Modelling the Evolution of the Atmospheric Boundary Layer coupled to the Land Surface and its Sensitivity to Parameter Values and Resolution.

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The representation of Stable Boundary Layers in Numerical Weather Prediction and Climate models suffers basically from two main problems. At first, these models require more friction than can be justified from field observations. Consequently, the obtained stable boundary layers are too thick compared to observations. At second, these models often show unphysical decoupling of the atmosphere from the surface. When the wind drops, and the modeled surface fluxes vanishes, the model surface temperature shows a rapid cooling, increasing the stability. This positive feedback makes the model unable to recouple the atmosphere to the surface, while in nature this occurs in a natural way. Both model deficiencies strongly influence the forecasting of frost damage and fog.

A recent study by the authors showed that the stable boundary layer can be modelled satisfactorily from a local perspective, if we use (a) very fine vertical resolution in the lower part of the boundary layer in order to get correct radiative flux divergence; (b) stability coefficient functions consistent with the data; and (c) very fine resolution in the soil. Those requisites are not normally met by parameterizations used in large-scale GCM models. In this study we will present a sensitivity study on resolution in the soil and the atmosphere, mixing function form. We find a strong model sensitivity on vertical resolution in the soil and the thermal properties of the vegetation surface.