

Global Carbon Flux Estimates from 1980 to 2001

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Carbon dioxide flux estimates were calculated using a transport model and a state-of-the-art inverse technique. The computational efficiency of the inverse technique and the relatively low resolution and simplicity of the transport model allow for a total of 21 years of carbon flux estimates to be made using assimilated wind fields that vary interannually. Assimilated meteorology from the European Centre for Medium-Range Weather Forecasts (ECMWF) was used for 1980 through 1992, and fields from the National Centers for Environmental Prediction (NCEP) were used for 1983 through 2001. The GLOBALVIEW-CO₂ data product through 2001 was used to constrain the inversion, along with prior flux estimates from ocean flux observations and satellite observations of greenness. The results indicate the importance of considering interannual variability in transport. In addition, it appears that differences between the two assimilated wind products also affect the partitioning of carbon flux between the land and the oceans. Figure 1 is for an inversion relatively unconstrained by prior information. Shown are annual average flux estimates.

Plans for the North American Carbon Program include relatively dense sampling of temperate North America. Pseudodata were calculated using a forward transport model and assumed fluxes in an inversion in order to assess the possible impact of future networks on carbon flux estimates. The results suggest that errors for northern hemisphere land regions may be reduced by roughly a factor of two by the additional observational constraints on the North American carbon budget.

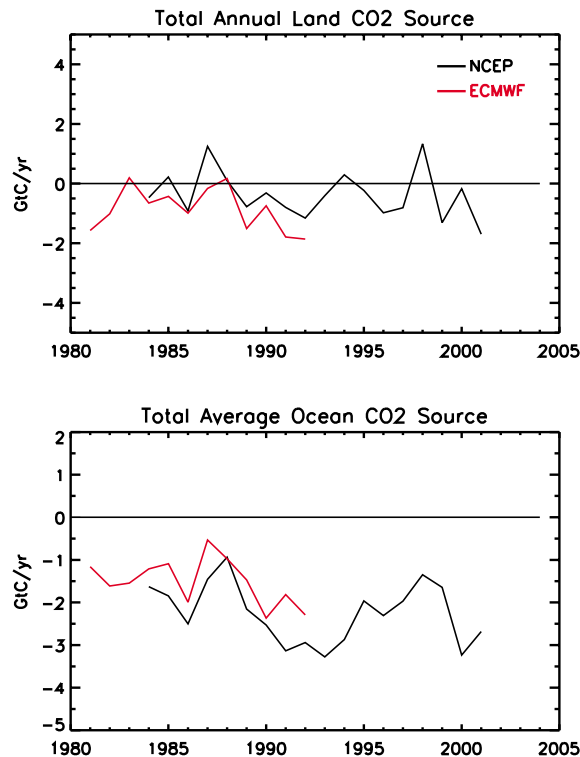


Figure 1. CO₂ flux estimates using Transport Model 3 (TM3), NCEP and ECMWF reanalysis meteorological fields, and smoothed CO₂ observations from GLOBALVIEW.