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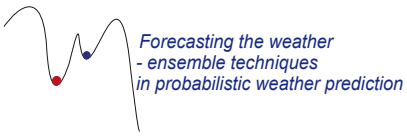

Retrieval of vertically integrated water vapor from SEVIRI measurements

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Satellite-based remote sensing in Earth sciences provides an efficient way to quantitatively estimate meteorological elements of the atmosphere in high spatial and temporal resolution. Satellite measurements broadcasted to ground-based receiving stations are widely used in environmental and atmospheric science for monitoring purposes. Remotely sensed data is also routinely utilized in numerical weather prediction (NWP). The second installation of the Meteosat Second Generation programme (MSG-2, or Meteosat-9) is a geostationary satellite operated by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). The Spinning Enhanced Visible and Infrared Imager (SEVIRI) is a radiometer installed on the MSG-2 satellite, which observes radiation in 12 spectral bands and provides data with a nominal 3 and 1 km horizontal resolution.
The presented research activity is based on data acquired by the MSG receiving station located in Budapest, Hungary, at the Eötvös Loránd University (ELU). We adapted the SAF NWC software (Satellite Application Facility on support to Nowcasting and Very Short-Range Forecasting; developed by the Spanish Meteorological Agency) at the Department of Meteorology at ELU, and derived several products to support environmental research and weather forecast. We analyze vertically integrated water vapor products derived from SAF NWC. The software uses two different algorithms, which are based on (i) statistical and (ii) physical retrieval of the integrated water vapor content. Vertically integrated water vapor and layer integrated water vapor at three levels (i.e. 1013-840 hPa, 840-437 hPa, and 437-0 hPa) are calculated in 15 minutes temporal and 3 km spatial resolution (in nadir). The target area covers the Carpathian Basin located in Central-Eastern Europe. Our investigation is mostly focusing on cloud-free conditions in the vicinity of Hungary during 2009. We used radiosonde data for 5 European measuring stations to evaluate the accuracy of the different integrated water vapor estimations. The SAF NWC based results are compared to the estimated vertically integrated water vapor values derived from the MODerate resolution Imaging Spectroradiometer (MODIS, onboard satellites Terra and Aqua) data as well. These measurements were collected by the co-located polar orbiting satellite receiving station at ELU. The received Direct Broadcast (DB) MODIS data are processed based on freely distributed software packages (SeaDAS and IMAPP Level2). There are two different methods to derive integrated water vapor based on the near-infrared and the thermal infrared channels of the MODIS instrument. The main aim is to critically assess the applicability of the retrieval methods to calculate integrated water vapor. Our results can directly be used in data assimilation related data selection and contribute to the improvement of weather forecasts.