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Variational Assimilation System for Ground-based GPS Slant Total Delays

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Geodetic processing enables estimation of the tropospheric delays affecting the microwave signals broadcasted by the satellites of the Global Positioning System (GPS). These delay estimates can be considered as atmospheric humidity observations. The delay can be estimated either in the vertical column above the ground-based receiver, or along the slanted signal path between the satellite and the receiver. These two strategies lead to estimates of Zenith Total Delay (ZTD) and Slant Total Delay (STD), respectively.

The three-dimensional variational assimilation system of the High Resolution Limited Area Model (HIRLAM 3D-Var) has been modified to be capable of assimilating the STD observations. This presentation gives a description of the assimilation system characteristics with emphasis on the evaluation aspects.

Two basically different evaluation approaches have been adopted. The first approach uses hypothetical STD observations at a single receiver station. The second approach makes use of real STD, ZTD and radiosonde observations and focuses on comparison between the assimilation increments obtained by assimilating data from different observing systems. The assimilation system is concluded to be able to extract information contained in the STD observations.