Convection and land-atmosphere coupling in mountainous terrain

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Abstract

Thunderstorm activity in many land regions peaks in summer, when surface heat fluxes and the atmospheric moisture content reach an annual maximum. Modelling studies as well as satellite and ground-based observations alike suggest that especially under quiescent synoptic conditions the timing and vigor of many summer thunderstorms is influenced by the presence of a triggering mechanism. Mountain ranges and isolated hills often act as such a trigger by generating thermal circulations and by providing a lifting mechanism for air parcels. On the other hand, the soil-moisture content and distribution play a crucial role in the occurrence and distribution of convective cells by partitioning the available energy into sensible and latent surface heat fluxes. Soil-moisture heterogeneities provide a further means to trigger convective cells by generating thermal circulations.

In a combined system, where orography and soil moisture interact a number of phenomena occur. As one example, orography influences the soil-moisture distribution by gravitational effects. Another example is the interplay of thermal circulations generated by orography and land-surface inhomogeneities. In this colloquium talk the combined impact of soil moisture and orography on moist convection will be reviewed and illustrated by recent studies.