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Relationship between MODIS fire counts and GOME-2 tropospheric NO_2 measurements

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Biomass burning has an ongoing role in determining the composition of Earth's surface and atmosphere. The term biomass burning comprises prescribed and wild fires (vegetation fires), as well as biofuel use, such as wood or peat for heating and cooking. Biomass burning represents an important source of aerosol particles and greenhouse gases such as CO_2, CH4 and N2O, but also chemically active gases such as CO and NO_2 are observed in the plumes.

Even though vegetation fire emission inventories have improved considerably in recent years, large uncertainties remain in the temporally and spatially highly variable biomass burning emissions, especially due to uncertainties in input parameters. While satellite observed CO emissions from biomass burning have been investigated in great detail in the last years, NO_2 has received much less attention. This can be explained by difficulties posed by the short atmospheric lifetime of NO_2 and its photochemical equilibrium with NO but also the complicated retrieval of NO_2 due to the presence of smoke and aerosols in the biomass burning plumes.

Here, we present the relationship between observed fire counts and NO_2 tropospheric vertical column densities from MODIS and GOME-2 measurements, respectively. The MOZART model for 1997 was used to determine monthly averaged air-mass factors and cloud fraction was derived by the FRESCO algorithm from SCIAMACHY measurements. The results show good correlation values (> 0.7) in many parts of the world, especially in the Subtropics. Future work will be further improvement of the retrieval for specific biomass burning situations in order to estimate total emissions from biomass burning for representative biomass burning regions by the use of appropriate models.