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How are the coastal breezes affected by changes in the land surface? Analysis from a case study using WRF

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Sea breezes are common and recurrent thermally-driven wind circulations formed in coastal areas under conditions of weak synoptic forcing. The different heat capacity between the land and the sea causes the thermal contrast needed for their formation. Therefore, the temperature changes at the surface of both the sea and the land influence the breezes characteristics. In this work, we investigate how sensitive are the sea breezes to changes in land cover and soil moisture, which may have a direct impact on the surface temperature inland. This is done through the design of different sensitivity experiments performed with the Weather Research and Forecasting (WRF) model, where we tested the effect of the land use and soil moisture modification. This was done through the simulation of a typical sea-breeze case study in the coastal area of the southwest of the Iberian Peninsula (Gulf of Cádiz). The differences among the experiments are compared spatially and confronted with observations from different meteorological towers at the coast and inland. A special emphasis is made on the changes observed in the area of the National Park of Doñana. This area is characterised by large shallow marshes with varying seasonal status and extensive rice crops. Thus, contrasting conditions of the surface are typically observed, which also depend on the previous hydrological conditions. Preliminary results highlight the importance of the correct representation of the surface inland to obtain a proper simulation of the sea-breeze system. Besides, new lines of research emerge to analyse the impacts caused by other potential modifications in the surface conditions of the land and the ocean (e.g., global change, urbanization, crop modification, changes in precipitation regimes or sea surface temperature, etc).