

Shading indicates activities that are no longer active

**Ia. NDACC Long-Term Measurement Activities
(Listed according to Station Latitude)**

Northern Hemisphere High-Latitude Stations (60°N - 90°N)

Alert, Canada (82.50°N, 62.33°W)

Sondes (Aerosol)	D. Tarasick (EC) and J. Rosen (U. Wyoming) – Backscatter measurements of aerosol profiles available for the winter from 1989 to 1993.
Sondes (Ozone)	D. Tarasick (EC) – ECC sondes launched weekly since 1987. NDACC archiving began in 1996 under former PI, Fast.

Heiss Island, Russia (80.6°N, 58.1°E)

Sondes (Aerosol)	J. Rosen (U. Wyoming) and V. Khattatov (CAO) – Backscatter measurements of aerosol profiles available for the winter from 1989 to 1992.
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Eureka, Canada (80.05°N, 86.42°W)

FTIR	H. Fast (EC) and K. Shibata and Y. Makino (MRI) – Bomem DA8 system (0.004 cm ⁻¹ resolution) deployed in February 1993 and removed in February 2009. Intercompared with NPL mobile instrument in spring 1999. Data archived for the winters of 1996-2000 and 2003-2006.
FTIR	K. Strong (U. Toronto) – Bruker 125HR (0.0027 cm ⁻¹ resolution, mid-infrared), installed in July 2006. Direct-sun solar absorption spectra are collected in a semi-automated operation on clear-sky days from polar sunrise (approx. February 20) until polar sunset (approx. October 20). Three intercomparison campaigns with the Bomem DA8 FTIR (see above entry) were conducted prior to the removal of the DA8: February to April 2007, February to April 2008, and July 2007. Alternating mid-infrared NDACC and near-infrared TCCON measurements on a semi-daily basis since 2010. Operations in 2012 and 2013 were affected by budget cuts. New funding has enabled operations through to 2018.

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Lidar (Aerosol)	T. Nagai (MRI) and O. Uchino (MRI) – Nd:YAG Lidar (1064 and 532 nm; dual polarization) deployed in February 1993. Operations were winter only. Operations were expanded to allow for tropospheric retrievals. Operations suspended after spring 2002. Data exist in the database for the two winters spanning 1993 – 1995.
Lidar (Aerosol)	Carswell (EC) – DIAL system (XeCl excimer laser similar to that at Toronto: 43.66°N, 79.40°W) deployed in February 1993 for winter season, nighttime only operations. Operation suspended after spring 2002. Data exists in the database for winters 1994 to 1998.
Lidar (Ozone)	J. Drummond and A. Tikhomirov (Dalhousie U.) – DIAL system (XeCl excimer laser similar to that at Toronto: 43.66°N, 79.40°W) deployed in February 1993 for winter season, nighttime only operations. Operation suspended for 2002 and 2003, and resumed in 2004. Early data exist in the database under PI Carswell for 1993-1998 and resumed under PI Strawbridge in 2004. The system has five detection channels, four receiver channels (2 Raman, 2 Rayleigh) to improve the ozone profile in the presence of aerosols, and one channel for water vapor. Recent measurements have focused on the approximately 4-week period leading up to polar sunrise.
Lidar (Temperature)	J. Drummond and A. Tikhomirov (Dalhousie U.) – DIAL system (XeCl excimer laser similar to that at Toronto: 43.66°N, 79.40°W) deployed in February 1993 for winter season, nighttime only operations. Operation suspended for 2002 and 2003, and resumed in 2004. Early data exist in the database under PI Carswell for 1993 to 1998, and resumed in 2004 under PI Strawbridge. Recent measurements have focused on the approximately 4-week period leading up to polar sunrise.
Sondes (Ozone)	D. Tarasick (EC) – ECC sondes launched once per week year-round beginning in November 1992, with two additional soundings per week in winter. NDACC data archiving began in 1996 under PI, Fast. Launches are currently taking place at the nearby Eureka weather station (79.99°N, 85.90°W, 10 masl).

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UV/Vis Spectrometer K. Strong (U. Toronto) – Two DOAS systems (Jobin-Yvon Triax-180 triple-grating spectrometers with CCD detector).
Primary: “PEARL-GBS” UV – permanently installed in August 2006. Sun-tracker installed in spring 2008 for direct sun, MAX-DOAS, and zenith-sky viewing.
Secondary: “UT-GBS” UV – spring campaigns since 1999; permanently installed in 2011. Sun-tracker installed in fall 2014 for direct sun, MAX-DOAS, and zenith-sky viewing.
Measure column O₃, NO₂, BrO, and OCIO from polar sunrise (~ February 20) until polar sunset (~ October 20). Intercomparison campaigns with a SAOZ instrument were conducted in spring 2007 and 2008. Operations in 2012 and 2013 were affected by budget cuts. New funding has enabled operations through to 2018.

Ny Ålesund, Spitsbergen (78.92°N, 11.93°E)

FTIR J. Notholt (U. Bremen) and M. Palm (AWI) – Bruker 120M (0.004 cm⁻¹ resolution), deployed 1992 to 1995. Replaced by Bruker 120HR (0.0028 cm⁻¹ resolution) in 1995. Operates all year with lunar (polar night) observations added since December 1992. Upgraded to 125 HR in 2012.

Lidar (Aerosol) C. Ritter, R. Neuber, and M. Maturilli (AWI) – Multi-wavelength system (excimer and Nd:YAG) making winter measurements between 10 and 45 km since 1991. In 1999 the system was upgraded for tropospheric measurements of aerosol and water vapor. Since 2001 it is a “3+2+1” Raman lidar.

Lidar (Ozone) P. Von der Gathen (AWI) – Multi-wavelength system (excimer and Nd:YAG) making winter measurements between 13 and 45 km from 1991 - 2011. Operations suspended due to laser failure and insufficient funds for replacement.

Lidar (Temperature) C. Ritter, R. Neuber, and M. Maturilli (AWI) – Multi-wavelength system (excimer and Nd:YAG) making winter aerosol and temperature measurements between 10 and 45 km since 1991. A four-channel receiver was added in 1999 for tropospheric aerosol and water vapor measurements. In 1999 the system was upgraded for tropospheric measurements of aerosol and water vapor and temperature measurements ceased.

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Microwave (ClO)	J. Notholt (U. Bremen) and O. Schrems (AWI) – Campaign operations in winter of 1993/94; permanent operation in winter/spring since 1995. Participated in a ClO radiometer intercomparison at Ny Ålesund in spring 1997. Intermittent data archived from 1995 to 2003. Archived under previous PI (K. Kunzi).
Microwave (Ozone)	J. Notholt and M. Palm (U. Bremen) – Campaign operations in 1994 and 1995; permanent operations since then with the exception of 2004-2006.
Sondes (Aerosol)	J. Rosen (U. Wyoming) – Backscatter measurements of aerosol profiles available from 1996 to 2005.
Sondes (Ozone)	P. von der Gathen and M. Rex (AWI) – Year-round soundings since 1992.
Sondes (Water Vapor)	M. Maturilli (AWI) – Cryogenic frost point sondes flown with a frequency ranging from every other month to twice per month.
UV/Vis. Spectrometer	G. Hansen and T. Svendby (NILU) and A. Pazimo and F. Goutail (LATMOS-IPSL) – SAOZ NO ₂ and ozone system operating since September 1990. Reanalysis of data from 2013 through at least 2016 is currently underway. J. P. Burrows and A. Richter (U. Bremen) – Measurements of ozone, NO ₂ , BrO, IO, and OClO from February to May and August to November. Participated in intercomparison at OHP in June 1996. Database extends back to 1995.

Thule, Greenland (76.53°N, 68.74°W)

FTIR	M. Coffey and J. Hannigan (NCAR) – Bruker 120M (0.004 cm ⁻¹ resolution) installed at South Mountain in 1999, operating under autonomous control. Also capable of lunar observations. Operated another instrument (0.06 cm ⁻¹ resolution) at Søndre Stromfjord (67.02°N, 50.72°W) during the 1994/95 winter for SESAME. Instrument moved to Building 1971 (1km from previous location at same altitude) in Summer 2011. In May 2015 a new Bruker 125HR FTIR operating with new software control and new solar tracker was installed.
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Lidar (Aerosol)	A. di Sarra, T. Di Iorio, and M. Cacciani (U. Rome, ENEA) – Winter-only measurements from September 1991 to 1996. Values currently too small to retrieve. Data are archived under previous PI (G. Fiocco).
Lidar (Temperature)	A. di Sarra, T. Di Iorio, and M. Cacciani (U. Rome, ENEA) – Profiles from 25 – 75 km. Winter measurements from November 1993 to 1997. Year-round operation with daylight observations began in 2006. Did not operate in early 1998 to 2001, 2004 to 2005, and 2008. Data from 1993 to 1997 are archived under previous PI (G. Fiocco).
Microwave (HNO ₃)	G. Muscari (INGV) – Winter only campaigns in 2002, 2003, 2010, 2011, and 2012. Vertical profiles from 15 to 40 km altitude with ~4-hour time resolution. Discontinued.
Sondes (Aerosol)	J. Rosen (U. Wyoming) and N. Larsen (DMI) – Backscatter measurements of aerosol profiles available for January 1992 – December 1998.
Sondes (Ozone)	N. Jepsen (DMI) – Soundings made during campaigns. Database extends back to October 1991. Data through 2016 archived under original PI (P. Eriksen).
UV/Vis. Spectrometer	N. Jepsen (DMI) – SAOZ system for NO ₂ and ozone column measurements operating since September 1990. Data through 2016 archived under original PI (P. Eriksen).

Dikson Island, , Russia (73.50°N, 80.23°E)

Sondes (Aerosol)	J. Rosen (U. Wyoming) – Backscatter measurements in the winters of 1991 and 1992.
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Summit, Greenland (72.34°N, 38.29°W)

Sondes (Ozone)	B. Johnson (NOAA/ESRL) – Weekly soundings since February 2005. Daily launches in April and July 2008. Ozonesonde launches ceased in July 2017 due to NOAA funding constraints. Other sources of support are being investigated.
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Spectral UV

G. Bernhard (Biospherical Instruments), and J. E. Frederick (U. Chicago) – Measurement of spectral irradiance between 280 and 600 nm with an SUV-150B spectroradiometer. The instrument is calibrated with standard lamps every two weeks. Observations started in August 2004. The system has been part of the National Science Foundation’s Arctic Observing Network and was decommissioned in August 2017 due to the lack of funds. The system is undergoing refurbishment at the factory for possible relocation at a yet-to-be-determined location.

Barrow, AK, USA (71.32°N, 156.68°W)

Spectral UV

G. Bernhard (Biospherical Instruments) and J. E. Frederick (U. Chicago) – Measurement of spectral irradiance between 280 and 600 nm with an SUV-100 spectroradiometer. The instrument is calibrated with standard lamps every two week. Observations started in December 1990. The system was part of the National Science Foundation’s Arctic Observing Network and was decommissioned in July 2016 due to the lack of funds. It is currently stored at the NOAA facility in Barrow while new funding is sought.

Scoresbysund / Ittoqqortoormiit, Greenland (70.48°N, 21.97°W)

Sondes (Aerosol)

N. Larsen (DMI) and J. Rosen (U. Wyoming) – Backscatter measurements of aerosol profiles available for January 1994 – February 1996.

Sondes (Ozone)

N. Jepsen (DMI) – ECC sondes launched weekly since 1989. Data through 2016 archived under original PI (P. Eriksen).

UV/Vis. Spectrometer

A. Pazimo, F. Goutail, J. P. Pommereau (LATMOS-IPSL) and P. Eriksen (DMI) – SAOZ system for NO₂ and O₃ operated since November 1991, upgraded with a new detector in 1996.

Andøya, Norway (69.28°N, 16.01°E)

Lidar (Ozone)

S. Blindheim (ARR) and K. Stebel (NILU) – DIAL system operated at ALOMAR Observatory from December 1994 to April 2011 and archived under previous PI Hansen. Limited measurements reinitiated in 2014.

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Lidar (Temperature) A. Hauchecorne (LATMOS-IPSL) – Rayleigh/Mie/Raman system operated since 1995 at ALOMAR Observatory. Data archived for 1995 and 1996.

Kiruna, Sweden (67.84°N, 20.41°E)

FTIR T. Blumenstock (KIT-IMK), U. Raffalski (IRF), and Y. Matsumi (STEL) – Bruker 120HR (0.002 cm⁻¹ resolution) operated since 1996. It is fitted with four detectors for both solar and lunar measurements. Intercompared with the NPL travel instrument in March 1998. Remote control capability exists since 2004. Upgraded to Bruker 125 in 2007. Data archived since 1996.

Sondes (Aerosol) N. Larsen (DMI) and J. Rosen (U. Wyoming) – Backscatter measurements of aerosol profiles available for the winter from 1991 to 2002.

UV/Vis. Spectrometer P. V. Johnston and K. Kreher (NIWA) – Operating for NO₂ and ozone since 1991; extended to BrO and OCIO in 1997. Operations discontinued in 2012 due to budget cuts.

T. Wagner (MPIC) and U. Platt (U. Heidelberg) – Zenith sky DOAS spectrometer for vertical column densities of O₃ and NO₂. Began NDACC measurements in August 2015.

Sodankylä, Finland (67.37°N, 26.65°E)

Dobson/Brewer R. Kivi (FMI) – Brewer #037 observations beginning May 1988.

Sondes (Aerosol) E. Kyrö (FMI) and J. Rosen (U. Wyoming) – Backscatter aerosol profile measurements available for the winter from 1994 - 2003.

Sondes (Ozone) R. Kivi (FMI) – Year round soundings approximately once per week with additional launches during winter and campaigns. NDACC data archived from 1991- 2004 under previous PI (Kyro).

Sondes (Water Vapor) R. Kivi (FMI) – Cryogenic frost point sondes flown with a frequency ranging from every other month to twice per month.

UV/Vis. Spectrometer A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and R. Kivi (FMI) – SAOZ system for NO₂ and O₃ operated since February 1990, upgraded with a new detector in 1995.

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Søndre Strømfjord, Greenland (66.99°N, 50.95°W)

Dobson/Brewer	N. Jepsen (DMI) – Brewer #053 observations when sunlit conditions permit beginning in February 1998. Data through 2016 archived under original PI (P. Eriksen).
Lidar (Temperature)	M. McCready (SRI) and J. Thayer (U. Colorado) – Rayleigh/Mie system in operation since November 1992. Presently operates year-round and has a daylight-measurement capability. Also retrieves backscatter-ratio profiles of noctilucent clouds and polar stratospheric clouds. Data archived from 1994 - 2008 under former PI, Heinselmann.

Zhigansk, Russia (66.8°N, 123.4°E)

UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and V. Dorokhov (CAO) – SAOZ system for NO ₂ and O ₃ operated since December 1991, upgraded with a new detector in September 2005.
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Salekhard, Russia (66.5°N, 66.7°E)

Sondes (Ozone)	V. Dorokhov (CAO) – Typically two launches per month in the January to April timeframe since 1997 with data archived since 2005.
UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and V. Dorokhov (CAO) – SAOZ system for NO ₂ and O ₃ operated since November 1998 (with data archived since January 2001).

Yakutsk, Russia (62.0°N, 129.7°E)

Sondes (Aerosol)	J. Rosen (U. Wyoming) and V. Yushkov (CAO) – Backscatter measurements of aerosol profiles available for the winter from 1995 - 2003.
Sondes (Ozone)	V. Dorokhov (CAO) – ECC sondes launched twice per week from January to March, and once per month from April to December. Program ran from 1995 - 2005. Data archived for 2004-2005.

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Harestua, Norway (60.2°, 10.8°E)

FTIR	J. Mellqvist, J. Klyft, and G. Persson (Chalmers U. Technology) – Bruker 120M (0.0035 cm ⁻¹ resolution) measurements conducted throughout the year, but mainly during winter at the Solar Observatory. Intercompared with the NPL instrument in September/October 1994. Upgraded to 125M in 2008-2009. Data available since late 1994; early data archived under previous PI (Galle). Current retrieval algorithm is SFIT2 v.3.93.
UV/Vis. Spectrometer	M. Van Roozendaal (IASB-BIRA) – Two DOAS systems (one for NO ₂ and ozone, the other for BrO and OCIO) operated during winter campaigns from January 1994 until March 1997, and continuously since January 1998.

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Northern Hemisphere Midlatitude Stations (30°N - 60°N)

St. Petersburg, Russia (59.9°N, 29.8°E)

FTIR M. Makarova (SPbU) – Measurements using a Bruker IFS 125HR (resolution up to 0.002 cm^{-1}) began in 2009. The observation site is located in a suburb of greater St. Petersburg. Retrieval algorithms: SFIT4 (V.0.9.4.4), PROFFIT 9.6. Ancillary atmospheric observations include those made using a UV/Vis. spectrometer, a microwave radiometer, and an aerosol lidar (ceilometer). Measurements affiliated with the Aerosol Robotic Network (AERONET) are also conducted.

Onsala, Sweden (57.4°N, 11.93°E)

Microwave (Water Vapor) P. Forkman and D. Murtagh (OSO) – Data from microwave (water vapor) 22-GHz radiometer operating at Onsala Space Observatory since 2002. Also retrieve mesospheric CO and O₃.

Zvenigorod, Russia (55.7°N, 36.8°E)

UV/Vis Spectrometer A. Gruzdev and A. Elokhov (IAP) – Morning and evening NO₂ measurements since 1990. Hosted instrument intercomparison in September 1997.

Bremen, Germany (53.1°N, 8.8°E)

FTIR J. Notholt (U. Bremen) – Bruker 120HR through 2003, Bruker 125HR since 2004. Maximum resolution 0.0028 cm^{-1} . Typically make one or two observations per week. Retrieval with SFIT2, SFIT4, and GFIT. The flat surroundings are conducive to satellite validation. The FTIR observations are complemented by microwave and DOAS measurements.

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Legionowo, Poland (52.40°N, 20.97°E)

Sondes (Ozone) B. Kois and M. Orłowski (IMGW-PIB) – ECC sondes launched weekly since June 1993. Additional sondes have been launched in concert with the MATCH campaigns and the Envisat/SCIAMACHY validation program. Database extends back to 1979 with OSE sondes. The station's WMO number is 12374. Data archived since 1995; early data archived under previous PIs (Litynska and Zablocki).

Aberystwyth, UK (52.4°N, 4.1°W)

Sondes (Ozone) G. Vaughan (U. Manchester) – Soundings on a campaign basis from 1991 - 2001. Activity has been completed.

UV/Vis. Spectrometer G. Vaughan (U. Manchester) – SAOZ system for NO₂ and O₃ operated since 1991. Also operated at Lerwick, UK (60.1°N, 1.1°E) and Aberdeen, UK (57°N, 2°W) during the EASOE (November 1991 to April 1992) and SESAME (February to April 1994) campaigns, respectively.

Lindenberg, Germany (52.21°N, 14.12°E)

Sondes (Ozone) R. Dirksen (DWD) – Weekly ECC + RS41 sondes launched weekly. Bimonthly ozone soundings are conducted jointly with the CFH sondes.

Sondes (Water Vapor) R. Dirksen (DWD) – Cryogenic frostpoint hygrometer (CFH) sondes flown with a frequency ranging from every other month to twice per month.

DeBilt, The Netherlands (52.10°N, 5.18°E)

Dobson/Brewer M. Allaart (KNMI) – Brewer No. 189. Data in the NDACC database begin in 1994. Intercompared with traveling standard in August 2012 and in September 2014.

Sondes (Ozone) M. Allaart (KNMI) – Database extends back to 1992 for ozone, temperature, and humidity.

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Valentia, Ireland (51.94°N, 10.25°W)

Dobson/Brewer M. Gill (ME) - Brewer (#088) MkIV observations beginning January 1993. Early data is archived under previous PIs (Lambkin, Varghese, and Gillespie).

Uccle, Belgium (50.8°N, 4.35°E)

Dobson/Brewer H. De Backer (RMIB) – Brewer #016 observations beginning in 1984.

H. De Backer (RMIB) – Dobson #040 observations started in July 1971 and stopped at the end of May 2009. This instrument is being refurbished and will be relocated at Kiev, Ukraine under the responsibility of the University of Kiev.

Sondes (Ozone) H. De Backer and R. Van Malderen (RMIB) – Brewer-Mast sondes launched three times per week from 1969 to March 1997. Z-ECC sondes used since April 1997.

Villeneuve d'Ascq, France (50.61°N, 3.14°E)

Spectral UV C. Brogniez, F. Auriol, and F. Minvielle (LOAL) – Measurements of spectral UV irradiance (290 – 450 nm) with a double monochromator (JY HD10) were initiated in May 1997 and continued through 2008 with some interruptions due to instrument problems. The instrument took part in the SUSPEN intercomparison campaign (July 1997), and the QASUME instrument validation project (September 2004). In 2008 the JY HD10 was replaced with a Bentham DTMc300 spectroradiometer for which data are available beginning in 2009.

Praha, Czech Republic (50.01°N, 14.45°E)

Sondes (Ozone) P. Skrivankova (CHMI) - ECC sondes launched 3 times per week since January 1992 for profile measurements from 0 to 34 km. More frequent launches have occurred during campaigns. Data archived since 2004.

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Groß-Enzersdorf, Austria (48.20°N, 16.56°E)

Spectral UV S. Simic and D. Rauter (BOKU-Met) – Measurement of the spectral distribution of UV irradiance (290 – 500 nm) with a Bentham DM150 spectroradiometer. Observations started in February 1998.

Hohenpeissenberg, Germany (47.80°N, 11.02°E)

Dobson/Brewer U. Köhler (DWD) – Daily Dobson #104 observations beginning May 1967; since 1986 only on work days. Daily Brewer #010 observations since January 1984.

Lidar (Ozone) W. Steinbrecht (DWD) – Measurements from 15 to 50 km several times per month since October 1987. Intercomparison with travelling standard lidar (STROZ from NASA-GSF) in October 2005.

Lidar (Temperature) W. Steinbrecht (DWD) – Measurements from 30 to 60 km several times per month since October 1987. Intercomparison with travelling standard lidar (STROZ from NASA-GSFC) in October 2005.

Sondes (Ozone) W. Steinbrecht (DWD) – Observations with Brewer-Mast ozonesondes since 1967. One launch per week before 1978; 2 to 3 launches per week since 1978. Routine comparison of sonde and lidar profiles. Data archived at NDACC since 1987.

Garmisch, Germany (47.48°N, 11.06°E) / Zugspitze, Germany (47.42°N, 10.98°E)

FTIR R. Sussmann (IMK-IFU) – Bruker 120HR (0.0028 cm⁻¹ resolution) operating since 1995 at Zugspitze. Remote control of measurements implemented in early 1998. An update to Bruker 125HR electronics was performed in Jan 2006. Column retrieval and a priori profile optimization fully automated. A NIR-FTIR operates at Garmisch in association with the TCCON Network.

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Lidar (Aerosol) T. Trickl (IMK-IFU) – System at Garmisch similar to the instrument at Mauna Loa (19.54°N, 155.58°W); operated as a ruby system from 1976 to 1990 and as a Nd:YAG system since 1991. Data archived (1994 – 2010). Early data is archived under a previous PI (Jaeger).

Spectral UV P. Werle (IMK-IFU) – Measurements of spectral distribution of UV irradiance using a double monochromator Bentham DTM300V since 1994 at Garmisch and since 1995 at Zugspitze. Work initiated at both sites for the ground truthing of satellite-derived UV maps. Garmisch operations were suspended in 2002. Prior to 2000, the PI for measurements at both sites was G. Seckmeyer and until 2002 S. Thiel. Measurements at both sites have been discontinued.

Hoher Sonnblick, Austria (47.05°N, 12.95°E)

Spectral UV S. Simic and D. Rauter (BOKU-Met) – Measurement of the spectral distribution of UV irradiance (290 – 500 nm) with a Bentham DM150 spectroradiometer. Observations started in February 1997.

Bern, Switzerland (46.95°N, 7.45°E) / Zimmerwald, Switzerland (46.88°N, 7.47°E)

Microwave (Ozone) N. Kämpfer (U. Bern) – Volume mixing ratio profiles (20 to 70 km) since November 1994 at Bern. Site is 60 km from the Jungfrauoch. Intercompared with Payerne, Switzerland (46.8°N, 7.0°E) ozonesondes. In the long-term future, this instrument will be replaced. A new instrument is operating on a regular basis in Payerne.

Microwave (Water Vapor) N. Kämpfer (U. Bern) – Volume mixing ratio profiles (20 to 70 km) initiated at Bern in Winter 2001/2001 and moved to Zimmerwald in September 2006. Validated against balloon sondes for 20 to 25 km, and against HALOE and POAM above 25 km. For details, refer to <http://www.iapmw.unibe.ch/research/projects/MIAWARA/>

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Payerne, Switzerland (46.82°N, 6.95°E)

- Lidar (Water Vapor) A. Haefele (MeteoSwiss) – Operational since August 2008 as part of the RALMO (Raman Lidar for meteorological observations) project. Also retrieves temperature and aerosols.
- Microwave (Ozone) D. Ruffieux and E. Maillard (MeteoSwiss) and N. Kämpfer (U. Bern) – Deployed from January 2000 to June 2002 in Bern (46.95°N, 7.45°E, prior to permanent siting at Payerne. The instrument provides ozone volume mixing ratios between 20/25 and 65 km with a 1 hour time resolution.
- Sondes (Ozone) R. Stübi and D. Ruffieux (MeteoSwiss) – Observations with Brewer Mast ozonesondes three times per week beginning November 1966. Data archived since 1990. Data through 2013 archived under previous PI (Viatte).

Arosa, Switzerland (46.78°N, 9.68°E)

- Dobson/Brewer R. Stübi and H. Schill (MeteoSwiss) – Daily Dobson #101 observations beginning July 1926. Data through 2013 archived under previous PI (Viatte).

Jungfraujoch, Switzerland (46.55°N, 7.98°E)

- FTIR P. Demoulin and E. Mahieu (U. Liège) – Double-pass grating instrument operated from 1977 until October 1989 (with limited data back to 1950). Data are not presently in the NDACC archive but most of them can be obtained from the PI's.
- P. Demoulin - A home-built FTS with 2m maxOPD operated from 1984 – 2008. Data from this instrument are being reprocessed and archived for the 1989 – 2008 time period.
- E. Mahieu (U. Liège) - A Bruker 120HR with 5m maxOPD has been in regular operation since 1994. Remote control of this instrument was implemented in October 2008.
- UV/Vis. Spectrometer M. Van Roozendaal (IASB-BIRA) – SAOZ system for NO₂ and ozone operated since June 1990. Upgraded with new detector (more pixels) and control system in late 1998. A MAXDOAS system has been in operation since July 2010.

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Minneapolis, MN, USA (45.14°N, 93.21°W)

Sondes (Aerosol) J. Rosen (U. Wyoming) – Dustsonde measurements from 1963 - 1968.

Briançon, France (44.90°N, 6.65°E)

Spectral UV A. de la Casinière and T. Cabot (IRSA, UJF Grenoble) – Measurements of spectral UV irradiance with two instruments. The first UV spectroradiometer (SPUV02, JY HD10 system) was operational from 2000 to 2003. The instrument was intercompared at Huelva, Spain in 2002. The other UV spectroradiometer (IRSA, Bentham DM150 system) was operational from 2001 to 2005.

Observatoire de Bordeaux, France (44.83°N, 0.52°W)

Dobson/Brewer J. de La Noë (Bordeaux) – Daily Dobson #49 observations beginning in 1985, but previously carried out at Biscarosse (60 km from Bordeaux) from 1976 to 1983. Instrument moved to Observatoire Midi-Pyrénées/Lannemezan in September 2004. Data archived for 1996-2003

Microwave (Ozone) J. de La Noë and N. Schneider (Bordeaux) – Profiles from 25 to 70 km obtained on a year-round basis since January 1995. Ceased operations in mid-2003.

Moshiri, Japan (44.4°N, 142.3°E)

FTIR T. Nagahama (STEL) – Bruker 120HR (0.0028 cm⁻¹ resolution) operating at the Observatory since April 1996. The instrument experienced sun tracker failures from April 2007 to June 2009 and again in late 2010. Not currently operational. NDACC measurements were scheduled to resume in mid-2015 with a Bruker 125HR. However, no data have been archived and measurements ceased in September 2016. The instrument was scheduled to be moved to ISEE in Nagoya. Total column data from 1996 to 2000 archived under former PI Kondo, and vertical distribution data from 1996 to 2007 archived by Y. Nagahama (NIES).

UV/Vis. Spectrometer Y. Matsumi (STEL), M. Koike and Y. Kondo (U. Tokyo), and P. V. Johnston (NIWA) – Measurements of NO₂ and ozone have been made at the Observatory available from 1991 to 2008.

Shading indicates activities that are no longer active

Observatoire de Haute Provence, France (43.94°N, 5.71°E)

Dobson/Brewer	M.-R. De Backer-Barilly (GSMA Reims) and G. McConville (NOAA/ESRL) – Total ozone and Umkehr database using Dobson instrument #085 extends back to 1983.
Lidar (Aerosol)	J. Jumelet and S. Khaykin (LATMOS-IPSL) – Began NDACC operations in March 1991 (stopped from 1995 – 1998 and between April 2008 and July 2009). Data archived under previous PI (C. David).
Lidar (Ozone)	S. Godin-Beekmann (LATMOS-IPSL) – Began NDACC operations in January 1991. Database extends back to 1986. New lidar system installed in January 1994. Participated in July 1992 and 1997 intercomparisons with GSFC mobile lidar and ozonesondes.
Lidar (Temperature)	Ph. Keckhut and A. Hauchecorne (LATMOS-IPSL) – Began NDACC operations in January 1991. Database extends back to 1979. Participated in July 1992 and 1997 intercomparisons with GSFC mobile lidar. Data from 2011 to October 2012 are of low quality and are not archived.
Lidar (Trop. Ozone)	G. Ancellet (LATMOS-IPSL) – Tropospheric ozone measurements from 1990 – 2009; upgraded and resumed in 2012.
Lidar (Water Vapor)	Ph. Keckhut and A. Hauchecorne (LATMOS-IPSL) – Same system as used for temperature measurements. Water Vapor measurements started in 1999.
Sondes (Ozone)	S. Godin-Beekmann and G. Ancellet (LATMOS-IPSL) – Soundings conducted approximately once per week since 1986. Data archived since 1995. Participated in July 1997 intercomparison with GSFC mobile lidar.
Spectral UV	C. Brogniez, F. Auriol, and F. Minvielle (LOAL) – Spectral irradiance measurements (290 – 400 nm) using a Bentham DTMc 300 spectroradiometer that was installed at the end of 2008. Data submission was suspended in 2010 due to calibration issues that have subsequently been resolved; all data since 2008 are being reprocessed and submitted to the NDACC DHF

Shading indicates activities that are no longer active

UV/Vis. Spectrometer A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) – SAOZ system for NO₂ and ozone operating since June 1992, upgraded with a new detector in June 1995; NDACC intercomparisons in 1992, 1995, 1996, and 2003. A new mini-SAOZ was installed in September 2011 for long-term comparisons with existing SAOZ to ascertain NDACC qualifications.

Toronto, Canada (43.66°N, 79.40°W)

FTIR K. Strong (U. Toronto) - Bomem DA8 (0.004 cm⁻¹ resolution) installed October 2001; routine measurements since May 2002.

Lidar (Aerosol) H. Fast (EC) – Year-round operation of Rayleigh system from late 1989 through April 2000. Data archived under the previous PI (Pal) for 1991 to 1993 and for 1996 to 1997.

Lidar (Ozone) H. Fast (EC) – DIAL system with year-round nighttime measurements from 1991 through 1997; also retrieved aerosol and temperature profiles. Data archived under the previous PI (Pal) for 1991 to 1997, with no data for 1995.

Lidar (Temperature) H. Fast (EC) – Year-round operation of Rayleigh system from late 1989 through April 2000. Data archived under the previous PI (Pal) for 1991 to 1992 and 1996 to 1997.

Rikubetsu, Japan (43.46°N, 143.77°E)

FTIR T. Nagahama (STEL) and I. Morino (NIES) – Bruker 120M (0.004 cm⁻¹ resolution) installed by STEL in May 1995. Operations suspended in 2009. Tested at Toyokawa (35°N, 137°E) from December 1994 to April 1995. Bruker 120/5HR (0.0035 cm⁻¹ resolution) installed by NIES in 2013. Total column data prior to 2000 is archived under previous PI (Kondo), and vertical distribution data from 1996 to 2009 is archived by Y. Nagahama (NIES).

Microwave (Ozone) A. Mizuno (STEL) and T. Nagahama and H. Ohyama (ISEE) – Profiles from 15 to 60 km obtained on a year-round basis since December 1999.

UV/Vis. Spectrometer Y. Matsumi (STEL), M. Koike and Y. Kondo (U. Tokyo), and P. V. Johnston (NIWA) – Measurements of NO₂ and ozone were made at the Observatory from March 1994 to October 1997.

Shading indicates activities that are no longer active

Observatoire Midi-Pyrenees/Lannemezan, France (43.12°N, 0.38°E)

Dobson/Brewer F. Gheusi, S. Derrien, and G. Bret (Univ. Paul Sabatier) – Daily Dobson #49 measurements since October 2004, continuing previous observations at Biscarosse (60 km from Bordeaux) from 1976 to 1983 and Observatoire de Bordeaux (44.83°N, 0.52°W) from 1985 to 2004.

London, Ontario, Canada (43.1°N, 81.34°W)

Lidar (Temperature) R. Sica (Univ. of Western Ontario) – Rayleigh temperature measurements since 1993. Raman temperature measurements since 1999. Significant data gaps in 2008-2010. Minimal data in 2010 due to instrument re-location.

Lidar (Water Vapor) R. Sica (Univ. of Western Ontario) – Raman water vapor measurements since 1999. Significant data gaps in 2008-2010. No data in 2010 due to instrument re-location.

Issyk-Kul, Kyrgyz Republic (42.6°N, 77.0°E)

UV/Vis Spectrometer V. Sinyakov (KNU) – Morning and evening NO₂ measurements since 1983. Participated in 1997 intercomparison at Zvenigorod.

Rome - Tor Vergata, Italy (41.84°N, 12.65°E)

Lidar (Water Vapor) G.L. Liberti (ISAC – CNR) – Tropospheric water vapor Raman lidar system operational since May 2002. Elastic channel observation at 355 nm and 532 nm also available. Also retrieves temperature between 15 and 80 km.

Laramie, WY, USA (41.32°N, 105.67°W)

Sondes (Aerosol) J. Rosen (U. Wyoming) – Dustsonde measurements from 1971 - 1988. Backscatter measurements of aerosol profiles available for May 1989 – September 2000.

Shading indicates activities that are no longer active

Potenza, Italy (40.63 °N, 15.80°E)

- Lidar (Temperature) P. Di Girolamo (U. della Basilicata) – Raman lidar system (BASIL) operational since 2004. Also retrieves water vapor (see below entry) and aerosols.
- Lidar (Water Vapor) P. Di Girolamo (U. della Basilicata) – Raman lidar system (BASIL) operational since 2004. Also retrieves temperature (see above entry) and aerosols.

Boulder, CO, USA (39.99°N, 105.26°W)

- Dobson/Brewer G. McConville (NOAA/ESRL) – Daily Dobson #061 observations beginning September 1966. Previous PI's were R. Evans and S. J. Oltmans.
- Lidar (Aerosol) J. E. Barnes (NOAA/ESRL) – Aerosol measurements using Nd:YAG system. The database for 532-nm backscatter extends back to January 2000. Not operational 2012-2016. Hope to restart measurements in 2017.
- Sondes (Ozone) B. Johnson (NOAA/ESRL) - Weekly ECC sondes since June 1991.
- Sondes (Water Vapor) D. Hurst (NOAA/ESRL) – Monthly NOAA frost point hygrometer sondes launched year-round since 1980 to obtain profiles of water vapor, temperature, pressure, and winds from surface to ~26 km. An ECC ozonesonde is part of the payload when the NOAA FPH is launched.
- Spectral UV P. Disterhoft (NOAA/ESRL) and B. Liley, M. Kotkamp, and R. McKenzie (NIWA) – Spectral UV irradiance measurements (285-450 nm) since June 1998. Three different NIWA double monochromators have been used at three sites in and around Boulder. The present instrument (UV5) has been in use since August 2001, and participated in the 2003 International UV Spectroradiometer Intercomparison at Table Mountain, CO. It is calibrated biannually with external reference lamps and weekly stability calibrations are conducted with an internal lamp.

Shading indicates activities that are no longer active

Wallops Island, VA, USA (37.94°N, 75.46°W)

Dobson/Brewer	G. McConville (NOAA/ESRL), F. L. Bliven (WFF), and A. M. Thompson (GSFC) – Daily Dobson #038 observations beginning June 1967 with data originally archived at NDACC from 1995 until October 2012 under F. J. Schmidlin (WFF). Previous NOAA PI was R. Evans.
Sondes (Ozone)	F. L. Bliven (WFF) and A. M. Thompson (GSFC) – Weekly launches of ECC sondes. Program began in July 1967 with data originally archived at NDACC from 1995 to October 2012 under F.J. Schmidlin (WFF).

Seoul, South Korea (37.58°N, 127.00°E)

Microwave (Water Vapor)	J. Oh and S Ka (SWU) – Operation of the SWARA system since 2006 with instrument upgrades occurring in 2011.
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Tsukuba, Japan (36.05°N, 140.13°E)

Lidar (Ozone)	H. Nakane (NIES) – Also retrieved temperature and aerosols. No longer operational. Data archived for August 1988 to February 2010.
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Kiso, Japan (35.8°N, 137.6°E)

UV/Vis. Spectrometer	Y. Kondo (U. Tokyo) and P. V. Johnston (NIWA) – Measurements of NO ₂ and ozone were made at the Observatory from 1992 to 1996.
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Huntsville, AL, USA (34.73°N, 86.64°W)

Lidar (Trop. Ozone)	M. Newchurch and S. Kuang (U. Alabama, Huntsville) – Tropospheric ozone DIAL system operational since 2008. Measurements are from 1 – 12 km daytime and nighttime. A low altitude channel (0.1 – 2 km) was added in February 2013.
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Shading indicates activities that are no longer active

Table Mountain, CA, USA (34.4°N, 117.7°W)

Lidar (Aerosol)	T. Leblanc and T. D. Walsh (JPL) – Aerosol measurements at 353nm from 1989 to August 1999 and from 355 nm from November 1999 on. Data up to Dec. 2013 archived under previous PI (McDermid).
Lidar (Ozone and Temperature)	T. Leblanc and T. D. Walsh (JPL) – Ozone and temperature database extends back to 1989. Instrument has been used for testing, research, and intercomparisons. Data up to Dec. 2013 archived under previous PI (McDermid).
Lidar (Trop. Ozone)	T. Leblanc and T. D. Walsh (JPL) – Tropospheric ozone system operational since November 1999. Data up to Dec. 2013 archived under previous PI (McDermid).
Lidar (Water Vapor)	T. Leblanc and T. D. Walsh (JPL) – Tropospheric and lower stratospheric water vapor Raman lidar system operational since July 2005. Data prior to 2008 was experimental and is not in the NDACC archive.
Microwave (Ozone)	A. Parrish (Millitech & U. MA), I. S. Boyd (U MA), and B. J. Connor (BC Consulting) – Deployed from August 1989 – June 1992 prior to permanent siting at Lauder.
Microwave (Water Vapor)	G. Nedoluha and R. M. Gomez (NRL) and I. S. Boyd (U MA) – Instrument #1 (WVMS1) deployed from January to October 1992 and May to November 1993; WVMS3 deployed from September 1995 until March 1996 when it was deployed to Mauna Loa (19.54°N, 155.58°W); WVMS2 deployed September 1993 to November 1997 and operated intermittently from November 2003 to July 2008. WVMS4 replacement of WVMS2 began in July 2008 and has operated continuously from December 2008 to present over the altitude range (26 – 80 km)..

Kitt Peak, AZ, USA (31.9°N, 111.6°W)

FTIR	C. Rinsland (LaRC) – Continuous record of infrared solar spectra from 1978 to 2005 using the FTS (0.005 cm ⁻¹ resolution) in the McMath Pierce Telescope. Operations resumed briefly in 2009.
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Shading indicates activities that are no longer active

Northern Hemisphere Subtropical and Tropical Stations (0°N - 30°N)

Izaña, Tenerife, Spain (28.30°N, 16.48°W)

Dobson/Brewer	A. Redondas and E. Cuevas (AEMET) – Brewer measurements initiated in May 1991 using a Mark II single monochromator. Replaced with a double Brewer #157 in July 1998.
FTIR	T. Blumenstock and M. Schneider (KIT-IMK) and O. Garcia (AEMET) – Measurements performed using a Bruker 120M (0.0035 cm ⁻¹ resolution) since February 1999. Replaced with a Bruker 125HR (0.0035 cm ⁻¹ resolution) in 2005.
Sondes (Ozone)	N. Prats (AEMET) - Weekly ECC sondes since November 1992 for profile measurements from 0 to 34 km. More frequent launches have occurred during specific campaigns.
UV/Vis. Spectrometer	M. Gil (INTA) – NO ₂ and ozone data using a scanning spectrometer. Archived from 1993 – 1999 under former PI (Yela) and continues with current PI. Instrument participated in the 1996 OHP intercomparison. Also retrieves column abundances of ozone, H ₂ O, and O ₄ .

Mauna Kea, HI, USA (19.83°N, 155.48°W)

Microwave (CIO)	G. Nedoluha and R. M. Gomez (NRL); B. J. Connor, I. S. Boyd, and T. Mooney (BC Consulting); and A. Parrish (U MA) – One of three NDACC instruments developed by Millitech; in operation since 1992. Two instruments were intercompared at this site for 22 months from 1993 to 1995 prior to the Antarctic deployment of one of them (see Scott Base entry). The Mauna Kea instrument was permanently moved to Mauna Loa in the fall of 2015.
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Hilo, HI, USA (19.72°N, 155.07°W)

Sondes (Ozone)	B. Johnson and S. Oltmans (NOAA/ESRL) – Weekly soundings since 1982. NDACC data archived since 1991.
Sondes (Water Vapor)	D. Hurst (NOAA/ESRL) – Monthly NOAA frostpoint hygrometer sondes launched year-round since 2010 to obtain profiles of water vapor, temperature, pressure, and winds from surface to ~26 km. An ECC ozonesonde is part of the payload when the NOAA FPH is launched.

Shading indicates activities that are no longer active

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Mauna Loa, HI, USA (19.54°N, 155.58°W)

Dobson/Brewer	G. McConville (NOAA/ESRL) – Daily Dobson #076 observations beginning December 1963, with about 20 Umkehr retrievals per month. NDACC data archived since 1970. Previous PI's were R. Evans and S. J. Oltmans.
FTIR	J. Hannigan and M. Coffey (NCAR) – Resumed measurements in 2009 with a new automated system and the same Bruker 120HR mentioned below. In 2011 the instrument was upgraded to a Bruker 125HR (data lapse March 2010-August 2011). D. Murcay and R. Blatherwick (U. Denver) – Bomem DA3 (0.002 cm ⁻¹ resolution) operated once per week from November 1991 to November 1995. Automated Bruker 120HR (0.0035 cm ⁻¹ resolution) installed August 1995. Operations suspended in 2001, resumed briefly for 2003, then resumed intermittently from 2006 - 2009.
Lidar (Aerosol, Ozone and Temperature)	T. Leblanc and T. D. Walsh (JPL) – Multi-wavelength system deployed in July 1993. Data up to Dec. 2013 archived under previous PI (McDermid).
Lidar (Aerosol, Temperature, and Water Vapor)	J. E. Barnes (NOAA/ESRL) – Ruby and Nd:YAG systems; Ruby system operational from 1974 to January 1998. Nd:YAG system began operations in April 1994. Temperature retrievals began in June 1994. Nd:YAG system began retrieving water vapor in October 2005.
Microwave (ClO)	G. Nedoluha and R. M. Gomez (NRL); B. J. Connor, I. S. Boyd, and T. Mooney (BC Consulting); and A. Parrish (U MA) – This instrument was moved from Mauna Kea (see the entry for that site) in September 2015. Resumed vertical profile measurements (21 – 45 km) in March 2016.
Microwave (Ozone)	G. Nedoluha and R. M. Gomez (NRL), A. Parrish (U. MA) and I. S. Boyd (BC Consulting) – One of two Millitech-built systems; installed in 1995 following testing and intercomparisons at Table Mountain Facility (34.4°N, 117.7°W). Participated in intercomparison at Mauna Loa in July 1995. Retrieving profiles from 20 to 64 km from July 1995 to April 1996 and from August 1996 to May 2015. Measurements (20 – 72 km) with a new instrument began in 2016.

Shading indicates activities that are no longer active

Microwave (Water Vapor)	G. Nedoluha and R. M. Gomez (NRL) and I. S. Boyd (BC Consulting) – NRL Water Vapor Microwave Spectrometer #3 (WVMS3) operating since March 1996 following testing at Table Mountain Facility. Measurements have been taken with the new WVMS6 since 2010 over the altitude range (40 - 80 km).
Spectral UV	P. Disterhoff (NOAA/ESRL) and J. B. Liley and M. Kotkamp (NIWA) – Global and scattered UV spectral irradiances (285 – 450 nm) since 1995. Data archived under previous PI (McKenzie).
UV/Vis. Spectrometer	R. Querel and A. Thomas (NIWA) – DOAS, measuring trace gases from global and scattered irradiance, since 1996. Current measurements, since late April 2009, of NO ₂ and BrO slant columns are made using a CCD detector. Spectrometer damaged in early 2014 and returned to Lauder. Measurements are unlikely to continue. Data up to 2009 are archived under previous PI (Johnston). Data from 2009 – 2013 not yet archived.

Altzomoni, Mexico (19.12°N, 98.66°W)

FTIR	M. Grutter de la Mora and W. Stremme (UNAM) – Measurements performed routinely with a Bruker 120/5HR (0.0035 cm ⁻¹) acquired from DLR and upgraded by IMK-ASF in 2011. The instrument was installed in May 2012 at the Altzomoni Observatory, a high altitude station located in Central Mexico at 3,985 masl. Retrievals are performed with PROFFIT.
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San Jose, Costa Rica (9.59°N, 84.12°W)

Sondes (Water Vapor)	H. Selkirk (USRA/GESTAR), H. Vömel (NCAR), and J. Andrés Diaz (Universidad de Costa Rica) – Monthly and campaign-based launches of the Cryogenic Frostpoint Hygrometer since July 2005. Water vapor data provided up to ~28 km. In addition to the CFH, the payload includes an ECC ozonesonde and a radiosonde, initially the Vaisala RS80 radiosonde. The RS80 was superseded in April 2010 with the iMet-1-RSB radiosonde. Ancillary data include PTU, GPS altitude and winds together with ozone partial pressure and mixing ratio to ~30 km. The current launch site is located on the campus of the Universidad de Costa Rica in San Pedro. Earlier sites at Juan Sanatamaria International Airport, Alajuela, and the Universidad Nacional, Heredia, are 19.2 and 10.2 km, respectively, west of the UCR site.
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Shading indicates activities that are no longer active

Paramaribo, Surinam (5.75°N, 55.2°W)

Dobson/Brewer	C. Becker (Met. Service, Paramaribo) and M. Allaart (KNMI) – Continuous observations of total ozone and the UV spectrum, complemented by Umkehr zenith sky observations at dusk and dawn, have been made using a Brewer MkIII (#159) since April 1999. Data archived under former PI (Allart).
FTIR	T. Warneke (U. Bremen) – Bruker 120M through 2013, updated to 125M electronics in 2013. Maximum resolution 0.005 cm ⁻¹ . Typically make one or two campaigns per year. Retrieval with SFIT2, SFIT4 and GFIT.
Sondes (Ozone)	C. Becker (Met. Service, Paramaribo) and A. PETERS (KNMI) – Weekly balloon sondes launched year-round since September 1992, measuring profiles of ozone (ECC-6a cell), temperature, pressure, humidity, and wind (using GPS). Data archived under former PI, Scheele.

Tarawa, Kiribati Republic (1.4°N, 172.9°E)

UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and P. V. Johnston (NIWA) – SAOZ system operated from July 1992 – July 1999.
	P. V. Johnston (NIWA) – NIWA system for NO ₂ and ozone operated beginning mid-1995. Measurements ceased in May 1999 due to a computer failure.

Shading indicates activities that are no longer active

Southern Hemisphere Subtropical and Tropical Stations (0°N - 30°S)

Natal, Brazil (5.83°S, 35.20°W)

Sondes (Aerosol)	J. Rosen (U. Wyoming) – Backscatter measurements of aerosol profiles available on a campaign basis for November 1995 to December 2004.
Sondes (Ozone)	N. P. Leme and F. Raimundo da Silva (INPE), A.M Thompson (GSFC), and F.L. Bliven (WFF).– Weekly ECC sondes since July 1967. NDACC data archived from 2000 until October 2012 under F. J. Schmidlin (WFF).

Ciater/Bandung, Indonesia (6.4°S, 107.4°E)

UV/Vis. Spectrometer	Y. Kondo (Tokyo U.) and W. A. Matthews (NIWA) – NIWA system for NO ₂ and ozone operated from August 1994 to 1998.
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Cape Matatula, American Samoa (14.25°S, 170.56°W)

Dobson/Brewer	G. McConville (NOAA/ESRL) – Daily Dobson #042 observations beginning December 1975. Previous PI's were R. Evans and S. J. Oltmans.
Sondes (Ozone)	B. Johnson (NOAA/ESRL) - Weekly ECC sondes since June 1991 and archived since 1995.

Reunion Island, France (St. Denis - 20.9°S, 55.5°E)

FTIR	M. De Mazière (IASB-BIRA) – Bruker 120M operating on a campaign basis since 2002. Installed in 2009 for quasi-permanent operation until end of December 2011. Bruker 125HR installed in 2013, mainly for TCCON measurements but provides NDACC measurements as needed.
Lidar (Ozone)	T. Portafaix (U. de la Réunion) and S. Godin-Beekmann (LATMOS-IPSL) – Stratospheric ozone DIAL system installed in May 2000. Year-round ozone profiles from 15 to 45 km. Instrumental problems from 2006 to present with intermittent operations from 2002 – 2006 and archived under former PI Baray. Operations suspended at St. Denis; instrument moved to Maito Observatory in February 2013.

Shading indicates activities that are no longer active

Lidar (Temperature)	Ph. Keckhut (LATMOS-IPSL) – Measurements since April 1994 using Nd:YAG system. Operations suspended at St. Denis in 2008; instrument moved to Maito Observatory in February 2013.
Sondes (Ozone)	F. Posny (U. de la Réunion) – Measurements since September 1992. Once every 2 weeks from 1992 – 1999; once per week since 1999. Receiving equipment and acquisition software replaced for Meteo Modem system in August 2007. NDACC data archived since 1998.
Spectral UV	C. Brogniez, F. Auriol, and F. Minvielle (LOAL) – Spectral irradiance measurements (290 – 400 nm) with a Bentham DTMc 300 spectroradiometer that was installed at the end of 2008. Data being reprocessed after an intercomparison with the QASUME standard instrument in 2013.
UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and T. Portafaix (U. de la Réunion) – SAOZ system for NO ₂ and ozone operating since July 1993; upgraded with a new detector in 1997.

Reunion Island, France (Maito Observatory - 21.1°S, 55.4°E)

FTIR	M. De Mazière (IASB-BIRA) – Bruker 125HR installed in March 2013 for NDACC measurements.
Lidar (Ozone)	T. Portafaix (U. de la Réunion) and S. Godin-Beekmann (LATMOS-IPSL) – Stratospheric ozone DIAL system began making measurements in February 2013.
Lidar (Temperature and Water Vapor)	Ph. Keckhut and A. Hauchecorne (LATMOS-IPSL) – Measurements since April 1994 using a Nd:YAG system. Operations suspended at St. Denis in 2008 and resumed at the Maito Observatory in February 2012.
Lidar (Trop. Ozone)	V. Dufлот (U. de la Réunion)– Tropospheric ozone DIAL system began making measurements in February 2013 in preparation for NDACC certification. Ozone profiles are routinely obtained from 6-19 km. Participated in Maito Lidar Calibration Campaigns in April 2013 and November 2013 and in the Maito Observatory Gas and Aerosols NDACC Experiment in May 2015. Instrument certified for NDACC affiliation February 2017.

Shading indicates activities that are no longer active

Lidar (Water Vapor) Ph. Keckhut (LATMOS-IPSL) – Raman lidar system began measurement testing in February 2013, with valid measurements obtained since October 2013. Optimal range of the measurements is 2.2 – 22 km. Participated in Mado Lidar Calibration Campaigns in April 2013 and November 2013 and in the Mado Observatory Gas and Aerosols NDACC Experiment in May 2015. Instrument certified for NDACC affiliation February 2017.

Bauru, Brazil (22.3°S, 49.0°W)

UV/Vis. Spectrometer A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and G. Held (UNESP) – SAOZ system for NO₂ and ozone operating since November 1995; upgraded with a new detector in February 2001.

Alice Springs, Australia (23.80°S, 133.87°E)

Spectral UV J. B. Liley and M. Kotkamp (NIWA) and S. Rhodes (BoM) – Measurements of spectral UV irradiance (285 – 450 nm) since 2005 using a Bentham (UV6 and UV7) spectrometer. Data currently archived under former PI (McKenzie).

Southern Hemisphere Midlatitude Stations (30°S - 60°S)

Mildura, Australia (34.19°S, 142.16°E)

Sondes (Aerosol)

J. Rosen (U. Wyoming) – Dustsonde measurements from 1973 - 1980.

Wollongong, Australia (34.41°S, 150.88°E)

FTIR

N. Jones and D. Griffith (U. Wollongong) – Operation of a Bruker HR 125 (0.004 cm⁻¹ from January 2008 to present. Operation of a Bomem DA8 (0.004 cm⁻¹ resolution) from May 1996 to January 2008. Measurements using a Bomem DA3 (0.02 cm⁻¹ resolution) from December 1994 to May 1996.

Lauder, New Zealand (45.04°S, 169.68°E)

Dobson/Brewer

R. Querel, S. Nichol, and H. Shiona (NIWA) and G. McConville (NOAA/ESRL) – Daily Dobson #072 observations beginning January 1987. Data archived under R. Evans.

FTIR

D. Smale and J. Robinson (NIWA) – Bruker 120M (400-4000 cm⁻¹ range, 0.0035 cm⁻¹ resolution) operating since August 1990; Bruker 120HR (400-4000 cm⁻¹ range, 0.0035 cm⁻¹ resolution) added in August 2001. Data archived under PI Smale, HDF format and former PI (Wood) in Ames. Prior to the Bruker 120M installation, campaign measurements were made in 1986-89 with a Bomem DA2 (0.02cm⁻¹ resolution).

Lidar (Aerosol)

B. Liley (NIWA) – Mobile Nd:YAG system operated extensively at Tsukuba (36.05°N, 140.13°E) for retrievals from 6 to 36 km; deployed at Lauder in November 1992. Operated weekly. Data archived under PI, Uchino, up to 1999 and under PI, Nagai, onward. Ceased operations in 2009.

B. Liley (NIWA) – System used initially at Dumont d'Urville (66.67°S, 140.01°E). Aerosol profile data (5 to 35 km) available from 1994 to 1997 under PI, Steffanutti. Operated weekly, but laser is failing.

Shading indicates activities that are no longer active

Lidar (Ozone)	R. Querel (NIWA) – Installed November 1994 by RIVM (former PI Daan Swart). Participated in OPAL and TOPAL intercomparison campaigns with GSFC mobile lidar, LaRC microwave ozone radiometer, and ozonesondes in 1995 and 2002, respectively. New laser installed and retrieval software updated in 2007; all data reprocessed. Retrieving ozone from 8 to 50 km year-round (attempting to get one measurement per week). Also retrieves aerosols (8 to 25 km) and temperature (8 to 70 km) profiles. However, neither are submitted to the NDACC database. Ownership and PI responsibilities transferred from RIVM to NIWA as of July 2017.
Microwave (Ozone)	G. Nedoluha and R. M. Gomez (NRL), A. Parrish (U. MA), and I. S. Boyd (BC Consulting) – Retrieving profiles from 20 to 70 km from October 1992 to November 1994 and continuing from April 1995. Instrument is identical to Mauna Loa system and participated in intercomparisons at Table Mountain Facility (34.4°N, 117.7°W) in July 1989. Observatoire de Haute Provence (43.94°N, 5.71°E) in July 1992, and Lauder in April 1995. This instrument also operated at Table Mountain Facility from July to November 1989 and from May 1990 to June 1992.
Microwave (Water Vapor)	G. Nedoluha and R. M. Gomez (NRL) and I. S. Boyd (U MA) – NRL WVMS1 deployed from November 1992 to April 1993 and January 1994 to present following tests and intercomparisons at Table Mountain Facility (34.4°N, 117.7°W); presently retrieving from 40 to 80 km. WVMS1 was replaced by WVMS7 in 2011.
Sondes (Aerosol)	J. Rosen (U. Wyoming) and B. Liley (NIWA) – Backscatter measurements of aerosol profiles (0 to 34 km) monthly from February 1992 – 1998; two to three times per year for 1999-2000. No current activity.
Sondes (Ozone)	R. Querel (NIWA) – Weekly ECC sondes (DMT) year-round since August 1986 for obtaining profiles of ozone, temperature, pressure, and winds from 0 to 32 km. Early data archived under previous PIs (Bodeker and Zeng).
Sondes (Water Vapor)	R. Querel (NIWA) and D. Hurst (NOAA/ESRL) – Monthly NOAA frostpoint hygrometer sondes launched year-round since 2004 for obtaining profiles of water vapor, temperature, pressure, and winds from 0 to 32 km.

Shading indicates activities that are no longer active

Spectral UV J. B. Liley and M. Kotkamp (NIWA) – Measurements of the spectral distribution of UV irradiance (285 – 450 nm) using a double monochromator since December 1989. In November 1993, the original UVL spectrometer (JYDH10), which allowed observations only in fair-weather conditions, was replaced by the UVM spectrometer (Bentham DM300). In September 1998, the integrating sphere on this instrument was replaced by a PTFE diffuser to allow all-weather observations, including during rain. There have been occasional periods of spectral sky radiance and spectral actinic flux observations. The latter also may be derived from spectral irradiance measurements. Direct beam spectral UV irradiance measurements have been made since 2011 (with the UV2 spectrometer). A variety of filter radiometers also have been used since 1992. Information regarding specific instruments and deployments are available from the PIs. Data through 2013 archived under former PI, McKenzie.

UV/Vis. Spectrometer R. Querel (NIWA) – Zenith measurements of NO₂ and ozone. Database extends back to 1980 using a grating scanning monochromator; BrO/OCIO since 1995 using a CCD array; direct sun from 2001; MAXDOAS from 2004. Early data through 2012 archived under previous PI (Johnston).

Kerguelen Island (49.3°S, 70.3°E)

UV/Vis. Spectrometer A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) – SAOZ system for NO₂ and ozone operating since December 1995; upgraded with a new detector in January 2000.

Rio Gallegos, Argentina (51.60°S, 69.32°W)

Lidar (Ozone) J. Salvador, E. Wolfram, and E. Quel (CEILAP) – Ozone DIAL system with periodic measurements going back to 2005. Began official NDACC operations in 2008. No measurements were conducted during 2016 and part of 2017 due to funding issues.

UV/Vis. Spectrometer A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) and E. Quel (CEILAP) – SAOZ system for NO₂ and ozone operating since March 2008.

Shading indicates activities that are no longer active

Macquarie Island, Australia (54.50°S, 158.95°E)

UV/Vis. Spectrometer R. Querel (NIWA) – Zenith measurements of column NO₂ and O₃, since September 1995 with a grating scanning monochromator. Original spectrometer previously operated on Campbell Island. Spectrometer replaced in 2002 with a similar unit. Some data archived under previous PIs (Wood) for 1996-2003 and (Johnston) for 2006-2012.

Ushuaia, Argentina (54.82°S, 68.32°W)

Spectral UV G. Bernhard and C. Booth (Biospherical Instr.) – Measurements of UV spectroradiometer irradiance, with an SUV-100 and GUV-511, initiated in November 1988. Operations ceased at the end of 2008 due to funding termination.

UV/Vis. Spectrometer M. Yela and O. Puentedura (INTA) – Vertical column densities of NO₂ have been obtained using a zenith sky DOAS scanning spectrometer since 1994. These NO₂ measurements will be continued until 2018 to overlap those being made by a MAX-DOAS instrument that was installed in 2016. The MAX-DOAS is also making measurements of O₃ and IO.

Shading indicates activities that are no longer active

Southern Hemisphere High-Latitude Stations (60°S - 90°S)

Marambio Station, Antarctica (Argentina) (64.23°S, 56.63°W)

UV/Vis. Spectrometer M. Yela and O. Puentedura (INTA) – Zenith sky DOAS scanning spectrometer for vertical column densities of NO₂ since 1994. In 2005 a PDA array spectrometer was installed for measurements of NO₂ and O₃. Since 2015, two MAX-DOAS systems have been operating (one for NO₂, O₃, and IO and the other for BrO and OCIO). Both of the older systems will continue to take measurements until 2018 in order to overlap with those by the MAX-DOAS systems.

Palmer, Antarctica (USA) (64.77°S, 64.05°W)

Spectral UV P. Disterhoft (NOAA/ESRL) and G. Bernhard (Biospherical Instr.) – Measurements of spectral distribution of UV irradiance from 285 – 600 nm in 0.2 nm steps with an SUV-100 double monochromator. Measurements were initiated in May 1988 and archived since 1990. Calibrated fortnightly during the measurement season.

Faraday, Antarctica (Ukraine) (65.25°S, 64.27°W)

UV/Vis. Spectrometer H. Roscoe (BAS) – SAOZ system for NO₂ and ozone operated at this location from January 1990 until the station closed in December 1995. System operating at Rothera, Antarctica (67.57°S, 68.13°W) since January 1996.

Dumont d'Urville, Antarctica (France) (66.67°S, 140.01°E)

Lidar (Aerosol) J. Jumelet (LATMOS-IPSL) and M. Snels (ISAC-CNR) – Operated from March through November from 1989 - 1998. Data from 1999 to 2002 are of poor quality due to instrument degradation. Instrument inactive from 2002 until a new lidar was installed in January 2005. Operational since 2006. Data archived under former PIs Stephanuti (1989-1998) and David (2006-2010).

Lidar (Ozone) M. Marchand (LATMOS-IPSL) and F. Cairo (ISAC- CNR) – Operated from 1991 to 2001. Data are archived from 1991-1998 under former PI (S. Godin-Beekmann). Operations ceased in 2001 due to instrument degradation. A new lidar was operational from 2006 until laser failure in 2013. Repairs are postponed.

Shading indicates activities that are no longer active

Sondes (Ozone)	J. Jumelet (LATMOS-IPSL) – Approximately 25 soundings per year. Database extends back to 1990. Data before 2003 archived under former PI (Goutail).
UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) – SAOZ system for NO ₂ and ozone operating since January 1988; upgraded with a new detector in 1994.

Rothera, Antarctica (United Kingdom) (67.57°S, 68.13°W)

UV/Vis. Spectrometer	H. Roscoe (BAS) – SAOZ system operated at Faraday (UK Antarctic Station: 65.25°S, 64.27°W) from January 1990 until the station closed in December 1995. System operating at this location since January 1996. Data from 2011 – 2016 not yet in archive.
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Syowa Base, Antarctica (Japan) (69.01°S, 39.59°E)

UV/Vis. Spectrometer	Y. Kondo (Tokyo U.) and W. A. Matthews (NIWA) – NIWA system for NO ₂ and ozone operated from 1990 - 1995.
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Neumayer Station, Antarctica (Germany) (70.62°S, 8.37°E)

Sondes (Ozone)	P. van der Gathen and M. Rex (AWI) – Vaisala ECC-6a sondes launched weekly since 1992, with increased frequency during Austral spring.
UV/Vis. Spectrometer	U. Friess, and U. Platt (U. Heidelberg) - Dual-channel DOAS spectrograph installed in January 1999 for measuring ozone, NO ₂ , OClO, and BrO.

Concordia Dôme C, Antarctica (France) (75.10°S, 123.35°E)

Lidar (Aerosol)	M. Snels (ISAC-CNR) - Measurements are being taken twice daily (30 – 40 minutes per observation) from June throughout October since 2014. The system uses a NdYag laser emitting at 532 nm and 1064 nm; the 14 inch Cassegrain Schmidt telescope has 5 channels (a 532 nm high channel, a 532 nm low channel, a 532 nm depolarized channel, a 1064 nm channel and a Raman channel at 608 nm).
UV/Vis. Spectrometer	A. Pazmino, F. Goutail, and J. P. Pommereau (LATMOS-IPSL) – SAOZ system for column NO ₂ and ozone operating since September

Shading indicates activities that are no longer active

2007.

Arrival Heights, Antarctica (New Zealand) (77.83°S, 166.67°E)

Dobson/Brewer	S. Nichol and H. Shiona (NIWA) – Daily Dobson #017 observations beginning 1988.
FTIR	D. Smale and J. Robinson (NIWA) – Trace gas profiles beginning in 1996 with a Bruker 120M (400-4000 cm ⁻¹ range, 0.0035 cm ⁻¹ resolution). A Bruker 125HR (400-4000 cm ⁻¹ range, 0.0035 cm ⁻¹ resolution) was installed in November 2014 and operated in parallel with the Bruker 120M. Intercomparisons between the two instruments occurred over the Austral Summer seasons 2014-2015 and 2015-2016) with the retirement of the Bruker 120M in February 2016. From 1991-1995 measurements were taken using a Bomem DA2 (0.02 cm ⁻¹ resolution) and an Eocom (0.06 cm ⁻¹ resolution). 1991-1995 HCl and HNO ₃ total column data are archived under the previous PI (Murcray).
Spectral UV	P. Disterhoft (NOAA/ESRL) and G. Bernhard (Biospherical Instruments) – Measurements of the spectral distribution of irradiance from 285-600 nm with an SUV-100 double monochromator. Measurements were initiated in March 1988. The SUV-100 is calibrated fortnightly during the measurement season.
UV/Vis. Spectrometer	R. Querel (NIWA) – Zenith sky DOAS, NO ₂ column measurements since 1991 using a scanning grating monochromator. Two units operated in parallel, one at Scott Base, one at Arrival Heights. In 1998 a MAXDOAS UV/Vis spectrometer was installed and operated in conjunction with the University of Heidelberg. In 2005 a UV/Vis Grating CCD array spectrometer was installed for measurements of BrO and OCIO. In November 2013 the spectrometer was reconfigured (wavelength region expanded) to include spectral measurements to permit NO ₂ retrievals. Some data archived under former PIs (Wood and Johnston).

McMurdo Station, Antarctica (USA) (77.85°S, 166.63°E)

Lidar (Aerosol)	M. Snels (ISAC-CNR), F. Cairo (ISAC-CNR), and G. Di Donfrancesco (ENEA) – Database extends back to 1990. Measurements were made from February through October. Data from 1990 to 2002 are archived under previous PI (Adriani). Operations discontinued in October 2010. Relocation to Dome C planned for 2014.
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Shading indicates activities that are no longer active

Sondes (Aerosol)	J. Rosen (U. Wyoming)– Dustsonde measurements of aerosol profiles from 1973 to 1979.
Sondes (Ozone)	T. Deshler (U. Wyoming) – Database dates back to 1986; twice per week springtime measurements only except for 1994 when operations were conducted in the winter period as well. Operations ceased in October 2010.
UV/Vis. Spectrometer	S. Solomon (NOAA/ESRL) – Database taken by R. Sanders (deceased) from February 1991 through February 1994 in the NDACC archive.

Scott Base, Antarctica (New Zealand) (77.85°S, 166.78°E)

Microwave (ClO)	G. Nedoluha and R. M. Gomez (NRL); B. J. Connor (BC Consulting); I. S. Boyd and A. Parrish (U MA), and T. Mooney (SUNY)– Millitech instrument deployed in January 1996 following measurements and intercomparisons at Mauna Kea (19.83°N, 155.48°W). Has been making measurements (16 – 43 km) yearly in the August – October period since then.
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Belgrano II Station, Antarctica (Spain) (77.87°S, 34.62°W)

Sondes (Ozone)	M. Yelta and M. Navarro (INTA) – Vaisala ECC-6a sondes launched year-round (40 /year) since 1999, with increased frequency during Austral spring. More frequent launches have occurred during specific campaigns. Launches were reduced in August- December (2015-2016) due to budget issues.
UV/Vis. Spectrometer	M. Yela and O. Puentedura (INTA) – Zenith sky DOAS scanning spectrometer for vertical column densities of NO ₂ from February to May and from August to November since 1995. Since 2011, two MAX-DOAS systems have been operating (one for NO ₂ , O ₃ , and IO and the other for BrO and OCIO). The DOAS measurements will continue until 2018 in order to overlap with those made by the MAX-DOAS system.

South Pole Station, Antarctica (USA) (90.00°S)

Dobson/Brewer	G. McConville (NOAA/ESRL) – Daily Dobson data archived since December 1963. Dobson#80 replaced Dobson#82 in 2004. Dobson#82 returned in January 2009. Dobson #42 replaced #82 at
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Shading indicates activities that are no longer active

the end of 2012.

Sondes (Aerosol)	J. Rosen (U. Wyoming)– Dustsonde measurements of aerosol profiles from 1972 to 1980 and Backscatter measurements from 1990 to 1991.
Sondes (Ozone)	B. Johnson and S. Oltmans (NOAA/ESRL) – Approximately 75 soundings per year since 1986. Data archived at NDACC since 1991.
Spectral UV	P. Disterhoft (NOAA/ESRL) and G. Bernhard (Biospherical Instr.) – Spectral distribution of UV irradiance (280 – 600 nm) with an SUV-100 double monochromator. Measurements initiated in February 1988 and archived since 1990. Calibrated fortnightly.