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Multi-Sensor Retrieval Algorithm for Daytime Total Column Water Vapor from Passive Imagers

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A novel algorithm for total column water vapor (TCWV) retrieval, which uses a combination of satellite-based measurements in the near-infrared (NIR) and infrared (IR) spectrum, is presented. The algorithm is built with a modular approach so that it can be used for a wide array of passive sensors. It is based on a fast forward model for NIR and IR bands at the water vapor absorption peaks in use on current and future instruments.

An Ocean Land & Colour Imager (OLCI) TCWV retrieval for land surfaces has been developed, building on earlier work done for MERIS and MODIS, including extensive validation exercises using well-established ground-based TCWV observations as reference. The retrieval is extended to a synergy with IR measurements at 11 and 12um from the Sea and Land Surface Temperature Radiometer (SLSTR), also onboard the Sentinel-3 satellites. This allows more accurate TCWV retrievals over dark water surfaces.

Moreover, support is planned for the polar-orbiting meteorological satellite instruments such as METimage on Metop - Second Generation (Metop-SG) and geostationary instruments such as the Flexible Combined Imager (FCI) onboard Meteosat Third Generation (MTG).

Application examples of the newly derived TCWV observations include studying the potential of assimilating OLCI's high spatial resolution TCWV fields in Numerical Weather Prediction (NWP) as well as detection of convective initiation in TCWV fields before the onset of clouds and precipitation within the German project RealPEP.