



Atmospheric Chemistry, Carbon Cycle and Climate (AC4) Program

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NOAA/OAR Climate Program Office

INTRODUCTION

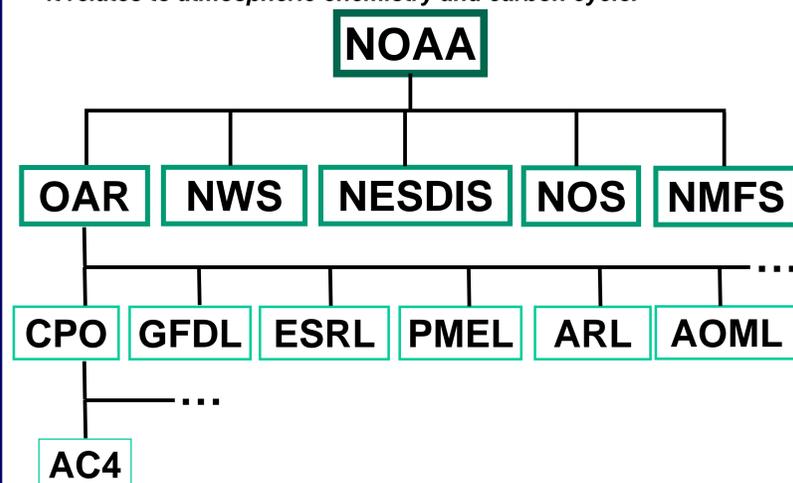
Program goal: Determine the processes governing atmospheric concentrations of greenhouse gases and aerosols in the context of the Earth System and Climate.

AC4 is a competitive research program formed in Fiscal Year 2013 that incorporates research on atmospheric chemistry and carbon cycle. The program aims to provide a process-level understanding of the climate system through observation, modeling, analysis, and field studies to support the development and improvement of models and ultimately predictions.

In collaboration with NOAA Laboratories and academic community, AC4 program and its direct predecessor programs have traditionally supported research on chemically active greenhouse gases, aerosols, their precursors, aerosol-cloud interactions in connection with field studies, as well as research on atmospheric and oceanic components of carbon cycle, including ocean biogeochemistry and ocean acidification.

ORGANIZATIONAL STRUCTURE

NOAA is organized into five Line Offices, most of them of operational nature such as the Weather Service (NWS). Research at NOAA is performed in the Office of Oceanic and Atmospheric Research (OAR). AC4 program is part of OAR, under Climate Program Office (CPO). Also in OAR there are several NOAA Laboratories that perform atmospheric chemistry and carbon cycle research. These laboratories are Geophysical Fluid Dynamics Laboratory (GFDL), Earth System Research Laboratory (ESRL), Pacific Marine Environmental Laboratory (PMEL), Air Resources Laboratory (ARL), and Atlantic Oceanographic & Meteorological Laboratory (AOML). Below is an abbreviated organizational chart as it relates to atmospheric chemistry and carbon cycle.



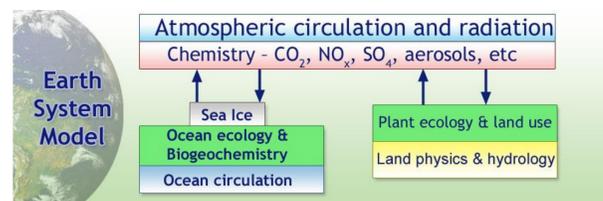
NWS: National Weather Service
 NESDIS: National Environmental Satellite, Data, and Information Service
 NOS: National Ocean Service
 NMFS: National Marine Fisheries Service

CURRENT SCIENTIFIC FOCI

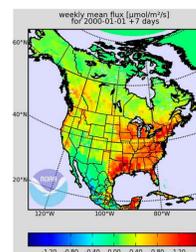


Aircraft, ship and tall tower: three of NOAA's research platforms

- Improve the diagnosis and attribution of sources and sinks of aerosols and greenhouse gases through increased efforts in **synthesis of data**, especially focusing on areas revisited in **NOAA field campaigns** (e.g. West Coast US, South-East US, Arctic)
- Through national and regional **field measurements** and modeling, quantify the interaction between anthropogenic and biogenic emissions, determine the pathways for aerosol production and ageing (including aerosol-cloud interactions), and quantify aerosol radiative properties

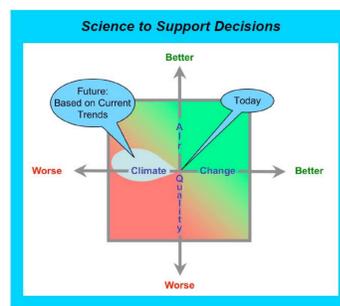


Schematic of NOAA/GFDL Earth System Model; a map of fluxes provided by CarbonTracker



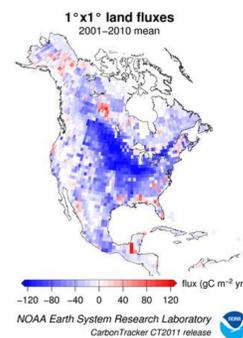
- Improve coupling of atmosphere, ocean and land components in **Earth System Models** with a particular initial emphasis on the nitrogen cycle
- Reduce uncertainty on North American CO₂ flux estimates in **CarbonTracker** through improved techniques in data assimilation to better quantify the North American CO₂ budget
- Quantify greenhouse gas fluxes in areas of increasing emissions (**urban environments**, and **oil and gas fields**) by conducting targeted observations and modeling

RESEARCH HIGHLIGHTS



CalNex field campaign took place May-July 2010 in and off the coast of California. The study emphasized the interactions between air quality and climate. In collaboration with California Air Resources Board (CARB) and California Energy Commission (CEC), NOAA scientists and their academic partners made atmospheric chemistry relevant measurements via aircraft, ship and ground sites. The findings of the study will also inform policy decisions in California.

CarbonTracker is an assimilation system that produces quantitative estimates of atmospheric carbon uptake and release for North America and the rest of the world that are consistent with observed patterns of CO₂ in the atmosphere. The newest release of CarbonTracker ("CT2011") uses multiple models to explicitly estimate the influence of first-guess fluxes on the final result. CarbonTracker is intended to be a tool for the community, and feedback and collaboration from anyone interested are welcome.



PARTNERSHIPS

Working towards fulfilling NOAA's mission, AC4 program partners with a number of scientific entities to work on field campaigns, joint solicitations, research projects, conferences and workshops. Some of AC4 partners include:

- NOAA OAR Laboratories
- Academia
- Private Sector
- Other Federal Agencies, Interagency Groups, (such as US Global Change Research Program)
- Interagency and International Programs, e.g. NACP, IGAC
- Other NOAA Line Offices
- Scientific Organizations, e.g. Gordon Conference, SOLAS



SUBMITTING AND REVIEWING PROPOSALS

Program announcement: AC4 typically issues a program announcement on an annual basis; research priorities are announced in the summer, with Letters of Intent due several weeks later and full proposals due 90 days later.

Proposal review: AC4 conducts both mail and panel reviews. Many community members are involved in the review process, and relevant volunteer reviewers are always welcome.

Contact: Please contact Monika Kopacz or Kenneth Mooney to be included on the AC4 email list to hear about upcoming solicitations or to volunteer to review proposals.

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REFERENCES

AC4 program website:
<http://cpo.noaa.gov/ClimatePrograms/EarthSystemScienceESS/AtmosphericChemistryCarbonCycleClimate.aspx>

Climate Program Office (CPO)
www.climate.noaa.gov

Carbon Cycle Science Plan:
<http://www.carboncyclescience.gov/USCarbonCycleSciencePlan-August2011.pdf>

NOAA CalNex field study
<http://esrl.noaa.gov/csd/projects/calnex/>

CarbonTracker: CarbonTracker.noaa.gov

NOAA's Next Generation Strategic Plan
<http://www.ppi.noaa.gov/ngsp/>

US Global Change Research Program
<http://www.globalchange.gov/>

