The heatwaves of the 2013/2014 Australian Summer

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AFAC 2014

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Introduction

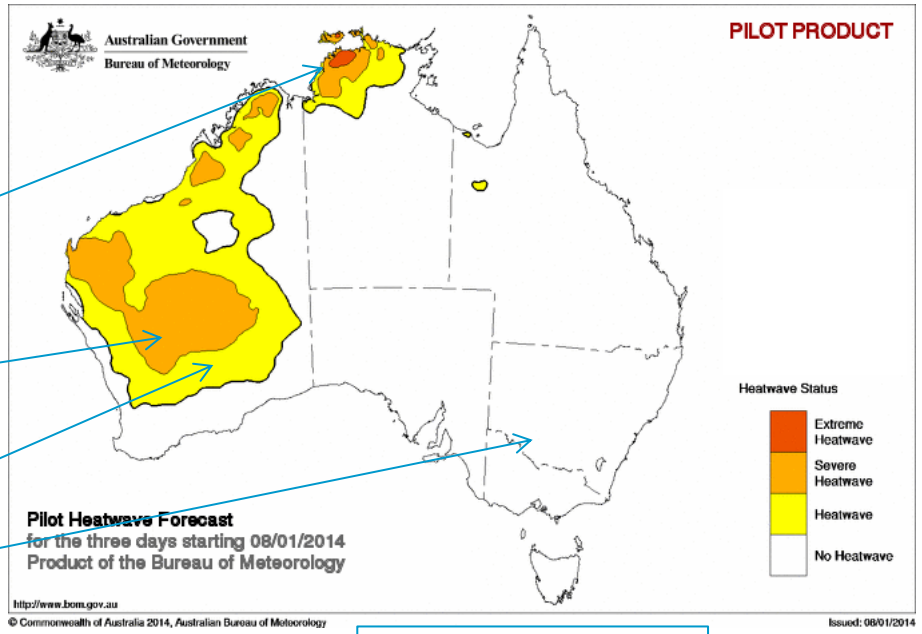
- Heatwaves
  - Significant natural hazard in Australia
  - More hazardous to human life than bushfires, tropical cyclones, floods
- Summer 2008/2009
  - Bushfires among the worst in the history of the Australian nation
  - High death toll, but …
  - Many more lives were lost to the summer heatwaves
- January 2014
  - The Bureau introduced a pilot national heatwave forecasting service
  - Forecasting areas of "no heatwave", "low-intensity heatwave", "severe heatwave" and "extreme heatwave"
  - Pilot service expected to run again this summer (2014/2015)
  - http://www.bom.gov.au/australia/heatwave/

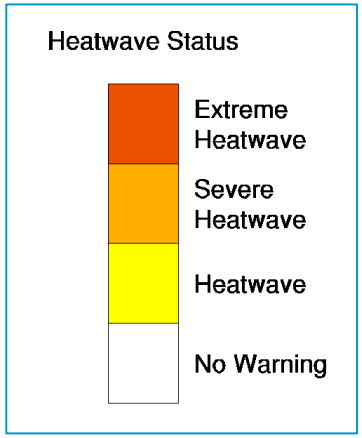
Presentation outline

- What the forecast products looked like
- The Excess Heat Factor (EHF)
- How the forecasts went
- The heatwaves of the 2013/2014 summer
- Looking forward

What the forecast products looked like

- Forecast map says something about the average temperature across a three-day period (TDP)
- Areas of
  - Extreme heatwave
  - Severe but not extreme heatwave
  - Low-intensity or non-severe heatwave
  - No heatwave
- "Pilot" service because underlying temperature forecasts are currently derived from unadjusted model guidance
  - not from official Bureau forecasts





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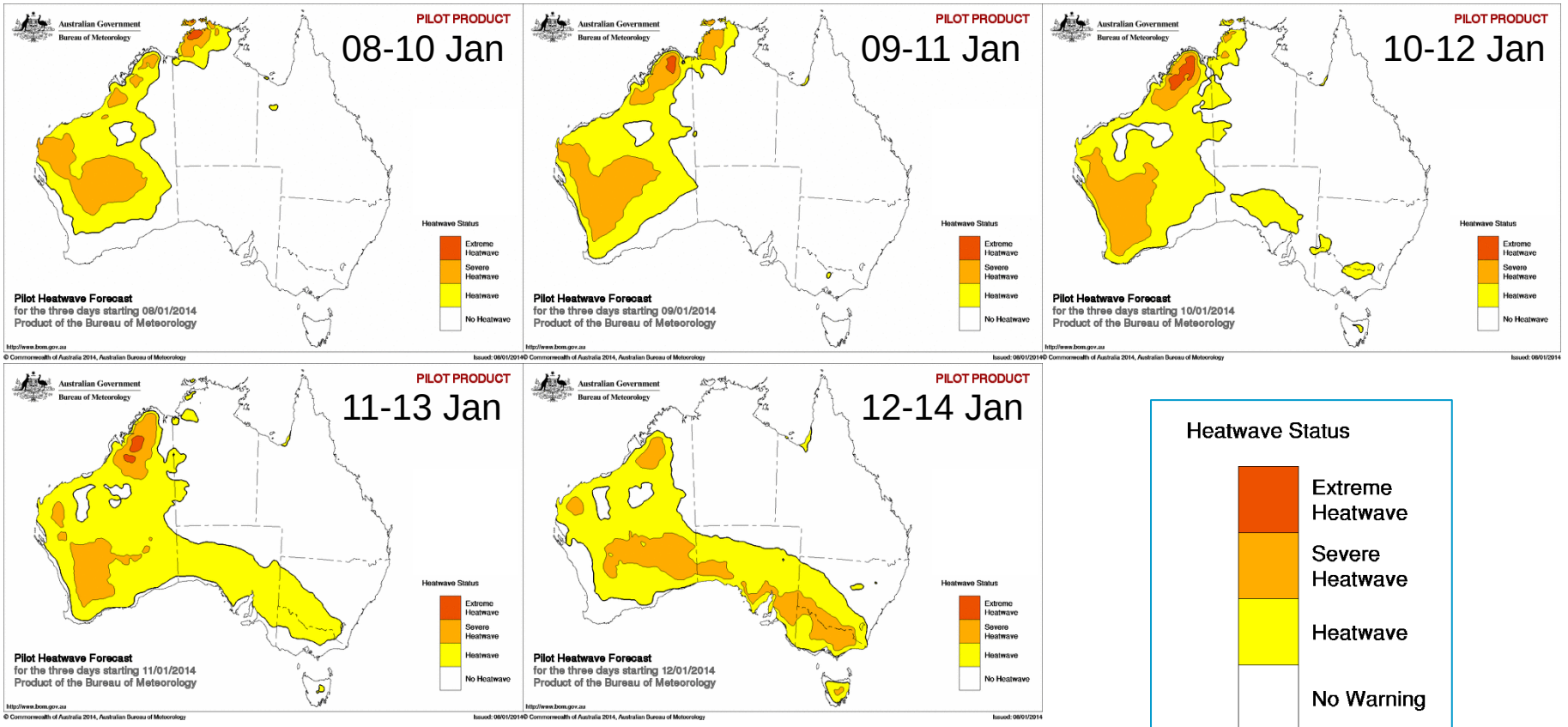
What the forecast products looked like

- On 8 January 2014, the Bureau issued these forecast maps, together with accompanying commentary



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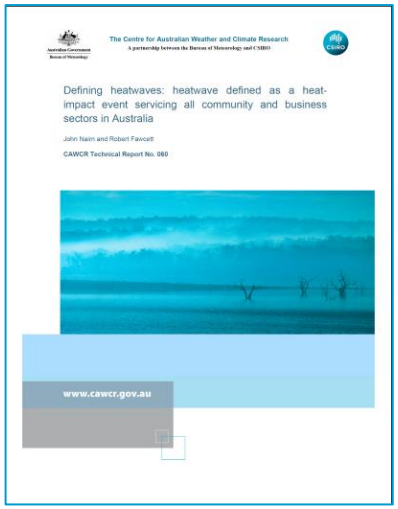
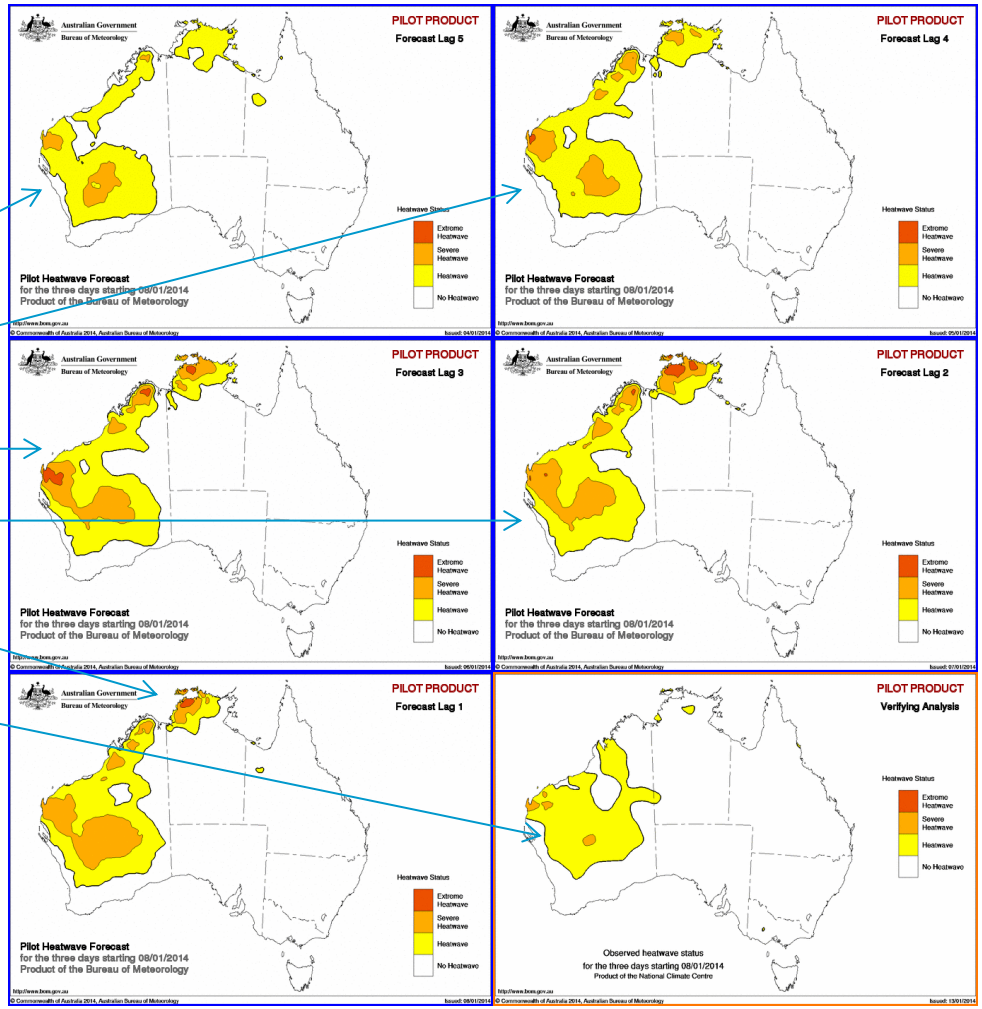
The Excess Heat Factor

- Pilot heatwave forecasts are based on the Excess Heat Factor (EHF)
- EHF
  - Is based on daily mean temperature (average of Tmax and following Tmin)
  - Looks at temperature averaged over a three-day period
  - Is a product of two ingredients
  - Ingredient 1 measures how hot the TDP is with respect to the annual temperature cycle at the location
  - Ingredient 2 measures how hot the TDP is with respect to the previous 30 days
- Threshold for severity is 85th percentile
  - 15% of heatwaves in climatology period are designated severe
- Full details in CAWCR Technical Report 60



How the forecasts went

- Verification based on comparison of forecast areas
- TDP 08-10 January 2014 percentage area in heatwave
  - Forecast Lag 5: 20.3%
  - Forecast Lag 4: 23.0%
  - Forecast Lag 3: 23.6%
  - Forecast Lag 2: 24.3%
  - Forecast Lag 1: 23.9%
  - Observed: 16.6%



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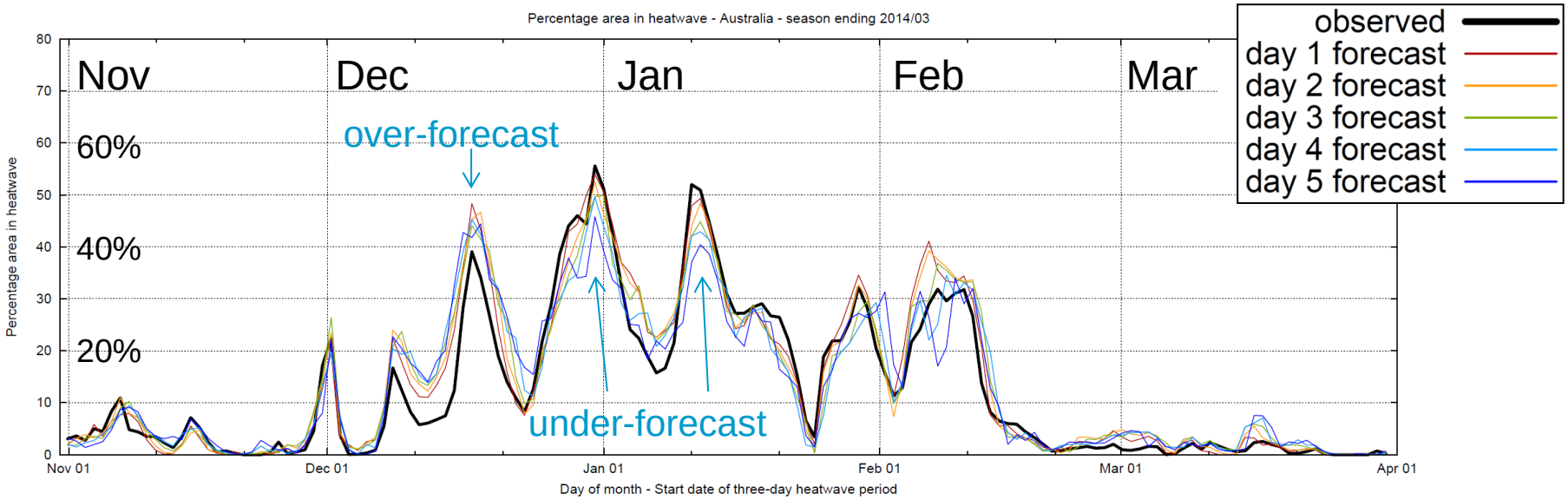
How the forecasts went

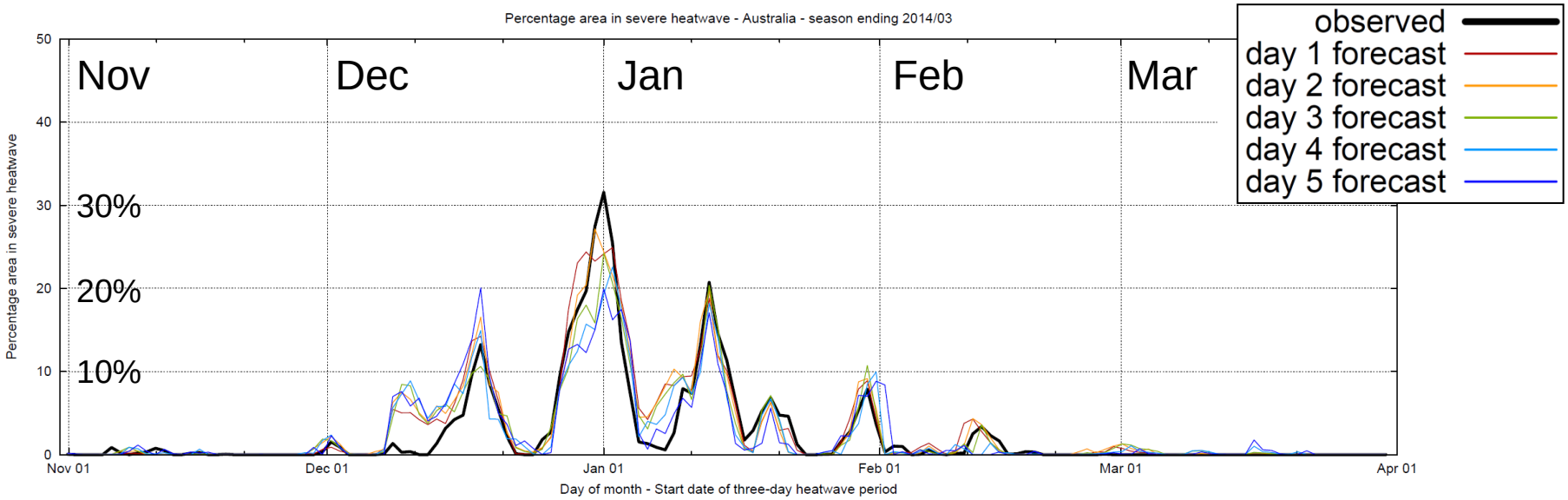
- Percentage area of Australia in heatwave (forecast, observed)



- Some under-forecasting, over-forecasting, but no major events missed
- HW forecast performance reflects good ability to predict daily max, min temperatures out to seven days

How the forecasts went

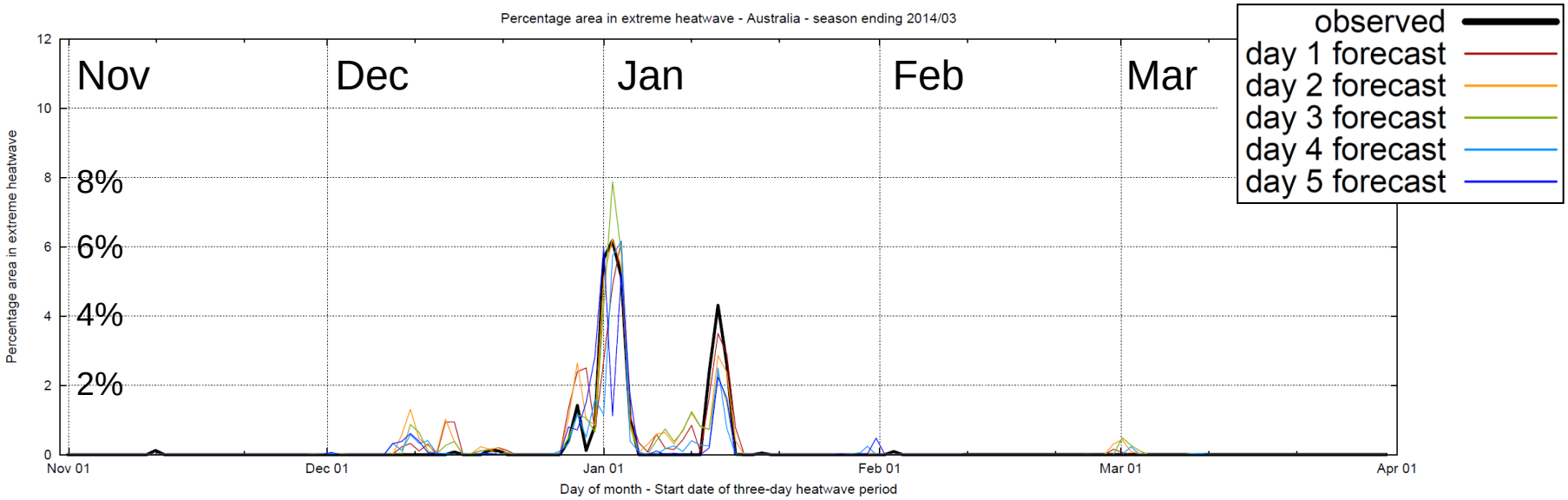
- Percentage area of Australia in severe heatwave (forecast, observed)



- Some under-forecasting, over-forecasting, but no major events missed

How the forecasts went

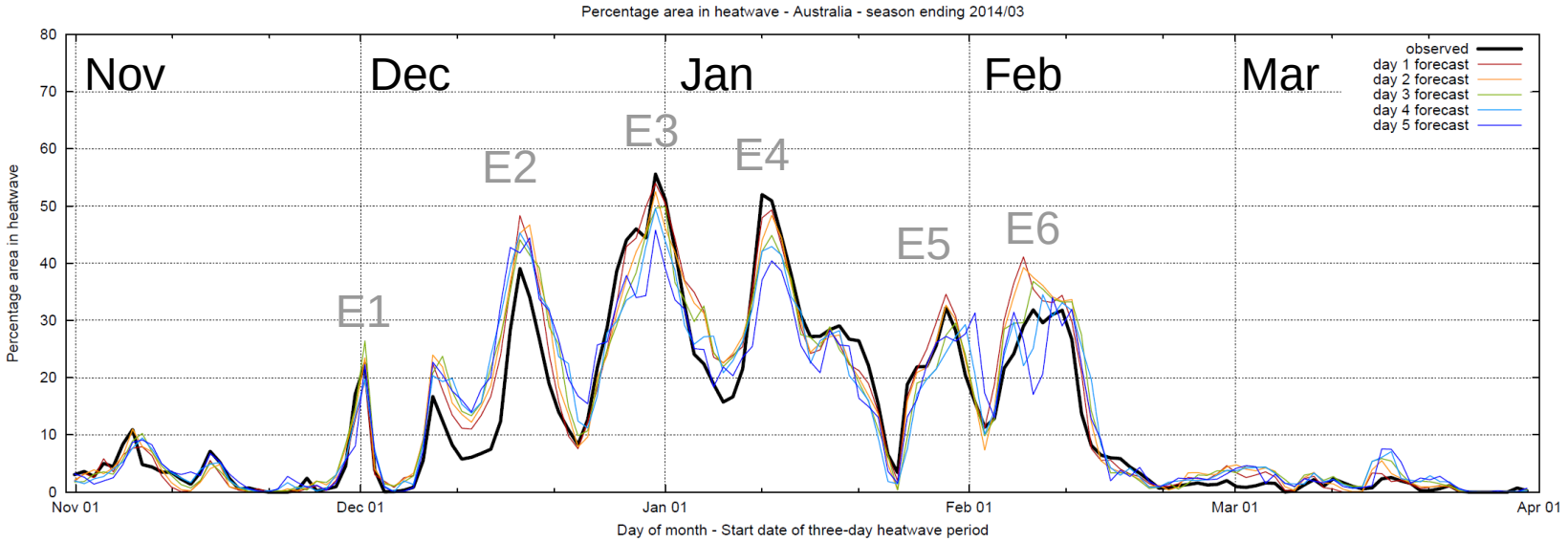
- Percentage area of Australia in extreme heatwave (forecast, observed)



- Some false alarms
- It is harder to predict extreme HWs than to predict severe HWs

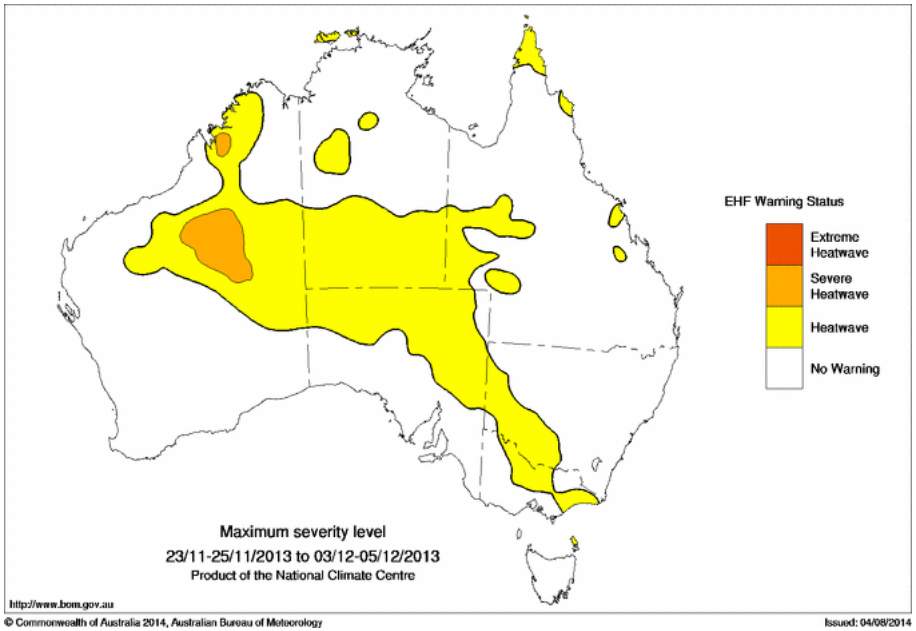
The heatwaves of the Australian summer

- Six main episodes in 2013/2014 summer



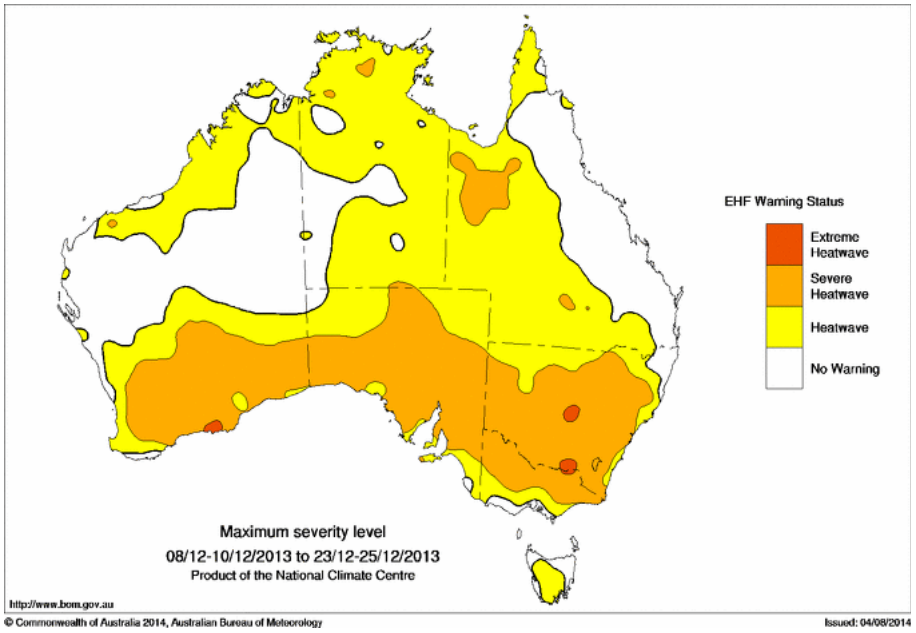
Episode 1 – Late Nov / Early Dec

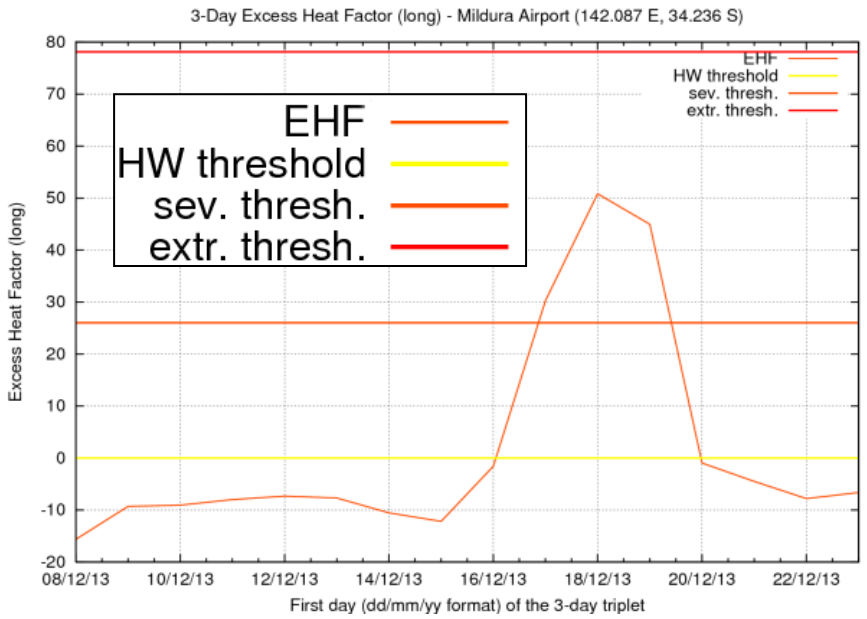
- Mild HW conditions across much of inland Australia
- Severe HW conditions in parts of WA



Episode 2 – Mid December

- Severe HW conditions across southern Australia
- Southern Victoria, coastal NSW spared
- Mildura – 5 consecutive days ≥ 35.8 °C





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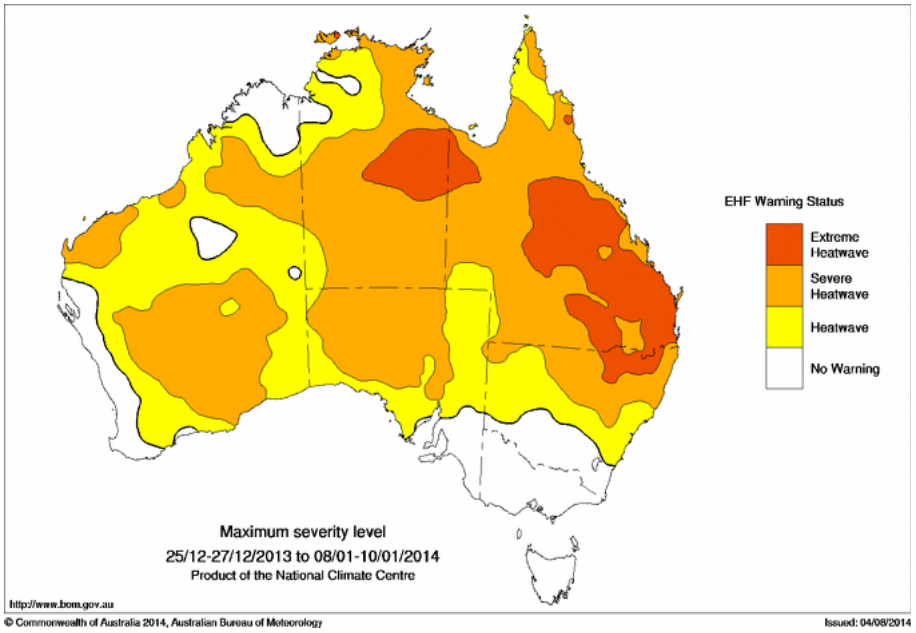
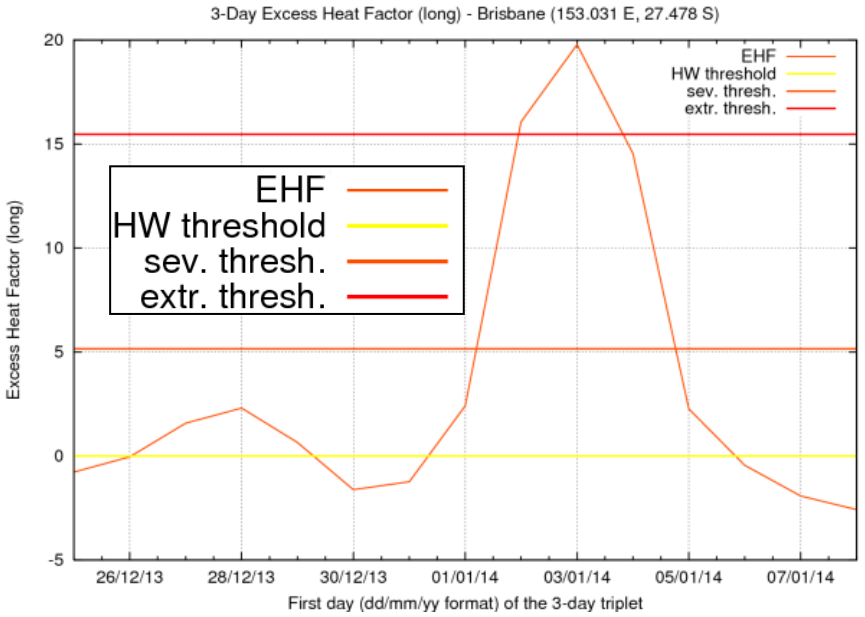
Episode 3 – Late Dec / Early Jan

- Severe HW conditions across most of northern Australia
- Large areas of extreme HW conditions across southeast Qld
- Many new high max. temp. records set in Qld, NSW (SCS47)





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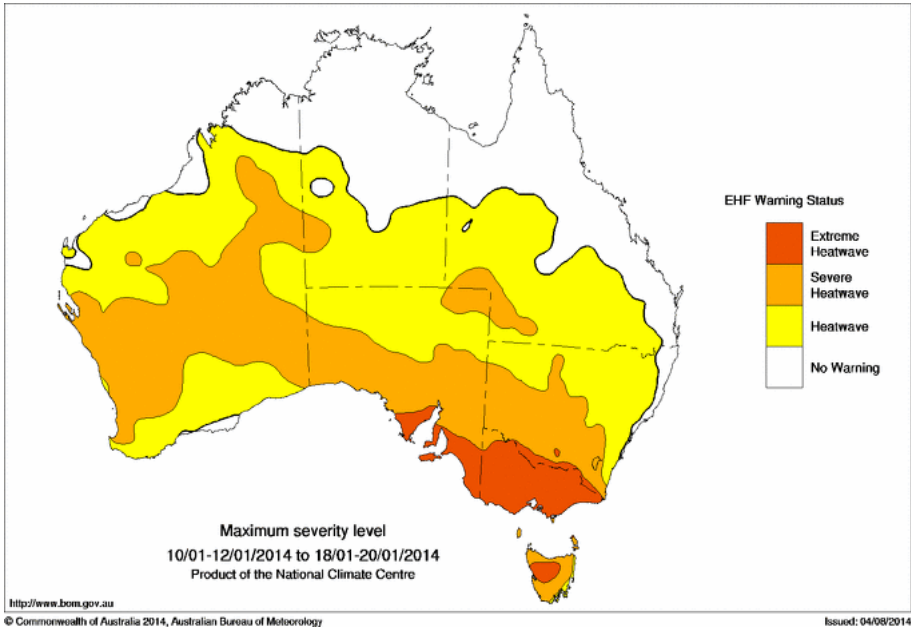
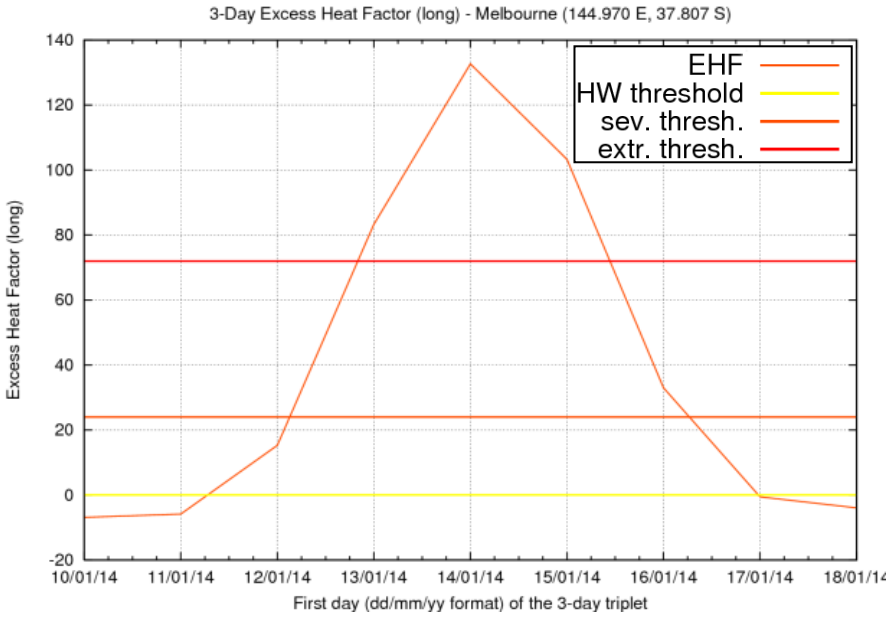
Episode 4 – Mid January

- Severe HW conditions across southern Australia
- Strongest impact was in the southeast – nearly all Victoria experienced extreme HW conditions
- Melbourne – 4 consecutive days ≥ 41.7 °C
  - Vic. deaths likely > 100 †
  - Ambulance callout rates for cardiac arrests reached 8 times average rate †

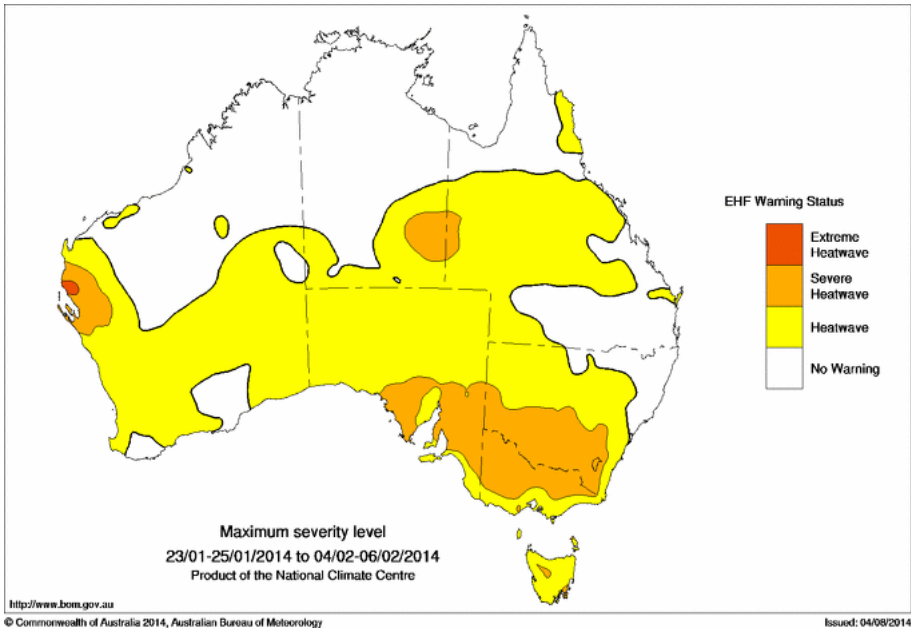


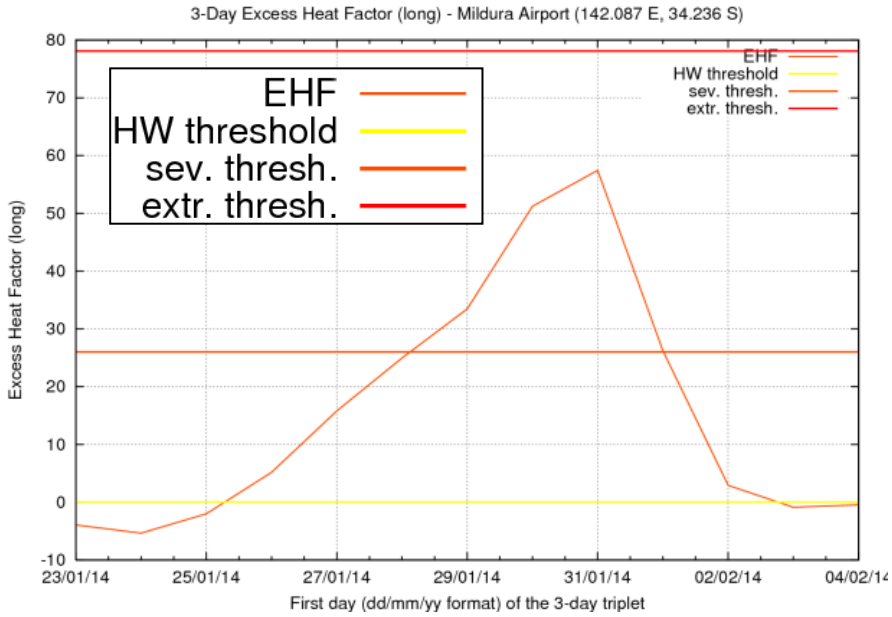


† ABC News 23 Jan 2014

Episode 5 – Late Jan / Early Feb

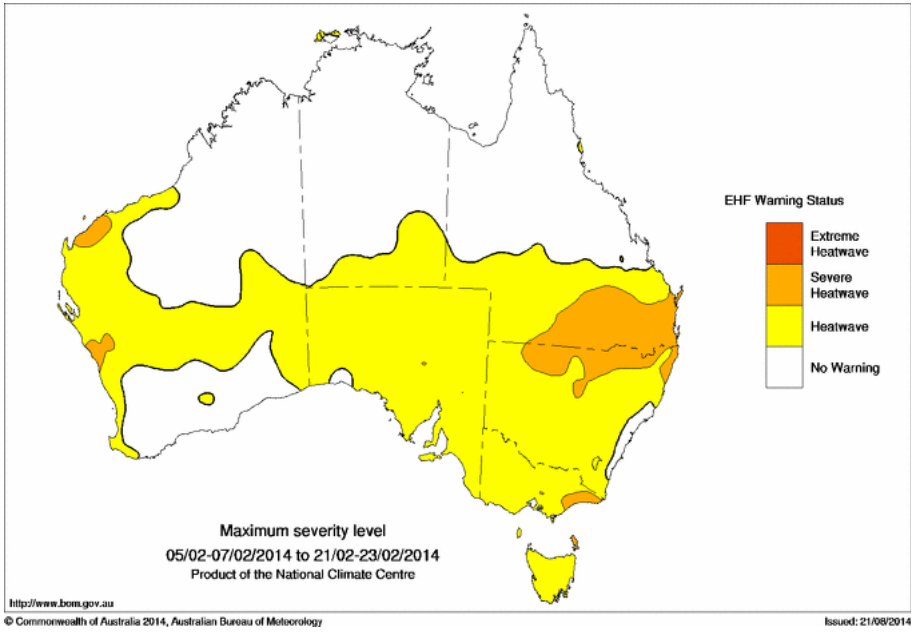
- HW conditions across most of southern Australia
- Severe HW conditions across southeast inland

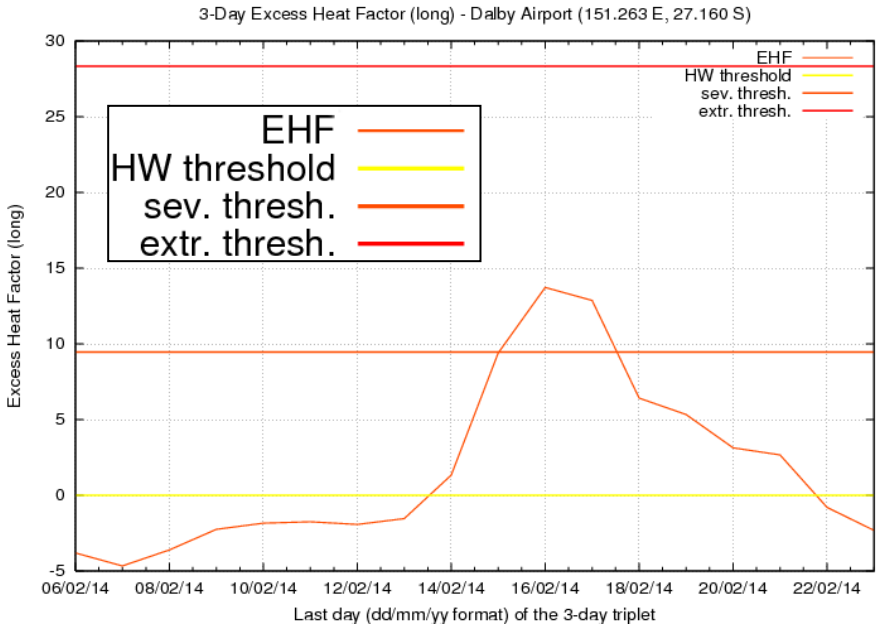




Episode 6 – Early to mid February

- HW conditions across southern Australia
- Severe HW conditions in southeast Qld / northeast NSW





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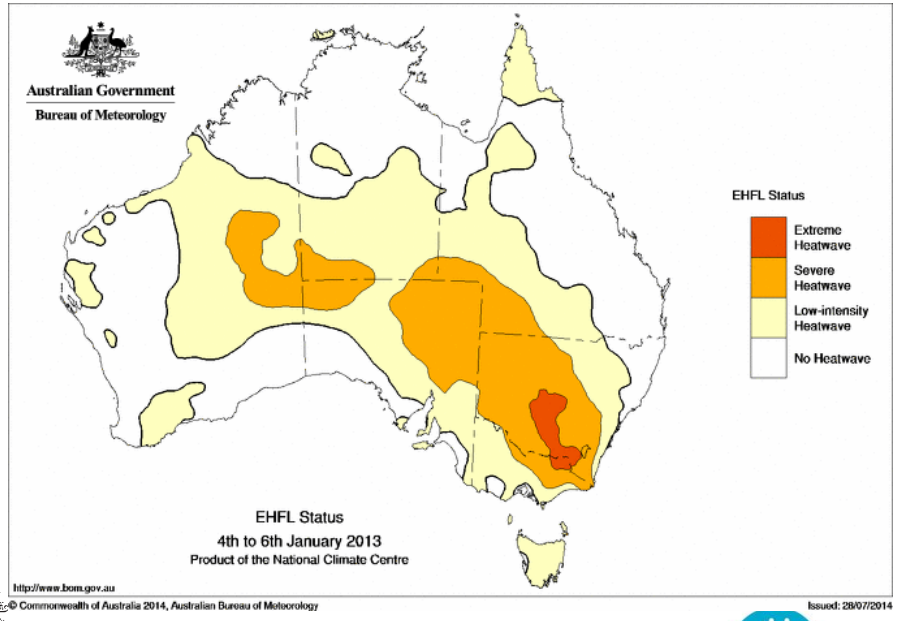
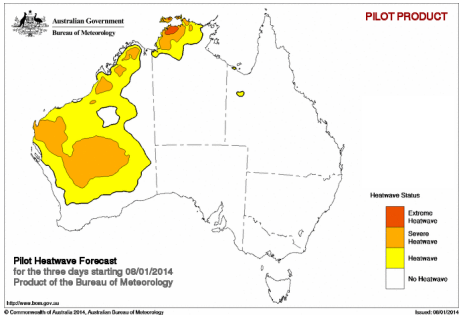
Looking forward

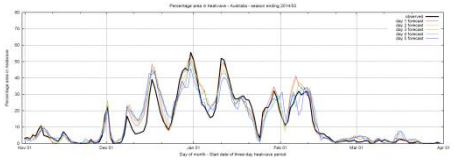
- Pilot heatwave warning service likely to run again this summer
- Two more TDP maps to be added to help describe the ending of HWs
  - {Day before yesterday} + {Yesterday} + {Today}
  - {Yesterday} + {Today} + {Tomorrow}
  - {Today} + {Tomorrow} + {The next day}
  - {Tomorrow} + {The next day} + {The day after} …
- De-emphasising the colour of the low-intensity HWs in the maps and an explicit indication that they are "low-intensity"
- Run HW forecasts off official Bureau temperature forecasts from summer 2015/2016

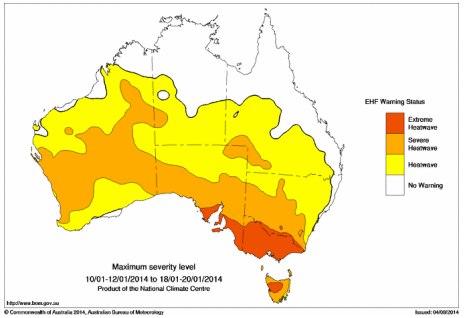


Summary

- HWs most lethal natural hazard we have in Australia
- Pilot national heatwave forecasting system started on 8 January 2014
- It gives forecast guidance on low-intensity, severe and extreme HWs
- Forecast performance in 2013/2014 summer was pleasing
- Summer 2013/2014 saw severe HWs in many parts of the nation







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Thank you

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