Geophysical Research Abstracts, Vol. 7, 10155, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10155

Homogeneous long-time series of GPS and VLBI troposphere parameters

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Troposphere parameters estimated from space geodetic techniques allow a global monitoring of the lower part of the atmosphere. Systematic effects within each single technique degrade the accuracy and the stability of the zenith delay determination, especially over longer periods of time. Answering the question whether long-term trends in tropospheric parameters arise from a possible increase of atmospheric water vapor is therefore difficult. A comparison of independent time series from different techniques can help to detect systematic effects, to identify problems in local ties of co-located stations, and to quantify errors in the troposphere parameters themselves.

In this contribution we will compare consistent multi-year time series of troposphere zenith delays and gradients from different GPS and VLBI solutions. The GPS solutions (1994-2004) were computed as part of a reprocessing project of the Technical Universities in Dresden and Munich. VLBI solutions using equal modeling and parameterization were generated by DGFI. Co-located sites are used to investigate systematic effects and the long-term behavior of the two space geodetic techniques. The homogeneity of these completely reprocessed time series is essential to avoid misinterpretations.

Troposphere parameters are highly correlated with other parameters, e.g., station heights, terrestrial scale as well as technique-specific parameters like satellite antenna phase center variations (PCVs). A simultaneous comparison of consistent station coordinates and troposphere parameters from more than one technique allows deeper

insight into the correlation of these parameters and into long-term geodynamic, geophysical and atmospheric signals contained in the series. Different sets of GPS PCVs can be assessed by looking at the impact they have on the estimated troposphere parameter and coordinate series compared to those of VLBI. In addition, valuable information about the quality of local ties may be gained. Finally, the results of our comparisons will help to answer the question whether space geodetic techniques might be appropriate to climatological studies.