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Estimates of Southern Ocean carbon uptake from atmospheric inverse analyses

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We present estimates of Southern Ocean air-sea CO_2 fluxes for the period 2000-2018 derived with the GEOSChem-LETKF (GCL) inverse analysis system in conjunction with the NOAA surface CO_2 monitoring network (ObsPack, Cooperative Global Atmospheric Data Integration Project, 2018). We assess the impact of alternative representations of the ocean prior flux distribution and its associated uncertainties on derived flux estimates. Ocean flux distributions assessed include the surface pCO_2-based representation of Landschutzer et al. 2016 and the more recent pCO_2-based estimates of Watson et al. 2020. We present GCL estimates of the long-term trend and interannual variability of air-sea CO_2 fluxes in the Southern Ocean (south of 45˚S). These results are assessed against independent estimates from atmospheric inverse analyses and ocean biogeochemical models taken from the Global Carbon Budget 2020 synthesis (Friedlingstein et al. 2020).