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Mesoscale circulations over complex terrain in the Valencia coastal region, Spain – Part 1: Simulation of diurnal circulation regimes

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Abstract. We collected ground-based and aircraft vertical profile measurements of meteorological parameters during a 2-week intensive campaign over the Valencia basin, in order to understand how mesoscale circulations develop over complex terrain and affect the atmospheric transport of tracers. A high-resolution version of the RAMS model was run to simulate the campaign and characterize the diurnal patterns of the flow regime: night-time katabatic drainage, morning sea-breeze development and its subsequent coupling with mountain up-slopes, and evening flow-veering under larger-scale interactions. An application of this mesoscale model to the transport of CO_2 is given in a companion paper. A careful evaluation of the model performances against diverse meteorological observations is carried out. Despite the complexity of the processes interacting with each other, and the uncertainties on modeled soil moisture boundary conditions and turbulence parameterizations, we show that it is possible to simulate faithfully the contrasted flow regimes during the course of one day, especially the inland progression and organization of the sea breeze. This gives confidence with respect to future applicability of mesoscale models to establish a reliable link between surface sources of tracers and their atmospheric concentration signals over complex terrain.

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