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Inversing grided land surface carbon fluxes focusing on Asia region

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Abstract:

With the global carbon budget research carrying out, there is a growing scientific and political interest to better understand terrestrial carbon cycle at global and regional scales. Asia, contributed one of the largest uncertainties to global carbon budget, needs further more investigation and study. The contribution of Asia to the global carbon cycle is characterized by its high fossil fuel emissions due to economic booming and demand steep rising in energy, a rapidly increasing land cover change or degradation caused by population explosion and crop land expansion, a fast forest recovering in virtue of forest afforestation in the past 20 years. These unique characteristics force the exchange of terrestrial carbon more heterogeneous in Asian continent, and lead the Asian carbon balance research's implementation more difficult. In view of the Asian net ecosystem exchange (NEE) of carbon characteristics, we used a state-of-the-art CO_2 data assimilation system called CarbonTraker to estimate NEE of CO_2 in Asia for every week during the years 2000-2009. This approach includes the following three steps: (1) the atmospheric transport model (TM5) used in the data assimilation system was nested to be 1x1 degree grid in Asian area while globally at 2x3 degree resolution; (2) the number of CO_2 observation sites was expend with 22 in Asia (including CONTRAIL and NOAA's CO_2 measurement); and (3) two different prior [U+FB02]ux products were used to estimate uncertainty ranges. We [U+FB01]nd the Asian terrestrial biosphere absorbed about 1.89 PgC (1 petagram=1015 g) per year averaged over the period studied, partly offsetting the estimated 3.87 PgC/yr release by fossil fuel burning and cement manufacturing. The estimated sink is located mainly in the boreal Asia, while the temperate Asia and the tropical Asia are a week sink and a very small source, respectively. The results also show that the surface fluxes produced by the CarbonTracker system were reasonably consistent with the recent history of CO_2 in the atmosphere and other independent bottom-up estimates.