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Retrievals of cloud parameters from TROPOMI/Sentinel-5 Precursor and comparison against VIIRS/S-NPP

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The operational TROPOMI/Sentinel-5 Precursor cloud parameters are retrieved using OCRA (Optical Cloud Recognition Algorithm) and ROCINN (Retrieval of Cloud Information using Neural Networks) algorithms that have been successfully applied to the prior operational processing of GOME/ERS-2 and GOME-2 MetOp-A/B data.
The ROCINN algorithm retrieves cloud height, cloud optical thickness and cloud albedo from NIR measurements in and around the oxygen A-band (∼760nm) taking as a-priori the radiometric cloud fraction (Loyola et al., 2018). The latter is computed by the OCRA algorithm which is based on a broad-band UV/VIS color space approach (Lutz et al., 2016). Two models which treat the clouds differently are implemented in the ROCINN algorithm. The first approach called Clouds-as-Reflecting-Boundaries (CRB) assumes that the cloud is a reflecting surface whereas the second and more realistic model called Clouds-as-Layers (CAL) represents the cloud as a homogeneous cluster of scattering spherical particles.
The loose formation of the Suomi-NPP satellite with Sentinel-5 Precursor (S5P) enables the direct comparison of the TROPOMI cloud properties against VIIRS cloud products. The ROCINN cloud parameters (i.e. cloud top height and optical thickness) from S5P are compared against the VIIRS cloud product developed by NASA. The VIIRS products are re-gridded to the footprints of TROPOMI. The initial results showed high correlation with a negative bias for the cloud top height and a positive bias for the cloud optical thickness. The bias in the cloud optical thickness is significantly smaller for the continental clouds and the bias in the cloud top height is smaller for the marine clouds.
Some discrepancies have been observed for the convective clouds associated with a high top above 6 km and large optical thickness over 23, following the cloud classification from the international satellite cloud climatology project (ISCCP). Other discrepancies have been also identified on ice phase clouds like cirrus/cirrostratus.
The improvement of the retrieved cloud top height in deep convective and ice clouds is a challenge for the coming Copernicus mission Sentinel-4 which is planned to be launched in 2023. The latter involves a better parameterization of ice crystal.