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Accuracy of simulated diurnal valley winds in the Swiss Alps: Influence of grid resolution and land surface characteristics

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The purpose of this contribution is to investigate the influence of grid resolution and land surface characteristics including topography and soil properties on the accuracy of the simulated diurnal valley winds in the European Alps. COSMO simulations with 2.2 and 1.1 km grid resolution and old and new land surface characteristics datasets are evaluated against a large set of observations for a fair-weather summer period in July 2006. The episode considered is characterized by strong daytime up-valley flows, and weak nighttime down-valley flows. In some areas, the formation of shallow convection and a transition to precipitating convection in the afternoon are observed. The diurnal cycle of the simulated valley wind averaged over several Alpine valleys is in good agreement with the observed evolution for both model resolutions. The differences between the 1.1 and 2.2 km resolution runs are quite small. Differences between individual valleys are, however, large. In the default setup, the valley wind near Chur in the Rhine valley is well represented, while in the similarly-sized Rhone valley, the simulated valley wind at Sion is much too weak. Detailed sensitivity experiments are undertaken in order to investigate the causes of these differences and more generally to investigate criteria for an accurate simulation of real-world diurnal valley winds.