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Integrated water vapour from IGS ground-based GPS observations: A global dataset

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Water vapour plays an important role in the Earth's atmosphere system. E.g., it transports large amounts of latent heat energy, is the basic prerequisite for precipitation, and represents an important greenhouse gas. Thus, precise knowledge of spatial and temporal water vapour distribution is important in meteorology for both, numerical weather prediction and climatological studies. Considering the high temporal and spacial variability of water vapour compared to other meteorological quantities (e.g., pressure or temperature), conventional observations (e.g., radiosondes or meteorological satellites) give only limited information. Additional water vapour data from new observation techniques are highly desirable to achieve an adequate observation coverage. The humidity induced part of ground-based zenith path delay (ZPD) observations from the Global Positioning System (GPS) provides a valuable source of vertically integrated water vapour (IWV) information. Based on its global network observations (currently about 280 stations), the International GNSS Service (IGS) provides 2-hourly measurements of ZPD from February 1997 until the end of 2006 and a new 5-minute ZPD dataset starting from October 2000. We present initial results of IWV derivation from ZPD measurements applying 6-hourly global analyses from the European Centre for Medium-Range Weather Forecasts (ECMWF) to derive surface pressure and temperature information needed for conversion. The GPS IWV results are validated using humidity data from global radiosonde observations and ECMWF analyses. Beside IWV conversion, ECMWF data also provide an opportunity to monitor the performance of IGS station surface meteorology sensors.