

Horizontal variations of NO₂ and HCHO measured with MAX-DOAS and Sentinel-5P

Kezia Lange
(IUP)

Abstract

Nitrogen oxides are with their influence on air quality, tropospheric ozone production, human health and the environment 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 NO_x emissions is in form of NO which is converted to NO₂ in a few minutes and is therefore found near to the sources and can be used for the detection of pollution. Due to the spectral characteristics of NO₂ it can be observed by the differential optical absorption spectroscopy (DOAS).

Because of the large number of sources and also the relatively short lifetime of NO₂ in the order of hours, horizontal variations of NO₂ can be observed by ground-based MAX-DOAS measurements and also by satellite. Due to the different measurement geometries of both measurement approaches, investigations on differences of horizontal variations are of interest for example to validate satellite measurements.

Sentinel-5P with the instrument TROPOMI started in October 2017 and provides, thanks to the high spatial resolution of 3.5 km x 7 km, the possibility to investigate horizontal variations of NO₂ and other trace gases like HCHO on small scales such as individual cities. It is possible to investigate emissions and lifetimes for nitrogen oxides and due to the higher resolution, there is a better identification of different emission sources than in data from earlier satellite instruments.

As some first results of my PhD I will present an analysis based on Sentinel-5P NO₂ data and ECMWF wind data for the city of Riyadh. The Sentinel-5P data is calculated as a mean for different wind directions to get clear emission patterns. Emissions and lifetimes are calculated and compared to results from similar studies on OMI data.

I will also present a new MAX-DOAS instrument and its location, which is well suited for investigations of horizontal variations and plans for a measurement campaign for validation of Sentinel-5P data.