



Precipitable water trends and variability investigated from homogenized global, long-term, GPS and DORIS datasets

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High-quality, consistent, global, long-term datasets of zenith tropospheric delay (ZTD) and precipitable water (PW) were produced from Global Positioning System (GPS) and Doppler Orbitography Radiopositioning Integrated by Satellite (DORIS) measurements. The GPS dataset (based on IGS repro1 & trop-new) comprises more than 400 sites over the globe among which 120 sites have more than 15 years of data (1995-2010). The DORIS data comprises 81 sites over the globe with 23 sites having more than 15 years of data. The ZTD data were screened using a two-level screening method. The first level uses post-processing information and applies range checks and outlier checks to ZTD and formal error estimates. It rejects less than 3% of the data. The second screening level detects outliers by comparing GPS and DORIS ZTD data with ECMWF reanalysis (ERA-Interim) data and rejects about 1% of the data. There is good consistency between the screened DORIS and GPS data and the ERA-Interim reanalysis data. However, biases and shifts are evidenced in the DORIS and GPS data which potentially result from instrument changes (e.g. replacement of DORIS Alcatel antennas with Starec antennas). Afterward, the GPS and DORIS PW data were homogenized by applying constant offset corrections based on the median difference with respect to ERA-Interim PW data. Such an offset is applied each time a known station equipment change occurs (based on station log files). Precipitable water vapour trends and variability (seasonal cycle, intra-seasonal and inter-annual variability) from GPS, DORIS and ERA-Interim data are compared at common sites with more than 10 or 15 years of data. Good consistency is found between all three datasets. This work demonstrates the high potential of the GPS and DORIS PW datasets for climate monitoring. These datasets may also be used for the verification of climate model simulations and climate data, e.g. PW measurements from radiosondes and satellites.