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Atmospheric water vapor monitoring from local GNSS networks: comparisons of GNSS data adjustment strategies

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Since many years GNSS has been regarded by the meteorological community as one of the systems for atmospheric water vapor remote sensing. Time series of GNSS wet delays are estimated as by-products of accurate positioning. Their assimilation into numerical weather prediction (NWP) models is being investigated at both research and operational levels, although typically at coarse space resolutions (e.g. few tens of km). A dedicated use of this system for water vapor monitoring at higher resolutions is still under investigation. Ad hoc networks have been designed and implemented to collect data at a high spatial resolution (station inter-distances of 1-10 km), to have an insight into the spatial distribution of GNSS derived wet delays and/or into the impact of such information on high resolution NWP models. Within this research framework the paper reports the comparisons carried out between ZWD time series obtained from the data collected by an Italian and a Japanese dense networks of permanent geodetic GNSS receivers. Tropospheric delays have been estimated by applying different data adjustment strategies: relative positioning and PPP (precise point positioning). For this last strategy two different solutions have been analyzed and compared: the Bernese software batch solution, and the RTNet software Kalman filter solution. Assessment of the results were performed against IGS GNSS delays as well as by comparison with radiosonde-derived precipitable water vapor (PWV).