Improving runoff predictions in ungauged catchments using hydrological models together with remotely sensed data

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This paper investigates the potential to improve runoff predictions in ungauged catchments by using hydrological models together with remote sensing data in 685 unregulated catchments widely distributed across Australia. Three models are selected, two lumped rainfall-runoff models, SIMHYD and Xinanjiang models and a grid-based hydrological model, AWRA-L. First, for each catchment, the three models are calibrated using three methods: (1) against recorded streamflow data, (2) against recorded streamflow together with remotely sensed actual evapotranspiration data and (3) against recorded streamflow together with passive microwave soil moisture data. Second, each catchment is assumed as ‘ungauged’ and model simulation is carried out in each ungauged catchment where monthly runoff is predicted using the optimised parameter sets obtained from the three calibration methods and the three models, respectively, in the geographically nearest neighbour catchment. Finally, simulated runoff is evaluated against recorded runoff. Model simulation results show that use of calibration methods (2) and (3) can improve runoff predictions in ungauged catchments, compared to the method (1). This result suggests that it is very useful to use remote sensing data together with hydrological models for better runoff predictions.