Using a Numerical Weather Model to convert WVR brightness temperatures to delay

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The relation between atmosphere brightness temperatures as measured by a microwave Water Vapor Radiometer (WVR) and the delay a radio wave would experience traversing the same path is not unique. To convert from brightness temperature to delay, usually for geodetic applications or comparisons, a statistical relation is used. This relation is generally based on brightness temperatures and delays calculated from radiosonde measurements at a climatologically similar location and time period. Such a procedure is needed because radiosonde information is rarely available close to the WVR.

A less accurate, but potentially more widely available, source of the temperature and spatial distribution of water vapor is a numerical weather model (NWM) or forecast. In principle this information can be utilized to provide the conversion to delay at the location and for the conditions at the time of the WVR measurement.

During the CONT02 VLBI campaign in 2002 October WVRs were operated at several of the VLBI sites. In addition the MM5 NWM has been run as a series of 12 hour forecasts initialized every 6 hours at two of the sites for which WVR measurements are available. The forecasts were calculated on a finest grid of 3 km spacing. The forecast information will be used to convert the WVR brightness temperatures to delay, and the results will be evaluated by comparison with measurements of the delays by VLBI and GPS.