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Analysis of convection in three tropical-like Mediterranean storms using satellite and lightning networks

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Tropical-like storms in the Mediterranean Sea with a clear eye surrounded by an axisymmetric cloud structure are quite unusual. A few cases per year on average are identified in satellite images in all the Mediterranean basin. These storms, once generated over the sea, can affect islands and continental coastal lands. Although documented tropical-like cyclones have not usually achieved hurricane intensity, their potential for damage is high due to the densely populated Mediterranean coastal regions. Therefore, it is important to accurately forecast these rare events using numerical models. It is known, however, the difficulties suffered by simulations due to the scarcity of meteorological observations in maritime areas. Assimilation of satellite derived information in MM5 simulations by means of convective or stratiform precipitation classification from Meteosat datasets is explored in our group. The success of these assimilation techniques depends on the algorithm skill to discriminate between both rainfall regimes. Two satellite methods aimed at detecting convective points are developed and applied on the environments of three tropical-like storms. The first method is based on the channels difference between the 6.5 μm (water vapour) and the 11.5 μm (thermal infrared) while, the second, on the cooling rate of cloud top pixels in thermal infrared images. Finally, convective points from both techniques are spatially verified using electrical discharges from lightning networks in order to find the most accurate method.