



Australian Government

Bureau of Meteorology

Towards enhanced ACCESS-based regional atmospheric reanalysis for Australia

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Bureau of Meteorology

ACCESS SCIENCE DAY

11 June 2021

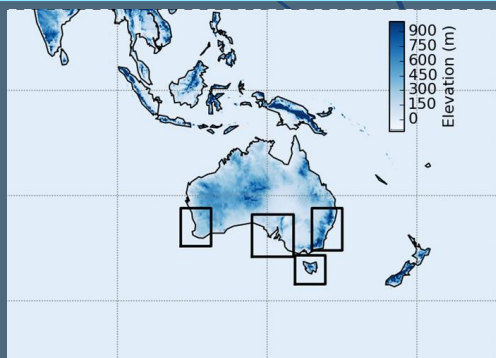


Delivering Australian Climate Service

- Atmospheric reanalysis as a foundational data
- Improving upon BARRA1 (Regional Unified Model + JULES)
- Consistent, detailed characterisation of historical hazards and continuous intelligence of recent events
- Common modelling framework for BARPA projections (see Harvey Ye's talk)

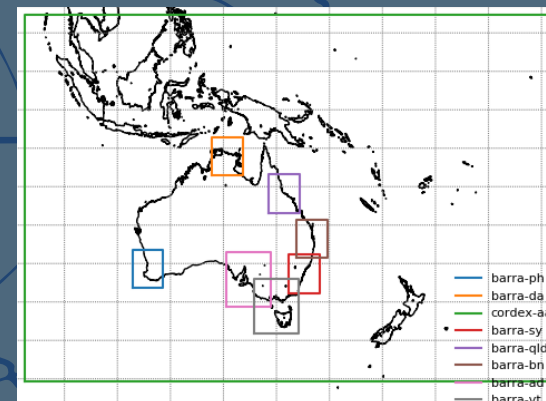
BARRA1

- 12km national
- 1.5km over cities
- 1990 – Feb 2019
- Deterministic
- 4DVar analysis
- Fewer obs than ACCESS NWP
- Nested in ERA-Interim
- GA6.1/GL6.1



BARRA2

- 12km national
- 2-4km over more regions
- 1980 to present, regular updates
- Hybrid 4DVar analysis
- Half-resolution ensemble to capture uncertainty
- More obs
- Nested in ERA5
- Improved soil moisture analysis



Prototype national reanalysis (BARRA-R2p) to provide more recent reanalyses

BARRA2

- 12km national ✓
- 2-4km over more cities
- 1980 to present, regular updates
- Hybrid 4DVar analysis
- Half-resolution ensemble to capture uncertainty
- More obs ✓
- Nested in ERA5 ✓
- Improved soil moisture analysis ✓
- GA7.2/GL8.1 ✓

Black Summer trial: 1 December 2019 to 31 March 2020

- 18 December 2019 was the hottest Australia-wide day on record. 11 days in December 2019 recorded national area-averaged maximum at or above 40° C
- Large areas of Australia had their highest accumulated forest fire danger index in December 2019.

(Source: Bureau Special Climate Statements 73)

Winter 2020 trial: July 2020 to August 2020

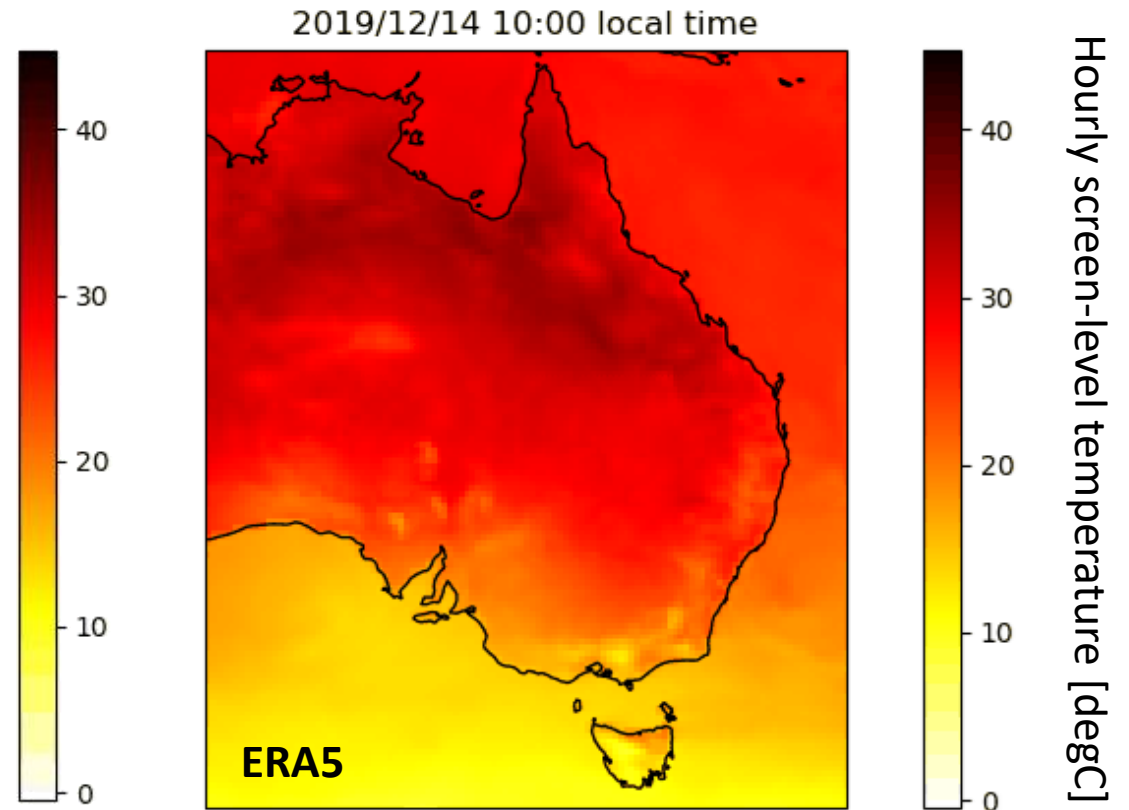
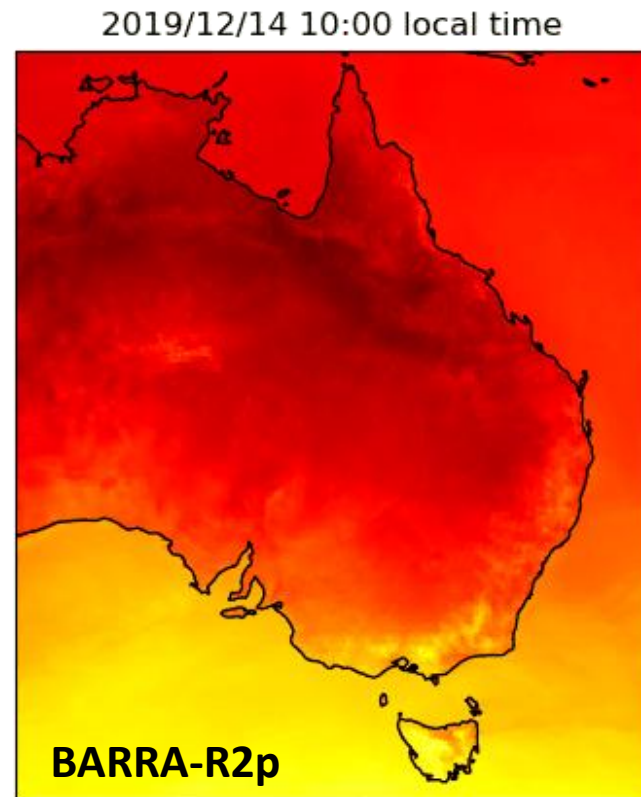
- Heavy rainfall to Tasmania, particularly on 5 August
- Isolated thunderstorms to South Australia
- Snow in the Flinders Ranges on 7 August
- Rain to much of inland NSW between 7-9 August, and heavy rain followed in south coast NSW between 8-10 August, with some stations had record high rainfall on 9 August

(Source: Bureau Monthly Review)

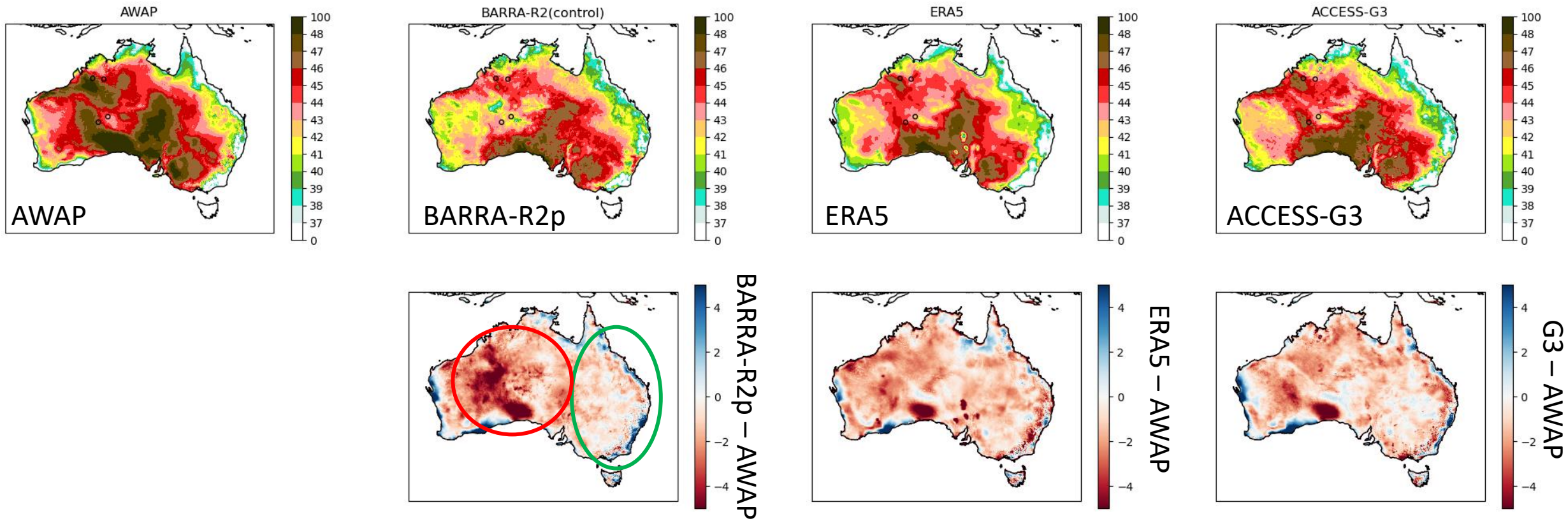
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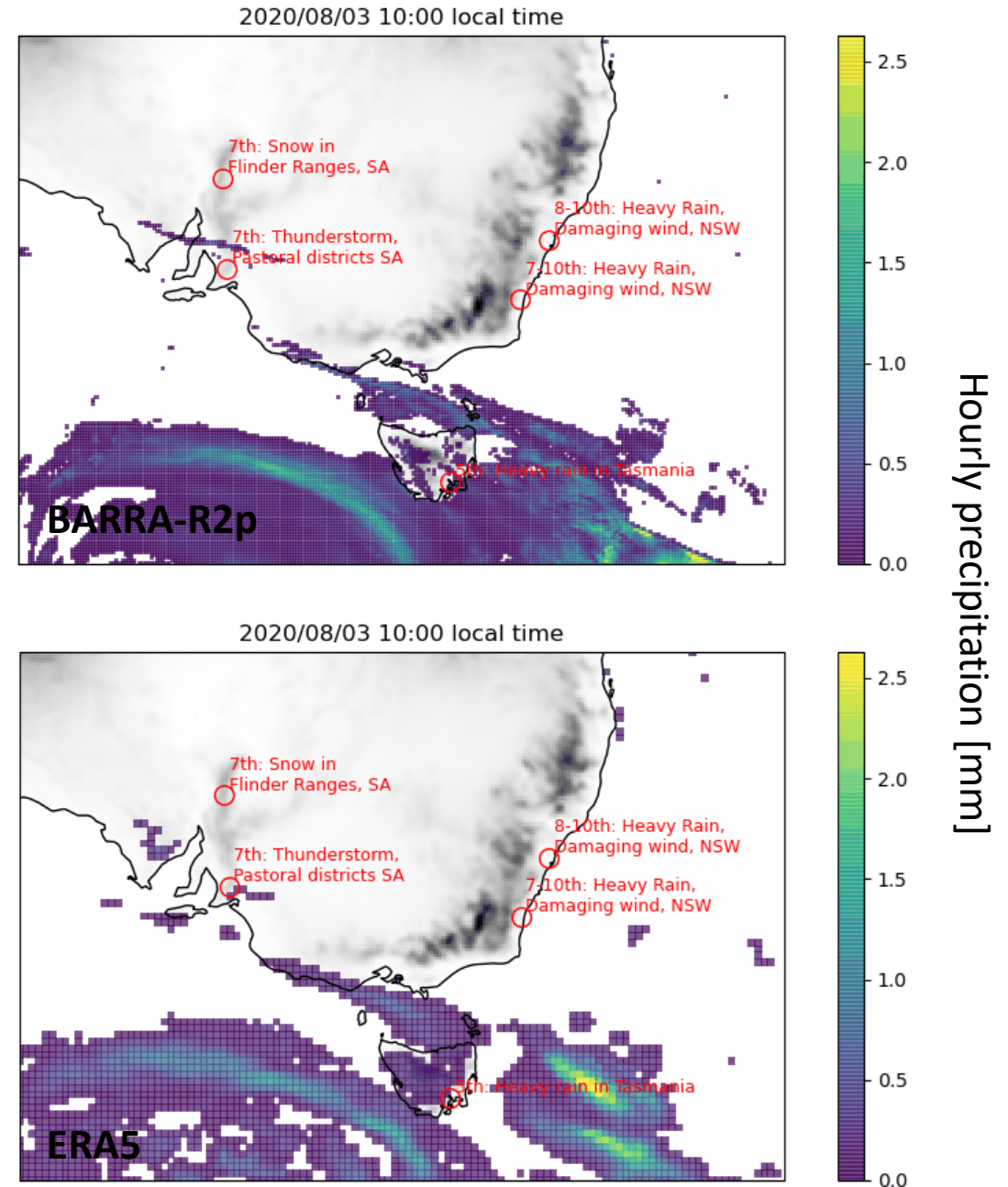


Maximum temperature between 16-22 December 2019



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Summary

- BARRA-R2p shows greater consistency with ACCESS-G3 (Global NWP) than ERA5
- Changes to soil moisture analysis to improve high temperature extreme simulations
- Minimum of two month spin up, to stabilise satellite bias to zero, using variational bias correction
- Evidences that new schemes in GA8 (e.g., prognostic entrainment scheme, fountain buster) improve precipitation
- Using Hybrid 4DVar to assimilate observations better, by modelling time varying model error covariances
- Full development of BARRA2 is underway



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Thank you

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