



Australian Government
Bureau of Meteorology

Operational climate outlooks at the Australian Bureau of Meteorology

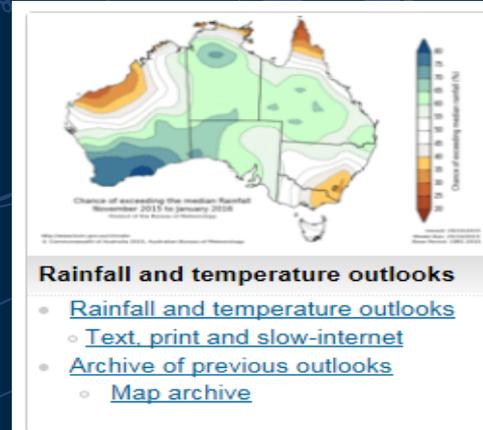
Current operational system along with proposed improvements

*Robert Smalley, on behalf of Climate Monitoring and Prediction Section,
(Lead: Dr David Jones)*

10/11/2015

The Climate Outlooks service

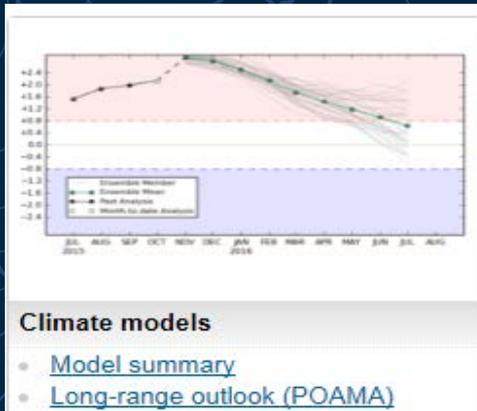
- National: rainfall & temperature
 - seasonal (3-month)
 - monthly (next 2 months)
- Tropical outlooks
 - Tropical cyclone outlook
 - Northern rainfall onset
- Long range outlooks
 - POAMA, international models



November 2015 - January 2016
Climate and Water Outlook

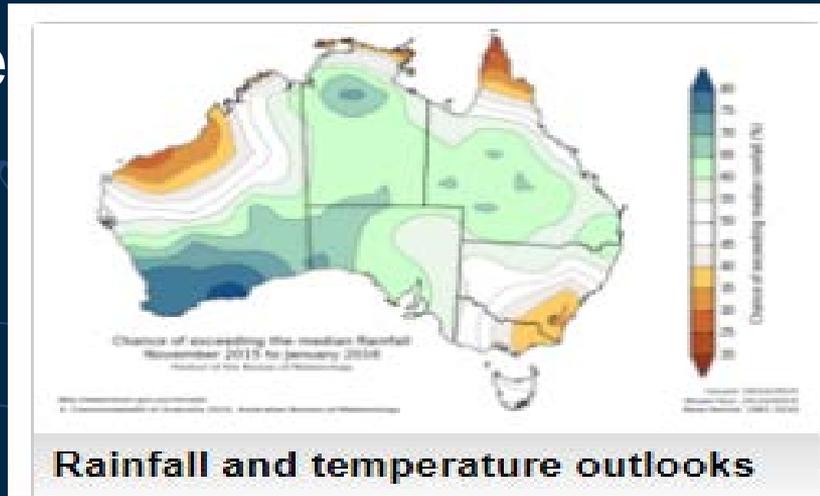
Outlook videos

- [Monthly outlook video](#)
- [Archive of previous videos](#)
- [About climate outlooks](#)
- [Climate outlooks demonstration](#)



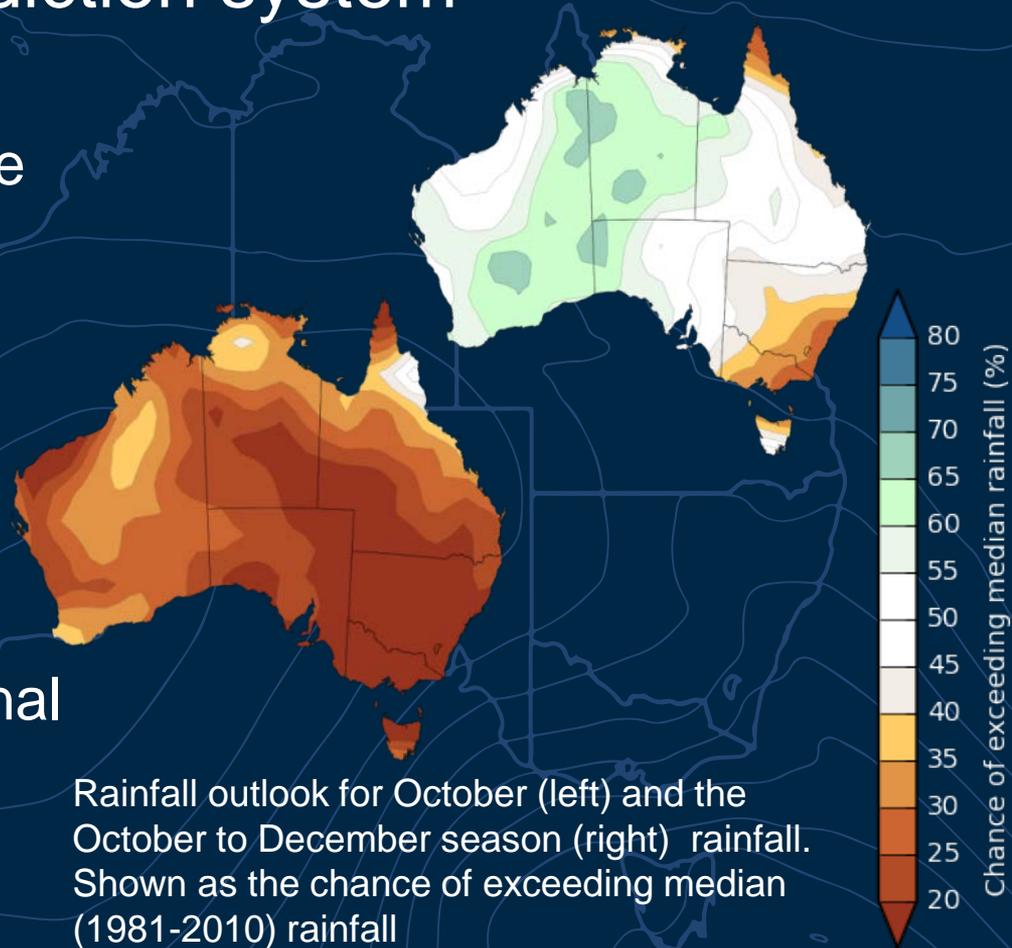
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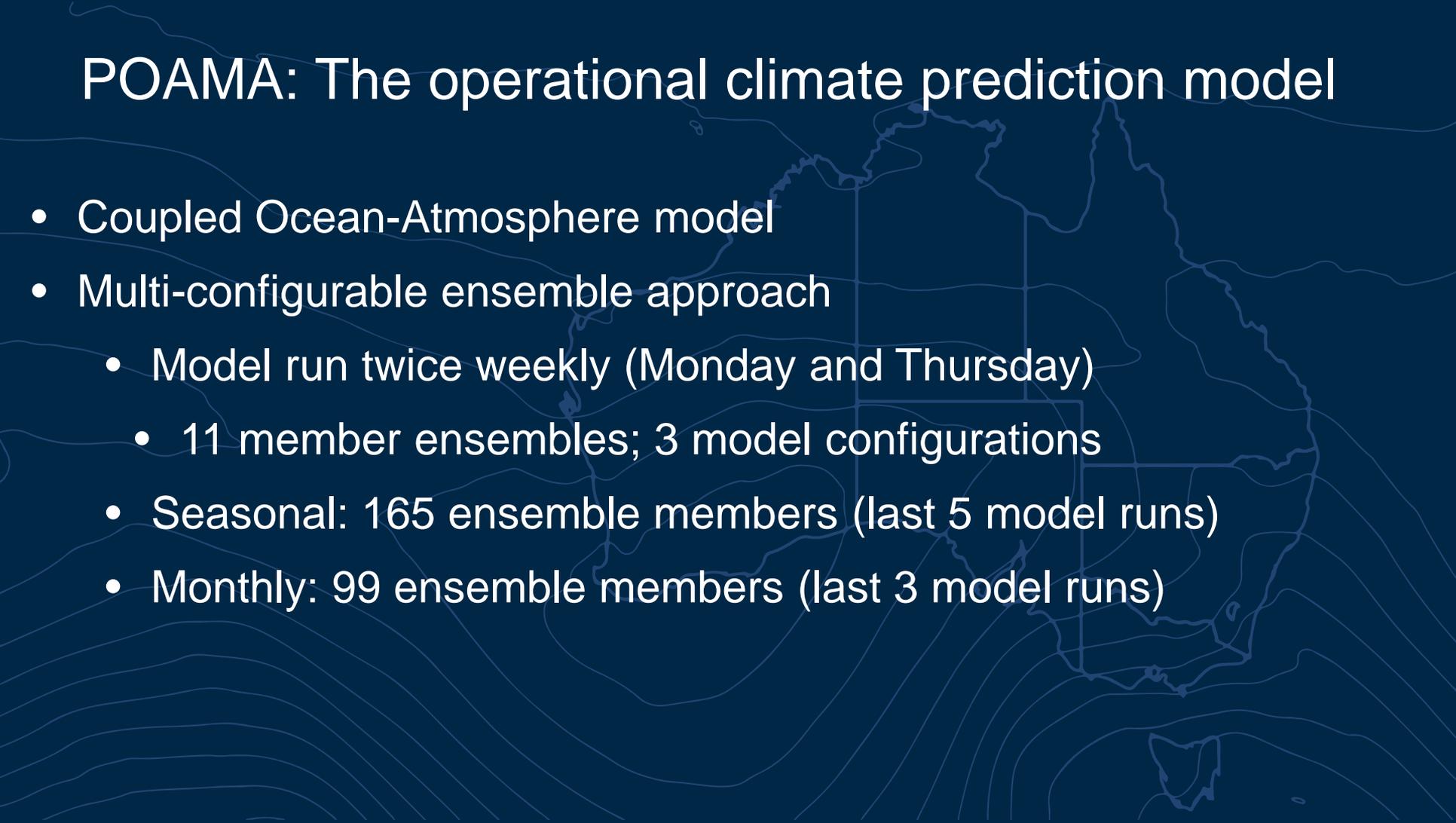
Operational climate prediction system

- Relies entirely on the Predictive Ocean-Atmosphere Model for Australia (POAMA)
- No forecaster (human) input
 - only model forecast output
- Probabilistic outlooks only
- Climatologists takes international model output to frame the text



Rainfall outlook for October (left) and the October to December season (right) rainfall. Shown as the chance of exceeding median (1981-2010) rainfall

POAMA: The operational climate prediction model



- Coupled Ocean-Atmosphere model
- Multi-configurable ensemble approach
 - Model run twice weekly (Monday and Thursday)
 - 11 member ensembles; 3 model configurations
 - Seasonal: 165 ensemble members (last 5 model runs)
 - Monthly: 99 ensemble members (last 3 model runs)

Monthly & seasonal prediction: Operational process

Week starting	Sunday 1 November	Sunday 8 November	Sunday 15 November	Sunday 22 November	29
Day of run	M T	M T	M T	M	

Monthly meeting (1.5 hours)

General climate discussion
(20-30 people)

Verification of last month & season

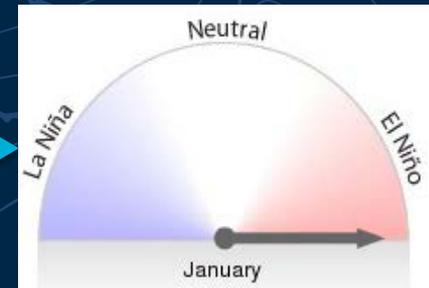
ENSO, IOD, SAM, ocean conditions, tropical activity (e.g. MJO, OLR), surface winds

Preliminary POAMA forecast maps

Model Summary

Survey of International climate models

6 month outlooks of Pacific & Indian Ocean temperatures



Monthly & seasonal prediction: Operational process

POAMA model run output

Monday's run (available Tuesday)

Seasonal: current and past 4 runs
165 ensemble members

Monthly: current and past 2 runs
99 ensemble members

Week
starting

Sunday 22
November

29

Day of run

M

■

Finalisation

Climatologists draft text to support outlook, using content from earlier monthly meeting to assist with communication

Internal key messages written to support staff communicating the message. Includes expansion of complicated messages

Draft circulated for review by climate and communications staff for clarity

Text finalised, key messages circulated, climate outlook released

Monthly & seasonal prediction: Operational process

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M

Thursday 26 Nov.

Climate Outlook on
www, to media and
stakeholders

Supporting video
- climate and water
- youtube (3-5 min)
- national TV: Sunday

Government briefing

Monthly & seasonal prediction: Allows for reissue

- October & October-December outlook issued 24 September
- Changed outlook in subsequent model runs
 - Emerging positive IOD
 - Enhancing strong El-Nino influences
- October & October-December outlook was reissued on 7 October
 - Verified well for rainfall and temperature

Operational climate prediction system

*See **orange text** for probabilistic terms*

The October outlook shows a notable shift towards a drier month nation-wide, with southeast Australia indicating **a less than 20% chance of exceeding median rainfall**. This means the region has **a greater than 80% chance of a drier month**.

October to December is likely to be drier than average across southeast and northeast Australia. Conversely, eastern parts of WA, and southern parts of the NT show a slightly **increased chance** of a wetter three months.

The current outlook reflects a combination of a mature El Niño in the Pacific, and an emerging positive Indian Ocean Dipole.

Historical outlook accuracy for October to December is moderate over most of Australia.

Climate outlooks products



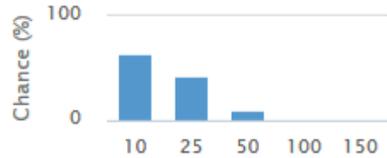
Outlook for October at Melbourne

Rainfall

Median **57 mm**

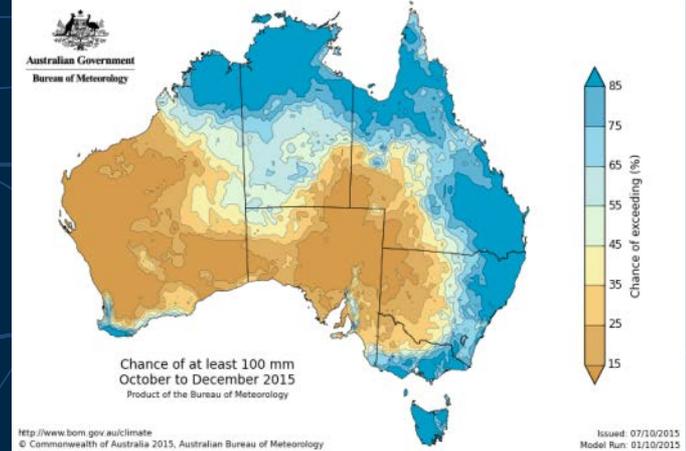
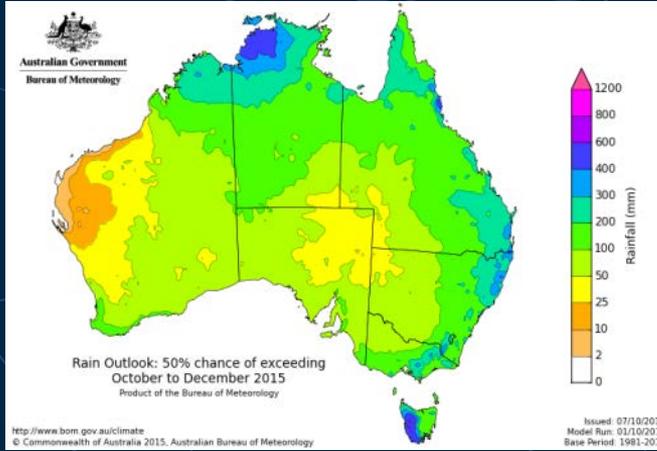
Chance of above median **Very unlikely**

Rainfall total of at least (mm)



Past accuracy

Moderate

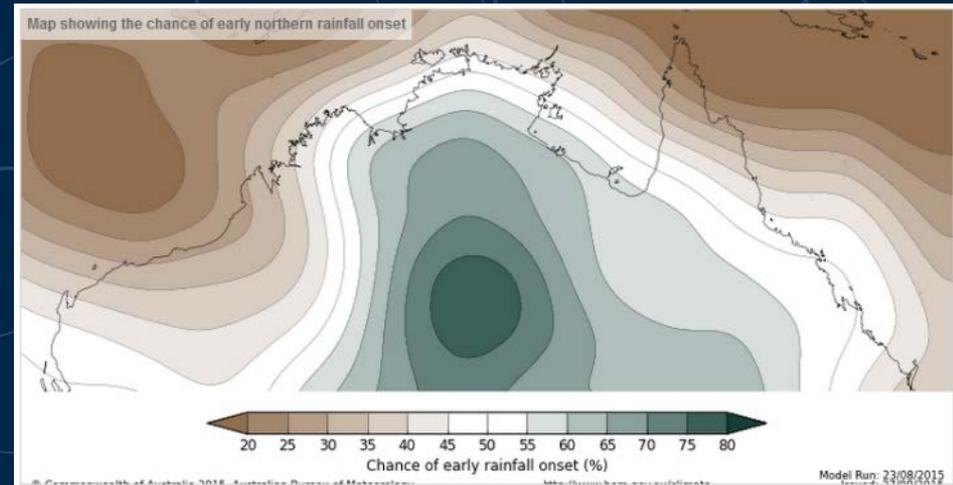
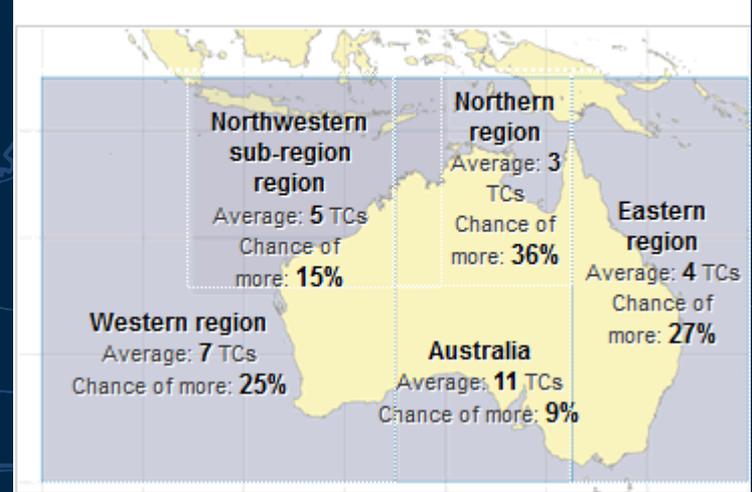


50% chance of Xmm for October to December (left), percentage chance of at least 100mm for October to December (right)

The Climate Outlooks service

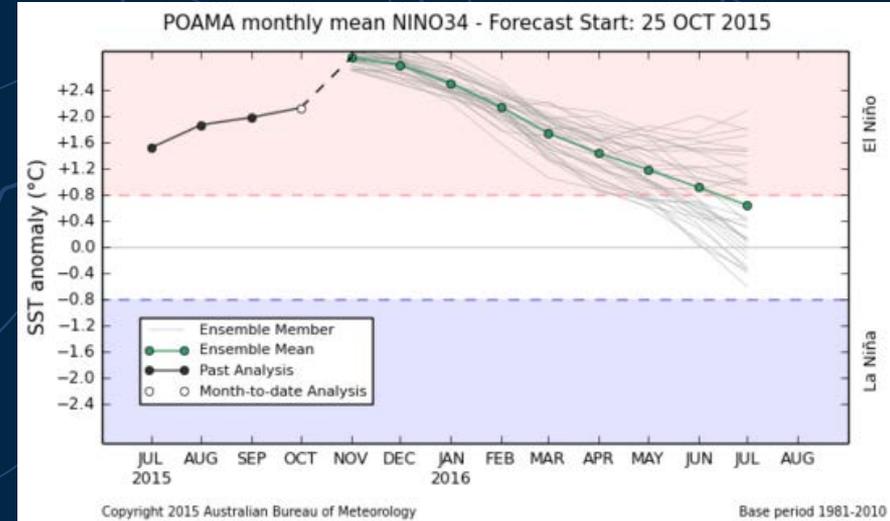
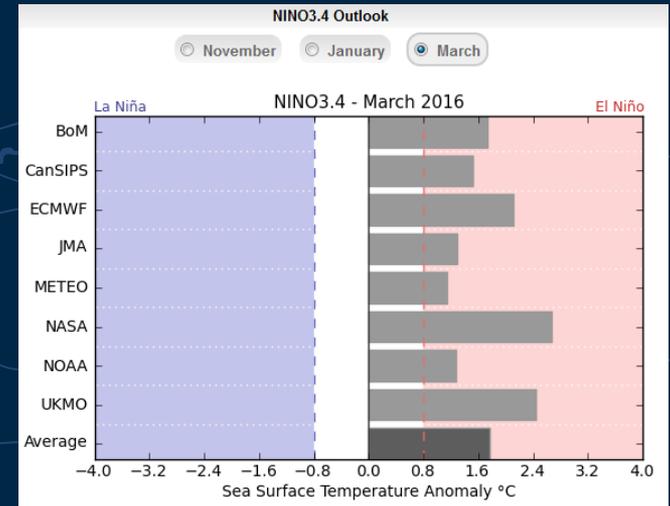
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 - statistical
 - Northern rainfall onset
 - Dynamic (POAMA)

Chance of more tropical cyclones for the 2015–16 season



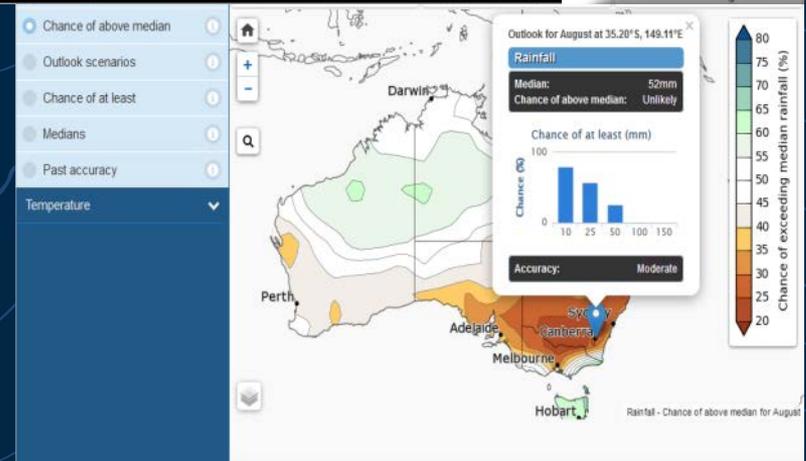
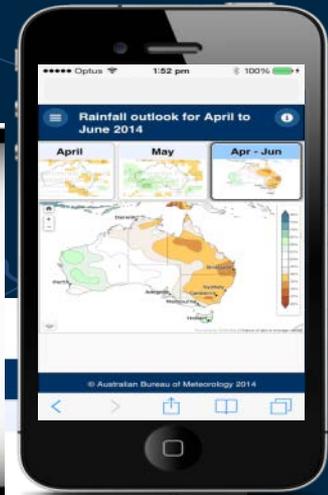
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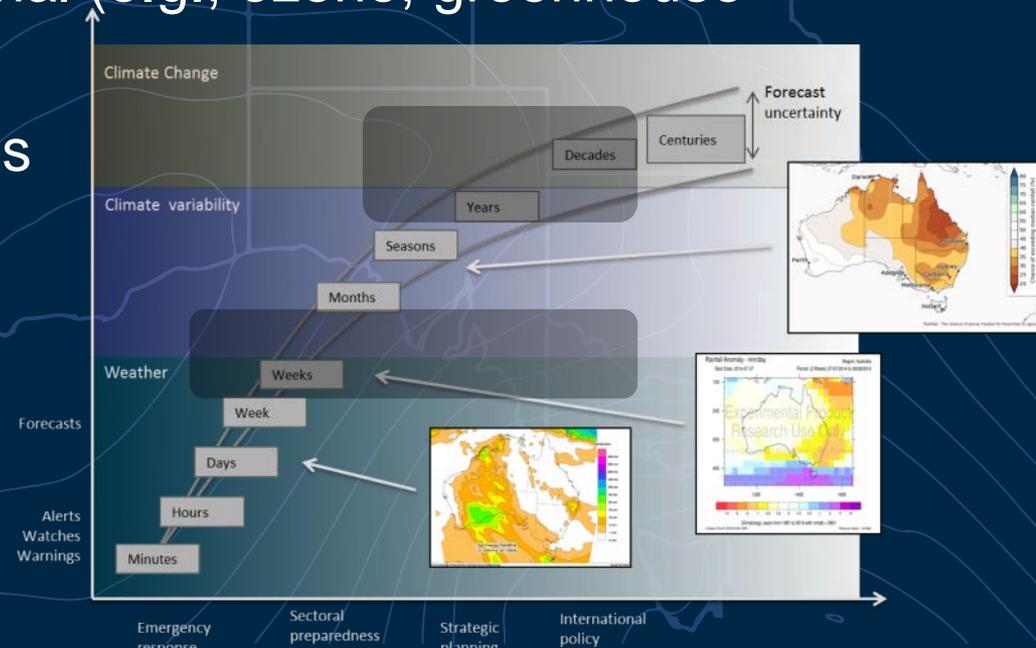
The Climate Outlooks service: strengths

- Temperature and rainfall
- Can add more variables
- Model is accurate and reliable
- Engaging and intuitive
- Large user base
- Operationally supported



Areas for improvement...

- Coarse 250km grid resolution
- Limited compatibility with decision support models
- No explicit climate change signal (e.g., ozone, greenhouse gas increases)
- Gap between days and months
- Accuracy below best practice

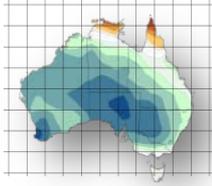




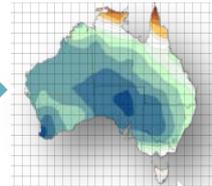
BETTER SEASONAL OUTLOOKS

Finer model detail

Moving from 250 km to 60 km resolution



Australia: 120 to 2000 grid points

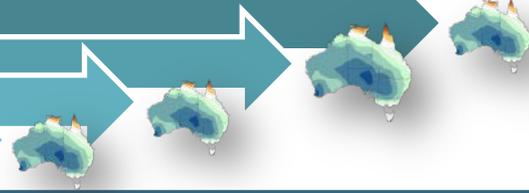


meaning
more localised information by accounting for local conditions

More outlook periods

Seamless: filling the gap between 7-day and monthly outlooks

Season
Month
Fortnight
Week



Outlooks updated weekly

Higher outlook skill



Likely 10% improvement in outlook accuracy



meaning
the best outlooks for Australia of all international models

World class service



meaning
information is clear, concise and available when and where you need it

More intelligence possible:

- Evaporation
- Humidity
- Wind
- Drought
- Extremes
- Tropical Cyclones

Not only rainfall and temperature

Bigger user returns



Reduce losses: agricultural production lost from 2010-11 La Niña:

More than **\$2 billion**
ABARES



Potential value of improved seasonal forecasts:

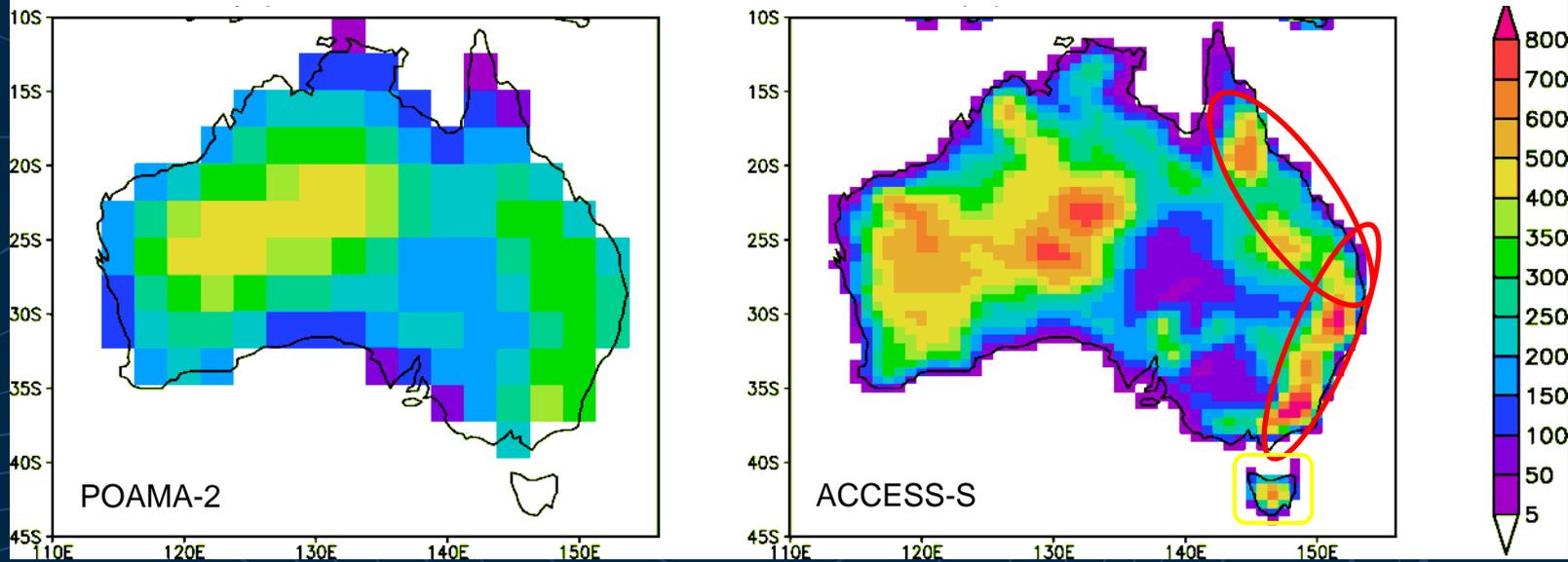
More than **\$1 billion** per year
Centre for International Economics 2014



Improved resolution

- Resolution increase from 250 km to 60 km
- Able to resolve the **Great Dividing Range**, **Tasmania**, **coastal zones** and river basins

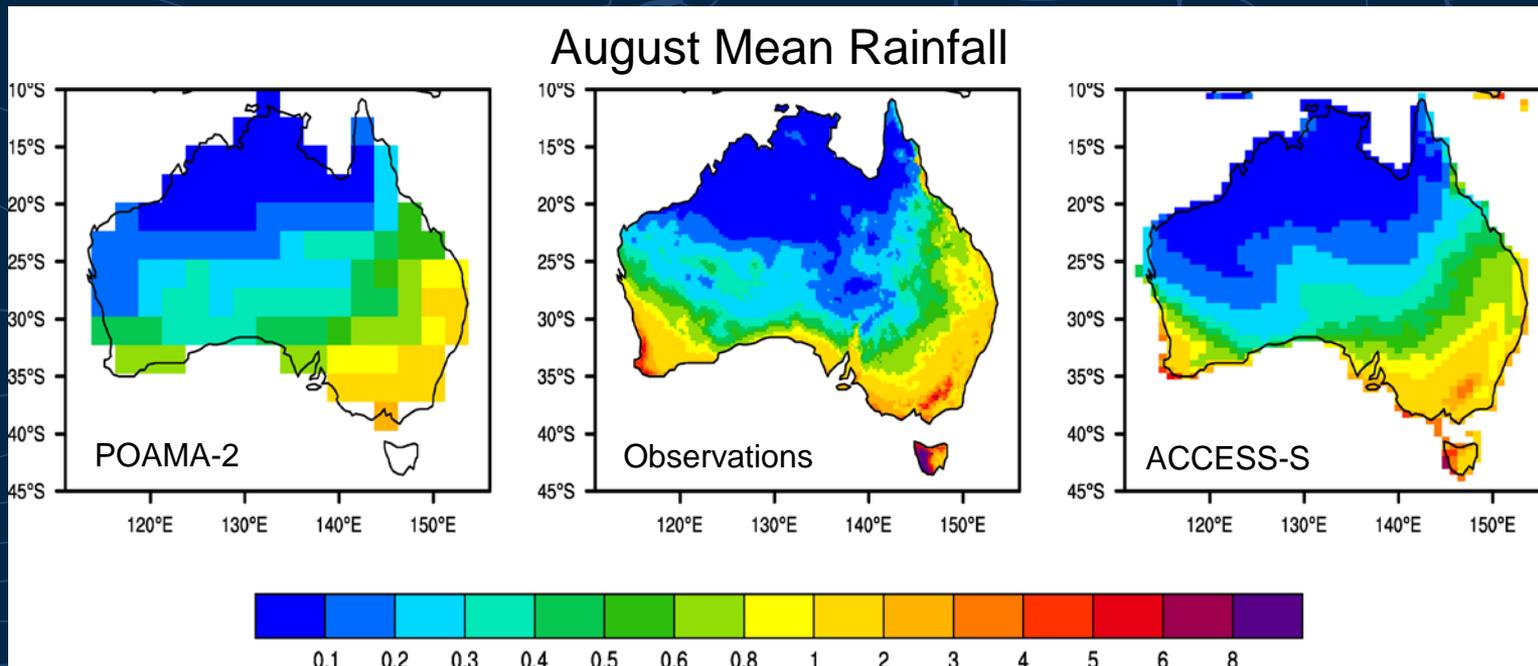
Australian topography





Better model climate

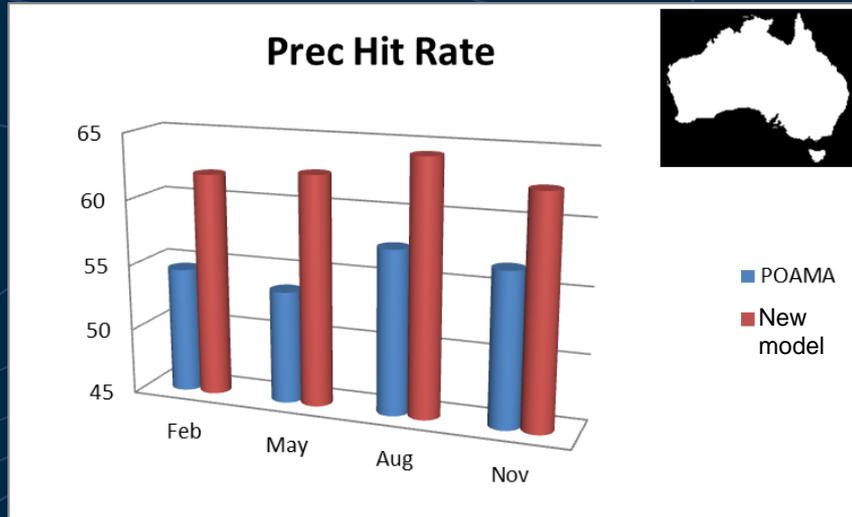
- Able to provide realistic weather sequences
- Link to decision models (e.g., fire models, crop models etc)



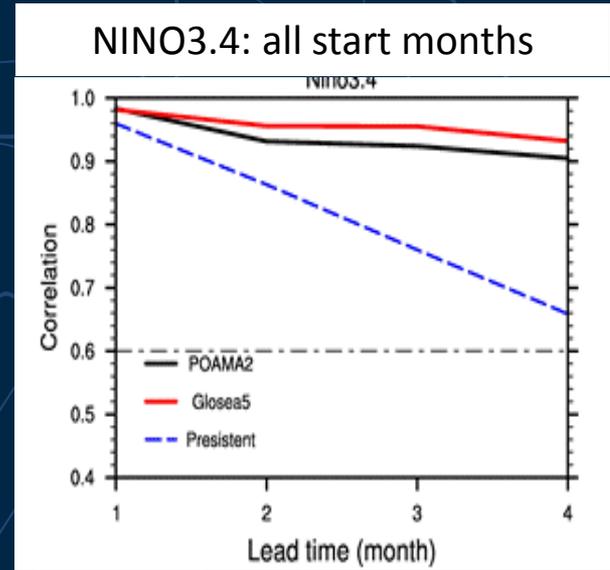


More accurate outlooks

- Early testing shows improved accuracy for rainfall
- Better predictions of El Niño / La Niña



Rainfall forecast accuracy



El Niño forecast accuracy

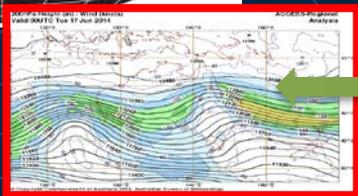
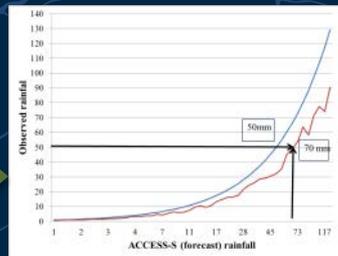
The calibration and downscaling

- Dynamic approach: Climate model downscaling

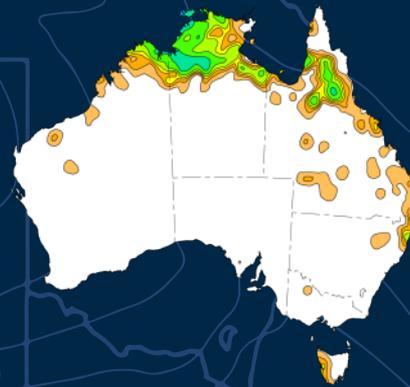
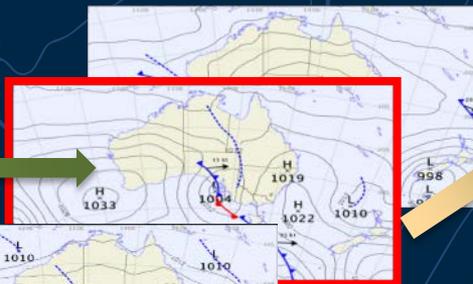
ACCESS-S forecast of weather variables (~60km, XYZ ensembles)

Calibration & downscaling

Downscaled outcomes



Match





Where next?

- 2015: Obtain feedback on current service and priorities for improvement
→ Develop service solutions
- 2016: Test deployment of new model
- 2017: First deployment of new outlook service (including multi-week)
- 2018: Further upgrade to model (physics, initial conditions)
- 2019: New outlooks service fully deployed



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Thank you

Questions?

