



## Ground-based GPS water vapour tomography

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In the last years the European GPS networks passed through a period of rapid development. The increasing extension and density of the GPS networks make the GPS meteorology to a promising tool for remote sensing of the atmosphere. Together with 3D reconstruction techniques, such as tomography, spatially resolved meteorological quantities, e. g. water vapour fields, can be acquired.

The preconditions to water vapour GPS tomography above Germany will be discussed in detail. Simulations of GPS data which might be acquired from the existing GPS networks are used to estimate the information provided by these data, e. g. resolution, distribution, temporal variation. Some reconstructed water vapour fields are presented to demonstrate the quality and the limitations of ground-based GPS in the present state.

Based on this analysis several suggestions for future improvements of GPS networks and data analysis techniques will be developed. Simulations show the impact of some future improvements and are used to estimate the effort necessary to obtain results required by modern numerical weather forecast models. Ground-based European GPS networks of different densities have been simulated to test the tomographic reconstruction methods. As a preliminary result a network consisting of 35 km cells would be required to obtain reliable reconstructed 3D fields with a horizontal resolution of about  $50 \times 50 \text{ km}^2$  and a vertical resolution of 8 layers within the troposphere (up to 10 km height).