Implementation of a gridded river routing for land surface models and evaluation of streamflow across Australia

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1. Introduction

- As part of the ongoing R & D efforts, the Bureau has set out to develop an improved implementation of JULES in a whole of earth system modelling approach (Figure 1).
- This will open a path to consistent and seamless hydrological analysis and prediction capabilities at various spatio-temporal scales at the Bureau.
- This study focuses on implementing a gridded river routing model (CaMa-Flood) and evaluate streamflow simulations from AWRA-L and JULES models.

2. Method and Data

- CaMa-Flood is a distributed hydrodynamic model that routes runoff to oceans and inland lakes/rivers along a prescribed river network map (Figure 2).
- Streamflow was evaluated across 460 catchments with varying topographic and hydro-climatic conditions using the Hydrological Reference Stations (HRS) dataset.

3. Results

- Comparison of accumulated and routed streamflow show that > 60% of locations show better skill after the routing in the current set up (Figure 3).
- Reasonable model performance obtained across northern Australia and along the east coast. However, the model performance is relatively low in the western and south-western Australia.
- First result of uncontrolled river systems show good temporal relationship, however, further investigation required in terms of total runoff (Figures 4 and 5).

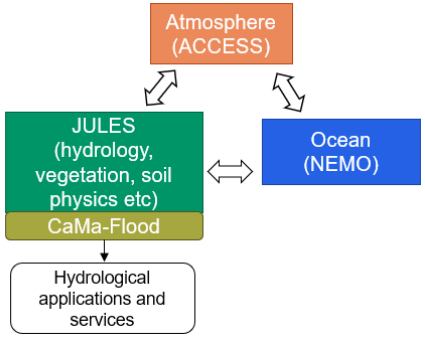


Figure 1: Coupled modelling approach

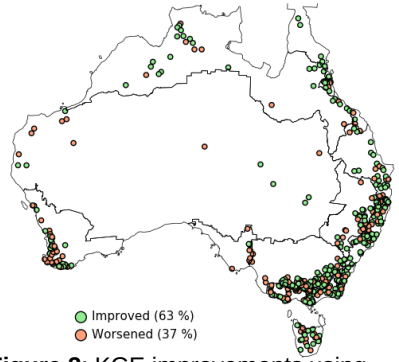


Figure 3: KGE improvements using AWRA-L as a baseline simulation

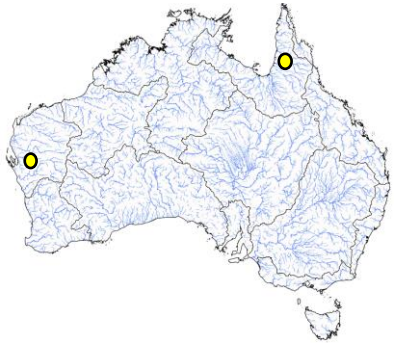


Figure 4: River network as well as location of Wenlock and Gascoyne Rivers

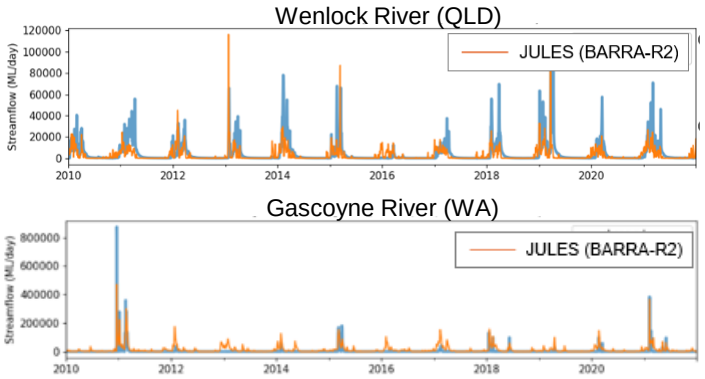
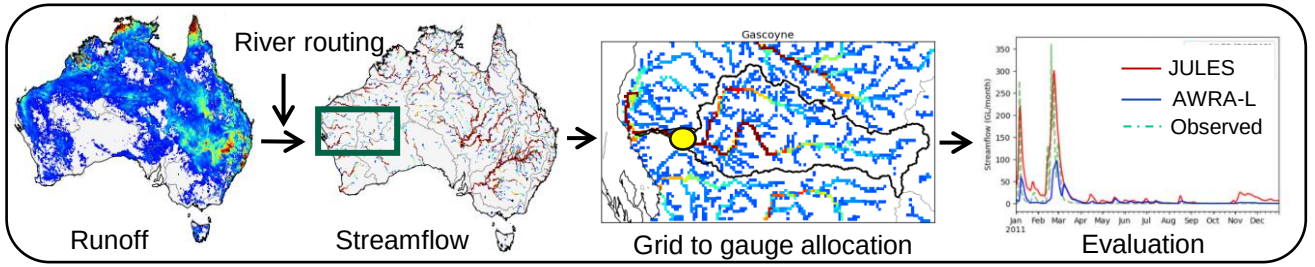


Figure 5: Comparison of observed and modelled streamflow

Figure 2: River routing implementation and streamflow evaluation workflow



4. Next steps

- Improving the river network with high resolution DEM
- JULES model physics improvements
- Benchmarking against SWIFT and G2G

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