Plinius Conference Abstracts
Vol. 13, Plinius13-36-1, 2011
13th Plinius Conference on Mediterranean Storms

Assessing medicane risk using synthetic event sets

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Tropical-like cyclones developed over the Mediterranean Sea, also called medicanes, are infrequent warm-core small scale cyclones that pose in risk islands and coastal regions. Although tropical cyclones and medicanes differ in their dimensions and other meteorological parameters such as maximum wind velocity, their energetics, based on the thermodynamic disequilibrium between the sea and the atmosphere, appear to be similar.

The low frequency of medicanes and the difficulty of detecting them, complicate their study. Our aim is to find characteristic patterns in medicane development that distinguish them from other types of Mediterranean cyclones, but the absence of a large historical database is problematic for our research.

A recent technique used in the study of tropical cyclones has been adapted to create a considerable collection of synthetic medicane events in the present climate. These events are consistent with the Mediterranean climatological variables and permit us to develop a database of events, circumventing the problem of the low number of real detected events. Furthermore, these synthetic cyclones are independent of historical medicane data: The inputs come directly from gridded climate variables (in this case from reanalysis data but it can be from GCMs, too), which affords a high potential utility in the study of how medicanes will respond to climate change.

As a first step, we will compare the genesis probability distribution of synthetic medicanes to observations. Spatial density and track maps created using our technique identify the Central and Western Mediterranean regions as the most likely areas of cyclone formation. Other parameters, like the annual and monthly frequency of the events, central surface pressure, radius of maximum circular wind and wind speed values are examined in this work, too. Although these results are not entirely satisfactory, they are good enough to be considered a useful tool to complement risk assessment based on the limited number of observed events.