From COPS to HyMeX: Assimilating ground-based remote sensing data into high-resolution atmospheric models to predict extreme precipitating events

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Introduction
Ground-based remote sensing instruments are central to observe the atmosphere, and therefore contribute directly to the comprehension of atmospheric processes. They can also contribute to this comprehension indirectly through their use in data assimilation to improve initial conditions of atmospheric simulations. From an operational point of view, the assimilation of data collected by such instruments can also potentially improve weather forecasts.

Achievements from the COPS campaign
The Convective and Orographically induced Precipitation Study (COPS) campaign that took place in the Summer 2007 in an area including the Vosges and Black Forest aimed at "advance[ing] the quality of forecasts of orographically-induced convective precipitation by four-dimensional observations and modelling of its life cycle" (Wulfmeyer et al. 2008). For that purpose, a large number of remote sensing instruments have been deployed during this campaign. First results from assimilation experiments of data collected during the COPS campaign, like GPS Zenith Total Delay (ZTD) or radar data, have shown positive impacts at high resolution, especially for convective events (Yan et al. 2009, Caumont et al. 2009). Since then, the assimilation of GPSs and radar Doppler velocity has even been included in the first operational version of Arome, in December 2008. The COPS campaign has thus contributed to show the potential of remote sensing data for assimilation and paved the way for their inclusion in operational convective-scale assimilation systems.

Towards the HyMeX campaign
As for the COPS area, the region covered by HyMeX is prone to heavy precipitating events, which can lead to even more severe damage. Improving the comprehension and prediction of such specific events is one of HyMeX’s primary goals. Therefore, during the HyMeX campaign, similar ground-based remote sensing instruments will be deployed. As for COPS, our aim is to assimilate reflectivity and Doppler velocity into the Arome model running on the HyMeX domain at a horizontal resolution of 2.5 km, and assess the impact of these observations on weather situations different from those that occurred during COPS. In addition, we plan to assimilate new observation data types like dual-polarization observations and reflectivity from ground-based weather radars, as well as wind from vertical profilers. Contributions and/or model intercomparisons on this topic are welcome so as to collect more data and/or do model intercomparisons.

References
Caumont, O., E. Wulmtler, G. Jaubert, and V. Ducrocq, 2009: Assimilation of weather radar reflectivity in the AROME model for the COPS-COPS. Proc. Int. Conf. on Alpine Meteorology (ICAM 2009), Reutte, Germany, Annals der Meteorologie, 44, 80-81.