Assimilation of GOSAT XCO_2 Retrievals in CarbonTracker

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In this study, surface carbon dioxide (CO_2) fluxes were estimated by assimilating column-averaged dry air mole fraction (XCO_2) of satellite-based CO_2 measurements into the CarbonTracker (CT2013B) which is an inverse modeling system for estimating surface CO_2 flux based on an ensemble Kalman filter. The XCO_2 used was derived from Atmospheric CO_2 Observations from Space retrievals of the Greenhouse Gases Observing SATellite (ACOS-GOSAT). The inversion experiments were conducted with and without GOSAT XCO_2 retrievals in addition to conventional surface CO_2 concentration measurements.

Figure 1 shows the average biosphere and ocean CO_2 fluxes from July 2009 to May 2010. The results show that the global balance of sources and sinks of surface CO_2 fluxes was maintained for the experiments with and without GOSAT XCO_2, whereas the magnitudes of the optimized surface CO_2 fluxes in subcontinental regions were changed. The surface CO_2 uptake over Europe increased, whereas the surface CO_2 uptake in Eurasian Boreal (Northern part of Asia continent) decreased. These results are consistent with the previous studies using GOSAT XCO_2 retrievals to estimate surface CO_2 fluxes. The modeled XCO_2 simulated by the optimized surface CO_2 fluxes with GOSAT XCO_2 were more consistent with the GOSAT XCO_2 compared to the modeled XCO_2 without GOSAT XCO_2, which implies that data assimilation system developed for satellite observations performed appropriately.

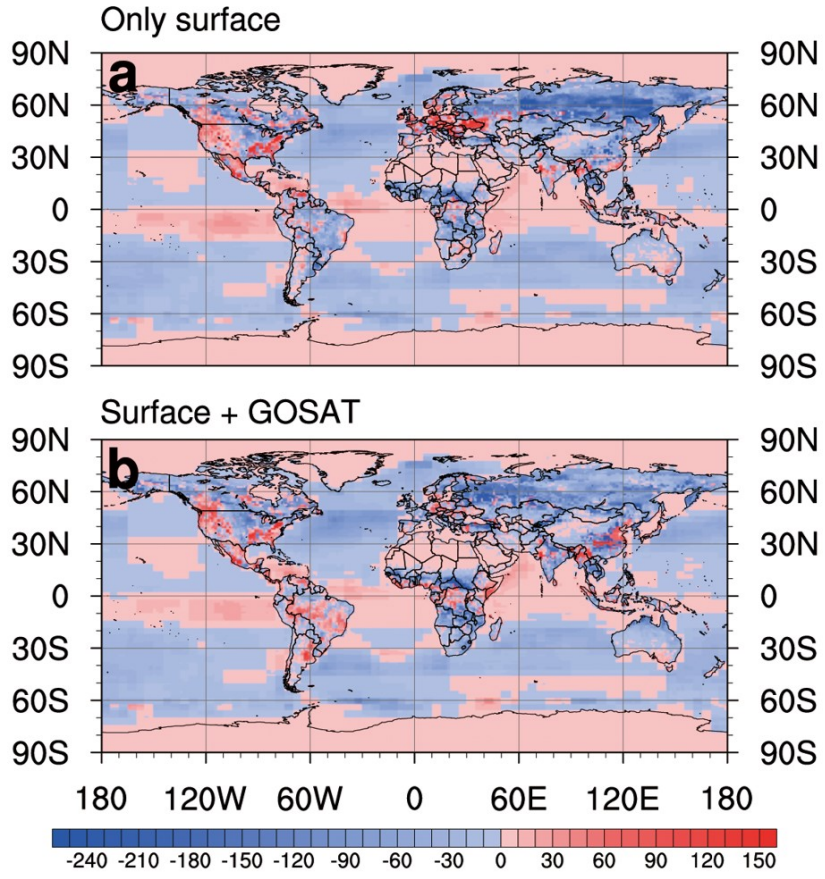

Figure 1. Average biosphere and ocean CO_2 fluxes (gC m^{-2} yr^{-1}) from July 2009 to May 2010 inferred from (a) only conventional surface CO_2 concentration observations and (b) GOSAT XCO_2 retrievals in addition to conventional surface CO_2 concentration observations.