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Comparison of time series of integrated water vapor measured using radiosonde, GPS and microwave radiometer at the CNR-IMAA Atmospheric Observatory

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Information about the amount and spatial distribution of atmospheric water vapor is essential to improve our knowledge of weather forecasting and climate change. Water vapor is highly variable in space and time depending on the complex interplay of several phenomena like convection, precipitation, turbulence, etc. It remains one of the most poorly characterized meteorological parameters. Remarkable progress in using of Global Navigation Satellite Systems (GNSS), in particular GPS, for the monitoring of atmospheric water vapor has been achieved during the last decades. Various studies have demonstrated that GPS could provide accurate water vapor estimates for the study of the atmosphere.
Different GPS data processing provided within the scientific community made use of various tropospheric models that primarily differs for the assumptions on the vertical refractivity profiles and the mapping of the vertical delay with elevation angles. This works compares several models based on the use of surface meteorological data. In order to calculate the Integrated Water Vapour (IWV), an algorithm for calculating the zenith tropospheric delay was implemented. It is based upon different mapping functions (Niell, Saastamoinen, Chao and Herring Mapping Functions).
Observations are performed at the Istituto di Metodologie per l'Analisi Ambientale (IMAA) GPS station located in Tito Scalo, Potenza (40.60N, 15.72E), from July to December 2014, in the framework of OSCAR project (Observation System for Climate Application at Regional scale). The retrieved values of the IWV using the GPS are systematically compared with the other estimation of IWV collected at CIAO (CNR-IMAA Atmospheric Observatory) using the other available measurement techniques. In particular, in this work the compared IWV are retrieved from:

1. a Trimble GPS antenna (data processed by the GPS-Met network, see gpsmet.nooa.gov);
2. a Novatel GPS antenna (data locally processed using a software developed at CIAO);
3. radiosondes (processed using GRUAN processing algorithm);
4. a microwave radiometer (data processed using a retrieval based on a neural network).

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Discrepancies between the time series will be shown and critically discussed.