Towards a hyperresolution land data assimilation system for Australia

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Abstract: In 2011 Wood *et al*. issued an aspirational 'grand challenge' to the global water-carbon-energy modelling community to model terrestrial water balance at ~ 1-km scale globally and ~100-m continentally at (sub-)daily time steps. They argue that efforts towards achieving this *hyperresolution* level of prediction will drive developments in hydrological models and lead to multiple societal benefits, including enhanced capability for droughts and flooding forecasting at unprecedented spatial scales. The demands on computational resources for the task are immense, particularly as the endeavour will utilise the burgeoning of water cycle related satellite products and the many surface observation networks that are increasingly sharing their data via the internet. Storage, assimilation of these data into hydrological models, and the world-wide dissemination of water information products is a formidable challenges for any computing infrastructure.

This paper discusses the potential for hyperresolution modelling of Australia's water and carbon balance. The demands for information products at <1-km resolution are described in the content of water resources and carbon assessments, as they serve as the impetus for the development of a continental land data assimilation system in Australia. We examine the preparedness of the National Computational infrastructure (NCI) to ingest the 'flood' of observations from earth observation and ground-based systems, and to serve as the platform for collaboration between universities and government agencies by providing a common modelling environment for all researchers. Finally we present progress towards the installation of data assimilation software on the NCI, as well as establishment of a satellite soil moisture products collection.

Keywords: *Hyperresolution, land surface modeling, data assimilation, computational infrastructure*