EGU21-14067
https://doi.org/10.5194/egusphere-egu21-14067
EGU General Assembly 2021

Co-evolution of carbon cycle and air quality fluxes constrained by CMS-Flux and MOMO-Chem assimilation systems

Kevin Bowman, Kazuyuki Miyazaki, Junjie Liu, and Anthony Bloom
JPL-Caltech, United States of America (kevin.w.bowman@jpl.nasa.gov)

Rapid regional changes in anthropogenic emissions in response to the COVID-19 pandemic have underscored the contribution of fossil fuel (FF) emission uncertainty to regional carbon budgets. Typical methods for spatially-explicit FF emissions are dependent on national reporting, which can incur substantial latencies. However, the concomitant changes in short-lived pollutants from common emission sources point to opportunities to develop independent low-latency estimates of fossil fuel emissions and to better understand anthropogenic processes. Here we combine state-of-the-art Multiple Model Multi Constituent chemical data assimilation system (MOMO-Chem) with bottom-up FF emissions to repartition the net carbon fluxes from the NASA Carbon Monitoring System Flux (CMS-Flux) project. To that end, we implement a novel Kalman filtering algorithm that predicts emission ratio co-evolution of air quality (AQ) and carbon species. Based upon top-down estimates of AQ emissions, FF CO2 emissions and uncertainties can be rapidly determined. We show overall good agreement between predicted FF fluxes and the latest bottom-up inventories. These data are in turn used to interpret the decadal evolution of CMS-Flux net carbon exchange. This approach is an important step in quantifying both regional fossil fuel and natural carbon fluxes contributions to the atmospheric CO2 growth rate.