3.16 A FIRST ANALYSIS OF THE VALLIRANA RADAR DATA QUALITY AND ITS CONTRIBUTION TO THE RADAR NETWORK OF THE METEOROLOGICAL SERVICE OF CATALONIA (XRAD)

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In 2012, the Vallirana radar (PBE) had a critical leveling pointing problem, among other issues, that arose because the antenna system was outdated and the tower was too old. From January 2013 to September 2016, the operation of this radar was interrupted, the old inappropriate tower was replaced for a new, reinforced one and the antenna-pedestal system was upgraded to the "standard" XRAD module, Orbit AL-1017-1E, in order to match the specifications of the rest of the XRAD radars. With these changes and the corresponding reception chain configuration, the PBE data has been included in the XRAD composite, improving the reflectivity data field coverage over Catalonia, especially over the Metropolitan Area of Barcelona (MAB), which is one of the most populated areas of South Europe, also with high precipitation rates and frequently affected by floods and severe weather.

The reception chain configuration included: (1) the receiver calibration measurements, (2) the tuning of the processing algorithms already implemented in the RVP8 signal processor and (3) the configuration tasks. One of the main problems, while configuring the PBE reception chain, was to deal with the high electromagnetic noise produced by the significant telecommunication activity in the surroundings of the radar site, which degrades the signal-to-noise (SNR) figure. On one hand, this random noise affects negatively the threshold values of the static quality filters applied: SNR (LOG), Clutter-to-Signal Ratio (CSR) and Signal Quality Index (SQI). On the other hand, the random noise in combination with the ground clutter produces false echoes, holes and speckles in the weather echoes registered by the radar. In this case, due to the noisier environment, the clutter filter which better minimizes these non-desired effects is the Gaussian Model Adaptive Processing technique (GMAP, Siggia and Passarelli 2004), while the common option in the XRAD is the use of a filter with fixed or variable window in the frequency domain. In this work, this issue is described and briefly discussed by comparing different reflectivity outputs depending on the configuration.

In the present work, a description of the PBE receiver calibration and antenna operation is presented. In addition, a XRAD coverage study over the MAB is carried on, comparing the situation with and without PBE. The incorporation of this radar to the XRAD improves notably the quality of the reflectivity field over this region, lowering the beam height relative to the terrain surface, increasing the registration time rate and filling the pixels that present beam blockage for the other XRAD radars.

Finally, in order to show the relevance of the PBE contribution to the XRAD composite, different rainfall episodes that took place at the beginning of 2018 have been analysed, comparing the outputs with and without the radar. The results of the evaluation of several derived reflectivity products, individual or composite, exemplify the data quality enhancement over the studied area.