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Intercomparison of different Wildland Fire Emission Data Sets and their Effect on global tropospheric Carbon Monoxide and Ozone

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Identification of savanna and forest fire emission sources and strengths is a prerequisite for successful global chemistry transport modeling in fire-prone regions. Ozone precursors, such as carbon monoxide and nitrogen oxides, are released by vegetation fires and contribute to temporal and spatial shaping of tropospheric composition. Fires are also responsible for strong inter-annual variabilities of global trace gas distribution.

Several global wildland fire emission inventories have recently become available that are based on a variety of different fire satellite products such as ATSR, TRMM-VIRS, and AVHRR fire counts or MODIS and the GBA2000 area burned algorithms. The current fire data situation has benefited considerably from satellite retrieved fire products. However, the data differ substantially in terms of detection quantity and seasonality. Some of the reasons identified are different overpass times of the satellites, algorithm optimization for specific ecosystems and types of fires, and the spatial signal resolution.

In this paper, an intercomparison of these global inventories is presented, comprising two different approaches of ATSR-scaled emissions and two new bottom-up approaches (the Global Wildland Fire Emission Model GWEM (Hoelzemann et al., 2004) of the Max Planck Institute for Meteorology, and the Global Fire Emissions Dataset GFED (Van der Werf et al., 2003).

These emission data sets are used in a case study of the year 2000 with the

global Chemistry Transport Model MOZART-2. Validation with satellite-borne carbon monoxide measurements by MOPITT, and ground-based observations from the CMDL network provides an insight to regional performances of the different inventories. Free tropospheric concentrations vary by up to 100 % on the regional scale and still up to 30 % on the continental scale. Further evaluations with ozone soundings from SHADOZ and aircraft data from MOZAIC investigate the impact of the wildland fire emissions on tropospheric ozone production.