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Future of Australian Forecasting models

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Outline

- Benefits of innovative forecasting tools
- Our data and models
- Challenges in the use of forecasts for farmers
- The future – improved capability, capacity and technological innovation

Benefits of innovative forecasting tools

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Realising the benefits: seasonal forecasts

Industry	Potential annual value of forecast
	A$m
Construction	192
Electricity	2.3
Coal mining	68
Oil and gas	93
Transport	5
Water supply	28
Agriculture	1 567

Note: All values are given in Australian dollars at 2012 prices

Source: CIE estimates

- Research from the Centre for International Economics for the Managing Climate Variability program
- Value to agriculture to ~$1.6 billion per year – much greater than for other sectors
- Value to other climate sensitive industries up to $192 million per year
- Benefits through applications and better decisions

http://www.managingclimate.gov.au/publications/benefits-of-improved-forecasts/

Our data and models

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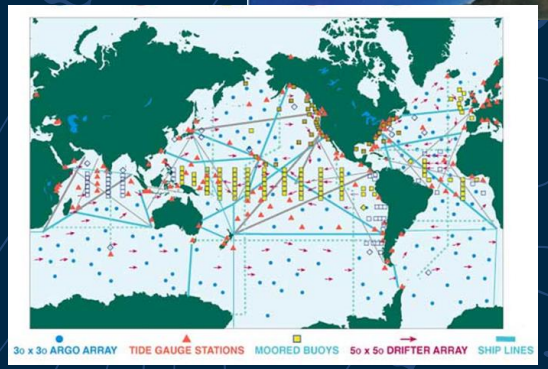
We are a part of the global observing system

Each day the Bureau collects:

- **~ 10 million atmospheric observations** suitable for ingest into our operational NWP systems
- **~ 5.5 million ocean observations** suitable for ingest into our operational ocean systems
- An additional **~ 1 billion observations**, per day, already arriving from the next generation of satellites such as Himawari-8/9 from Japan
- Mostly received, ingested, visualised, assimilated, applied etc in (near) real time



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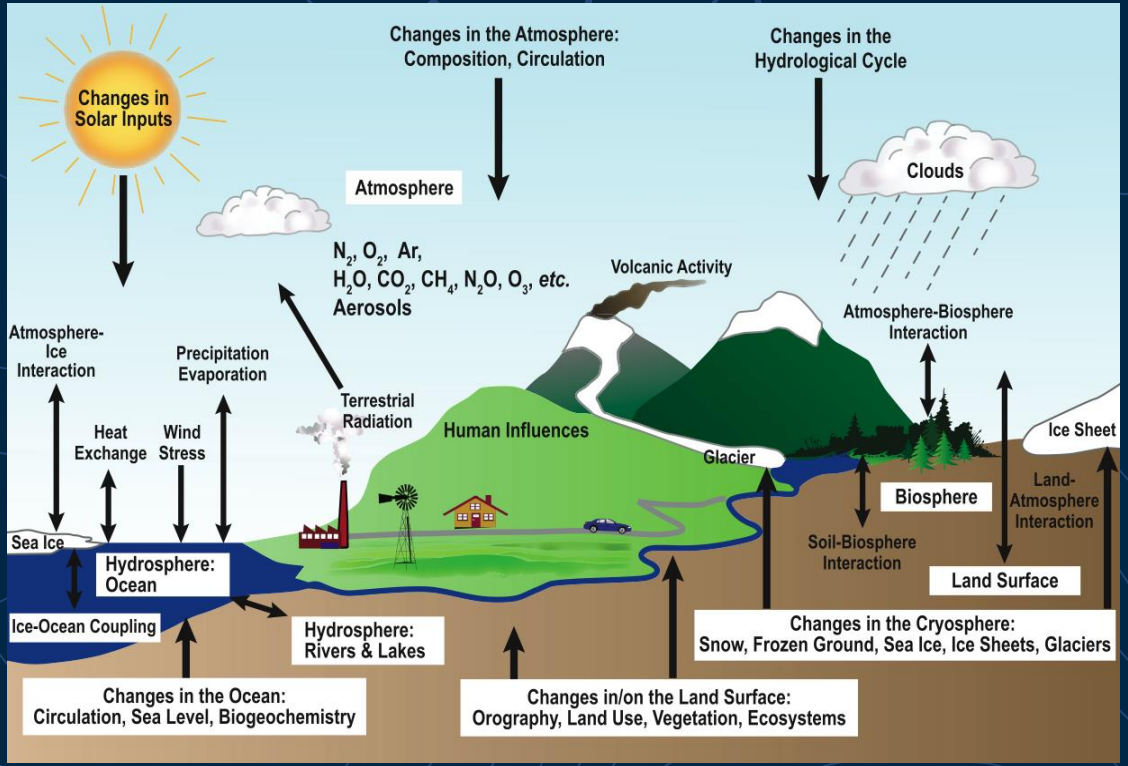
Earth System Models

- Weather
- Climate
- Air quality
- Ash dispersion
- Radiative dispersion
- Ocean dynamics
- Tides
- Storm surges
- Tsunamis

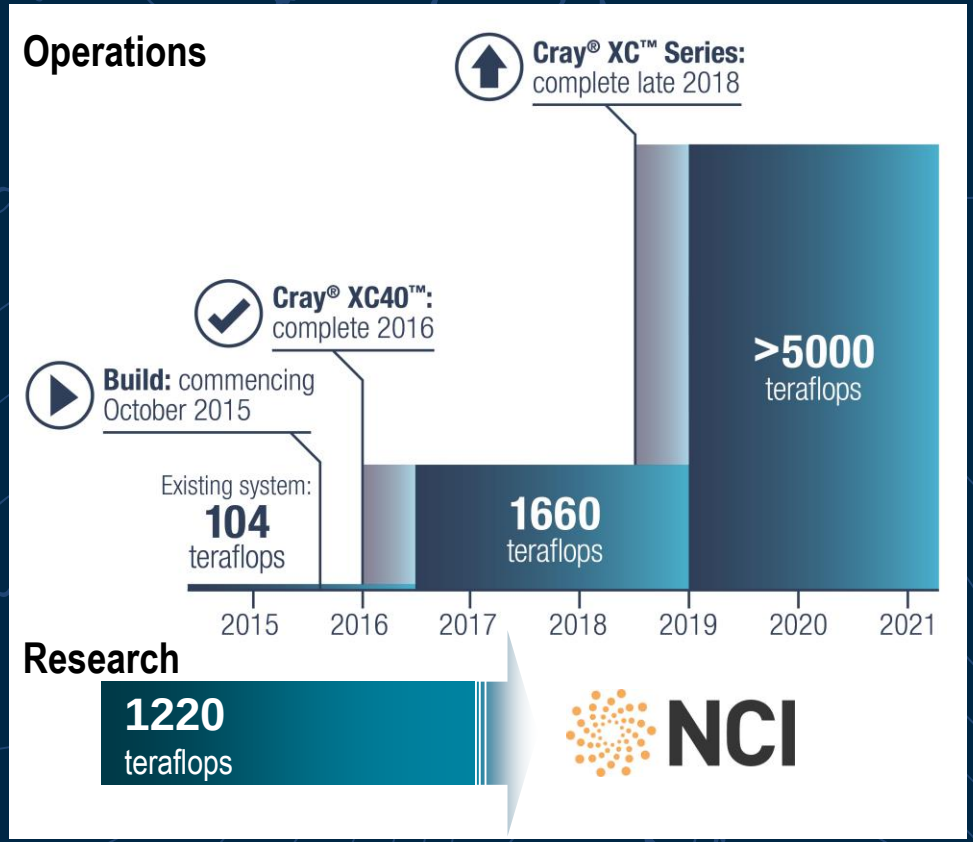
- River flood heights
- River flow volumes
- Groundwater levels
- Soil moisture
- Water storage
- Water quality
- Space weather



Upgraded high performance computing

Benefits

- Higher resolution, more accurate
- More frequent, more up to date
- More members, more certain
- On-demand, more responsive



Challenges in the use of forecasts for farmers

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Key challenges for seasonal forecasting

- User confidence
- Improving skill
- More local, better resolution
- Better supporting decisions
- Effective communication/interpretation

MARKET RESEARCH AND USER CENTRED DESIGN

Stage 1: Qualitative Research
- *Interview internal Bureau Stakeholders*

Stage 2: Qualitative Research
- *Interview 10 VIP product users*

Stage 3: Quantitative Research
- *Open Public Online Survey*

Stage 4: Product Testing
- *User Workshop*

Stage 5: Product Testing
- *User Interviews*

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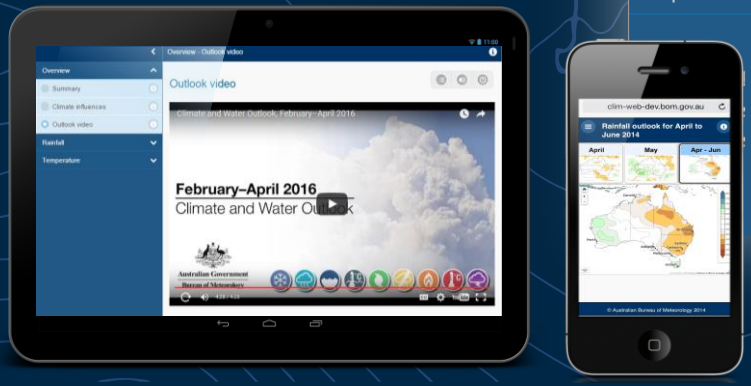
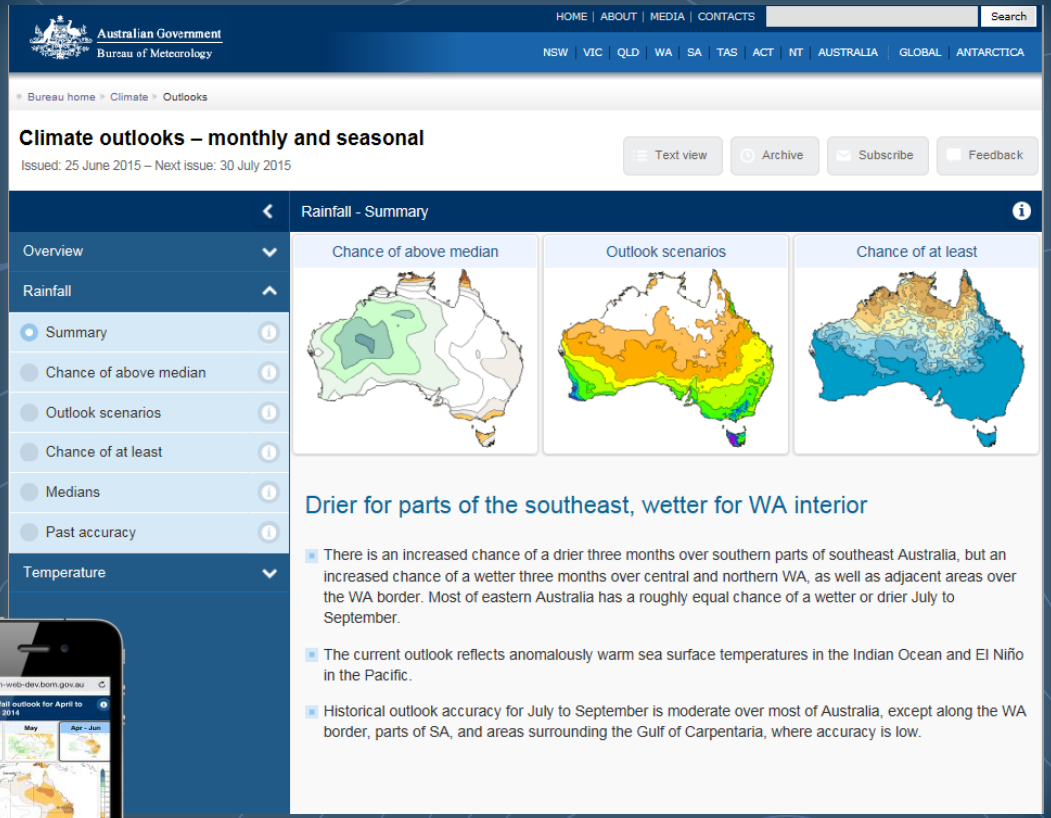
From August 2014

- New (and much improved) website
  - Interactive
  - More explanation
  - Monthly forecasts
  - Monthly explanatory videos
  - Mobile and tablet friendly





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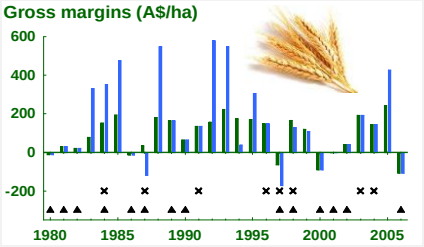
Key research challenges

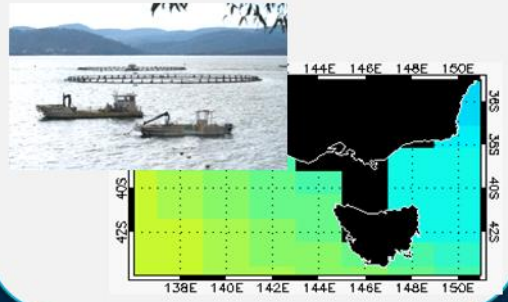
- ACCESS S2: high resolution multi-week and seasonal prediction, tailored for agriculture
  - Model evaluation and development
  - Products and support for applications
- Tackling systematic biases which limit forecast skill
  - Tropical convection (Indian Ocean), Southern Ocean, Indonesian throughflow, teleconnections, etc
- Forecasting extreme rainfall and frosts/cold extremes
  - Understand key drivers
  - Product development, including multi-week

Crop modelling



APSIM
AGRICULTURAL PRODUCTION SYSTEMS SIMULATOR

Aquaculture: Salmon farms (TAS)



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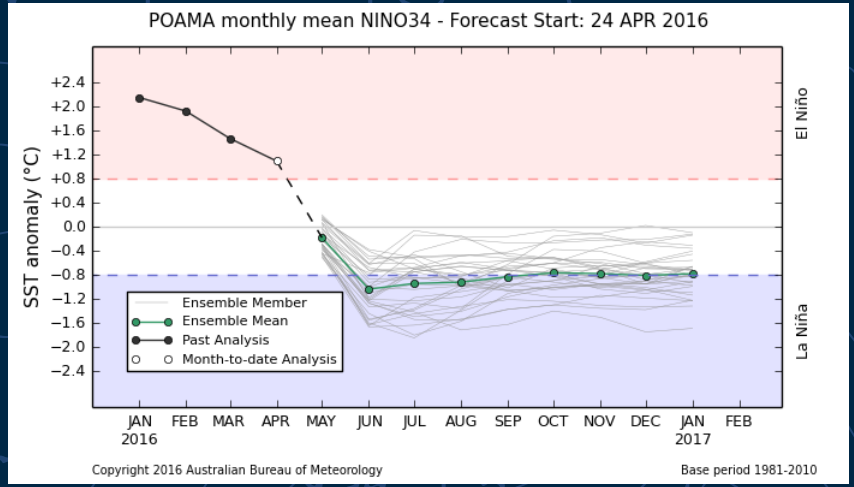
Key research challenges

- Better representation and forecasts of the land surface
  - Improved understanding of land surface in forecast skill
  - New products, e.g. soil moisture
- Multi-year predictions for Australia
  - Investigate past skill in forecasting 'swings' in ENSO over several years
  - Feasibility of operational forecasts



The future – improved capability, capacity and technological innovation

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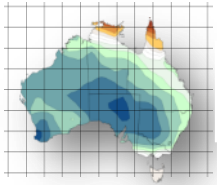
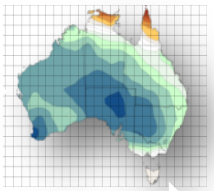
IMPROVED CLIMATE OUTLOOKS

Finer model detail

Moving from 250 km to 60 km resolution



Australia:120 to 2000 grid points

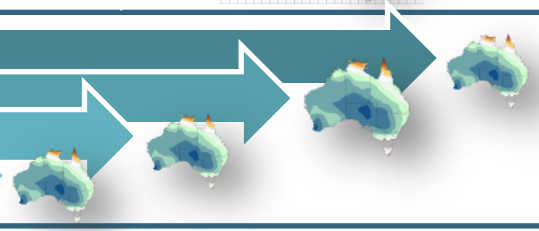


meaning
more localised information
by accounting for local conditions

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

+

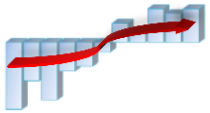
meaning
information is clear, concise and available when and where you need it

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

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So, what else can we expect?

- Machine to machine transfer of information … directly to decision support
- Higher resolution and more skilful forecasts
- Ensemble information for the shorter timescales, i.e. multiple forecasts for the same period, for better risk assessment
- Richer verification products to improve confidence and models
- Information delivery further diversified for greater uptake
    - desktop, mobile, videos, wearables, vehicles

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Thank you

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Outlook for May to July 2016