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Case Study of the California Low Level Coastal Jet Comparisons Between Observed and Model-Estimated Winds and Temperatures using WRF and COAMPS

Ricardo Tomé (1,2), Alvaro Semedo (3,4), Raza Ranjha (5), Michael Tjernström (5), and Gunilla Svensson (5)

(1) CCMMG, Azores University Terceira, Azores, Portugal (rftome@fc.ul.pt), (2) CGUL, IDL, Lisbon University Lisbon, Portugal, (3) Department of Earth Sciences, Uppsala University Uppsala, Sweden, (4) Riso-DTU National Laboratory for Sustainable Energy, Technical University of Denmark Roskilde, Denmark, (5) Stockholm University Stockholm, Sweden

A low level coastal jet (LLCJ) is a low-troposphereic wind feature driven by the pressure gradient produced by a sharp contrast between high temperatures over land and lower temperatures over sea. This feature has been identified and studied in several areas of the world, where such a land-sea temperature contrast exist: off the coast of Somalia, near Lima, Peru, off the Mediterranean coast of Spain, in the Southwest coast of Africa, or in the South China Sea coast. Nevertheless, the California LLCJ is probably the most studied coastal jet in the world, with several studies available in the literature. Coastal jets have a notorious impact on coastal areas. Climatologically they are associated with coastal upwelling processes. The major coastal fishing grounds in the world are usually in areas of upwelling, and the abundance of fish at the surface is supported by the upwelled nutrient-rich waters from deeper levels. The effect of this upwelled water to the fishing industry and to the habitat of an enormous diversity of marine life is of paramount importance, and has led to numerous studies in this field. Littoral areas are usually densely populated, and often airports are built in areas where a LLCJ may occur. Thus, aviation operations are deeply influenced by this weather feature, which has a significant impact on the takeoff and landing of airplanes. Therefore the forecasting of LLCJ features is very important for several reasons.The forecasting skills of mesoscale models, while challenging in any region, become particularly complex near coastlines, where processes associated with the coastal boundary add additional complexity: interaction of the flow with the coastal orography, sharp sea-land temperature gradients, highly baroclinic environment, complex air-sea exchanging processes, etc. The purpose of this study is to assess the forecasting skills of the limited-area models WRF (Weather Research and Forecasting) and COAMPS® (Coupled Ocean-Atmosphere Mesoscale Prediction System) in resolving the California LLCJ, off the Big Sur coast. Model runs with different resolutions (6Km and 2Km) are verified against vertical profiles of wind speed and direction, and temperature, from radiosondes. The radiosondes profiles used here were collected during a scientific cruise, off the coast of California, on board the research vessel Point Sur, from 4 to 7 August, 2004. The data were collected along and perpendicular to the coast of Big Sur, south of Point Sur, where an area of supercritical flow adjustment took place.