



The Cooperative Global Air Sampling Network Newsletter

Greetings to our cooperating partners and network affiliates! We would like to welcome the newest additions to the global network: Valladolid, Spain; Shangdianzi, People’s Republic of China; Cape Point, South Africa; Dongsha Island, Taiwan; and Pacific Celebes, Pacific Ocean.

The attached figure shows a three-dimensional, smoothed representation of the variation of atmospheric carbon dioxide (CO₂) with latitude and time for the period 2000-2009. The monthly mean CO₂ data for your site are shown in the inset, and the latitude band for your site is highlighted in red in the “flying carpet.” This figure summarizes significant

features of the distribution and variations of atmospheric CO₂: annual mean CO₂ concentrations are 3-4 ppm higher in the Northern Hemisphere where emissions from fossil fuel combustion are greatest; strong seasonality in the Northern Hemisphere is due to photosynthesis (CO₂ uptake) and respiration (CO₂ release) by plants on land; seasonality in the Southern Hemisphere is much smaller and opposite in phase to the north; the long term increase is essentially the same at all latitudes due to the long lifetime of CO₂ and mixing of CO₂ throughout the atmosphere. Thousands of samples collected by all of you were used to make this figure.

ESRL Carbon Cycle Greenhouse Gases Group

The NOAA ESRL Carbon Cycle Greenhouse Gases (CCGG) Group makes ongoing discrete flask measurements from land and sea surface sites and small aircraft, and continuous measurements from baseline observatories and tall towers. These measurements document the spatial and temporal distributions of carbon-cycle gases and provide essential constraints to our understanding of the global carbon cycle.

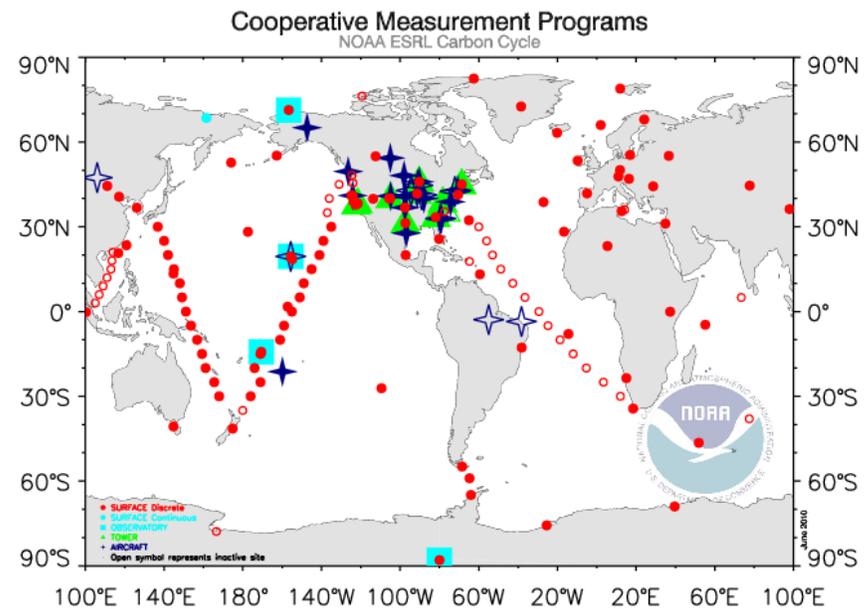
The Cooperative Global Air Sampling Network began in 1967 at Niwot Ridge, Colorado. Today, the network is an international effort that includes discrete samples from 65 cooperative fixed sites and 2 commercial ships. Air samples are collected approximately weekly and returned to Boulder for measurement.

The Aircraft Measurement Program started in 1992 in Northern Colorado. There are now 16 sites located throughout the United States, Canada, and the Cook Islands. These data are used to construct vertical profiles and time series grouped by altitude, which helps estimate carbon sources and sinks.

NOAA ESRL GMD Baseline Observatories include: Barrow, Alaska;

Mauna Loa, Hawaii; American Samoa; and South Pole, Antarctica. Measurements from these stations are far from pollution sources and help establish background concentrations for the gases of interest. These observatories are hosts to numerous cooperative research projects from around the world.

ESRL’s CCGG group began making measurements from tall towers in the 1990s to extend long-term carbon-cycle gas monitoring to continental areas. Existing television, radio, and cell phone towers are utilized as platforms for in-situ and flask sampling. This provides regionally representative measurements of CO₂ and related gases in the continental boundary layer.



The NOAA ESRL Carbon Cycle Group collects samples at 4 baseline observatories, 9 tall tower sites, 16 small aircraft sites, 2 commercial ships, and 65 surface sites.



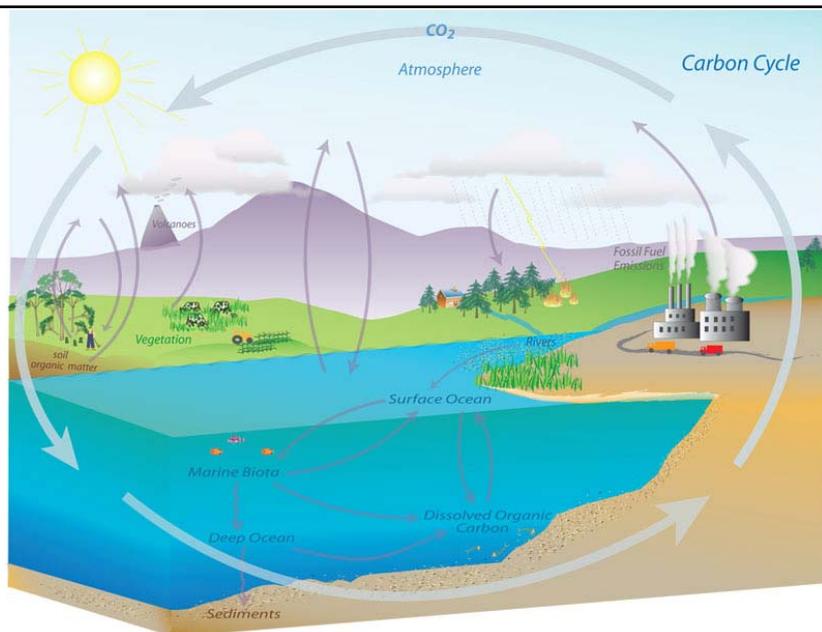
Sampling Tips

- **Please send back broken flasks** - most can be repaired and parts can be reused.
- **Please use the flasks in the order you receive them (oldest ones first)** - this will help keep our records up to date and your site supply accurate.

What is the Carbon Cycle?

Of the greenhouse gases, CO₂ is of greatest concern because it contributes the most to the greenhouse effect and climate change. For this reason, scientists (at NOAA and elsewhere) have been studying this molecule carefully and attempting to quantify its abundance in the atmosphere in order to track how and why it changes. The CO₂ molecule is involved in a complex series of processes called the carbon cycle, where the carbon atom within the molecule moves between many different natural reservoirs (i.e. the terrestrial biosphere, the atmosphere, and the oceans). As carbon is transferred between reservoirs, processes that release CO₂ into the atmosphere are called sources, and processes that remove CO₂ from the atmosphere are called sinks.

Carbon is continuously exchanged and recycled among the reservoirs through natural processes. These processes occur at various rates ranging from short-term fluctuations, which occur daily and seasonally, to very long-term cycles, which occur over hundreds of millions of years. For example, there is a clear seasonal cycle in atmospheric CO₂ as plants photosynthesize during the growing season, removing large amounts of CO₂. Respiration from both plants and animals and decomposition of leaves, roots, and organic compounds release CO₂ back into the atmosphere. On a scale spanning decades to centuries, CO₂



levels fluctuate gradually between the ocean and atmospheric reservoirs as ocean mixing occurs between surface and deep waters and the surface waters exchange CO₂ with the atmosphere. Much longer cycles occur, on the scale of geologic time, due to the deposition and weathering of carbonate and silicate rock.

Measuring CO₂ and understanding the carbon cycle has become increasingly important over the last few decades due to climate change. Because of all your efforts we are able to track and document the long-term trends of CO₂ and other greenhouse gases. Thank You!

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Interested in learning more about GMD's projects? Check out these Web links:

GMD home page: www.esrl.noaa.gov/gmd

CCGG home page: www.esrl.noaa.gov/gmd/ccgg

Cooperative Air Sampling Network: www.esrl.noaa.gov/gmd/ccgg/flask.html

Interactive Data Visualization: www.esrl.noaa.gov/gmd/ccgg/iadv