



## **Lifetimes and emission fluxes of nitrogen oxides from cities and power plants estimated by Sentinel-5P observations**

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Nitrogen oxides ( $\text{NO}_x$ ) are, due to their influence on air quality, tropospheric ozone production and human health, important trace gases in the atmosphere. They enter the atmosphere mostly by anthropogenic activities, with the largest part coming from fossil fuel combustion. The majority of  $\text{NO}_x$  emissions are in form of NO which is converted to  $\text{NO}_2$  within a few minutes and has a tropospheric lifetime of a few hours. Consequently,  $\text{NO}_2$  is found near the emission sources and can be used for the detection of pollution. Due to the spectral characteristics of  $\text{NO}_2$  it can be observed by the differential optical absorption spectroscopy (DOAS). The required measurements can be made by ground-based or satellite based remote sensing instruments, as in this study with Sentinel-5P.

Sentinel-5P with the instrument TROPOMI was started in October 2017 and provides, thanks to the high spatial resolution of 3.5 km x 7 km, the possibility of detailed investigations on lifetimes and emissions of nitrogen oxides. Due to the higher resolution of Sentinel-5P compared to previous satellite instruments, there is a better identification of different emission sources also on small scales such as individual cities.

In this study, the first year of Sentinel-5P data is analyzed for different wind situations based on ECMWF wind data. The Sentinel-5P data is averaged for eight different wind directions to get clear emission patterns. Out of that lifetimes and emissions are calculated. This evaluation method in combination with the high spatial resolution makes it possible to determine different emission sources within a city. Emission sources can be separated and single plumes can be analyzed.