



Effect of troposphere mapping functions based on numerical weather models on the terrestrial reference frame

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The terrestrial reference frame, e.g. realized as ITRF2000, is determined as a combination from several space geodetic techniques. The contributing radio techniques (GPS, VLBI, and DORIS) have to account for the same tropospheric refraction above the sites in their analyses. Models of the tropospheric delays are based on mapping functions which map down the zenith delays onto certain elevation angles. This is still a major error source in the determination of accurate terrestrial reference frames. Most of the analysis centers use the Niell Mapping Functions NMF (Niell, 1996) which have been derived from a standard atmosphere and therefore are functions of the day of the year, latitude and height of the stations, only. In the last years, troposphere mapping functions have been developed that are based on numerical weather models, e.g. the Vienna Mapping Functions VMF (Boehm and Schuh, 2004). These are given as site-specific time series with a time resolution of six hours. Extensive comparisons for large data sets (VLBI observations between 1984 and 2005) between NMF and VMF show that there are not only improvements in precision but also in the accuracy of the site coordinates with the new mapping functions based on numerical weather models. E.g., there is an improvement of baseline length repeatabilities with VMF, or some seasonal variations in station height time series can very well be explained by deficiencies of NMF.