# CLIMATE SIMULATIONS OF LARGE SCALE CONDITIONS ASSOCIATED WITH THE GENESIS OF MEDICANES

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## INTRODUCTION

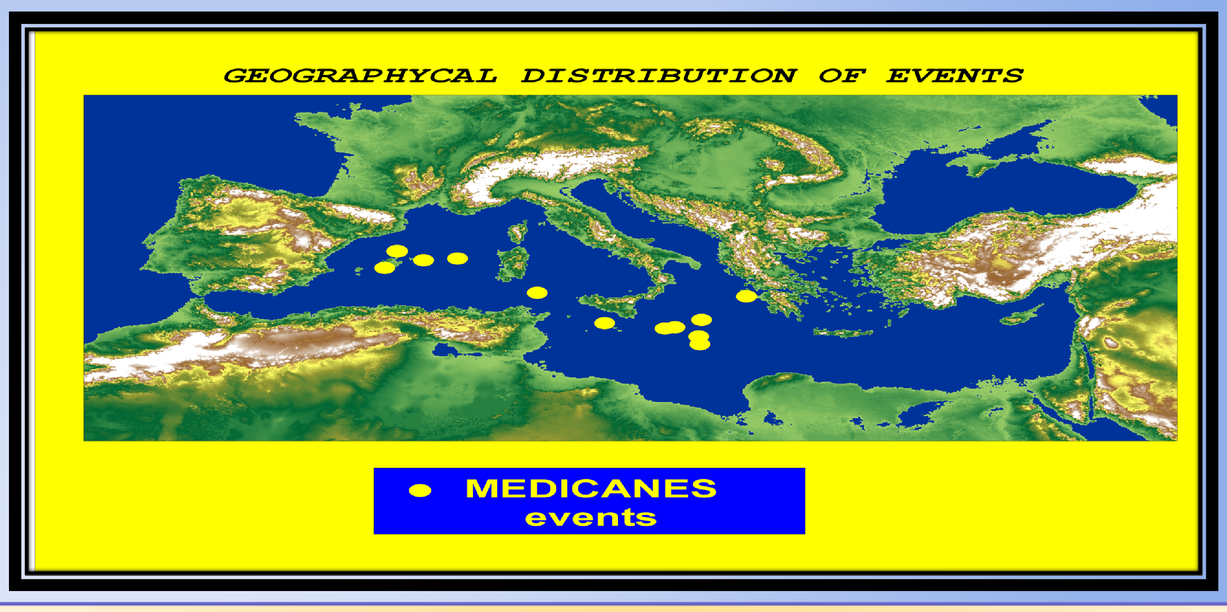
Medicanes (Mediterranean tropical-like storms) are violent windstorms that, once developed over the sea, have the potential to affect islands and coastal regions. This phenomenon operates on the thermodynamical disequilibrium between the sea and the atmosphere like topical cyclones. This analogy is confirmed through their visual appearance in satellite images: axisymmetric cloud structures with a convective wall around a relatively cloud-free central eye.

## GENESIS PROPABILITY INDEX "GENPDF"

$$GENPDF = \left|10^5\eta\right|^{\frac{3}{2}} \left|\frac{H}{50}\right|^3 \left|\frac{V_{max}}{70}\right|^3 (1+0.1V_{shear})^{-2}$$

A genesis probability index "GENpdf" has been formulated in the literature which has been successfully tested for the observed genesis of tropical storms. It depends on the thermodynamic contrast between the sea surface and overlying air, the low-tropospheric vorticity, mid-tropospheric relative humidity and the deep-layer wind shear. Large values of this index are revealed as a necessary -although not sufficient- diagnostic indicator of Medicane producing synoptic environments after analysing twelve different cases. The present study attempts to analyse the changes in frequency and intensity of these Medicane potential environments imposed by global warming.

**Period 1981-2003, events of Medicanes**



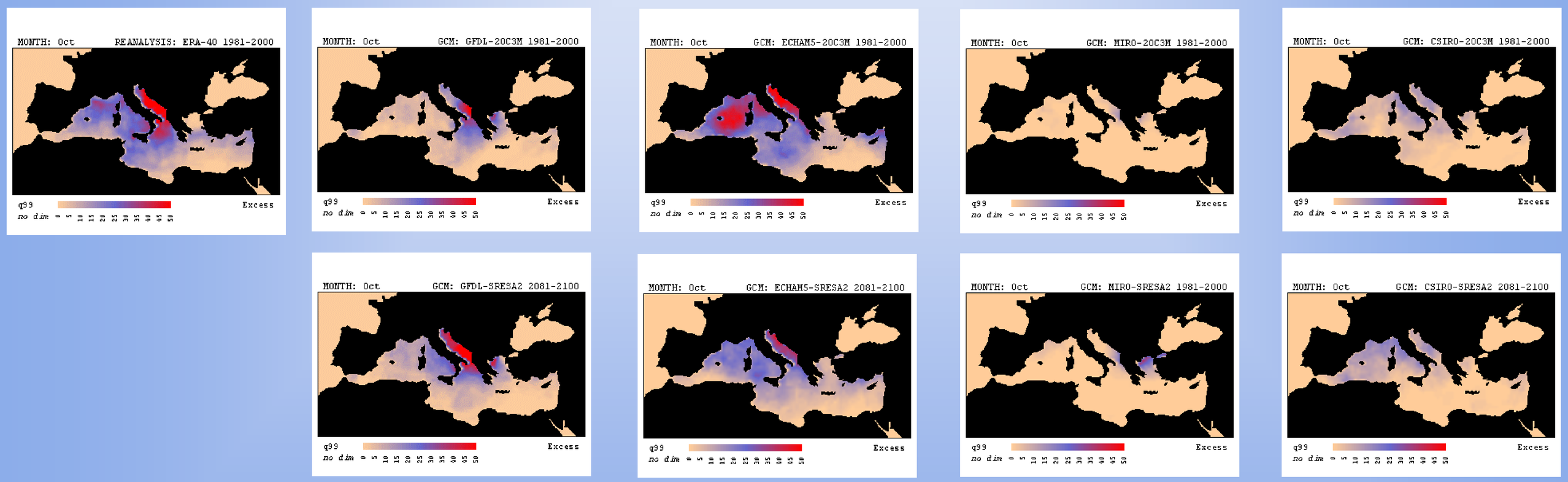

There are twelve detected events for the period 1981-2003. This image shows that all these events are located between the Balearic Islands and the Greek peninsula (Western and Central areas of the Mediterranean Sea).

These detected Medicanes are more frequent in winter and autumn but they can occur at the beginning of spring and in late summer.

The lifetime of the detected Medicanes ranges from 6 to 72 hours and the diameter is generally less than 300 km owing to the small size of the Mediterranean Sea.

## RESULTS

The ERA-40 reanalysis for the period 1981-2000 are first analysed to obtain the q99 and q99.9 percentiles of GENpdf for the whole Mediterranean basin. On the other hand, climate simulations for 1981-2000 (control) and 2081-2100 (future) under A2 and A1B scenarios provided by five GCMs are considered. Monthly and subregional exceedance of q99 and q99.9 are calculated from these simulations. These exceedances are first compared against the ERA-40 time-spatial patterns to assess the goodness of each GCM for the control period, and then the changes between control and future time slices are evaluated.




## CONCLUSIONS

- The exceedance of GENpdf is higher in autumn and winter reaching the maximun in October for all the GCMs and for the ECMWF reanalysis (ERA-40).
- The areas with higher excess of GENpdf extreme threshold values are in the Western and Center basins of the Mediterranean Sea, in agreeement with the genesis zones of the twelve observed events in the period 1981-2003.
- For the control period (1981-2000, 20C3M): All the GCMs show lower values of the GENpdf's exceedance than ERA-40. ECHAM5 and GFDL are closer to the reanalysis than the other climate models.
- For the future period (2081-2100, SRESA2): The behaviour of the GCMs is different: GFDL, ECHAM5 and MIRO show that the exceedance of GENpdf extremes tends to be lower, while CSIRO does not show significant changes.

## REFERENCES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## ACKNOWLEDGEMENTS


- Project Medicanes (GCL2008-01271/CLI) from Ministerio de Ciencia e Innovación (Spain)
- WRCP CMIP3 multi-model database for providing the GCM Simulations.
- EUMETSAT for providing satellite images