

## A Validation Project for Trace Gas and Aerosol Products by TROPOMI/S5P over Eastern China

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The TROPOMI/S5P mission launched on 13 October 2017 will measures key atmospheric trace gas concentrations and aerosol/cloud properties to provide information on air quality and climate change. Validations are needed under polluted atmospheric conditions to better understand the measurements of species involved in anthropogenic emissions. For this purpose, we are carrying out a validation project approved by the European Space Agency, which aims to validate the TROPOMI/S5P data with independent ground-based measurements at multiple fixed sites and a moving platform in Eastern China, a densely populated and highly polluted region.

The project includes that (i) validation of TROPOMI/S5P tropospheric  $\text{NO}_2$  and  $\text{O}_3$  columns with ground-based MAX-DOAS  $\text{NO}_2$  and  $\text{O}_3$  retrievals at six MAX-DOAS sites in eastern China, i.e. Xuzhou, Nanjing, Hangzhou, Shenzhen, Fuzhou and Shanghai; (ii) validation of TROPOMI/S5P aerosol layer heights with ground-based LIDAR aerosol backscatter profiles retrievals at six LIDAR sites, i.e. Xuzhou, Zhengzhou, Wuxi, Wuhan, Fuzhou, and Shanghai. In addition, four sun-photometer sites in Xuzhou, Beijing, Wuxi, and Shanghai will be included for providing aerosol optical properties, e.g., aerosol optical thickness, phase function, single scattering albedo. Long-term ground-based measurements at these sites will be collected and compared to the satellite products during the commissioning and the operative phase of TROPOMI/S5P. In order to improve the coverage of spatial gradients and horizontal inhomogeneity in individual satellite pixels, mobile measurements using a vehicle equipped with a MAX-DOAS and a LIDAR will be carried out in autumn and winter 2018. The vehicle will travel at a constant speed around 100 km/h along the TROPOMI/S5P orbits during 12:00-14:00 under various air quality conditions, i.e. clean, light pollution, and heavy pollution days. The mobile measurements will cover clean regions, polluted regions and pollution hot-spots (e.g., coal-fired power plant). The special route will be planned referring to the possible pollutants transport path under winter monsoon.

The scientific objectives of this project are, (i) to investigate the effect of the presence of aerosols on the  $\text{NO}_2$  retrieval; (ii) to understand the impact of a-priori information on the aerosol layer height retrieval; (iii) to assess the ability of TROPOMI with high spatial resolution in detecting point source emission as compared to OMI. The primary expected outcome of the proposed project is to improve our understanding of the quality of the TROPOMI/S5P  $\text{NO}_2$ ,  $\text{O}_3$  and aerosol product in highly-polluted areas.

In this presentation, we will present the ground-based measurements including tropospheric  $\text{O}_3$  column, tropospheric  $\text{NO}_2$  column, aerosol loading and optical properties, and aerosol profiles in Xuzhou from November 2017 to March 2018 and compare their with the preliminary results of TROPOMI level 2 products. We will also attempt to improve the aerosol retrieves using the measurement coverage of the Level 1 data with good quality on 28 and 29 November 2017.