



Determination of the 3D Water Vapor Distribution in the Troposphere on a Continuous Basis Using GPS

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GPS signals are sensitive to the water vapor of the troposphere. Operating a permanent GPS network, the total amount of the water vapor content can be determined on a continuous basis. GPS-tomography is a technique to resolve its 3-dimensional distribution by estimating the values of wet refractivity in a given voxel model. This approach is able to account for the vertical resolution of water vapor in the troposphere. We developed the software package AWATOS which is based on the assimilation of GPS double difference observations. Applying a least-squares inversion, the inhomogeneous spatial distribution of water vapor is determined with a high temporal resolution.

This contribution depicts the results of an extensive study, carried out with the dense Swiss national permanent GPS network AGNES. Vertical water vapor profiles have been determined at the 30 well-distributed GPS stations in the area of Switzerland. These profiles have been generated on an hourly basis during 2 weeks in October 2004. Radiosondes as well as hourly profile data of the numerical weather model aLMo of MeteoSwiss are used for comparison. Different external constraints and the integration of data from independent measurement sensors are presented and analyzed. The statistical evaluation of the tomographic solutions compared with the data of aLMo reveals an overall good agreement of around 5 ppm (refractivity units). Further investigations are aimed at improving the constraints in order to increase the resolution of the 3-dimensional water vapor determination.