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On the performance of the Maximum Entropy Production model contrasted with a land surface scheme in simulating surface energy fluxes

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Hydrological projections under future climate change have been shown to be sensitive to the formulation of evapotranspiration. Many hydrological models still rely on empirical formulations of this flux, and hence do not take into account the surface energy budget (SEB). On the other hand, land surface schemes (LSSs), which are used within the climate models to describe land hydrology and associated surface heat fluxes (SHF), rely on the energy conservation. Due to LSSs complexity, they are not suitable for integration in traditional hydrological models. A newly developed and relatively simple Maximum Entropy Production model (MEP), which operates under the constraint of energy conservation and allows for an appropriate partitioning of available energy into SHF, appears to be a good alternative for integration in hydrological models. However, the MEP's performances still need to be evaluated under various environmental conditions. This study aims to evaluate the SHF simulated by MEP using observations over a multi-year period from several carefully chosen snow-free sites located in low-latitude regions. Moreover, simulated fluxes were compared to those derived from the Canadian Land Surface Scheme (CLASS), which was run at the same sites. The analysis of simulated and observed fluxes associated with different water stress conditions suggests that the abilities of MEP and CLASS in estimating sensible and latent heat fluxes are comparable. It was also found that the MEP and CLASS fluxes are in a good agreement with observations. However, the simulated nocturnal fluxes show that both models are in less agreement with the observations.