

Ground-GPS data assimilation and its impact on Mediterranean heavy rainfall prediction

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During 5-9 September 2005, a convective system has hit the region of south France where there exists a high density network of ground-GPS stations from the OHMCV campaign. This event gives us a good chance to evaluate the impact of assimilation of high spatial resolution GPS Zenith Total delay(ZTD) observations on the prediction of rainfall with the mesoscale model MesoNH.

ZTD observations have been assimilated with the 3D-Var data assimilation system based on the ALADIN limited area model. Two 6-h cycle assimilation experiments (with and without ZTD observations) using this mesoscale data assimilation system were conducted for a duration of 1 month including the heavy rainfall period. Conventional observations as well as METEOSAT clear air radiances were also assimilated in both experiments. A pre-processing of ZTD observations was carried out before their assimilation in order to apply a quality check on the observations and remove bias.

To evaluate the impact of GPS data assimilation on the high-resolution forecast of the heavy rainfall event, two forecast trials with the non hydrostatic model MesoNH (2.5km) were realized using the analysis of the cycle assimilation experiments as the initial conditions and boundary limit conditions. These two forecast trials were conducted every 12 hours from 00 UTC, 5 September 2005 to 00 UTC, 9 September. Each run lasted 18 hours.

We found that assimilating GPS ZTD observations has some certain impact on the statistics of background humidity and wind field used in the assimilation cycle experiments while for other parameters, the impact is almost neutral. And the results of the two high-resolution forecast trials suggests that the GPS data helps recover slightly better the distribution and intensity of this rainfall events.