ESRL ATMOSPHERIC CHEMISTRY COLLABORATIONS 2004-2007

JOINT INSTITUTES:

- **Cooperative Institute for Research in Environmental Sciences (CIRES):** NOAA Cooperative Institute at the University of Colorado**.** Extensive joint research and atmospheric monitoring projects are conducted at the Boulder facilities.
- **Cooperative Institute for Arctic Research (CIFAR):** NOAA Cooperative Institute at the University of Alaska. Cooperative research in arctic atmospheric science at the Barrow and Boulder facilities.
- **Cooperative Institute for Mesoscale Meteorological Studies (CIMMS):** NOAA Cooperative Institute at the University of Oklahoma. ESRL provides large amounts of high quality data for modelers.
- **Cooperative Institute for Research in the Atmosphere (CIRA):** NOAA Cooperative Institute at the Colorado State University. Joint research projects are conducted at the Boulder facility.
- **Joint Institute for Marine and Atmospheric Research (JIMAR):** NOAA Cooperative Institute at the University of Hawaii. Studies of long range transport of mercury flowing from Asia to Hawaii.

OTHER NOAA LABS:

- **GFDL (Geophysical Fluid Dynamics Lab):** ESRL cooperates in conducting Global Carbon Cycle modeling and Global Climate Model results compared to observed radiation.
- **PMEL (Pacific Marine Environment Lab):** ESRL conducts joint aerosol chemical composition measurements and analyses with PMEL.
- **AOML (Atlantic Oceanographic and Meteorological Lab) and PMEL**: ESRL conducts cooperative carbon cycle and halocarbon measurements in the marine environment along with the study of sulfur particulates in the global atmosphere with these labs.
- **ARL (Air Resources Lab):** ESRL Radiation Project utilizes some ARL field sites and is developing a plan for future collaboration in surface energy budget monitoring activities with ARL. ESRL collaborates with ARL on stratospheric ozone, atmospheric chemical modeling, and air quality research.

OTHER NOAA OAR PROGRAMS:

- **Arctic Research Program:** ESRL participates in experiments to determine emissions of important trace gases along the Siberian Railway corridor. ESRL is assisting in the establishment of two arctic observatories funded by NOAA through the Arctic Research Program Office.
  ESRL is conducting a retrospective analysis and expansion of the arctic climate-monitoring network.

- **Office of Global Programs:** ESRL conducts climate, stratospheric ozone, air quality research and monitoring of radiatively important trace gases on a global scale with funding from this office. ESRL is also active in the SEARCH program.

OTHER NOAA RELATIONSHIPS:

- **National Weather Service (NWS):** ESRL has total-column ozone and/or solar radiation instrumentation and cooperative operations at seven NWS stations across the U.S. and UV monitoring at the NWS site in Nome and St Paul, Alaska.
- **NESDIS (National Environmental Satellite, Data, & Information Service):** ESRL hosts and supports a polar satellite data downlink antenna for NESDIS at the Barrow Observatory.
- The Barrow Observatory hosts a **NESDIS Climate Reference Network (CRN)** site. Similar CRN instruments will be added to the Mauna Loa and Trinidad Head Baseline Station sites in FY2004
- **NOAA CRN** sites are hosted at **SURFRAD** sites Bondville, Ill; Goodwin Creek Miss; Ft Peck, Montana; Barrow, Alaska; Mauna Loa, Hawaii; and Sioux Falls, South Dakota.
- ESRL obtains carbon cycle flasks from the "Ships of Opportunity Program" operated by **NESDIS.**

OTHER FEDERAL AGENCIES:

- **Department of Energy (DOE):** ESRL hosts the Atmospheric Radiation Measurement (ARM) North Slope of Alaska site at the Barrow facility. ESRL scientists operate the surface and airborne aerosol monitoring programs at the DOE/ARM Southern Great Plains site in Oklahoma and the surface aerosol monitoring program at the ARM Mobile Facility. ARM also provides funding for GMD to development better UV instruments. ESRL cooperates with DOE Environmental Energy Technologies Division to operate the Tall Towers in Walnut Grove and Sutro, California.
- **The Northeast Regional Center of the National Institute for Global Environmental Change (NIGEC)** provides funding to both ESRL and Harvard University to monitor important trace gases at the Harvard Forest tower site, Massachusetts.
- **Battelle-Northwest Laboratories:** ESRL samples for Persistent Organic pollutants (POPS) in the arctic at the Barrow Observatory.
- ESRL is funded by **DOE** to conduct aerosol long-term measurements and process studies as part of the **Atmospheric Radiation Measurements (ARM) program** and **Atmospheric Science Program (ASP).** The ARM Mobile Facility has deployed with ESRL cooperation at Point Reyes, CA; Niamey, Niger; and Heselback, Germany. **Other DOE:** ESRL is host to radionuclide collectors at all of the baseline observatories except Trinidad Head, California.
- **National Aeronautics and Space Administration (NASA):** ESRL is host to, and provides manpower for a NASA Advanced Global Atmospheric Gas Experiment (AGAGE) site in American Samoa. It also hosts the NOAA/NASA

- **Network for the Detection of Atmospheric Composition Change (NDACC)** facility at Mauna Loa, Hawaii and conducts NDACC measurements at the South Pole, Boulder, Colorado and Summit, Greenland.
- ESRL provides airborne trace gas instrumentation and data analysis for NASA airborne campaigns on aircraft, balloon, and unmanned aircraft for **NASA** missions, including Tropical Composition, Cloud and Climate Coupling Experiment.
- **NASA** also supports the observation and analysis of surface radiation budget projects in ESRL permitting NOAA to fulfill international obligations to the WMO and for the management of the Baseline Surface Radiation Network managed by ESRL.
- **NASA** Wallops Island, VA is host to and operates a NOAA Dobson.
- **Other DOC, NIST** – Cooperative activities in the development and maintenance of long-term absolute UV calibration standard references
- ESRL is the co-investigator in the **NASA Southern Hemisphere Additional Ozonesonde (SHADOZ)** project; ESRL operates three international ozonesonde stations in the network.
- ESRL operates surface radiation sites at Kwajalein and Bermuda with NASA funding. ESRL contributes a major component to the **NASA Clouds and Earth's Radiant Energy System.**
- ESRL is host to the **NASA AERONET** sunphotometer project's primary calibration site at Mauna Loa Observatory.
- Mauna Loa Observatory hosts the **National Center for Atmospheric (NCAR) Research High Altitude Observatory** facilities supported by the National Science Foundation.
- ESRL is participating in two intensive campaigns utilizing the **NCAR Gulfstream-5** aircraft to survey trace gas distributions in the UT/LS from high northern to high southern latitudes in different seasons.
- ESRL and **NCAR** participate in extensive trace gas intercomparisons to maintain intercomparability and consistency of measurements.
- **Naval Surface Warfare Center (NAVSWC):** ESRL supports a Navy magnetic fields monitoring installation at the Barrow Observatory.
- **Defense Advanced Research Projects Agency (DARPA):** ESRL provides gas standards and climatology of trace gases from different environments around the world.
- **United States Department of Agriculture (USDA):** ESRL hosts the USDA solar radiation baseline calibration site at Mauna Loa, Hawaii.
- ESRL operates precipitation gauges at the Barrow Baseline station for the **USDA**.
- **United States Geological Survey (USGS):** The USGS Arctic Magnetic Observatory is located adjacent to the ESRL Barrow Observatory and is operated by ESRL staff.
- ESRL collaborates with the **USGS Alaska Science Center** and **Russian National Academy** in a study of arctic climate variability.

- Mauna Loa Observatory is host to a **USGS** seismometer and tilt and strain well to monitor local lava flows and earthquakes.
- ESRL operates the Central UV Calibration Facility in direct support of the **US Dept of Agriculture** US UV network.
- ESRL operates a small network of Brewer UV spectrometers for the **Environmental Protection Agency** for multiple applications.
- **Department of Interior (Parks Service):** Mauna Loa Observatory maintains two helicopter landing sites used by the Parks Service for patrols and facility repairs.
- **Environmental Protection Agency (EPA):** The EPA studies long-range transport of mercury in the atmosphere in a joint project with ESRL at Mauna Loa Observatory.
- **Federal Aviation Administration (FAA):** Mauna Loa Observatory is host to an FAA GPS system for controlling aircraft in the Pacific Basin.
- **United States Army:** Mauna Loa Observatory is host to a large command and control radio system used by the **U.S. Army** for the Pacific Army live fire base on the Island of Hawaii.
- ESRL operates a solar radiation facility with the **U.S. Army** on Kwajalein Island, Pacific Ocean.
- **United States Air Force (USAF):** The USAF ships helium, free of charge, to ESRL balloon sites from a depot in Texas to any airbase in the world that is near a ESRL balloon site.
- The **Air Force** samples air flasks for ESRL on Ascension Island in the mid-Atlantic Ocean.
- A guest **Air Force** scientist at ESRL maintains and updates the MODTRAN radiative transfer code for the USAF.
- Mauna Loa Observatory hosts a **USAF**-supported **Civil Air Patrol** radio re-broadcast facility covering the State of Hawaii.
- Support is given to the BRW Observatory by the **USAF** Long Range Radar Site in Barrow, including snow removal and road maintenance.
- **National Science Foundation (NSF):** ESRL operates the NSF-owned Clean Air Facility (CAF) at the South Pole, and is instrumenting the NSF Summit, Greenland, research facility. ESRL collects air samples in the Drake Passage aboard the L.M Gould operated by NSF.
- **U.S Fish and Wildlife Service:** Collection of air samples at Midway Island.
- **U.S. Department of Agriculture:** Tall Tower sites at Argyle, Maine and Wisconsin.
- **Lawrence Berkeley National Laboratory:** Tall Tower sites at Walnut Grove and Sutro, California.
- ESRL is host to a wide range of **NSF**-sponsored university research projects (in excess of 30) at the five ESRL Baseline stations.
- **United States Navy (USN):** Mauna Loa Observatory is host to a Navy camera system for the control and monitoring of bombing in the Pohakuloa live fire range.

STATE AGENCIES:

- **Hawaii State Department of Health (DOH), Honolulu:** Mercury samples collected at Mauna Loa Observatory are analyzed by the DOH.
- **Illinois State Water Survey, Urbana, Illinois:** This agency hosts the ESRL Bondville aerosol monitoring site that has been monitoring the climate forcing properties of aerosols at that location since 1994.
- **Hawaii County Police, Hawaii:** Mauna Loa Observatory hosts a radio re-broadcast facility for the police and Hawaii Civil Defense radios covering all of the Island of Hawaii.
- **Colorado Department of Public Health and Environment**, Air Pollution Control Division: ESRL provides background values for a number of trace gases of interest to the division.
- **Texas Agricultural Experiment Station:** Tall Tower site in Texas.

LOCAL PARTNERSHIPS:

- Metro Wastewater Reclamation District, Colorado: Local radiation environment
- Denver Water Board, Colorado: Local radiation environment
- ATSC, Norman, Oklahoma: Activities at the Kwajalein BSRN site
- Eppley Laboratory, Rhode Island: Instrument design, modification, and calibration
- Atmospheric Observing Systems, Boulder, Colorado: Sampling systems
- Bermuda Biological Station for Research, Inc.: Flask sampling
- Biospheric Instruments, Inc., California: Solar radiation instruments
- ENSI, Colorado: Ozonesondes
- Joseph Sealy, Barbados: Flask sampling
- Pinnacle Towers Inc., Texas: CO_2 sampling tower
- PIQUNIQ Management Corporation, Shemya, Alaska: Sampling
- Point Arena Lighthouse Keepers, Inc., California: Flask sampling
- Wisconsin Educational Communications Board: CO2 sampling tower
- Atmospheric Environment Research (AER), Cambridge, Massachusetts: Airborne halocarbon data and modeling support
- ASOS, Boulder, Colorado: CO2 monitors, airborne flask samplers
- Bondville, Ill. Field site: operated by Illinois State Water Survey
- Fort Peck, Mont. Field site: operated by Fort Peck Indian Tribes
- High Precision Devices, Boulder, Colorado: Air sampling equipment
- Friends of Midway: Air sampling at Midway Island
- DuPont Company, New Jersey: Halocarbon emission estimates
- M&D Consulting, Germany: Provides halocarbon emission data and uses halocarbon data to validate models
- Greenwood Group, Ponca City, OK: Operates light aircraft used by ESRL for long-term measurements of aerosol vertical profiles

UNIVERSITY PARTNERSHIPS (Aircraft Sampling):

Carbon Cycle Greenhouse Gases Aircraft Program Sites

- Bondsville, IL: NOAA
- Beaver Crossing, NE: Hap's Air Service
- Boreal Ecosystem Research and Monitoring Sites (BERMS) Saskatchewan: Transwest Air
- Briggsdale, CO: Airwest Flight Center
- Cape May, NJ: AirTec, Inc
- Dahlen, ND: Fargo Jet Center, Inc
- Oahu Island, HI: Pacific Air Charters
- Harvard Forest, MA: Four Star Aviation
- Homer, IL: Midwest Avtech, Inc
- Park Falls, WI: Clark Aviation
- Isle of Shoals, NH: Ken MacLean
- Poker Flats, AK: Warbelows Air Ventures, Inc.
- Ponca City, OK: Greenwood Aviation
- Sinton, TX: Skypark Aviation
- Trinidad Head, CA: Becco, Inc.

UNIVERSITY PARTNERSHIPS (Baseline Observatories):

Some universities have projects at more than one baseline observatory and some universities have a number of different projects at one observatory.

- **Barrow Observatory, Alaska**
  - Scripps Institution of Oceanography, La Jolla: Carbon cycle gas monitoring, organic aerosol sampling
  - University of Tokyo, Japan: Magnetic micro-pulsations
  - University of California, Irvine: Methane flask sampling, C^{14} in air
  - Princeton University, California: Oxygen in air flask sampling
  - San Diego State University, California: Carbon-dioxide flux from the tundra.
  - State University of New York, Albany: Thaw depth in permafrost
  - University of Washington, Washington: Arctic coastal ice optical characteristics
  - University of Alaska, Fairbanks: SuoimiNet GPS meteorology station, Institute of Arctic Biology – Arctic climate change studies, snow gauge studies
- **Mauna Loa Observatory, Hawaii**
  - Scripps Institution of Oceanography, La Jolla: Carbon cycle gases and oxygen
  - Stanford University, California: GPS derived column water vapor
  - University of California, Davis: Aerosol chemistry
  - University of Hawaii, Honolulu: Sulphate chemistry
  - State University of New York, Stonybrook: Carbon monoxide and its isotopes
  - California Institute of Technology, California: Cosmic dust fluxes
  - University of Massachusetts, Amherst: Stratospheric ozone profiles
  - University of California, Irvine: Trace gas sampling

University of New Hampshire, University of Hawaii, Michigan Aerospace, and Mount Washington Observatory: GroundWinds lidar
University of Denver: FTIR columns spectra of atmospheric gases
Colorado State University, Fort Collins: Ultraviolet radiation project
Central Connecticut University: Clidar aerosol lidar project
University of Nations: Calibration of Microtops ozone meters
Kinki University, Japan: Solar radiation instrument calibration for satellite measurements
Meteorological Research Institute, Japan: Spectral radiation calibrations for solar radiation measurements
University of Michigan: Atmospheric lidar measurements

- **Trinidad Head Observatory, California**
  Humboldt State University, California: Operation of the Trinidad Head Baseline station and weekly release of ozonesondes
  Scripps Institute of Oceanography, La Jolla, California: Joint collection of flask samples and sharing data
- **Samoa Observatory, American Samoa**
  Meteorological Research Institute, Japan: Spectral radiation calibrations for solar radiation measurements (foreign government agency)
- **South Pole Observatory, Antarctica**
  Scripps Institution of Oceanography, La Jolla: Carbon cycle gases and oxygen sampling. Sampling of firn air to delineate historic trends for trace gases
  University of Arizona: Hydrogen peroxide
  University of California, San Diego: Isotopes of oxygen
  Georgia Institute of Technology: Sulphate and nitrogen chemistry reaction experiments
  University of Idaho: Radiation measurements, Dome C, Antarctica

UNIVERSITY PARTNERSHIPS (other):

- **Niwot Ridge, Colorado, High Altitude Sampling Facility**
  University of Colorado, Mountain Research Station joint research and monitoring operations at Niwot Ridge, Colorado
- **Institute for Alpine and Arctic Research (INSTAAR):** Joint carbon cycle gas isotope research program
- **Cooperative Dobson ozone total column spectrometer, surface ozone, and/or ozonesonde network**

  CNRS, University of Riems, Haute Provence, France
  NIWA, Lauder, New Zealand,
  Bureau of Meteorology, Perth, Australia

  Meteorological and Hydrological Service, Marcapomacocha, Peru
  Meteorological and Hydrological Service, San Cristobal, Galapagos, Ecuador

  University of the South Pacific, Suva, Fiji

  Bermuda Biological Station, Tudor Hill, Bermuda

University of Alabama, Huntsville
University of Colorado, Boulder
Florida State University, Tallassee
Humbold State, Arcata, California
University of Alaska, Fairbanks
Center for Remote Sensing, Department of Geography, Boston University, MA
University of Rhode Island, Rhode Island: Weekly balloon-borne ozonesonde location at Narragansett, RI

- **ESRL and University of Colorado/CIRES cooperative water vapor/ozone sonde network**

  LAPAN, Bandung, Indonesia
  LAPAN, Biak, Indonesia
  LAPAN, Watukosek, Indoensia
  LAPAN, Kototabang, Indonesia
  Howard University, Beltsville, MD
  Instituto Nacional de Meteorología é Hidrología, Galapagos Island, Ecuador
  Met Service of Vietnam, Hanoi, Vietnam
  Mauna Loa Observatory, Hilo, Hawaii
  University of La Reunion Island, Indian Ocean, France
  German Weather Service, Lindenberg, Germany
  National Weather Service, Midland, TX
  JPL Table Mountain Facility, Wrightwood, California
  Kiribati Weather Service, Tarawa, Kiribati
  Universidad Nacional and Instituto de Meteorología Nacional, Alajuela, Costa Rica
  Finnish Meteorological Institute, Sodankylä, Finland

- **Cooperative flask sampling program for carbon cycle and halocarbon gases, including aircraft sampling programs not listed under Carbon Cycle Network and Halocarbon Network Collaborations**

  University of Colorado, Boulder
  University of Bristol, England
  University of Sao Paulo, Brazil
  University of Fiji
  University College, Galway, Ireland
  Harvard University, Massachusetts
  Bowdoin College, Maine
  Princeton University, New Jersey
  University of Guam
  Southern California Marine Institute

- University of Illinois, Urbana-Champaign: Aerosol monitoring
- National Autonomous University of Mexico: Aerosol measurements
- University of La Laguna, Spain: Aerosol data analysis
- University of Stockholm, Sweden: Aerosol/cloud measurements

- Dalhousie University, Canada: Joint ocean trace gas research
- Universitaet Frankfurt, Germany: Institut fuer Meteorologie und Geophysik: Future surface sampling site, airborne trace gas research
- University of Goteburg, Sweden: International assessment of ozone
- University of Maryland: Radiometer calibrations and consultation for the operation of remote climate radiation observation sites.
- Utrecht University, Netherlands: International assessment of ozone, studies of atmospheric methyl chloroform, intercomparisons of trace gases
- University of New England, Maine and Bigelow, Laboratory: Joint ocean trace gas research
- Princeton University: Ice firn research
- Woods Hole Oceanographic Institution: Joint ocean trace gas research
- University of Guam
- Southern California Marine Institute
- University of Idaho: Dome Concordia (Antarctica) Satellite (AIRS) surface characteristics and temperature validations studies
- University of Washington: Study of snow-air interactions and radiation regime at Dome Concordia
- University of Alabama: Cloud detection automation
- Sinte Gleska University, South Dakota: Educational partnership
- University of California, San Diego, Scripps: ABC radiation calibrations
- University of Washington: Studies of snow surface properties in Antarctica
- Hampton University: Balloon-borne radiative flux measurements
- Colorado State University: IR Calibration exchange and occasional academic lectures, UV calibrations.
- University of Toronto, Canada: SEARCH and Canadian Network for Detection of Arctic Change
- Swiss Institute of Technology (ETH), Zurich: BSRN calibrations
- Eppley Laboratory, Rhode Island: Instrument design, modification, and calibration
- University of Utah: Aerosol data analysis
- National Autonomous University of Mexico: Aerosol measurements and analysis
- University of La Laguna, Spain: Aerosol data analysis
- Harvard Forest Observatory, Harvard: Carbon cycle gas measurements and halocarbon group gases.
- University of Puerto Rico: Cooperative aerosol measurements at Cape San Juan, Puerto Rico
- Penn State University: Wisconsin Tall Tower site
- University of Wisconsin: Wisconsin Tall Tower site
- University of Iowa: Iowa Tall Tower site.
- University of Maine: Argyle, Maine Tall Tower site.
- Weizmann Institute of Science, Israel: US-Israeli Bi-national Science Foundation Grant for the study of carbonyl sulfide interactions with the terrestrial biosphere.

- Stanford University; modeling and measurement comparisons of carbonyl sulfide.
- University of East Anglia, United Kingdom; carbonyl sulfide modeling and measurement comparisons.

INTERNATIONAL PARTNERSHIPS:

ESRL operates an international cooperative flask-sampling program for carbon cycle and halocarbon gases, including aircraft sampling. The country of the measurement and the cooperating agency or individual is listed:

- Estevan Point, Canada : H.F. Schulz
- Fortaleza, Brazil: : LBA INPE/CPTEC
- Molokai Island, Hawaii: Hawaii Air Ambulance
- Rarotonga, Cook Islands : Air Rarotonga LTD
- Santarem, Brazil: LBA INPE/CPTEC
- Alert, Nunavut, Canada : Meteorological Service of Canada
- Ascension Island,: USAF
- Assekrem, Algeria : Office de la Meteorologie
- Terceira Island, Azores, Portugal : Instituto de Meteorologia
- Baltic Sea, Poland : Morski Instytut Rybacki
- St. Davids Head, Bermuda : Bermuda Biological Station
- Tudor Hill, Bermuda : Bermuda Biological Station
- Black Sea, Constanta, Romania: Marine Research Institute
- Cape Grim, Tasmania, Australia : CSIRO
- Christmas Island, Kiribati: Dive Kiribati
- Crozet Island, France: Centre des Faibles Radioactivities
- Easter Island, Chile : Direccion Meteorologica de Chile
- Mariana Islands, Guam : Guam Marine Laboratory
- Halley Station, Antarctica : British Antarctic Survey
- Hegyhatsal, Hungary: Hungarian Meteorological Service
- Storhofdi, Iceland : Icelandic Meteorological Office
- Tenerife, Canary Islands : Instituto Nacional de Meteorologia
- Sary Taukum, Kazakhstan : Institute of Environment
- Plateau Assy, Kazakhstan: Institute of Environment
- Mace Head, Ireland: University College Galway
- Sand Island, Midway: U.S. Fish and Wildlife Service
- Gobabeb, Namibia: Desert Research Foundation
- Ochsenkopf, Germany : Max Planck Institute
- Pallas-Sammaltunturi, Finland: Finnish Meteorological Institute
- Pacific Ocean, N/A : Volunteer Ship Program
- Ragged Point, Barbados : Private Party
- Mahe Island, Seychelles : Seychelles Bureau of Standards
- Shemya Island, Alaska : PIQUNIQ Management Corp.
- South Pacific Ship, N/A : Voluntary Observing Ship
- Ocean Station M, Norway : Norway Meteorological Institute
- Syowa Station, Antarctica: Japan Institute of Polar Research

- Shemya Island, Alaska: PIQUNIQ Management Corp.
- Ulaan Baatar, Mongolia: Blue Sky Aviation
- Arembepe, Brazil: Instituto de Energeticas e Nucleares Bureau of Meteorology and Geophysics
- Bukit Kototabang, Indonesia: Deutscher Wetterdienst
- Hohenpeissenberg, Germany: ENEA
- Lampedusa, Italy: National Central University
- Lulin, Taiwan: Kenya Meteorological Department
- Mt. Kenya, Kenya: Institute of Experimental Meteorology
- Obninsk, Russia: National Science Foundation
- Summit, Greenland:
- Tierra Del Fuego, Argentina: Servicio Meteorologico Nacional
- Ulaan Uul, Mongolia: Mongolian Hydromet
- Sede Boker, Israel: Weizmann Institute of Science
- Mt. Waliguan, China: Chinese Academy of Meteorological Sciences
- Ny-Alesund, Svalbard: Norway Meteorological Institute
- Tae-ahn Peninsula, South Korea: Korea-China Centre for Atmospheric Research

****For a complete list of ESRL Sampling Sites and measurement details please see, *'ESRL Sampling Locations'* which can be found under 'Supporting Documents' on the ESRL review web page.****

OTHER INTERNATIONAL PARTNERSHIPS:

ESRL has a variety of Partnerships, Cooperative Agreements and Memorandum of Understandings with agencies in other countries to conduct sampling and other measurements.

- Alfred Wegener Institute, Bremerhaven, Germany: Cooperation in the operation of the WCRP BSRN data archive and various polar aerosol optical depth studies.
- WMO – World Climate Research Program -GEWEX: ESRL provides international management of the WCRP Baseline Surface Radiation Network
- National Institute of Polar Research, Japan: Studies of polar aerosol optical properties
- Environment Canada Meteorological Service : SEARCH, and joint research operations at Alert and Eureka
- National Academy of Sciences, Russia: Cooperation on BSRN site
- Roshydromet, Russia: SEARCH, and establishment of climate monitoring station in Northern Siberia
- World Meteorological Organization, Switzerland : BSRN, GAW, and GCOS activities
- World Radiation Center, Switzerland: Radiometer calibration and characterization studies
- World Climate Research Program, Geneva: BSRN and GEWEX activities
- Bureau of Meteorology, Perth, Australia: Operates a Dobson spectrophotometer under supervision of ESRL

- Leibniz Institute for Tropospheric Research, Leipzig, Germany: Collaborative aerosol measurements at Barrow, joint workshop participation to improve aerosol instruments and measurement methodologies
- Paul Scherrer Institute, Villigen, Switzerland: ESRL hosted a Swiss postdoctoral student in 2006
- German Aerospace Center (DLR), Oberpfaffenhofen, Germany: ESRL hosted a German postdoctoral student in 2005
- Czech Hydrometeorological Institute: Collaboration on calibrations of Dobson instruments
- Centre National de la Recherche Scientifique, France: Operates a Dobson spectrophotometer under supervision of ESRL and University of Reims
- Deutscher Wetterdienst, Germany: Calibrations of Dobson spectrophotometers
- Instituto Nacional de Pesquisas Espaciais (INPE), Brazil: Dobson spectrophotometer calibrations; joint WMO/GAW operations.
- National Institute of Water & Atmospheric Research, New Zealand : Operates a Dobson spectrophotometer under supervision of ESRL
- Servicio Meteorológico Nacional, Argentina: Calibrations of Dobson spectrophotometers
- Servicio Nacional de Meteorología e Hidrología del Perú : Operates Dobson spectrophotometer under supervision of ESRL
- South African Weather Service: Calibrations of Dobson spectrophotometers, aerosol measurements at Cape Point GAW station
- Max Planck Institute for Chemie, Mainz, Germany: TROICA Trans-Siberian Observations into the Chemistry of the Atmosphere
- University of Kiel, Institute fűr Meerskunde, Kiel, Germany: Halocarbon measurements
- China Meteorological Administration, Chinese Academy of Meteorological Sciences (CAMS): Cooperative aerosol measurements at Mt. Waliguan GAW station
- Algerian Meteorological Service, Tamanrasset, Algeria: Operates SURFRAD site, collects carbon cycle flasks
- Brazilian Meteorological Service: Measurements at Bahia GAW station are supported by ESRL
- Indonesian Bureau of Meteorology and Geophysics: Measurements at Sumatra GAW station are supported by ESRL

NON-NOAA REIMBURSABLE SUPPORT

- Texas Commission on Environmental Quality and University of Texas: Air quality and climate research
- National Aeronautics and Space Administration: Research on climate and stratospheric ozone
- State of Maryland: Air quality research
- Department of Energy: Climate, aerosol and air quality research
- State Department: Atmospheric science research
- Environmental Protection Agency: Atmospheric science research

- Department of Interior: Atmospheric science research
- National Science Foundation: Air quality research
- Department of Defense: Air quality and atmospheric science research

COLLABORATION ON NATIONAL AND INTERNATIONAL ASSESSMENTS

Climate

- Intergovernmental Panel on Climate Change
- World Meteorological Organization
- United Nations Environment Programme
- World Climate Research Programme/Stratospheric Processes and their Role in Climate
- International Geosphere-Biosphere Programme /International Global Atmospheric Chemistry project
- International Geosphere-Biosphere Programme /Analysis, Integration, and Modeling of the Earth System project
- U.S. Climate Change Science Program (NASA, EPA, NSF, NRL,USDA, DOE, FAA, DOI, and others)
- National Aeronautics and Space Administration

Stratospheric Ozone

- World Meteorological Organization
- United Nations Environment Programme
- World Climate Research Programme/Stratospheric Processes and their Role in Climate
- U.S. Climate Change Science Program (NASA, EPA, NSF, NRL,USDA, DOE, DOI, FAA, and others)
- National Aeronautics and Space Administration

Air Quality

- NARSTO (U.S.-Canada-Mexico research coordination on air quality)
- International Geosphere-Biosphere Programme /International Global Atmospheric Chemistry project

MAJOR RESEARCH COLLABORATIONS: OTHER NOAA

Climate

- National Environmental Satellite, Data, and Information Service
- Office of Marine and Aviation Operations

Stratospheric Ozone

- National Environmental Satellite, Data, and Information Service
- National Weather Service

Air Quality

- National Weather Service
- Office of Marine and Aviation Operations

RESEARCH COLLABORATIONS: NON-NOAA (Partial List)

Climate

- Environmental Protection Agency
- Laboratory for Atmospheric and Space Physics
- Lawrence Livermore National Laboratory
- National Aeronautics and Space Administration
- National Center for Atmospheric Research
- National Institute of Standards and Technology
- National Science Foundation
- Aerodyne Research Inc.
- Bay Area Environmental Research Institute
- Desert Research Institute
- Droplet Measurement Technologies
- Physical Sciences Inc.
- World Meteorological Organization
- European Commission
- Alfred Wegener Institute for Polar and Marine Research
- Belgian Institute for Space Aeronomy
- Centre National de la Recherche Scientifique
- Centre National d'Etudes Spatiales
- China Meteorological Administration
- DLR Institute of Atmospheric Physics
- Eidgenössische Technische Hochschule
- Environment Canada
- European Centre for Medium-Range Weather Forecasting
- Forschungszentrum Jülich
- French Meteorological Service
- Institut Pierre Simon Laplace
- Japan Meteorological Agency
- Laboratoire d'Aérologie, Toulouse
- Laboratoire des Sciences du Climat et de l'Environnement
- Max-Planck-Institut Hamburg
- Met Office, U.K.
- National Institute for Environmental Studies
- National Institute of Water and Atmospheric Research
- Netherlands Environmental Assessment Agency
- Norwegian Institute for Air Research
- Nordic Envicon Oy
- California Institute of Technology

- Colorado State University
- Denver University
- Duke University
- Harvard University
- Hokkaido University
- Ibaraki University
- Johns Hopkins University
- Keio University
- McGill University
- Pennsylvania State University
- Stanford University
- Technical University of Munich
- Univeristy of California Berkeley
- Universidad Nacional de Autonoma Mexico
- Universite de Pierre et Marie Curie
- University of Alabama Huntsville
- University of Bremen
- University of California Irvine
- University of Cambridge
- University of Colorado Boulder
- University of East Anglia
- University of Edinburgh
- University of Helsinki
- University of Jerusalem
- University of Leeds
- University of Reading
- University of Rhode Island
- University of Toronto
- University of Virginia
- University of Wisconsin
- Valparaiso University
- Weismann Institute

Stratospheric Ozone

- Environmental Protection Agency
- Laboratory for Atmospheric and Space Physics
- Lawrence Livermore National Laboratory
- National Aeronautics and Space Administration
- National Center for Atmospheric Research
- National Institute of Standards and Technology
- National Science Foundation
- Aerodyne Research Inc.
- Bay Area Environmental Research Institute
- Desert Research Institute

- Droplet Measurement Technologies
- Physical Sciences Inc.
- World Meteorological Organization
- European Commission
- Alfred Wegener Institute for Polar and Marine Research
- Belgian Institute for Space Aeronomy
- Centre National de la Recherche Scientifique
- China Meteorological Administration
- DLR Institute of Atmospheric Physics
- Eidgenössische Technische Hochschule
- Environment Canada
- European Centre for Medium-Range Weather Forecasting
- Forschungszentrum Jülich
- French Meteorological Service
- Institut Pierre Simon Laplace
- Japan Meteorological Agency
- Laboratoire d'Aérologie, Toulouse
- Laboratoire des Sciences du Climat et de l'Environnement
- Max-Planck-Institut Hamburg
- Met Office, U.K.
- National Institute for Environmental Studies
- National Institute of Water and Atmospheric Research
- Netherlands Environmental Assessment Agency
- Norwegian Institute for Air Research
- Nordic Envicon Oy
- California Institute of Technology
- Colorado State University
- Denver University
- Duke University
- Harvard University
- Hokkaido University
- Ibaraki University
- Johns Hopkins University
- Keio University
- McGill University
- Pennsylvania State University
- Stanford University
- Univeristy of California Berkeley
- Universidad Nacional de Autonoma Mexico
- Universite de Pierre et Marie Curie
- University of Bremen
- University of California Irvine
- University of Cambridge
- University of Colorado Boulder

- University of East Anglia
- University of Edinburgh
- University of Helsinki
- University of Jerusalem
- University of Leeds
- University of Reading
- University of Toronto
- University of Virginia
- University of Wisconsin
- Weismann Institute

Air Quality

- Brookhaven National Laboratory
- Department of Energy Pacific Northwest Laboratory
- Department of Interior Mineral Management Service\
- DOE Argonne National Laboratory
- DOE Los Alamos National Laboratory
- Environmental Protection Agency
- Federal Aviation Administration
- National Aeronautics and Space Administration
- National Institute of Standards and Technology
- Tennessee Valley Authority
- U.S. Coast Guard
- National Center for Atmospheric Research
- Woods Hole Oceanographic Institution
- Aerodyne Research Inc.
- Los Angeles World Airports
- Volpe National Transportation Systems Center
- DLR Institute for Atmospheric Physics
- Environment Canada
- European Space Agency
- German Aerospace Institute
- Laboratoire d'Aérologie, Toulouse
- Met Service of Slovenia
- Norwegian Institute for Air Research
- Royal Dutch Meteorological Institute
- Baylor University
- California Institute of Technology
- Denver University
- Florida State University
- Fort Hayes State University
- Georgia Institute of Technology
- Harvard University
- Howard University

- Lamar University
- Michigan Tech University
- North Carolina State University
- Oregon State University
- Pennsylvania State University
- Plymouth State College
- Portland State University
- Rice University
- Scripps Institution of Oceanography
- Stanford University
- Texas A&M University
- Texas Tech University
- University of Alabama Huntsville
- University of Bremen
- University of California Davis
- University of California Irvine
- University of California Los Angeles
- University of California Santa Cruz
- University of Central Florida
- University of Colorado Boulder
- University of Houston
- University of Iowa
- University of Leicester
- University of Manchester
- University of Maryland
- University of Massachusetts
- University of Miami
- University of New Hampshire
- University of Rhode Island
- University of Stockholm
- University of Texas
- University of Washington
- Washington State University
- Western Michigan University