

# Global Monitoring Division

## Sampling Sites, Measurement Programs and Data Sets



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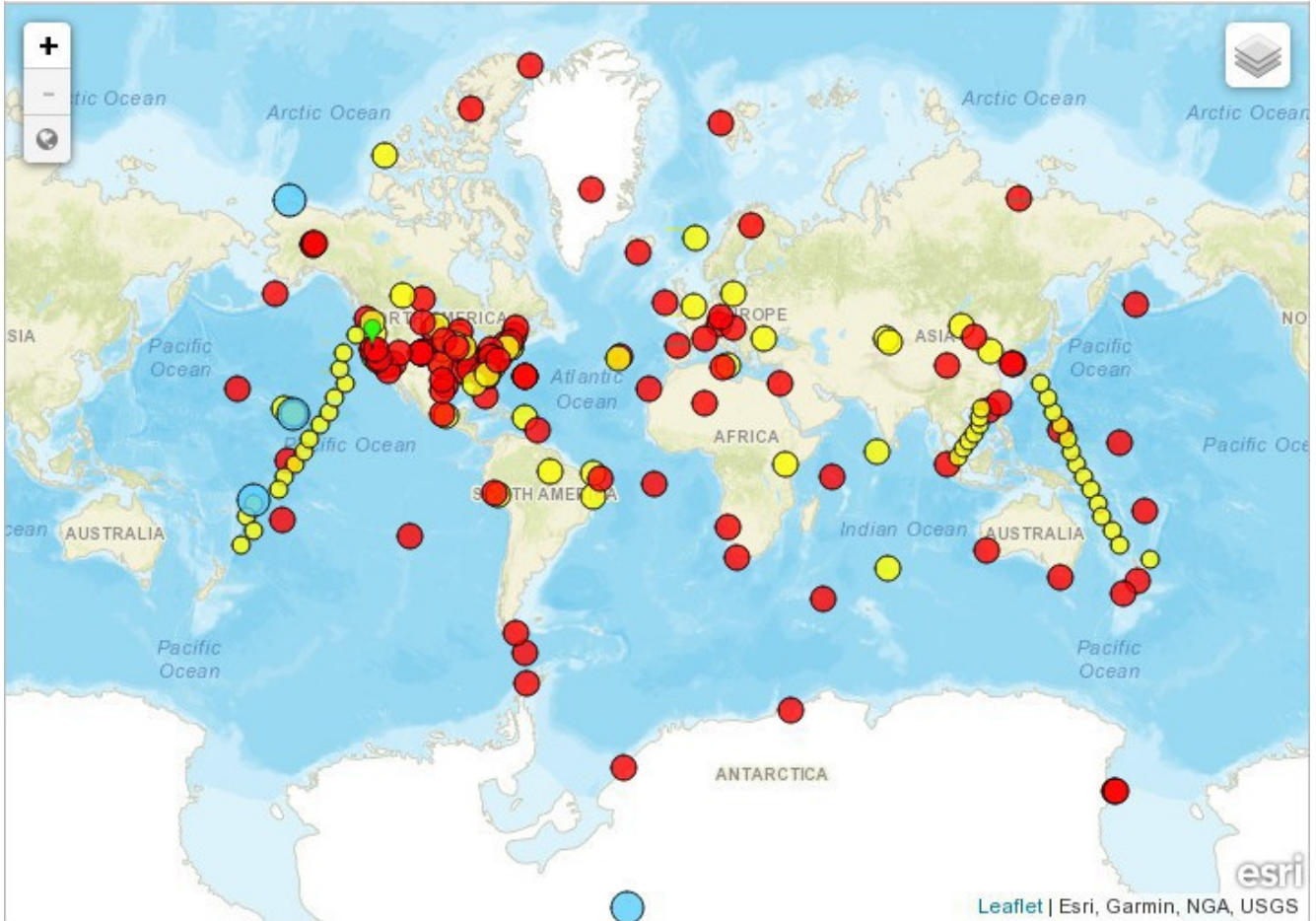
#### Part 1: Observatory Measurements and Data Sets

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# Global Monitoring Division NOAA, Boulder, Colorado

## GMD Measurement and Data Set Locations



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## **Contents: Part 1: Observatory Measurements and Data Sets**

**Barrow**  
**Summit**  
**Trinidad Head**  
**Mauna Loa**  
**Samoa**  
**South Pole**

Following two photographs of each observatory, the species measured at that observatory, first sample date and current status of the measurements can be found. All of the observatories are included even though Summit and Trinidad Head are not conducting the full complement of measurements as the other four Baseline Observatories, and are no longer considered a full GMD ABO. The data from all observatories and cooperative programs are archived and openly available to researchers.

All GMD data sets are available through GMD FTP sites or by contact with the GMD PI responsible for the data set. All data are available at the respective World Data Centers and are being formatted for archiving in the NOAA's National Centers for Environmental Information (NCEI).

These data sets are not the only GMD data sets available from the observatories and cooperative programs, but represent a sampling of the most requested data by scientists from around the globe.

## **Part 2: GMD Measurements: National, International and Cooperative Programs**

In Part 2, GMD measurements are listed by species and location of the measurements.

A summary of the species measured at the cooperative sites and in cooperative programs with a list of the programs and contact points round out Part 2.

GMD collects data from 196 sites globally with 76 being in the United States. The complete list is on the final page of Part 2.

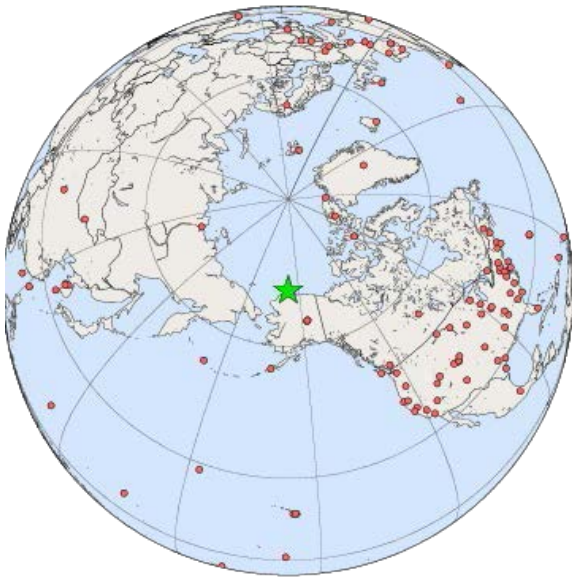




Utqiagvik (Barrow) Atmospheric Baseline Observatory in early winter.



Utqiagvik (Barrow) Atmospheric Baseline Observatory in mid-summer.



## Location

- » Country: United States 
- » Latitude: 71.3230° North
- » Longitude: 156.6114° West
- » Elevation: 11.00 masl
- » Time Zone: Local Standard Time + 9.0 hour(s) = UTC

## Contact

- » Contact Name: [Bryan Thomas](#)
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- » Fax: (907) 852-4622

## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Photo Gallery](#)

## Description

Barrow Observatory, established in 1973, is located near sea level 8 km east of UtqiaĀvik, Alaska at 71.32 degrees north. This facility is manned year around by 2 engineers/scientists who often commute to work in winter on snow machines. Due to its unique location, dedicated and highly trained staff, excellent power and communications infrastructure, the Barrow Observatory is host to numerous cooperative research projects from around the world.

BRW is located so that it receives minimal influence from anthropogenic effects. It is about 8 km northeast of the village of UtqiaĀvik (formerly Barrow) and has a prevailing east-northeast wind off the Beaufort Sea. It is attended at least 5 days a week for routine inspection and maintenance of the instrumentation. In addition, the National Weather Service (NWS) maintains a weather observing facility in Barrow. Although the measurements at Barrow are made over open tundra, there are large lagoons and a number of lakes in the vicinity, and the Arctic Ocean is less than 3 km northwest of the site. Because of its proximity to these bodies of water and the fact that the prevailing winds are off the Beaufort Sea, BRW is perhaps best characterized as having an Arctic maritime climate affected by variations of weather and sea ice conditions in the Central Arctic.

### GMD Projects at Barrow, Alaska

#### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1971-04-25	Ongoing
Methane	CH <sub>4</sub>	1983-04-06	Ongoing
Carbon Monoxide	CO	1988-07-24	Ongoing
Molecular Hydrogen	H <sub>2</sub>	1988-07-24	Ongoing
Nitrous Oxide	N <sub>2</sub> O	1997-05-02	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1997-05-02	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	1990-01-06	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	1990-01-06	Ongoing
Carbon-13/Carbon-12 in Methane	d <sup>13</sup> C (CH <sub>4</sub> )	1998-01-03	Ongoing
D/H in Methane	dD (CH <sub>4</sub> )	2005-04-01	Terminated - 2010-03-12
Methyl Chloride	CH <sub>3</sub> Cl	2005-05-20	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2007-02-16	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2007-02-16	Ongoing
ethane	C <sub>2</sub> H <sub>6</sub>	2005-05-20	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2005-05-20	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2005-05-20	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2005-05-20	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2005-05-20	Ongoing



Parameter	Formula	First Sample Date	Status
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2005-05-20	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2005-05-20	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2005-05-20	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2005-05-20	Ongoing
isoprene	C <sub>5</sub> H <sub>8</sub>	2007-02-16	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-05-25	Ongoing
Carbon-14/Carbon in Methane	D <sup>14</sup> C (CH <sub>4</sub> )	2013-03-26	Ongoing
Carbon-13/Carbon-12 in Carbon Monoxide	d <sup>13</sup> C (CO)	1990-03-28	Terminated - 1996-08-21

### Carbon Cycle In Situ Observatory

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1973-07-24	Ongoing
Methane	CH <sub>4</sub>	1986-01-29	Ongoing
Carbon Monoxide	CO	1991-09-11	Ongoing
Nitrous Oxide	N <sub>2</sub> O	2013-06-27	Ongoing

### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1994-12-24	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1994-12-24	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	1994-11-25	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1992-04-08	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1994-12-24	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1994-04-15	Ongoing
CFC-114	CFC-114	1992-02-14	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1992-04-08	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1992-02-14	Ongoing
methyl bromide	CH <sub>3</sub> Br	1994-01-26	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	1993-01-07	Ongoing
methyl iodide	CH <sub>3</sub> I	1994-03-23	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1992-02-14	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	1994-04-15	Ongoing
chloroform	CHCl <sub>3</sub>	1992-12-17	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1995-01-10	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	1998-03-07	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	1993-12-11	Ongoing
bromoform	CHBr <sub>3</sub>	1998-01-17	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	1999-02-12	Ongoing
carbonyl sulfide	COS	2000-03-25	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2000-08-03	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2000-08-03	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-10-03	Terminated - 2017-04-24
carbonyl disulfide	CS <sub>2</sub>	2005-04-22	Terminated - 2015-03-13
ethane	C <sub>2</sub> H <sub>6</sub>	2014-10-03	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2007-01-19	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-10-03	Ongoing

Parameter	Formula	First Sample Date	Status
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2007-01-19	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2007-01-19	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2007-01-19	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2013-04-30	Ongoing
Halon 1301	CF <sub>3</sub> Br	2004-02-14	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	1995-02-25	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2007-01-19	Ongoing
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2011-06-13	Ongoing
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2009-08-10	Ongoing
CFC-115	CClF <sub>2</sub> CF <sub>3</sub>	2007-01-19	Ongoing
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2007-01-19	Ongoing
CFC- 13	CClF <sub>3</sub>	2007-01-19	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2014-10-03	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-01-19	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2009-03-26	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1992-04-08	Ongoing
Chloroiodomethane	CH <sub>2</sub> CI	2017-02-10	Ongoing
diiodomethane	CH <sub>2</sub> I <sub>2</sub>	2017-02-10	Ongoing
Bromoiodomethane	CH <sub>2</sub> BrI	2017-02-10	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2017-02-10	Ongoing
Bromodichloromethane	CHBrCl <sub>2</sub>	2017-02-10	Ongoing
CFC- 11	CCl <sub>3</sub> F	1994-12-24	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-10-03	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-10-03	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2014-10-03	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2015-06-19	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-10-03	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2014-10-03	Ongoing
CFC-112	CCl <sub>2</sub> CClF <sub>2</sub>	2014-10-10	Ongoing
HFO-1234yf	CH <sub>2</sub> =CF <sub>2</sub> CF <sub>3</sub>	2016-08-29	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2017-01-24	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	CHCl <sub>2</sub> CF <sub>3</sub>	2017-11-27	Ongoing
1,1-dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	2017-02-10	Ongoing
dibromochloromethane	CHBr <sub>2</sub> Cl	2017-02-10	Ongoing
Ethyl Chloride	C <sub>2</sub> H <sub>5</sub> Cl	2011-06-13	Ongoing
Propyne	C <sub>3</sub> H <sub>4</sub>	2011-06-13	Ongoing
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	2014-10-03	Ongoing

#### HATS InSitu Observatory

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1998-06-16	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1998-06-15	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1998-11-12	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1998-06-16	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1998-08-30	Ongoing

Parameter	Formula	First Sample Date	Status
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1998-09-03	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1998-06-15	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1998-06-16	Ongoing
chloroform	CHCl <sub>3</sub>	1998-06-01	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1998-06-16	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1998-06-16	Ongoing
CFC- 11	CCl <sub>3</sub> F	1998-06-16	Ongoing

#### Aerosol Surface In-Situ

Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$\bar{I}f_{sp}$	1976-05-07	Ongoing
Light Absorption Coefficient	$\bar{I}f_{ap}$	1988-01-01	Ongoing
Particle Number Concentration	$N_t$	1976-05-07	Ongoing
Aerosol Chemical Composition		1998-01-01	Ongoing
Cloud condensation nucleus number concentration	$N_{ccn}$	2006-08-12	Terminated - 2012-12-22
Aerosol Hygroscopic Growth	f(RH)	2006-08-21	Terminated - 2013-10-18

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		1976-03-01	Ongoing
Downwelling Shortwave		1976-03-01	Ongoing
Diffuse		1995-07-05	Ongoing
Upwelling Shortwave		1985-01-01	Ongoing
Downwelling Longwave		1993-04-20	Ongoing
Upwelling Longwave		1993-04-20	Ongoing
Spectral		2001-04-01	Ongoing

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1973-03-14	Ongoing

#### Dobson Total Ozone

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1973-07-29	Ongoing

#### Meteorology

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	1973-02-17	Ongoing
Wind Direction	wd	1973-02-17	Ongoing
Temperature	temp	1976-01-01	Ongoing
Ambient Pressure	press	1976-01-01	Ongoing
RelativeHumidity	rh	1976-01-01	Ongoing



	Site	Category	Name	Type	Frequency	Year
1	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Daily Averages	Multiple
2	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Daily Averages	Multiple
3	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Daily Averages	Multiple
4	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Daily Averages	Multiple
5	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cfc12)	Insitu	Daily Averages	Multiple
6	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Daily Averages	Multiple
7	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Daily Averages	Multiple
8	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Daily Averages	Multiple
9	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Daily Averages	Multiple
10	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
11	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Daily Averages	Multiple
12	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Hourly Averages	Multiple
13	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Hourly Averages	Multiple
14	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Hourly Averages	Multiple
15	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Hourly Averages	Multiple
16	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cfc12)	Insitu	Hourly Averages	Multiple
17	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Hourly Averages	Multiple
18	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Hourly Averages	Multiple
19	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Hourly Averages	Multiple
20	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Hourly Averages	Multiple
21	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
22	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Hourly Averages	Multiple
23	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Monthly Averages	Multiple
24	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Monthly Averages	Multiple
25	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Monthly Averages	Multiple
26	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Monthly Averages	Multiple

	Site	Category	Name	Type	Frequency	10 Year
27	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
28	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Monthly Averages	Multiple
29	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Monthly Averages	Multiple
30	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Monthly Averages	Multiple
31	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Monthly Averages	Multiple
32	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
33	Barrow, Alaska, United States (BRW) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Monthly Averages	Multiple
34	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Daily Averages	Multiple
35	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Daily Averages	Multiple
36	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
37	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
38	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
39	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Hourly Averages	Multiple
40	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Hourly Averages	Multiple
41	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
42	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
43	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
44	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Monthly Averages	Multiple
45	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Monthly Averages	Multiple
46	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
47	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
48	Barrow, Alaska, United States (BRW) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
49	Barrow, Alaska, United States (BRW) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1973
50	Barrow, Alaska, United States (BRW) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1974
51	Barrow, Alaska, United States (BRW) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1975
52	Barrow, Alaska, United States (BRW) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1976
53	Barrow, Alaska, United States (BRW) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1977











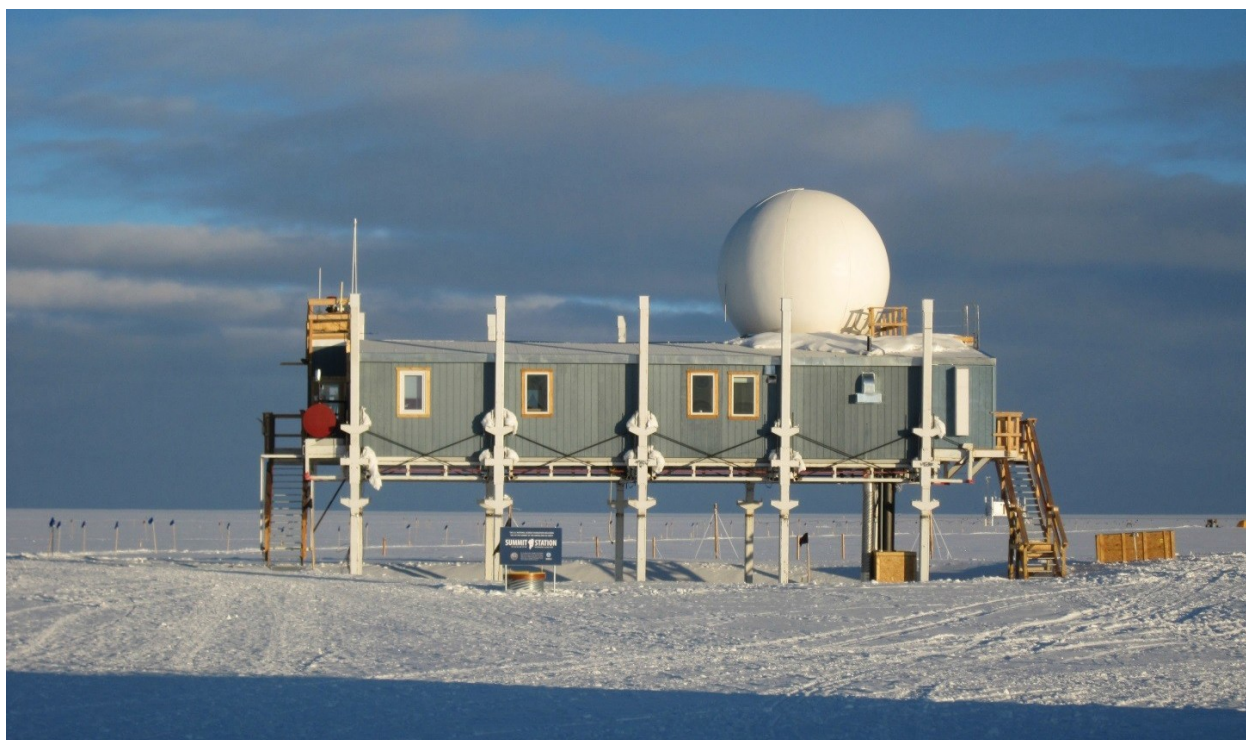
	Site	Category	Name	Type	Frequency	15 Year
160	<b>Barrow, Alaska, United States (BRW)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2012
161	<b>Barrow, Alaska, United States (BRW)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2013
162	<b>Barrow, Alaska, United States (BRW)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2014
163	<b>Barrow, Alaska, United States (BRW)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2015
164	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
165	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
166	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
167	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
168	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Discrete	Multiple
169	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
170	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
171	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple
172	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
173	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Discrete	Multiple
174	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
175	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i-C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
176	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
177	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
178	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
179	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Monthly Averages	Multiple
180	<b>Barrow, Alaska, United States (BRW)</b>	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly	Multiple
181	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
182	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
183	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
184	<b>Barrow, Alaska, United States (BRW)</b> Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Monthly Averages	Multiple

	Site	Category	Name	Type	Frequency	Year
185	Barrow, Alaska, United States (BRW) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (rad)	In-situ	Minute Averages	Multiple
186	Barrow, Alaska, United States (BRW) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	In-situ	Hourly Averages	Multiple
187	Barrow, Alaska, United States (BRW) In-situ ch4 daily averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	In-situ	Daily Averages	Multiple
188	Barrow, Alaska, United States (BRW) In-situ ch4 hourly averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	In-situ	Hourly Averages	HourlyData
189	Barrow, Alaska, United States (BRW) In-situ ch4 monthly averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	In-situ	Monthly Averages	Multiple
190	Barrow, Alaska, United States (BRW) In-situ co2 daily averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	In-situ	Daily Averages	Multiple
191	Barrow, Alaska, United States (BRW) In-situ co2 hourly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	In-situ	Hourly Averages	Multiple
192	Barrow, Alaska, United States (BRW) In-situ co2 monthly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	In-situ	Monthly Averages	Multiple

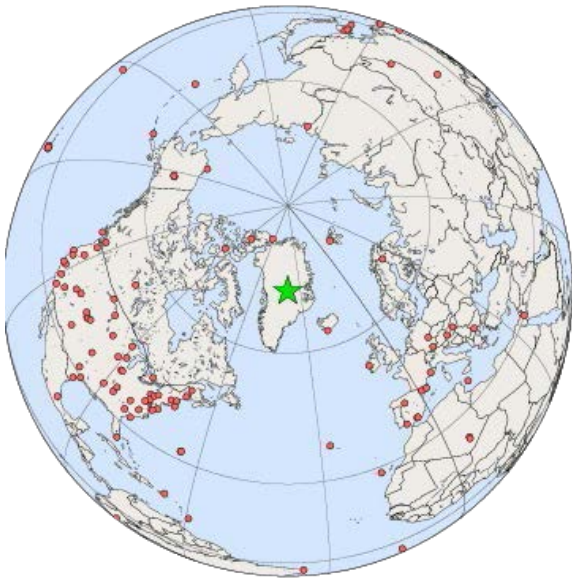




Summit, Greenland, Atmospheric Watch Observatory where 108 trace gas (weekly flasks, aerosol and continuous meteorological measurements are maintained.



Central support, kitchen and communications (the "Big House") building, Summit, Greenland.



## Location

- » Country: Greenland 
- » Latitude: 72.5962° North
- » Longitude: 38.422° West
- » Elevation: 3209.54 masl
- » Time Zone: Local Standard Time + 2.0 hour(s) = UTC

## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Publications](#)
- » [Personnel](#)
- » [Current Weather](#)
- » [Photo Gallery](#)

## Cooperating Agencies



» [National Science Foundation Office of Polar Programs](#)

## Description

The Greenland Environmental Observatory (GEOSummit) on the summit of the Greenland Ice Sheet (3200 m above sea level) was established by the U.S. [National Science Foundation \(NSF\)](#) and the Danish Commission for Scientific Research in Greenland to provide year-round, long-term measurements for monitoring and investigations of the Arctic environment. The multidisciplinary facility is home to several year-round investigations as well as numerous seasonal campaigns which take advantage of the unique location of the observatory. GEOSummit provides investigators ease of access to the highest site north of the Arctic Circle. Since 1989, when the GISP II ice-coring activities began, the site has hosted numerous atmospheric and glaciological investigations. Following two trial winter over periods (1997-1998, and 2000-2002), the NSF Long Term Observatory (LTO) program committed funding to maintain year-round measurements of key baseline variables of climate change at the site. In addition, several programs funded through European agencies have a year round presence at the site.

Logistical support at Summit is provided by CH2M HILL Polar Services, under contract to NSF. NOAA has maintained a presence at Summit since the mid 1990s, begun mainly to conduct greenhouse gas measurements, with NOAA and NSF technicians working together to ensure continuity of data. From 2005 to present, NOAA Corps Officers have served as technicians during various phases throughout the year. Beginning in August of 2009, NOAA staff became a year-round permanent addition to the station crew, ensuring the long-term continuity of NOAA data and providing additional scientific support for the site.

The NOAA Summit Atmospheric Baseline Observatory was downgraded from its status as a full "Observatory" to a "Sampling Site" on August 1, 2017. NOAA technician time and cargo intensive projects in the NOAA measurement suite were removed from the site. However, surface ozone monitoring instrumentation, a basic meteorology system, aerosol instrumentation, and halocarbon and greenhouse gas flask sampling capabilities continue to operate at the site in partnership with the NSF. The downgrade follows a Global Monitoring Division-wide evaluation of scientific goals and global observing network capabilities that resulted in realignment to best meet NOAA's mission and the nation's scientific needs.

All data from Summit are available on the Global Monitoring Division's website: <https://esrl.noaa.gov/gmd/dv/data/index.php?site=sum>

## GMD Projects at Summit

### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1997-06-23	Ongoing
Methane	CH <sub>4</sub>	1997-06-23	Ongoing
Carbon Monoxide	CO	1997-06-23	Ongoing
Molecular Hydrogen	H <sub>2</sub>	1997-06-23	Ongoing
Nitrous Oxide	N <sub>2</sub> O	1997-06-23	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1997-06-23	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	1997-06-23	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	1997-06-23	Ongoing
Carbon-13/Carbon-12 in Methane	d <sup>13</sup> C (CH <sub>4</sub> )	2010-04-27	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	2004-10-18	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2006-07-17	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2006-07-17	Ongoing

Parameter	Formula	First Sample Date	Status
ethane	C <sub>2</sub> H <sub>6</sub>	2004-10-18	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2004-10-18	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2004-10-18	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2004-10-18	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2004-10-18	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2004-10-18	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2004-10-18	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2004-10-18	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2004-10-18	Ongoing
Wind Speed	ws	1997-06-23	Ongoing
Wind Direction	wd	1997-06-23	Ongoing
Temperature	temp	2004-05-10	Terminated - 2004-08-09
isoprene	C <sub>5</sub> H <sub>8</sub>	2006-07-17	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-09-24	Ongoing

### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	2004-06-20	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	2004-06-20	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	2004-06-20	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	2004-06-20	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	2004-06-20	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	2004-06-20	Ongoing
CFC-114	CFC-114	2004-06-20	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	2004-06-20	Ongoing
Halon-1211	CBrClF <sub>2</sub>	2004-06-20	Ongoing
methyl bromide	CH <sub>3</sub> Br	2004-06-20	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	2004-06-20	Ongoing
methyl iodide	CH <sub>3</sub> I	2004-06-20	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	2004-06-20	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	2004-06-20	Ongoing
chloroform	CHCl <sub>3</sub>	2004-06-20	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	2004-06-20	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	2004-06-20	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	2009-03-10	Ongoing
bromoform	CHBr <sub>3</sub>	2004-06-20	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2004-06-20	Ongoing
carbonyl sulfide	COS	2004-06-20	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2004-06-20	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2004-06-20	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-08-13	Terminated - 2016-08-30
carbonyl disulfide	CS <sub>2</sub>	2005-03-08	Ongoing
ethane	C <sub>2</sub> H <sub>6</sub>	2014-08-13	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2014-08-13	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-08-13	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2014-08-13	Ongoing

i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2014-08-13	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2012-08-15	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2012-08-15	Ongoing
Halon 1301	CF <sub>3</sub> Br	2005-03-22	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	2009-03-10	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2014-08-13	Ongoing
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2011-05-08	Ongoing
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2009-06-08	Ongoing
CFC-115	CClF <sub>2</sub> CF <sub>3</sub>	2014-08-13	Ongoing
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2014-08-13	Ongoing
CFC- 13	CClF <sub>3</sub>	2014-08-13	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2014-08-13	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2014-08-13	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2014-08-13	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	2004-06-20	Ongoing
Chloriodomethane	CH <sub>2</sub> ClI	2016-09-13	Ongoing
diiodomethane	CH <sub>2</sub> I <sub>2</sub>	2016-09-13	Ongoing
Bromiodomethane	CH <sub>2</sub> BrI	2016-09-13	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2016-09-13	Ongoing
Bromodichloromethane	CHBrCl <sub>2</sub>	2016-09-13	Ongoing
CFC- 11	CCl <sub>3</sub> F	2004-06-20	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-08-13	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-08-13	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2014-08-13	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2014-08-13	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-08-13	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2014-08-21	Ongoing
CFC-112	CCl <sub>3</sub> CClF <sub>2</sub>	2014-08-21	Ongoing
HFO-1234yf	CH <sub>2</sub> =CFCF <sub>3</sub>	2016-07-28	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2016-09-13	Ongoing
1,1-dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	2016-09-13	Ongoing
dibromochloromethane	CHBr <sub>2</sub> Cl	2016-09-13	Ongoing
Ethyl Chloride	C <sub>2</sub> H <sub>5</sub> Cl	2011-05-08	Ongoing
Propyne	C <sub>3</sub> H <sub>4</sub>	2011-05-08	Ongoing
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	2014-08-13	Ongoing

### HATS InSitu Observatory

Parameter	Formula	First Sample Date	Status
Methane	CH <sub>4</sub>	2007-07-01	Ongoing
Carbon Monoxide	CO	2007-07-01	Ongoing
Molecular Hydrogen	H <sub>2</sub>	2007-07-01	Ongoing
Nitrous Oxide	N <sub>2</sub> O	2007-07-16	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	2007-07-16	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	2007-07-24	Ongoing



Parameter	Formula	First Sample Date	Status
Halon-1211	$\text{CBrClF}_2$	2007-11-22	Ongoing
CFC-113	$\text{CCl}_2\text{FCClF}_2$	2007-07-20	Ongoing
chloroform	$\text{CHCl}_3$	2007-07-01	Ongoing
carbon tetrachloride	$\text{CCl}_4$	2007-07-20	Ongoing
Methyl Chloroform	$\text{CH}_2\text{CCl}_3$	2007-07-20	Ongoing
CFC- 11	$\text{CCl}_3\text{F}$	2007-07-20	Ongoing

#### Aerosol Surface In-Situ

Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$I_{f_{sp}}$	2011-01-10	Ongoing
Light Absorption Coefficient	$I_{f_{ap}}$	2011-01-10	Ongoing
Particle Number Concentration	$N_t$	2011-01-10	Terminated - 2011-07-21

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		2006-05-28	Terminated - 2017-04-30
Downwelling Shortwave		2006-05-28	Terminated - 2017-04-30
Diffuse		2006-05-28	Terminated - 2017-04-30
Upwelling Shortwave		2006-05-28	Terminated - 2017-04-30
Downwelling Longwave		2006-05-28	Terminated - 2017-04-30
Upwelling Longwave		2006-05-28	Terminated - 2017-04-30

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	$\text{O}_3$	2000-06-01	Ongoing

#### Ozonesonde

Parameter	Formula	First Sample Date	Status
Ozone	$\text{O}_3$	2005-02-12	Terminated - 2017-07-25

#### Meteorology

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	2008-06-25	Ongoing
Wind Direction	wd	2008-06-25	Ongoing
Temperature	temp	2008-06-26	Ongoing
Ambient Pressure	press	2008-06-25	Ongoing
Relative Humidity	rh	2008-08-15	Ongoing

	Site	Category	Name	Type	Frequency	Year
1	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Daily Averages	Multiple
2	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Daily Averages	Multiple
3	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
4	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Daily Averages	Multiple
5	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
6	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Daily Averages	Multiple
7	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
8	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Daily Averages	Multiple
9	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Hourly Averages	Multiple
10	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Hourly Averages	Multiple
11	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
12	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Hourly Averages	Multiple
13	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
14	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Hourly Averages	Multiple
15	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
16	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Hourly Averages	Multiple
17	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Monthly Averages	Multiple
18	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Monthly Averages	Multiple
19	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
20	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Monthly Averages	Multiple
21	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
22	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Monthly Averages	Multiple
23	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
24	<b>Summit, Greenland (SUM)</b> Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Monthly Averages	Multiple
25	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2008
26	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2009

	Site	Category	Name	Type	Frequency <sup>2,3</sup>	Year
27	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2010
28	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2011
29	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2012
30	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2013
31	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2014
32	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2015
33	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2016
34	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	2017
35	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2008
36	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2009
37	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2010
38	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2011
39	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2012
40	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2013
41	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2014
42	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2015
43	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2016
44	<b>Summit, Greenland (SUM)</b> Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Minute Averages	2017
45	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2003
46	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2004
47	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2005
48	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2006
49	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2007
50	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2008
51	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2009
52	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2010

	Site	Category	Name	Type	Frequency	Year
53	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2011
54	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2012
55	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2013
56	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2014
57	<b>Summit, Greenland (SUM)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2016
58	<b>Summit, Greenland (SUM)</b> Vertical Profile of Ozone from Balloon flight.	Ozone	Ozone (O <sub>3</sub> )	Balloon	Vertical Profile	Multiple
59	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
60	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
61	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
62	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
63	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Discrete	Multiple
64	<b>Summit, Greenland (SUM)</b>	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
65	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
66	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple
67	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
68	<b>Summit, Greenland (SUM)</b>	Non- Methane	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
69	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
70	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n- C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
71	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
72	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
73	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Monthly Averages	Multiple
74	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly Averages	Multiple
75	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
76	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
77	<b>Summit, Greenland (SUM)</b> Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple



	Site	Category	Name	Type	Frequency <sup>25</sup>	Year
78	Summit, Greenland (SUM) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (grad)	Insitu	Minute Averages	Multiple
79	Summit, Greenland (SUM) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	Insitu	Hourly Averages	Multiple



Trinidad Head, CA, Atmospheric Baseline Observatory (2002-2017).



Trinidad Head Observatory where 126 trace gas (weekly flasks and aircraft profiles), ozonesonde and continuous meteorological measurements are maintained.



## Location

- » Country: United States 
- » Latitude: 41.0541° North
- » Longitude: 124.151° West
- » Elevation: 107.00 masl
- » Time Zone: Local Standard Time + 8.0 hour(s) = UTC

## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Publications](#)
- » [Personnel](#)
- » [Photo Gallery](#)

## Cooperating Agencies

- » [Scientific Aviation, Inc](#)
- » [AGAGE](#)
- » [Scripps Institution of Oceanography](#)
- » [Humboldt State University Marine Laboratory](#)

## Description

Trinidad Head Observatory (THD) is located on a point jutting into the ocean along the remote northern coast of California approximately 40 km (25 miles) north of Eureka, California, the main regional population center. The coastal climate is dominated by maritime influences, with moderate year-round temperatures and moderate-to-high humidity. To the immediate west of Trinidad Head is the unobstructed Pacific Ocean. To the east, the coastal range is dominated by redwood forests. The town of Trinidad represents the primary community in the immediate vicinity and supports approximately 400 year-round residents. The Telonicher Marine Laboratory (TML), a satellite facility of Humboldt State University (HSU), is also located in Trinidad.

NOAA established an atmospheric baseline observatory at Trinidad Head in 2002. Because of its relatively remote coastal location and prevailing maritime airflow, NOAA felt the site would provide scientists with an opportunity to observe and monitor both regional and global atmospheric conditions reasonably free from local influences.

An instrument trailer was installed in April 2002 allowing measurements of aerosols, surface ozone, radiation, and flask sampling for halocarbons and carbon cycle gases. Bi-weekly airborne vertical profile measurements provide a continuous baseline of pollution and climate forcing agents in air entering the U.S. Co-located with the Trinidad Head Observatory, the Scripps Institution of Oceanography operates two in situ instruments, one as part of the Advanced Global Atmospheric Gases Experiment (AGAGE), the other for measuring changes in atmospheric oxygen concentrations.

The NOAA Trinidad Head Atmospheric Baseline Observatory was downgraded from its status as a full "Observatory" to a "Sampling Site" on June 5, 2017. Most long-term projects and infrastructure were removed from the site. Three research projects remain at THD in partnership with other entities: surface ozone monitoring instrumentation (partnership with SIO), ozonesonde launching capabilities (partnership with HSU), and halocarbons flask sampling capabilities (partnership with AGAGE). The downgrade follows a Global Monitoring Division-wide evaluation of scientific goals and global observing network capabilities that resulted in realignment to best meet NOAA's mission and the nation's scientific needs.

All Trinidad Head data are available on the Global Monitoring Division's website: <https://esrl.noaa.gov/gmd/dv/data/index.php?site=thd>

## GMD Projects at Trinidad Head, California

### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	2002-04-19	Terminated - 2017-06-01
Methane	CH <sub>4</sub>	2002-04-19	Terminated - 2017-06-01
Carbon Monoxide	CO	2002-04-19	Terminated - 2017-06-01
Molecular Hydrogen	H <sub>2</sub>	2002-04-19	Terminated - 2017-06-01
Nitrous Oxide	N <sub>2</sub> O	2002-04-19	Terminated - 2017-06-01
Sulfur Hexafluoride	SF <sub>6</sub>	2002-04-19	Terminated - 2017-06-01
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	2002-04-19	Terminated - 2017-06-01
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	2002-04-19	Terminated - 2017-06-01
Methyl Chloride	CH <sub>3</sub> Cl	2004-10-07	Terminated - 2017-06-01
Benzene	C <sub>6</sub> H <sub>6</sub>	2004-10-07	Terminated - 2017-06-01
toluene	C <sub>7</sub> H <sub>8</sub>	2004-10-07	Terminated - 2017-06-01

Parameter	Formula	First Sample Date	Status <sup>28</sup>
ethane	C <sub>2</sub> H <sub>6</sub>	2004-10-07	Terminated - 2017-06-01
ethene	C <sub>2</sub> H <sub>4</sub>	2004-10-07	Terminated - 2017-06-01
propane	C <sub>3</sub> H <sub>8</sub>	2004-10-07	Terminated - 2017-06-01
propene	C <sub>3</sub> H <sub>6</sub>	2004-10-07	Terminated - 2017-06-01
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2004-10-07	Terminated - 2017-06-01
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2004-10-07	Terminated - 2017-06-01
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2004-10-07	Terminated - 2017-06-01
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2004-10-07	Terminated - 2017-06-01
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2004-10-07	Terminated - 2017-06-01
Wind Speed	ws	2002-04-19	Terminated - 2017-06-01
Wind Direction	wd	2002-04-19	Terminated - 2017-06-01
Temperature	temp	2004-08-20	Terminated - 2004-09-22
isoprene	C <sub>5</sub> H <sub>8</sub>	2004-10-07	Terminated - 2017-06-01
Acetylene	C <sub>2</sub> H <sub>2</sub>	2004-10-07	Terminated - 2017-06-01

### Carbon Cycle Airborne Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	2003-09-02	Ongoing
Methane	CH <sub>4</sub>	2003-09-02	Ongoing
Carbon Monoxide	CO	2003-09-02	Ongoing
Molecular Hydrogen	H <sub>2</sub>	2003-09-02	Ongoing
Nitrous Oxide	N <sub>2</sub> O	2003-09-02	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	2003-09-02	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	2014-09-27	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	2003-10-08	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	2003-10-08	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	2004-11-12	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	2004-11-12	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	2004-11-12	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	2004-11-12	Ongoing
CFC-114	CFC-114	2004-11-12	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	2004-11-12	Ongoing
Halon-1211	CBrClF <sub>2</sub>	2004-11-12	Ongoing
methyl bromide	CH <sub>3</sub> Br	2004-11-12	Ongoing
CFC-11 (ion 101)	CCl <sub>3</sub> F (ion 101)	2004-11-12	Terminated - 2015-11-12
CFC-11 (ion 103)	CCl <sub>3</sub> F (ion 103)	2010-05-23	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	2004-11-12	Ongoing
methyl iodide	CH <sub>3</sub> I	2004-11-12	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	2004-11-12	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	2004-11-12	Ongoing
chloroform	CHCl <sub>3</sub>	2004-11-12	Ongoing
methyl chloroform (ion 97)	CH <sub>3</sub> CCl <sub>3</sub>	2004-11-12	Ongoing
methyl chloroform (ion 99)	CH <sub>3</sub> CCl <sub>3</sub>	2010-05-23	Terminated - 2012-10-04
carbon tetrachloride	CCl <sub>4</sub>	2004-11-12	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	2004-11-12	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	2004-11-12	Ongoing



Parameter	Formula	First Sample Date	Status
bromoform	CHBr <sub>3</sub>	2004-11-12	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2004-11-12	Ongoing
carbonyl sulfide	COS	2004-11-12	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2015-10-15	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2004-11-12	Ongoing
HCFC-124	CHClFCF <sub>3</sub>	2004-11-12	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2007-07-25	Ongoing
carbonyl disulfide	CS <sub>2</sub>	2004-11-12	Ongoing
Sample Pressure	press	2007-06-09	Terminated - 2010-06-20
ethane	C <sub>2</sub> H <sub>6</sub>	2014-09-27	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2014-09-27	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2007-06-09	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2014-09-27	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-09-27	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2007-06-09	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2007-06-09	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2007-06-09	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2014-09-27	Ongoing
Temperature	temp	2003-09-02	Ongoing
Ambient Pressure	press	2004-01-22	Terminated - 2013-04-18
RelativeHumidity	rh	2003-09-02	Ongoing
Halon 1301	CF <sub>3</sub> Br	2007-06-09	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	2007-06-09	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2007-06-09	Ongoing
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2007-06-09	Ongoing
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2007-06-09	Ongoing
CFC-115	CClF <sub>2</sub> CF <sub>3</sub>	2007-06-09	Ongoing
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2007-06-09	Ongoing
CFC- 13	CClF <sub>3</sub>	2007-06-09	Ongoing
Chloroethane	CH <sub>3</sub> CH <sub>2</sub> Cl	2007-06-09	Terminated - 2014-05-11
HFC-23	CHF <sub>3</sub>	2007-06-09	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2008-03-22	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2008-03-22	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2009-04-04	Ongoing
HFC-134	CHF <sub>2</sub> CHF <sub>2</sub>	2009-04-04	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2014-09-27	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-09-27	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-09-27	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2015-10-15	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2014-09-27	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-09-27	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2015-10-15	Ongoing
CFC-112	CCl <sub>2</sub> CClF <sub>2</sub>	2014-09-27	Ongoing
C2HCl3	C <sub>2</sub> HCl <sub>3</sub>	2014-09-27	Ongoing



Parameter	Formula	First Sample Date	Status <sup>30</sup>
HFO-1234yf	CH <sub>2</sub> =CFCF <sub>3</sub>	2016-09-17	Ongoing
HFO-1234ze	CHF=CHCF <sub>3</sub>	2016-09-17	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2018-01-13	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	CHCl <sub>2</sub> CF <sub>3</sub>	2018-01-13	Ongoing
morpholine	C <sub>5</sub> F <sub>11</sub> NO	2017-12-08	Ongoing
PFTEA	(C <sub>2</sub> F <sub>5</sub> ) <sub>3</sub> N	2017-12-08	Ongoing
PFTPA	(C <sub>3</sub> F <sub>7</sub> ) <sub>3</sub> N	2017-12-08	Ongoing

#### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	2002-02-26	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	2002-02-26	Ongoing
HFC- 134a	CH <sub>2</sub> F <sub>2</sub> CF <sub>3</sub>	2002-02-26	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	2002-03-06	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	2002-02-26	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	2002-03-06	Ongoing
CFC-114	CFC-114	2002-02-26	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	2002-02-26	Ongoing
Halon-1211	CBrClF <sub>2</sub>	2002-02-26	Ongoing
methyl bromide	CH <sub>3</sub> Br	2002-03-06	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	2002-02-26	Ongoing
methyl iodide	CH <sub>3</sub> I	2002-02-26	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	2002-02-26	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	2002-03-06	Ongoing
chloroform	CHCl <sub>3</sub>	2002-02-26	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	2002-02-26	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	2002-02-26	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	2002-03-06	Ongoing
bromoform	CHBr <sub>3</sub>	2002-02-26	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2002-02-26	Ongoing
carbonyl sulfide	COS	2002-04-03	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2002-02-26	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2002-02-26	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-09-09	Terminated - 2017-04-18
carbonyl disulfide	CS <sub>2</sub>	2005-04-08	Terminated - 2015-03-08
ethane	C <sub>2</sub> H <sub>6</sub>	2014-09-09	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2007-01-17	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-09-09	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2007-01-17	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2006-12-27	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2006-12-27	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2013-05-05	Ongoing
Halon 1301	CF <sub>3</sub> Br	2004-02-26	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	2004-02-26	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2007-01-17	Ongoing

Parameter	Formula	First Sample Date	Status
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2011-06-19	Ongoing
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2009-08-10	Ongoing
CFC-115	CCIF <sub>2</sub> CF <sub>3</sub>	2007-01-07	Terminated - 2015-10-03
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2007-01-17	Ongoing
CFC- 13	CCIF <sub>3</sub>	2007-01-17	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2014-09-09	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-01-17	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2009-03-14	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	2002-02-26	Ongoing
Chloriodomethane	CH <sub>2</sub> ClI	2017-02-12	Ongoing
diiodomethane	CH <sub>2</sub> I <sub>2</sub>	2017-02-12	Ongoing
Bromiodomethane	CH <sub>2</sub> BrI	2017-02-12	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2017-02-12	Ongoing
Bromodichloromethane	CHBrCl <sub>2</sub>	2017-02-12	Ongoing
CFC- 11	CCl <sub>3</sub> F	2002-02-26	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-09-09	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-09-09	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2014-09-09	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2014-09-09	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-09-09	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2014-09-28	Ongoing
CFC-112	CCl <sub>2</sub> CClF <sub>2</sub>	2014-10-13	Ongoing
HFO-1234yf	CH <sub>2</sub> =CFCF <sub>3</sub>	2016-08-16	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2017-01-28	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	CHCl <sub>2</sub> CF <sub>3</sub>	2017-12-19	Ongoing
1,1-dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	2017-02-12	Ongoing
dibromochloromethane	CHBr <sub>2</sub> Cl	2017-02-12	Ongoing
Ethyl Chloride	C <sub>2</sub> H <sub>5</sub> Cl	2011-06-19	Ongoing
Propyne	C <sub>3</sub> H <sub>4</sub>	2011-06-19	Ongoing
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	2014-09-09	Ongoing

#### Aerosol Surface In-Situ

Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$\dot{I}f_{sp}$	2002-01-01	Terminated - 2017-06-01
Light Absorption Coefficient	$\dot{I}f_{ap}$	2002-01-01	Terminated - 2017-06-01
Particle Number Concentration	$N_t$	2002-01-01	Terminated - 2017-06-01
Aerosol Chemical Composition		2002-01-01	Terminated - 2005-01-01
Aerosol Hygroscopic Growth	f(RH)	2002-01-01	Terminated - 2006-01-01

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		2002-04-10	Terminated - 2017-04-30
Downwelling Shortwave		2002-04-10	Terminated - 2017-04-30
Diffuse		2002-04-10	Terminated - 2017-04-30
Downwelling Longwave		2003-05-20	Terminated - 2017-04-30

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	2002-04-18	Ongoing

**Ozonesonde**

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1997-08-21	Ongoing

**Lidar**

Parameter	Formula	First Sample Date	Status
Aerosol backscatter (532 nm)		2005-05-06	Terminated - 2014-03-25

**Meteorology**

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	2002-06-29	Ongoing
Wind Direction	wd	2002-06-29	Ongoing
Temperature	temp	2002-04-10	Ongoing
Ambient Pressure	press	2002-04-10	Ongoing
RelativeHumidity	rh	2002-04-10	Ongoing

**OzoneAirborne**

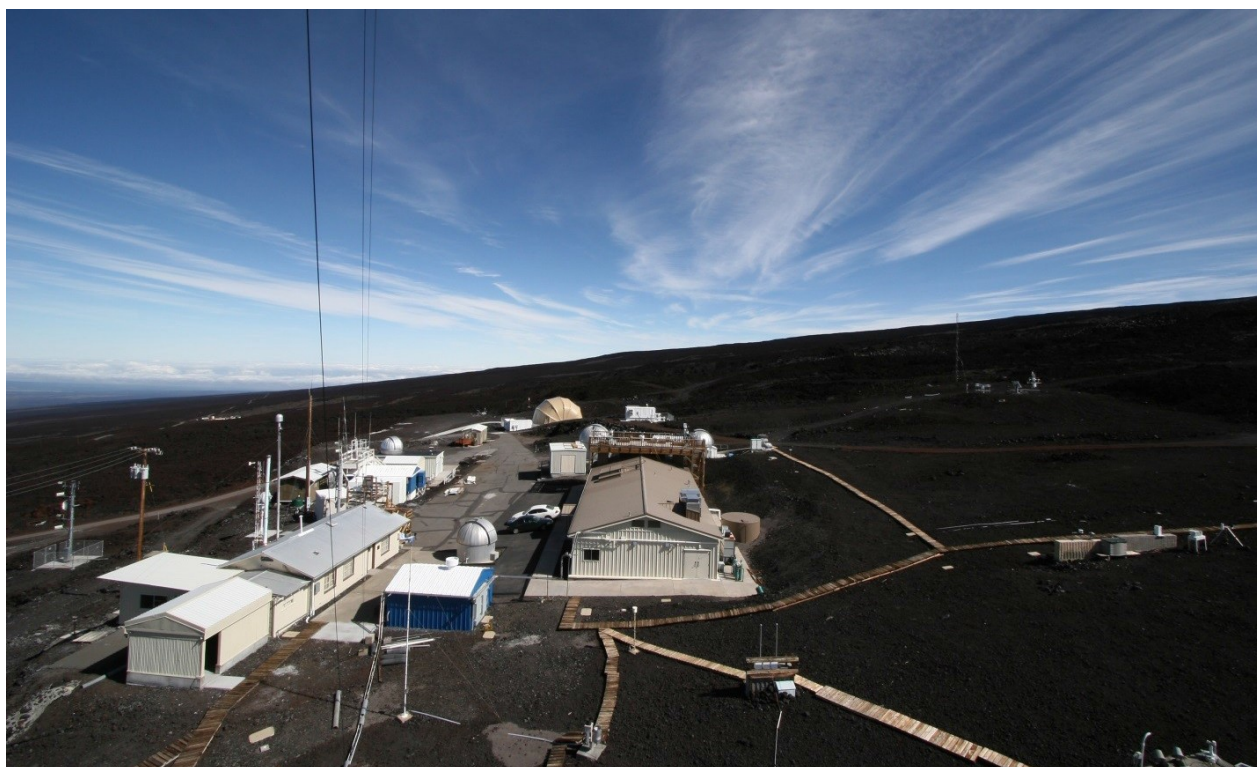
Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	2005-07-13	Terminated - 2011-10-08



	Site	Category	Name	Type	Frequency	Year
30	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2002
31	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2003
32	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2004
33	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2005
34	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2006
35	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2007
36	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2008
37	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2009
38	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2010
39	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2011
40	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2012
41	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2013
42	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2014
43	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2015
44	Trinidad Head, California, United States (THD) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2016
45	Trinidad Head, California, United States (THD) Vertical Profile of Ozone from Balloon flight.	Ozone	Ozone (O <sub>3</sub> )	Balloon	Vertical Profile	Multiple
46	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
47	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
48	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
49	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
50	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
51	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
52	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple



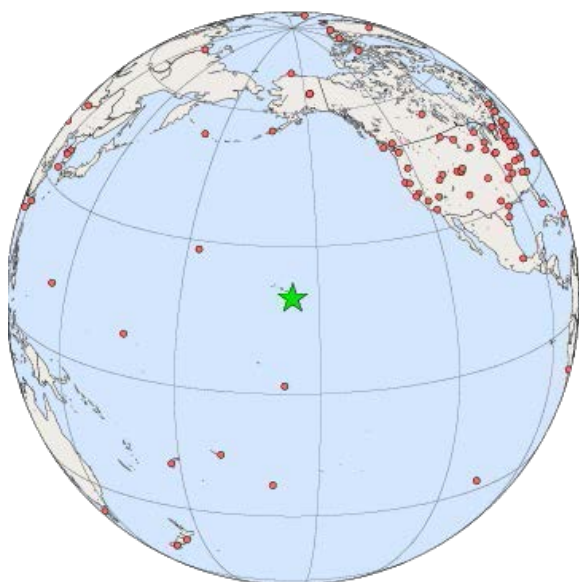
	Site	Category	Name	Type	Frequency	Year
53	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
54	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
55	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
56	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n- C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
57	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
58	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
59	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly Averages	Multiple
60	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
61	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
62	Trinidad Head, California, United States (THD) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
63	Trinidad Head, California, United States (THD) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (grad)	Insitu	Minute Averages	Multiple
64	Trinidad Head, California, United States (THD) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	Insitu	Hourly Averages	Multiple



Mauna Loa Atmospheric Baseline Observatory viewed from the sampling tower.



Mauna Loa Atmospheric Baseline Observatory viewed from the south looking across the valley to the Mauna Kea astronomical facilities. The MLO NDACC building is in the foreground.



## Location

- » Country: United States 
- » Latitude: 19.5362° North
- » Longitude: 155.5763° West
- » Elevation: 3397.00 masl
- » Time Zone: Local Standard Time + 10.0 hour(s) = UTC

## Contact

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## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Photo Gallery](#)

## Description

Mauna Loa Observatory is located on the Island of Hawaii at an elevation of 3397 m on the northern flank of Mauna Loa volcano at 200 north. Established in 1957, Mauna Loa Observatory has grown to become the premier long-term atmospheric monitoring facility on earth and is the site where the ever-increasing concentrations of global atmospheric carbon dioxide were determined. The observatory consists of 10 buildings from which up to 250 different atmospheric parameters are measured by a complement of 12 NOAA/ESRL and other agency scientists and engineers.

### GMD Projects at Mauna Loa, Hawaii

#### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1969-08-20	Ongoing
Methane	CH <sub>4</sub>	1983-05-06	Ongoing
Carbon Monoxide	CO	1989-07-07	Ongoing
Molecular Hydrogen	H <sub>2</sub>	1989-07-07	Ongoing
Nitrous Oxide	N <sub>2</sub> O	1995-12-15	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1995-12-15	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	1990-01-12	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	1990-01-12	Ongoing
Carbon-13/Carbon-12 in Methane	d <sup>13</sup> C (CH <sub>4</sub> )	1998-01-02	Ongoing
D/H in Methane	dD (CH <sub>4</sub> )	2005-04-06	Terminated - 2009-11-03
Methyl Chloride	CH <sub>3</sub> Cl	2005-05-11	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2006-12-13	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2006-12-13	Ongoing
ethane	C <sub>2</sub> H <sub>6</sub>	2005-05-11	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2005-05-11	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2005-05-11	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2005-05-11	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2005-05-11	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2005-05-11	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2005-05-11	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2005-05-11	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2005-05-11	Ongoing
isoprene	C <sub>5</sub> H <sub>8</sub>	2006-12-13	Ongoing

Parameter	Formula	First Sample Date	Status
Acetylene	C <sub>2</sub> H <sub>2</sub>	2006-12-13	Ongoing

### Carbon Cycle InSitu Observatory

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1974-05-17	Ongoing
Methane	CH <sub>4</sub>	1987-04-03	Ongoing
Carbon Monoxide	CO	1992-05-29	Ongoing

### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1994-12-19	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1994-12-19	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	1994-11-07	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1991-12-30	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1994-12-19	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1993-08-30	Ongoing
CFC-114	CFC-114	1991-12-30	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1992-02-10	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1991-12-30	Ongoing
methyl bromide	CH <sub>3</sub> Br	1993-08-30	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	1992-12-28	Ongoing
methyl iodide	CH <sub>3</sub> I	1994-04-11	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1991-12-30	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	1994-01-18	Ongoing
chloroform	CHCl <sub>3</sub>	1992-12-28	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1994-12-19	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	1998-03-09	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	1993-11-22	Ongoing
bromoform	CHBr <sub>3</sub>	1998-01-15	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	1999-02-01	Ongoing
carbonyl sulfide	COS	2000-03-13	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2000-08-14	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2000-08-14	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-09-09	Terminated - 2017-04-18
carbonyl disulfide	CS <sub>2</sub>	2005-04-13	Terminated - 2015-03-10
ethane	C <sub>2</sub> H <sub>6</sub>	2014-09-09	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2006-12-27	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-09-09	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2006-12-27	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2006-12-27	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2006-12-27	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2013-04-30	Ongoing
Halon 1301	CF <sub>3</sub> Br	2004-03-08	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	1995-03-13	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2006-12-27	Ongoing
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2011-06-14	Ongoing

Parameter	Formula	First Sample Date	Status
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2009-08-13	Ongoing
CFC-115	CClF <sub>2</sub> CF <sub>3</sub>	2006-12-27	Ongoing
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2006-12-27	Ongoing
CFC- 13	CClF <sub>3</sub>	2006-12-27	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2014-09-09	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2006-12-27	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2009-03-12	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1991-12-30	Ongoing
Chloriodomethane	CH <sub>2</sub> ClI	2017-02-01	Ongoing
diiodomethane	CH <sub>2</sub> I <sub>2</sub>	2017-02-01	Ongoing
Bromiodomethane	CH <sub>2</sub> BrI	2017-02-01	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2017-02-01	Ongoing
Bromodichloromethane	CHBrCl <sub>2</sub>	2017-02-01	Ongoing
CFC- 11	CCl <sub>3</sub> F	1994-12-19	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-09-09	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-09-09	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2014-09-09	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2014-09-09	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-09-09	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2014-09-30	Ongoing
CFC-112	CCl <sub>2</sub> CClF <sub>2</sub>	2014-10-14	Ongoing
HFO-1234yf	CH <sub>2</sub> =CF <sub>2</sub> CF <sub>3</sub>	2016-08-16	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2017-01-03	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	CHCl <sub>2</sub> CF <sub>3</sub>	2017-12-19	Ongoing
1,1-dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	2017-02-01	Ongoing
dibromochloromethane	CHBr <sub>2</sub> Cl	2017-02-01	Ongoing
Ethyl Chloride	C <sub>2</sub> H <sub>5</sub> Cl	2011-06-14	Ongoing
Propyne	C <sub>3</sub> H <sub>4</sub>	2011-06-14	Ongoing
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	2014-09-09	Ongoing

### HATS InSitu Observatory

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1999-07-08	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1999-06-25	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1998-11-28	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1999-06-25	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1999-04-23	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1999-01-01	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1998-12-03	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1999-12-14	Ongoing
chloroform	CHCl <sub>3</sub>	1998-09-01	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1999-06-25	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1999-04-23	Ongoing
CFC- 11	CCl <sub>3</sub> F	1999-06-25	Ongoing

### Aerosol Surface In-Situ



Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$\dot{I}f_{sp}$	1974-01-01	Ongoing
Light Absorption Coefficient	$\dot{I}f_{ap}$	1990-01-01	Ongoing
Particle Number Concentration	$N_i$	1974-01-01	Ongoing

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		1976-03-01	Ongoing
Downwelling Shortwave		1976-03-01	Ongoing
Diffuse		1976-03-01	Ongoing
Downwelling Longwave		1993-10-31	Ongoing
Spectral		2001-07-01	Ongoing

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	$O_3$	1973-09-20	Ongoing

#### Dobson Total Ozone

Parameter	Formula	First Sample Date	Status
Ozone	$O_3$	1957-12-01	Ongoing

#### Lidar

Parameter	Formula	First Sample Date	Status
Aerosol backscatter (694 nm)		1974-12-03	Terminated - 1998-10-27
Aerosol backscatter (532 nm)		1994-04-04	Ongoing
Aerosol backscatter (1064 nm)		2001-01-05	Ongoing
Water vapor density		2005-10-26	Ongoing

#### Meteorology

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	1977-01-01	Ongoing
Wind Direction	wd	1977-01-01	Ongoing
Temperature	temp	1977-01-01	Ongoing
Ambient Pressure	press	1977-01-01	Ongoing
Relative Humidity	rh	1977-01-01	Ongoing

	Site	Category	Name	Type	Frequency	Year
1	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Daily Averages	Multiple
2	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Daily Averages	Multiple
3	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Daily Averages	Multiple
4	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Daily Averages	Multiple
5	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cfc12)	Insitu	Daily Averages	Multiple
6	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Daily Averages	Multiple
7	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Daily Averages	Multiple
8	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Daily Averages	Multiple
9	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Daily Averages	Multiple
10	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
11	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Daily Averages	Multiple
12	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Hourly Averages	Multiple
13	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Hourly Averages	Multiple
14	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Hourly Averages	Multiple
15	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Hourly Averages	Multiple
16	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cfc12)	Insitu	Hourly Averages	Multiple
17	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Hourly Averages	Multiple
18	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Hourly Averages	Multiple
19	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Hourly Averages	Multiple
20	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Hourly Averages	Multiple
21	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
22	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Hourly Averages	Multiple
23	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Monthly Averages	Multiple
24	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Monthly Averages	Multiple
25	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cfc11)	Insitu	Monthly Averages	Multiple
26	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cfc113)	Insitu	Monthly Averages	Multiple

	Site	Category	Name	Type	Frequency	Year
27	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
28	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Monthly Averages	Multiple
29	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Monthly Averages	Multiple
30	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Monthly Averages	Multiple
31	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Monthly Averages	Multiple
32	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
33	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Monthly Averages	Multiple
34	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Daily Averages	Multiple
35	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Daily Averages	Multiple
36	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
37	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
38	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
39	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Hourly Averages	Multiple
40	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Hourly Averages	Multiple
41	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
42	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
43	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
44	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCI4)	Insitu	Monthly Averages	Multiple
45	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Monthly Averages	Multiple
46	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
47	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
48	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
49	Mauna Loa, Hawaii, United States (MLO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1977
50	Mauna Loa, Hawaii, United States (MLO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1978
51	Mauna Loa, Hawaii, United States (MLO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1979
52	Mauna Loa, Hawaii, United States (MLO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1980
53	Mauna Loa, Hawaii, United States (MLO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1981











	Site	Category	Name	Type	Frequency	47Year
159	Mauna Loa, Hawaii, United States (MLO) In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	In-situ	Hourly Averages	2016
160	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
161	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
162	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
163	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
164	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Discrete	Multiple
165	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
166	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
167	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple
168	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
169	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Discrete	Multiple
170	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
171	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
172	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n- C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
173	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
174	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
175	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Monthly Averages	Multiple
176	Mauna Loa, Hawaii, United States (MLO)	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly	Multiple
177	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
178	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
179	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
180	Mauna Loa, Hawaii, United States (MLO) Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Monthly Averages	Multiple
181	Mauna Loa, Hawaii, United States (MLO) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (grad)	In-situ	Minute Averages	Multiple
182	Mauna Loa, Hawaii, United States (MLO) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	In-situ	Hourly Averages	Multiple
183	Mauna Loa, Hawaii, United States (MLO) In-situ ch4 daily averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	In-situ	Daily Averages	Multiple
184	Mauna Loa, Hawaii, United States (MLO) In-situ ch4 hourly averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	In-situ	Hourly Averages	HourlyData

	Site	Category	Name	Type	Frequency	48 Year
185	Mauna Loa, Hawaii, United States (MLO) In-situ ch4 monthly averages	Greenhouse Gases	Methane (CH <sub>4</sub> )	Insitu	Monthly Averages	Multiple
186	Mauna Loa, Hawaii, United States (MLO) In-situ co2 daily averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Daily Averages	Multiple
187	Mauna Loa, Hawaii, United States (MLO) In-situ co2 hourly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Hourly Averages	Multiple
188	Mauna Loa, Hawaii, United States (MLO) In-situ co2 monthly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Monthly Averages	Multiple



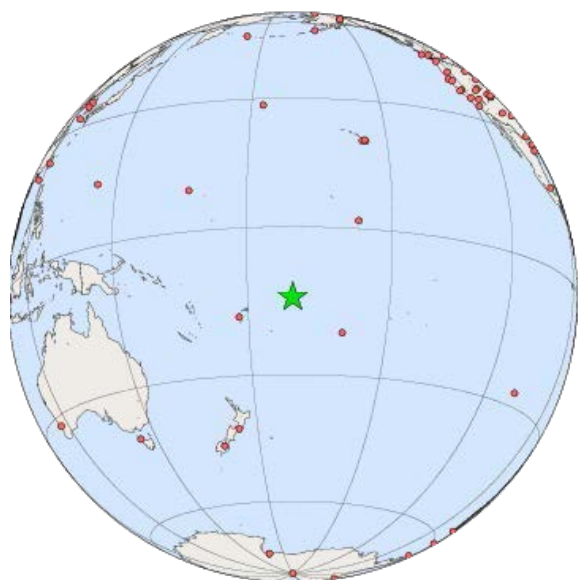


American Samoa Atmospheric Baseline Observatory viewed from the sampling tower. The prevailing winds are at the back of the photographer looking north-west.




American Samoa Atmospheric Baseline Observatory viewed from the south-east with the Dobson ozone spectrometer dome and radiation deck on the second level.





## Location

- » Country: American Samoa 
- » Latitude: 14.2474° South
- » Longitude: 170.5644° West
- » Elevation: 42.00 masl
- » Time Zone: Local Standard Time + 11.0 hour(s) = UTC

## Contact

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## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Photo Gallery](#)

## Description

The Samoa Observatory is located on the northeastern tip of Tutuila island, American Samoa, on a ridge overlooking the South Pacific Ocean. Established in 1974 on a 26.7 acre site, the observatory is one of four GMD Baseline Observatories. Cape Matatula is approx. 1 km from the village of Tula. Prevailing winds are marine. Since its construction, the Samoa Observatory has survived two major hurricanes with only minor damage. A staff of 2 operates the year around facility commuting to work. This Observatory has the distinction of obtaining 30% of its daytime power from solar panels.

### GMD Projects at Tutuila

#### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1972-01-15	Ongoing
Methane	CH <sub>4</sub>	1983-04-23	Ongoing
Carbon Monoxide	CO	1988-09-22	Ongoing
Molecular Hydrogen	H <sub>2</sub>	1989-01-05	Ongoing
Nitrous Oxide	N <sub>2</sub> O	1997-05-07	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1997-05-07	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	1990-01-04	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	1990-01-04	Ongoing
Carbon-13/Carbon-12 in Methane	d <sup>13</sup> C (CH <sub>4</sub> )	1998-01-06	Ongoing
D/H in Methane	dD (CH <sub>4</sub> )	2005-03-28	Terminated - 2009-09-11
Methyl Chloride	CH <sub>3</sub> Cl	2005-05-12	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2007-01-16	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2007-01-16	Ongoing
ethane	C <sub>2</sub> H <sub>6</sub>	2005-05-12	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2005-05-12	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2005-05-12	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2005-05-12	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2005-05-12	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2005-05-12	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2005-05-12	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2005-05-12	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2005-05-12	Ongoing

Parameter	Formula	First Sample Date	Status
isoprene	C <sub>5</sub> H <sub>8</sub>	2007-01-16	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-05-25	Ongoing

### Carbon Cycle In Situ Observatory

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1976-01-01	Ongoing

### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1994-11-29	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1994-11-29	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	1994-11-29	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1991-11-26	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1994-11-29	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1993-11-09	Ongoing
CFC-114	CFC-114	1991-12-30	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1992-02-11	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1991-12-30	Ongoing
methyl bromide	CH <sub>3</sub> Br	1993-11-09	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	1993-01-14	Ongoing
methyl iodide	CH <sub>3</sub> I	1993-01-14	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1991-12-30	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	1994-01-12	Ongoing
chloroform	CHCl <sub>3</sub>	1993-01-14	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1994-11-29	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	1998-03-11	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	1993-12-15	Ongoing
bromoform	CHBr <sub>3</sub>	1998-01-06	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	1999-01-19	Ongoing
carbonyl sulfide	COS	2000-03-07	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2000-08-16	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2000-08-09	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-09-15	Terminated - 2017-04-22
carbonyl disulfide	CS <sub>2</sub>	2005-04-11	Terminated - 2015-02-25
ethane	C <sub>2</sub> H <sub>6</sub>	2014-09-15	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2007-01-12	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-09-15	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2007-01-12	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2007-01-12	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2007-01-12	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2013-04-17	Ongoing
Halon 1301	CF <sub>3</sub> Br	2007-01-12	Ongoing
Halon 2402	CBrF <sub>2</sub> CBrF <sub>2</sub>	1995-02-13	Ongoing
HFC- 143a	CH <sub>3</sub> CF <sub>3</sub>	2007-01-12	Ongoing
HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	2011-04-06	Ongoing
HFC-365mfc	CH <sub>3</sub> CF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	2009-07-02	Ongoing

Parameter	Formula	First Sample Date	Status
CFC-115	CClF <sub>2</sub> CF <sub>3</sub>	2007-01-12	Terminated - 2015-09-05
HFC-125	CHF <sub>2</sub> CF <sub>3</sub>	2007-01-12	Ongoing
CFC- 13	CClF <sub>3</sub>	2007-01-12	Ongoing
Perfluoropropane	C <sub>3</sub> F <sub>8</sub>	2014-09-15	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-01-12	Ongoing
HFC-32	CH <sub>2</sub> F <sub>2</sub>	2009-03-12	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1991-11-26	Ongoing
Chloroiodomethane	CH <sub>2</sub> ClI	2017-01-27	Ongoing
diiodomethane	CH <sub>2</sub> I <sub>2</sub>	2017-01-27	Ongoing
Bromoiodomethane	CH <sub>2</sub> BrI	2017-01-27	Ongoing
Bromochloromethane	CH <sub>2</sub> BrCl	2017-01-27	Ongoing
Bromodichloromethane	CHBrCl <sub>2</sub>	2017-01-27	Ongoing
CFC- 11	CCl <sub>3</sub> F	1994-11-29	Ongoing
tetrafluoromethane	CF <sub>4</sub>	2014-09-15	Ongoing
hexafluoroethane	CF <sub>3</sub> CF <sub>3</sub>	2014-09-15	Ongoing
nitrogen trifluoride	NF <sub>3</sub>	2014-09-30	Ongoing
sulfuryl fluoride	SO <sub>2</sub> F <sub>2</sub>	2014-09-15	Ongoing
HFC-236fa	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	2014-09-15	Ongoing
HCFC-133a	CH <sub>2</sub> ClCF <sub>3</sub>	2014-09-30	Ongoing
CFC-112	CCl <sub>2</sub> CClF <sub>2</sub>	2014-10-06	Ongoing
HFO-1234yf	CH <sub>2</sub> =CFCF <sub>3</sub>	2016-08-20	Ongoing
1,2-dichloroethane	CH <sub>2</sub> ClCH <sub>2</sub> Cl	2017-01-21	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	CHCl <sub>2</sub> CF <sub>3</sub>	2017-12-08	Ongoing
1,1-dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	2017-01-27	Ongoing
dibromochloromethane	CHBr <sub>2</sub> Cl	2017-01-27	Ongoing
Ethyl Chloride	C <sub>2</sub> H <sub>5</sub> Cl	2011-04-06	Ongoing
Propyne	C <sub>3</sub> H <sub>4</sub>	2011-04-06	Ongoing
Trichloroethylene	C <sub>2</sub> HCl <sub>3</sub>	2014-09-15	Ongoing

#### HATS InSitu Observatory

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1998-12-08	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1998-12-03	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1999-02-16	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1998-12-08	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1999-01-28	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1999-01-28	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1999-03-02	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1998-12-03	Ongoing
chloroform	CHCl <sub>3</sub>	1998-12-01	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1998-12-08	Ongoing
Methyl Chloroform	CH <sub>3</sub> CCl <sub>3</sub>	1998-12-08	Ongoing
CFC- 11	CCl <sub>3</sub> F	1998-12-08	Ongoing

#### Aerosol Surface In-Situ

Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$\dot{Y}_{f_{sp}}$	1977-01-01	Terminated - 1991-03-29
Light Absorption Coefficient	$\dot{Y}_{f_{ap}}$	1977-01-01	Terminated - 1991-03-29
Particle Number Concentration	$N_t$	1977-01-01	Terminated - 2017-07-21

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		1976-02-01	Ongoing
Downwelling Shortwave		1976-02-01	Ongoing
Diffuse		1995-08-21	Ongoing
Downwelling Longwave		1999-08-06	Ongoing

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	$O_3$	1975-12-14	Ongoing

#### Dobson Total Ozone

Parameter	Formula	First Sample Date	Status
Ozone	$O_3$	1975-12-18	Ongoing

#### Ozonesonde

Parameter	Formula	First Sample Date	Status
Ozone	$O_3$	1986-04-01	Ongoing

#### Lidar

Parameter	Formula	First Sample Date	Status
Aerosol backscatter (532 nm)		2005-04-13	Terminated - 2010-07-30

#### Meteorology

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	1976-01-21	Ongoing
Wind Direction	wd	1976-01-21	Ongoing
Temperature	temp	1976-01-05	Ongoing
Ambient Pressure	press	1976-01-09	Ongoing
Relative Humidity	rh	1976-01-06	Ongoing

	Site	Category	Name	Type	Frequency	Year
1	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Daily Averages	Multiple
2	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Daily Averages	Multiple
3	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
4	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Daily Averages	Multiple
5	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
6	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Daily Averages	Multiple
7	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Daily Averages	Multiple
8	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Daily Averages	Multiple
9	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Daily Averages	Multiple
10	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
11	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Daily Averages	Multiple
12	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Hourly Averages	Multiple
13	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Hourly Averages	Multiple
14	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
15	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Hourly Averages	Multiple
16	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
17	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Hourly Averages	Multiple
18	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Hourly Averages	Multiple
19	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Hourly Averages	Multiple
20	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Hourly Averages	Multiple
21	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
22	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Hourly Averages	Multiple
23	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Monthly Averages	Multiple
24	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Monthly Averages	Multiple
25	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
26	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Monthly Averages	Multiple



	Site	Category	Name	Type	Frequency	Year
27	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
28	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Monthly Averages	Multiple
29	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Monthly Averages	Multiple
30	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Monthly Averages	Multiple
31	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Monthly Averages	Multiple
32	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
33	Tutuila, American Samoa (SMO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexaf luoride (sf 6)	Insitu	Monthly Averages	Multiple
34	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Daily Averages	Multiple
35	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chlorof orm (CH3CCI3)	Insitu	Daily Averages	Multiple
36	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
37	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
38	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
39	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Hourly Averages	Multiple
40	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chlorof orm (CH3CCI3)	Insitu	Hourly Averages	Multiple
41	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
42	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
43	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
44	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Monthly Averages	Multiple
45	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chlorof orm (CH3CCI3)	Insitu	Monthly Averages	Multiple
46	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
47	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
48	Tutuila, American Samoa (SMO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
49	Tutuila, American Samoa (SMO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1976
50	Tutuila, American Samoa (SMO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1977
51	Tutuila, American Samoa (SMO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1978
52	Tutuila, American Samoa (SMO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1979
53	Tutuila, American Samoa (SMO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1980











	Site	Category	Name	Type	Frequency	Year
158	Tutuila, American Samoa (SMO) Vertical Profile of Ozone from Balloon flight.	Ozone	Ozone (O <sub>3</sub> )	Balloon	Vertical Profile	Multiple
159	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
160	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
161	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
162	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
163	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Discrete	Multiple
164	Tutuila, American Samoa (SMO)	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
165	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
166	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple
167	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
168	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Discrete	Multiple
169	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
170	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
171	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
172	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
173	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
174	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Monthly Averages	Multiple
175	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly Averages	Multiple
176	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
177	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
178	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
179	Tutuila, American Samoa (SMO) Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Monthly Averages	Multiple
180	Tutuila, American Samoa (SMO) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (grad)	Insitu	Minute Averages	Multiple
181	Tutuila, American Samoa (SMO) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	Insitu	Hourly Averages	Multiple
182	Tutuila, American Samoa (SMO) In-situ co2 daily averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Daily Averages	Multiple
183	Tutuila, American Samoa (SMO) In-situ co2 hourly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Hourly Averages	Multiple

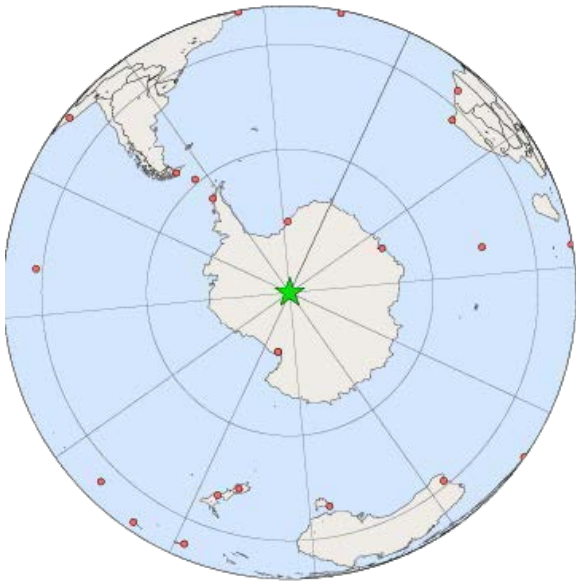
	Site	Category	Name	Type	Frequency	Year
184	Tutuila, American Samoa (SMO) In-situ co2 monthly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Monthly Averages	Multiple




South Pole Atmospheric Baseline Observatory in time lapse with lidar beam.



GMD South Pole staff releasing a large plastic balloon carrying an ozonesonde to measure stratospheric ozone concentrations. Temperature  $-80^{\circ}\text{F}$  ( $-62^{\circ}\text{C}$ ).



## Location

- » Country: United States 
- » Latitude: 89.98° South
- » Longitude: 24.8° West
- » Elevation: 2810.00 masl
- » Time Zone: Local Standard Time + -12.0 hour(s) = UTC

## Contact

- » Contact Name: NOAA
- » Address: NOAA/ ESRL Project O-257-S  
South Pole Station  
PSC 768 Box 400, APO AP, 96598-5400, Antarctica
- » Phone: (303) 497-6655
- » Fax: (303) 497-5590

## Data

- » [Available datasets](#)
- » [Data visualization](#)
- » [Photo Gallery](#)

## Cooperating Agencies



» National Science Foundation

## Description

The South Pole Observatory was established at the geographical south pole at 2837 m above sea level in 1957 as part of the International Geophysical Year. The South Pole Observatory (SPO) is one of six atmospheric baseline observatories for NOAA's Earth System Research Laboratory, Global Monitoring Division (GMD). The National Science Foundation provides the infrastructure for the NOAA/ESRL scientific operations including a state of the art science building named the Atmospheric Research Observatory opened in 1997. ARO was built to house current atmospheric research and replaced NOAA's Clean Air Facility in operation from 1977 to 1997. Two GMD observatory staff spend one year tours of duty at the station which includes a 9 month period of isolation and six months of darkness. Atmospheric data has been collected from South Pole since the International Geophysical Year (IGY), 1957 - 1958.

### GMD Projects at South Pole, Antarctica

#### Carbon Cycle Surface Flasks

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1975-01-21	Ongoing
Methane	CH <sub>4</sub>	1983-02-20	Ongoing
Carbon Monoxide	CO	1989-12-15	Ongoing
Molecular Hydrogen	H <sub>2</sub>	1989-12-15	Ongoing
Nitrous Oxide	N <sub>2</sub> O	1997-01-16	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1997-01-16	Ongoing
Carbon-13/Carbon-12 in Carbon Dioxide	d <sup>13</sup> C (CO <sub>2</sub> )	1993-03-28	Ongoing
Oxygen-18/Oxygen-16 in Carbon Dioxide	d <sup>18</sup> O (CO <sub>2</sub> )	1993-03-28	Ongoing
Carbon-13/Carbon-12 in Methane	d <sup>13</sup> C (CH <sub>4</sub> )	1998-01-01	Ongoing
D/H in Methane	dD (CH <sub>4</sub> )	2005-02-11	Terminated - 2010-01-08
Methyl Chloride	CH <sub>3</sub> Cl	2005-01-28	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	2006-10-15	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2006-10-15	Ongoing
ethane	C <sub>2</sub> H <sub>6</sub>	2005-01-28	Ongoing
ethene	C <sub>2</sub> H <sub>4</sub>	2005-01-28	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2005-01-28	Ongoing
propene	C <sub>3</sub> H <sub>6</sub>	2005-01-28	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2005-01-28	Ongoing

Parameter	Formula	First Sample Date	Status
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2005-01-28	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2005-01-28	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2005-01-28	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2005-01-28	Ongoing
isoprene	C <sub>5</sub> H <sub>8</sub>	2006-10-15	Ongoing
Acetylene	C <sub>2</sub> H <sub>2</sub>	2007-01-01	Ongoing

### Carbon Cycle In Situ Observatory

Parameter	Formula	First Sample Date	Status
Carbon Dioxide	CO <sub>2</sub>	1975-11-25	Ongoing

### HATS Flask Sampling

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	N <sub>2</sub> O	1995-01-13	Ongoing
Sulfur Hexafluoride	SF <sub>6</sub>	1995-01-13	Ongoing
HFC- 134a	CH <sub>2</sub> FCF <sub>3</sub>	1994-03-03	Ongoing
HCFC-22	CHF <sub>2</sub> Cl	1992-07-04	Ongoing
CFC- 12	CCl <sub>2</sub> F <sub>2</sub>	1995-01-13	Ongoing
Methyl Chloride	CH <sub>3</sub> Cl	1995-10-18	Ongoing
CFC-114	CFC-114	1992-07-04	Ongoing
HCFC-142b	CH <sub>3</sub> CF <sub>2</sub> Cl	1992-07-04	Ongoing
Halon-1211	CBrClF <sub>2</sub>	1992-07-04	Ongoing
methyl bromide	CH <sub>3</sub> Br	1995-10-18	Ongoing
HCFC-141b	CH <sub>3</sub> CCl <sub>2</sub> F	1993-01-09	Ongoing
methyl iodide	CH <sub>3</sub> I	1992-01-23	Ongoing
CFC-113	CCl <sub>2</sub> FCClF <sub>2</sub>	1992-07-04	Ongoing
dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	1995-10-18	Ongoing
chloroform	CHCl <sub>3</sub>	1993-01-09	Ongoing
carbon tetrachloride	CCl <sub>4</sub>	1995-01-13	Ongoing
dibromomethane	CH <sub>2</sub> Br <sub>2</sub>	1998-03-01	Ongoing
tetrachloroethylene	C <sub>2</sub> Cl <sub>4</sub>	1993-02-08	Ongoing
bromoform	CHBr <sub>3</sub>	1997-12-15	Ongoing
Benzene	C <sub>6</sub> H <sub>6</sub>	1999-02-01	Ongoing
carbonyl sulfide	COS	2000-05-15	Ongoing
HCFC-21	CHCl <sub>2</sub> F	2000-02-18	Ongoing
HFC-152a	CH <sub>3</sub> CHF <sub>2</sub>	2000-01-23	Ongoing
toluene	C <sub>7</sub> H <sub>8</sub>	2014-02-24	Terminated - 2017-02-12
carbonyl disulfide	CS <sub>2</sub>	2006-01-27	Terminated - 2015-02-08
ethane	C <sub>2</sub> H <sub>6</sub>	2014-02-24	Ongoing
propane	C <sub>3</sub> H <sub>8</sub>	2006-12-08	Ongoing
i-butane	i-C <sub>4</sub> H <sub>10</sub>	2014-02-24	Ongoing
n-butane	n-C <sub>4</sub> H <sub>10</sub>	2006-12-08	Ongoing
i-pentane	i-C <sub>5</sub> H <sub>12</sub>	2006-12-08	Ongoing
n-pentane	n-C <sub>5</sub> H <sub>12</sub>	2006-12-08	Ongoing
n-hexane	n-C <sub>6</sub> H <sub>14</sub>	2013-01-11	Ongoing
Halon 1301	CF <sub>3</sub> Br	2004-02-01	Ongoing



Parameter	Formula	First Sample Date	Status
Halon 2402	$\text{CBrF}_2$ $\text{CBrF}_2$	1995-10-18	Ongoing
HFC- 143a	$\text{CH}_3\text{CF}_3$	2006-12-08	Ongoing
HFC-227ea	$\text{CF}_3\text{CHF}_2$	2010-11-08	Ongoing
HFC-365mfc	$\text{CH}_3\text{CF}_2\text{CH}_2\text{CF}_3$	2009-02-25	Ongoing
CFC-115	$\text{CClF}_2\text{CF}_3$	2006-12-08	Ongoing
HFC-125	$\text{CHF}_2\text{CF}_3$	2006-12-08	Ongoing
CFC- 13	$\text{CClF}_3$	2006-12-08	Ongoing
Perfluoropropane	$\text{C}_3\text{F}_8$	2014-02-24	Ongoing
Acetylene	$\text{C}_2\text{H}_2$	2006-12-08	Ongoing
HFC-32	$\text{CH}_2\text{F}_2$	2008-09-08	Ongoing
Methyl Chloroform	$\text{CH}_3\text{CCl}_3$	1992-07-04	Ongoing
Chloriodomethane	$\text{CH}_2\text{ClI}$	2016-06-07	Ongoing
diiodomethane	$\text{CH}_2\text{I}_2$	2016-06-07	Ongoing
Bromiodomethane	$\text{CH}_2\text{BrI}$	2016-06-07	Ongoing
Bromochloromethane	$\text{CH}_2\text{BrCl}$	2016-06-07	Ongoing
Bromodichloromethane	$\text{CHBrCl}_2$	2016-06-07	Ongoing
CFC- 11	$\text{CCl}_3\text{F}$	1995-01-13	Ongoing
tetrafluoromethane	$\text{CF}_4$	2014-02-24	Ongoing
hexafluoroethane	$\text{CF}_3\text{CF}_3$	2014-02-24	Ongoing
nitrogen trifluoride	$\text{NF}_3$	2014-12-08	Ongoing
sulfuryl fluoride	$\text{SO}_2\text{F}_2$	2014-12-08	Ongoing
HFC-236fa	$\text{CF}_3\text{CH}_2\text{CF}_3$	2014-02-24	Ongoing
HCFC-133a	$\text{CH}_2\text{ClCF}_3$	2014-02-24	Ongoing
CFC-112	$\text{CCl}_2\text{CClF}_2$	2014-02-24	Ongoing
HFO-1234yf	$\text{CH}_2=\text{CF}_2$	2016-02-25	Ongoing
1,2-dichloroethane	$\text{CH}_2\text{ClCH}_2\text{Cl}$	2016-08-08	Ongoing
2,2-Dichloro-1,1,1-Trifluoroethane	$\text{CHCl}_2\text{CF}_3$	2017-03-08	Ongoing
1,1-dichloroethane	$\text{C}_2\text{H}_4\text{Cl}_2$	2016-06-07	Ongoing
dibromochloromethane	$\text{CHBr}_2\text{Cl}$	2016-06-07	Ongoing
Ethyl Chloride	$\text{C}_2\text{H}_5\text{Cl}$	2010-11-08	Ongoing
Propyne	$\text{C}_3\text{H}_4$	2010-11-08	Ongoing
Trichloroethylene	$\text{C}_2\text{HCl}_3$	2014-02-24	Ongoing

#### HATS InSitu Observatory

Parameter	Formula	First Sample Date	Status
Nitrous Oxide	$\text{N}_2\text{O}$	1998-01-26	Ongoing
Sulfur Hexafluoride	$\text{SF}_6$	1998-01-26	Ongoing
HCFC-22	$\text{CHF}_2\text{Cl}$	1998-01-25	Ongoing
CFC- 12	$\text{CCl}_2\text{F}_2$	1998-01-27	Ongoing
Methyl Chloride	$\text{CH}_3\text{Cl}$	1999-07-02	Ongoing
HCFC-142b	$\text{CH}_3\text{CF}_2\text{Cl}$	1998-01-25	Ongoing
Halon-1211	$\text{CBrClF}_2$	1998-01-30	Ongoing
CFC-113	$\text{CCl}_2\text{FCClF}_2$	1998-01-30	Ongoing
chloroform	$\text{CHCl}_3$	1998-01-01	Ongoing
carbon tetrachloride	$\text{CCl}_4$	1998-02-10	Ongoing

Parameter	Formula	First Sample Date	Status
Methyl Chloroform	CH <sub>2</sub> CCl <sub>3</sub>	1998-01-30	Ongoing
CFC- 11	CCl <sub>3</sub> F	2000-02-16	Ongoing

#### Aerosol Surface In-Situ

Parameter	Formula	First Sample Date	Status
Light Scattering Coefficient	$I_{f_{sp}}$	1979-01-01	Ongoing
Light Absorption Coefficient	$I_{f_{ap}}$	1979-01-01	Ongoing
Particle Number Concentration	$N_i$	1974-01-01	Ongoing

#### Radiation In-Situ Observatory

Parameter	Formula	First Sample Date	Status
Direct Normal		1976-02-01	Ongoing
Downwelling Shortwave		1978-01-01	Ongoing
Diffuse		1995-11-10	Ongoing
Upwelling Shortwave		1985-01-01	Ongoing
Downwelling Longwave		1993-11-21	Ongoing
Upwelling Longwave		1993-11-21	Ongoing
Spectral		2000-12-01	Ongoing

#### Surface Ozone

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1975-01-23	Ongoing

#### Dobson Total Ozone

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1963-12-04	Ongoing

#### Ozonesonde

Parameter	Formula	First Sample Date	Status
Ozone	O <sub>3</sub>	1967-01-17	Ongoing

#### Meteorology

Parameter	Formula	First Sample Date	Status
Wind Speed	ws	1975-02-21	Ongoing
Wind Direction	wd	1975-02-21	Ongoing
Temperature	temp	1977-01-01	Ongoing
Ambient Pressure	press	1977-01-01	Ongoing
Relative Humidity	rh	1977-03-29	Ongoing

#### Antarctic UV

Parameter	Formula	First Sample Date	Status
Total Ozone	O <sub>3</sub>	1988-02-01	Ongoing
Spectral UV Irradiance (285-600 nm)		1988-02-01	Ongoing
5 channel narrow-band (~10 nm) filter UV radiometer		1988-02-01	Ongoing
Total solar irradiance		1988-02-01	Ongoing
UV index		1988-02-01	Ongoing
Total UV daily dose		1988-02-01	Ongoing

	Site	Category	Name	Type	Frequency	Year
1	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Daily Averages	Multiple
2	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Daily Averages	Multiple
3	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
4	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Daily Averages	Multiple
5	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
6	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Daily Averages	Multiple
7	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Daily Averages	Multiple
8	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Daily Averages	Multiple
9	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Daily Averages	Multiple
10	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
11	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Daily Averages	Multiple
12	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Hourly Averages	Multiple
13	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Hourly Averages	Multiple
14	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
15	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Hourly Averages	Multiple
16	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
17	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Hourly Averages	Multiple
18	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Hourly Averages	Multiple
19	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Hourly Averages	Multiple
20	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Hourly Averages	Multiple
21	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
22	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Hourly Averages	Multiple
23	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Monthly Averages	Multiple
24	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCl3)	Insitu	Monthly Averages	Multiple
25	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
26	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-113 (cf c113)	Insitu	Monthly Averages	Multiple

	Site	Category	Name	Type	Frequency	Year
27	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
28	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Methyl Chloride (ch3cl)	Insitu	Monthly Averages	Multiple
29	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	Halon- 1211 (h1211)	Insitu	Monthly Averages	Multiple
30	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-142b (hcf c142b)	Insitu	Monthly Averages	Multiple
31	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Halocompounds	HCFC-22 (hcf c22)	Insitu	Monthly Averages	Multiple
32	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
33	South Pole, Antarctica, United States (SPO) Continuous in-situ CATS GC measurements.	Greenhouse Gases	Sulfur Hexafluoride (sf 6)	Insitu	Monthly Averages	Multiple
34	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Daily Averages	Multiple
35	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Daily Averages	Multiple
36	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Daily Averages	Multiple
37	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Daily Averages	Multiple
38	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Daily Averages	Multiple
39	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Hourly Averages	Multiple
40	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Hourly Averages	Multiple
41	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Hourly Averages	Multiple
42	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Hourly Averages	Multiple
43	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Hourly Averages	Multiple
44	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Carbon Tetrachloride (CCl4)	Insitu	Monthly Averages	Multiple
45	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	Methyl Chloroform (CH3CCI3)	Insitu	Monthly Averages	Multiple
46	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-11 (cf c11)	Insitu	Monthly Averages	Multiple
47	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Halocompounds	CFC-12 (cf c12)	Insitu	Monthly Averages	Multiple
48	South Pole, Antarctica, United States (SPO) Continuous in-situ RITS GC measurements.	Greenhouse Gases	Nitrous Oxide (n2o)	Insitu	Monthly Averages	Multiple
49	South Pole, Antarctica, United States (SPO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1975
50	South Pole, Antarctica, United States (SPO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1977
51	South Pole, Antarctica, United States (SPO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1978
52	South Pole, Antarctica, United States (SPO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1979
53	South Pole, Antarctica, United States (SPO) Continuous In-situ measurements of meteorology	Meteorology	Meteorology (met)	Insitu	Hourly Averages	1980











	Site	Category	Name	Type	Frequency <sup>3</sup>	Year
162	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2007
163	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2008
164	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2009
165	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2010
166	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2011
167	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2012
168	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2013
169	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2014
170	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2015
171	<b>South Pole, Antarctica, United States (SPO)</b> In-situ Hourly Averages of aerosol properties measured at 10 meters above ground level	Aerosols	Aerosols	Insitu	Hourly Averages	2016
172	<b>South Pole, Antarctica, United States (SPO)</b> Vertical Profile of Ozone from Balloon flight.	Ozone	Ozone (O <sub>3</sub> )	Balloon	Vertical Profile	Multiple
173	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	ethane (C <sub>2</sub> H <sub>6</sub> )	Flask	Discrete	Multiple
174	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	propane (C <sub>3</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
175	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	isoprene (C <sub>5</sub> H <sub>8</sub> )	Flask	Discrete	Multiple
176	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Discrete	Multiple
177	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Discrete	Multiple
178	<b>South Pole, Antarctica, United States (SPO)</b>	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Discrete	Multiple
179	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Discrete	Multiple
180	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Discrete	Multiple
181	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Discrete	Multiple
182	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Discrete	Multiple
183	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- butane (i-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple
184	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	i- pentane (i- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
185	<b>South Pole, Antarctica, United States (SPO)</b> Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- butane (n-C <sub>4</sub> H <sub>10</sub> )	Flask	Discrete	Multiple

	Site	Category	Name	Type	Frequency	Year
186	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Non- Methane Hydrocarbons	n- pentane (n- C <sub>5</sub> H <sub>12</sub> )	Flask	Discrete	Multiple
187	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	Methane (CH <sub>4</sub> )	Flask	Monthly Averages	Multiple
188	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Methane (d <sup>13</sup> C (CH <sub>4</sub> ))	Flask	Monthly Averages	Multiple
189	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Monoxide (CO)	Flask	Monthly Averages	Multiple
190	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Flask	Monthly Averages	Multiple
191	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	C13/C12 in Carbon Dioxide (d <sup>13</sup> C (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
192	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	O18/O16 in Carbon Dioxide (d <sup>18</sup> O (CO <sub>2</sub> ))	Flask	Monthly Averages	Multiple
193	South Pole, Antarctica, United States (SPO) Air samples collected in glass flasks.	Greenhouse Gases	Molecular Hydrogen (H <sub>2</sub> )	Flask	Monthly Averages	Multiple
194	South Pole, Antarctica, United States (SPO) Continuous in-situ measurements of solar radiation.	Radiation	Surface Radiation (grad)	Insitu	Minute Averages	Multiple
195	South Pole, Antarctica, United States (SPO) Continuous measurements of surface ozone.	Ozone	Ozone (O <sub>3</sub> )	Insitu	Hourly Averages	Multiple
196	South Pole, Antarctica, United States (SPO) In-situ co2 daily averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Daily Averages	Multiple
197	South Pole, Antarctica, United States (SPO) In-situ co2 hourly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Hourly Averages	Multiple
198	South Pole, Antarctica, United States (SPO) In-situ co2 monthly averages	Greenhouse Gases	Carbon Dioxide (CO <sub>2</sub> )	Insitu	Monthly Averages	Multiple



# Sampling Sites, Measurement Programs and Data Sets

## Part 2: Measurements: National, International and Cooperative Programs

Global Monitoring Division  
NOAA, Boulder, Colorado



*Atmospheric Research Observatory - South Pole, Antarctica*

*Photo by: Patrick Cullis*

Sampling Sites and Measurement Programs Global Monitoring Division, ESRL, Boulder, Colorado		February 2018
Measurement	United States and Territories	International
<b>Aerosol - Optics and microphysics</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
Absorption, scattering, and particle number at most sites. Additional measurements, e.g., cloud condensation nuclei, aerosol hygroscopicity and/or chemical composition at some sites.	Barrow, Alaska Bondville, Illinois Boone, North Carolina <i>Cape Cod, Massachusetts (campaign, closed)</i> Cape San Juan, Puerto Rico <i>Lamont, Oklahoma (discontinued)</i> Mauna Loa, Hawaii Mount Bachelor, Oregon <i>Point Reyes, California (campaign, closed)</i> Steamboat Springs, Colorado <i>Trinidad Head, California (closed)</i>	Alert, Canada Anmyeon-do, Korea <i>Azores, Portugal (campaign, closed)</i> <i>Black Forest, Germany (campaign, closed)</i> Cape Grim, Australia Cape Point, South Africa East Trout Lake, Canada Egbert, Canada Gosan, South Korea Granada, Spain Hyytiälä, Finland K'puszta, Hungary <i>Manacapuru, Brazil (campaign, closed)</i> Mazagon, Spain Montsec, Spain Montseny, Spain Mt. Lulin, Taiwan Mt. Moussala, Bulgaria Mt. Waliguan, China <i>Nainital, India (campaign, closed)</i> <i>Niamey, Niger (campaign, closed)</i> <i>Resolute Bay, Canada (closed)</i> <i>Seoul, South Korea (closed)</i> <i>Shouxian, China (campaign, closed)</i> Sierra Nevada Station, Spain South Pole, Antarctica (United States) Summit, Greenland Tiksi, Russia <i>Tutuila, American Samoa (discontinued)</i> Whistler, Canada Zugspitze, Germany
<b>Aerosol - Lidar</b>	<b>Vertical Profiles</b>	<b>Vertical Profiles</b>
Aerosol light scattering versus altitude.	Boulder, Colorado (stratosphere) (weekly) Mauna Loa, Hawaii (stratosphere) (weekly) <i>Trinidad Head, California (troposphere) (closed)</i> <i>Tutuila, American Samoa (stratosphere) (down for repairs)</i>	South Pole, Antarctica (troposphere) (daily) <i>Summit, Greenland (strat &amp; trop, discontinued)</i>
<b>Aerosol - Black Carbon</b>	<b>Surface, Continuous</b>	<b>Surface, Continuous</b>
	Barrow, Alaska Mauna Loa, Hawaii	Mt. Lulin, Taiwan South Pole, Antarctica (United States) <i>Summit, Greenland (closed)</i> Tiksi, Russia
<b>Carbon Cycle Gases</b>	<b>Surface, Continuous</b>	<b>Surface, Continuous</b>
(Species listed →)	Barrow, Alaska (CO <sub>2</sub> , CH <sub>4</sub> , CO) Fox, Alaska (CO <sub>2</sub> , CO, CH <sub>4</sub> ) Martha's Vineyard, Massachusetts (CO <sub>2</sub> ) (offshore platform) Mauna Loa, Hawaii (CO <sub>2</sub> , CH <sub>4</sub> , CO) Mt. Bachelor, Oregon (CO <sub>2</sub> ) Shenandoah, Virginia (CO <sub>2</sub> , CO)	<i>Cherskiy, Russia (CH<sub>4</sub>) (inactive funding hold)</i> South Pole, Antarctica (United States) (CO <sub>2</sub> ) Tutuila, American Samoa (CO <sub>2</sub> )
<b>Carbon Cycle Gases</b>	<b>Tall Tower, Continuous</b>	<b>Tall Tower, Continuous</b>
(Species listed →)	Argyle, Maine (CO <sub>2</sub> , CO) Beech Island, South Carolina (CO <sub>2</sub> , CO) <i>Erie, Colorado (CO<sub>2</sub>, CO) (closed)</i> <i>Grifton, North Carolina (CO<sub>2</sub>) (closed)</i> Moody, Texas (CO <sub>2</sub> , CO) Park Falls, Wisconsin (CO <sub>2</sub> , CH <sub>4</sub> , CO) Walnut Grove, California (CO <sub>2</sub> , CH <sub>4</sub> , CO) West Branch, Iowa (CO <sub>2</sub> , CO)	

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<b>Carbon Cycle Gases</b>	<b>Airborne, Light Aircraft (Bi-weekly)</b>	<b>Airborne, Light Aircraft (Bi-weekly)</b>
(Flask Samples) Species Measured In Carbon Cycle Flasks: CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O, SF <sub>6</sub> , <sup>13</sup> C in CO <sub>2</sub> , <sup>18</sup> O in CO <sub>2</sub> <sup>13</sup> C in CH <sub>4</sub> , CH <sub>3</sub> D, plus CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, HFC-143a, -125, -32 Halon 1211, -1301, -2402. CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I N <sub>2</sub> O, SF <sub>6</sub> , COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	<i>Beaver Crossing, Nebraska (closed)</i> <i>Bondville, Illinois (closed)</i> <i>Bradgate, Iowa (closed)</i> Briggsdale, Colorado Cape May, New Jersey Charleston, South Carolina <i>Dahlen, North Dakota (closed)</i> <i>Fairchild, Wisconsin (closed)</i> <i>Harvard Forest, Massachusetts (closed)</i> Homer, Illinois Isles of Shoals, New Hampshire Kodiak USCG, Alaska (various locations in Alaska) <i>Oahu, Hawaii (closed)</i> <i>Oglesby, Illinois (closed)</i> Park Falls, Wisconsin Poker Flat, Alaska Ponca City, Oklahoma <i>Rowley, Iowa (closed)</i> Sinton, Texas Trinidad Head, California West Branch, Iowa	East Trout Lake, Canada Estevan Point, Canada Raratonga, Cook Islands <i>Ulaanbaatar, Mongolia (closed)</i>
<b>Carbon Cycle Gases</b>	<b>Airborne, Campaigns</b>	<b>Airborne, Campaigns</b>
(In-Situ Continuous and Flask Packages) CO <sub>2</sub> , CH <sub>4</sub> , CO Species Measured In Carbon Cycle Flasks: CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O, SF <sub>6</sub> , <sup>13</sup> C in CO <sub>2</sub> , <sup>18</sup> O in CO <sub>2</sub> , <sup>13</sup> C in CH <sub>4</sub> , CH <sub>3</sub> D, plus CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, HFC-143a, -125, -32 Halon 1211, -1301, -2402. CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I N <sub>2</sub> O, SF <sub>6</sub> , COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	ACT-America NASA (Middle and Eastern U.S.) <i>CARVE NASA (Alaska) (ended)</i> Urban Dome/INFlux NIST (Indianapolis and D.C. Area)	ATom NASA (pole-to-pole, Atlantic and Pacific) <i>HIPPO NSF (pole-to-pole, Atlantic and Pacific) (ended)</i>
<b>Carbon Cycle Gases</b>	<b>Ship Sampling, Carbon Cycle Flasks</b>	<b>Ship Sampling, Carbon Cycle Flasks</b>
(Flask Samples) Species Measured In Carbon Cycle Flasks: CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O, SF <sub>6</sub> , <sup>13</sup> C in CO <sub>2</sub> , <sup>18</sup> O in CO <sub>2</sub> <sup>13</sup> C in CH <sub>4</sub> , CH <sub>3</sub> D		<i>Antarctic Ocean, Chinese Shi annual (on hold)</i> Drake Passage Transect (every 6 weeks) Eastern Pacific Transect (bi-monthly) <i>North Atlantic, Norway (Station M), weekly (closed)</i> <i>South China Sea (semi-monthly) (closed)</i> <i>Western Pacific Transect (variable) (closed)</i>

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Measurement	United States and Territories	International
<b>Carbon Cycle Gases</b>	<b>Surface, Weekly Flasks</b>	<b>Surface, Weekly Flasks</b>
Species Measured	Barrow, Alaska	Alert, Canada
In Carbon Cycle Flasks:	Cape Kumukahi, Hawaii	<i>Amsterdam Island, France (closed)</i>
CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O, SF <sub>6</sub> ,	<i>Cape Meares, Oregon (closed)</i>	Anmyeon-do, Republic of Korea
<sup>13</sup> C in CO <sub>2</sub> , 18O in CO <sub>2</sub>	Cold Bay, Alaska	<i>Arembepe, Brazil (closed)</i>
<sup>13</sup> C in CH <sub>4</sub> , CH <sub>3</sub> D plus	<i>Grifton, North Carolina (CO2) (closed)</i>	Ascension Island, United Kingdom
Volatile Organic Compounds:	Guam, Marianas Islands	Assekrem, Algeria
ethane, n-hexane,	Key Biscayne, Florida	<i>Baltic Sea, Poland (closed)</i>
propane, propene	Lamont, Oklahoma	Baring Head, New Zealand
methyl-chloride, ethane,	Mauna Loa, Hawaii	<i>Bird Island, United Kingdom (closed)</i>
i-pentane, n-pentane	Midway Island, Pacific	<i>Black Sea, Romania (closed)</i>
i-butane, n-butane	Niwot Ridge, Colorado	Bukit Kototabang, Indonesia
in a subset of flasks.	<i>Olympic Peninsula, Washington (closed)</i>	Cape Grim, Australia
	Park Falls, Wisconsin	Cape Point, South Africa
	<i>Point Arena, California (closed)</i>	Christmas Island, Kiribati
	Shemya Island, Alaska	<i>Conejo, Mexico (closed)</i>
	<i>Trinidad Head, California (closed)</i>	Crozet Island, Indian Ocean
	Tutuila, American Samoa	Dongsha Island, Taiwan
	Wendover, Utah	<i>Dwejra Point, Gozo (closed)</i>
		Easter Island, Chile
		Gobabeb, Namibia
		Halley Station, Antarctica (United Kingdom)
		Hegyhatsal, Hungary
		Hohenpeissenberg, Germany
		<i>Kaashidhoo, Maldives (closed)</i>
		Kibbutz Ketura, Israel
		<i>Lac La Biche, Canada (closed)</i>
		Lampedusa, Italy
		Mace Head, Ireland
		Mahe Island, Seychelles
		<i>McMurdo Station, Antarctica (closed)</i>
		<i>Mould Bay, Canada (closed)</i>
		<i>Mt. Kenya, Kenya (closed)</i>
		Mt. Lulin, Taiwan
		Mt. Waliguan, China
		Natal, Brazil
		Ny-Alesund, Svalbard
		<i>Obninsk, Russia (closed)</i>
		<i>Ocean Station C, United States (closed)</i>
		<i>Ocean Station M, Norway (closed)</i>
		Ochsenkopf, Germany
		Palmer Station, Antarctica (United States)
		<i>Plateau Assy, Kazakhstan (closed)</i>
		Ragged Point, Barbados
		Sammaltunturi, Finland
		<i>Sary Takum, Kazakhstan (closed)</i>
		<i>Shangdianzi, China</i>
		Sierra Negra Volcano, Mexico
		South Pole, Antarctica (United States)
		<i>St. Croix, Virgin Islands (closed)</i>
		<i>St. David's Head, Bermuda (closed)</i>
		Summit, Greenland
		Syowa, Antarctica (Japan)
		Tae-ahn Peninsula, Republic of Korea
		Tenerife, Canary Islands
		Terceira, Azores
		Tiksi, Russia
		Tudor Hill, Bermuda
		Ulaan Uul, Mongolia
		Ushuaia, Argentina
		Valladolid, Spain
		Vestmannaeyjar, Iceland

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Global Monitoring Division, ESRL, Boulder, Colorado		
Carbon Cycle Gases	Surface, Tower Flasks	Surface, Tower Flasks
Species Measured In Carbon Cycle Flasks: CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O, SF <sub>6</sub> , <sup>13</sup> C in CO <sub>2</sub> , 18O in CO <sub>2</sub> , <sup>13</sup> C in CH <sub>4</sub> , CH <sub>3</sub> D, plus CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, HFC-143a, -125, -32 Halon 1211, -1301, -2402. CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I N <sub>2</sub> O, SF <sub>6</sub> , COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	Argyle, Maine Beech Island, South Carolina <i>Erie, Colorado (closed)</i> Fox, Alaska Lamont, Oklahoma <i>Martha's Vineyard, Massachusetts (offshore) (closed)</i> Moody, Texas Mt. Bachelor, Oregon Mt. Wilson, California Niwot Ridge, Colorado Park Falls, Wisconsin Sutro, California Walnut Grove, California West Branch, Iowa	

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Global Monitoring Division, ESRL, Boulder, Colorado		
Measurement	United States and Territories	International
<b>Halocarbon Network</b>	<b>Surface, Weekly High Pressure Flasks</b>	<b>Surface, Weekly High Pressure Flasks</b>
Species Measured In Halocarbon Flasks CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, -143a, -125, -32 Halon 1211, -1301, -2402 CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I, COS N <sub>2</sub> O, SF <sub>6</sub> , CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub> Species in blue are measured less frequently than weekly	Barrow, Alaska Cape Kumukahi, Hawaii Harvard Forest, Massachusetts Mauna Loa, Hawaii Niwot Ridge, Colorado Park Falls, Wisconsin Trinidad Head, California Tutuila, American Samoa	Alert, Canada (weekly) Cape Grim, Australia (weekly) Mace Head, Ireland (weekly) Mt Waliguan, China (weekly) Negev Desert, Israel (bi-weekly) Palmer, Antarctica (United States) (bi-weekly) South Pole, Antarctica (United States) (bi-weekly) Summit, Greenland (bi-weekly) <i>Tierra del Fuego, Chile (closed)</i>
<b>Halocarbon Species</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
N <sub>2</sub> O, SF <sub>6</sub> , CFC-11, CFC-12 CFC-113, halon-1211, CHCl <sub>3</sub> , CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , (all but Summit: HCFC-22, HCFC-142b, COS, CH <sub>3</sub> Cl (Summit: CO, H <sub>2</sub> , CH <sub>4</sub> )	Barrow, Alaska Mauna Loa, Hawaii Niwot Ridge, Colorado Tutuila, American Samoa	South Pole, Antarctica (United States) <i>Summit, Greenland (discontinued)</i>
<b>Halocarbon Species</b>	<b>Surface, Tower Flasks</b>	<b>Surface, Tower Flasks</b>
Measured In Carbon Cycle Flasks CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, -143a, -125, -32 Halon 1211, -1301, -2402 CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I, COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	Argyle, Maine Beech Island, South Carolina Central Alaska (CRV) Erie, Colorado <i>Martha's Vineyard, Massachusetts (closed)</i> Moody, Texas Mt. Bachelor, Oregon Mt. Wilson, California Park Falls, Wisconsin Sutro, California Walnut Grove, California West Branch, Iowa West Lafayette, Indiana (INFLUX campaign)	



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<b>Halocarbon Species</b>	<b>Airborne, Light Aircraft, Bi-weekly</b>	<b>Airborne, Light Aircraft, Bi-weekly</b>
Measured in Carbon Cycle Flasks CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, -143a, -125, -32 Halon 1211, -1301, -2402 CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I, COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	<i>Beaver Crossing, Nebraska (closed)</i> <i>Bondville, Illinois (closed)</i> <i>Bradgate, Iowa (closed)</i> Briggsdale, Colorado Cape May, New Jersey Central Alaska (CRV) - (periodic NASA campaign) Charleston, South Carolina Dahlen, North Dakota <i>Fairchild, Wisconsin (closed)</i> <i>Harvard Forest, Massachusetts (closed)</i> Homer, Illinois Isles of Shoals, New Hampshire Kodiak USCG, Alaska <i>Oahu, Hawaii (closed)</i> Park Falls, Wisconsin Poker Flat, Alaska Ponca City, Oklahoma <i>Rowley, Iowa (closed)</i> Sinton, Texas Trinidad Head, California West Branch, Iowa West Lafayette, Indiana (INFLUX campaign)	East Trout Lake, Canada Estevan Point, Canada Rarotonga, Cook Islands <i>Ulaanbaatar, Mongolia (closed)</i>
<b>Halocarbon Missions</b>	<b>Airborne, Large Balloons and Aircraft</b>	<b>Airborne, Large Balloons and Aircraft</b>
<b>Balloon Measurements:</b> CH <sub>4</sub> , H <sub>2</sub> , CO, N <sub>2</sub> O, SF <sub>6</sub> , CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , halon-1211, CHCl <sub>3</sub> , CFC-11, -12, -113. <b>Aircraft:</b> Above list plus PAN, HFC-134a, COS, CS <sub>2</sub> HCFC-22, -141b, -142b CH <sub>3</sub> Br, CH <sub>3</sub> I <b>Periodic aircraft, from flasks (HIPPO 1-5 only)</b> CFC-11, -12, -113, -115 HCFC-22, -141b, -142b CH <sub>3</sub> CCl <sub>3</sub> , CCl <sub>4</sub> , CH <sub>2</sub> Cl <sub>2</sub> , CHCl <sub>3</sub> , C <sub>2</sub> Cl <sub>4</sub> HFC-134a, -152a, -365mfc, -227ea, -143a, -125, -32 Halon 1211, -1301, -2402. CH <sub>3</sub> Br, CH <sub>3</sub> Cl, CH <sub>3</sub> I, COS CH <sub>2</sub> Br <sub>2</sub> , CHBr <sub>3</sub> C <sub>2</sub> H <sub>2</sub> , C <sub>3</sub> H <sub>8</sub> , n-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , iC <sub>5</sub> H <sub>12</sub> , C <sub>6</sub> H <sub>6</sub>	Barbers Point, Hawaii (aircraft, periodic) ATom 1-4, Aug2016-May2018 (NASA aircraft, global). Palmdale, CA; Anchorage, AS; Kona, HI, American Samoa; Minneapolis, MN; Bangor ME. Edwards, California (aircraft, periodic) Fairbanks, Alaska (aircraft/balloons, periodic) Ft. Sumner, New Mexico (balloon, periodic) HIPPO 1-5, Jan2009-Aug2011 (NSF aircraft, global) locations: American Samoa Anchorage, Alaska Arvada, Colorado Barrow, Alaska Cold Bay, Alaska Honolulu, Hawaii Kona, Hawaii Houston, Texas (aircraft, periodic) Key West, Florida (aircraft, periodic) Kennedy Space Center, Florida, (aircraft, periodic)	Ascension Island, United Kingdom (aircraft periodic) Punta Arenas, Chile (aircraft, periodic) Christchurch, New Zealand (aircraft, periodic) Lajes, Azores (aircraft periodic) Thule and Kangerlussuaq, Greenland (aircraft periodic) Recife, Brazil and Cabo Verde (aircraft periodic) Christchurch, New Zealand (aircraft, periodic) COBRA (aircraft, Canada and United States) HIPPO 1-5, Jan2009-Aug2011 (NSF aircraft, global). Christchurch, New Zealand Darwin, Australia Easter Island, Chile Honiara, Australia Papeete, Tahiti Rarotonga, Cook Islands Saipan, North Mariana Islands San Jose, Costa Rica Sand Island, Midway Islands Kiruna, Sweden (balloon, periodic) San Jose, Costa Rica (aircraft) Janziero du Norte, Brazil (balloon, periodic)
<b>Halocarbon Species</b>	<b>Unmanned Aircraft Systems (UAS)</b>	<b>Unmanned Aircraft Systems (UAS)</b>
CH <sub>4</sub> , H <sub>2</sub> , CO, N <sub>2</sub> O, SF <sub>6</sub> , CHCl <sub>3</sub> , CFC-11, -12, RH halon-1211, O <sub>3</sub> , H <sub>2</sub> O, T	Alaska Mission California Mission Gray Butte, California (Altair, test phase) Western U.S. (Altair, wildfires, periodic)	GloPac (aircraft, Arctic & Pacific) ATTREX (aircraft, Pacific and Indian Oceans)

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Measurement	United States and Territories	International
<b>Ozone</b>	<b>Surface, In Situ, Continuous</b>	<b>Surface, In Situ, Continuous</b>
	Barrow, Alaska <i>Erie, Colorado</i> Mauna Loa, Hawaii Moody, Texas Niwot Ridge, Colorado Trinidad Head, California Weaverville, California Mt. Bachelor Observatory, Oregon Table Mountain, Boulder, Colorado	McMurdo, Antarctica (United States) Lauder, New Zealand Ragged Point, Barbados South Pole, Antarctica (United States) Summit, Greenland Tudor Hill, Bermuda <i>Westman Island, Iceland (closed)</i> Tiksi, Russia Tutuila, American Samoa Pico, Azores, Portugal
<b>Ozone</b>	<b>Total Column Ozone</b>	<b>Total Column Ozone</b>
	Barrow, Alaska (Dobson) Bismarck, North Dakota (Dobson) Bondville, Illinois (Brewer) *** Boulder, Colorado (Dobson)** Caribou, Maine (Dobson) Fairbanks, Alaska (Dobson)** Fort Peck, Montana (Brewer)*** Hanford, California (Dobson) Houston, Texas (Brewer) Mauna Loa, Hawaii (Dobson)** Nashville, Tennessee (Dobson) Niwot Ridge (Brewer)*** Raleigh, North Carolina (Brewer)*** Table Mountain, Colorado (Brewer)*** <i>Tallahassee, Florida (Dobson) (closed)</i> Tutuila, American Samoa (Dobson) Wallops Island, Virginia (Dobson)	Lauder, New Zealand** (Dobson) Haute Provence, France** (Dobson) Maracompoche, Peru (Dobson) (cooperative) <i>Perth, Australia** (Dobson) (Temporarily suspended)</i> South Pole, Antarctica (United States) (Dobson)  ** Also conduct Umkehr profiles that give ozone concentrations in 8 successive layers within the sounding twice per day.  ***Also conduct Umkehr profile measurements that yield ozone concentrations in 10 successive layers at sunrise and sunset.
<b>Ozone Profiles</b>	<b>Balloonborne Ozonesondes, Weekly</b>	<b>Balloonborne Ozonesondes, Weekly</b>
	Barrow, Alaska (periodic campaigns) Boulder, Colorado Houston, Texas (periodic campaigns) <i>Huntsville, Alabama (1999-2018 - Support ended 2017)</i> Mauna Loa, Hawaii (1982 - 2018) <i>Narragansett, Rhode Island (2004 - 2011 - Discontinued)</i> <i>Trinidad Head, California (1997-2018 Transferred to CARB 2017)</i>	Galapagos Islands, Ecuador San Jose, Costa Rica South Pole, Antarctica (United States) <i>Summit, Greenland (discontinued)</i> Suva, Fiji <i>WatuKosek, Indonesia (SHADOZ 2013 - Discontinued)</i> Ha Noi, Vietnam Tutuila, American Samoa La Reunion, Reunion Island
<b>Ozone Profiles</b>	<b>Light Aircraft, Weekly Profiles</b>	<b>Light Aircraft, Weekly Profiles</b>
	<i>Beaver Crossing, Nebraska (closed)</i> <i>Bondville, Illinois (closed)</i> <i>Bradgate, Iowa (closed)</i> Briggsdale, Colorado Cape May, New Jersey Charleston, South Carolina <i>Fairchild, Wisconsin (closed)</i> Homer, Illinois Isles of Shoals, New Hampshire <i>Oglesby, Illinois (closed)</i> Ponca City, Oklahoma <i>Rowley, Iowa (closed)</i> Trinidad Head, California <i>West Branch, Iowa (closed)</i>	Estevan Point, Canada <i>Ulaanbaatar, Mongolia (closed)</i>
<b>Water Vapor Profiles</b>	<b>Balloonborne Water Vapor Profiles</b>	<b>Balloonborne Water Vapor Profiles</b>
	Boulder, Colorado (1980 to present) Ft. Sumner, New Mexico (periodic campaigns) Guam (campaigns 2014, 2016) Hilo, Hawaii (2010 to present) Houston, Texas (campaign 2011) Table Mountain, California (campaign 2009)	Lauder, New Zealand (2004 to present) Kunming, China (campaign 2012)

GMD Sampling Sites and Measurement Programs Global Monitoring Division, ESRL, Boulder, Colorado		February 2018
<b>Surface Radiation Budget</b>	<b>SURFRAD Continuous Measurements</b>	<b>SURFRAD Continuous Measurements</b>
Downwelling short wave and long wave radiation, albedo, aerosol optical depth, direct beam and diffuse radiation, UV and UVB radiation, photosynthetically active radiation, and T, RH, WS, WD, P	Bondville, Illinois Desert Rock, Nevada Fort Peck, Montana Goodwin Creek, Mississippi Penn State, Pennsylvania Sioux Falls, South Dakota Table Mountain (Boulder), Colorado	Barrow, Alaska South Pole, Antarctica
<b>Surface Radiation</b>	<b>SOLRAD Continuous Measurements</b>	<b>SOLRAD Continuous Measurements</b>
Downwelling solar total, direct beam and diffuse radiation plus UVB total	Albuquerque, New Mexico Bismarck, North Dakota Hanford, California Madison, Wisconsin Salt Lake City, Utah Seattle, Washington Sterling, Virginia Oak Ridge, Tennessee (closed) Tallahassee, Florida (closed)	
<b>Surface Radiation</b>	<b>BSRN Continuous Measurements</b>	<b>BSRN Continuous Measurements</b>
Downwelling short wave and long wave radiation, albedo, aerosol optical depth, direct beam and diffuse radiation and UV radiation, and T, RH, WS, WD, P	Barrow, Alaska Erie, Colorado (closed), Tutuila, American Samoa (no albedo or long wave up) Bondville, Illinois Fort Peck, Montana Table Mountain, Colorado Goodwin Creek, Mississippi Penn State, Pennsylvania Sioux Falls, South Dakota Table Mountain (Boulder), Colorado	Kwajalein, Marshall Islands*(no albedo or long wave up) Prospect Hill, Bermuda* (no albedo or long wave up) South Pole, Antarctica (United States)*  Alert, Canada Alice Springs, Australia Cabauw, Netherlands Cambourne, United Kingdom Carpentras, France Cocos Island, Australia DeAar, South Africa (closed) Dome Concordia, Antarctica (with ISAC, Italy) Eureka, Canada Florianopolis, Brazil Fukuoka, Japan Ilorin, Nigeria Ishigakijima, Japan Izana, Spain Lerwick, United Kingdom Lindenberg, Germany Mt. Waliguan, China (GAW) Neumayer, Antarctica (Germany) Ny Alesund, Svalbard Palaiseau, France Payerne, Switzerland Regina, Canada (discontinued) Sede Boker, Israel Sumatrak, Indonesia (GAW) Summit, Greenland (discontinued) Syowa, Antarctica (Japan) Tamanrasset, Algeria Tateno, Japan Tiksi, Russia Toravere, Estonia Xianghe, China
<b>Surface UV Radiation</b>	<b>UV Continuous</b>	<b>UV Continuous</b>
	Bondville, Illinois Boulder, Colorado Fort Peck, Montana Houston, Texas Mauna Loa, Hawaii Niwot Ridge, Colorado Raleigh, North Carolina Goodwin Creek, Mississippi Penn State, Pennsylvania Sioux Falls, South Dakota Desert Rock, Nevada Table Mountain (Boulder), Colorado	McMurdo, Antarctica (United States) South Pole, Antarctica (United States) Palmer, Antarctica (United States)

\* GMD Operated

GMD Sampling Sites and Measurement Programs		February 2018
Global Monitoring Division, ESRL, Boulder, Colorado		
<b>Meteorology</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
<b>Wind</b> Propeller Anemometer	Barrow, Alaska (10 m) Table Mountain (Boulder), Colorado (8 m) Mauna Loa, Hawaii (10 and 38 m) <i>Trinidad Head, California (10 m) (closed)</i> Bondville, Illinois (8 m) Goodwin Creek, Mississippi (8 m) Fort Peck, Montana (8 m) Penn State, Pennsylvania (8 m) Sioux Falls, South Dakota (8 m) Desert Rock, Nevada (8 m)	Alert, Canada (SEARH Project) South Pole, Antarctica (United States) (2, 10, and 30 m) Summit, Greenland (10 m) Tutuila, American Samoa (17 m)
<b>Meteorology</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
<b>Barometric Pressure</b> Pressure transducer	Barrow, Alaska Table Mountain (Boulder), Colorado Mauna Loa, Hawaii <i>Trinidad Head, California (closed)</i> Bondville, Illinois Goodwin Creek, Mississippi Fort Peck, Montana Penn State, Pennsylvania Sioux Falls, South Dakota Desert Rock, Nevada	Alert, Canada (SEARH Project) South Pole, Antarctica (United States) Summit, Greenland Tutuila, American Samoa
<b>Meteorology</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
<b>Ambient Temperature</b> Aspirated platinum resistance probes	Barrow, Alaska (3 and 16 m) Table Mountain (Boulder), Colorado (2 and 8 m) Mauna Loa, Hawaii (2, 9, and 37 m) <i>Trinidad Head, California (2 and 10 m) (closed)</i> Bondville, Illinois (8 m) Goodwin Creek, Mississippi (8 m) Fort Peck, Montana (8 m) Penn State, Pennsylvania (8 m) Sioux Falls, South Dakota (8 m) Desert Rock, Nevada (8 m)	Alert, Canada (SEARCH Project) South Pole, Antarctica (United States) (2, 10, and 30 m) Summit, Greenland (2 and 8 m) Tutuila, American Samoa (2 and 17 m)
<b>Meteorology</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
<b>Dewpoint Temperature</b> Hygrothermometers and relative humidity probes	Barrow, Alaska (3 m) Table Mountain (Boulder), Colorado (8 m) Mauna Loa, Hawaii (2 m) <i>Trinidad Head, California (2 m) (closed)</i> Bondville, Illinois (8 m) Fort Peck, Montana (8 m) Goodwin Creek, Mississippi (8 m) Sioux Falls, South Dakota (8 m) Penn State, Pennsylvania (8 m) Desert Rock, Nevada (8 m)	Alert, Canada (SEARCH Project) South Pole, Antarctica (United States) (2 m) Summit, Greenland (2 m) Tutuila, American Samoa (2 m)
<b>Meteorology</b>	<b>Surface, Continuous Measurements</b>	<b>Surface, Continuous Measurements</b>
<b>Precipitation</b> Tipping bucket	<i>Boulder, Colorado (closed)</i> Mauna Loa, Hawaii	Tutuila, American Samoa

Cooperative Programs co-located at Baseline Observatories Global Monitoring Division, ESRL, Boulder, Colorado		February 2018
<b>American Samoa Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
Persistent Organic Pollutants CFC-11, CFC-12, CFC-113, CCl <sub>4</sub> , CH <sub>3</sub> CCl <sub>3</sub> , CH <sub>4</sub> , N <sub>2</sub> O, CHCl <sub>3</sub>	Environment and Climate Change Canada NASA/AGAGE NASA/AGAGE NASA/AGAGE NASA/AGAGE	<a href="https://www.ec.gc.ca/rs-mn/">https://www.ec.gc.ca/rs-mn/</a> <a href="http://agage.eas.gatech.edu/">http://agage.eas.gatech.edu/</a> <a href="http://agage.eas.gatech.edu/">http://agage.eas.gatech.edu/</a> <a href="http://agage.eas.gatech.edu/">http://agage.eas.gatech.edu/</a> <a href="http://agage.eas.gatech.edu/">http://agage.eas.gatech.edu/</a>
Medusa AERONET Photometers CO <sub>2</sub> , <sup>13</sup> C, N <sub>2</sub> O (flask) O <sub>2</sub> /N <sub>2</sub>	NASA/Goddard Space Flight Center Scripps Institution of Oceanography Scripps Institution of Oceanography	<a href="http://aeronet.gsfc.nasa.gov/">http://aeronet.gsfc.nasa.gov/</a> <a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a> <a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
Hydrocarbons Ionospheric imaging	University of California, Irvine Johns Hopkins University	<a href="http://www.physsci.uci.edu/">http://www.physsci.uci.edu/</a> <a href="http://www.jhuapl.edu/">http://www.jhuapl.edu/</a>
<b>Barrow, Alaska Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
Atmospheric Radiation Measurement (ARM) site Mercury analysis (until 2015) Persistent Organic Pollutants Climate Reference Network (CRN) POES Satellite downlink POES Satellite uplink Aerosols filter EarthScope Plate Boundary Observatory CO <sub>2</sub> Flux CO <sub>2</sub> , <sup>13</sup> C, N <sub>2</sub> O (flask) O <sub>2</sub> /N <sub>2</sub> Thaw depth in permafrost SoumiNet GPS Black Carbon Hydrocarbons Detachment 460 radiation monitoring Precip gauge (until 2016) Geomagnetics	Department of Energy Desert Research Institute Environment and Climate Change Canada NOAA/NESDIS/NCDC NOAA/NESDIS NOAA/NESDIS NOAA Pacific Marine Environmental Laboratory National Science Foundation San Diego State University Scripps Institution of Oceanography Scripps Institution of Oceanography State University of New York, Albany; University of Delaware USDA NRCS UNAVCO University of California, Davis University of California, Irvine United States Air Force USDA/Snow Survey USGS	<a href="http://www.arm.gov/sites/nsa.stm">http://www.arm.gov/sites/nsa.stm</a> <a href="https://www.dri.edu">https://www.dri.edu</a> <a href="http://www.msc-smc.ec.gc.ca/gaps/">http://www.msc-smc.ec.gc.ca/gaps/</a> <a href="http://www.ncdc.noaa.gov/oa/climate/uscrn/">http://www.ncdc.noaa.gov/oa/climate/uscrn/</a> <a href="http://www.oso.noaa.gov/poes/">http://www.oso.noaa.gov/poes/</a> <a href="http://www.oso.noaa.gov/poes/">http://www.oso.noaa.gov/poes/</a> <a href="http://www.pmel.noaa.gov/">http://www.pmel.noaa.gov/</a> <a href="https://www.nsf.gov/funding/pgm">https://www.nsf.gov/funding/pgm</a> <a href="http://gcrj.sdsu.edu/?p=149">http://gcrj.sdsu.edu/?p=149</a> <a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a> <a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a> <a href="https://www.albany.edu">https://www.albany.edu</a> <a href="http://www.suominet.ucar.edu/support/">http://www.suominet.ucar.edu/support/</a> <a href="http://delta.ucdavis.edu/index.htm">http://delta.ucdavis.edu/index.htm</a> <a href="http://www.physsci.uci.edu/">http://www.physsci.uci.edu/</a> Not Applicable <a href="http://www.ak.nrcs.usda.gov/snow/">http://www.ak.nrcs.usda.gov/snow/</a> <a href="http://geomag.usgs.gov/observatories/barrow/">http://geomag.usgs.gov/observatories/barrow/</a>
<b>Mauna Loa, Hawaii Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
Radon CMB radiation Ionospheric disturbances (TIDDBIT) Cosmic dust fluxes Clidar aerosol lidar UV <sup>13</sup> C/ <sup>12</sup> C and <sup>18</sup> O/ <sup>16</sup> O in CO <sub>2</sub> Persistent Organic Pollutants Refractory black, organic, and elemental carbon GPS Testbed Hawaii Civil Emergency Service Volcano Activity Communications Airglow studies Satellite solar radiation calibration Spectral radiation calibration Column O <sub>3</sub> Sun photometer calibration AERONET Photometers Pyranometer Pandora ozone Stratospheric O <sub>3</sub> & Temp Profiles PANOPTES CIMEL sun photometer Water vapor, chloride oxide FTIR column spectra of atmospheric gases Solar Spectra Stratospheric Composition Change	ANSTO ASIAA-AMIBA ASTRA California Institute of Technology Central Connecticut University Colorado State University/USDA CSIRO Environment and Climate Change Canada Environment and Climate Change Canada FAA/Stanford University Hawaii State Civil Defense Hawaii Volcano Observatory HPA Johns Hopkins University Kindai University, Japan Meteorological Research Institute, Japan MSC Canada NASA AMES NASA Goddard Space Flight Center NASA Goddard Space Flight Center NASA Goddard Space Flight Center NASA Jet Propulsion Laboratory NASA Jet Propulsion Laboratory National Ecological Observatory Network (NEON) Naval Research Labs NCAR NCAR FTS NDACC	<a href="http://www.ansto.gov.au/">http://www.ansto.gov.au/</a> <a href="http://amiba.asiaa.sinica.edu.tw/">http://amiba.asiaa.sinica.edu.tw/</a> <a href="http://www.astrospace.net">http://www.astrospace.net</a> <a href="http://www.caltech.edu">http://www.caltech.edu</a> <a href="http://www2.ccsu.edu">http://www2.ccsu.edu</a> <a href="http://uvb.nrel.colostate.edu/UVB/">http://uvb.nrel.colostate.edu/UVB/</a> <a href="http://www.csiro.au/">http://www.csiro.au/</a> <a href="http://www.msc-smc.ec.gc.ca/gaps/">http://www.msc-smc.ec.gc.ca/gaps/</a> <a href="http://www.msc-smc.ec.gc.ca/gaps/">http://www.msc-smc.ec.gc.ca/gaps/</a> <a href="http://aa.stanford.edu/about/control.php">http://aa.stanford.edu/about/control.php</a> <a href="http://www.hawaiicounty.gov/active-alerts/">http://www.hawaiicounty.gov/active-alerts/</a> <a href="http://hvo.wr.usgs.gov/maunaloa/">http://hvo.wr.usgs.gov/maunaloa/</a> <a href="http://www.hpa.edu/">http://www.hpa.edu/</a> <a href="http://www.jhuapl.edu/">http://www.jhuapl.edu/</a> <a href="https://www.kindai.ac.jp">https://www.kindai.ac.jp</a> <a href="http://www.mri-jma.go.jp/index_en.html">http://www.mri-jma.go.jp/index_en.html</a> <a href="http://exp-studies.tor.ec.gc.ca/e/ozone/ozonecanada.htm">http://exp-studies.tor.ec.gc.ca/e/ozone/ozonecanada.htm</a> <a href="https://www.nasa.gov/ames">https://www.nasa.gov/ames</a> <a href="http://aeronet.gsfc.nasa.gov/">http://aeronet.gsfc.nasa.gov/</a> <a href="http://atmospheres.gsfc.nasa.gov/climate/">http://atmospheres.gsfc.nasa.gov/climate/</a> <a href="http://atmospheres.gsfc.nasa.gov/climate/">http://atmospheres.gsfc.nasa.gov/climate/</a> <a href="http://tmf-web.jpl.nasa.gov/">http://tmf-web.jpl.nasa.gov/</a> <a href="http://tmf-web.jpl.nasa.gov/">http://tmf-web.jpl.nasa.gov/</a> <a href="http://www.nrel.gov/neon/">http://www.nrel.gov/neon/</a> <a href="http://www.nrl.navy.mil/">http://www.nrl.navy.mil/</a> <a href="https://ncar.ucar.edu">https://ncar.ucar.edu</a> <a href="http://www.acd.ucar.edu/irwg/">http://www.acd.ucar.edu/irwg/</a> <a href="http://www.ndaccdemo.org">http://www.ndaccdemo.org</a>



Cooperative Programs co-located at Baseline Observatories Global Monitoring Division, ESRL, Boulder, Colorado		February 2018
<b>Mauna Loa, Hawaii Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
CO <sub>2</sub> , <sup>13</sup> C, N <sub>2</sub> O	NIES	<a href="http://www.nies.go.jp/index.html">http://www.nies.go.jp/index.html</a>
Carbon monoxide	NOAA Air Resources Lab	<a href="http://www.arl.noaa.gov">www.arl.noaa.gov</a>
Hg <sup>0</sup> , Hg <sup>+2</sup> , Hg <sup>p</sup>	NOAA Air Resources Lab	<a href="http://www.arl.noaa.gov">www.arl.noaa.gov</a>
Particulates	NOAA Air Resources Lab	<a href="http://www.arl.noaa.gov">www.arl.noaa.gov</a>
Surface O <sub>3</sub> and SO <sub>2</sub>	NOAA Air Resources Lab	<a href="http://www.arl.noaa.gov">www.arl.noaa.gov</a>
Meteorology	NOAA Earth System Research Lab (GSD)	<a href="http://gpsmet.noaa.gov/">http://gpsmet.noaa.gov/</a>
Meteorology	NOAA National Weather Service	<a href="http://www.prh.noaa.gov/hnl/">http://www.prh.noaa.gov/hnl/</a>
Rainfall at Kulani Mauka site	NOAA National Weather Service	<a href="http://www.prh.noaa.gov/hnl/">http://www.prh.noaa.gov/hnl/</a>
Seismic activity	NOAA Pacific Tsunami Warning Center	<a href="http://ptwc.weather.gov">http://ptwc.weather.gov</a>
Climate Reference Network (CRN)	NOAA/NESDIS/NCDC	<a href="http://www.ncdc.noaa.gov/oa/climate/uscrn/">http://www.ncdc.noaa.gov/oa/climate/uscrn/</a>
Seismic activity	NOAA Pacific Tsunami Warning Center	<a href="http://ptwc.weather.gov/">http://ptwc.weather.gov/</a>
BrO	NOAA and NIWA	<a href="http://www.niwa.co.nz/">http://www.niwa.co.nz/</a>
NO <sub>2</sub>	NOAA and NIWA	<a href="http://www.niwa.co.nz/">http://www.niwa.co.nz/</a>
UV	NOAA and NIWA	<a href="http://www.niwa.co.nz/">http://www.niwa.co.nz/</a>
Climate Reference Network (CRN)	NOAA/NESDIS/NCDC	<a href="https://www.ncdc.noaa.gov/crn">https://www.ncdc.noaa.gov/crn</a>
Global Oscillation Network Group (GONG)	National Solar Observatory	<a href="https://gong.nso.edu">https://gong.nso.edu</a>
Stratospheric ozone profiles	Naval Research Labs	<a href="https://www.nrl.navy.mil">https://www.nrl.navy.mil</a>
Multi-filter rotating shadowband radiometer	Pacific Northwest National Laboratory (PNNL)	<a href="https://www.pnnl.gov">https://www.pnnl.gov</a>
Solar calibration	Pacific Northwest National Laboratory (PNNL)	<a href="https://www.pnnl.gov">https://www.pnnl.gov</a>
Video Surveillance	Pohakuloa Training Area Range Surveillance System	<a href="http://cnic.navy.mil/PMRF/index.html">http://cnic.navy.mil/PMRF/index.html</a>
CO <sub>2</sub> (continuous)	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
CO <sub>2</sub> , <sup>13</sup> C, N <sub>2</sub> O (flask)	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
O <sub>2</sub> /N <sub>2</sub>	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
CO <sub>2</sub> /CH <sub>4</sub>	SIO – Earth Networks Center for Climate Research	<a href="http://www.earthnetworks.com/OurNetworks/">http://www.earthnetworks.com/OurNetworks/</a>
GPS-derived column water vapor	Stanford University	<a href="https://www.stanford.edu">https://www.stanford.edu</a>
CO and CO isotopes	State University of New York, Stony Brook	<a href="http://www.stonybrook.edu">http://www.stonybrook.edu</a>
Aerosol Chemistry	University of California, Davis	<a href="http://vista.cira.colostate.edu/improve/">http://vista.cira.colostate.edu/improve/</a>
Long transport of Aerosols	University of California, Davis - Delta group	<a href="http://delta.ucdavis.edu/projects.htm">http://delta.ucdavis.edu/projects.htm</a>
MAX-DOAS	University of Colorado, Boulder	<a href="http://climate.colorado.edu/">http://climate.colorado.edu/</a>
Variable Young Star Survey	University of Hawaii - Institute for Astronomy	<a href="http://www.ifa.hawaii.edu/~reipurth/VYSOS/Home.html">http://www.ifa.hawaii.edu/~reipurth/VYSOS/Home.html</a>
ATLAS	University of Hawaii - Institute for Astronomy	<a href="http://www.ifa.hawaii.edu">http://www.ifa.hawaii.edu</a>
Sulphate chemistry	University of Hawaii, Honolulu	<a href="https://www.hawaii.edu">https://www.hawaii.edu</a>
Corrosion and fungal spores	University of Hawaii, Manoa	<a href="http://www.hawaiicorrosionlab.org/index.htm">http://www.hawaiicorrosionlab.org/index.htm</a>
Extraterrestrial particles	University of Hawaii	<a href="https://www.hawaii.edu">https://www.hawaii.edu</a>
Precipitation	University of Hawaii	<a href="https://www.hawaii.edu">https://www.hawaii.edu</a>
Atmospheric lidar measurements	University of Michigan	<a href="https://www.umich.edu">https://www.umich.edu</a>
Mercury studies	University of Nevada - Reno	<a href="https://www.unr.edu">https://www.unr.edu</a>
Stratospheric ozone	University of New Hampshire/NIWA	<a href="http://www.astro.umass.edu/~fcracol/">http://www.astro.umass.edu/~fcracol/</a>
CO14 flask sampling	University of Rochester	<a href="https://www.rochester.edu">https://www.rochester.edu</a>
Mercury sampling	USGS	<a href="https://www.usgs.gov">https://www.usgs.gov</a>
Seismometer and strain meters	USGS	<a href="http://hvo.wr.usgs.gov/">http://hvo.wr.usgs.gov/</a>
Video surveillance, communications	United States Navy Pacific Missile Range Facility	<a href="http://www.navy.mil">http://www.navy.mil</a>
Communications - radio repeaters	United States Postal Inspector	<a href="https://postalinspectors.uspis.g">https://postalinspectors.uspis.g</a>
Filter Radiometer/PMOD	World Radiation Center	<a href="http://www.pmodwrc.ch/worcc/">http://www.pmodwrc.ch/worcc/</a>
<b>South Pole Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
<sup>13</sup> C/ <sup>12</sup> C and <sup>18</sup> O/ <sup>16</sup> O in CO <sub>2</sub>	CSIRO	<a href="http://www.csiro.au/">http://www.csiro.au/</a>
CO <sub>2</sub> , CH <sub>4</sub> , CO, H <sub>2</sub> , N <sub>2</sub> O	CSIRO	<a href="http://www.csiro.au/">http://www.csiro.au/</a>
Brewer - Ozone	Environment and Climate Change Canada	<a href="http://es-ee.tor.ec.gc.ca/e/ozone/ozone.htm">http://es-ee.tor.ec.gc.ca/e/ozone/ozone.htm</a>
AERONET Photometers	NASA Goddard Space Flight Center NASA	<a href="http://aeronet.gsfc.nasa.gov/">http://aeronet.gsfc.nasa.gov/</a>
MPLNET Cloud Profiling	Goddard Space Flight Center	<a href="http://mplnet.gsfc.nasa.gov/">http://mplnet.gsfc.nasa.gov/</a>
NIPR All Sky Camera (until 2017)	National Institute of Polar Research (Japan)	<a href="http://www.nipr.ac.jp/english/polar-research.html">http://www.nipr.ac.jp/english/polar-research.html</a>
CO <sub>2</sub> , <sup>13</sup> C, N <sub>2</sub> O (flask)	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
Firn air sampling	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
O <sub>2</sub> /N <sub>2</sub>	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
Oxygen Isotopes	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>
<b>Summit, Greenland Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
Summit site operation	National Science Foundation	<a href="https://www.nsf.gov">https://www.nsf.gov</a>
Aerosol light absorption and scattering	Georgia Institute of Technology	<a href="http://www.gatech.edu">http://www.gatech.edu</a>
<b>Trinidad Head, California Measurement Program</b>	<b>Home Institution</b>	<b>Websites</b>
Weekly ozonesonde (began 2017)	California Air Resources Board	<a href="https://ww2.arb.ca.gov/homepage">https://ww2.arb.ca.gov/homepage</a>
Trinidad Head Observatory Operation (until 201)	Humboldt State University Humboldt	<a href="https://www.humboldt.edu">https://www.humboldt.edu</a>
Weekly ozonesonde (until 2017)	State University NASA/Goddard	<a href="https://www.humboldt.edu">https://www.humboldt.edu</a>
AERONET Photometers (until 2017)	Space Flight Center	<a href="http://aeronet.gsfc.nasa.gov/">http://aeronet.gsfc.nasa.gov/</a>
Flask sampling/sharing data (ongoing)	Scripps Institution of Oceanography	<a href="http://scrippsco2.ucsd.edu/">http://scrippsco2.ucsd.edu/</a>

GMD Sampling Sites Summary		Feb-18
Global Monitoring Division, ESRL, Boulder, Colorado		
U.S. State and Territory	International Country and Ocean	International Country and Ocean
Key: (1), (2) ... denotes the separate sites or sample locations in each state/territory/country/ocean basin.		
Alaska (1) American Samoa (1) California (10) Colorado (7) Florida (3) Hawaii (6) Illinois (2) Indiana (1) Iowa (1) Maine (3) Massachusetts (2) Minnesota (1) Mississippi (1) Montana (1) Nevada (1) New Hampshire (1) New Jersey (1) New Mexico (2) North Carolina (2) North Dakota (2) Oklahoma (2) Oregon (1) Pennsylvania (1) Puerto Rico (1) South Carolina (2) South Dakota (1) Tennessee (1) Texas (3) Utah (2) Virginia (3) Washington (1) Wisconsin (2)	Algeria (2) Antarctica (7) Arctic Ocean Aircraft (1) Argentina (1) Atlantic Ocean Aircraft (2) Australia (5) Azores (Portugal) (3) Barbados (1) Bermuda (2) Brazil (4) Bulgaria (1) Canada (6) Canary Islands (Spain) (1) Chile (2) China (4) Cook Islands (1) Costa Rica (1) Drake Passage Ship (1) Easter Island (Chile) (1) Ecuador (1) Estonia (1) Fiji (1) Finland (2) France (3) Germany (4) Greenland (3) Guam (1) Hungary (2) Iceland (1) Crozet Island (France) (1) Indian Ocean Aircraft (1) Indonesia (2) (continued, column right, top)	(continuation of column to the left) Ireland (1) Israel (3) Italy (1) Japan (3) Kiribati (1) Marshall Islands (1) Mexico (1) Midway Islands (1) Mongolia (1) Namibia (1) Netherlands (1) New Zealand (4) Nigeria (1) Northern Mariana Islands (1) Peru (1) Republic of Korea (3) Reunion Island (France) (1) Russia (1) Seychelles (1) Pacific Ocean Aircraft (4) Pacific Ocean (Eastern) Ship (1) Pacific Ocean (Western) Ship (1) South Africa (1) Spain (7) Svalbard (1) Sweden (1) Switzerland (1) Tahiti (1) Taiwan (2) United Kingdom (3) Vietnam (1)

**GMD SITE TOTALS**

**Number of different U.S. states and territories operating in = 32**

**Total Number of all U.S. state and territory locations = 76**

**Number of different foreign countries operating in = 58**

**Total Number of all foreign locations = 120**

**TOTAL NUMBER OF ALL GLOBAL SITES IN OPERATION (U.S. + FOREIGN) = 196**