

Assimilation experiments with ground-based GPS observations in the Canadian Regional Deterministic Prediction System

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Better information on the often highly variable atmospheric moisture field is of great importance in the effort to improve numerical weather prediction (NWP), especially over the 0-2 day range at regional and local scales. Measurements of GPS zenith tropospheric delay (ZTD) from networks of ground-based receivers provide valuable information on integrated water vapour (IWV). In theory, better moisture analyses in NWP systems leads to improved forecasts of related elements such as clouds, precipitation, and convective stability.

Research towards assimilation of ground-based GPS measurements has been ongoing at the Environment Canada (EC) Meteorological Research Division for a number of years, using near-real-time data from the NOAA Global Systems Division (GSD) ground-based GPS (GB-GPS) network. The ground-based GPS data come from a network of over 400 GPS receivers located primarily over North America and consist of 30-minute ZTD measurements with collocated (or nearby) surface observations of pressure, temperature and relative humidity that can be used for retrieval of IWV from ZTD. This paper presents results of recent experiments involving the addition of NOAA/GSD GB-GPS network ZTD and collocated surface weather observations to the upcoming version of the EC Regional Deterministic Prediction System (RDPS). The upcoming RDPS, to be implemented in 2012, uses a 4D variational (4D-Var) method to produce a limited area regional (North America) analysis which provides initial conditions for a 48h integration of the 15 km GEM (Global Environmental Multi-Scale) Limited Area Model. GB-GPS data are added to conventional upper-air, surface, aircraft, satellite and GPS radio occultation data in the 4D-Var regional analysis, and the impact of the new data on analyses and forecasts of the RDPS is evaluated over summer and winter seasons. Future plans for GB-GPS data in the RDPS are also presented.