CLIMATE CHANGE PROJECTIONS OF MEDICANES WITH A LARGE MULTI-MODEL ENSEMBLE OF REGIONAL CLIMATE MODELS[1]

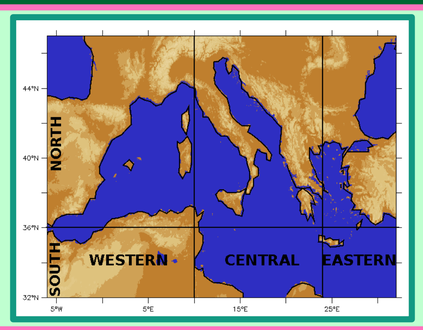
EMS2016-252

Raquel Romera[a], Miguel Ángel Gaertner[b], Enrique Sánchez[b], Marta Domínguez[c], Juan Jesús González-Alemán[a], Mario Marcello Miglietta[d]

(a) Environmental Sciences Institute, University of Castilla-La Mancha, Spain (b) Environmental Sciences Faculty, University of Castilla-La Mancha, Spain
(c) Physics Sciences Faculty, University Complutense of Madrid, Spain (d) Consiglio Nazionale delle Ricerche, Istituto di Scienze dell'Atmosfera e del clima, Italy

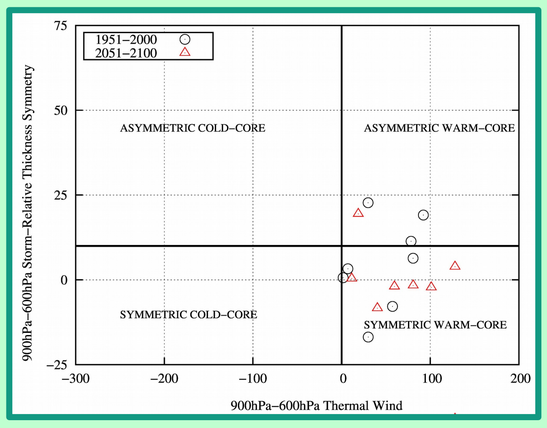
1. DATA[2] AND DOMAIN

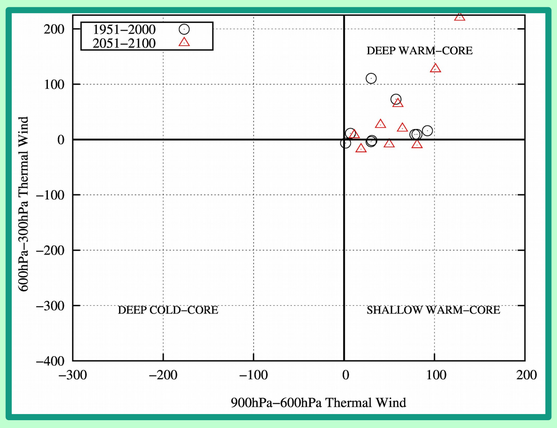
- 10 Evaluation runs (minimum period: 1961-2000) from 10 RCMs
- 13 Future Regional Climate Runs:
  - 6 forcing GCMs
  - 2 emission scenarios
  - 9 RCM runs: 1950-2050
  - 4 RCM runs: 1950-2100
- Observations from Miglietta et al. (2013)[3]



2. MEDICANES: DETECTION AND CLASSIFICATION

- Detection and thacking method: Picornell et al. (2001)[4], based on sea level pressure and 700 hPa horizontal wind
- Intensity: daily maximum 10m wind speed
- Classification (Hart, 2003[5]): symmetry and lower and upper troposphere thermal wind. Medicanes are the cyclones with both lower and upper tropospheric warm core.

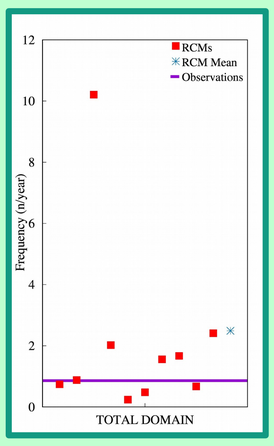


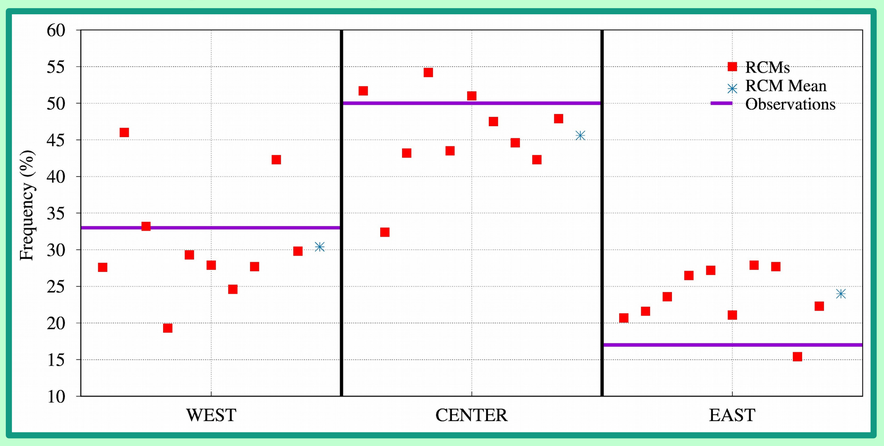


Phase space diagram for the most intense medicanes of each simulation.

This methodology has been already used in Gaertner et al. (2007)[6]

3. MEDICANES FREQUENCY (Evaluation 1961-2000)



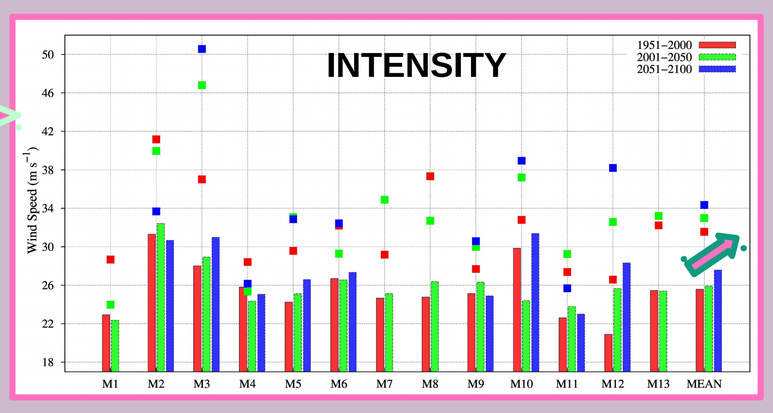


4. MEDICANES: CLIMATE CHANGE PROJECTIONS (1951-2100)

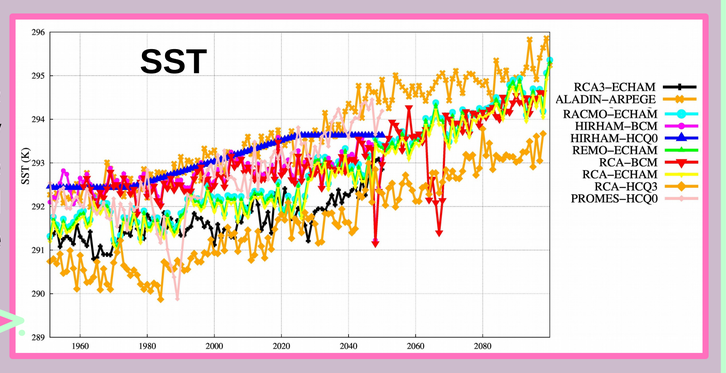
95th percentile of the **daily maximum wind speed** (bars) and maximum wind speed (squares)

Large variability among simulations in values and in the trend in the future climate

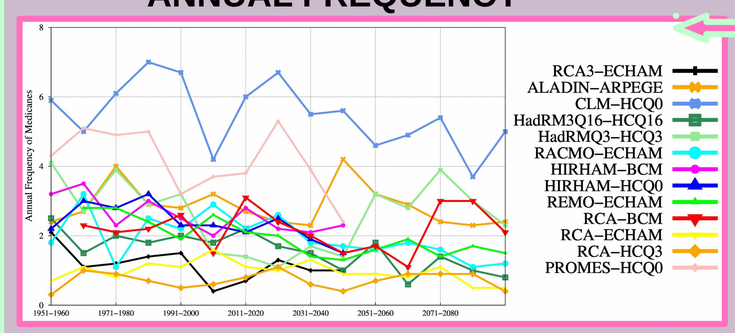
Increase of extreme intensities in the second half of XXIst century (6/9 runs and Ensemble Mean)



This increase in the medicane intensity extremes could be related to the projected increase in **sea surface temperature** (SST).

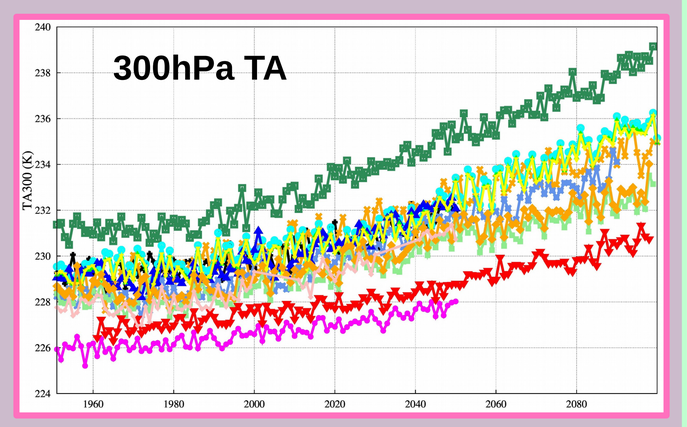


ANNUAL FREQUENCY

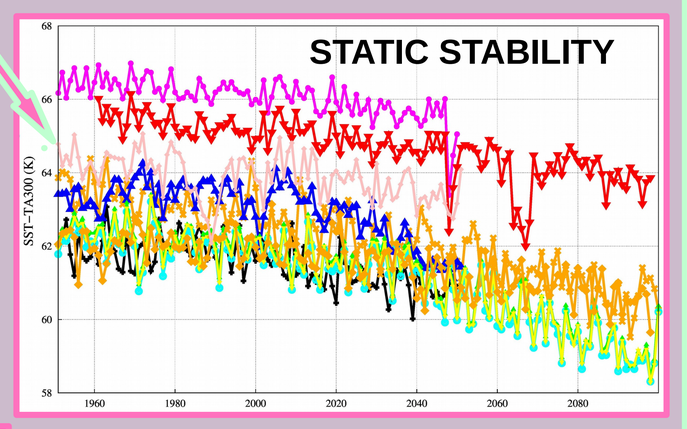


Decrease in the number of medicanes at the end of the century.

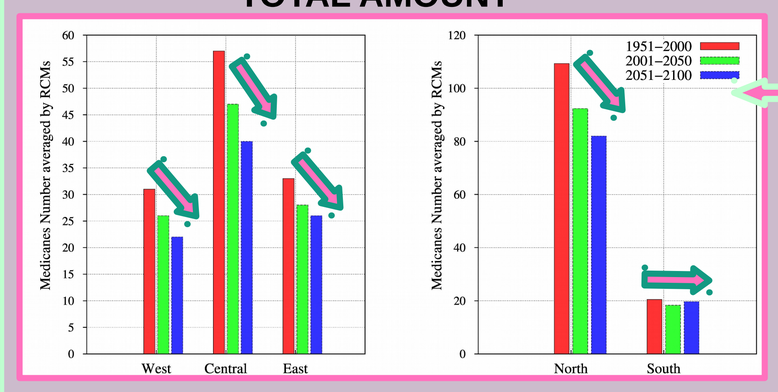
Positive trend in 300 hPa temperature (statistically significant in nine of the thirteen runs).
A decrease in the number of cut-offs affecting the Mediterranean Sea could be expected in the future.



Positive trend for **static stability**.



TOTAL AMOUNT

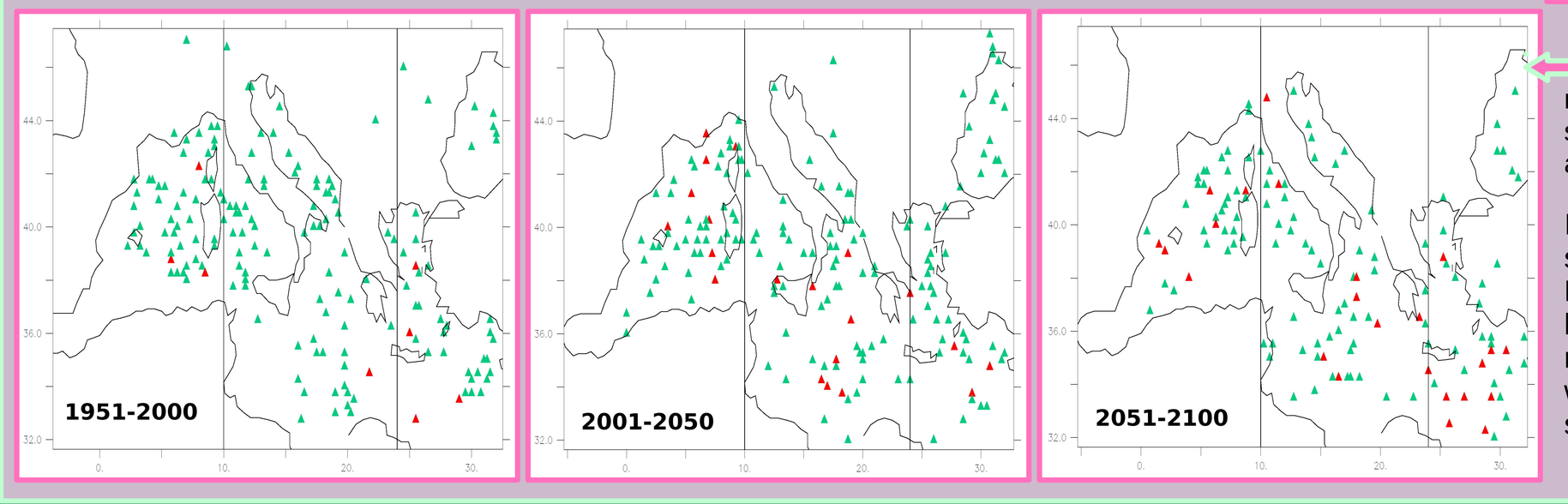


Decrease in the number of medicanes

The central region will suffer a larger decrease than the other areas.

The southern part of the Mediterranean Sea is the only place where the number of medicanes should not experience any change in the future.

SPATIAL DISTRIBUTION



Spatial distribution of the detected medicanes with maximum surface wind speed above 25 ms^{-1} (green colour) and above 33 ms^{-1} (red colour).

In the future climate the medicanes seem to be distributed all over the Mediterranean Sea in a more homogeneus way. The most intense medicanes could form in the regions where the number of events is more scarce (S and E).

REFERENCES:

(1) Romera R, Gaertner MA, Sánchez E, Domínguez M, González-Alemán JJ, Miglietta MM (2016) Climate change projections of medicanes with a large multi-model ensemble of regional climate models. Global Planet Change (Second Review)

(2) Van der Linden P, Mitchell JFB (2009) Ensembles: Climate Change and its Impacts: summary of research and results from the Ensembles Project. Mediterranean… vol 160 http://ensembles- eu.metoffice.com/docs/Ensembles_final_report_Nov09.pdf\nhttp://onlinelibrary.wiley.com/doi/10.1002/9781119941156.ch9/summary

(3) Miglietta MM, Laviola S, Malvaldi A, Conte D, Levizzani V, Price C (2013) Analysis of tropical-like cyclones over the Mediterranean Sea through a combined modeling and satellite approach. Geophys Res Lett 40(10): 2400-2405, doi: 10.1002/grl.50432

(4) Picornell MA, Jansà A, Genovés A, Campins J (2001) Automated database of mesocyclones from the Hirlam-0.5 analyses in the western Mediterranean. Int J Climatol 21: 335-354

(5) Hart R (2003) A cyclone phase space derived from thermal wind and thermal assymmetry. Mon Wea Rev 131: 585-616

(6) Gaertner MA, Jacob D, Gil V, Domínguez M, Padrono E, Sánchez E, Castro M (2007) Tropical cyclones over the Mediterranean Sea in climate change simulations. Geophys Res Lett 34(14): L14711, doi: 10.1029/2007GL029977

Download this poster:

Contact:
Raquel.Romera@uclm.es
ICAM, UCLM
Avda. Carlos III, s/n
Toledo (SPAIN)

Web: momacgroup.github.io