

Severe convection in the Mediterranean from microwave observations

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The Mediterranean region is frequently affected by intense meteorological events such as heavy precipitation and flash floods as well as occasional but potentially devastating tropical-like cyclones. In particular, deep convective systems can accumulate considerable rain volumes over a region in only a few hours. A special class of intense convective events called convective overshootings (COV) has been shown to be associated with particularly severe weather such as heavy rainfall, damaging winds, hails, and tornadoes in the Mediterranean.

In this study, we illustrate the potential of passive microwave observations for establishing a climatology of severe convection in the Mediterranean. In particular, we use the observations from the passive microwave sounder MHS (Microwave Humidity Sounder) conjointly with the cloud radar Rasta to characterize deep convection (DC) and convective overshootings occurrences during the fall 2012. We analyse two cases for which high amounts of rain have been reported over Balearic Islands and northeastern Spain, respectively. The first case, that took place on 20 October, is characterized by a mesoscale convective system that triggered 149 mm of rain in 24 h and flooding in the Ebro Basin. We detect during this case a 50 km-diameter convective overshooting characterized by two elevated towers with ice water content up to 1.4 g/m³ at 12.5 km. The second case took place on 12 October and triggered 100 mm of rain in 24 h, with wind gusts (100 km/h), hail and local flooding in the Balearic Islands. This case was also characterised by an overshooting region with remarkably high ice water content (> 2 g/m³ at 12 km). These two cases permit to validate the detection of DC and COV in the Mediterranean using MHS measurements leading to the development of a long-term climatology from 1999. The climatology illustrates the strong seasonal and interannual variability of DC and COV. Most of COV and DC occur during fall when many severe convection events develop over southern Italy and western Greece.