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A regional climate model's surface water and energy budgets: The role of precipitation assimilation

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Precipitation assimilation has been proposed to overcome the hydrological imbalance between analysis schemes and their associated short-term forecasts. More recently continuous assimilation of precipitation rates has been used to improve model's hydroclimatology (e.g., the National Centers for Environmental Prediction North American Regional Reanalysis). Precipitation assimilation in a regional modeling system has been proven useful to the large-scale analysis downscaling, and to the surface hydrology depiction due to the constant interaction between the atmospheric and the land-surface models. Because of continuous adjustment of the water vapor during the model integration, one expects beneficial changes in the model's cloud distribution and surface energy budgets as a result of the assimilation scheme. Here a regional climate model's response to the precipitation adjustment was evaluated using the surface radiation terms of the Global Energy and Water-cycle EXperiment (GEWEX) Surface Radiation Budget (SRB) datasets, together with the hydrometeorological variables, and the surface water and energy budget terms from global reanalyses. Near-surface temperature has also improved in response to more realistic soil moisture changes, especially in the Midwest of United States where during the summer period the land-atmosphere coupling is stronger.