Performance comparison of a low cost dual-polarization X-band mini radar with references systems in X and C bands in Rome supersite

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In recent years, new developments on X-band dual-polarization technology have received the interest of scientific and operational communities. New enterprises are focusing on the optimization of cost, benefit and performance of low-power and compact mini radar technologies as well as their use in a network configuration. It is known that their limitations are the smaller range due to low power and the significant signal attenuation at X-band in heavy rain.

Within the context above, an innovative Mini radar with dual-Polarization capability at X-band (hereafter called MiniPolX) was tested during an experimental campaign in which MiniPolX observations were evaluated against other two polarimetric radars used as benchmark systems. These two reference radars are the National Observatory of Athens' X-band (XPOL) mobile system and the National Research Council (CNR)'s C-band (Polar55C) high power system. For the experimental campaign the three radars were located at the same site which is the research area of ISAC-CNR in Rome. Additionally, a dense network of rain gauges and disdrometers were also involved in the analysis.

The same processing dual-polarization chain was applied to MiniPolX, XPOL and Polar55C raw data to avoid including uncertainties due to differences chains process from each of the three radars. The dual-polarization chain focused on data-quality control, precipitation classification, path attenuation correction and rain estimation.

This paper wants to show the results of the experimental analysis after the first six-months of measurement campaigns, during which MiniPolX has operated under different rain regimes including intense convective events and moderate widespread precipitation. Despite some lower performance at longer ranges the preliminary results revealed that MiniPolX, when compared with more accurate systems, shows acceptable performance in terms of polarimetric measurements and accuracy of spatial variability of rainfall. This makes MiniPolX a reliable low-cost solution for both local and extra-urban scale weather monitoring.