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Measurement of Ozone with Their Precursors in high Temporal and Spatial Resolution from Geostationary Orbit over Asia : Performance Prediction of GEMS

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GEO-KOMPSAT-2 is planned for launch in 2019 as twin satellites, 2A as weather and 2B as atmospheric environment and ocean satellite, with a 16-channel Advanced Meteorological Imager (AMI), a UV-Visible scanning spectrometer, Geostationary Environment Spectrometer (GEMS), and Geostationary Ocean Color Imager (GOCI-2). GEMS measures ozone, aerosol and their precursors including NO_2, and SO_2. The instrument is basically a step-and-stare scanning UV-visible imaging spectrometer, with scanning Schmidt telescope and Offner spectrometer. A UV-enhanced 2D CCD takes images, with one axis spectral and the other north-south spatial, with east-west scanning over time.

Spectral coverage of GEMS is 300 - 500 nm with resolution of 0.6 nm and 3 samples/band. The mission covers most of the interesting region in Asia. Science algorithms are under the development. Error analysis was carried out using the optimal estimation method with TOMS climatology, GEOSChem and VLIDORT. For the analysis, randomly generated conditions were extracted for different time of day in 12 months with actual viewing geometry from a GEO satellite at 128.2 oE. Through the spatial and spectral coadding and flexible EW scan to increase the SNR, the performance of GEMS is predicted to satisfy the science requirements in most of the cases. Measurements of SO_2 in winter season is very challenging but can be resolved if 4 pixels are coadded and the EW scan is reduced half to increase SNR.

Synchronous measurements of atmospheric composition together with the meteorological variables and ocean color information are expected to contribute to better understanding on the distribution and transboundary transportation of air pollution, and on interactions between meteorology and air chemistry in the Asia-Pacific region. This mission is expected to improve the accuracy of atmospheric chemistry modeling and to better understand the distribution of ozone, aerosol and their precursors. Furthermore, the constellation of the GeoKOMPSAT with the NASA Tropospheric Emissions: Monitoring of Pollutions(TEMPO) over North America and the ESA Senteniel-4 UV-Visible-NIR(UVN) spectrometer over Europe in 2019- 2022 time frame can result in great synergistic outcomes including enhancing significantly our understanding in globalization of tropospheric pollution.