INTRODUCTION

The present study provides a comparison between two methods (LeA, used at Univ. Salento, and BeA, used at FU Berlin) characterized by two different approaches in cyclone identification and tracking which allows to identify two different kind of systems: closed system (LeA, fig.1-a) and open system (BeA, fig.1-b). Both schemes have been applied to the mean Sea Level Pressure field, ERA Interim reanalysis 1.5°x1.5°, 1989-2009.

CYCLONE IDENTIFICATION AND TRACKING

LeA (Lecce algorithm) searches for SLP minimum, characterizes area, which depends on previous dislocation and defines time step. Most likely system chosen as next track element.

BeA (Berlin algorithm) searches for SLP minimum and SLP maximum in the vicinity. Only closed systems are operated on original grid. Prediction of core pressure and location for the next time step. Most likely system chosen as next track element.

EXPLOSIVE MEDITERRANEAN CYCLONES

An explosive cyclone (or bomb) is characterized by exceptional deepening:

\[ NDC = \frac{N_{p}}{12h} \sin \frac{\Phi}{2} \]

where \( N_{p} \) is the central pressure change of a system over 12h that occurs at latitude \( \Phi \).

The number of cyclogenesis events associated with explosive developments inside MR detected by BeA is larger than by LeA. Reasons for this fact are (a) LeA tends to detect cyclones at a later stage than BeA and (b) most explosive cyclones experience the fastest deepening rate during the first stages of their development, which is often missed by LeA.

SUMMARY

Considering cyclones statistics, differences between the two tracking algorithms involve:

- the detection of cyclones at different stages of their development
- a different count of cyclogenesis processes in the main cyclogenesis areas inside MR, nonetheless identified by both tracking algorithms
- a different count of systems becoming explosive inside MR
- in some cases the attribution of same extreme event to two different cyclone located nearby the location where the event occurs.

CYCLOGENESIS IN THE MR

The presence of the Mediterranean region (MR) and the areas selected for this study are shown in Fig. 2. The Mediterranean region is defined as the area between 20°N and 60°N, 0° and 30°E.

SUMMARY

Both schemes are able to identify the main cyclogenesis areas in the MR (Fig. 3). BeA identifies more cyclogenesis events than LeA inside the Mediterranean region, mainly in WM and EM. This is attributed to the consideration of open systems in BeA and the merging of small systems in LeA.

Table 1: Number of cyclogenesis processes detected by LeA and BeA inside the Mediterranean region (MR) and the areas selected for this study.

<table>
<thead>
<tr>
<th>Region</th>
<th>BeA</th>
<th>LeA</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>209</td>
<td>106</td>
</tr>
<tr>
<td>WM</td>
<td>276</td>
<td>130</td>
</tr>
<tr>
<td>EM</td>
<td>217</td>
<td>106</td>
</tr>
<tr>
<td>IR</td>
<td>245</td>
<td>129</td>
</tr>
</tbody>
</table>

BeA identifies more cyclogenesis events than LeA inside the Mediterranean region, mainly in WM and EM. This suggests that the two schemes react differently to heat lows generated in summer and spring. Mediterranean cyclones detected by BeA tend to be deeper in the first stage of their development (Fig. 4).

CYCLONE PRODUCING SEVERE PRECIPITATIONS

Fig. 5 Cyclone tracks LeA (a) and BeA (c) corresponding to storms producing extreme precipitation in the MR. Red dot: location of storm at time with maximum intensity of precipitation. Green dot: location where precipitation has been recorded. Black dot: location where precipitation has been recorded.

Fig. 6 Density of cyclogenesis processes (average annual frequencies for each grid point) detected using LeA (a) and BeA (b).