Assimilating satellite surface observations of surface inundation, albedo and vegetation into the AWRA landscape hydrology model

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The Australian Water Resource Assessment Landscape model (AWRA-L) provides national scale annual water balance assessments by simulating energy and water fluxes on a daily time step and providing timely, comprehensive and accurate estimates of historical, present day and projected future landscape water balance in Australia. AWRA-L is a grid based biophysical model that simulates water stocks and flows in soil, vegetation and local catchment ground water systems. One of the challenges facing models such as AWRA-L is the limited on-ground climate and water monitoring networks restrict the information available to parameterise variables. To overcome this, many of the energy and vegetation variables and processes included in the model are simulated within the model itself or based on estimates from historical observations. Examples of these include, soil and vegetation albedo, leaf area index, biomass and vegetation cover change. Satellite observations have the potential to provide reliable estimates of many of these properties with high spatial and temporal resolution. Assimilation of these data into landscape hydrology models can improve their reliability and confidence.

Here we investigate the influence of using satellite surface inundation, albedo and vegetation observations as forcing within the AWRA model. The albedo and vegetation observations were unmixed using National Carbon Accounting System forest mapping (Guerschman et al., 2011) to provide the relative contribution of different land cover types within each analysis grid cell. These data were assimilated into the model using a simple nudging scheme (that could be developed further with better error information) and the assimilated data was used to update states (canopy mass, open water fraction) as well as parameters (albedo, extinction coefficient, canopy conductance). The gross primary productivity model of Yebra et al. (2015) was also included.

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