Remote sensing of vertical integrated water vapour using SEVIRI infrared measurements

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A methodology for the retrieval of atmospheric water vapor is presented which utilizes the infrared-channels of the Spinning Enhanced Visible and Infrared Imager (SEVIRI) on board the geostationary satellite METEOSAT8. The measured SEVIRI brightness temperatures depend on the amount of integrated water vapor (IWV) and allow therewith its estimation.

The developed algorithms are based on different data sets, which relate SEVIRIs measured brightness temperatures to the corresponding IWV. First, we performed a huge number of radiative transfer simulations for a wide range of atmospheric and surface conditions. Second, we utilized the IWV products from NASAs Moderate Resolution Imaging Spectroradiometer (MODIS) on TERRA for land pixel and ESA's microwave radiometer on ENVISAT for sea pixel. The inversion is made by means of multiple non-linear regressions.

Considering the different datasets two algorithms were developed: Simulation Based Algorithm (SBA) and Measurement Based Algorithm (MBA).

First results of both algorithms were compared to the derived integrated water vapor from MODIS and microwave radiometers. The comparisons show an accuracy between 0.3 and 0.7 g/cm² for the MBA and between 0.7 and 1.3 g/cm² for the SBA. One reason for the lower accuracy of the SBA water vapor might be related to an emphasis on certain atmospheric and surface conditions used to set up the radiative transfer simulations.

The MBA shows a good agreement with the compared products and allows the retrieval of the integrated water vapor above land and ocean regions during the day and at night. The MBA product can be realized every 15 minutes for the full disk.

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