Geophysical Research Abstracts
Vol. 16, EGU2014-131, 2014
EGU General Assembly 2014

Daily precipitation extreme events for the Iberian Peninsula and its association with Atmospheric Rivers

Alexandre M Ramos (1), Ricardo M Trigo (1), and Margarida LR Liberato (2)

(1) University of Lisbon, Instituto Dom Luiz, Portugal (amramos@fc.ul.pt), (2) Escola de Ciências e Tecnologia, University of Trás-os-Montes e Alto Douro (UTAD), Portugal

Extreme precipitation events in the Iberian Peninsula during the extended winter months have major socio-economic impacts such as floods, landslides, extensive property damage and life losses. These events are usually associated with low pressure systems with Atlantic origin, although some extreme events in summer/autumn months can be linked to Mediterranean low pressure systems. Quite often these events are evaluated on a casuistic base and making use of data from relatively few stations.

An objective method for ranking daily precipitation events is presented here based on the extensive use of the most comprehensive database of daily gridded precipitation available for the Iberian Peninsula (IB02) and spanning from 1950 to 2008, with a resolution of 0.2° (approximately 16 x 22 km at latitude 40°N), for a total of 1673 pixels. This database is based on a dense network of rain gauges, combining two national data sets, 'Spain02' for peninsular Spain and Balearic islands, and 'PT02' for mainland Portugal, with a total of more than two thousand stations over Spain and four hundred stations over Portugal, all quality-controlled and homogenized. Through this objective method for ranking daily precipitation events the magnitude of an event is obtained after considering the area affected as well as its intensity in every grid point and taking into account the daily precipitation normalised departure from climatology. Different precipitation rankings are presented considering the entire Iberian Peninsula, Portugal and also the six largest river basins in the Iberian Peninsula.

Atmospheric Rivers (AR) are the water vapour (WV) core section of the broader warm conveyor belt occurring over the oceans along the warm sector of extra-tropical cyclones. They are usually W-E oriented steered by pre-frontal low level jets along the trailing cold front and subsequently feed the precipitation in the extra-tropical cyclones. They are relatively narrow regions of concentrated WV responsible for horizontal transport in the lower atmosphere. It was shown that more than 90% of the meridional WV transport in the mid-latitudes occurs in the AR, although they cover less than 10% of the area of the globe. The large amount of WV that is transported can lead to heavy precipitation and floods.

In this work we use an automated AR detection algorithm for the North Atlantic Ocean Basin to identify the major AR events that affected the Iberian Peninsula based on the NCEP/NCAR reanalysis. The two different databases (extreme precipitation events and AR) will be analysed together in order to study ARs in detail in the North Atlantic Basin and, additionally, the relationship with precipitation-related events in Iberian Peninsula. Results confirm the significance link between these phenomena, as the TOP 20 days of the ranking of precipitation anomalies for the Iberian Peninsula includes 19 days that are clearly related with AR events.

This work was partially supported by FEDER (Fundo Europeu de Desenvolvimento Regional) funds through the COMPETE (Programa Operacional Factores de Competitividade) and by national funds through FCT (Fundação para a Ciência e a Tecnologia, Portugal) under project STORMEx FCOMP-01-0124-FEDER-019524 (PTDC/AAC-CLI/121339/2010). A. M. Ramos was also supported by a FCT postdoctoral grant (FCT/DFRH/SFRH/BPD/84328/2012).