



Decadal variations in atmospheric water vapor time series estimated using GNSS, ERA-Interim, and synoptic data

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Ground-based GNSS (Global Navigation Satellite Systems) have efficiently been used since the 1990s as a meteorological observing system. Recently scientists used GNSS time series of precipitable water vapor (PWV) for climate research although they may not be sufficiently long. In this work, we compare the trend estimated from GNSS time series with that estimated from European Center for Medium-Range Weather Forecasts Reanalysis (ERA-Interim) data and meteorological measurements. We aim at evaluating climate evolution in Central Europe by monitoring different atmospheric variables such as temperature and PWV. PWV time series were obtained by three methods: 1) estimated from ground-based GNSS observations using the method of precise point positioning, 2) inferred from ERA-Interim data, and 3) determined based on daily surface measurements of temperature and relative humidity. The other variables are available from surface meteorological stations or received from ERA-Interim. The PWV trend component estimated from GNSS data strongly correlates (>70%) with that estimated from the other data sets. The linear trend is estimated by straight line fitting over 30 years of seasonally-adjusted PWV time series obtained using the meteorological measurements. The results show a positive trend in the PWV time series with an increase of 0.2–0.7 mm/decade with a mean standard deviations of 0.016 mm/decade. In this paper, we present the results at three GNSS stations. The temporal increment of the PWV correlates with the temporal increase in the temperature levels.