



Reconstruction of Mediterranean Winter Cyclones by Climate Models

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The output of simulations of 9 models that were part of the CMIP-3 Project is compared to the NCEP-NCAR reanalyzed data for 1961-1990. The aim is to evaluate their ability to reconstruct the temporal and spatial features of the winter Mediterranean cyclones. The properties examined are the spatial distribution of cyclone occurrence, the trend in their occurrence and the location of the Mediterranean upper-level trough.

Beside their ability to reconstruct the maxima of cyclone density within the Mediterranean, the models show varying degree of discrepancy. Most serious is their general tendency to underestimate the level of cyclone occurrences, especially in the western part, where the simulated winter average cyclone counts was 60% of that observed. A possible reason for that is the models' tendency to overestimate both the subtropical high-pressure belt and the low pressure over the high latitudes. This is expressed in the doubling of the south to north pressure gradient between western North Africa and Western Europe. This gradient was found correlated, with marginal significance, with the density of the Mediterranean cyclones. The models skill in reproducing the cyclone density distribution was found to be correlated also with their spatial resolution, 0.8 for the number of vertical levels and 0.56 for the horizontal grid spacing. The improvement expected in the models' spatial resolution suggests that their ability to reproduce the Mediterranean cyclones would be improved as well.

Another discrepancy found is the models' inability to reproduce the observed decreasing trend in Mediterranean cyclones, especially in its eastern part, which may reflect natural climate variability not captured by the models.