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Teleconnections between El Niño events and the north western Iberian Peninsula extreme rainfall

Isabel Iglesias (1,2), M. Nieves Lorenzo (1), Belén Rodríguez-Fonseca (3), Juan J. Taboada (4), and Moncho Gómez-Gesteira (1)

(1) Grupo de Física de la Atmósfera y del Océano. Facultad de Ciencias. Universidad de Vigo, Ourense, Spain, (2) Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR), Universidade do Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal, (3) Departamento de Física de la Tierra, Astronomía y Astrofísica I, Universidad Complutense de Madrid, Madrid, Spain, (4) Meteogalicia. Santiago de Compostela, Spain

Climate variability in the Euro-Atlantic sector is difficult to forecast. The area is located in the mid-latitude belt, which is dominated by internal variability. This makes the identification of a clear connection between atmosphere and ocean a complex task and increases the effort needed to make a seasonal forecast (Lorenzo et al., 2009).
The North Atlantic atmospheric variability exerts an influence over European climate but also tropical oceans (Rodriguez-Fonseca et al., 2010). A previous research has studied the impact of El Niño–Southern Oscillation (ENSO) on Europe (Lorenzo et al., 2011). The mechanisms that explain the ENSO teleconnections are not linear and the way in which the ENSO signal reaches the Euro-Atlantic sector is under debate involving different hypotheses.
The area under study is located in the western mid-latitude belt of Europe, where it receives a significant amount of rainfall throughout the year. Its location produces that some climatic variables depend on more than one atmospheric pattern to explain their variability and the strength of the correlation between atmospheric modes and stream flow is not stationary, reducing the skill of teleconnection indices to be used for seasonal forecasting.
This non stationarity could be related with different atmospheric modes or changes, as the so-called Climate Shift (CS). This term is used to define a change in the atmosphere–ocean system circulation that took place in the North Pacific Ocean between 1976 and 1977 produced by the change in the sign of the Pacific Decadal Oscillation (PDO) index.
The present work finds that the relationship between the Pacific El Niño phenomenon in winter and the anomalous spring rainfall in the north western Iberian Peninsula is not stationary or linear, varying with the different El Niño spatial configurations (central versus eastern El Niño), phases, and periods. In this way, extreme positive rainfall events are related to central El Niño events before the CS, whereas after the CS the extreme positive rainfall events are more related to eastern Pacific events. The ENSO signal seems to travel via Walker-Hadley mechanism before CS and Rossby waves after CS.

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