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The Iberian Peninsula Coastal Low-Level Jet Climatology and Dynamics

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A coastal low-level jet (CLLJ) is an important mesoscale phenomenon of some regional coastal climates, and is characterized by a coast-parallel flow as a consequence of a large synoptic forcing caused by a high pressure system over the ocean and a thermal low inland. CLLJ regions coincide with cold equator-ward eastern boundary currents in the mid-latitudes, where the contrast between the cold ocean and the warm land in the summer is high. As a response of CLLJ occurrences a positive feedback mechanism is triggered: the coast-parallel wind induces upwelling currents at the coast, reducing the sea surface temperature, which in turn increase the thermal (pressure) gradient at the coast, leading to higher wind speeds. The most studied CLLJ is most probably the California coastal jet. The Iberian Peninsula Coastal Jet (IPCJ) is an example of a CLLJ, developed mostly during the summer season, due to the effect of the Azores high-pressure in the North Atlantic sub-basin, and to the presence of a thermal low pressure system inland over the Iberian Peninsula. This seasonal coastal wind is often called the Nortada (northerly wind).
A statistical analysis of the global occurrences of CLLJs was performed in Ranjha et al. (2013) based on the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA-Interim reanalysis. They have found that there are five main areas of CLLJ occurrences, including the western coast of the Iberian Peninsula. Recently Soares et al. (2014) presented a climatology of the IPCJ based on a high resolution (9 km) downscaling data produced using the WRF mesoscale model, forced by 20 years of ERA-Interim reanalysis (1989-2008). Their results showed three different areas (closer to the coast) of higher frequency of occurrence of IPCJ: in vicinity of Viana do Catelo, south of Cabo Raso and south of Cabo S. Vicente.
The present study uses the downscaled WRF high resolution data produced in Soares et al. (2012) to study the mesoscale structure, spatial variability and temporal characteristics of the IPCJ at 9 km resolution for a period between 1989 and 2008, along the west coast of Portugal-Spain.
Following the findings of Soares et al. (2014) more details on the climatology of the IPCJ are presented. A detailed analysis of the IPCJ structure and dynamics is also presented, along with the analysis of a CLLJ case study (at 1 km resolution) centered in Cabo Raso and Guincho, in the vicinity of Lisbon in the west coast of Portugal, is also presented.

References

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