MEDITERRANEAN TROPICAL-LIKE CYCLONES: PRESENT AND FUTURE

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The Mediterranean basin is characterized by an extremely active cyclogenesis activity. Most of the cyclones generated in the area have a baroclinic nature. A few storms every year, however, develop a dynamical evolution similar to the one of tropical cyclones, showing an axis-symmetric vertical profile, a warm core, a cloud-free eye surrounded by a cloud cover with spiral shape, and winds up to the hurricane speed. The strongest between such storms have been called medicanes (*Medi*terranean hurri*canes*) and exhibit a striking resemblance to the lower-latitudes hurricanes, except for the mesoscale spatial extent.

Medicanes are considered rare phenomena, - the number of observed cases documented in the literature is around ten - but are associated to severe damages on coastal areas. Due to the scarcity of observations over sea and the coarse resolution of the long-term reanalysis datasets, it is difficult to construct homogeneous statistics of the formation of medicanes.

Using an approach based on the high-resolution dynamical downscaling of the NCEP/NCAR reanalyses (tested on a number of historical cases in Cavicchia and von Storch 2012), and exploiting an objective detection algorithm specifically designed to single out their features, the statistical properties of medicanes (annual cycle, decadal and interannual variability, geographical distribution, trends) over the last six decades have been studied in a systematic way, and the linkage between the frequency of medicanes formation and synoptic patterns have been investigated.

It was found that medicanes occur indeed with a low frequency, and that they are formed mostly during the cold season in the western Mediterranean and in the region extending between the Ionian Sea and the northern coast of Africa (Cavicchia et al 2013). The environmental factors related with the formation of medicanes have been analyzed, finding that the triggering of medicanes requires a sufficiently large difference between the sea surface temperature and the temperature in the upper atmospheric layers, in order to increase the atmospheric instability. A low wind shear, high moisture content, and high low-level vorticity are all factors that favor the development of medicanes.

Applying the same downscaling procedure to the atmospheric fields produced by a global model, forced with different future climate scenarios greenhouse gas concentration, we estimate the impact of climate change on the statistics of Mediterranean tropical-like cyclones.
We find that in the last three decades on the century, the number of mesoscale storms in the Mediterranean showing tropical-like features is projected to decrease. On the other hand, the percentage of such storms reaching a high intensity shows a tendency towards a moderate increase.

References

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