Geophysical Research Abstracts
Vol. 17, EGU2015-8628, 2015
EGU General Assembly 2015

A morning transition case between the land and the sea breeze regimes

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To better understand the diurnal cycle of the Sea-Breeze (SB) in the island of Mallorca, during September 2013 the Mallorca Sea Breeze experimental field campaign (MSB13) took place in the Campos basin (located in the south side of the island). Measurements in the lower boundary layer (captive balloon and multicopter) and close to the surface were taken in a site close to the coast (500m inland). In this work an observed morning transition of the SB is further analysed through the observations and a high-resolution mesoscale simulation of this selected case.

With the combined inspection of model results and observations, it is found that during the night-time the air flows out of the island: a land-breeze is found near the coast and downslope winds at the mountain slopes. After sunrise and during the previous phase (0600-0800 UTC) the temperature difference between land and sea is reduced meanwhile the wind has the land-breeze direction. During the preparatory phase (0800-1000 UTC) the land surface temperature is warmer than the sea and the wind weakens and veers towards the SB direction. Finally, during the development phase (1000-1200 UTC) the SB front propagates through the center of the Campos basin to the end of the basin, enhanced by the mountain upslope winds. Therefore, the radiative warming stops. The temperature, momentum and TKE budgets are used to understand the most relevant physical processes involved in each of the phases.