Long Time Series of Tropospheric Parameters from Very Long Baseline Interferometry

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In geodetic VLBI (Very Long Baseline Interferometry) the observations of extragalactic radio sources are performed at two frequencies (2.3 and 8.4 GHz) by a global network of radio telescopes. The most important observable for geodesy is the time delay between the arrival times of a plane wavefront at two radio telescopes. From a sufficient number of these observables various parameters can be estimated with highest accuracy, e.g. the Earth orientation parameters or baseline lengths. The variable tropospheric refraction is a major
source of errors for the estimation of these geodetic parameters by VLBI. The influence of the tropospheric refraction is taken into account by appropriate models which usually contain a hydrostatic and a wet part. By special mapping functions the tropospheric zenith delay is mapped to the elevation of the observation. The tropospheric wet zenith delays have to be estimated within the VLBI least-squares fit. In the last years it has become evident that the tropospheric parameters determined by VLBI can also be used for meteorological and climatological studies. In particular the wet component of the tropospheric zenith delay is of high interest. VLBI observations have been carried out at some stations since the beginning of the eighties, what allows the determination of the tropospheric parameters for more than 20 years. In this presentation the influence of the used terrestrial reference system and mapping functions on the estimated tropospheric parameters is investigated. Long time series of tropospheric parameters from VLBI were compared with GPS and ECMWF data w.r.t. linear trends and amplitudes of annual and semiannual components. Good agreement was found for seasonal variations, though linear trends showed some disagreement. Possible reasons of this disagreement are discussed.