Geophysical Research Abstracts
Vol. 18, EGU2016-10258, 2016
EGU General Assembly 2016

Dynamics of the Iberian Peninsula Coastal Low-Level Jet

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Abstract

Coastal low-level jets (CLLJ) are important mesoscale phenomena of some regional coastal climates. They are characterized by a coast-parallel flow which has a wind speed maxima within the first few hundred meters above sea level (usually below 1000 m, and most of the times around 500 m), encapsulated within the marine atmospheric boundary layer (MABL). Coastal jets have a larger scale synoptic forcing behind them: a high pressure system over the ocean and a thermal low inland. The regions where CLLJ occur coincide with cold equator-ward eastern boundary currents in the mid-latitudes (with an exception of the coast of Oman in the Arabian Sea), where the contrast between the cold ocean and the warm land in the summer is highest. 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 Iberian Peninsula Coastal Jet (IPCJ) is an example of a CLLJ, developed mostly during the summer season due to the effect of the semi-present Azores high-pressure system in the North Atlantic and of a thermal low pressure system inland. This synoptic pattern drives a seasonal (western) coast parallel wind, often called the Nortada (northerly wind), where the IPCJ develops. A detailed analysis of the IPCJ structure and dynamics will be presented, trough the analysis of two case studies off the west coast of Portugal. The case studies are simulated using the WRF mesoscale model, at 9 and 3 km horizontal resolution, forced by the ECMWF (European Centre for Medium-Range Weather Forecasts) ERA-Interim reanalysis. The MABL structure off the west coast of Iberia, the interaction of the flow with the two main west Iberia capes (Finisterre and Roca), and the consequences on the cloud cover and wind speed up- and down-wind of the capes will be analysed.