



## The Cooperative Global Air Sampling Network Newsletter

Greetings to our cooperating partners and network affiliates. Thank you for another great year of greenhouse gas monitoring!

The attached figure shows the sampling frequency at your site for 2010 and 2011. The statistics on the plot are based on the goal for your location (e.g., weekly, biweekly). Most of you are close to the target and we appreciate your conscientious effort to attain good temporal coverage.

Please note that if there were equipment or logistical problems at your site during this time period that resulted in loss of samples, it will affect the statistics. Also, those sites from which we have not received all of the 2011 samples yet will have inaccurate statistics on the plot. Please let us know if we can help in some way to maximize good samples taken at the target frequency (our e-mail address is [ccgflask@noaa.gov](mailto:ccgflask@noaa.gov)).

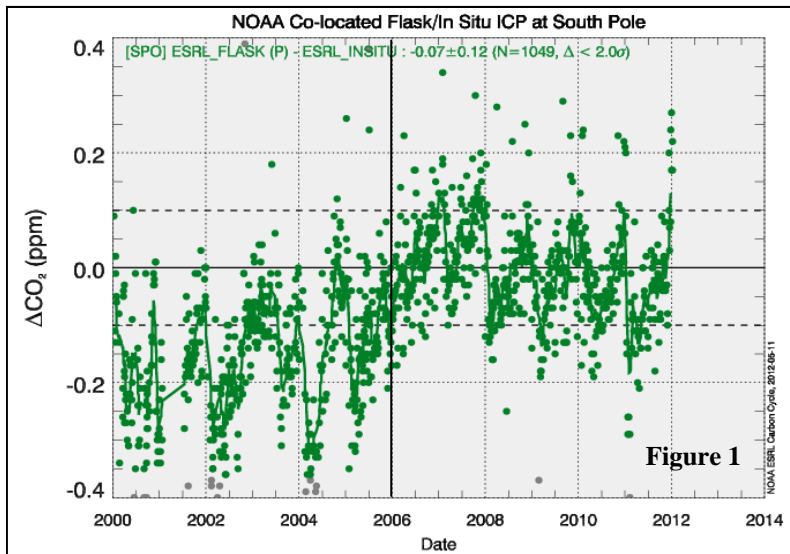
### Intra- and Inter-Laboratory Comparisons

NOAA's Carbon Cycle Greenhouse Gases (CCGG) Group measures discrete (flask) and quasi-continuous (in situ) samples from surface sites, aircraft flights, and tall towers. To make sure our different collection and measurement techniques are internally consistent, we perform regular internal comparisons (intra-laboratory). These comparisons include flasks and cylinders on our measurement instruments, flasks and in situ measurements at our observatories and tall towers, and co-located flasks at our observatories.

Figure 1 shows a comparison of carbon dioxide ( $\text{CO}_2$ ) from flasks and in situ measurements co-located at South Pole. From 2000-2005 the average agreement is  $-0.15 \pm 0.12$  ppm indicating the in situ measurements are higher than the flask measurements. Starting in 2006, the agreement improves to  $-0.01 \pm 0.08$  ppm.

CCGG also participates in comparisons with other labs around the world to assess the quality of our data (inter-laboratory). One example is the comparison at Alert, Canada (ALT). Weekly flask pairs are collected in NOAA flasks at ALT and then sent to Environment Canada (EC) in Downsview, Ontario. EC measures one member of the pair on their instrument and then ships the complete pair of flasks to NOAA's lab in Boulder, Colorado. NOAA measures both flasks in the pair and the results from NOAA and EC are shared. Figure 2 shows the same-air comparison at ALT for  $\text{CO}_2$ . Even though the agreement between the two labs is very good ( $-0.01 \pm 0.08$  ppm), we do see a shift in late 2009 indicating a change in the comparison.

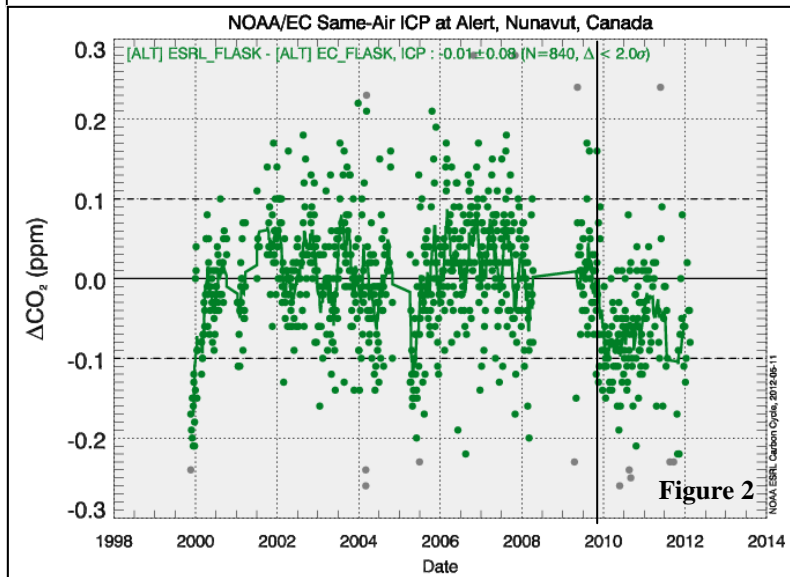
Intra- and inter-laboratory experiments are an important step in quality assurance of the CCGG data. By comparing independent atmospheric measurements of the same sample, or samples that are co-located, we can find and diagnose collection or measurement problems quickly.



**Figure 1:** NOAA intra-laboratory comparison of flasks and in situ measurements of  $\text{CO}_2$  co-located at South Pole (above).

**Figure 2:** NOAA and EC inter-laboratory, same-air  $\text{CO}_2$  comparison at Alert, Nunavut, Canada (below).

(The dashed lines indicate the WMO recommended level of agreement.)



**Figure 2**



### Sampling Tips

- Please send back broken flasks and parts - 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.

### Niwot Ridge / Mountain Research Station

NOAA's Carbon Cycle Greenhouse Gases (CCGG) Group started sampling air for carbon dioxide (CO<sub>2</sub>) measurements at Niwot Ridge (NWR) in 1968. NWR is in the University of Colorado Mountain Research Station (MRS) study area, ~35 km west of Boulder, Colorado, USA. This site lies above tree line at an elevation of approximately 3500 m and consists of alpine tundra, glacial lakes, and permafrost (Picture 1). NWR is part of the Roosevelt National Forest and has been designated a Biosphere Reserve by the United Nations Education, Scientific and Cultural Organization (UNESCO) and an Experimental Ecology Reserve by the U.S. Department of Agriculture Forest Service.

This valuable NWR CO<sub>2</sub> data set, spanning almost 45 years, shows a pronounced seasonal cycle (red) and a long-term trend (blue) increasing from ~322 ppm in the late 1960s to ~393 ppm at present (Figure 3). These data also provide insight on continental carbon exchange.

Obtaining this long record at a remote location requires some effort. An unimproved road takes station personnel to a gate within a few kilometers of the site.

The last stretch from the gate is done on foot, snowmobile, or skis depending on the season. CCGG flasks are sampled every Tuesday and carried to and from the site in a large backpack. Site staff also deploy CCGG's programmable flask packages (PFPs) at NWR, which are controlled remotely to take samples almost daily. The PFPs are measured for the same set of greenhouse gases as the 2.5 L network flasks.

The MRS is staffed daily to support projects from several different institutions. Research topics include ecology, atmospheric science, hydrology, and geomorphology. For more information on NWR and the MRS please visit the links below.

[culter.colorado.edu/NWT/](http://culter.colorado.edu/NWT/)

[www.colorado.edu/mrs/](http://www.colorado.edu/mrs/)

[www.esrl.noaa.gov/gmd/dv/site/site.php?code=NWR](http://www.esrl.noaa.gov/gmd/dv/site/site.php?code=NWR)



Picture 1

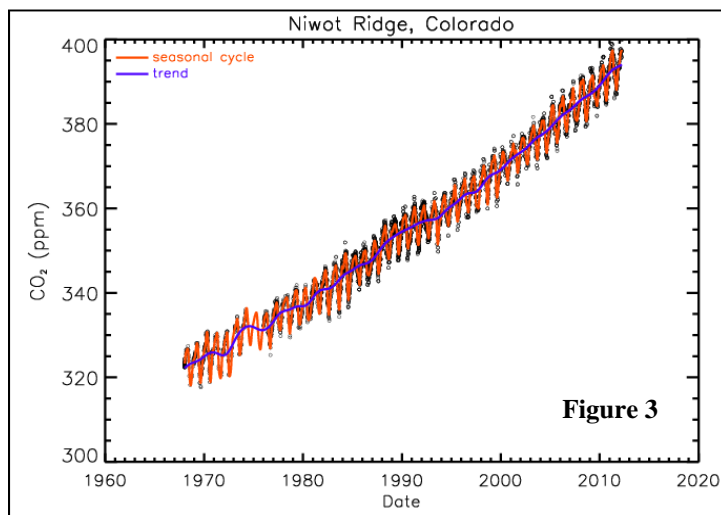


Figure 3

**Picture 1:** CCGG's Niwot Ridge, Colorado (NWR) air sampling site (left).

**Figure 3:** Carbon dioxide measurements from NWR showing the seasonal cycle in red and the trend in blue (above).

#### Interested in learning more about us? Check out these Web links:

GMD home page: [www.esrl.noaa.gov/gmd](http://www.esrl.noaa.gov/gmd)

CCGG home page: [www.esrl.noaa.gov/gmd/ccgg](http://www.esrl.noaa.gov/gmd/ccgg)

Cooperative Network: [www.esrl.noaa.gov/gmd/ccgg/flask.html](http://www.esrl.noaa.gov/gmd/ccgg/flask.html)

Interactive Data Visualization: [www.esrl.noaa.gov/gmd/ccgg/iadv](http://www.esrl.noaa.gov/gmd/ccgg/iadv)

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