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Estimating Cloud optical thickness from SEVIRI, for air quality research, by implementing a semi-analytical cloud retrieval algorithm

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Clouds play an important role in Earth's climate system. As they affect radiation hence photolysis rate coefficients (ozone formation),they also affect the air quality at the surface of the earth. Thus, a satellite remote sensing technique is used to retrieve the cloud properties for air quality research.

The geostationary satellite, Meteosat Second Generation (MSG) has onboard, the Spinning Enhanced Visible and Infrared Imager (SEVIRI). The channels in the wavelength 0.6 μm and 1.64 μm are used to retrieve cloud optical thickness (COT). The study domain is over Europe covering a region between 35°N-70°N and 5°W-30°E, centred over Belgium.

The steps involved in pre-processing the EUMETSAT level 1.5 images are described, which includes, acquisition of digital count number, radiometric conversion using offsets and slopes, estimation of radiance and calculation of reflectance. The Sun-earth-satellite geometry also plays an important role.

A semi-analytical cloud retrieval algorithm (Kokhanovsky et al., 2003) is implemented for the estimation of COT. This approach doesn't involve the conventional look-up table approach, hence it makes the retrieval independent of numerical radiative transfer solutions.

The semi-analytical algorithm is implemented on a monthly dataset of SEVIRI level 1.5 images. Minimum reflectance in the visible channel, at each pixel, during the month is accounted as the surface albedo of the pixel. Thus, monthly variation of COT over the study domain is prepared.

The result so obtained, is compared with the COT products of Satellite Application Facility on Climate Monitoring (CM SAF).

Henceforth, an approach to assimilate the COT for air quality research is presented.

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