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Characteristics of the CO flux inversion according to the different types of forests fires over the Northern America with assimilation of MOPITT and IASI

Hélène Peiro and Sean Crowell
University of Oklahoma, Norman, United States

Carbon monoxide (CO) is an air pollutant and a key player in atmospheric chemistry. Accurate representations of the location and magnitude of CO surface emissions are required to accurately quantify the CO flux signal. Magnitude of CO emissions from different sources categories is not well quantified. In particular, emissions from biomass burning bring large uncertainties due to the variability of fires in both space and time. In addition, different vegetation types, combined with the spatial/temporal patterns of the biomass consumed during fires, leads to different level of magnitude in the CO emission. The global coverage and the high resolution of satellites measuring CO by infrared remote sensing allow to improve our ability to map CO and to understand its variability. Among these orbiting instruments, there are the Measurements of Pollution in the Troposphere (MOPITT) from satellite TERRA and the Infrared Atmospheric Sounding Interferometer (IASI) on board the satellite METOP-A and B. The advantage of using MOPITT is that it has a higher sensitivity in the lower troposphere than IASI.

In this presentation we will demonstrate the potential of the MOPITT-IASI CO inversion for qualitatively constraining the CO emissions from biomass burning sources over the Northern America for the 2015 year. We apply a 4D-VAR data assimilation system using the 6x4 global version of the chemistry transport model TM5 with 25 vertical sigma hybrid levels. CO column retrievals from MOPITT v7 and IASI-FORLI are assimilated jointly.

Validation between the combination of IASI and MOPITT assimilated in TM5 with the Global Greenhouse Gas Reference Network's aircraft program of the NOAA is applied. MOPITT+IASI CO inversion allows hence an accurate vertical structure in the troposphere and a better exploitation of CO emissions for the different types of forests over the Northern America. Validation against the Total Carbon Column Observing Network (TCCON) shows good agreement of CO flux magnitude and variability compared to the prior GFED 4.1s used for the biomass burning prior emissions. The assimilation of IASI and MOPITT improves CO estimations and allows to accurately observe CO magnitudes and variability of forest fires over the United States and Canada.