Evaluation of Simulated Atmospheric (CO_2) Using Analyzed Climate, Transport and Satellite Vegetation

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We have run Colorado State University's Simple Biosphere Model (SiB) and Goddard Space Flight Center's Parameterized Chemical Transport Model (PCTM) in a step-wise coupled fashion, both driven by assimilated meteorological fields from the NASA Goddard - EOS Data Assimilation System (GEOS-4), for the year 2000. Comparing the resulting [CO_2] and CO_2 flux field outputs with observations taken from flasks, continuous analyzers and aircraft campaigns (e.g., COBRA), we can diagnose model strengths and weaknesses on various spatial and temporal scales. An example of such a comparison is shown in Figure 1. In addition, we are evaluating planetary boundary layer mixing, since this critical component of atmospheric transport and CO_2 measurement is likely to be an important consideration in understanding the models' performance.

By carefully considering these strengths and weaknesses, together with driver data accuracy and "background flux" limitations (such as a static fossil fuel emissions field for 1990), we attempt to gain insight into the underlying mechanisms as well as generate a global [CO_2] field with associated uncertainties in order to improve the performance of inversion studies and regional simulations.

Note that by using surface meteorology from a self-consistent source (GEOS-4) to drive biosphere CO_2 fluxes, winds, planetary boundary layer turbulence and convective transport, we are allowing the models to “act in concert” as both CO_2 flux and transport are influenced by identical forcings.

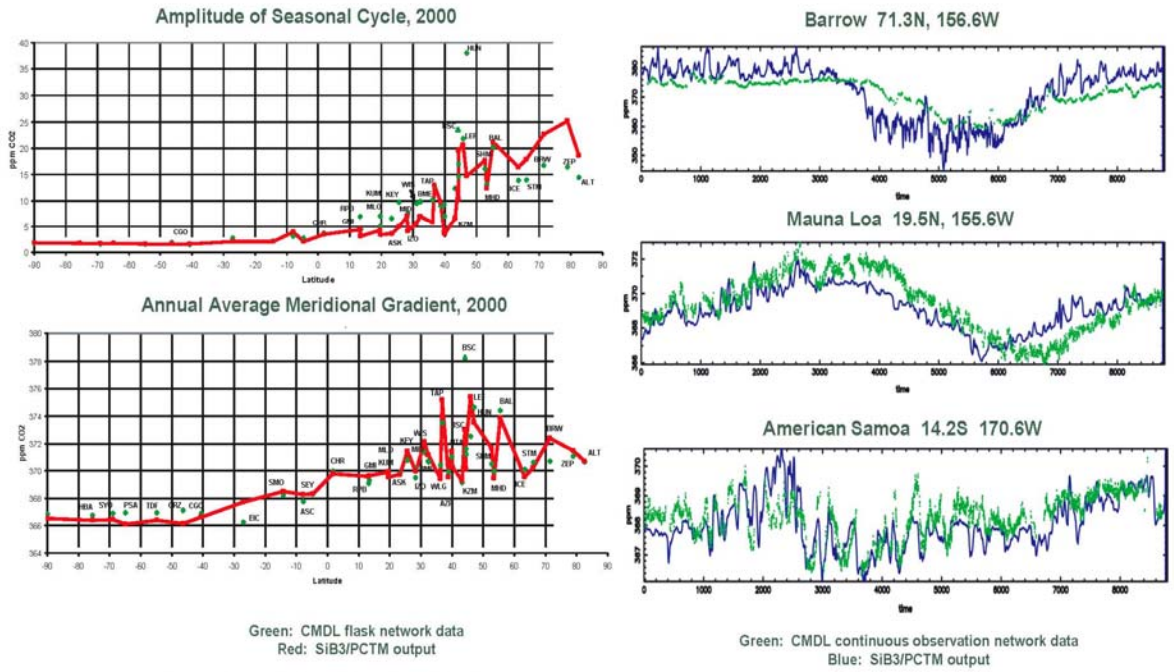

Figure 1. Illustration of a comparison of SiB3-PCTM output with CMDL flask and continuous measurements for 2000.