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Seasonal Air-sea CO_2 Fluxes in a Global Ocean Inverse Model

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We investigate CO_2 uptake by the ocean with a three dimensional global inverse ocean model.

The new approach lies in the calculation of spatially and temporally varying air-sea fluxes by assimilating water column carbon data, avoiding difficulties with changing gas-transfer velocities and their wind-speed dependencies. The model includes biological production near the surface and export particle remineralization below. Production and downward particle fluxes vary monthly following SeaWiFS chlorophyll data. Monthly DIC and DOC values are simulated. Starting air-sea fluxes are from Takahashi (2002).

GLODAP DIC data are assimilated using the adjoint method, and CO_2 air-sea fluxes are modified by the model until agreement with DIC data is optimal. In the present stage we are able to reduce DIC misfits by around 50%. The optimal air-sea fluxes are similar to those proposed by Takahashi. Differences are in larger flux-amplitudes and in the northern hemisphere.