VALIDATION OF DINAMICALLY DOWNSCALED ERA-40 AND ERA-INTERIM OVER SPAIN

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1.- INTRODUCTION

The State Meteorological Agency of Spain (AEMET) and the Spanish Harbour Authority (OPPE) have recently launched a project aiming to provide climate change scenarios of ocean variables over Mediterranean Sea and other ocean areas surrounding Spain. As part of this project, ERA40 and ERA-Interim reanalysis were downscaling using the RCA regional atmospheric climate model. We present here some results of the validation of precipitation fields obtained from RCA integrations forced with ERA-Interim reanalysis and comparison with other precipitation datasets.

2.- DATA

- High-resolution (0.22°) daily gridded precipitation over Spain (Spain02) based on in situ QC’ed data from more than 2000 stat. (Herrera et al. 2010).
- Gridded precipitation from CRU (0.5°) (Mitchell y Jones 2005; http://www Climat obs.uea.ac.uk/).
- Gridded precipitation from GPCP (0.5°) (Rudolf et al. 2010; http://www. meteo. hal.inra.fr).
- ERA Interim re-analysis; H=12-H=24 from 00, 12 UTC (Dee et al. 2011; http:// www.ecmwf.int).
- Downscaled precipitation from RCA integrations (0.2°) forced by ERA-Interim.

3.- METHOD

For the comparison of all precipitation data from different sources against Spain02 we use the following selected statistical scores (Wigley & Santer 1990):

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Definition</th>
<th>$H_0$ Value</th>
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<tbody>
<tr>
<td>SITES1</td>
<td>mean of the standardized square differences</td>
<td>0</td>
</tr>
<tr>
<td>SPREX1</td>
<td>ratio of the spatial means of the spatial variances</td>
<td>1</td>
</tr>
<tr>
<td>r</td>
<td>correlation of the mean field</td>
<td>0.9 – 0.99</td>
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</table>

A bootstrapping method based in the Pool Permutation Procedure (Preisendorfer & Barnett 1983) has been applied for the assessment of the statistical significance of the above defined scores. Spatial maps also show a first glance of geographical distribution of differences.

4.- RESULTS

Figure 1-4 show mean annually accumulated pcp in 1989-2004 period. Figures 5-8 show 95th percentil of monthly accumulated pcp. Figures 9-11 show time correlation map. Figure 12 shows mean annual cycle of pcp. Figures 13-16 show, from left to right, month by month SITES, SPREX, SPREX2, and $r$ scores. Figures 17-19 show p-values of their corresponding scores above. Horizontal black lines mark 5% and 95% significance levels.

SPATIAL MAPS: Only RCA is able to reproduce structure details linked to orography (Fig.3). Extremes structure is best reproduced by RCA (Fig. 7). GPCP dataset and ERA-i reanalysis correlate better than RCA with Spain02, mainly in Eastern Spain where pcp is mainly convective (Fig. 9-11). Regarding the annual cycle, RCA (red) overestimates observations from Spain02 (green) more than other datasets (Fig. 12).

MONTHLY SCORES: Temporal (SPREX1) and spatial (SPREX1) variances are better reproduced by RCA (nearer to 1). Only for September and October RCA shows a significative difference with Sp02 in SPREX1. For RCA, SPREX1 p-values are never under 5% significance level whereas for ERA-i and GPCP they are for every month except March. However, scores related to mean behaviour, SITES1 and correlation of time mean $(r)$, are worse for RCA. GPCP compares better for SITES1 and ERA-Interim compares better for $r$ (although for $r$, differences with respect to the observation are not statistically significative for any of the datasets (not shown)).

5.- CONCLUSIONS

- RCA shows better agreement with observations in scores related to spatial structure (spatial variability or location of extremes) but performs worse in classical scores, as bias or mse, due to overestimation of pcp mainly in mountainous areas.
- RCA is clearly the best dataset to locate precipitation extremes, although values are overestimated.
- RCA proves to be a reasonably good tool to dynamically downscale precipitation in order to obtain regionalized scenarios of climate change.

REFERENCES


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