



Future evolution of cyclones with tropical characteristics in the Mediterranean basin: effect of atmosphere-ocean coupling high resolution

Jesús Gutierrez-Fernandez, Juanje Jesús Gonzalez-Aleman, and Miguel Angel Gaertner
Universidad de Castilla-La Mancha, Spain (jesus.gutierrez1@alu.uclm.es)

Cyclones with tropical characteristics are rare in the Mediterranean Sea, because atmospheric and oceanic conditions are unfavourable for their development and maintenance. In the Mediterranean Sea, this type of cyclones are called Medicanes (“Mediterranean Hurricanes”). In recent years, some intense Medicanes have been observed such as the medicane of November 2011 [1]. Medicanes are associated with phenomena like heavy winds, rain, and storm surge, which affect specially coast areas.

The main aim of this work is the study of future projections for these type of cyclones in the Mediterranean basin with climate regional models, analysing the effect of the atmosphere-ocean coupling and high resolution.

The analysis is realized for the future climate scenario RCP85 until 2100. The simulations were done in the framework of European projects MedCORDEX y EuroCORDEX. The analysis procedure includes the detection of cyclones with a method adapted for mesoscale cyclones [2] and the application of Hart method [3] for analysing the structure of the cyclones and detecting tropical characteristic.

The first results of this study show a greater frequency and intensity of Medicanes in higher resolution models compared to lower resolution ones, in agreement with previous results [4]. Also, a decrease of Mediterranean cyclones towards the end of the twenty-first century is generally found. The comparison of an air-sea coupled simulation with an uncoupled simulation shows interesting results: for present climate conditions, a higher medicane frequency is found in the uncoupled simulation, but during the last decades of present century more medicanes are detected in the coupled run. The projected future medicane decrease is therefore much smaller in the coupled run, pointing to complex and time-varying effects of air-sea coupling on this type of extreme phenomena.

Referencies

[1] Miglietta, M. M., 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. *Geophysical Research Letters*, 40(10), 2400-2405.

[2] Picornell, M. A., Jansa, A., Genovés, A., & Campins, J. (2001). Automated database of mesocyclones from the HIRLAM (INM)-0.5° analyses in the western Mediterranean. *International Journal of Climatology*, 21(3), 335-354

[3] Hart, R. E. (2003). A cyclone phase space derived from thermal wind and thermal asymmetry. *Monthly Weather Review*, 131(4), 585-616.