

The dependence of evaporative efficiency of vegetated surfaces on ground cover weight fractions in mesic ecosystems

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Bare soil evaporation has been studied extensively, but less is certain regarding how the site-specific features, especially the overstory tree canopy and ground covers, mediate evaporation processes. Inspired by the recent advances on modelling bare soil evaporative efficiency (SEE), our study explored SEE over a range of soil substates and ground cover types, with and without the presence of an overstory canopy in three mesic ecosystems in Canadian Rocky Mountains. We found a significant relationship between the critical soil water content and ground cover biomass fractions across various ground cover types, both with and without the presence of overstory canopy, which is expected to be prevalent across various ecosystems. Moreover, we proposed a simple approach for modelling SEE for non-bare soil conditions and a correction method to account for below-canopy SEE. We show that our model can yield satisfactory simulations and that our approach is expected to be widely applicable, given the strength that its parameters are easily acquired, and its formulations are simple and straightforward. While the model may be particularly suited to mesic ecosystems, the underlying mechanism of SEE suggests that our model can also be applied in dryer conditions. Our approach will greatly improve ET parameterization in land-surface models (LSMs) and increase our knowledge of the global water cycle and ecosystem responses under climate change impacts.