13.13 ON THE USE OF NWP MODEL OUTPUTS TO PRODUCE RADAR VPR CORRECTIONS

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Radar and gauge networks offer nowadays complementary means for measuring precipitation. Rain gauge networks provide a precise but often sparse measure of the rainfall while radar networks can sample precipitation at high resolution over broad areas but with large estimation errors. Combining hourly radar rain gauge accumulations is one of the solution considered at Météo-France for producing a better QPE product (Laurantin, 2008). However, there is a strong need to produce more accurate radar precipitation estimations for situations where gauge networks cannot represent well enough precipitation field: over short accumulation periods, in convective situations or in mountainous areas. One of the most important limitation for estimating precipitation at the ground with radars is the height of the radar beam that increases with the range from the radar and the elevation considered. The estimation becomes particularly difficult when the lowest radar elevation scan is blocked by mountains and higher elevation beams are used to estimate the precipitation behind.

In many operational weather services, a Vertical Profile of Reflectivity (VPR) correction (Kitchen et al., 1994; Andrieu and Creutin, 1995; Vignal et al., 1999; Borga et al., 2000; Seo et al., 2000; Germann and Joss, 2002; Tabary, 2007; Kirstetter et al., 2010) is calculated and used to estimate the reflectivity at the ground. However, to derive this correction, radar data are generally aggregated over large parts of the radar domain and the correction can hardly take into account the true temporal and spatial variability of the VPR. Ideally, the VPR should be estimated in each point of the radar domain.

Equipped with a radar forward operator (Caumont et al. 2006; Augros et al, 2016), the French operational high-resolution NWP model AROME (Brousseau et al., 2016) can produce realistic yet possibly shifted VPRs every hour with a horizontal resolution up to 1.3 x 1.3 km^2. The new method developed in this study relies on the potential of AROME forecasts for retrieving local VPRs. Through a Bayesian method (Kummerow et al., 1996, 2001; Caumont et al. 2010), the closest simulated VPR profile to the apparent one (observation) in terms of reflectivity is searched and then applied to estimate the rain rate a the ground.

This new method has been evaluated on several precipitating events. The VPRs retrieved by the method and the current operational algorithm are compared to VPRs produced by the vertically oriented scans of the neighbouring radars, showing the greater consistency of the new VPRs. The hourly radar accumulations obtained by using this new method are in better agreement with rain gauges accumulations than the current operational ones, the RMSE is reduced by about 10%, with most of the improvements at long range.

The computational time obtained suggest that the method is compatible with a real-time use and could be implemented operationally. This first result gives inter-

esting perspectives on how to improve radar QPEs at long range and over complex terrain.

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