ABSTRACT

Title: "Identifying and Evaluating the Relationships that Control a Land Surface Model's Hydrological Behavior"

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The inherent soil moisture-evaporation relationships used in today's land surface models (LSMs) arguably reflect a lot of guesswork given the lack of contemporaneous evaporation and soil moisture observations at the spatial scales represented by regional and global models. The inherent soil moisture-runoff relationships used in the LSMs are also of uncertain accuracy. Evaluating these relationships is difficult but crucial given that they have a major impact on how the land component contributes to hydrological and meteorological variability within the climate system.

The relationships, it turns out, can be examined efficiently and effectively with a simple water balance model framework. The simple water balance model, driven with multi-decadal observations covering the conterminous United States, shows how different prescribed relationships lead to different manifestations of hydrological variability, some of which can be compared directly to observations. Through the testing of a wide suite of relationships, the simple model provides estimates for the underlying relationships that operate in nature and that should be operating in LSMs. We examine the relationships currently used in a number of different LSMs in the context of the simple water balance model results and make recommendations for potential first-order improvements to these LSMs.