



EARTH SYSTEM RESEARCH LABORATORY

Serving Society through Science

Atmospheric Chemistry at ESRL: Introduction and Overview

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Introduction and Overview

- Foci of ESRL research in atmospheric chemistry (*Ravishankara*)
- Interconnections among endeavors (*Ravishankara*)
- Our overall approach (*Ravishankara*)
- Linkages to national and international frameworks (*Butler*)
- Observations and networks (*Butler*)
- Products and services (*Butler*)

How our research is linked to national and international efforts





“Drivers” of our Research

- **Public Laws**
 - Global Change Research Act of 1990
 - Clean Air Act 1990
 - Global Climate Protection Act of 1990
 - Energy Policy Act of 2002
 - Oceans Act 2000
- **International Agreements**
 - U. N. Framework Convention on Climate Change (UNFCCC)
 - Montreal Protocol on Substances that Deplete the Ozone Layer (and subsequent amendments)
 - Group on Earth Observations (GEOSS, GCOS)
 - North American Research Strategy for Tropospheric Ozone (NARSTO)
 - Convention on Long-range Transboundary Air Pollution
- **Interagency Programs and Agreements**
 - Climate Change Science Program (CCSP)
 - Committee on the Environment and Natural Resources (CENR)
 - Memoranda of Understanding between NOAA and EPA



NOAA Mission Requirements

- Improve quantification of the forces bringing about changes in *Earth's climate* and related systems; provide near-term and mid-term decision support information and assessments.
- *Monitor the ozone layer* and ozone depleting gases; understand changes; assess the consequences of changes.
- “Provide information to support effective *air quality* decision-making” and will improve the accuracy of air quality prediction models.



NOAA Strategic Plan

- Climate Mission Goal
 - Desired Outcomes
 - A predictive understanding of climate
 - A climate literate society
 - Programs
 - Climate Observation and Monitoring Program
 - Climate Research and Modeling Program
- Weather and Water Mission Goal
 - Desired Outcomes
 - Reduced loss of life, injury, and damage to the economy
 - Better, quicker, and more valuable weather and water information to support improved decisions
 - Increased customer satisfaction with weather and water information and services
 - Program
 - Air Quality Program



US Climate Change Science Program (CCSP)

- Strategic Plan Framework
 - Atmospheric Composition
 - Carbon Cycle
 - Observing and Monitoring
- Coordination of priorities among agencies
 - Interagency Working Groups
 - Scientific Steering Groups
 - Subcommittees
- Synthesis and Assessment Products
 - North American carbon budget (SAP 2.2)
 - Aerosol properties and their impacts on climate (SAP 2.3)
 - Ozone-depleting substances, ozone layer recovery, and ultraviolet radiation (SAP 2.4)

Committee on Environment and Natural Resources (CENR)

- Subcommittee on Air Quality Research
- Subcommittee on Ecological Systems
- Subcommittee on Toxics and Risk Assessment
- Subcommittee on Natural Disaster Reduction
- Subcommittee on Water Availability and Quality
- Interagency Working Group on Earth Observations
- Subcommittee on Oceans
- Interagency Working Group on Dioxins





International Linkages

(Examples)

- World Meteorological Organization (WMO/GAW)
- World Climate Research Programme (SPARC, GEWEX)
- United Nations Environment Programme
- International Geosphere-Biosphere Programme (IGAC, AC&C, SOLAS, et al.)
- Global Climate Observation System (GEOSS-GCOS, AOPC)
- Network for Detection of Atmospheric Composition Change (NDACC)

Observations and Networks



NOAA ESRL Baseline Observatories

Mauna Loa, Hawaii



Summit, Greenland



South Pole, Antarctica



Cape Matatula, American Samoa



Trinidad Head, California

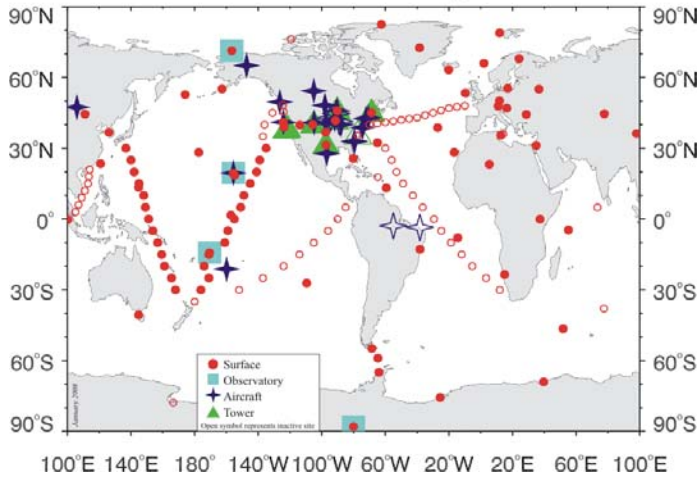


Pt. Barrow, Alaska



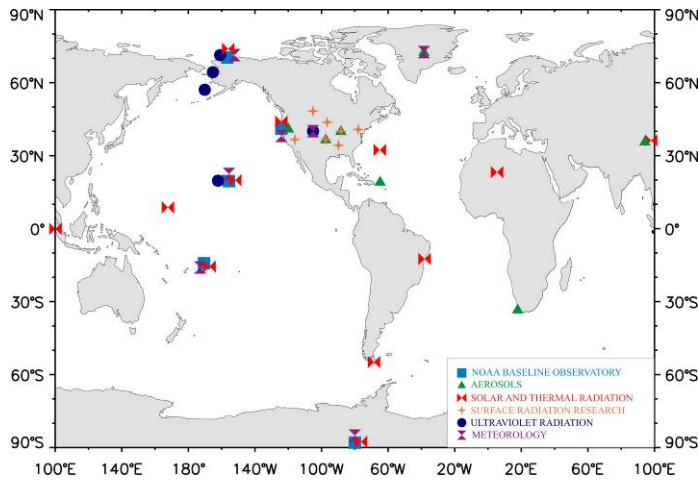
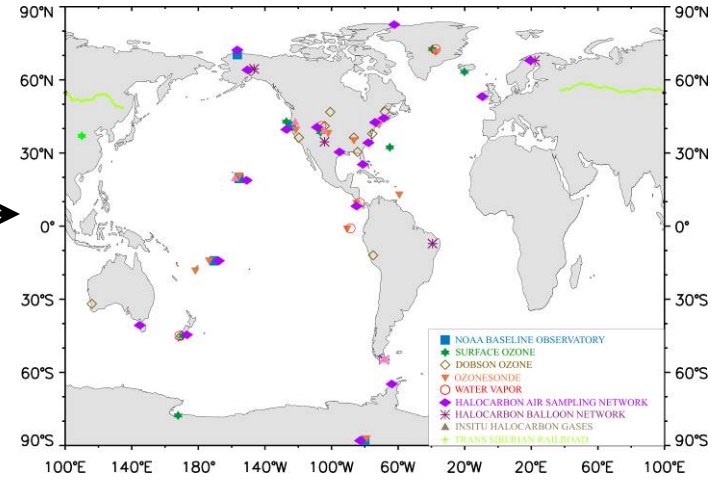
NOAA/ESRL Observing Networks

2008 Measurement Programs



← Carbon Cycle

Halocarbons and Ozone

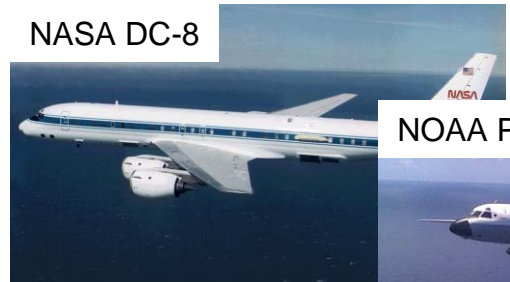


← Aerosols, Radiation

Private
Light Aircraft



NASA DC-8



NOAA P3



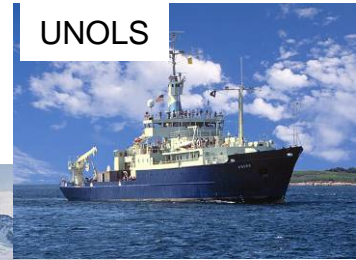
NASA WB-57



NOAA



UNOLS



Int'l



DOE Cessna



DOE G-1

Aircraft

Sampling Platforms

Ships



Cooperative
sampling
sites



Surface

Tall Towers



What we produce from our research





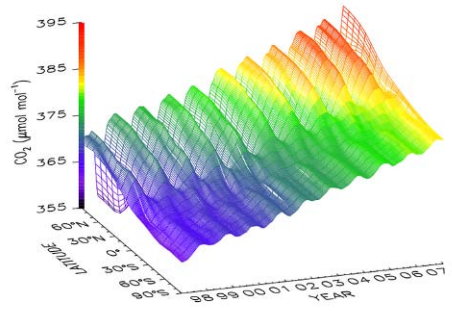
Types of Products from ESRL Research

- Publications: > 740 publications in refereed literature between 2004 and 2007.
- Assessments
 - IPCC Assessment Reports
 - Ozone Assessments
 - CCSP Assessments
 - Air Quality Assessments
- Data products and services
 - On line at ESRL
 - US Data Centers
 - World Data Centers
 - Model Data Evaluation Archives
 - International Initiatives, Programs, Bulletins



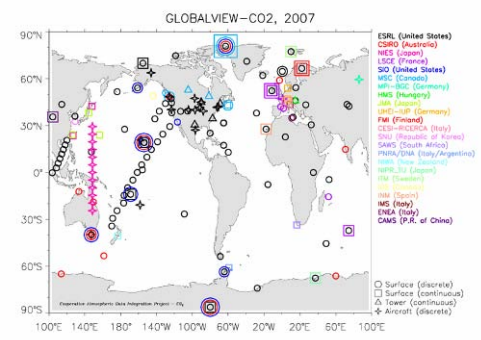


Data sets & Visual displays



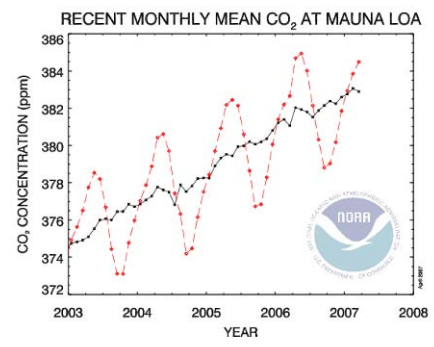
Emission Maps

Globalview

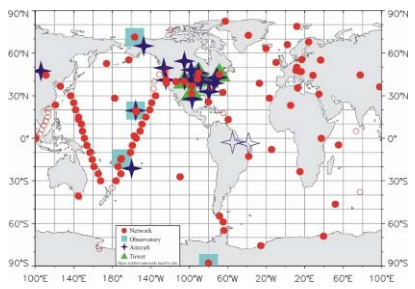


NOAA/ESRL
On-line
products

Global trends

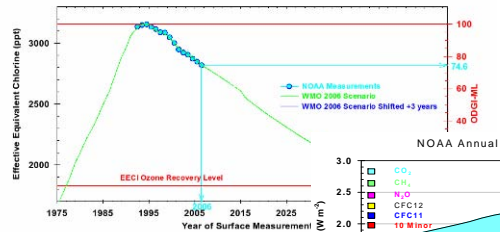


IADV

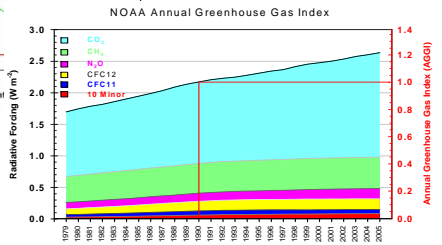


ODGI

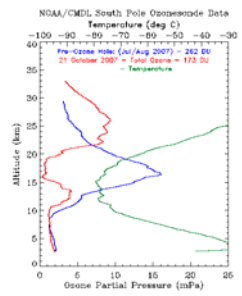
NOAA Midlatitude Ozone Depleting Gas Index (ODGI-ML)



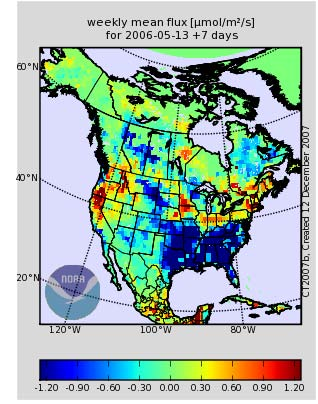
AGGI



Ozone Hole Visualization



Carbon Tracker



Assessments

- Our contributions to Assessments are the highest level product for our research:

- Provide evaluations and syntheses of the most recent research
- Operate at the interface of science and policy, providing policy-relevant information



- IPCC Assessments

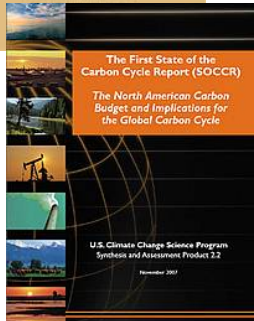
- Inform nations through UNFCCC on climate and climate change mitigation
 - Significant vehicles for educating global society on climate change

- Ozone Assessments

- Inform nations through the Vienna Convention on the Ozone layer
 - Resulted in significant amendments to the Montreal Protocol
 - Led to acceleration of production phaseouts, most recently HCFCs

- CCSP Synthesis and Assessment Reports

- Provide US policy-makers with climate-relevant information





Summary

- Comprehensive, high-quality, global and regional research
- Driven by national and international policies
- Well coordinated with other national and international institutions
- Productive and relevant





Review Agenda

- Stratospheric ozone (*Solomon, Hofmann, et al.*)
- Carbon dioxide, methane, and climate forcing (*Tans, Butler, et al.*)
- Regional air quality (*Fehsenfeld, Meagher, et al.*)
- Non-CO₂ climate gases (*Fahey, Elkins, et al.*)
- Aerosols and climate (*Ogren, Murphy, et al.*)
- Chemical transformation and long-range transport (*Parrish, Schnell, et al.*)