TRANSPORTE ANÓMALO DE HUMEDAD RELACIONADO CON LA LLEGADA DE CICLONES EXTRATROPICALES A LA PENÍNSULA IBÉRICA

ANOMALOUS MOISTURE TRANSPORT RELATED TO LANDFALLING EXTRATROPICAL CYCLONES OVER THE IBERIAN PENINSULA

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SUMMARY

The Iberian Peninsula (IP) is often affected by extreme extratropical cyclone (EC)-related hydrometeorological events. The anomalous moisture uptake (AMU) related to landfalling ECs over the IP between 1985-2014 is analyzed through a Lagrangian approach. We performed our analysis in terms of hydrological years and their classification into extremely wet, wet and normal. The results show that wet and extremely wet hydrological years exhibit higher values of days under cyclonic influence. Annual EC-related positive AMU for wet and normal periods exhibits higher values near the landfall region, in agreement with the local convergence of water vapour along the pathways. Principally, the annual wet period was characterized by a displacement of the AMU inner lower central North Atlantic, Western Mediterranean and Cantabrian Sea.

Extratropical cyclones (ECs) are a major phenomenon characterising mid-latitude weather and regional climatic conditions. The ECs formed or developed over the North Atlantic play a determinant role in the hydrological cycle of regions such as Western Europe. The Iberian Peninsula (IP) is often affected by extreme cyclone-related hydrometeorological events. For the period 1985-2014, FLEXPART-WRF simulations forced with ERA5 were used to investigate the anomalous moisture uptake (AMU) related to landfalling ECs over the IP. The landfall was assumed when any point within the radius of the EC matched with an IP land mask grid. We performed our analysis in terms of hydrological years and their classification into extremely wet, wet and normal, following four quantile precipitation criteria (40%, 60%, 80%). Our results highlight a larger number of days in which the IP was under the cyclonic influence (EC centre or radial area over land) for both wet and extremely wet hydrological years. The analysis of the cyclone features for an entire life cycle of up to 7 days revealed that the maximum winds varied between 60 and 72.5 m/s; meanwhile, for a lifetime greater than 48 h, the radius ranged between 550 and 600 km, with smaller dimensions for normal hydrological years. In addition, during wet and normal hydrological years the evolution of the central mean sea level pressure shows two minimums reaching between 50 and 100 hours, more deepened for wet period cyclones. Strictly for the cyclone landfall time-steps, annual EC-related positive AMU for wet and normal periods exhibits higher values near the landfall region, in agreement with the local convergence of water vapour along the pathways. Nevertheless, the widespread evaporative pattern over the North Atlantic, extended to the western coast, denotes the importance of these moisture sources for EC-related precipitation. Principally, the annual wet period was characterized by a displacement of the AMU inner lower central North Atlantic, Western Mediterranean and Cantabrian Sea.