Biomass burning as a source of NOx emissions

1. Temporal correlation between fire radiative power (FRP) and tropospheric NOx vertical columns (TVC NOx)

- Why important?
  - NOx radiative play key roles in tropospheric chemistry
  - NO (Nitric oxide) and nitrogen dioxide (NO2) are coupled in the atmosphere
  - NO2 is produced from NO by its reaction with ozone (O3)

- Estimation
  - biomes
  - MODIS
  - in Spectroscopy (blue)

The aims of the study

To establish an empirical relationship between FRP and TVC NOx as a tool to estimate the emissions of NOx. The comparison of FRP and TVC NOx is studied globally and for selected regions, and fire emission rates (FERs) are derived for the different types of vegetation.

1. Mean gradients of the best fitting least-squares regression lines for pixels with r > 0.3 (GOME-2) or MODIS Terra (red), Aqua (blue), and OMI (green) for NOx emissions.

- Global Ozone Monitoring Experiment (GOME-2) on board No.1-5 (EUMETSAT) since October 2006
- MODerate Resolution Imaging Spectroradiometer (MODIS) on board Terra (10.2 x 10.2 km) and Aqua (13.5 x 13.5 km) satellites (NASA), 36 spectral bands ranging from 0.4-14.4 μm differences

- FRP, NOx emissions

2. Conversion of TVC NOx into NOx emissions and comparison with bottom-up NOx emissions

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Conclusions

- The strong correlation between the two independent geophysical parameters FRP and TVC NOx has been investigated for the morning and early afternoon conditions.
- After the conversion of TVC NOx into mass concentrations of NOx, the use of a population density data set and a global land cover map enabled the estimation of fire emission rates of NOx for different types of vegetation on a 1° x 1° grid
- The main results show that the highest FEPRs are found for wooded grassland, whereas the lowest values are found forundra. Further, we found differences amongst the selected regions for certain land cover types (e.g., cultivated crops)
- Future work will be undertaken in order to enable the estimation of global fire emissions of NOx by using the retrieved FEPRs.