

Polarimetric signatures of Mediterranean storms retrieved by an operational polarimetric X-band radar system

Gianfranco Vulpiani

Department of Civil Protection, Italy

Luca Baldini (Institute of Atmospheric Sciences and Climate, National Research Council, Rome, Italy)

Elisa Adirosi (Institute of Atmospheric Sciences and Climate, National Research Council, Rome, Italy)

Nicoletta Roberto (Institute of Atmospheric Sciences and Climate, National Research Council, Rome, Italy)

E-mail: gianfranco.vulpiani@protezionecivile.it

A couple of severe Mediterranean storms occurred in 2013 and observed by an X-band radar, belonging to the Italian radar network, are documented in terms of their polarimetric signatures.

On the 21st of February 2013, a convective system originated in the Tirreanean sea, hit only marginally the central-eastern coastline of Sicily (Italy), causing the flash-flood of the city of Catania. The optimal radar location, i.e., the system is located inside the Catania airport at just few kilometers from the city center, enabled to well reconstruct the storm characteristics.

On the 21st of August 2013, a mesoscale convective system lasted some hours and originated by the temperature gradient between sea and land surface, flodeed the city of Siracusa (south-estearn Sicily) with about 180 mm of rainfall registered in two hours by the nearby rain gauge.

Absolute and differential attenuation are dealt with differential phase measurements properly processed through an iterative approach using a short moving window. A Bayesian hydrometeor classification algorithm was also adopted to support the analysis of the storm characteristics. Extemporaneous signal extinction caused by close-range hail core causing significant differential phase shift in very short range path is documented.

The localized peaks of precipitation amount were well reconstructed using a combined polarimetric rainfall algorithm based on reflectivity and specific differential phase. The rainfall algorithm parameterization is derived by DSD observations collected in Central Italy during the HyMeX field campaign in 2012.