Global Reconciliation of Land, Ocean, and River Carbon Fluxes

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Disparities and uncertainties in the sinks for carbon on land are tied to uncertainties in the magnitude and the north-south distribution of ocean and river carbon fluxes. We use a new observational constraint based on ocean heat transport and its tight link to ocean carbon transport to evaluate existing ocean and river fluxes and propose a revised budget. Our revised ocean/river budget, combining carbon dioxide partial pressure (pCO₂) based ocean flux estimates with a global river carbon discharge of ~0.8 PgC/y, shows a stronger ocean and river carbon uptake in the northern extra-tropics than prior budgets and therefore calls for a weaker northern land sink.

Figure 1. Temporal evolution of the Northern land sink derived from our revised carbon budget for the 1990-2010 period and extrapolated in time using a linear relationship with fossil fuel emissions from 1) Le Quéré et al. (2015) (filled circles) and 2) Boden et al. (2015) (open circles). Fossil fuel emissions were averaged over 10-year periods to smooth out interannual variability.
