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Improvement of modeled soil wetness conditions and turbulent fluxes through the assimilation of observed discharge

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The objective of this paper is to improve the performance of a hydrologic model through the assimilation of observed discharge. Since an observation of discharge at a certain time is always influenced by the catchment wetness conditions and meteorology in the past, the assimilation method will thus also have to modify both the past and present soil wetness conditions. For this purpose, a Bias-Corrected Retrospective Ensemble Kalman Filter has been used as assimilation algorithm. The assimilation methodology takes into account bias in the forecast state variables for the calculation of the optimal estimates. A set of twin experiments has been developed, in which it is attempted to correct the model results obtained with erroneous initial conditions, and strongly over- and underestimated precipitation data. The results suggest that the assimilation of observed discharge can correct for erroneous model initial conditions. When the precipitation used to force the model is underestimated, the assimilation of observed discharge can reduce the bias in the modeled turbulent fluxes. This is due to a correction of the modeled soil moisture.In the case of an overestimation of the precipitation, an improvement in the modeled wetness conditions is also obtained after data assimilation, but this does not lead to a significant improvement in the modeled energy balance. The results in this paper indicate that there is potential to improve the estimation of hydrologic states and fluxes through the assimilation of observed discharge data.