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Radar and satellite observations of a severe wet microburst over Tuscany

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In the last decades, severe weather events are become more and more frequent: the socio-economic impacts they have produced were devastating. Flooding, huge damages to building and human losses are some consequences of their extraordinary strength. Different observing sensors can allow characterising such events dynamically and microphysically. The joint use of these heterogeneous measurements is certainly essential for the needs of their monitoring and possible nowcasting. While in situ networks (i.e. raingauges) often are not able to capture their dynamic and intensity, meteorological radar systems represent a meaningful tool for characterising the spatial distribution and the temporal evolution of intense precipitation systems very localised in time and space. In the present work, different radar observations, one X-band and two C-band radars in Tuscany, one S-band radar in Corse, are used to investigate a severe wet microburst over Tuscany, occurred on the 1st of August 2015. A weak trough located in the Tyrrhenian Sea between Corse and Tuscany led to the formation of a multicellular convective storm, rapidly moving towards the inner part of Tuscany. As witnessed by the local reports, the hail grains, the intense wind gusts and precipitation produced huge damages to buildings, uprooted secular trees and injured one person.

The results of this work show how the integration of different radar observations led to multiple benefits: firstly, the actual displacement of the radars provided a fully and continuous monitoring of the event, allowing a correct characterization of its dynamics; secondly, a good spatial resolution (especially of the X-band radar with its 450 m) allowed discerning with great details the precipitation features. CAPPI and HVMI products reconstruct the great vertical development of the weather systems and the composite map shows reflectivity values up to 60dBZ. Undoubtedly, the combination of homogeneous information coming from different layers in the atmosphere allows investigating deeply the cells from different heights and formation stages.

In addition, geostationary satellite observations from Meteosat Second Generation are used both to enlarge the temporal dynamic overview and to characterise the physics of the convective system, which is very developed vertically with very low cloud top temperature up to -70°C, as observed in the MSG IR channel. Overshooting tops are present in the mature stage of the system, as witnessed by the shadows that are present over the very bright and white background, as observed in the MSG HRV channel.