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Land-atmosphere coupling on short time scales in semi-arid regions

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Semi-arid regions, such as the Mediterranean, are among those where society relies greatly on available soil moisture. In terms of physics, in these regions soil moisture has a great soil moisture control on cloudiness and precipitation.

The diurnal cycle of semi-arid regions is not well represented by weather and climate models. This is mainly associated with incorrect timing of the diurnal cycle of convection, and the improper representation of mesoscale phenomena, such as sea breezes. Currently, the next generation of models is moving towards being convection permitting. While this might resolve some of the presented issues, it presents a whole new set of challenges for land surface models.

In this study, we present an overview of the current state of land-surface modeling in convection permitting simulations, and present a quantification of feedbacks between the land surface and turbulent fluctuations in the atmosphere under soil moisture limiting conditions. These results are based on a case study that is representative for the Mediterranean summer, and a sensitivity analysis thereof. In this analysis, special focus is given to the role soil moisture heterogeneity and its influence on evapotranspiration.