

# **Climatology of sensitivities of Mediterranean intense cyclones and heavy rain episodes**

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In the pursue of better forecasts, interest has grown in recent years to improve the operational observations strategies. The costs of both terrestrial and spatial components of the observation networks are very high and society is continuously demanding for a more efficient prediction system with cheaper observing systems and more valuable end-user forecasts. In this framework, targeted observations have received great attention within the operational weather community. Keeping in mind the chaotic nature of the atmosphere and so the high sensitivity of numerical weather forecasts to the initial conditions, the idea of making special observational efforts over certain areas of interest has great potential. The MEDEX project (<http://medex.inm.uib.es>) is aimed at improving the forecasts of high impact weather (HIW) in the Mediterranean.

The aim of this study is to obtain the climatologically significant sensitive areas for Mediterranean HIW. Since no good databases of Mediterranean HIW are currently available, we use a twofold approach. On one hand, intense cyclones detected from the ECMWF ERA40 reanalysis are considered as a first proxy for Mediterranean HIW. Also, and taking into account the limitations of using this proxy for the late warm season heavy rain episodes, a database of heavy rain events that comprise some Western Mediterranean countries is used. For the two sets of episodes (intense cyclones and heavy rain days) we perform an objective cluster analysis of tropospheric fields using the k-means method and compute the sensitivities for each of the resulting classes. For each cluster, a representative sensitivity field is computed using the MM5 Adjoint Model. We explore various aspects of the resulting set of sensitivity fields such as the temporal evolution, the intensity, or the most sensitive fields.

Preliminary results show that although the sensitive areas for Mediterranean HIW are not particularly confined, it is remarkable how areas poorly sampled by the regular observing networks, such as North Africa and the eastern North-Atlantic, are highlighted in the compendiary sensitivity maps.