

BARPA-C - Convective-Scale Regional Climate Modelling in Australia

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Natural hazards are changing across Australia and globally in response to anthropogenic climate change. Accurate projections of Australian climate hazards, such as intense rainfall, extreme winds, bushfires, and cyclones, depend to varying degrees on the representation of atmospheric convection in climate models and its upscale effects on synoptic weather systems. Furthermore, the locations of exposed populations such as urban centres and coastlines are often poorly resolved in low resolution climate models. The Bureau of Meteorology is developing a suite of modelling systems, BARPA, based on the Met Office Unified Model (MetUM) coupled to the JULES land surface model, for generating an ensemble of projections for Australian Climate Service (ACS).

As a convection-permitting regional climate model, BARPA-C uses the latest regional atmosphere and land- configuration of the models RAL3.2. BARPA-C builds on BARPA-R, the Bureau's core set of downscaled 17-km projections, which relies on a parametrisation scheme to provide atmospheric convection. Following regional climate modelling protocols, BARPA-C has been evaluated by downscaling reanalysis data and comparing modelled to observed climatologies. 10 years of ERA5 have been downscaled to 4-km grid-spacing using BARPA-C, from 2013 to 2022, via the regional-scale BARPA-R nest. The application of spectral nudging techniques to improve the representation of large-scale climate features has been investigated. This presentation will evaluate BARPA-C against high-resolution observational datasets, including radar data, Himawari8 and BARRA-C2. This assessment will also evaluate the ability of BARPA-C to improve the representation of climate hazards, such as intense rainfall and extreme winds, compared to BARPA-R and global driving models.