Geophysical Research Abstracts
Vol. 15, EGU2013-8948, 2013
EGU General Assembly 2013

First results of the tomographic reconstruction of atmospheric water vapour using GNSS observations in Hungary

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The continuously operating GNSS networks play an important role not only in surveying but in geodesy and other geosciences, too. Using the precise coordinates of these stations, the tropospheric delay of the GNSS signals can be estimated. This shows a strong correlation with the integrated water vapour in the atmosphere. Nowadays the vertically intergated water vapour is routinely estimated from 52 GNSS stations over the territory of Hungary on an hourly basis.

A more detailed model of the distribution of atmospheric water vapour can be created using the slant tropospheric delays estimated along the propagation path of the satellite signals. In this paper a four-dimensional tomographic model is introduced based on modeled and observed slant tropospheric delays.

The modeled slant delays are computed using the estimated vertical delays and the Niell-mapping function. Since the real distribution of the atmospheric water vapour may not follow the isotropic Niell-mapping function, slant tropospheric delays are estimated from the double-difference residuals of the GNSS observations using a zero-mean assumption.

The first results of the tomographic reconstruction are presented in the paper and they are validated with radiosonde observations at both of the Hungarian Radiosonde launching sites.