

3.12 SEVERE WEATHER AND HAIL DETECTION USING THE X BAND WEATHER RADAR TUSCANY NETWORK

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In the last years, an occurrence increment of the weather patterns generating severe thunderstorms was observed for the Mediterranean area. This aspect has been particularly relevant in Tuscany (central Italy) where several heavy rains events led to river floods and landslides, especially in coastal areas. Indeed, the synergy of high sea surface temperatures and moist air-masses combined with deep troughs can produce very unstable environments that are favourable to the occurrence of such events.

For a better characterization of these phenomena and for limiting the related risks, a regional X-band weather radar network has been implemented in the Tuscany coastal areas. Three single-polarization weather radars, located in Livorno, Castiglione della Pescaia and Cima di Monte (Elba island), compose the regional network.

Firstly, this work describes the performances of such a network in the monitoring of some precipitation events, particularly intense. The radar composite has been compared with some ancillary data as satellites, raingauges, lightning observations and other radar systems operating in different frequencies (C and S band).

Severe weather systems are sometimes characterized by the presence of hail. Because of its spatial and temporal variability, an accurate detection of hail from ground measurements is very difficult, but an operational hail detection system could be useful for several objectives, from supporting risk management at urban scales to the assessment of damages in agriculture.

Few methods exist for automatic hail detection using single polarization radars, mainly based on the analysis of the vertical structure of reflectivity. Some methods use ancillary data, as the freezing level and the ground temperature, for a better characterization of the microphysics of the maximum vertical reflectivity cell, and consequently the presence of hail.

Two different algorithms, based on the Waldvogel approach and on the Vertically-Integrated Liquid Density (VIL-Density) product, have been tested and compared to assess the capability of such radar network in hail detection with the aim of developing a POH (Probability-of-Hail) index.

Some hail case studies, identified by the Tuscany meteorological office reports, have been analysed and preliminary results concerning the performances of these methods are shown.
