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Climate change and the future of medicanes: statistical-deterministic projections based on CMIP5 models

Romualdo Romero (1) and Kerry Emanuel (2)

(1) Universitat de les Illes Balears, Departament de Física, Palma de Mallorca, Spain (romu.romero@uib.es), (2) Massachusetts Institute of Technology, Department of Atmospheric Science, Cambridge, MA, USA (emanuel@mit.edu)

Medicanes are mesoscale maritime storms that from a physical point of view operate much as tropical cyclones. Although with typical wind intensities far below those registered in their tropical analogues, these Mediterranean cyclones pose serious threat to the affected islands and coastal regions and can adversely affect open sea activities. Both a justified concern about the way these extreme phenomena could respond to global warming (e.g. possible changes in frequency, intensity or regional variability) and the fact that no systematic effort has yet been devoted to answer these questions within the context of the CMIP5 simulations, motivate the present work. We apply a statistical-deterministic method, originally devised for the tropical cyclone problem but which has been adapted for the dynamics of mid latitudes, to generate thousands of synthetic tracks of medicanes along with their radial distributions of winds; these synthetic storms are compatible with the "climates" provided by 30 CMIP5 models in both historical and RCP85 simulations for a recent (1986-2005) and a future (2081-2100) period, respectively. We examine the present-to-future multimodel mean changes in medicane risk, with special attention to robust patterns (in terms of the degree of consensus among individual models on the sign of change) and privileging the subset of 20 models exhibiting the highest agreement with the results yielded by two reanalyses (ERA-interim and NCEP-ncar). According to our results, future change in the number of medicanes is unclear (on average the total frequency of storms does not vary) but it is found a profound redistribution of the population along the spectrum of lifetime maximum winds: the results project a higher number of moderate and violent medicanes at the expense of weak storms. Spatially, the method projects an increased occurrence of medicanes in the western Mediterranean and Black Sea that is balanced by a reduction of storm tracks in contiguous areas, particularly in the central Mediterranean; however, future extreme events (winds >60 kt) become more probable in all subbasins.