

**Author(s):**

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**1.0 Data Set Overview:**

ORCAS Field Project, Project PIs Britton Stephens (NCAR Earth Observing Laboratory), Matthew Long (NCAR Climate & Global Dynamics) Time period covered: 1/15/2016 through 2/29/2016

AWAS measurements from on board the NSF/NCAR Gulfstream-V

[https://www.eol.ucar.edu/field\\_projects/orcas](https://www.eol.ucar.edu/field_projects/orcas)

**2.0 Instrument Description:**

The Advanced Whole Air Sampler (AWAS) collects air samples in stainless steel canisters for later analysis for a wide variety of trace gases. The analysis was conducted with a gas chromatograph/mass spectrometer/FID/ECD combination instrument to measure a range of chlorofluorocarbons, hydrochlorofluorocarbons, halomethanes and haloethanes, C2-C8 non-methane hydrocarbons, C1 – C5 alkyl nitrates, and selected sulfur compounds.

**4.0 Data Format:**

Data are in ICARTT format, one file per research flight.

**5.0 Data Remarks:**

Please contact P.I. prior to use.

**6.0 References:**

Andrews, S. et al., A comparison of very short-lived halocarbon (VSLS) aircraft measurements in the West Tropical Pacific from CAST, ATTREX and CONTRAST, *Atmos. Meas. Tech.*, 9, 5213-5225, 2016.

Navarro, Maria A., Elliot Atlas, Alfonso Saiz-Lopez, Xavier Rodriguez-Lloveras, Douglas Kinnison, Jean-Francois Lamarque, Simone Tilmes, Michal Filus, Neil R.P. Harris, Elena Menegu, Matthew J. Ashfold, Alistair J. Manning, Carlos A. Cuevas, Sue Schauffler, Valeria Donets, Airborne measurements of organic bromine compounds in the Pacific tropical tropopause layer, *Proc. Natl. Acad. Sci.*, 112 (51), E7155-E7155, 2015.

Pan, L., K. P. Bowman, E. Atlas, S. C. Wofsy, F. Zhang, J. Bresch, B. A. Ridley, J. V. Pittman, C. Homeyer, P. Romashkin, W. Cooper, The Stratosphere-Troposphere Analyses of Regional Transport Experiment. *Bulletin of the American Meteorological Society*, 91: 327-342, 2010.

Schauffler, S. M., E. L. Atlas, D. R. Blake, F. Flocke, X. Tie, R. A. Lueb, J. M. Lee, V. Stroud, W. Travnicek, Distributions of brominated organic compounds in the troposphere and lower stratosphere, *J. Geophys. Res.* D17, 21,513-21,536, 1999.

Common Variable Category	Variable Short Name	Common Unit	Variable Long Names	CAS (NIST)	Formula	MW/AW
Trace Gases: Nitrogen Compounds	MethylNitrate	pptv	volume_mixing_ratio_of_methyl_nitrate_in_air	598-58-3	CH3NO3	77.0395
Trace Gases: Nitrogen Compounds	EthylNitrate	pptv	volume_mixing_ratio_of_ethyl_nitrate_in_air	625-58-1	C2H5NO3	91.066
Trace Gases: Nitrogen Compounds	n_PropylNitrate	pptv	volume_mixing_ratio_of_n_propyl_nitrate_in_air	627-13-4	C3H7NO3	105.0926
Trace Gases: Nitrogen Compounds	i_PropylNitrate	pptv	volume_mixing_ratio_of_isopropyl_nitrate_in_air	1712-64-7	C3H7NO3	105.0926
Trace Gases: Nitrogen Compounds	2_ButylNitrate	pptv	volume_mixing_ratio_of_2_butyl_nitrate_in_air	924-52-7	C4H9NO3	119.1192
Trace Gases: Nitrogen Compounds	2_PentylNitrate	pptv	volume_mixing_ratio_of_2_pentyl_nitrate_in_air	1002-16-0	C5H11NO3	133.14724
Trace Gases: Nitrogen Compounds	3_PentylNitrate	pptv	volume_mixing_ratio_of_3_pentyl_nitrate_in_air	1002-16-0	C5H11NO3	133.14724
Trace Gases: Sulfur Compounds	OCS	pptv	volume_mixing_ratio_of_carbonyl_sulfide_in_air	463-58-1	COS	60.076
Trace Gases: Sulfur Compounds	DMS	pptv	volume_mixing_ratio_of_dimethylsulfide_in_air	75-18-3	CH3SCH3	62.135
Trace Gases: Halocarbons and Halogens	Methyl_Bromide	pptv	volume_mixing_ratio_of_methyl_bromide_in_air	74-83-9	CH3Br	94.939
Trace Gases: Halocarbons and Halogens	Methyl_Chloride	pptv	volume_mixing_ratio_of_methyl_chloride_in_air	74-87-3	CH3Cl	50.4872
Trace Gases: Halocarbons and Halogens	Methyl_Iodide	pptv	volume_mixing_ratio_of_methyl_iodide_in_air	74-88-4	CH3I	141.939
Trace Gases: Halocarbons and Halogens	Dibromomethane	pptv	volume_mixing_ratio_of_dibromomethane_in_air	74-95-3	CH2Br2	173.835
Trace Gases: Halocarbons and Halogens	Dichloromethane	pptv	volume_mixing_ratio_of_dichloromethane_in_air	75-09-2	CH2Cl2	84.932
Trace Gases: Halocarbons and Halogens	Diiodomethane	pptv	volume_mixing_ratio_of_diiodomethane_in_air	75-11-6	CH2I2	267.84
Trace Gases: Halocarbons and Halogens	Bromochloromethane	pptv	volume_mixing_ratio_of_bromochloromethane_in_air	74-97-5	CH2BrCl	129.38
Trace Gases: Halocarbons and Halogens	Chloriodomethane	pptv	volume_mixing_ratio_of_chloriodomethane_in_air	593-71-5	CH2ClI	176.38
Trace Gases: Halocarbons and Halogens	Bromodichloromethane	pptv	volume_mixing_ratio_of_bromodichloromethane_in_air	75-27-4	CHBrCl2	163.828
Trace Gases: Halocarbons and Halogens	HCFC22	pptv	volume_mixing_ratio_of_hcfc22_in_air	75-45-6	CHClF2	86.4681
Trace Gases: Halocarbons and Halogens	Dibromochloromethane	pptv	volume_mixing_ratio_of_dibromochloromethane_in_air	124-48-1	CHBr2Cl	208.279
Trace Gases: Halocarbons and Halogens	HCFC21	pptv	volume_mixing_ratio_of_hcfc21_in_air	75-43-4	CHClF2	102.9224
Trace Gases: Halocarbons and Halogens	Bromoform	pptv	volume_mixing_ratio_of_tribromomethane_in_air	75-25-2	CHBr3	252.731
Trace Gases: Halocarbons and Halogens	Chloroform	pptv	volume_mixing_ratio_of_trichloromethane_in_air	67-66-3	CHCl3	119.3767
Trace Gases: Halocarbons and Halogens	H1211	pptv	volume_mixing_ratio_of_halon1211_in_air	353-59-3	BrCF2	165.364
Trace Gases: Halocarbons and Halogens	CFC12	pptv	volume_mixing_ratio_of_cfc12_in_air	75-71-8	CCl2F2	120.9129
Trace Gases: Halocarbons and Halogens	Carbon_Tetrachloride	pptv	volume_mixing_ratio_of_tetrachloromethane_in_air	56-23-5	CCl4	153.8215
Trace Gases: Halocarbons and Halogens	CFC11	pptv	volume_mixing_ratio_of_cfc11_in_air	83589-40-6	CCl3F	137.3672
Trace Gases: Halocarbons and Halogens	Chloroethane	pptv	volume_mixing_ratio_of_ethyl_chloride_in_air	75-00-3	C2H5Cl	64.5138
Trace Gases: Halocarbons and Halogens	MethylChloroform	pptv	volume_mixing_ratio_of_chloroethane_in_air	71-55-6	CH3CCl3	133.4033
Trace Gases: Halocarbons and Halogens	Ethyl_Iodide	pptv	volume_mixing_ratio_of_ethyl_iodide_in_air	75-03-6	C2H5I	155.9656
Trace Gases: Halocarbons and Halogens	1_2_Dichloroethane	pptv	volume_mixing_ratio_of_1_2_dichloroethane_in_air	107-06-2	C2H4Cl2	98.9586
Trace Gases: Halocarbons and Halogens	HFC152a	pptv	volume_mixing_ratio_of_diffluoroethane_in_air	75-37-6	C2H4F2	66.05
Trace Gases: Halocarbons and Halogens	HCFC141b	pptv	volume_mixing_ratio_of_1_1_dichloro_1_fluoroethane_in_air	1717-00-6	C2H3Cl2F	116.949
Trace Gases: Halocarbons and Halogens	HCFC142b	pptv	volume_mixing_ratio_of_1_dichloro_1_1_diffuoroethane_in_air	75-68-3	C2H3ClF2	100.4947
Trace Gases: Halocarbons and Halogens	Trichloroethylene	pptv	volume_mixing_ratio_of_trichloroethylene_in_air	79-01-6	C2HCl3	131.3874
Trace Gases: Halocarbons and Halogens	HFC134a	pptv	volume_mixing_ratio_of_1_1_1_2_tetrafluoroethane_in_air	811-97-2	C2HF4	102.0309
Trace Gases: Halocarbons and Halogens	Tetrachloroethylene	pptv	volume_mixing_ratio_of_tetrachloroethylene_in_air	127-18-4	C2Cl4	165.8322
Trace Gases: Halocarbons and Halogens	HCFC123	pptv	volume_mixing_ratio_of_hcfc123_in_air	306-83-2	C2HCl2F3	152.9299
Trace Gases: Halocarbons and Halogens	HCFC124	pptv	volume_mixing_ratio_of_hcfc124_in_air	2837-89-0	C2HClF4	136.4757
Trace Gases: Halocarbons and Halogens	CFC113	pptv	volume_mixing_ratio_of_cfc113_in_air	76-13-1	C2Cl3F3	187.3747
Trace Gases: Halocarbons and Halogens	H2402	pptv	volume_mixing_ratio_of_halon2402_in_air	124-73-2	C2Br2F4	259.823
Trace Gases: Halocarbons and Halogens	CFC114	pptv	volume_mixing_ratio_of_cfc114_in_air	76-14-2	CCl2CClF2	170.9204
Trace Gases: Halocarbons and Halogens	CFC115	pptv	volume_mixing_ratio_of_cfc115_in_air	76-15-3	CCl2F5	154.4661
Trace Gases: Halocarbons and Halogens	n_PropylBromide	pptv	volume_mixing_ratio_of_n_propyl_bromide_in_air	106-94-5	C3H7Br	122.992
Trace Gases: Carbon and Hydrocarbon Compound Ethane		pptv	volume_mixing_ratio_of_ethane_in_air	74-84-0	C2H6	30.069
Trace Gases: Carbon and Hydrocarbon Compound Propane		pptv	volume_mixing_ratio_of_propane_in_air	74-98-6	C3H8	44.0956
Trace Gases: Carbon and Hydrocarbon Compound n_Butane		pptv	volume_mixing_ratio_of_n_butane_in_air	106-97-8	C4H10	58.1222
Trace Gases: Carbon and Hydrocarbon Compound i_Butane		pptv	volume_mixing_ratio_of_isobutane_in_air	75-28-5	C4H10	58.1222
Trace Gases: Carbon and Hydrocarbon Compound n_Pentane		pptv	volume_mixing_ratio_of_n_pentane_in_air	109-66-0	C5H12	72.1488
Trace Gases: Carbon and Hydrocarbon Compound i_Pentane		pptv	volume_mixing_ratio_of_isopentane_in_air	78-78-4	C5H12	72.1488
Trace Gases: Carbon and Hydrocarbon Compound n_Hexane		pptv	volume_mixing_ratio_of_n_hexane_in_air	110-54-3	C6H14	86.1754
Trace Gases: Carbon and Hydrocarbon Compound Ethene		pptv	volume_mixing_ratio_of_ethene_in_air	74-85-1	C2H4	28.0532
Trace Gases: Carbon and Hydrocarbon Compound Propene		pptv	volume_mixing_ratio_of_propene_in_air	115-07-1	C3H6	42.0797
Trace Gases: Carbon and Hydrocarbon Compound Isoprene		pptv	volume_mixing_ratio_of_isoprene_in_air	78-79-5	C5H8	68.117
Trace Gases: Carbon and Hydrocarbon Compound Ethyne		pptv	volume_mixing_ratio_of_etyne_in_air	74-86-2	C2H2	26.0373
Trace Gases: Carbon and Hydrocarbon Compound Benzene		pptv	volume_mixing_ratio_of_benzene_in_air	71-43-2	C6H6	78.1118
Trace Gases: Carbon and Hydrocarbon Compound Ethylbenzene		pptv	volume_mixing_ratio_of_ethylbenzene_in_air	100-41-4	C8H10	106.165
Trace Gases: Carbon and Hydrocarbon Compound Toluene		pptv	volume_mixing_ratio_of_toluene_in_air	108-88-3	C7H8	92.1384
Trace Gases: Carbon and Hydrocarbon Compound o_Xylene		pptv	volume_mixing_ratio_of_o_xylene_in_air	95-47-6	C8H10	106.165
Trace Gases: Carbon and Hydrocarbon Compound m_p_Xylene		pptv	volume_mixing_ratio_of_sum_of_m_xylene_and_p_xylene_in_air	NA	NA	NA