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Surface-subsurface model intercomparison: A first set of benchmark results to diagnose integrated hydrology and feedbacks.

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There is a growing number of large scale, complex hydrologic models with fully 2D and 3D formulations that seek to combine surface and subsurface flow. Many of these models are coupled to land-surface energy balances, biogeochemical and ecological process models, and atmospheric models. Although they are being increasingly applied for hydrologic prediction and environmental understanding, no formal verification and/or benchmarking of these models has been performed. This presentation describes the results of a first intercomparison study of surface–subsurface models. The study is based on a series of benchmark problems, and the simulation results from seven coupled hydrologic models are presented. All the models simultaneously solve adapted forms of the Richards and shallow water equations, yet they span a range of approaches for the solution of the coupled equations, including global implicit, sequential iterative, and asynchronous linking. Various strategies are used to enforce flux and pressure continuity at the surface–subsurface interface. The simulation results show good agreement for the simpler test cases, while the more complicated test cases bring out some of the differences in physical process representations and numerical resolution approaches between the models.

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