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Global Climatology of the Coastal Low-Level Wind Jets using different Reanalysis

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Coastal Low-Level Jets (henceforth referred to as "coastal jets" or simply as CLLJ) are low-tropospheric mesoscale wind features, with wind speed maxima confined to the marine atmospheric boundary layer (MABL), typically bellow 1km. Coastal jets occur in the eastern flank of the semi-permanent subtropical mid-latitude high pressure systems, along equatorward eastern boundary currents, due to a large-scale synoptic forcing. The large-scale synoptic forcing behind CLLJ occurrences is a high pressure system over the ocean and a thermal low inland. This results in coastal parallel winds that are the consequence of the geostrophic adjustment. CLLJ are found along the California (California-Oregon) and the Canary (Iberia and Northeastern Africa) currents in the Northern Hemisphere, and along the Peru-Humboldt (Peru-Chile), Benguela (Namibia) and Western Australia (West Australia) currents in the Southern Hemisphere. In the Arabian Sea (Oman CLLJ), the interaction between the high pressure over the Indian Ocean in summer (Summer Indian Monsoon) and the Somali (also known as Findlater) Jet forces a coastal jet wind feature off the southeast coast of Oman. Coastal jets play an important role in the regional climates of the mid-latitude western continental regions. The decrease of the sea surface temperatures (SST) along the coast due to upwelling lowers the evaporation over the ocean and the coast parallel winds prevents the advection of marine air inshore. The feedback processes between the CLLJ and upwelling play a crucial role in the regional climate, namely, promoting aridity since the parallel flow prevents the intrusion of moisture inland, and increasing fish stocks through the transport of rich nutrient cold water from the bottom.
In this study, the global coastal low-level wind jets are identified and characterized using an ensemble of three reanalysis, the ECMWF Interim Reanalysis (ERA-Interim), the Japanese 55-year Reanalysis (JRA-55) and the NCEP Climate Forecast System Reanalysis (NCEP CFSR). The CLLJ detection method proposed by Ranjha et al. (2013) was used for the reanalysis data. The criteria was applied sequentially to wind-speed and temperature vertical profiles to detect the location and frequency of CLLJ. The CLLJs spatio-temporal features and the seasonal synoptic configuration associated with the presence of coastal jets are studied for the period (1979-2008) using the ensemble. The present study will allow us to investigate thoroughly the global coastal low-level jets occurrence and main properties, following a new perspective and to assess the uncertainties in the representation of this jets by the available reanalysis.

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