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Mediterranean Cyclones in a changing climate. First statistical results

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The Mediterranean storms play an important role in weather and climate. Their influence in determining the local weather is known; heavy precipitation systems and strong wind cases are often related to the presence of a cyclone in the Mediterranean. From a large-scale point of view, the Mediterranean storm track has importance in the vertical and horizontal transfers of heat and water vapour towards the Eastern regions. For all of these reasons, any future change related to the intensity, frequency or tracks of these storms can be important for both the local weather and local climate, at least, in the countries around the basin.

The Mediterranean cyclones constitute a study subject of increasing interest. Some climatologies from long series of re-analyses, like ERA15, NCEP/NCAR and ERA40, or from operational and high resolution analysis systems, like HIRLAM_INM and ECMWF, have allowed to define the main characteristics of these storms. Generally speaking, the Mediterranean storms have the characteristics of extratropical storms, showing smaller sizes and shorter life cycles than those ones developed in other maritime areas of the world. Moreover, the influence of the land areas and high mountains around the basin and the large-scale heat releases have been revealed as key factors for understanding their genesis and rates of development.

In spite of the fact that probably the existing automatic procedures include some large scale assumptions, which may not the best for the correct detection and tracking the Mediterranean storms, these procedures can provide a first and almost necessary step, from a statistical/climatological point of view, specially taking into account both the current resolution of the existent global re-analysis series and global climatic models and the state-of-the art about Mediterranean cyclones.

A cyclone detection and tracking procedure, originally designed for the description of Mediterranean storms, has been applied to the low resolution (1.5 degrees lat-lon) outputs of the JMA-GSM climate general circulation model. Preliminary results are here presented. Two different periods have been analysed. The first period, covering 1979-2002 has been compared with the previously computed ERA-40 climatology of cyclones. Results agree reasonably well with those obtained from ERA-40, providing confidence to the current climate simulation of JMA-GSM. Once validated the model from the perspective of cyclonic climatology under current climate conditions, the same procedure is applied to a scenario period (2075-2099) to investigate possible changes in cyclonic activity linked to climate change.