Revision Date: 14 November 2017

HIPPO Combined Discrete Flask and GC Sample GHG, Halocarbon, and Hydrocarbon Data (R_20121129)



Summary:

This data set contains the results of analyses of discrete samples from the on-board in situ PANTHER or UCATS GC instruments and the analyses of flask samples collected by the AWAS, NWAS, or MEDUSA whole air <u>flask</u> samplers for all Missions, 1 through 5, of the HIAPER Pole-to-Pole Observations (HIPPO) study of carbon cycle and greenhouse gases. The Missions took place from January of 2009 to September 2011.

This data set contains the results of analyses of discrete samples from the on-board in situ PANTHER or UCATS GC instruments and the analyses of flask samples collected by the AWAS, NWAS, or MEDUSA whole air <u>flask</u> samplers. The file contents and structure are suited for comparative analyses of the fast-sample GC and whole air sample results.

Each row of the data file contains the results for all of measurements of a discrete sample performed on one of several instruments.

The column titled 'INSTRUMENT' indicates which instrument / laboratory made a particular discrete measurement: I = AWAS/U.Miami, 2 = NWAS/NOAA + CU, 3 = PantherMSD/NOAA, 4 = MEDUSA/Scripps, 5 = UCATS~GC/NOAA, and 6 = PantherECD/NOAA.

When the same species was measured by more than one instrument (e.g., CFC_11), the results from all instruments are included in the same column (i.e., CFC_11). However, when only one instrument measured a given species (e.g., HCFC_21) the results are reported in in a column labeled to also indicated the source instrument (e.g., HCFC_21_AW).

Selected continuous parameters are also included in the data file. One-second merged data were aggregated, by averaging, over the precise sampling interval of each of the discrete samples. In the case of MEDUSA an exponential weighting function was applied for more accurate averaging.

In summary, the resulting data file's structure has discrete sample measurement values from a given instrument on each row while averaged one-second values occur on every row. Note that the time interval between discrete samples is not equal / continuous.

The first series of columns are the discrete sample results followed by the high-rate averaged parameters.

Data Notes:

The CO2.X, CO.X, and APO.X derived parameters only exist at 10-second resolution. For merging with the discrete sample results, the closest 10-second values were used.

Adjustments to measurements from AWAS flasks were made for differences in calibration scales between NOAA and U. Miami analyses for species that were measured by both laboratories. Species measured by both labs are reported in a single column. Compounds measured only at U. Miami were not adjusted. The U.Miami's PI is developing documentation about how these adjustments were made.

Adjustments to the MEDUSA CO₂ values were made for differences in calibration scales between the NOAA laboratory and Scripps Laboratory.

When the same species were measured by two or more instruments, comparable results are reported in a single column under a common name.

Scripps and NOAA isotope measurements are currently in separate columns but may be merged in the future.

Use: scientific analysis of the fast-sample GC and whole air samples

Summary of 10-Second Data Completeness by Mission

A supplementary file is provided with this product that summarizes the completeness of the reported data values. The completeness entries are the number of non-missing observations for each species in the main data file for each mission and in total. The number of observation given for species "jd" is the maximum number of possible non-missing observations per mission. The data are provided in one space-delimited format ASCII file.

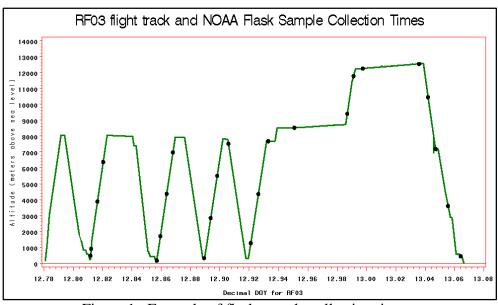


Figure 1. Example of flask sample collection times.

Data Set Citation:

[Back To Contents]

Cite this data set as follows:

Wofsy, S. C., B. C. Daube, R. Jimenez, E. Kort, J. V. Pittman, S. Park, R. Commane, B. Xiang, G. Santoni, D. Jacob, J. Fisher, C. Pickett-Heaps, H. Wang, K. Wecht, Q.-Q. Wang, B. B. Stephens, S. Shertz, A.S. Watt, P. Romashkin, T. Campos, J. Haggerty, W. A. Cooper, D. Rogers, S. Beaton, R. Hendershot, J. W. Elkins, D. W. Fahey, R. S. Gao, F. Moore, S. A. Montzka, J. P. Schwarz, A. E. Perring, D. Hurst, B. R. Miller, C. Sweeney, S. Oltmans, D. Nance, E. Hintsa, G. Dutton, L. A. Watts, J. R. Spackman, K. H. Rosenlof, E. A. Ray, B. Hall, M. A. Zondlo, M. Diao, R. Keeling, J. Bent, E. L. Atlas, R. Lueb, M. J. Mahoney. 2012. HIPPO Combined Discrete Flask and GC Sample GHG, Halo-, Hydrocarbon Data (R_20121129). Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, U.S.A. http://doi.org/10.3334/CDIAC/hippo_012 (CDIAC Release 20121129/ NCAR EOL Version 1.0)

*** Users are encouraged to include the Data File Name(s) with the citation to document the data file and version used for reproducibility. Please append: "[File name(s): list file name(s) or reference another included table or source that lists the files]"

Data Set Contents:

[Back To Contents]

Data files with version control information:

Data Product	File Name w/Version	Date Published	Date Superseded	Change Description
	HIPPO_discrete_continuous_merge_2 0121129.tbl	20121129		First archived version
	DISCRETE_meta_summary.tbl	20121129		First archived version

User's Guide Contents:

Data and Documentation Access

Data Set Citation

Data Set Contents

HIPPO Data Fair Use

Data Description

Data Dictionary

References

Data Center Information

HIPPO Project

The HIAPER Pole-to-Pole Observations (HIPPO) study is investigating the Carbon Cycle and greenhouse gases throughout various altitudes of the western hemisphere through the annual cycle. HIPPO is supported by the National Science Foundation (NSF) and its operations are managed by the Earth Observing Laboratory (EOL) of the National Center for Atmospheric Research (NCAR). Its base of operations is EOL's Research Aviation Facility (RAF) at the Rocky Mountain Metropolitan Airport (RMMA) in Jefferson County, Colorado. The main goal of this study is to determine the global distribution of carbon dioxide and other trace atmospheric gases by sampling at various altitudes and latitudes in the Pacific Basin.









Figure 2. NSF/NCAR G-V aircraft at various locations during Mission 1.

Data and Documentation Access:

[Back To Contents]

Get Data:

EOL HIPPO Data Archive and Web Site: Download imagery, publications, supporting documentation, instrument descriptions, data deictionary and component data: (www.eol.ucar.edu/projects/hippo)

Links to Companion Files and Supplemental Information:

EOL HIPPO Data Quality Reports: (www.eol.ucar.edu/projects/hippo)

- Mission Data Quality Reports
- Investigator provided "Readme Files"

HIPPO Data Policy -- Sharing, Access, and Use Recommendations: https://www.eol.ucar.edu/system/files/HIPPO_Full_Data_Policy_lah_20170915_1.pdf

UCAR HIPPO Project Web Site: http://hippo.ucar.edu/

HIPPO Flight Tracks in Google Earth: Download *.kmz files for Google Earth

HIPPO Data Fair Use

Back To Contents

Before you use HIPPO data, please first familiarize yourself with the HIPPO Data Fair Use agreement below. Your cooperation is appreciated.

The HIPPO data provided on this public archive are freely available and were furnished by HIPPO researchers who encourage their use. Data users are encouraged to consider the following recommendations for fair, appropriate, and optimal use of data products.

HIPPO Scientist Interactions:

- Please kindly inform the HIPPO scientist(s) associated with each data product about the new data analysis activity near the beginning of the effort, and of any publication plans as the effort nears completion.
- Consult with the respective HIPPO scientist(s) concerning your data analysis plans to assure that the latest data product is being used and that it is being used appropriately.
- HIPPO science team members are listed at http://hippo.ucar.edu/team. Alternatively, initiate contact with Dr. Steven C. Wofsy (swofsy@seas.harvard.edu), Lead Principal Investigator.

Acknowledgments:

- Please acknowledge (1) the use of HIPPO data products with a citation as provided in the data archive documentation, and (2) website information downloads as a bibliographic web citation.
- Acknowledge the agency or organization (e.g., NSF and NOAA) that supported the collection of the original HIPPO data when publishing new analyses and results using HIPPO data products.
- Please submit a HIPPO publication reference or reprint at http://www.eol.ucar.edu/projects/hippo/publications/publication_refs.html of your independent work so that all publications resulting from HIPPO data products may be tracked, recorded, and referenced.

Read the complete HIPPO Data Policy: Sharing, Access, and Use Recommendations https://www.eol.ucar.edu/system/files/HIPPO Full Data Policy lah 20170915 1.pdf

Data Description:

[Back To Contents]

Temporal and Spatial (horizontal) Coverage of Research Flights

These tables describe at a general level the mission-by-mission research flights

Mission	Flight Path Notes	Flight Path
HIPPO-1	Northern polar flight #1 reached 80° N.	
Sampling Dates	Southbound Pacific flights followed the typical central flight path.	
January 8 to January 30, 2009	Southern ocean flight reached 67° S, 175° W	
Vertical Profiles Flown	The northbound flights followed an Eastern Pacific Route over Central and Southern North America.	
138	HIPPO-1 was only mission to not return to the Arctic a second time.	Googe
Mission	Flight Path Notes	Flight Path
		.9
HIPPO-2	Northern polar flight #1 reached 80° N.	
HIPPO-2 Sampling Dates		
Sampling Dates October 31 to November 22,	Northern polar flight #1 reached 80° N. Both southbound and northbound Pacific	
Sampling Dates October 31 to	Northern polar flight #1 reached 80° N. Both southbound and northbound Pacific flights followed a central flight path.	
Sampling Dates October 31 to November 22, 2009 Vertical Profiles	Northern polar flight #1 reached 80° N. Both southbound and northbound Pacific flights followed a central flight path. Southern ocean flight reached 66° S, 174° W	Google
Sampling Dates October 31 to November 22, 2009 Vertical Profiles Flown	Northern polar flight #1 reached 80° N. Both southbound and northbound Pacific flights followed a central flight path. Southern ocean flight reached 66° S, 174° W	Goods State

Mission	Flight Path Notes	Flight Path
HIPPO-3	Northern polar flight #1 reached 84.75° N.	
Sampling Dates	Both southbound and northbound Pacific flights followed a central flight path. Southbound RF04 reached 41,000 feet over	
March 24 to April 16, 2010	the equator allowing insight into the atmospheric cross section near the Intertropical Convergence Zone (ITCZ).	
Vertical Profiles Flown	 Northbound RF09 was coordinated to track with the NASA Global Hawk (50,000 feet higher) and both intercepted the track of the 	
136	NASA Aura satellite, which carries the Microwave Limb Sounder (MLS). Southern ocean flight reached 66.8° S, 170° E. Northern polar flight #2 reached 85° N. Polar flight RF10 flew three 500 feet altitude by 5 minute legs crossing extensive networks of fractures in ice	Coogle Maydiana (2001) Strongury (2001) MASSA. Trend Alexina in Terrina of Open

Mission	Flight Path Notes	Flight Path
HIPPO-4	Northern polar flight #1 reached 84° N.	<u>+</u>
Sampling Dates	Southbound Pacific flights followed the typical central flight path. In the Southern Pacific, a Chilean volcanic	
June 14 to July 11, 2011	ash cloud caused a schedule change. Flights were delayed to allow ash-free air masses to move in to permit safe sampling. High	
Vertical Profiles Flown	latitude air masses were also pushed south, which limited GV access to Polar air.	
175	Southern ocean flight reached 58° S, 145° E. The northbound flights followed a Western Pacific route but the earthquake and tsunami in Japan necessitated a less westerly return than was planned. Northern polar flight #2 reached 82° N. Polar flight RF11 flew over Point Hope, AK and traversed open ocean, scattered ice, flooded ice, and ice with melt ponds with a low altitude transect ranging from 500 to 5,000 feet. Solid ice was not reach by turnaround at 82N.	Google Map data \$2015 imagery \$2016 NASA. TerraMerica: Terma of Usa.

Mission	Flight Path Notes	Flight Path
HIPPO-5	Northern polar flight #1 reached 82° N.	
Sampling Dates	Both southbound and northbound Pacific flights followed a central flight path.	
August 9 to September 8, 2011	 Southern ocean flight reached 67° S, 164° E. Flight RF09 reached the ice edge; one profile crossed the edge and another 	
Vertical Profiles Flown	profile crossed the edge and another profile was over solid ice. Northern polar flight #2 reached 87° N.	
190	Northern polar hight #2 reached 07 IV.	GOODS

Bounding Box for All Research Flights:



Flight paths for all five Missions

Longitude	Longitude	Northernmost Latitude	Southernmost Latitude
128.2 E	-84.0 W	87.04313 N	-67.15801 S

Spatial Coverage (vertical) of Research Flights

The 10-second merged data are highly time resolved due to the component 1-second in situ reporting frequency and vertically-resolved as well because of GV flight plans that performed 787 vertical ascents /descents from the ocean/ice surface/land surface to as high as the tropopause. It was planned to have two maximum altitude ascents per flight to the tropopause/lower stratosphere, one in the first half and one in the second half of a research flight. In between, several vertical profiles from below the planetary boundary layer (PBL) to the midtroposphere (1,000-28,000 feet) were flown.

- Profiles were flown approximately every 2.2° of latitude with 4.4° between consecutive near-surface or high-altitude samples.
- Rate of climb and descent was 1,500 ft/ minute (457 m/minute).
- During these profiles, the GV averaged a ground speed of about 175 m/sec or 10 km/min.

Typical Flight Plan

Ideally a flight would take off and go to FL430 (43,000 ft or 13,100 m) over the first 15 minutes, then descend belowFL290 (29,000 ft or 8,850 m) and proceed in a sawtooth pattern between FL270 (27,000 ft or 8250 m) and FL10 (1,000 ft or 300 m) with a 1,500 ft (457 m)/minute climb/descent rate, then climb to FL450 (45,000 ft or 13,700 m) near the end of the flight for about 15 minutes, then descend, and proceed to the airport.

Most of a flight was conducted below the international Reduced Vertical Separation Minimum (RVSM) usually 29,000 ft or 8,850 m, in order to allow the G-V to descend and climb constantly to collect data at different altitudes throughout the troposphere. All flights plans were subject to modifications depending upon local atmospheric conditions and approval by air traffic control.

On average, consecutive profile samples in the midtroposphere are separated by 2.2° of latitude, with 4.4° between consecutive near-surface or high-altitude samples. Most profiles extended from approximately 300 to 8,500 m altitude, constrained by air traffic, but significant profiling extended above approximately 14 km.

Flight Patterns

These two images provide a good visualization of the typical HIPPO flight pattern, which is designed to sample the global distribution of carbon dioxide and other trace atmospheric gases at various altitudes and latitudes in the Pacific Basin.

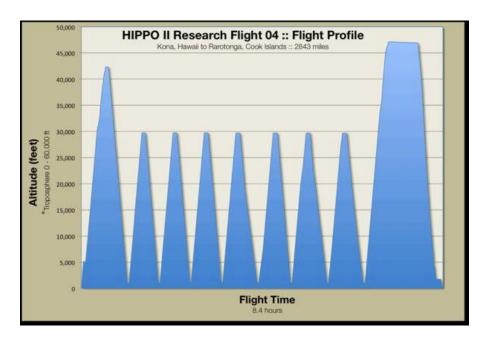


Figure 2. Example of NSF/NCAR G-V aircraft flight pattern. Eighteen profiles are shown in the image; the ascending and descending flight paths of each peak are a separate profile.

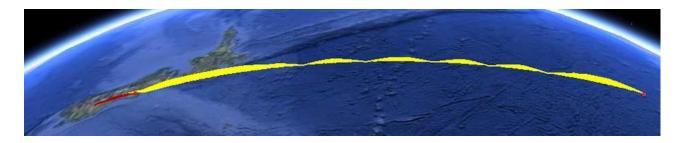


Figure 3. Example of NSF/NCAR G-V aircraft flight pattern. The x-axis in this figure is space and is a more realistic representation of the vertical aspect of a flight than in Figure 2.

Temporal Resolution of Merged Observations

Data Center Note: To provide a more complete description of the temporal resolution of measurements, we will be developing a table that lists for each instrument or sampling device, the native sampling duration, the reporting or integration interval, and the inter-sample interval.

Data File Description

A note about North American training and research flights:

For Mission 2-5, results of measurements collected during instrument check training flights and research flights conducted over North America are included in the data file. For Missions 2, 3, and 4, the training flights have "flt" values of -1 and 0. For Mission 5, research flights have "flt" values of 1 and 2. Users may want to exclude those from their HIPPO data analyses. The next flight in the series, the first HIPPO flight, originated at NCAR's Earth Observing Laboratory, Research Aviation Facility (RAF), located at the Rocky Mountain Metropolitan Airport (KBJC), Broomfield, CO and proceeded to Anchorage, AK.

Note that the first research flight for Mission 1 originated in Billings, MT, and has a"flt" value of 2.

This table provides an overview of sources of data in the Combined Discrete Flask and GC Sample product.

Instrume	Instrume		Institutio	Investigato	
nt	nt code	Instrument detail	n	rs	Method
	NA-V	Various	Various	Various	Not applicable
	NA	Not applicable	Harvard	Wofsy	Not applicable
	GV-TIME	GV time sychronized to GPS	NCAR	Romashkin	To be determined
	AWAS	Advanced Whole Air Sampler	U. Miami	Atlas	Not applicable
1	AWAS-MS	Advanced Whole Air Sampler- MS	U. Miami	Atlas	GC/MS (Gas chromatograph/mass spectrometer)
2	NWAS-M2	NOAA Whole Air Sampler - Montzka Mass Spectrometer #2	NOAA-GMD	Montzka, Miller	GC/MS (Gas chromatograph/mass spectrometer)
6	PANTHER- ECD	PAN and other Trace Hydrohalocarbon ExpeRiment	NOAA-GMD	Moore, Elkins	GC/ECD (Gas chromatograph/ electron capture detector)
3	PANTHER- MSD	PAN and other Trace Hydrohalocarbon ExpeRiment	NOAA-GMD	Moore, Elkins	GC/MS (Gas chromatograph/ mass spectrometer)
1	AWAS-FID	Advanced Whole Air Sampler- FID	U. Miami	Atlas	GC/FID (gas chromatograph/flame ionization detector), or occasionally GC/MS (Gas chromatograph/mass spectrometer)
2	NWAS- MAGICC	NOAA Whole Air Sampler - Measurement of Atmospheric Gases that Influence Climate Change	NOAA-GMD	Tans, Miller	GC/NDIR/Resonance Fluorescence/UV Absorption Spectroscopy
5	UCATS-UGC	Unmanned Aircraft Systems (UAS) Chromatograph for Atmospheric Trace Species	NOAA-GMD	Hurst, Hintsa	GC/ECD (Gas chromatograph/ electron capture detector)
1	AWAS-ECD	Advanced Whole Air Sampler- ECD	U. Miami	Atlas	GC/ECD (gas chromatograph/electron capture detector)
1	AWAS-RGD	Advanced Whole Air Sampler	U. Miami	Atlas	GC/RCD (gas chromatograph/reduction gas detector)
4	MEDUSA-IR	Multiple Enclosure Device for Unfractionated Sampling of Air (MEDUSA)	Scripps, NOAA	Stephens, Keeling, Bent	Infrared absorption
	NWAS-SIL	NOAA Whole Air Sampler - INSTAAR Stable Isotope Lab Mass spectrometry	NOAA-GMD	Vaughn, White	Mass spectrometry
	AO2-QCLS- OMS	Various	Multiple	Various	Various

Instrume nt	Instrume nt code	Instrument detail	Institutio n	Investigato rs	Method
	MEDUSA-				
	MEDUSA- MS	Multiple Enclosure Device for Unfractionated Sampling of Air (MEDUSA)	Scripps, NOAA	Stephens, Keeling, Bent	Sector-magnet mass spectrometry
	GV-GP	GV gust probe	NCAR	Romashkin	Radome differential pressure
	GV-AV	GV Avionics	NCAR	Romashkin	Thermal sensor?
	GV-CMS	GV cooled-mirror sensor	NCAR	Romashkin	Condensation?
	GV-LWCS	GV PMS liquid water content sensor (King probe)	NCAR	Romashkin	Heat loss from water vaporization
	GV-NOGPS	GV Novatel Omnistar-enabled GPS (Reference)	NCAR	Romashkin	GPS (Global Positioning System)
	GV-GUST	GV 5-hole radome gust probe	NCAR	Romashkin	Differential pressure?
	GV- MULTIPLE	Multiple GV instruments	NCAR	Romashkin	Various
	WIOLIIFEL	National Advisory Committee	INCAR	KOIIIdSIIKIII	National Advisory Committee for
	NACA	for Aeronautics method	NCAR	Romashkin Fahey, Gao, Spackman,	Aeronautics method
	SP2-PRES	Single particle soot photometer	NOAA-CSD	Schwarz, Perring	Pressure sensor
	GV-HIRS	GV Honeywell YG1854 Laseref SM Inertial Reference System 1	NCAR	Romashkin	IRS (Inertial Reference System) and GPS (Global Positioning System)
	GV-PS	GV Paroscientific Model 1000, using fuselage holes	NCAR	Romashkin	Pressure transducer
	GV-CDPT	GV calibrated differential pressure transducer	NCAR	Romashkin	Pressure sensors
	GV-SENSOR	GV aircraft sensor	NCAR	Romashkin	To be determined
	GV-RICE	GV Rosemount Model 871FA icing rate detector	NCAR	Romashkin	To be determined
	GV-MENSOR	GV Mensor 6100 sensor	NCAR	Romashkin	Pressure sensor
	GV-UCATS	GV and UCATS instruments	NCAR	Romashkin	Various
	GV-1DOAP	One Dimensional Optical Array Probe	NCAR	Romashkin	Laser beam, diode array
	GV-2DOAP	Two Dimensional Optical Array Probe	NCAR	Romashkin	Laser beam, diode array
	GV-2D-C	2D-C Probe	NCAR	Romashkin	Laser beam, diode array
	GV-CDP	Cloud droplet probe on GV	NCAR	Romashkin	Diode laser - forward scattered light
	UHSAS	Ultra-high sensitivity aerosol spectrometer	NCAR	Cooper	Aerosol spectrometer
	AO2-IR	NCAR Airborne Oxygen Instrument	NCAR	Stephens, Bent	Vacuum-ultraviolet absorption and Infrared absorption
	AO2-VUV	NCAR Airborne Oxygen Instrument	NCAR	Stephens, Bent	Vacuum-ultraviolet absorption
	AO2-M	NCAR Airborne Oxygen Instrument	NCAR	Stephens, Bent	Multiple
	QCLS-IR	Quantum Cascade Laser System (NCAR system built by Harvard/Aerodyne)	Harvard	Daube, Jimenez, Kort	Infrared absorption
	QCLS-NDIR	Quantum Cascade Laser System (NCAR system built by Harvard/Aerodyne)	Harvard	Daube, Jimenez, Kort	Nondispersive infrared analyzer
	OMS	Harvard Licor 6251 NDIR CO2 sensor, heritage NASA "Observations of the Middle Stratosphere"	Harvard	Daube, Pittman, Kort, Jimenez	Non-dispersed infrared absorption

Instrume	Instrume		Institutio	Investigato	
nt	nt code	Instrument detail	n	rs	Method
	GV-				
	AEROLASER	GV AeroLaser VUV CO sensor	NCAR	Campos	VUV fluorescence
				Fahey, Gao,	
	UV-PHOT-N	UV ozone photometer (NOAA)	NOAA-CSD	Spackman	Ultraviolet absorption
				Fahey, Gao,	
				Spackman,	
				Schwarz,	
	SP2	Single particle soot photometer	NOAA-CSD	Perring	LII (Laser-induced incandescence)
		Unmanned Aircraft Systems			
		(UAS) Chromatograph for			
	UCATS-UWV	Atmospheric Trace Species	NOAA-GMD	Hurst, Hintsa	Tunable diode laser
	UCATS-	2B (modified) UV ozone			
	PHOT	photometer (UCATS)	NOAA-GMD	Hurst, Hintsa	Photometer
		GV near-infrared vertical cavity			
		surface emitting laser (VCSEL)			
	GV-VCSEL	hygrometer	Princeton	Zondlo	Laser hygrometer

Data Dictionary:

[Back To Contents]

These data are considered at **Quality Level 2**. Level 2 indicates a complete, externally consistent data product that has undergone interpretative and diagnostic analysis by HIPPO researchers. Sampling, data collection and instrument calibration issues are identified in the daily mission summary reports, daily technician's reports and the Project Managers' Data Quality Reports, and have been addressed to the extent possible as indicated in the metadata.

Note that the data files are space delimited and use "NA" as the missing value code. NA is typically used in data products processed by "R".

When the same species was measured by more than one instrument (e.g., CFC_11), the results from all instruments are included in the same column (i.e., CFC_11 -- column 11). Note that there are three entries in the data dictionary for CFC_11, one for each instrument that measured it. The entries vary in the Instrument, Instrument Code, and Instrument Detail columns.

The first series of columns, 11 - 87, are the discrete sample results followed by the high-rate averaged parameters in columns 88-143.

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
	Column name	description	Unit	_		nt code	detail
n	Columniame	Indicates source of data	Ollit	name	nt	iit code	uetan
		In					
		discrete_continuous_m					
		erge file: 1=AWAS;					
		2=NWAS; 3=PANTHER-					
		MSD; 4=MEDUSA;					
1	INSTRUMENT	5=UCATS; 6=PANTHER-	None	None		NA-V	Various
1	INSTRUIVIENT	ECD. Decimal day number for	None	None		INA-V	various
		HIPPO project,					
		sequential, starting with					
2	jd	January 1, 2009	d	day		NA	Not applicable
3	Year	Year	у	year		NA	Not applicable
		HIPPO mission number	<i>'</i>	70			Т
4	H.no	(1 through 5)	None	None		NA	Not applicable
		Flight sequence number					
5	flt	within the mission	None	None		NA	Not applicable
6	DOY	Day of the year	d	day		NA	Not applicable
		Elapsed flight time,					
		seconds, since 0000					GV time
7	LITC	UTC on day flight started		sasand		CV/ TIME	sychronized to GPS
	UTC	Representative sample	S	second		GV-TIME	GPS
		time, seconds, since					
		0000 UTC on day flight					
8	UT_MID	started	S	second		NA-V	Various
		AWAS sample start					
		time, seconds, since					Advanced Whole Air
9	UT START	0000 UTC on day flight started	s	second		AWAS	Sampler
	01_31AK1	AWAS sample closure	3	Second		AWAS	Sumplet
		time, seconds, since					Advanced
		0000 UTC on day flight					Whole Air
10	UT_STOP	started	S	second		AWAS	Sampler
				part per			A d d
				trillion dry air mole			Advanced Whole Air
11	CFC 11	CFC-11 (CCl3F)	pptv	fraction	1	AWAS-MS	Sampler-MS
	_	, -,	1	part per			NOAA Whole Air
				trillion dry			Sampler -
	050.44	050 44 (05'55')		air mole	_		Montzka Mass
11	CFC_11	CFC-11 (CCl3F)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per trillion dry			PAN and other Trace
				air mole		PANTHER-	Hydrohalocarbo
11	CFC_11	CFC-11 (CCl3F)	pptv	fraction	6	ECD	n ExpeRiment
				part per			
				trillion dry			Advanced
40	CFC 12	CEC 42 (CC)252)		air mole		A)A/AC A 4C	Whole Air
12	CFC_12	CFC-12 (CCl2F2)	pptv	fraction part per	1	AWAS-MS	Sampler-MS NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
12	CFC_12	CFC-12 (CCl2F2)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			PAN and other
				trillion dry		DANTUES	Trace
12	CEC 12	CEC-12 (CCI2E2)	nntı.	air mole fraction	6	PANTHER- ECD	Hydrohalocarbo n ExpeRiment
12	CFC_12	CFC-12 (CCl2F2)	pptv	Haction	l p	LCD	ii Expeniment

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
	Column name	description	Unit			nt code	detail
n	Columniname	description	Unit	part per	nt	nt code	NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
13	CFC_13	CFC-13 (CCIF3)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			
				trillion dry			Advanced
14	CFC 112	CEC 112 (CC)2ECC(E2)	nntu	air mole	1	A14/AC N/AC	Whole Air
14	CFC_113	CFC-113 (CCl2FCClF2)	pptv	fraction part per	1	AWAS-MS	Sampler-MS NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
14	CFC_113	CFC-113 (CCI2FCCIF2)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			PAN and other
				trillion dry		544171155	Trace
1.4	CFC 112	CEC 112 (CC)2ECC(E2)	nntu	air mole fraction	6	PANTHER- ECD	Hydrohalocarbo n ExpeRiment
14	CFC_113	CFC-113 (CCI2FCCIF2)	pptv	part per	0	ECD	ii Experiment
				trillion dry			Advanced
				air mole			Whole Air
15	CFC_115	CFC-115 (CF2CICF3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
15	CFC 11F	CEC 11E (CE3CICE3)	nnt	air mole fraction	2	NIMA/AC NAD	Montzka Mass
15	CFC_115	CFC-115 (CF2CICF3)	ppt	part per	2	NWAS-M2	Spectrometer #2
				trillion dry			Advanced
				air mole			Whole Air
16	HCFC_21_AW	HCFC-21 (CHCl2F)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
17	HCFC 22	HCFC-22 (CHF2CI)	pptv	air mole fraction	1	AWAS-MS	Whole Air Sampler-MS
17	11010_22	1101 0-22 (0111 201)	pptv	part per	1	AWAS-WIS	NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
17	HCFC_22	HCFC-22 (CHF2CI)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			PAN and other
				trillion dry air mole		PANTHER-	Trace Hydrohalocarbo
17	HCFC 22	HCFC-22 (CHF2CI)	pptv	fraction	3	MSD	n ExpeRiment
17	TICI C_ZZ	TICI C ZZ (CITI ZCI)	pptv	part per	3	WISE	пехрепштене
				trillion dry			Advanced
				air mole			Whole Air
18	HCFC_141b	HCFC-141b (CH3CFCl2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			PAN and other
				trillion dry air mole		PANTHER-	Trace Hydrohalocarbo
18	HCFC 141b	HCFC-141b (CH3CFCl2)	pptv	fraction	3	MSD	n ExpeRiment
13			FF	part per			
				trillion dry			Advanced
				air mole			Whole Air
19	HCFC_142b	HCFC-142b (CH3CF2CI)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry air mole			Sampler - Montzka Mass
19	HCFC_142b	HCFC-142b (CH3CF2CI)	ppt	fraction	2	NWAS-M2	Spectrometer #2
13		.101 0 1 125 (011501 201)	PPC	part per	2		PAN and other
				trillion dry			Trace
				air mole		PANTHER-	Hydrohalocarbo
19	HCFC_142b	HCFC-142b (CH3CF2CI)	pptv	fraction	3	MSD	n ExpeRiment

				l lois			
Colum		Evnandad		Unit	Instrume	Instrumo	Instrument
	Caluman mana	Expanded	l loste	long	Instrume	Instrume	Instrument
n	Column name	description	Unit	part per	nt	nt code	detail
				trillion dry			Advanced
				air mole			Whole Air
20	HCFC_123_AW	HCFC-123 (C2HCl2F3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
24	11050 424 414	11050 424 (02110154)		air mole		A) A / A C A A C	Whole Air
21	HCFC_124_AW	HCFC-124 (C2HCIF4)	pptv	fraction part per	1	AWAS-MS	Sampler-MS
				trillion dry			Advanced
				air mole			Whole Air
22	HFC_125	HFC-125 (C2HF5)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
22	1150 405	1150 405 (001155)		air mole			Montzka Mass
22	HFC_125	HFC-125 (C2HF5)	ppt	fraction part per	2	NWAS-M2	Spectrometer #2
				trillion dry			Advanced
				air mole			Whole Air
23	HFC_23	HFC-23 (CHF3)	pptv	fraction	1	AWAS-MS	Sampler-MS
	_			part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
23	HFC_23	HFC-23 (CHF3)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			Advanced
				trillion dry air mole			Whole Air
24	HFC 134a	HFC-134a (C2H2F4)	pptv	fraction	1	AWAS-MS	Sampler-MS
	<u> </u>		1.1.	part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
24	HFC_134a	HFC-134a (C2H2F4)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			PAN and other
				trillion dry air mole		PANTHER-	Trace Hydrohalocarbo
24	HFC 134a	HFC-134a (C2H2F4)	pptv	fraction	3	MSD	n ExpeRiment
			P P V	part per			
				trillion dry			Advanced
				air mole			Whole Air
25	HFC_143a	HFC-143a (C2H3F3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry air mole			Sampler - Montzka Mass
25	HFC_143a	HFC-143a (C2H3F3)	ppt	fraction	2	NWAS-M2	Spectrometer #2
			1	part per			p
				trillion dry			Advanced
		HFC-152a (C2H4F2)		air mole			Whole Air
26	HFC_152a	(1,1-difluoroethane)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
		HFC-152a (C2H4F2)		trillion dry air mole			Sampler - Montzka Mass
26	HFC_152a	(1,1-difluoroethane)	ppt	fraction	2	NWAS-M2	Spectrometer #2
	- <u>-</u>	(,, :::::::::::::::::::::::::::::::::::	1.17.	part per			
				trillion dry			Advanced
		CFC-13b1 (Halon 1301,		air mole			Whole Air
27	Halon_1301	CF3Br)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
		CFC-13b1 (Halon 1301,		trillion dry air mole			Sampler - Montzka Mass
27	Halon_1301	CFC-1301 (Halon 1301,	ppt	fraction	2	NWAS-M2	Spectrometer #2
	11001	1 0.00.,	PP'	400.011		1412	Special official #2

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
		•		part per			
				trillion dry			Advanced
		CFC-12b1 (Halon 1211,		air mole			Whole Air
28	Halon_1211	CF2ClBr)	pptv	fraction	1	AWAS-MS	Sampler-MS NOAA Whole Air
				part per trillion dry			Sampler -
		CFC-12b1 (Halon		air mole			Montzka Mass
28	Halon_1211	1211,CF2ClBr)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			PAN and other
				trillion dry			Trace
20	11-1- 1211	CFC-12b1 (Halon 1211,		air mole		PANTHER-	Hydrohalocarbo
28	Halon_1211	CF2ClBr)	pptv	fraction	6	ECD	n ExpeRiment
				part per trillion dry			Advanced
		CFC-114b2 (Halon 2402,		air mole			Whole Air
29	Halon_2402	C2F4Br2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
20		CFC-114b2 (Halon 2402,		air mole			Montzka Mass
29	Halon_2402	C2F4Br2)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per trillion dry			Advanced
				air mole			Whole Air
30	ocs	Carbonyl sulfide (COS)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole	_		Montzka Mass
30	OCS	Carbonyl Sulfide (COS)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per trillion dry			PAN and other Trace
				air mole		PANTHER-	Hydrohalocarbo
30	ocs	Carbonyl sulfide (COS)	pptv	fraction	3	MSD	n ExpeRiment
		, , ,		part per			·
				trillion dry			Advanced
				air mole			Whole Air
31	CH3Cl	Methyl chloride (CH3Cl)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per trillion dry			NOAA Whole Air Sampler -
				air mole			Montzka Mass
31	CH3Cl	Methyl chloride (CH3Cl)	ppt	fraction	2	NWAS-M2	Spectrometer #2
		, , ,		part per			PAN and other
				trillion dry			Trace
				air mole		PANTHER-	Hydrohalocarbo
31	CH3Cl	Methyl chloride (CH3Cl)	pptv	fraction	3	MSD	n ExpeRiment
				part per trillion dry			Advanced
				air mole			Whole Air
32	CH3Br	Methyl bromide(CH3Br)	pptv	fraction	1	AWAS-MS	Sampler-MS
		, ,		part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
32	CH3Br	Methyl bromide(CH3Br)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per trillion dry			PAN and other Trace
		Methyl bromide		air mole		PANTHER-	Hydrohalocarbo
32	CH3Br	(CH3Br)	pptv	fraction	3	MSD	n ExpeRiment
		·		part per			
				trillion dry			Advanced
				air mole			Whole Air
33	CH3I	Methyl iodide (CH3I)	pptv	fraction	1	AWAS-MS	Sampler-MS

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
				part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
33	CH3I	Methyl iodide (CH3I)	ppt	fraction	2	NWAS-M2	Spectrometer #2
		, , ,		part per			PAN and other
				trillion dry			Trace
				air mole		PANTHER-	Hydrohalocarbo
33	CH3I	Methyl iodide (CH3I)	pptv	fraction	3	MSD	n ExpeRiment
				part per			
				trillion dry			Advanced
				air mole			Whole Air
34	CHCl3	Chloroform (CHCl3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
34	CHCl3	Chloroform (CHCl3)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			Advanced
		Methylene chloride		trillion dry air mole			Advanced
35	CH2CI2	•	nnt.	fraction	1	AWAS-MS	Whole Air Sampler-MS
33	CHZCIZ	(CH2Cl2)	pptv		1	AVVAS-IVIS	NOAA Whole Air
				part per trillion dry			Sampler -
		Methylene chloride		air mole			Montzka Mass
35	CH2Cl2	(CH2Cl2)	ppt	fraction	2	NWAS-M2	Spectrometer #2
33	CHZCIZ	(6112612)	ррі	part per		INVVAS-IVIZ	Spectrometer #2
				trillion dry			Advanced
		1,2-Dichloroethane		air mole			Whole Air
36	CH2CICH2CI AW	(C2H4Cl2)	pptv	fraction	1	AWAS-MS	Sampler-MS
			PP	part per	_		
				trillion dry			Advanced
		Methyl		air mole			Whole Air
37	CH3CCI3_AW	chloroform(CH3CCl3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		Trichloroethylene(C2HCl		air mole			Whole Air
38	C2HCl3_AW	3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		Carbon tetrachloride		air mole			Whole Air
39	CCI4	(CCI4)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
		Carbon tetrachloride		air mole	_		Montzka Mass
39	CCI4	(CCI4)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			A discourage of
		Totrochlore		trillion dry			Advanced
40	C2Cl4	Tetrachloroethylene (C2Cl4)	nntv	air mole fraction	1	AWAS-MS	Whole Air
40	C2Cl4	(C2C14)	pptv		1	AVVA3-IVI3	Sampler-MS NOAA Whole Air
				part per trillion dry			Sampler -
		Tetrachloroethylene		air mole			Montzka Mass
40	C2Cl4	(C2Cl4)	ppt	fraction	2	NWAS-M2	Spectrometer #2
+0	CZCIT	(02011)	PPI	part per		INVAD-IVIZ	Spectrometer #2
				trillion dry			Advanced
		Methyl		air mole			Whole Air
41	MeONO2_AW	nitrate(CH3ONO2)	pptv	fraction	1	AWAS-MS	Sampler-MS
			FF	part per	1		
				trillion dry			Advanced
		Ethyl		air mole			Whole Air
			•	1	1	AWAS-MS	Sampler-MS

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
	Column name	description	Unit	_		nt code	detail
n	Column name	description	Ullit	part per	nt	nt code	uetan
				trillion dry			Advanced
		Propyl		air mole			Whole Air
43	i_PropONO2_AW	nitrates(C3H7ONO2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		Propyl		air mole	_		Whole Air
44	n_PropONO2_AW	nitrates(C3H7ONO2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per trillion dry			Advanced
		Butyl nitrates		air mole			Whole Air
45	X2 ButylONO2 AW	(C4H9ONO2)	pptv	fraction	1	AWAS-MS	Sampler-MS
		(0000=/	P P V	part per			
				trillion dry			Advanced
		Pentyl nitrates		air mole			Whole Air
46	X3_C5ONO2_AW	(C5H11ONO2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
		Death Letterhee		trillion dry			Advanced
47	V2 CEONO2 AW	Pentyl nitrates (C5H11ONO2)	nnt.	air mole fraction	1	A14/AC N/AC	Whole Air
47	X2_C5ONO2_AW	(CSHIIONOZ)	pptv	part per	1	AWAS-MS	Sampler-MS
				trillion dry			Advanced
				air mole			Whole Air
48	C2H5Br AW	Ethyl bromide (C2H5Br)	pptv	fraction	1	AWAS-MS	Sampler-MS
	_	, ,		part per			
				trillion dry			Advanced
		Methylene		air mole			Whole Air
49	CH2Br2	bromide(CH2Br2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
		NA a thuile a a		trillion dry			Sampler -
49	CH2Br2	Methylene bromide(CH2Br2)	ppt	air mole fraction	2	NWAS-M2	Montzka Mass Spectrometer #2
43	CHZDIZ	brofflide(Cf12bf2)	ррс	part per		INVAS-IVIZ	Spectrometer #2
				trillion dry			Advanced
		Dibromochloromethane		air mole			Whole Air
50	CHClBr2_AW	(CHBr2Cl)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
				air mole			Whole Air
51	CHBr3	Bromoform (CHBr3)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per trillion dry			NOAA Whole Air Sampler -
				air mole			Montzka Mass
51	CHBr3	Bromoform (CHBr3)	ppt	fraction	2	NWAS-M2	Spectrometer #2
J			1007	part per			
				trillion dry			Advanced
				air mole			Whole Air
52	Ethane_AW	Ethane (C2H6)	pptv	fraction	1	AWAS-FID	Sampler-FID
				part per			1
				trillion dry			Advanced
53	Ethono AM	Ethene (C2H4)	nnty	air mole fraction	1	AMAS EID	Whole Air Sampler-FID
53	Ethene_AW	Luiene (C2A4)	pptv	part per	1	AWAS-FID	Jampier-FID
				trillion dry			Advanced
				air mole			Whole Air
54	Ethyne	Ethyne (C2H2)	pptv	fraction	1	AWAS-FID	Sampler-FID
				part per			NOAA Whole Air
				trillion dry			Sampler -
		1		air mole			Montzka Mass
54	Ethyne	Ethyne (C2H2)	ppt	fraction	2	NWAS-M2	Spectrometer #2

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
"	Columniame	description	Offic	part per	110	III Code	uetaii
				trillion dry			Advanced
				air mole			Whole Air
55	Propane	Propane (C3H8)	pptv	fraction	1	AWAS-FID	Sampler-FID
				part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
55	Propane	Propane (C3H8)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			A di a a a d
				trillion dry air mole			Advanced Whole Air
56	Isobutane AW	Isobutane (C4H10)	pptv	fraction	1	AWAS-MS	Sampler-MS
30	1305dtdiic_Avv	1305010110 (041110)	pptv	part per	-	AWAS IVIS	Sampler Wis
				trillion dry			Advanced
				air mole			Whole Air
57	n_butane	n-Butane (C4H10)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
				air mole	_		Montzka Mass
57	n_butane	n-Butane (C4H10)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			Advanced
				trillion dry air mole			Whole Air
58	Isopentane	Isopentane (C5H12)	pptv	fraction	1	AWAS-MS	Sampler-MS
30	ізореншіе	isopentarie (csrisz)	pptv	part per	-	AWASIVIS	NOAA Whole Air
				trillion dry			Sampler -
				air mole			Montzka Mass
58	Isopentane	Isopentane (C5H12)	ppt	fraction	2	NWAS-M2	Spectrometer #2
				part per			
				trillion dry			Advanced
				air mole			Whole Air
59	n_pentane	n-Pentane (C5H12)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry air mole			Sampler - Montzka Mass
59	n_pentane	n-Pentane (C5H12)	ppt	fraction	2	NWAS-M2	Spectrometer #2
	n_pentane	in rentaire (estille)	PPC	part per		1447.5 1412	Spectrometer #2
				trillion dry			Advanced
				air mole			Whole Air
60	n_hexane_AW	n-Hexane (C6H14)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		Isoprene (C5H10)?		air mole			Whole Air
61	Isoprene_AW	Different formula?	pptv	fraction	1	AWAS-MS	Sampler-MS
]				part per trillion dry			Advanced
				air mole			Whole Air
62	Benzene	Benzene (C6H6)	pptv	fraction	1	AWAS-MS	Sampler-MS
<u> </u>	2		FF**	part per			NOAA Whole Air
				trillion dry			Sampler -
]				air mole			Montzka Mass
62	Benzene	Benzene (C6H6)	ppt	fraction	2	NWAS-M2	Spectrometer #2
]				part per			
				trillion dry			Advanced
		T 1 (0=::=)		air mole			Whole Air
63	Toluene_AW	Toluene (C7H8)	pptv	fraction	1	AWAS-MS	Sampler-MS
]				part per			Advanced
				trillion dry air mole			Whole Air
64	Ethyl_benzene_AW	C2-Benzenes (C8H10)	pptv	fraction	1	AWAS-MS	Sampler-MS
04	Edityi_DeliZelle_AVV	CZ DCIIZCIIES (COI IIO)	Phra	Haction	1	77 V V 73-1V13	Sumplet IVIS

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
				part per			
				trillion dry			Advanced
C.F.	V. I ANA/	// /COLIAO)2		air mole		A)A/AC AAC	Whole Air
65	m_p_Xylene_AW	m+p-Xylene (C8H10)?	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per trillion dry			Advanced
				air mole			Whole Air
66	o_Xylene_AW	o-Xylene (C8H10)?	pptv	fraction	1	AWAS-MS	Sampler-MS
	/	7 (11111	part per			
				trillion dry			Advanced
		Methyl acetate		air mole			Whole Air
67	Methyl_Acetate_AW	(C3H6O2)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		Dimethyl sulfide		air mole			Whole Air
68	C2H6S_AW	(C2H6S)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			l
				trillion dry			Advanced
CO	Methyl_t_butylether_	Mathed the state of		air mole		A)A/AC	Whole Air
69	AW	Methyl-t-butyl ether	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per trillion dry			Advanced
		Sulfur hexafluoride		air mole			Whole Air
70	SF6	(SF6)	pptv	fraction	1	AWAS-MS	Sampler-MS
70	31.0	(5. 5)	pptv		-	7111715	NOAA Whole Air
							Sampler -
							Measurement of
				part per			Atmospheric
				trillion dry			Gases that
		Sulfur hexafluoride		air mole		NWAS-	Influence
70	SF6	(SF6)	ppt	fraction	2	MAGICC	Climate Change
							Unmanned
							Aircraft Systems
				part per			(UAS)
		Sulfur hexafluoride		trillion dry			Chromatograph for Atmospheric
70	SF6	(SF6)	nntv	air mole fraction	5	UCATS-UGC	Trace Species
70	310	(300)	pptv		3	UCATS-UGC	PAN and other
				part per trillion dry			Trace
		Sulfur hexafluoride		air mole		PANTHER-	Hydrohalocarbo
70	SF6	(SF6)	pptv	fraction	6	ECD	n ExpeRiment
	-	, ,	P.P.	part per	<u> </u>		
				trillion dry			Advanced
				air mole			Whole Air
71	PFC116_AW	PFC-116 (C2F6)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			
				trillion dry			Advanced
		PFC-318 (C4F8)		air mole			Whole Air
72	PFC_c_318_AW	(perfluorocyclobutane)	pptv	fraction	1	AWAS-MS	Sampler-MS
				part per			NOAA Whole Air
				trillion dry			Sampler -
73	CS2	Carbon disulphide (CC2)	nnt	air mole fraction	3	NIMAC NAD	Montzka Mass
/3	CJ2	Carbon disulphide (CS2)	ppt	part per	2	NWAS-M2	Spectrometer #2 PAN and other
				trillion dry			Trace
				air mole		PANTHER-	Hydrohalocarbo
73	CS2	Carbon disulphide (CS2)	pptv	fraction	3	MSD	n ExpeRiment
, 5		Sarbon disalpinac (CSZ)	PPCT	part per			Experiment
				trillion dry			Advanced
				air mole			Whole Air
				all Illole			WITOIC AII

				I I mit			
6-1		Fdad		Unit			tt
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
				part per			
				billion dry			Advanced
		(200		air mole	_		Whole Air
75	CH4_flask	Methane (CH4)	ppbv	fraction	1	AWAS-FID	Sampler-FID
							NOAA Whole Air
							Sampler -
				nort nor			Measurement of
				part per billion dry			Atmospheric Gases that
				air mole		NWAS-	Influence
75	CH4_flask	Methane (CH4)	ppb	fraction	2	MAGICC	Climate Change
75	CH4_Hask	Wethane (CH4)	ррь	part per	2	WAGICC	Chinate change
				billion dry			Advanced
				air mole			Whole Air
76	N2O_flask	Nitrous oxide (N2O)	ppbv	fraction	1	AWAS-ECD	Sampler-ECD
			PPO				NOAA Whole Air
							Sampler -
							Measurement of
				part per			Atmospheric
				billion dry			Gases that
				air mole		NWAS-	Influence
76	N2O_flask	Nitrous oxide (N2O)	ppb	fraction	2	MAGICC	Climate Change
				part per			
				billion dry			Advanced
				air mole			Whole Air
77	CO_flask	Carbon monoxide (CO)	ppbv	fraction	1	AWAS-RGD	Sampler
							NOAA Whole Air
							Sampler -
							Measurement of
				part per			Atmospheric
				billion dry air mole		NWAS-	Gases that Influence
77	CO flask	Carbon monoxide (CO)	ppb	fraction	2	MAGICC	Climate Change
//	CO_lidSk	Carbon monoxide (CO)	ρρυ	Haction	2	WAGICC	Unmanned
							Aircraft Systems
				part per			(UAS)
				billion dry			Chromatograph
				air mole			for Atmospheric
78	H2	Hydrogen (H2)	ppbv	fraction	5	UCATS-UGC	Trace Species
		, , ,	1	part per			PAN and other
				billion dry			Trace
				air mole		PANTHER-	Hydrohalocarbo
78	H2	Hydrogen (H2)	ppbv	fraction	6	ECD	n ExpeRiment
							NOAA Whole Air
							Sampler -
				part per			Measurement of
				million			Atmospheric
				dry air			Gases that
7.5	CO2 (II	Control die 11 (222)		mole	_	NWAS-	Influence
79	CO2_flask	Carbon dioxide (CO2)	ppm	fraction	2	MAGICC	Climate Change
							Multiple
				part per			Enclosure
				million			Device for
				dry air			Unfractionated
70	CO2 flools	Carbon diquide (CO2)	nnm	mole fraction	_	MEDIICAID	Sampling of Air (MEDUSA)
79	CO2_flask	Carbon dioxide (CO2)	ppm	Haction	4	MEDUSA-IR	(IVILDUSA)

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
••	Columnianic	u couription	- Cinc	Hame		iii couc	NOAA Whole Air
							Sampler -
							INSTAAR Stable
		delta 13C in CO2. See					Isotope Lab
		Data Dictionary's More					Mass
80	CO2isoC13_SIL	Information worksheet.	per mil	per mil		NWAS-SIL	spectrometry
							NOAA Whole Air
							Sampler -
		dalta 13C in CO3, Soc					INSTAAR Stable
		delta 13C in CO2. See Data Dictionary's More					Isotope Lab Mass
80	CO2isoC13 SIL	Information worksheet.	per mil	per mil	2	NWAS-SIL	spectrometry
	- COZISOCIS_SIE	momation wondered	permi	per min		1447.5 512	NOAA Whole Air
							Sampler -
							INSTAAR Stable
		delta 180 in CO2. See					Isotope Lab
		Data Dictionary's More					Mass
81	CO2isoO18_SIL	Information worksheet.	per mil	per mil		NWAS-SIL	spectrometry
							NOAA Whole Air
							Sampler - INSTAAR Stable
		delta 180 in CO2. See					Isotope Lab
		Data Dictionary's More					Mass
81	CO2isoO18_SIL	Information worksheet.	per mil	per mil	2	NWAS-SIL	spectrometry
							NOAA Whole Air
							Sampler -
		delta 13C in methane					INSTAAR Stable
		(CH4). See Data					Isotope Lab
82	CH4isoC13 SIL	Dictionary's More Information worksheet.	per mil	per mil		NWAS-SIL	Mass
02	CH4ISOCI3_3IL	illioillation worksheet.	permi	permi		INVVAS-SIL	spectrometry NOAA Whole Air
							Sampler -
		delta 13C in methane					INSTAAR Stable
		(CH4). See Data					Isotope Lab
		Dictionary's More					Mass
82	CH4isoC13_SIL	Information worksheet.	per mil	per mil	2	NWAS-SIL	spectrometry
		Apparent potential					
		oxygen (APO) based on					
		best available data, weighted by MEDUSA					
		averaging kernel. See					
		Data Dictionary's More				AO2-QCLS-	
83	APO_MED	Information worksheet.	per meg	per meg		OMS	Various
	_	Apparent potential					
		oxygen (APO) based on					
		best available data,					
		weighted by MEDUSA					
		averaging kernel. See				403.0016	
83	ADO MED	Data Dictionary's More Information worksheet.	nor mog	normog	4	AO2-QCLS- OMS	Various
83	APO_MED	mormation worksheet.	per meg	per meg per meg	4	OIVIO	Various
				(see			
		Oxygen/nitrogen ratio		reference		MEDUSA-	
84	O2N2_MED	(O2/N2) per meg	per meg)		SM	
				per meg			
				(see			
		Oxygen/nitrogen ratio		reference		MEDUSA-	
84	O2N2_MED	(O2/N2) per meg	per meg])	4	SM	

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
••	Columnianic	uescription	Oint	Hame	110	THE COUR	Multiple
							Enclosure
							Device for
		delta (Ar/N2). See Data					Unfractionated
		Dictionary's More				MEDUSA-	Sampling of Air
85	ArN2_MED	Information worksheet.	per meg	per meg		MS	(MEDUSA)
							Multiple Enclosure
							Device for
		delta (Ar/N2). See Data					Unfractionated
		Dictionary's More				MEDUSA-	Sampling of Air
85	ArN2_MED	Information worksheet.	per meg	per meg	4	MS	(MEDUSA)
							Multiple
							Enclosure
		delta 13C in CO2. See					Device for Unfractionated
		Data Dictionary's More				MEDUSA-	Sampling of Air
86	13CO2 MED	Information worksheet.	per mil	per mil		MS	(MEDUSA)
	_		,	· ·			Multiple
							Enclosure
							Device for
		delta 13C in CO2. See				MEDIICA	Unfractionated
86	13CO2 MED	Data Dictionary's More Information worksheet.	nor mil	nor mil	4	MEDUSA- MS	Sampling of Air (MEDUSA)
80	13CO2_IVIED	illioilliation worksheet.	per mil	per mil	4	IVIS	Multiple
							Enclosure
							Device for
		delta180 in CO2. See					Unfractionated
		Data Dictionary's More				MEDUSA-	Sampling of Air
87	18CO2_MED	Information worksheet.	per mil	per mil		MS	(MEDUSA)
							Multiple Enclosure
							Device for
		delta180 in CO2. See					Unfractionated
		Data Dictionary's More				MEDUSA-	Sampling of Air
87	18CO2_MED	Information worksheet.	per mil	per mil	4	MS	(MEDUSA)
88	AKRD	Aircraft attack angle	deg	degree		GV-GP	GV gust probe
89	SSRD	Aircraft sideslip angle	deg	degree		GV-GP	GV gust probe
		Temperature of the	<u> </u>				
		ambient air outside the		degree			
90	ATX	aircraft	deg C	Celsius		GV-AV	GV Avionics
		Dew point temperature					CV analod
91	DPXC	of the ambient air outside the aircraft	dea C			GV-CMS	GV cooled- mirror sensor
31	DEVC	outside the all trait	deg C	+	 	GV-CIVIS	GV PMS liquid
				gram per			water content
		Water (H2O), liquid		cubic			sensor (King
92	PLWCC	content	g/m3	meter		GV-LWCS	probe)
							GV Novatel
		Geometric altitude		meter			Omnistar-
93	GGALT	above mean sea level, datum WGS84	m asl	(above sea level)		GV-NOGPS	enabled GPS (Reference)
33	GOALI	dutum vv 0304	111 031	Jea level)		GV-NOGF3	GV Novatel
							Omnistar-
		Latitude from GPS,	decimal	decimal			enabled GPS
94	GGLAT	datum WGS84	degree	degree		GV-NOGPS	(Reference)
							GV Novatel
		Laurite de Company	ala - 1 1	ala - 1 1			Omnistar-
OF	GGLON	Longitude from GPS,	decimal	decimal		GV-NOGDS	enabled GPS
95	GGLON	datum WGS84	degree	degree		GV-NOGPS	(Reference)

Column name Expanded description Ounit name Column name Government description Minitume nt code Gov Nooge's Government great enabled GPS (Reference) Gov Nooge's Reference) Gov Nooge's Reference Nooge and Refere					11			
Column name description Unit name nt nt code detail							l	
96 GGSPD Ground speed m/s second GV-NOGPS (Reference) GV-NOGPS (GV-NOGPS) GV-NOGPS (GV-NOGPS) GV-NOGPS (GV-NOGPS) GV-NOGPS (GV-GUST oprobe meter per component, GPS- corrected m/s second GV-GUST probe prob	Colum				long			
96 GGSPD Ground speed m/s second GV-NOGPS (Reference) 97 GGTRK Ground track (direction) 98 UIC corrected m/s second GV-NOGPS (Reference) 99 VIC corrected m/s second GV-NOGPS (Reference) 100 WIC Vertical wind speed m/s second GV-GUST probe 100 WIC Vertical wind speed m/s second GV-GUST probe 101 MR H2O mixing ratio g/kg kilogram GV-CMS mirror sensor 102 PALT Pressure altitude m meter Pressure altitude ft foot NACA method 103 PALTF Pressure altitude ft foot NACA method 104 PCAB_SP2 Cabin pressure torr torr SP2-PRES Minertial Reference static pressure: research static pressure: research static pressure corrected for airflow effects and pressure corrected for airflow effects altitude angle degree GV-BIC	n	Column name	description	Unit	name	nt	nt code	
96 GGSPD Ground speed m/s second GV-NOGPS (Reference) 97 GGTRK Ground track (direction) 98 UC Wind vector, East component, GPS- corrected m/s second GV-NOGPS (Reference) 99 VIC corrected m/s second GV-NOGPS (Reference) 99 VIC corrected M/s second GV-NOGPS (Reference) 100 WIC Vertical wind speed m/s second GV-GUST probe radiomagust probe radiomagus								
96 GGSPD Ground speed m/s second GV-NOGPS (Reference) 97 GGTRK Ground track (direction) degree GV-NOGPS (Reference) 98 UIC corrected m/s Second GV-NOGPS (Reference) 98 UIC corrected m/s Second GV-GUST robbe radome gust probe robbe rob								
97 GGTRK Ground track (direction) degree (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-NOGFS (GV-GV) (GV	0.0	CCCDD	Considerated	/-			CVANOCRC	
97 GGTRK Ground track (direction) degree	96	GGSPD	Ground speed	m/s	secona		GV-NOGPS	
97 GGTRK Ground track (direction) degree								
97 GGTRK Ground track (direction) degree Wind vector, East component, GPS- corrected wind vector, North component, GPS- corrected wind wind vector, North component, GPS- second wind wind wind vector, North wind wind wind vector, North wind wind vector, North wind wind wind vector, North wind vector, No								
Wind vector, East component, GPS-corrected component, GPS-corrected wind vector, North component, GPS-corrected wind vector, North component, GPS-corrected my/s second GV-GUST probe GV-Shole randome gust probe GV-GUST grade gust grade gus	97	GGTRK	Ground track (direction)	degree			GV-NOGPS	
Second GV-GUST GV-GU				0.08.00				
98 UIC corrected m/s second GV-GUST probe (GV-Shole radome gust protection component, GPS-corrected m/s second GV-GUST Multiple GV shole radome gust protection meter per GV-GUST Multiple GV m/s second MULTIPLE intruments GV-GUST Multiple GV second MULTIPLE intruments GV-GUST Multiple GV second MULTIPLE intruments GV cooled-milror sensor Multiple GV milror sensor GV-GUST Multiple GV milror GV-GUST Multiple GV method Advisory Committee for Aeronautics method Single particle Soot GV-GUST Multiple GV Multip					meter per			radome gust
Commonent, GPS- Corrected	98	UIC	corrected	m/s	second		GV-GUST	l l
99 V/C corrected m/s second GV-GUST probe 100 WIC Vertical wind speed m/s second GV-GUST Multiple GV 101 MR H2O mixing ratio g/kg kilogram GV-CMS mirror sensor 102 MR H2O mixing ratio g/kg kilogram GV-CMS mirror sensor 103 PALT Pressure altitude m meter NACA method National Advisory Committee for Aeronautics 104 PCAB_SP2 Cabin pressure 105 PITCH Aircraft pitch attitude angle degree degree GV-HIRS System 1 106 PSXC efference hPa al GV-CDPT transducer transducer corrected, reference hPa al GV-SENSOR GV Rosemount Model 871FA licing rate ling rate indicator in Ference GV-Brosewell VG1854 Laseref SM Inertial References and GV-SENSOR GV Rosemount Model 871FA licing rate ling rate indicator in Ference GV-Brosewell VG1854 Laseref SM Inertial References and GV-SENSOR GV Rosemount Model 871FA licing rate ling rate indicator in first pressure for the green of GV-Brosemount Model 871FA licing rate licing rate indicator in first pressure for the green of GV-Brosemount Model 871FA licing rate licing rate indicator in first pressure for the green of GV-Brosemount Model 871FA licing rate licing rate indicator in first pressure for GV-Brosemount Model 871FA licing rate indicator in first pressure for GV-Brosemount Model 871FA licing rate licing rate indicator index index GV-RICC detector GV-RICC detector GV-RICC detector GV-RICC detector GV-RICC detector GV-RICC GV-RIC			Wind vector, North					GV 5-hole
meter per second gram per selection gram per			component, GPS-		meter per			radome gust
100 WIC Vertical wind speed m/s second MULTIPLE instruments Second MultiPle Instruments GV codel	99	VIC	corrected	m/s				
101 MR H20 mixing ratio g/kg kilogram GV-CMS mirror sensor mirror mirror mirror mirror mirror mirror sensor mirror sensor mirror mirror sensor mirror mirror sensor mirror mirror sensor mirror sensor mirror mirror sensor mirror mirror sensor mirror mirror sensor mirror mirror mirror sensor sensor sensor mirror mirror sensor sensor mirror mirror sensor mirror mirror mirror mirror mirror mirror sensor sensor sensor mirror mirror sensor sensor mirror sensor sensor mirror					meter per		GV-	Multiple GV
101 MR H20 mixing ratio g/kg kilogram GV-CMS mirror sensor National Advisory Committee for Aeronautics method Single particle soot Soot Soot Soot Soot Soot Soot Soot	100	WIC	Vertical wind speed	m/s			MULTIPLE	
Advisory Committee for Aeronautics Toz PALT Pressure altitude m meter NACA NATIONAl Advisory Committee for Aeronautics Modisory Committee for Aeronautics Modisory Committee for Aeronautics Modisory Committee for Aeronautics Model Aeronautics Model Model Single particle soot soot PALT Pressure altitude ft foot NACA Method Single particle soot soot Photometer GY Honeywell YG1854 Laseref SM Inertial Reference GV-BS Model 1000, using fuselage differential pressure transducer GV-PS holes GV-CDPT Transducer GV-SENSOR Sensor GV Acculibrated differential pressure transducer GV-SENSOR Sensor GV Rosemount Model 871FA Icing rate index Icing rate index GV-RICE GV-RICE GV-HIRS System 1 Reference SM Inertial Reference SM Inertia								
Advisory Committee for Aeronautics method NACA method Single partice soot soot photometer Soot photometer GV Honeywell YG1854 Laseref SM Inertial Reference static pressure research static pressure: research static pressure corrected for airflow effects 106 PSXC effects hPa al GV-PS GV aclibrated differential pressure. Dynamic pressure, corrected, reference hPa al GV-CDPT transducer TOR RHUM Relative humidity % percent GV-SENSOR GV Rosemount Model 109 RICE Raw icing rate indicator index index GV-RICE detector ROV-BIRS SYSTEM 1 Reference Static pressure hectopasc differential pressure corrected, reference hPa al GV-CDPT transducer GV aircraft icing rate index index index GV-RICE GV Honeywell YG1854 Laseref SM Inertial Reference index index GV-RICE GV Honeywell YG1854 Laseref SM Inertial Reference SM Iner	101	MR	H2O mixing ratio	g/kg	kilogram		GV-CMS	
Description Palt Pressure altitude m meter NACA Mational Advisory Committee for Aeronautics method National Advisory Committee for Aeronautics method Advisory Committee for Aeronautics method National Advisory Committee for Aeronautics method Single particle soot Soot Soot Soot Soot Soot Palt P								
102 PALT Pressure altitude m meter NACA method NACIONAL Mational Advisory Committee for Aeronautics 103 PALTF Pressure altitude ft foot NACA method 104 PCAB_SP2 Cabin pressure torr torr SP2-PRES photometer 105 PITCH angle degree degree GV-HIRS System 1 106 PSXC effects half pressure, corrected for airflow effects 107 QCXC corrected, reference hPa al GV-SENSOR sensor 108 RHUM Relative humidity % percent GV-SENSOR sensor 109 RICE Raw icing rate indicator index icing rate index index GV-BIRS System 1 100 ROLL Roll angle degree degree GV-HIRS System 1 110 ROLL Roll angle degree degree GV-HIRS System 1 111 TASX Airspeed, true m/s second MENSOR sensor 109 RINGE GV-BIRS GV-GV-GV-GV-GV-GV-GV-GV-GV-GV-GV-GV-GV-G								•
Pressure altitude m meter NACA method								
National Advisory Committee for Aeronautics method 103 PALTF Pressure altitude ft foot NACA method Single particle soot photometer 104 PCAB_SP2 Cabin pressure torr torr SP2-PRES photometer Aircraft pitch attitude angle degree degree GV-HIRS System 1 Reference static pressure corrected for airflow effects holes 105 PSXC effects holes 107 QCXC corrected, reference hPa al GV-CPPT transducer transducer transducer 108 RHUM Relative humidity % percent GV-SENSOR GV Rosemount Model 871FA icing rate long rate indicator 109 RICE Raw icing rate indicator index index GV-HIRS System 1 Rational Advisory Committee for Aeronautics method 104 PCAB_SP2 Cabin pressure torr torr torr SP2-PRES Single particle soot photometer GV Honeywell YG1854 Laseref SM Inertial Reference and GV-CPPT transducer detector for airflow effects index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference SM Inertial Reference SM Inertial Reference for SM Inertial Reference for SM Inertial Reference SM Inertia	102	DALT	Prossure altitude	m	motor		NACA	
Advisory Committee for Aeronautics method 103 PALTF Pressure altitude 104 PCAB_SP2 Cabin pressure 105 PITCH Aircraft pitch attitude angle 106 PSXC effects Dynamic pressure, corrected for airflow 107 QCXC Dynamic pressure, corrected, reference 108 RHUM Relative humidity Relative humidity Relative humidity Relative high and icing rate indicator Rould angle Advisory Committee for Aeronautics method Single particle Soot Pot Honeywell GV Honeywell GV Honeywell GV HIRS System 1 GV Paroscientific Model 1000, using fuselage differential pressure GV-PS hectopasc al GV-PS holes GV-CDPT transducer GV Aircraft GV SENSOR GV Aircraft GV Assemount Model 371FA icing rate index GV Honeywell YG1854 Laseref SM Inertial Reference SM Inertial Reference SM Inertial Reference GV Honeywell YG1854 Laseref SM Inertial Reference SM Inertial Reference SV Honeywell YG1854 Laseref SM Inertial Reference SM Inertial Referen	102	FALI	Fressure attitude	111	illetei		NACA	
Committee for Aeronautics Committee for Aeronautics Committee for Aeronautics Committee for Aeronautics Committee for Method								
103 PALTF Pressure altitude ft foot NACA method method method soot method soot photometer soot soot soot soot soot soot soot soo								•
Single particle soot soot soot soot soot soot soot soo								
SP2-PRES Soot Photometer SP2-PRES SP2-PRES SP3-PRES	103	PALTF	Pressure altitude	ft	foot		NACA	method
PCAB_SP2 Cabin pressure torr torr SP2-PRES photometer								Single particle
Aircraft pitch attitude angle degree degree GV-HIRS System 1 Reference static pressure: research static pressure: corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-CDPT transducer Dynamic pressure, corrected, reference hPa al GV-SENSOR sensor RHUM Relative humidity % percent GV-SENSOR sensor RICE Raw icing rate indicator index index index GV-RICE detector ROLL Roll angle degree degree GV-HIRS System 1 GV HIRS System 1 GV-PS holes GV Calibrated differential pressure government of transducer index index GV-CDPT transducer GV-SENSOR sensor GV Rosemount Model 871FA icing rate index index GV-RICE detector GV-RICE detector GV-RICE GV-HIRS System 1 GV-BIRS System 1 GV-BIRS System 1 GV-BIRS System 1 GV-BIRS System 1 Meter per GV- GV-Mensor 6100 MENSOR sensor GV Aircraft								soot
Aircraft pitch attitude angle degree degree GV-HIRS System 1 Reference static pressure: research static pressure: corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-SENSOR Sensor DY RICE Raw icing rate indicator index icing rate index Reference System 1 Aircraft pitch attitude degree degree GV-HIRS System 1 Reference System 1 GV Paroscientific Model 1000, using fuselage al GV-PS holes GV-PS holes GV-PS holes GV-CDPT transducer GV-SENSOR Sensor GV Rosemount Model 871FA icing rate index icing rate index GV-RICE detector GV-RICE GV-RICE detector GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE GV-RICE	104	PCAB_SP2	Cabin pressure	torr	torr		SP2-PRES	photometer
Aircraft pitch attitude angle degree degree GV-HIRS System 1 Reference static pressure: research static pressure corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-CDPT transducer 107 QCXC corrected, reference hPa al GV-SENSOR sensor RHUM Relative humidity % percent GV-SENSOR sensor RW icing rate indicator index index GV-RICE detector 109 RICE Raw icing rate indicator index index GV-RICE detector 110 ROLL Roll angle degree degree GV-HIRS System 1 RESUME RESULT Airspeed, true m/s second MENSOR sensor RW MENSOR SENSOR GV Aircraft GV-HIRS System 1 GV-GV GV Mensor 6100 SM Inertial Reference GV- GV Aircraft System 1 GV-GV-FIRS Sensor GV-GV-FIRS System 1 GV-GV-FIRS System 1 GV-GV-FIRS Sensor GV-GV-FIRS Sensor GV-GV-FIRS System 1 GV-GV-FIRS Sensor GV-GV-FIRS Sensor GV-GV-FIRS System 1 GV-GV-FIRS Sensor								GV Honeywell
Aircraft pitch attitude angle degree degree GV-HIRS System 1 Reference Static pressure: research static pressure corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-CDPT transducer 107 QCXC corrected, reference hPa al GV-SENSOR sensor Reference System 1 Dynamic pressure, hectopasc al GV-CDPT transducer GV aircraft sicing rate indicator index index GV-RICE detector Roy-RICE Raw icing rate indicator index index GV-RICE detector Roy-RICE GV-HIRS System 1 Roll angle degree degree GV-HIRS System 1 Reference System 1 Reference System 1 Reference System 1 Roll TASX Airspeed, true m/s second MENSOR sensor Reference GV-AIRS System 1 Roy-PS (GV Paroscientific Model 1000, using fuselage hectopasc al GV-PS (GV Counting fuselage hectopasc) all GV-PS (GV Counting fuselage hectopasc) all GV-PS (GV Aircraft sensor) all GV-PS (GV Aircraft senso								
Reference static pressure: research static pressure: research static pressure: research static pressure corrected for airflow effects hPa al GV-PS holes Dynamic pressure, hectopasc al GV-CDPT transducer Dynamic pressure, corrected, reference hPa al GV-SENSOR sensor RHUM Relative humidity % percent GV-SENSOR sensor RAW icing rate indicator ROLL Roll angle degree degree GV-HIRS System 1 Reference System 1 Reference GV-MIRS System 1 GV-PS holes GV-QCPD transducer GV-SENSOR sensor GV-SENSOR sensor GV-SENSOR GV-SENSOR sensor GV-RICE detector GV-HIRS System 1 Reference System 1 Reference System 1 Reference GV-HIRS System 1 Reference GV-HIRS System 1 GV-GV-HIRS System 1 Reference System 1 GV-GV-HIRS System 1 GV-GV-BIRS								
Reference static pressure: research static pressure: research static pressure: research static pressure corrected for airflow effects hPa al GV-PS holes 106 PSXC effects hPa al GV-PS holes 107 QCXC pynamic pressure, corrected, reference hPa al GV-CDPT transducer 108 RHUM Relative humidity % percent GV-SENSOR sensor 109 RICE Raw icing rate indicator index index GV-RICE detector 110 ROLL Roll angle degree degree GV-HIRS System 1 111 TASX Airspeed, true m/s second MENSOR sensor GV Paroscientific Model 1000, using fuselage hectopasc al GV-PS holes GV Calibrated differential pressure al GV-CDPT transducer GV-SENSOR GV Rosemount Model 871FA icing rate index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference System 1 Reference GV-HIRS System 1 GV-BICE GV HONEYWEIL Roll angle degree GV-HIRS System 1 MENSOR Sensor GV Rosemount GV HONEYWEIL ROLL System 1 MENSOR Sensor GV Rosemount GV HONEYWEIL ROLL System 1 MENSOR Sensor GV Rosemount GV HONEYWEIL ROLL System 1 MENSOR Sensor GV Rosemount GV HONEYWEIL System 1 GV Airspeed, true m/s second MENSOR Sensor	405	DITO!!	•		1.		01/11/06	
pressure: research static pressure corrected for airflow effects hPa al GV-PS holes 106 PSXC effects hPa al GV-PS holes 107 QCXC pynamic pressure, corrected, reference hPa al GV-CDPT transducer 108 RHUM Relative humidity % percent GV-SENSOR sensor 109 RICE Raw icing rate indicator index index GV-RICE detector 110 ROLL Roll angle degree degree GV-HIRS System 1 111 TASX Airspeed, true m/s second MENSOR sensor GV Paroscientific Model 1000, using fuse lectopasc al GV-PS holes GV Calibrated differential pressure al GV-PS for Calibrated differential pressure transducer GV-CDPT transducer GV-SENSOR sensor GV Rosemount Model 871FA icing rate indicator index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference SM Inertial Reference GV-HIRS System 1 meter per GV- GV- GV Mensor 6100 MENSOR sensor GV aircraft	105	PIICH	_	degree	degree		GV-HIRS	System 1
static pressure corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-CDPT transducer 107 QCXC corrected, reference hPa al GV-SENSOR GV aircraft sensor RHUM Relative humidity % percent GV-SENSOR sensor RICE Raw icing rate indicator index index GV-RICE detector ROV-RICE GV-HIRS System 1 ROLL Roll angle degree degree GV-HIRS System 1 TASX Airspeed, true m/s second MENSOR sensor Model 1000, using fuselage hectopasc al GV-PS holes GV-PS holes GV-CDPT transducer GV-SENSOR GV aircraft sensor GV-SENSOR GV aircraft index GV-RICE detector GV-RICE detector GV-HIRS System 1 Model 1000, using fuselage holes GV-CDPT transducer GV-SENSOR sensor GV Aircraft GV-SENSOR Sensor GV-RICE detector GV-HIRS System 1 MENSOR sensor GV- GV Mensor 6100 Sensor GV aircraft								GV Parassiantific
corrected for airflow effects hPa al GV-PS holes Dynamic pressure, corrected, reference hPa al GV-CDPT transducer			•					
106 PSXC effects hPa al GV-PS holes Dynamic pressure, Dynamic			· ·		hectopasc			
Dynamic pressure, corrected, reference hPa al GV-CDPT transducer 107 QCXC corrected, reference hPa al GV-CDPT transducer 108 RHUM Relative humidity % percent GV-SENSOR sensor 109 RICE Raw icing rate indicator index icing rate index index GV-RICE detector 100 ROLL Roll angle degree degree GV-HIRS System 1 100 ROLL Roll angle degree degree GV-HIRS System 1 100 ROLL Roll angle degree degree GV-HIRS System 1 100 ROLL Roll angle degree degree GV-GV-GV MENSOR sensor 110 ROLL Roll angle degree degree GV-GV-GV MENSOR sensor 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV-GV-GV aircraft	106	PSXC		hPa			GV-PS	
Dynamic pressure, corrected, reference hPa al GV-CDPT transducer 107 QCXC corrected, reference hPa al GV-CDPT transducer 108 RHUM Relative humidity % percent GV-SENSOR sensor 109 RICE Raw icing rate indicator index icing rate index index GV-RICE detector 100 ROLL Roll angle degree degree GV-HIRS System 1 100 RICE Roll angle meter per GV-GV-GV MENSOR Sensor 100 ROLL Roll angle meter per GV-GV-GV MENSOR Sensor 111 TASX Airspeed, true m/s second MENSOR Sensor 100 GV-CDPT transducer GV-CDPT transducer GV-Aircraft sensor GV-SENSOR Sensor GV-RICE detector GV-HIRS System 1 meter per GV-GV-GV Mensor 6100 MENSOR Sensor GV-aircraft							1	
107 QCXC corrected, reference hPa al GV-CDPT transducer 108 RHUM Relative humidity % percent GV-SENSOR sensor								l l
Relative humidity Research Research Research Relative humidity Research Research Research Reference Reference Research Res					hectopasc			pressure
108 RHUM Relative humidity % percent GV-SENSOR sensor GV Rosemount Model 871FA icing rate indicator index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference 110 ROLL Roll angle degree degree GV-HIRS System 1 TASX Airspeed, true m/s second MENSOR sensor GV Rosemount Model 871FA icing rate indicator index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference GV-HIRS System 1 meter per SCV-GV Mensor 6100 sensor GV Airspeed, true degree GV-GV GV Mensor 6100 sensor	107	QCXC	corrected, reference	hPa	al		GV-CDPT	
GV Rosemount Model 871FA icing rate index Icing rate index GV-RICE GV-RICE GV Honeywell YG1854 Laseref SM Inertial Reference 110 ROLL								
RICE Raw icing rate indicator Icing rate index Icing rate index GV-RICE GV	108	RHUM	Relative humidity	%	percent		GV-SENSOR	
RICE Raw icing rate indicator Icing rate index Icing rate index GV-RICE GV								
109 RICE Raw icing rate indicator index index GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference 110 ROLL Roll angle degree degree GV-HIRS System 1 meter per GV- GV Mensor 6100 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV-RICE detector GV Honeywell YG1854 Laseref SM Inertial Reference GV-HIRS System 1 meter per GV- GV Mensor 6100 MENSOR sensor				tata a t -	1-1			
GV Honeywell YG1854 Laseref SM Inertial Reference 110 ROLL Roll angle degree degree GV-HIRS System 1 meter per 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV aircraft	100	DICE	Day icing rate indicate				GV DICE	_
YG1854 Laseref SM Inertial Reference 110 ROLL Roll angle degree degree GV-HIRS System 1 meter per 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV aircraft	109	NICE	naw icing rate indicator	illuex	illuex		GV-RICE	
SM Inertial Reference 110 ROLL Roll angle degree degree GV-HIRS System 1 meter per GV- GV Mensor 6100 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV aircraft								
Reference Reference GV-HIRS System 1								
110 ROLL Roll angle degree degree GV-HIRS System 1 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV Mensor 6100 degree GV aircraft								
meter per GV-GV Mensor 6100 111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV aircraft	110	ROLL	Roll angle	degree	degree		GV-HIRS	
111 TASX Airspeed, true m/s second MENSOR sensor Cabin temperature at degree GV aircraft			<u> </u>	J				
Cabin temperature at degree GV aircraft	111	TASX	Airspeed, true	m/s			_	l l
					_			GV aircraft
	112	TCAB	aerosol rack	deg C			GV-SENSOR	sensor

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
••	Columnianic	acscription	- Oilit	name	110	GV-	Multiple GV
113	THETA	Potential temperature	к	kelvin		MULTIPLE	instruments
		Equivalent potential		1			GV and UCATS
114	THETAE	temperature	К	kelvin		GV-UCATS	instruments
		Virtual potential					GV and UCATS
115	THETAV	temperature	К	kelvin		GV-UCATS	instruments
		Total temperature					
		(static and RAM),		meter per			GV aircraft
116	TTX	reference	m/s	second		GV-SENSOR	sensor
		Wind vector,					
		longitudinal					GV 5-hole
117	LIVC	component, GPS- corrected	/	meter per		CV CUST	radome gust
117	UXC	corrected	m/s	second		GV-GUST	probe GV aircraft
118	XMACH2	Mach number squared	None	None		GV-SENSOR	sensor
110	AWACTZ	Wacii Humber squareu	None	None		GV-SENSON	One
		Cloud water droplet					Dimensional
		(40-600 um)		number			Optical Array
119	CONC1DC_LWO	concentration	number/L	per liter		GV-1DOAP	Probe
							Two
		Cloud water droplet					Dimensional
		(25-800 um)		number			Optical Array
120	CONC2C_LWO	concentration	number/L	per liter		GV-2DOAP	Probe
		Mean water droplet		micromet			
121	DBAR1DC_LWO	particle diameter?	um	er		GV-2D-C	2D-C Probe
				number			
		Claudous tandes des de 1/2		per cubic			Claud decelat
122	CONCD_LWI	Cloud water droplet (2- 50 um) concentration	number/c m3	centimete r		GV-CDP	Cloud droplet probe on GV
122	CONCD_LWI	Mean water droplet	1115	micromet		GV-CDP	Cloud droplet
123	DBARD LWI	particle diameter?	um	er		GV-CDP	probe on GV
120	20,110_2111	parasis and an arrangement of the second of	<u></u>	number		0.00.	Ultra-high
				per cubic			sensitivity
			number	centimete			aerosol
124	CONCU_RWI	Particle number density	per cm3	r		UHSAS	spectrometer
				number			Ultra-high
		Concentration of		per cubic			sensitivity
		particles 0.1	number/c	centimete			aerosol
125	CONCU100_RWI	micrometer and larger	m3	r .		UHSAS	spectrometer
		Concentration of		number			Ultra-high
		Concentration of particles 0.5	number/c	per cubic centimete			sensitivity aerosol
126	CONCU500 RWI	micrometer and larger	m3	r		UHSAS	spectrometer
120	20140000_1(441	micrometer and larger	1113	part per		0113/13	Spectrometer
				million			
				dry air			NCAR Airborne
		Carbon dioxide (CO2)		mole			Oxygen
127	CO2_AO2	ppm	ppm	fraction		AO2-IR	Instrument
				per meg			
				(see			NCAR Airborne
	00.405	(22)		reference			Oxygen
128	O2_AO2	Oxygen (O2) per meg	per meg)		AO2-VUV	Instrument
		Atmospheric potential					NCAR Airbarna
		oxygen (APO). See Data Dictionary's More					NCAR Airborne Oxygen
129	APO AO2	Information worksheet.	per meg	per meg		AO2-M	Instrument
123	/ O_AO2	mormation worksheet.	perineg	permeg	l	AUZ IVI	mad dinicit

				Unit			
Colum		Expanded		long	Instrume	Instrume	Instrument
n	Column name	description	Unit	name	nt	nt code	detail
		-					Quantum
							Cascade Laser
				part per			System (NCAR
				billion dry			system built by
				air mole			Harvard/Aerody
130	CH4_QCLS	Methane (CH4)	ppbv	fraction		QCLS-IR	ne)
							Quantum
							Cascade Laser
				part per			System (NCAR
				billion dry air mole			system built by Harvard/Aerody
131	N2O QCLS	Nitrous oxide (N2O)	vdqq	fraction		QCLS-IR	ne)
151	NZO_QCLS	Millious Oxide (N2O)	ppov	Haction		QCL3-IN	Quantum
							Cascade Laser
				part per			System (NCAR
				billion dry			system built by
				air mole			Harvard/Aerody
132	CO_QCLS	Carbon monoxide (CO)	ppbv	fraction		QCLS-NDIR	ne)
	- ·	, ,				-	Harvard Licor
							6251 NDIR CO2
				part per			sensor, heritage
				million			NASA
				dry air			"Observations of
				mole			the Middle
133	CO2_OMS	Carbon dioxide (CO2)	ppmv	fraction		OMS	Stratosphere"
							Quantum
				part per			Cascade Laser
				million			System (NCAR
				dry air			system built by
124	CO3 OCIC	Carban diavida (CO3)		mole fraction		OCI C NIDID	Harvard/Aerody
134	CO2_QCLS	Carbon dioxide (CO2)	ppmv	part per		QCLS-NDIR	ne)
				billion dry			
				air mole		GV-	GV AeroLaser
135	CO RAF	Carbon monoxide (CO)	ppbv	fraction		AEROLASER	VUV CO sensor

Example Data Records

Note that data files are space delimited and use "NA" as the missing value code. NA is typically used in data products processed by "R".

INSTRUMENT jd Year H.no flt DOY UTC UT_MID UT_START UT_STOP CFC_11 CFC_12 CFC_13 CFC_113 CFC_115 HCFC_21_AW HCFC_22 HCFC_141b HCFC_142b HCFC_123_AW HCFC_124_AW HFC_125 HFC_23 HFC_134a HFC_143a HFC_152a Halon_1301 Halon_1211 Halon_2402 OCS CH3CI CH3Br CH3I CHCl3 CH2Cl2 CH2ClCH2Cl_AW CH3CCl3_AW C2HCl3_AW CCl4 C2Cl4 MeONO2_AW EthONO2_AW i_PropONO2_AW n_PropONO2_AW X2_ButylONO2_AW X3_C5ONO2_AW C2H5Br_AW CH2Br2 CHClBr2_AW CHBr3 Ethane_AW Ethene_AW Ethyne Propane Isobutane_AW n_butane Isopentane n_pentane n_hexane_AW Isoprene_AW Benzene Toluene_AW Ethyl_benzene_AW C3_HC_32_AW C4H6as N2O_flask C2H6S_AW Methyl_t_butylether_AW SF6 PFC116_AW PFC_c_318_AW C52_HFC_32_AW CH4_flask N2O_flask C0_flask H2 CO2_flask CO2isoC13_SIL CO2isoO18_SIL CH4isoC13_SIL APO_MED O2N2_MED ArN2_MED 13CO2_MED 18CO2_MED AKRD SSRD ATX DPXC PLWCC GGALT GGLAT GGLON GGSPD GGTRK UIC VIC WIC MR PALT PALTF PCAB_SP2_PITCH_PSXC_QCXC_RHUM_RICE_ROLL_TASX_TCAB_THETA_THETAE_THETAV_TTX

UXC XMACH2 CONC1DC_LWO CONC2C_LWO DBAR1DC_LWO CONCD_LWI DBARD_LWI CONCU_RWI CONCU100_RWI CONCU500_RWI CO2_AO2 O2_AO2 APO_AO2 CH4_QCLS N2O_QCLS CO_QCLS CO2_OMS CO2_QCLS CO_RAF O3_ppb BC_ng_kg BC_ng_m3 H2O_UWV O3_UO3 H2Oppmv_vxl n.prof Dist

Line breaks added to improve readability.

Supplementary Data File

Summary of 10-Second Data Completeness by Mission

A supplementary file is provided with this product that summarizes the completeness of the reported data values. The completeness entries are the number of non-missing observations for each species in the main data file for each mission and in total. The number of observation given for species "jd" is the maximum number of possible non-missing observations per mission. The data are provided in one space-delimited format ASCII file.

Example Data Records

DISCRETE meta summary.tbl

species total_nonmissing H1 H2 H3 H4 H5
INSTRUMENT 32589 6547 6269 1811 9175 8787
jd 32589 6547 6269 1811 9175 8787
Year 32589 6547 6269 1811 9175 8787
H.no 32589 6547 6269 1811 9175 8787
flt 32589 6547 6269 1811 9175 8787
DOY 32589 6547 6269 1811 9175 8787
UTC 32589 6547 6269 1811 9175 8787

...
O3_ppb 32346 6505 6253 1795 9054 8739
BC_ng_kg 26215 5746 5529 1451 6220 7269
BC_ng_m3 26124 5736 5467 1432 6220 7269
H2O_UWV 32487 6546 6184 1810 9163 8784
O3_UO3 29149 6004 5782 0 9089 8274
H2Oppmv_vxl 26556 4386 3452 1372 9010 8336
n.prof 29719 5993 5664 1224 8458 8380
Dist 30900 6276 5919 1478 8791 8436

References: [Back To Contents]

Schwarz, J. P., J. R. Spackman, R. S. Gao, L. A. Watts, P. Stier, M. Schulz, S. M. Davis, S. C. Wofsy, and D. W. Fahey. 2010. Global-scale black carbon profiles observed in the remote atmosphere and compared to models, *Geophys. Res. Lett.*, 37, L18812. doi:10.1029/2010GL044372.

Tollefson, J. 2010. Jet reveals atmosphere's secrets. Published online 17 August 2010, Nature 466, 912. doi:10.1038/466912a

Wofsy, S. C., B. C. Daube, R. Jimenez, E. Kort, J. V. Pittman, S. Park, R. Commane, B. Xiang, G. Santoni, D. Jacob, J. Fisher, C. Pickett-Heaps, H. Wang, K. Wecht, Q.-Q. Wang, B. B. Stephens, S. Shertz, A.S. Watt, P. Romashkin, T. Campos, J. Haggerty, W. A. Cooper, D. Rogers, S. Beaton, R. Hendershot, J. W. Elkins, D. W. Fahey, R. S. Gao, F. Moore, S. A. Montzka, J. P. Schwarz, A. E. Perring, D. Hurst, B. R. Miller, C. Sweeney, S. Oltmans, D. Nance, E. Hintsa, G. Dutton, L. A. Watts, J. R. Spackman, K. H. Rosenlof, E. A. Ray, B. Hall, M. A. Zondlo, M. Diao, R. Keeling, J. Bent, E. L. Atlas, R. Lueb, M. J. Mahoney. 2012. HIPPO Merged 1-second Meteorology, Atmospheric Chemistry, Aerosol Data Collection (R_20121129). EOL Dataset https://data.eol.ucar.edu/dataset/112.028 DOI https://doi.org/10.5065/D6VX0DKK

Data Center Information:

Back To Contents

This data set is available through the NCAR EOL HIPPO Data Archive at https://www.eol.ucar.edu/field_projects/hippo

Data Archive:

Web Site: https://www.eol.ucar.edu/field_projects/hippo

Contact for Data Center Access Information:

Email: eol-archive@ucar.edu