Geophysical Research Abstracts
Vol. 13, EGU2011-6705, 2011
EGU General Assembly 2011

The impact of assimilating zenith total delay measurements from Ground-based GNSS receivers in the Met Office numerical weather prediction UK model

Gemma Bennitt and Thomas Levick
Met Office, Exeter, United Kingdom (gemma.bennitt@metoffice.gov.uk)

Zenith Total Delay (ZTD) measurements from Ground-based GNSS receivers have been assimilated into the Met Office regional numerical weather prediction models (NWP) since 2007. Previous ZTD impact studies performed at the Met Office have focused on assessing the overall impact over a range of weather conditions, in order to inform the decision of whether to assimilate the observations operationally. Impact studies performed prior to 2007 at the Met Office used NWP models with resolutions of 12 and 24 kilometres. Since those impact studies were performed, the number and distribution of ZTD observations has increased and there have been various improvements to the NWP models. It was therefore decided that the impact of the ZTD observations on forecasts should be reassessed.

Studies by other authors have shown that assimilation of ZTDs can be particularly beneficial in the prediction of heavy rainfall, particularly in situations of high moisture flux and rapidly developing convection. Previous studies at the Met Office have used the North Atlantic and European model at both 12 kilometre and 24 kilometre horizontal resolution. For this study, the Met Office UK 4 kilometre (UK4) model was used, which has a 4 kilometre horizontal resolution, and 70 vertical levels with a model top of 40 kilometre. The observations are assimilated using a three dimensional variational assimilation scheme. Forecasts are made out to 36 hours at analysis times of 03, 09, 15, and 21 UTC. Two case studies were chosen in which orographically enhanced localised convection developed over the UK, which produced heavy rainfall. The first case study, from the 18th June 2010, sees a line of heavy rain developing along the Pennines in northern England. The second case study, from 25th June 2010, sees a line of intense rain developing along the eastern side of the Welsh highlands. A third study period was run which covered a two week period starting on the 25th April 2010. For each study period a control experiment was run which used all observations normally assimilated by the UK4 model, which includes ZTDs, and a trial experiment was run in which ZTD observations were removed from the assimilation. The forecasts have been validated against surface observations.

Assimilation of ZTDs in all cases improved the overall forecast of six hour precipitation accumulation. The effect on forecasts of cloud and visibility was mixed. In the 14 day trial there were notable differences between the control and trial experiment in the humidity analysis when upper level fronts were identified. This illustrates the challenges of assimilating a column integrated observation.