X-band weather radar monitoring of precipitation fields in Naples Urban Areas: data quality, comparison and analysis

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The metropolitan areas of Naples is the most populous in Italy, having a population of 3,020,000 peoples, and being within the first ten most populous urban areas in the European Union. Within such areas population, industry, commerce, transport and government activities are highly affected by severe weather associated with convective storms, flash floods and mood slides as well as other damages caused by hail and lightning. In this respect X-band weather radars' capability to monitor precipitation at high spatial and temporal scales is of outmost importance and stimulates a significant interest within both meteorological and hydrological community. This is due to the fact that improving intense storm and flash flood forecast requires accurate quantitative rain measurements at small scales, especially in relatively limited basins.

Within this context an innovative single-polarization X-band low-cost mini-radar system has been installed and tested in Naples metropolitan areas. This work describes some preliminary results showing the usefulness and potentiality of such mini-systems especially at short ranges. An analysis of systematic errors (i.e., ground and sea clutter, attenuation effects and partial beam blocking) is dealt with as well as rainfall retrieval by exploiting a new techniques for gauge calibration. It should be noted that the high spatial and temporal resolution of X-band mini-radar precipitation estimates are suitable for a proper comparison with rain gauge network data. This comparison has been carried out for warm and cold season precipitation events, in order to evaluate results according to rainfall nature (stratiform, convective and orographic).