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Ten years of OMI observations: scientific highlights and impacts on the new generation of UV/VIS satellite instrumentation

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On July 15, 2004 Ozone Monitoring Instrument (OMI) was successfully launched from the Vandenberg military air force basis in California, USA, on NASA's EOS-Aura spacecraft. OMI is the first of a new generation of UV/VIS nadir solar backscatter imaging spectrometers, which provides nearly global coverage in one day with an unprecedented spatial resolution of 13 x 24 km2. OMI measures solar irradiance and Earth radiances in the wavelength range of 270 to 500 nm with a spectral resolution of about 0.5 nm. OMI is designed and built by the Netherlands and Finland and is also a third party mission of ESA.

The major step that was made in the OMI instrument compared to its predecessors is the use of 2-dimensional detector arrays (CCDs) in a highly innovative small optical design. These innovations enable the combination of a high spatial resolution and a good spectral resolution with daily global coverage. OMI measures a range of trace gases (O_3, NO_2, SO_2, HCHO, BrO, OClO, H_2O), clouds and aerosols. Albeit OMI is already 5 years over its design lifetime, the instrument is still fully operational. The successor of OMI is TROPOMI (TROPOspheric Monitoring Instrument) on the Copernicus Sentinel-5 precursor mission, planned for launch in 2015.

OMI's unique capabilities rely in measuring tropospheric trace gases with a small footprint and daily global coverage. The unprecedented spatial resolution of the instrument revealed for the first time tropospheric pollution maps on a daily basis with urban scale resolution leading to improved air quality forecasts. The OMI measurements also improve our understanding of air quality and the interaction between air quality and climate change by combining measurements of air pollutants and aerosols. In recent years the data are also used for obtaining high-resolution global emission maps using inverse modelling or related techniques, challenging the bottom-up inventories based emission maps. In addition to scientific research, OMI also contributes to several operational services, including volcanic plume warning systems for aviation, UV forecasts and the air quality forecasts.

In this invited talk an overview will be given of unique findings and new scientific results based on OMI data over the last 10 years and which unique OMI instrument features are recurring in the new generation of UV/VIS satellite instrumentation in Europe, USA and Asia.