Introduction

Co-located sites of the space-geodetic techniques GPS and VLBI allow for a comparison of the common parameters determined by these two independent techniques. Long-time series of homogeneously processed GPS and VLBI data computed by TU Munich/TU Dresden (GPS) and DFGI (VLBI) covering the time interval from 1994 till 2005 provide the basis for our comparisons of different troposphere mapping functions and hydrostatic a priori delays. In order to minimize systematic effects due to differences in modeling and parameterization of the GPS and VLBI solutions, all important models as well as the parameterization of the software packages Bernese and OC-CAM used for the GPS and VLBI processing have been harmonized. Thus, a maximum level of consistency is guaranteed.

Troposphere Modeling

The troposphere slant delay \( \Delta d_{\text{tp}} \) is expressed by

\[
\Delta d_{\text{tp}}(\varphi, \lambda, \theta, \phi) = f_{\text{tp}}(\varphi, \lambda, \theta, \phi) + \Delta b_{\text{tp}}(\varphi, \lambda, \theta, \phi) + \Delta a_{\text{tp}}(\varphi, \lambda, \theta, \phi) + \Delta a_{\text{tp}}(\varphi, \lambda, \theta, \phi)
\]

with

- \( \varphi \): zenith distance of satellite/quasar
- \( \lambda \): azimuth of satellite/quasar
- \( R \): receiver/telescope
- \( b_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): hydrostatic mapping function
- \( \Delta b_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): estimated (wet) troposphere zenith delay
- \( \Delta b_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): troposphere gradient in north-south direction
- \( \Delta b_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): troposphere gradient in east-west direction
- \( \Delta a_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): hydrostatic (a priori) troposphere zenith delay
- \( \Delta a_{\text{tp}}(\varphi, \lambda, \theta, \phi) \): wet mapping function

The different GPS and VLBI solutions are listed in Table 1.

<table>
<thead>
<tr>
<th>Solution</th>
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The GPS solutions are based on the complete and homogeneously reprocessed of a global GPS network conducted by TU Munich (Steigenberger et al., 2006) using a modified version of the Bernese GIPPS Software 5.0. The results of 1-day solutions covering the time period from 1 January 1994 till 30 October 2005 are used here. Parameters dependent weighting and a cut-off angle of 3° were applied. The VLBI solutions are based on observations of 49 telescopes from 2760 24-hour sessions between 4 January 1984 and 30 December 2005 using OCCAM 6.1 (Teller et al., 2004) and DOSS-LIS (Angermann et al., 2004). The terrestrial and the celestial reference frame as well as the ERPs were estimated simultaneously to guarantee full consistency within the VLBI solution (Tesmer et al., 2004). An elevation cut-off angle of 5° and a refined stochastic model that mainly consists of an elevation-dependent weighting (Tesmer and Kutterer, 2004) were applied.

Results

![Figure 1](image1.png)

Troposphere zenith delay: 2-hour resolution

![Figure 2](image2.png)

Troposphere zenith delay: 1-hour resolution

Table 1: Important characteristics of the GPS and VLBI tracking networks. Important characteristics of the GPS and the VLBI solutions are summarized in Table 2.

![Table 1](image3.png)

References
