Geophysical Research Abstracts, Vol. 9, 09033, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09033

Data processing and requirements for high-resolution GPS tomography

S. Lutz, M. Troller, A. Geiger, H.-G. Kahle
Institute of Geodesy and Photogrammetry, ETH Zürich

The main objective of the project presented is the determination of a 4-dimensional distribution of atmospheric water vapor over a local region using GPS tomography in order to meet the requirements of high resolution. Two dedicated field campaigns were carried out in July and October 2005 within a 50 by 50 square kilometers area in the Canton of Valais (Switzerland) to study the feasibility of the method for a non-permanent GPS densification network in a region of rugged topography.

The selection of the GPS campaign sites is based on a compromise between suitable height distribution of all stations and undisturbed observations. Data from the permanent Swiss networks AGNES and Swissat, from IGS stations and others were added in the subsequent processing. The analysis of the GPS data was extended by the generation of satellite visibility plots for each station. Furthermore, cycle slip detection, elevation dependent signal to noise ratios as well as elevation and satellite dependent multipath statistics are calculated. The influence of these effects on the tomographic solution are investigated. Bernese GPS Software Version 5.0 was used for the post-processing of the GPS data to obtain double-differenced residuals as well as zenith total delays (ZTD).

The data of air pressure, temperature and water vapor pressure was collected, collocated and calculated at the GPS station coordinates. The Saastamoinen formula was used to separate the ZTD into a wet and a dry part. The GPS-derived water vapor profiles calculated with the software package AWATOS are compared with other methods, such as radio soundings and solar spectrometry.

Investigations are carried out in view of near-real time processing. The introduction of rapid orbit products and the processing of hourly results are prepared for near real-time estimation needed for hydrological hazard assessment.