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OMI, TROPOMI, TROPOLITE: towards 1 x 1 km2 Air Quality and Emission monitoring

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The Ozone Monitoring Instrument (OMI), launched on board of NASA's EOS-Aura spacecraft on July 15, 2004, provides unique contributions to air quality monitoring from Space. The combination of urban scale resolution (13 x 24 km2 in nadir) and daily global coverage proved to be key features for the air quality community. The OMI data is currently used operationally for improving the air quality forecasts, for inverting high-resolution emission maps, UV forecast and volcanic plume warning systems for aviation. Due to its 12 year decade long continuous operation OMI provides the longest NO_2 and SO_2 record from space, which is essential to understand the changes to emissions globally.

In 2017 Tropospheric Monitoring Instrument (TROPOMI), will be launched on board ESA's Sentinel 5 Precursor satellite. TROPOMI will have a spatial resolution of 7x7 km2 in nadir; a more than 6 times improvement over OMI. The high spatial resolution serves two goals: (1) emissions sources can be detected with even better accuracy and (2) the number of cloud-free ground pixels will increase substantially. TROPOMI will continue OMI's ozone and air quality trace gas records. Added to that TROPOMI will measure the O_2 A band for better cloud detection, as well as CO and the second most important greenhouse gas CH4. TROPOMI will therefore be an important satellite mission for the EU Copernicus atmosphere service and will be followed by ESA's sentinel 4 and 5 satellites.

In the coming decades air pollution in megacities will continue to be a major area of concern and the need for timely, high resolution information on emissions will increase, preferably to a level where sources can be isolated on the < 1 x 1 km2 scale. Currently we are working on new follow-on satellite instrumentation, TROPOLITE, that is designed to fly on small satellites. With this instrument we envisage to improve emission monitoring of megacities to the < 1 x 1 km2 spatial resolution level. TROPOLITE can be viewed as an add-on to the Copernicus suite of atmospheric satellite instruments, adding high-resolution potential to the Copernicus backbone.

An overview of air quality applications, emission inventories, and trend analyses will be given, based on the excellent OMI data record, followed by an overview of the TROPOMI instrument and its capabilities. An outlook will be presented on the potentials of the TROPOMI and the new TROPOLITE instrument in the air quality domain.