Looking Down the Tail Pipe of North America: A Case Study for the Use of Offshore Towers to Constrain the North American Carbon Budget

C. Sweeney[1], T. Newberger[2], W.R. McGillis[2], A. Hirsch[1], A. Andrews[3], A. Jacobson[1], K. Masarie[3], W. Peters[1,4], and P. Tans[3]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309; 303-497-4771, Fax: 303-497-6290, E-mail: Colm.Sweeney@noaa.gov
[2]Lamont-Doherty Earth Observatory, Columbia University, New York, NY 10027
[3]NOAA Earth System Research Laboratory, Boulder, CO 80305
[4]Wageningen University and Research Center, Wageningen, 6708 PB, The Netherlands

Prevailing West to East winds across the North American continent suggest that differences in atmospheric carbon dioxide concentrations between air coming onto the West Coast and the air leaving the East Coast will provide a unique constraint on the North American carbon budget. In pursuit of this constraint it has been proposed that a fence comprised of aircraft and tower sites be placed around the perimeter of North America. The offshore tower is particularly appealing as a "fence post" because the local influence of the surrounding water is very small relative to the synoptic influence of air masses coming either from distant land sources and sinks or wide fetch of the ocean. This analysis looks at recent data collected from a 30-m tower off the South coast of Martha's Vineyard and foot prints from Lagrangian Particle Dispersion Models (LPDMs), as well as direct comparisons with Carbon Tracker to determine how synoptic the measured signals are.

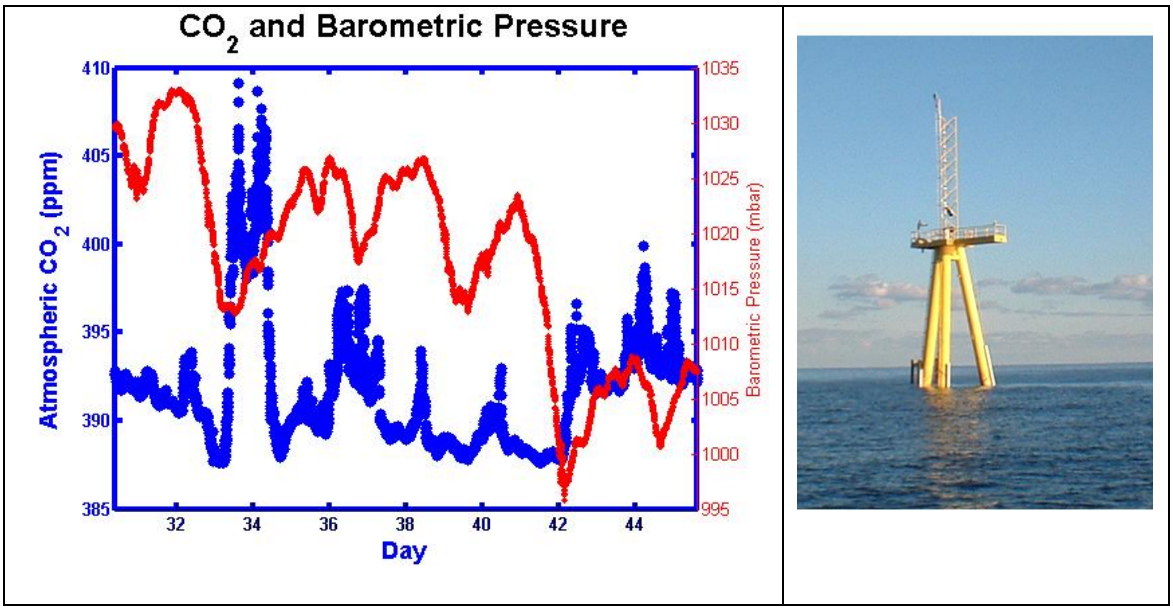

Figure 1. Carbon Dioxide and Barometric Pressure at Martha's Vineyard Observatory (MVO), 3.5 km South of Martha's Vineyard, MA. CO_2 mixing ratio (blue, mole/mole ratio) and barometric pressure measured at 10 m above sea level (red, mbar). The MVO tower mast stands approximately 30 m above the water (15 m depth).