

Tall Tower and Aircraft Measurements of Carbon Dioxide: Prospects for the North American Carbon Program (NACP)

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For over 10 years, we have monitored carbon dioxide mixing ratios over North America from tall (up to 600 m) transmitter towers (e.g., Figure 1) and aircraft (up to 8 km). The data, though sparse, give a measure of the temporal and 3-D spatial variability of CO₂ over the continent. Analysis of these data suggests ways in which measurements from a more extensive network of sites, such as is envisioned for the NACP, could be used to estimate net CO₂ surface fluxes on a regional scale (i.e., roughly one million square kilometers). We also evaluate the use of mixing ratio data from short (30-100 m) towers for regional flux estimates. Short towers are widely used for local-scale (a few hectares) measurements of atmosphere-surface exchange of CO₂ (FLUXNET). The results indicate that measurements of CO₂ mixing ratios at continental tower sites can be used to constrain estimates of regional CO₂ fluxes. However, at present, CO₂ mixing ratios are measured with sufficient accuracy relative to global reference gas standards at only a few continental sites.



Figure 1. Photo showing a 447-m-tall television transmitter tower in northern Wisconsin, which CMDL uses to measure CO₂ mixing ratios up to 400 m above the ground. The atmospheric boundary layer (ABL) depth is approximated by the cloud base. In this poster we discuss the budget of CO₂ within the ABL.