LARGE SCALE TEMPORAL AND SPATIAL GRADIENTS OF CO_2 AS DERIVED FROM THE NOAA/ESRL AIRCRAFT PROFILES

S.E. Peterson[2], C. Sweeney[2], D.W.Guenther[2], E.J. Dlugokencky[1], K.A. Masarie[1], P.M. Lang[1], and M.J. Heller[2]

[1]NOAA Earth System Research Laboratory, 325 Broadway, Boulder, CO 80305

[2]Cooperative Institute for Research in Environmental Sciences, University of Colorado, UCB 216, Boulder, CO 80309-0216; Sarah.Peterson@.noaa.gov

To assess the impacts of fossil fuel combustion on atmospheric composition and climate, Dave Keeling began measurements of CO_2 at the Mauna Loa Observatory in 1957. While such measurements are still useful in quantifying the atmospheric burden of CO_2, other measurement strategies are necessary to determine the fate and source of fossil-derived CO_2. To address this need the NOAA/ESRL GMD Carbon Cycle Greenhouse Gases Group created the aircraft sampling network in 1992. Currently this network consists of 20 aircraft sites primarily located in North America. The air samples collected are analyzed in Boulder, Colorado for CO_2, CO, H_2, N_2O, SF_6, and CH_4 as well as halocarbons and the isotopic ratio of CO_2. In this study we examine the spatial and temporal variability of CO_2 throughout a climatological year. The seasonal drawdown in CO_2 over the summer and build up in the winter persists at all sites. A general increase in the amplitude of the boundary layer CO_2 seasonal signal occurs as the air mass moves from west to east. The most dramatic summertime drawdown in the mid-continent arises from the intense agricultural growth in that region. Relative to the Mauna Loa site, East coast sites show a persistent positive offset in CO_2 concentrations due to fossil fuel input in the Midwest and East coast. The fossil fuel contribution is assessed based on concentration difference between Mauna Loa CO and SF_6 at each North American site.

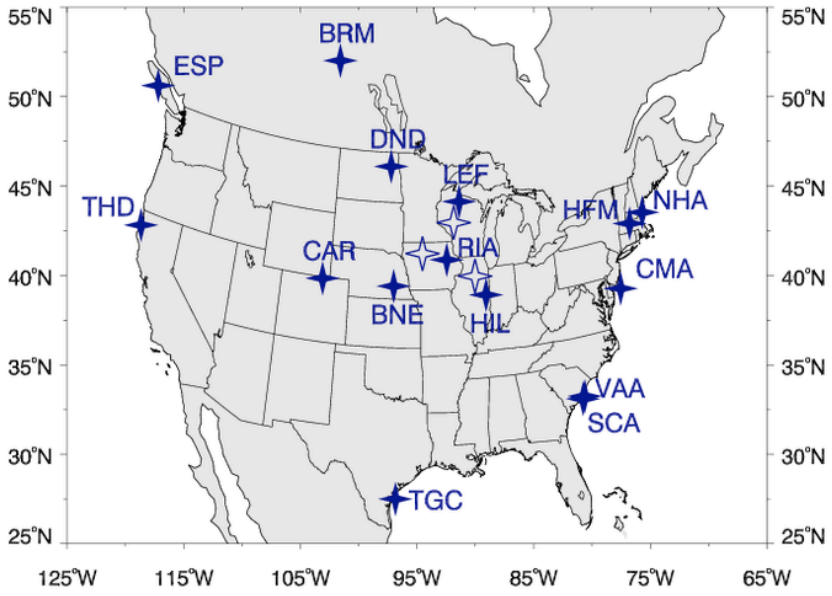

Fig. 1. This figure shows the current locations of the NOAA/ESRL/GMD Carbon Cycle Greenhouse Gases Group aircraft sites located in North America. The solid symbols indicate small aircraft sites and the open symbols represent other sampling strategies.