Geophysical Research Abstracts
Vol. 20, EGU2018-3471, 2018
EGU General Assembly 2018

Investigating the added value of the BARRA regional atmospheric reanalysis in Australia

Chun-Hsu Su (1), Nathan Eizenberg (1), Greg Kociuba (1), Dörte Jakob (1), Peter Steinle (1), Paul Fox-Hughes (2,3), Christopher White (3,4,5)

(1) Bureau of Meteorology, Melbourne, Australia, (2) Bureau of Meteorology, Hobart, Australia, (3) Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), Hobart, Australia, (4) School of Engineering and ICT, University of Tasmania, Hobart, Australia, (5) Department of Civil and Environmental Engineering, University of Strathclyde, Glasgow, UK

The Bureau of Meteorology Atmospheric high-resolution Regional Reanalysis for Australia (BARRA) is the first atmospheric reanalysis produced by the Bureau of Meteorology for the Australian region.
When complete, BARRA will provide over 25 years of hourly reconstructions of past atmospheric conditions from 1990 onwards. BARRA is bounded by the ERA-Interim reanalysis and comprises multiple convection permitting (1.5 km) dynamical downscaling (sub-domain) analyses nested within a mesoscale (12 km) regional atmospheric reanalysis over the Australia and New Zealand regions. BARRA will support high-quality assessments of weather and climate related risks, by providing additional detail beyond what can be obtained by coarser scale global reanalyses or global climate models.

BARRA is based on a fixed atmospheric and deterministic land surface assimilation system used at the UK Met Office for the UERRA (Uncertainties in Ensembles of Regional Reanalyses) project, and uses model nesting and Unified Model configurations based on the Bureau's operational numerical prediction ACCESS (Australian Community Climate and Earth-System Simulator) system. In contrast to the global reanalyses, high-resolution information on the land surface (e.g., tree heights, topography) was used along with additional observations from automatic weather stations in Australia and New Zealand, and locally derived satellite wind vectors over Australia and New Zealand. BARRA is initialized with the soil temperature and moisture fields are derived from a lower resolution (60 km) offline run of the Joint UK Land Environment Simulator (JULES) forced by ERA-Interim atmospheric variables.

In this presentation, we show that through the use of finer horizontal resolutions, BARRA can be expected to add fine-scale detail when compared to the coarse-resolution driving model. This anticipated added value is associated with a more realistic representation of surface forcings, a better simulation of the atmospheric circulation and gradients with higher resolution discretization of equations, and more explicit representations of fine-spatial scale processes (e.g., sea breezes, convective systems and tropical cyclones).

The first 6 years of reanalysis from 2010-2015 have now been completed for the regional and its sub-domains, including Tasmania. We demonstrate how BARRA can enable assessments of the likelihood of extreme events and other weather and climate related risks. We have studied forcing variables (e.g. screen temperature and humidity, 10 m wind, and precipitation) that influence extreme weather events and we highlight the added value BARRA can provide over coarser global reanalyses and traditional gridded climate datasets.