Session: C4 Poster: TH184A

CLIVAR-SPAIN contributions: An analysis of extreme precipitation events over the southern Iberian Peninsula. Trends and atmospheric mechanisms associated.

Jose Manuel Hidalgo Muñoz[†]; Daniel Arg¸eso; Sonia Raquel Gomiz Furtis; Maria Jesus Esteban Parra; Yolanda Castro DÌez
[†] University of Granada, Spain
Leading author: jhidalgo@ugr.es

This study focus in the characterization of extreme precipitation events in the southern Iberian Peninsula (Andalusia) by studying the existence of significant trends and the atmospheric mechanisms associated with them. For this purpose, a database of 86 stations with daily precipitation records for the period 1955-2006 was used. This database has overcome a quality control, which consisted of checking for suspicious, non-realistic and negative values. Furthermore, only stations with less than 10% of missing values were considered. The software RHtestV2 was subsequently used to ensure homogeneity. In order to take into account intensity and duration of extreme rainfall events, the indices of extreme events selected were, the greatest 1-day total rainfall (px1d), the greatest 5-day total rainfall (px5d), the simple daily intensity (pint) and the maximum number of consecutive dry and wet days (pxcdd and pxcwd, respectively). The existence of trends was evaluated both at seasonal and monthly time scales, except for summer, because the number of stations is significantly lower and the episodes of precipitation are scarce in our study area. The Mann-Kendall test was employed in determining if trends were significant. Furthermore, the stability of trends was also evaluated using 13 moving-windows of 40 years within the period of study. The findings indicate a significant spatial and seasonal variability in term of trends sign. Indeed, the most noteworthy results were found in winter, with a prevalence of decreasing trends for intensity indices in western and central Andalusia, whereas increasing trends appeared in the southeastern Andalusia. These marked differences in the sign of trends in short distances evidence the importance of using a dense network of stations for regional analysis of extremes. Overall, spring analysis reveals a negative trend in the intensity indices, especially in March. In autumn, the significance of trends was lower in comparison to winter and spring, and only September presented significant increasing trends in intensity indices. Synoptic patterns associated with heavy precipitation events were examined and compared with two large-circulation indices affecting the precipitation over Andalusia (the North Atlantic Oscillation, NAO, and the Western Mediterranean Oscillation, WeMO). This analysis was made for two sub-areas of Andalusia separately, the western-central area and the southeastern Andalusia, which are geographically separated by the Betics ranges, a natural barrier preventing the passage of cold fronts. In order to determine the synoptic patterns at the surface and 500-hPa level, a principal component analysis (PCA) in T-mode coupled with clustering techniques was employed. The seasonal distribution and the location of disturbances of the atmospheric patterns found were clearly differentiated in the two areas. It also should be noted that whereas some patterns affecting western and central area were associated with a highly negative NAO index, all synoptic patterns affecting both sub-areas were related to significant negative WeMO values. The detailed insight provided in this work regarding heavy rainfall events could be useful for policymakers designing risk-prevention procedures. This information is also interesting in socioeconomic strategies development, because of the economy of this area is based on tourism and agriculture, being both sector strongly affected by precipitation extremes. Acknowledgements: the Spanish Ministry of Science and Innovation, with additional support from the European Community Funds (FEDER), project CGL2010-21188/CLI has financed this study.