COMPARISON OF CLIMATE DATA SETS FOR THE ANALYSIS OF BIOLOGICAL TIME SERIES

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INTRODUCTION

In the last decade, the link between plankton and climate variability has been recognized through several studies in the Atlantic and Pacific Oceans. In the Mediterranean Sea such studies have begun more recently. An important question is which climate data sets and variables should be utilized for this analysis. In the case of the Mediterranean Sea, although connections to the North Atlantic Oscillation and to the mesoscale regime have been found, as specific Mediterranean dominant climate modes have not been well defined, then several climate variables can be used. This paper focuses on the comparison of three assimilation models, namely ERA-40, NCEP and COADS, observed data, using the Grid4D data set. We have selected variables (sea level pressure, wind stress, wind speed, SST) which are: a) other proxies of circulation changes or possibly related to changes in productivity, and b) common to at least two of the three data sets. We have then compared these variables utilizing three different scales: basin, regional and local. The regional (Adriatic Sea) and local (Gulf of Naples and Gulf of Trieste) areas have been chosen around the location of long-term (greater than 10 years) planktonic time series in the Italian seas (see map). We have then chosen a dominant species in the Gulf of Trieste (Acartia clausi) and have reviewed its interannual variability in comparison to the variability of the climate proxy.

Which climate data sets?

Which climate data sets?

(Top) Analysed and Remapped DATASETS

(Data Assimilation Process: combination between model outputs and observed data)

<table>
<thead>
<tr>
<th>DATASETS</th>
<th>PERIOD</th>
<th>GRID</th>
<th>FREQUENCY</th>
<th>IMPORTANT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGMN</td>
<td>1979-1993</td>
<td>1.125° x 1.125°</td>
<td>6 h and monthly</td>
<td>one model; many available variables; centered in Europe</td>
</tr>
<tr>
<td>ERA-40</td>
<td>1989-1996</td>
<td>1° x 1°</td>
<td>6 h and monthly</td>
<td>different forecast models and many available variables</td>
</tr>
<tr>
<td>NCEP</td>
<td>1981-1993</td>
<td>1.125° x 1.125°</td>
<td>6 h and monthly</td>
<td>not yet available</td>
</tr>
<tr>
<td>COADS</td>
<td>1970-1990</td>
<td>0.5° x 0.5°</td>
<td>6 h and monthly</td>
<td>one model; many available variables; centered in USA</td>
</tr>
</tbody>
</table>

Observation Data Collection: only data from observed data

Comparison of climate data sets at different scales: ERA-15, NCEP and COADS, 1979-93

Mediterranean Scale

Fig. 1. Monthly mean sea level pressures, ERA-15 and COADS. Both modelled and observed data sets agree quite well at this scale, evidencing the differences between the two basins, with higher variability in the Western Med. High pressures were 83 and 89, 100-104 hPa for the two basins, with pressure minima were 79, 82, 84, 90, 92, in the Western Med only.

The correspondence between observation and assimilated data is very high in the Mediterranean Sea, as can be seen by the associated correlation coefficients. The degree of correspondence is related to the time variable fields assimilated in the model, for example, as cloud cover (not shown at Mediterranean scale but shown at regional scale), where the model is not well enough Lat., and patterns and magnitude are different than in the regional NCEP and COADS cloud cover with respect to ERA-15 and COADS.

Regional Scale: Adriatic Sea

Fig. 2. Surface averaged monthly mean wind stress, ERA-15 and NCEP-40. The data from different assimilation models agrees quite well. The seasonal cycle, with winter wind intensification, is stronger in the W. basin. The winter of 93 is characterized by strong winds over the entire North Adriatic Sea, while the winds are on average weaker in the eastern basin.

Local Scale: Gulf of Naples and Gulf of Trieste

Fig. 3. Monthly mean sea level pressures and total cloud cover, ERA-15 and COADS. The pressures minima of 83, 89, 92, 93 are visible at this scale too. The pressure minima were 79, 82 and 86, which were present in the western basin in the eastern Med. and N. Adriatic Sea (the eastern part) are also present here.