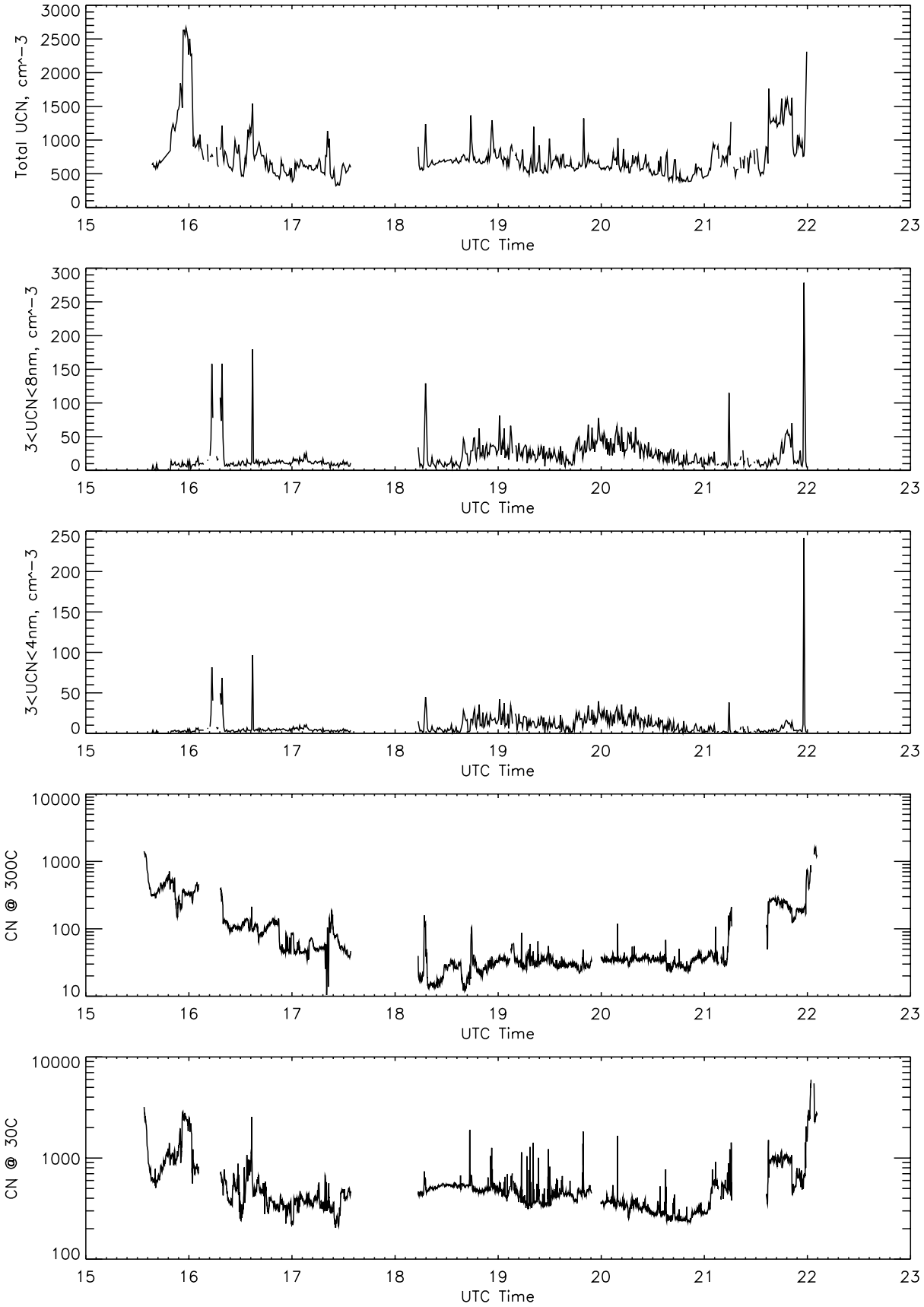

FINAL DATA: TRACE-P P3-B Flight 24
Flag
Cl, pptv
NO3, pptv
Na, pptv
NH4, pptv
UTC Time

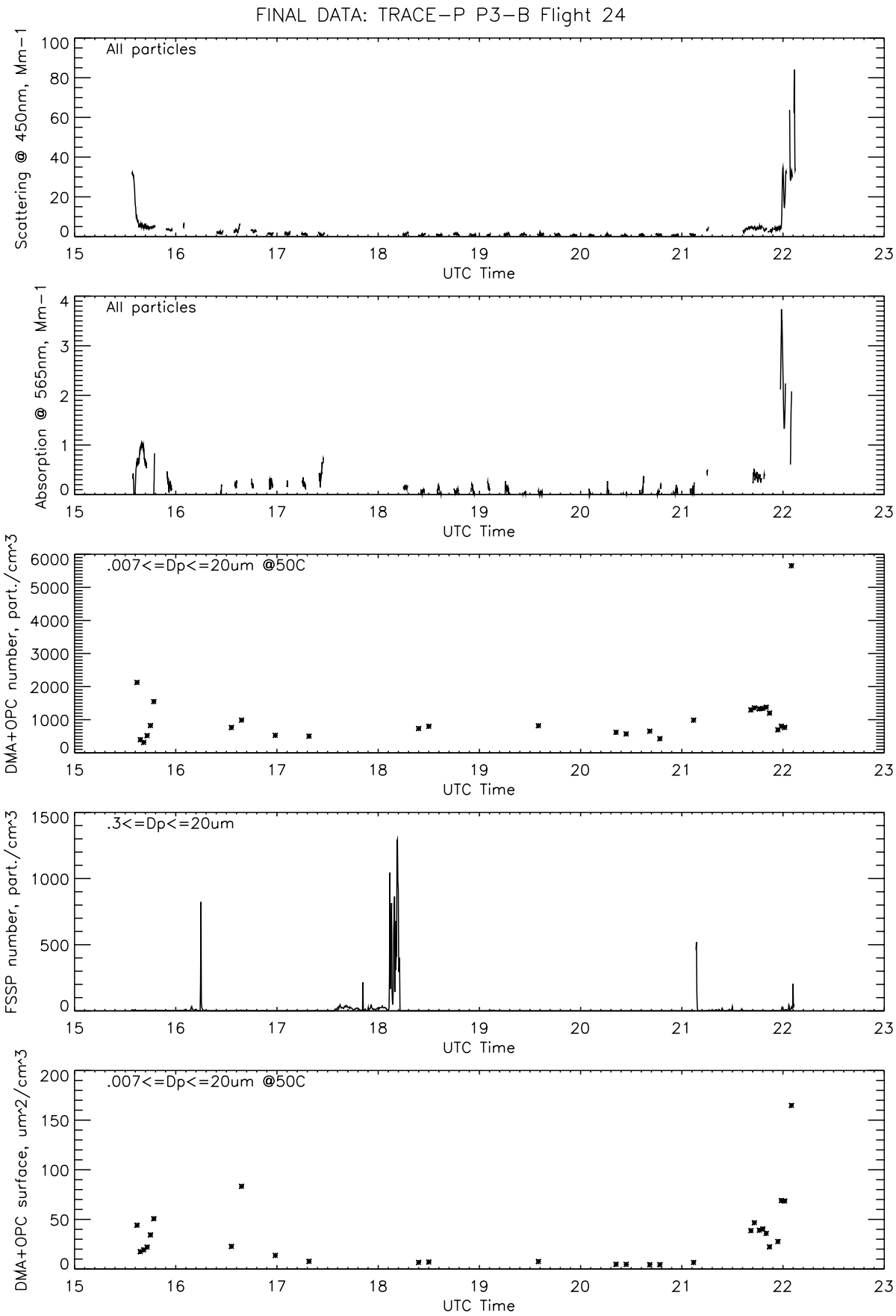

FINAL DATA: TRACE-P P3-B Flight 24
K, pptv
Ca, pptv
Mg, pptv
SO4, pptv
MSA, molecule/cc
UTC Time

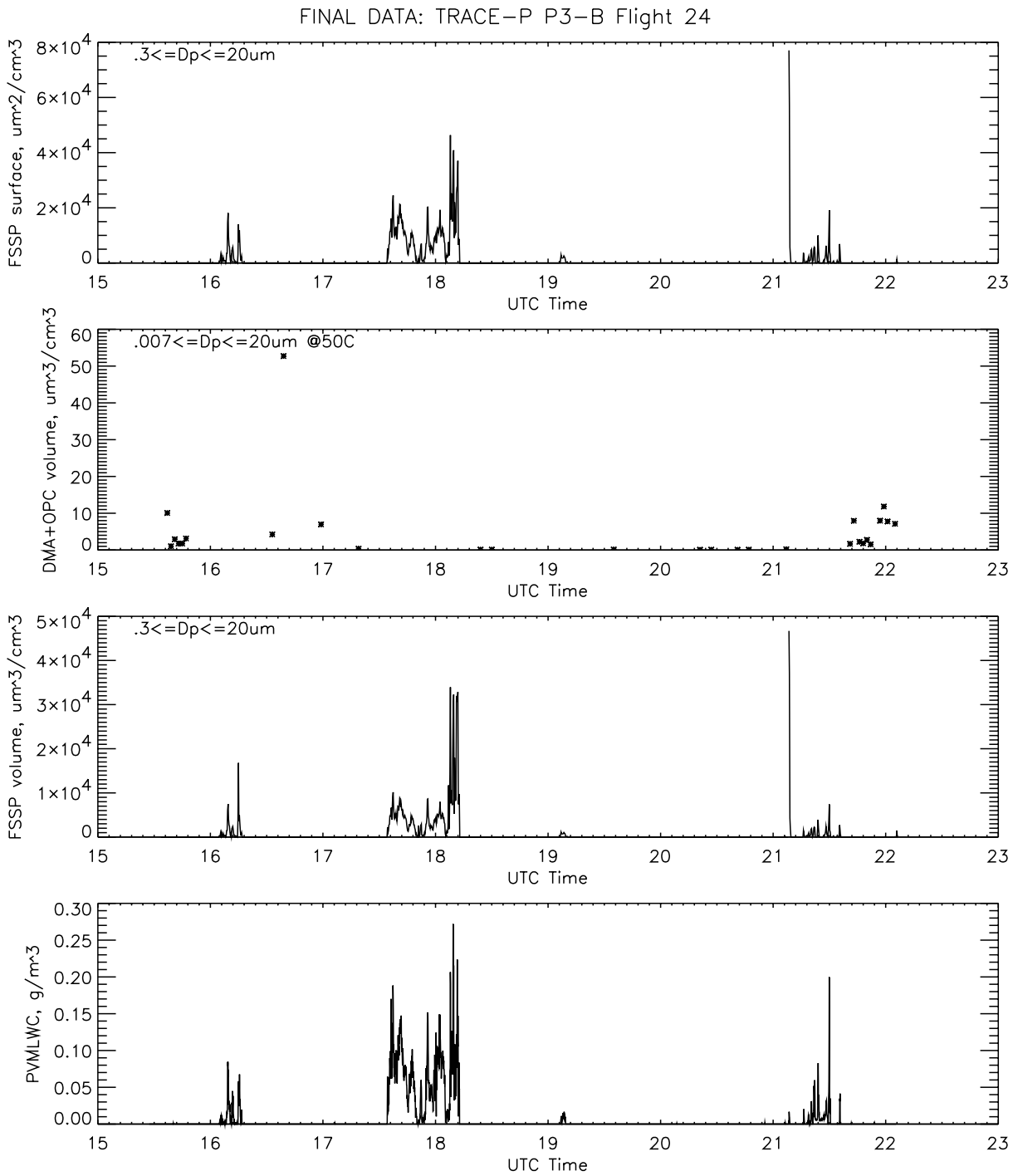
FINAL DATA: TRACE-P P3-B Flight 24



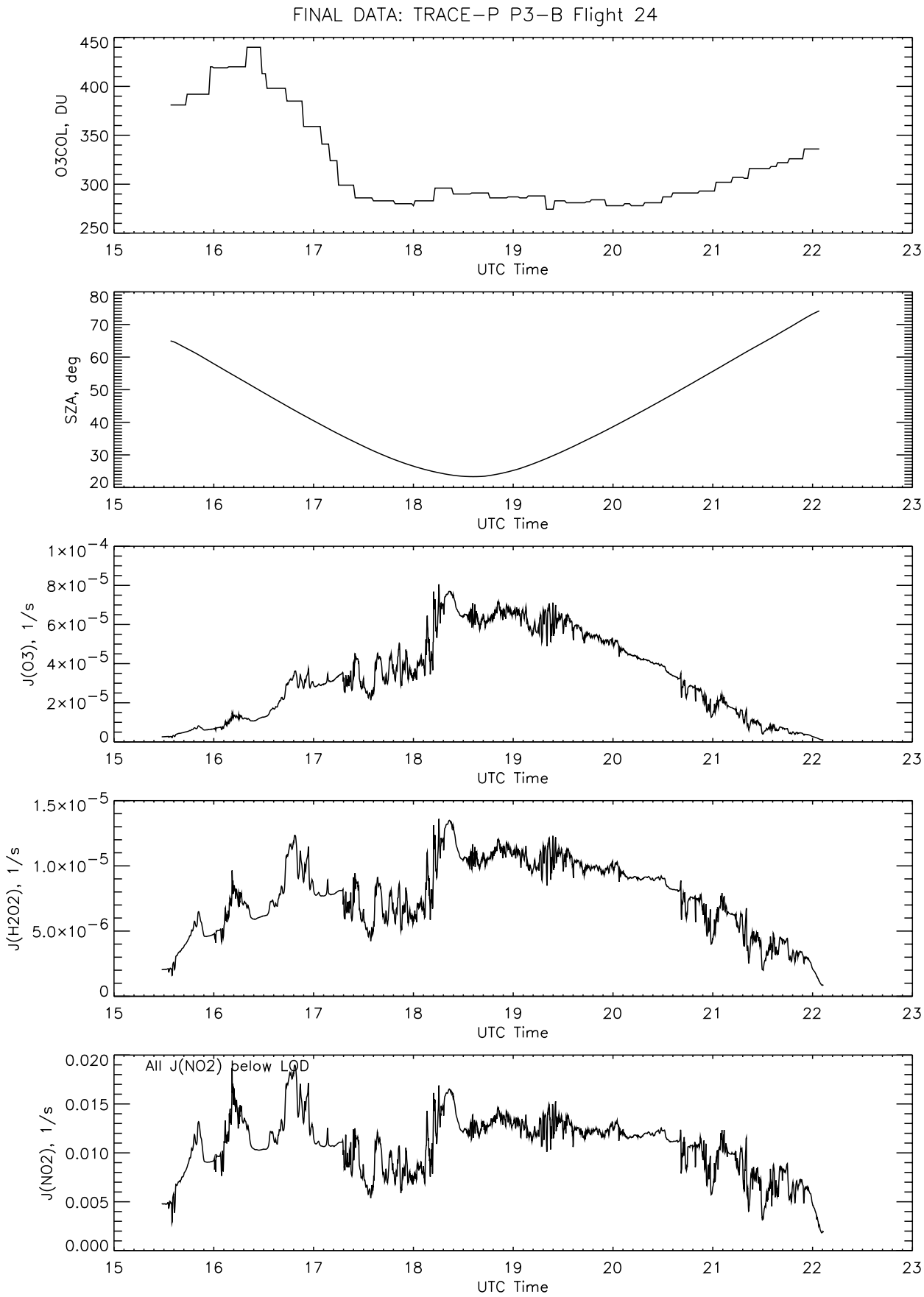
FINAL DATA: TRACE-P P3-B Flight 24

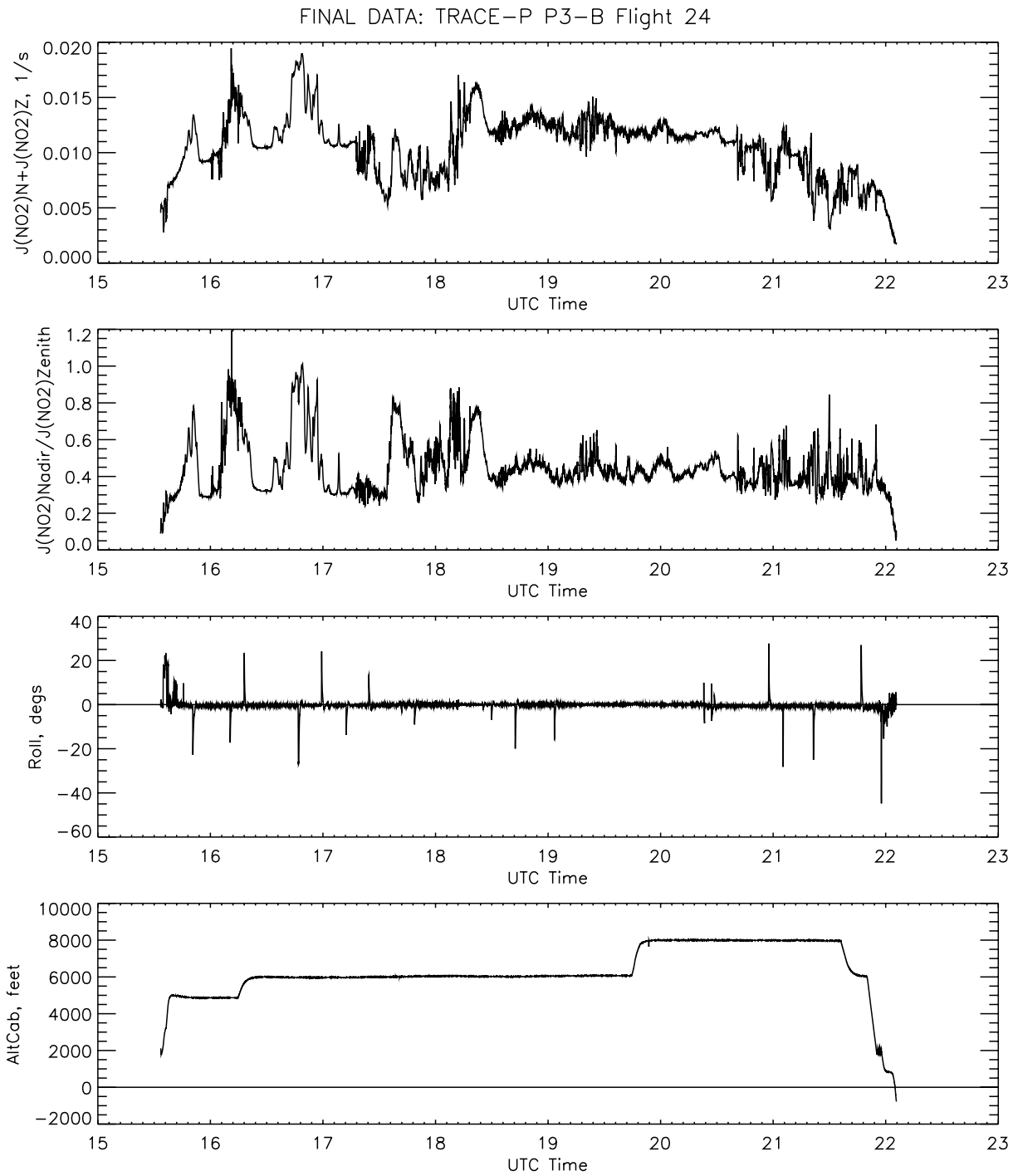



FINAL DATA: TRACE-P P3-B Flight 24
All particles
Scattering @ 450nm, Mm-1
UTC Time
All particles
Absorption @ 565nm, Mm-1
UTC Time
.007<=Dp<=20um @50C
DMA+OPC number, part./cm^3
UTC Time
.3<=Dp<=20um
FSSP number, part./cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC surface, um^2/cm^3
UTC Time

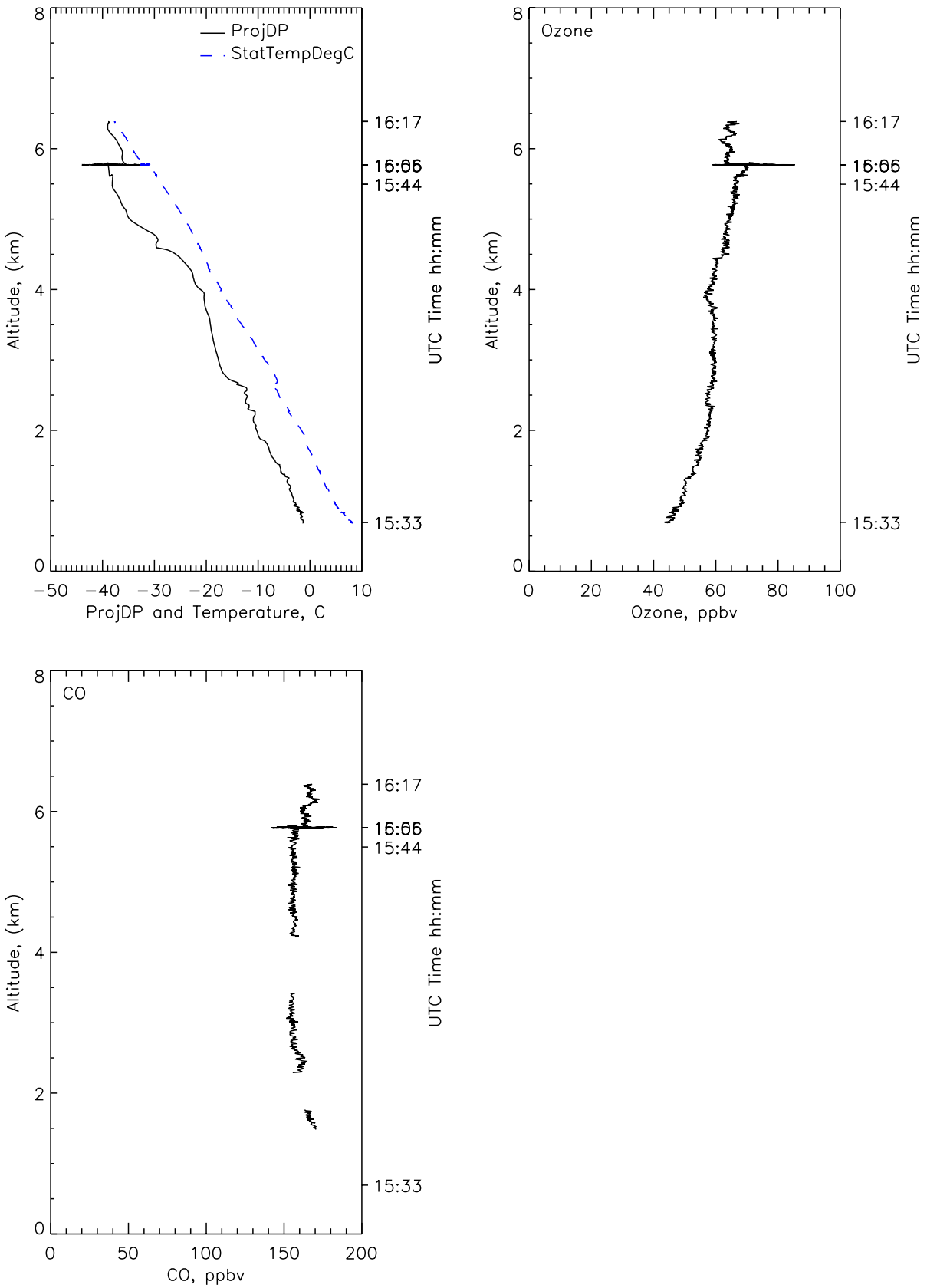

FINAL DATA: TRACE-P P3-B Flight 24
.3<=Dp<=20um
FSSP surface, um^2/cm^3
UTC Time
.007<=Dp<=20um @50C
DMA+OPC volume, um^3/cm^3
UTC Time
.3<=Dp<=20um
FSSP volume, um^3/cm^3
UTC Time
PVMLWC, g/m^3
UTC Time

LEFT BLANK

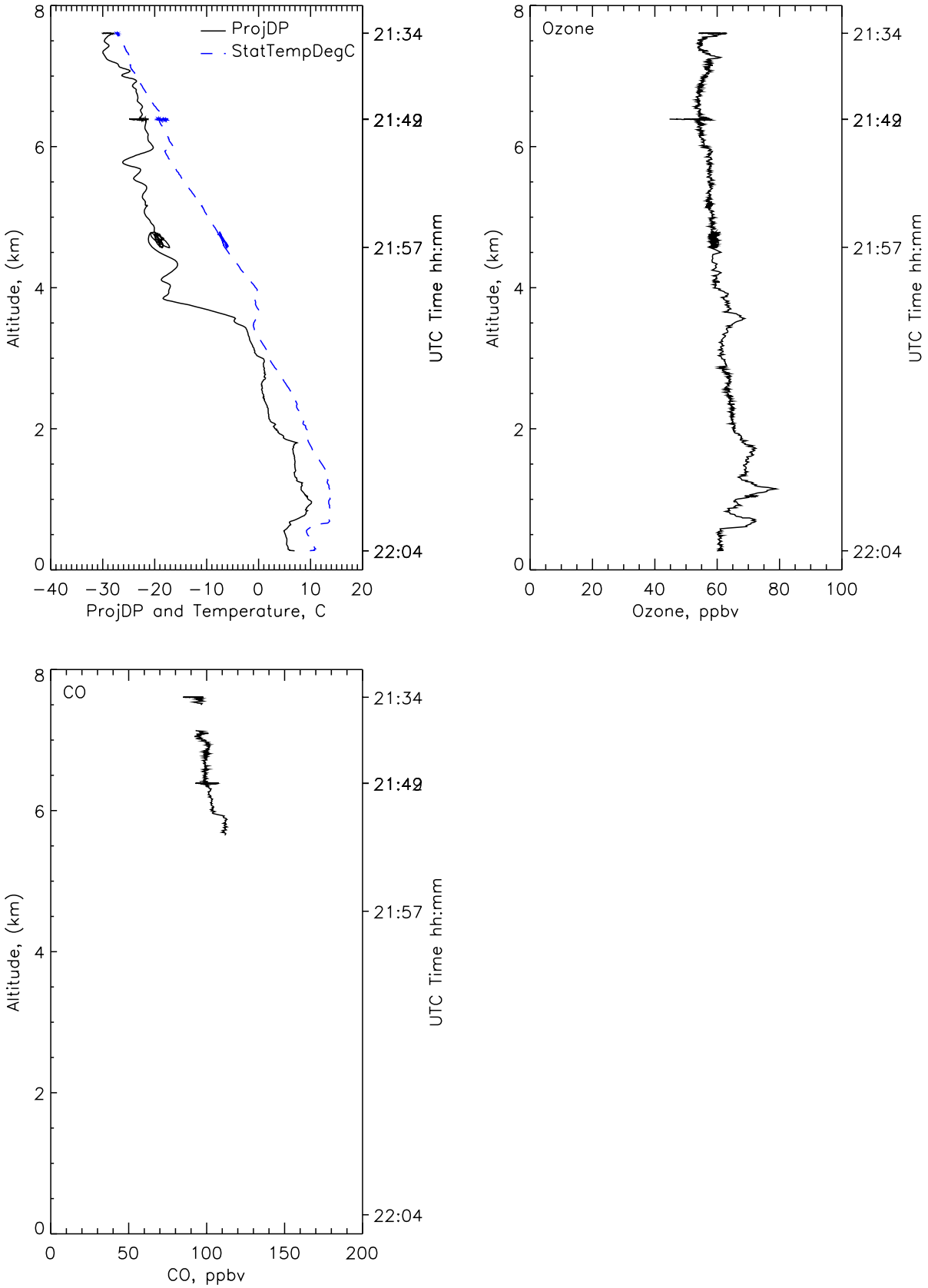

FINAL DATA: TRACE-P P3-B Flight 24
O3COL, DU
SZA, deg
J(O3), 1/s
J(H2O2), 1/s
J(NO2), 1/s
All J(NO2) below LOD
UTC Time


FINAL DATA: TRACE-P P3-B Flight 24
J(NO2)N+J(NO2)Z, 1/s
0.020
0.015
0.010
0.005
0.000
15
16
17
18
19
20
21
22
23
UTC Time
J(NO2)Nadir/J(NO2)Zenith
1.2
1.0
0.8
0.6
0.4
0.2
0.0
UTC Time
Roll, degs
40
20
0
−20
−40
−60
UTC Time
AltCab, feet
10000
8000
6000
4000
2000
0
−2000
UTC Time

Profile # 1 TRACE−P P3−B Flight 24



Profile # 2 TRACE−P P3−B Flight 24



APPENDIX B: LANGLEY ASDC DATA ARCHIVE

System Description

The Langley Atmospheric Sciences Data Center (ASDC), located at the NASA Langley Research Center in Hampton, Virginia, is responsible for archiving and distributing NASA science data in the areas of radiation budget, clouds, aerosols, and tropospheric chemistry. This ASDC will also archive some of the data sets, which result from the EOS program and other elements of the Earth Science Enterprise. The ASDC data can be accessed and ordered on line through the website: (http://eosweb.larc.nasa.gov/index.html). Users who cannot access the web or who have any questions concerning the Langley ASDC may contact:

Langley ASDC User and Data Services
Mail Stop 157D
NASA Langley Research Center
Hampton, VA 23681-0001
Phone: (757) 864-8656 (M-F 8am–4:30pm, Eastern Time)
FAX: (757) 864-8807
Email: larc@eos.nasa.gov

REPORT DOCUMENTATION PAGE

Form Approved
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1. REPORT DATE *(DD-MM-YYYY)*
01- 10 - 2003

2. REPORT TYPE
Technical Memorandum

3. DATES COVERED *(From - To)*

4. TITLE AND SUBTITLE
Compendium of NASA Data Base for the Global Tropospheric Experiment's Transport and Chemical Evolution Over the Pacific (TRACE-P)
Volume 2: P-3B

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Mary M. Kleb and A. Donald Scott, Jr.

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER
622-63-06-70

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
NASA Langley Research Center
Hampton, VA 23681-2199

8. PERFORMING ORGANIZATION REPORT NUMBER
L-18260B

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Washington, DC 20546-0001

10. SPONSOR/MONITOR'S ACRONYM(S)
NASA

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
NASA/TM-2003-212429/VOL2

12. DISTRIBUTION/AVAILABILITY STATEMENT
Unclassified - Unlimited
Subject Category 42
Availability: NASA CASI (301) 621-0390 Distribution: Standard

13. SUPPLEMENTARY NOTES
An electronic version can be found at http://techreports.larc.nasa.gov/ltrs/ or http://ntrs.nasa.gov

14. ABSTRACT

This report provides a compendium of NASA aircraft data that are available from NASA's Global Tropospheric Experiment's (GTE) Transport and Chemical Evolution over the Pacific (TRACE-P) Mission. The broad goal of TRACE-P was to characterize the transit and evolution of the Asian outflow over the western Pacific. Conducted from February 24 through April 10, 2001, TRACE-P integrated airborne, satellite- and ground based observations, as well as forecasts from aerosol and chemistry models. The format of this compendium utilizes data plots (time series) of selected data acquired aboard the NASA/Dryden DC-8 (vol. 1) and NASA/Wallops P- 3B (vol. 2) aircraft during TRACE-P. The purpose of this document is to provide a representation of aircraft data that are available in archived format via NASA Langley's Distributed Active Archive Center (DAAC) and through the GTE Project Office archive. The data format is not intended to support original research/analyses, but to assist the reader in identifying data that are of interest.

15. SUBJECT TERMS
Tropospheric chemical composition; Aircraft tropospheric measurements

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			STI Help Desk (email: help@sti.nasa.gov)
U	U	U	UU	564	19b. TELEPHONE NUMBER *(Include area code)* (301) 621-0390

Standard Form 298 (Rev. 8-98)
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