



Assimilation of ground-based GPS observations into the MM5 4D-Var system

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The importance of an accurate initialization of the water vapor field for numerical weather predictions has been underlined in numerous publications. Although the water vapor is initialized by radiosonde measurements, AMDAR, SYNOP, and satellite observation, severe gaps in the observed water vapor field exist.

During field campaigns, more sophisticated instrumentation is available that provides observations of the water vapor field in a high temporal and spatial resolution and high accuracy (e.g. DIAL and Raman lidar). However, for an operational usage, such instruments are yet too expensive and the necessary maintenance further restricts their operational utilizability.

With recent advances in Global Positioning System (GPS) atmospheric remote sensing, ground-based GPS receivers have become an important instrument that can provide high-resolution water vapor measurements operationally at low cost. Another advantage is that the system can operate under all weather conditions.

In this talk, the development of the necessary observation operator as well as results from a realtime assimilation study with GPS data provided by the GFZ Potsdam and the UK MetOffice is presented.

The used observation operator for GPS slant path delay, as a line integral over the refractivity from a ground station to a satellite, is presented. This observation operator

was implemented in the MM5 4D-Var and a realtime forecast system was set up in the framework of the D-PHASE and the COPS projects to provide forecasts during the six month period June to November 2007. A statistical analysis of the influence on the forecast, currently under preparation, is shown. First results demonstrate a positive impact on the representation of the diurnal cycle of precipitation in the COPS area.