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CCD Tropospheric ozone measurements from S5P/ TROPOMI satellite data using local cloud fields

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The talk gives an introduction about our current work which is about CCD Tropospheric ozone measurements from S5P/TROPOMI satellite data using local cloud fields.

The Convective Cloud Differential (CCD) and the Cloud Slicing Algorithm (CSA) are two different techniques that can only be applied in the tropics (20N-20S). The aim of this work is to develop an automated process to extend these cloud-based techniques into the middle latitudes. This is possible by taking advantage of the high spatial resolution data provided by TROPOspheric Monitoring Instrument (TROPOMI) onboard the Copernicus Sentinel-5 precursor satellite (3.5x5.5 km^2), which allows us to use local cloud fields rather than clouds limited to the Pacific sector. This provides an important basis for subsequent systematic applications in current and future missions of geostationary satellites, like ESA Sentinel 4, NASA Tempo, and GEMS (Korea) covering only middle latitudes.

In CCD, stratospheric ozone column is measured above convective clouds. We subtract this stratospheric ozone column from the total ozone column under clear sky condition to compute the tropospheric ozone. Since stratospheric ozone is more variable in the mid latitudes the cloud reference sector has to be more local. An iterative approach has been developed for the automatic selection of an optimal cloud reference sector for each retrieval grid box. This starts from the smallest cloud reference sector to the possible largest and stop when the cloud criteria are fulfilled. As a start we apply the local cloud field methods in the tropics where we compare our results with the standard CCD and NASA/GSFC SHADOZ ozonesonde data. We have found that local cloud method generally yield better agreement with sondes. The main challenge for future applications in particular at mid latitudes are the lack of local cloud data in certain regions and seasons and due to inhomogeneities in cloud and stratospheric ozone fields.