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Model deficiencies as a driver of hydrologic "non-stationarity"

Barry Croke
The Australian National University, Fenner School of Environment and Society and Mathematical Sciences Institute, Canberra, Australia (barry.croke@anu.edu.au)

Climate extremes can lead to a change in the hydrological response of a catchment, leading to questions about whether this change is permanent or whether the catchment will recover to it's original state. The Millenium Drought (so named because it occurred at the start of the 21st century) in Australia was a roughly decade long drought which affected much of the country. Combined impacts of the long-term drought and anthropogenic factors (e.g. groundwater use) lead to declining flows and water quality problems, particularly in the Murray Darling Basin.

As part of a larger integrated water resource project in the Lower Campaspe River Basin (Northern Victoria, Australia), a coupled surface water / groundwater model has been developed to capture the impacts of groundwater use on surface water flows. This model is being used as a component of an integrated model to explore water resource management scenarios for possible future climates.

This paper will discuss the development of the surface water model, and coupling this to the groundwater model. This will include use of observed groundwater levels as an initial indicator of the impact of groundwater levels on surface water flows. The model attempts to capture the variation in the flows through time, including through the Millenium drought as well as the recovery after the drought broke in 2009. Results will be presented for a number of gauges in the basin, including Axe Creek, one of the strongest examples of the impact of the Millenium Drought in the region.