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The Impact of Climate Change on the Iberian Coastal Low-Level Jet: EURO-CORDEX Projections

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A coastal jet is a low-tropospheric wind feature driven by the pressure gradient produced by a sharp contrast between high temperatures over land and lower temperatures over the sea. Although being a mesoscale feature, coastal low level jets (CLLJ) have a larger scale synoptic pattern forcing behind them: a high pressure system and a thermal low in land. For this reason CLLJ potential regions coincide with cold eastern boundary currents in the mid-latitudes (Ranjha et al. 2013). In these areas, the contrast between the cold ocean and the warm land in the summer is intensified by the impact of the coastal winds on the ocean generating upwelling currents and sharpening the temperature gradient close to the coast, giving rise to strong baroclinic structures at the coast. Due to the persistence and strong low-level baroclinic structure between the cool ocean and the heated continent, the pressure gradient maximum is at the coast, decreasing both landward and seaward off the coastal boundary. A low level wind maximum is generated, through thermal wind considerations, due to the intensifying equatorward flow with decreasing altitude until it is balanced by surface friction. During the summertime the Iberian Peninsula is under the effect of the Azores High and of a thermal low pressure system inland, giving rise to a seasonal northerly wind, and to CLLJ events, as shown by Soares et al. (2014).
The effects of a climate change on the climatology of the CLLJ off the west coast of the Iberian Peninsula are studied here. The study is based on the Euro-CORDEX 50km downscaling data produced using the WRF mesoscale model, for the present climate, forced by the ERA-Interim reanalysis (1989-2008), and for the control run (1960-2005) and future climate forced by the GCM (global climate model) EC-Earth (2006-2100; at the RCP8.5 emission scenario). The projected changes on the Iberian CLLJ are analysed for a time slice at the end of the 21st century (2071-2100).

References

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