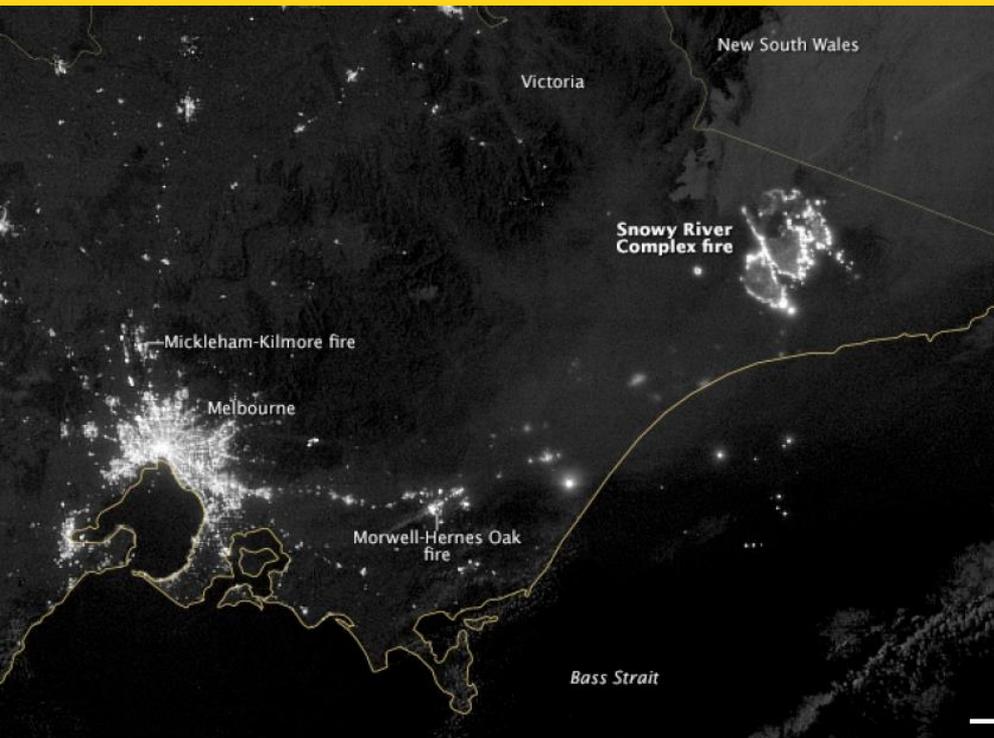




bushfire&natural
HAZARDSCRC

MITIGATING THE EFFECT OF SEVERE FIRES, FLOODS AND HEATWAVES THROUGH IMPROVEMENT TO LAND DRYNESS MEASURES & FORECASTS

Vinod Kumar, Imtiaz Dharssi
Bureau of Meteorology



An Australian Government Initiative



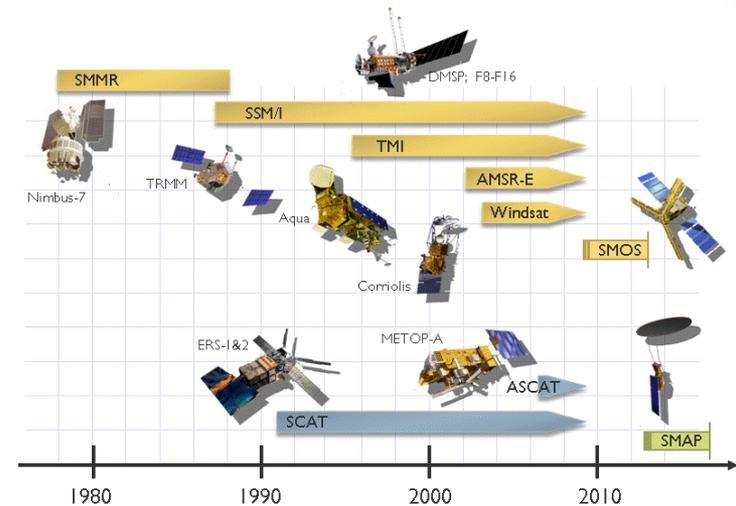
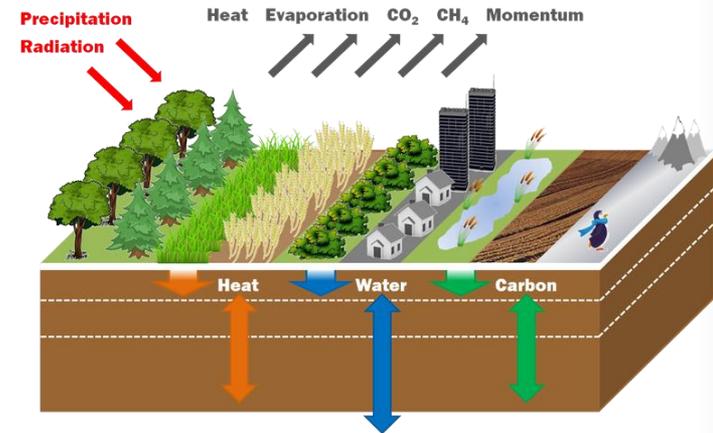
Picture courtesy: NASA

Background

- *"From the standpoint of fire control, the significant moisture relationships are those which exists in an upper layer of soil and a covering layer of duff. ..."* (Keetch & Byram, 1968, pp 24.)
- KBDI / MSDI
 - >> single soil layer (~1 m)
 - Simple (very simple!) bucket model
 - 60's science
- *"... a good system that work throughout the seasons should not depend upon a fixed depth of soil horizon to indicate fire danger. A system employing multi-layer soil model is desirable..."* (Bovio & Camia, 1997).

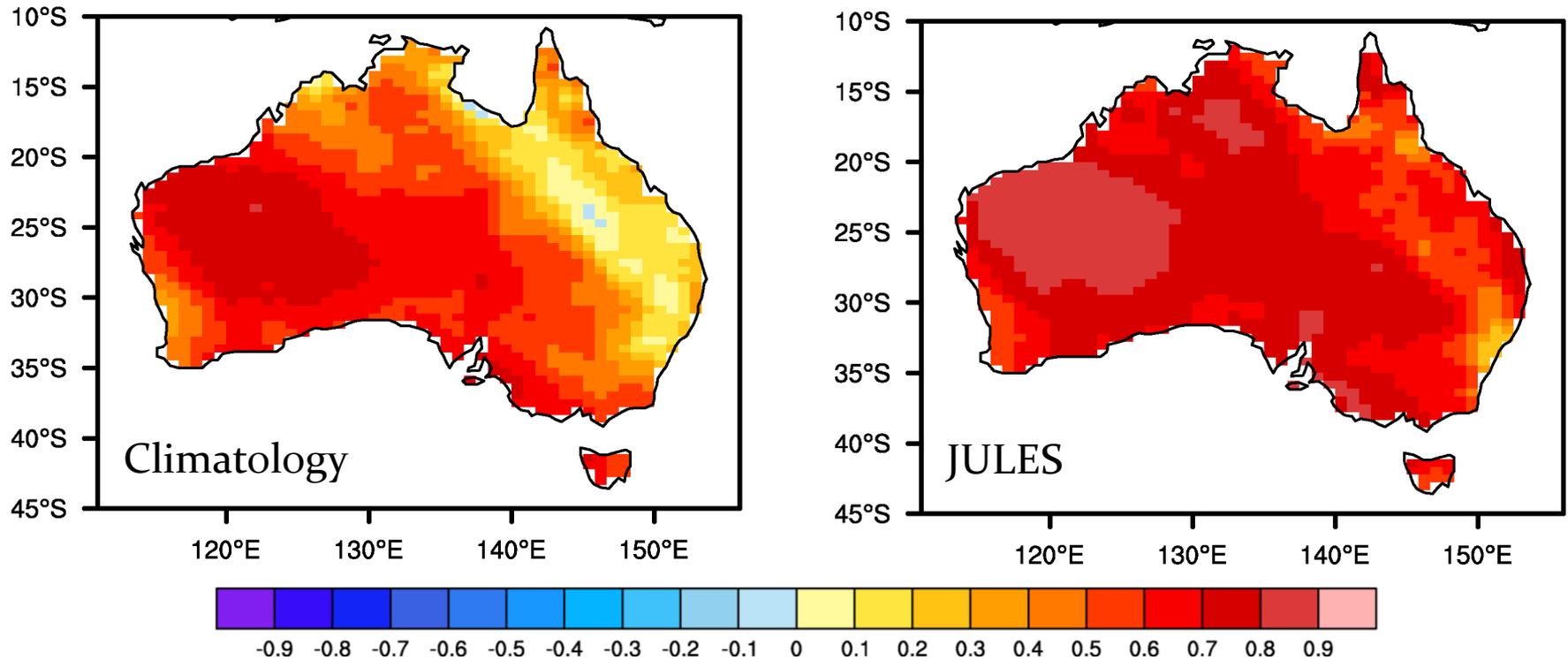
JASMIN [JULES based Australian Soil Moisture Information]

- Physics based land surface model.
 - High resolution (5 km).
 - Four soil layers, to 3 m deep.
 - 0–10; 10–35; 35–100; 100–300 (in cm)
 - Includes different:
 - land-use / vegetation type
 - soil type
- Can include a data assimilation system that can use satellite information.
- Used in BoM's numerical weather prediction & seasonal forecasting models.



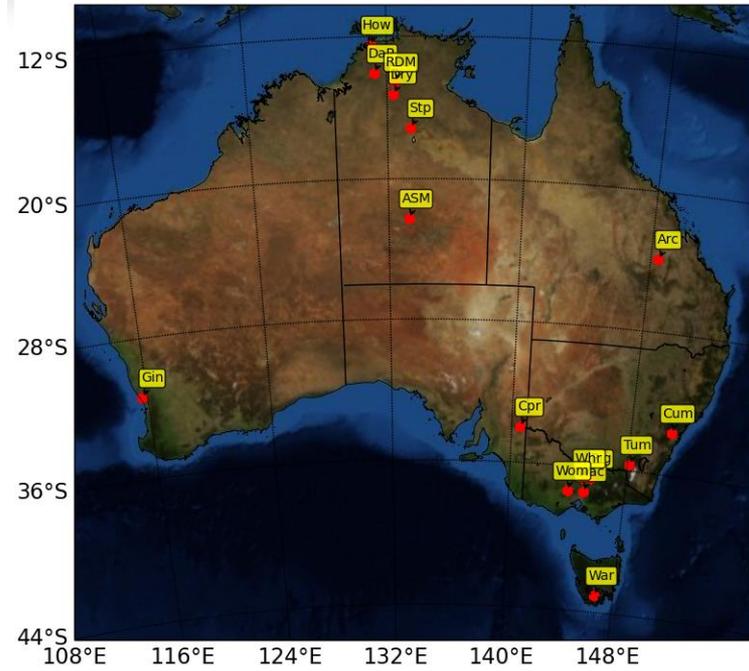
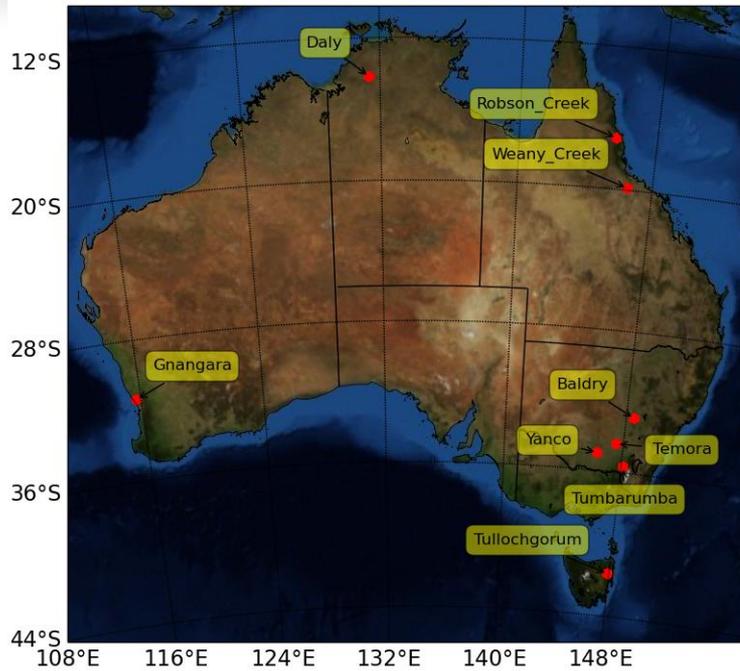
ACCESS Seasonal Forecasting

- Impact of soil moisture initialization on 2m daily maximum temperature.
- Forecast skill in terms of anomaly correlation – May 1990 to 2012

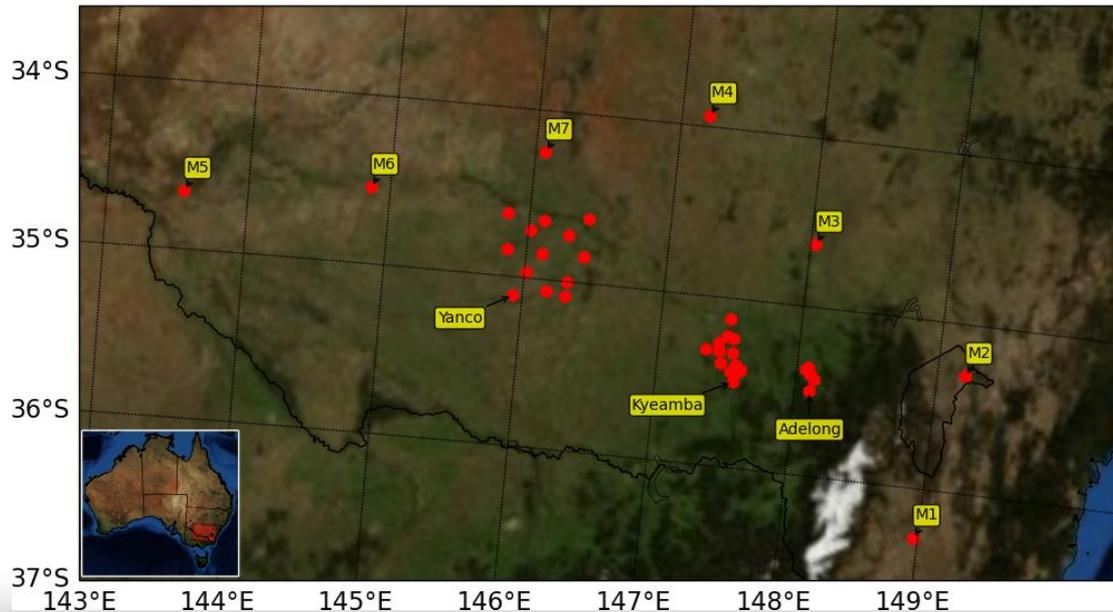


Courtesy: Maggie Zhao, BoM

CosmOz



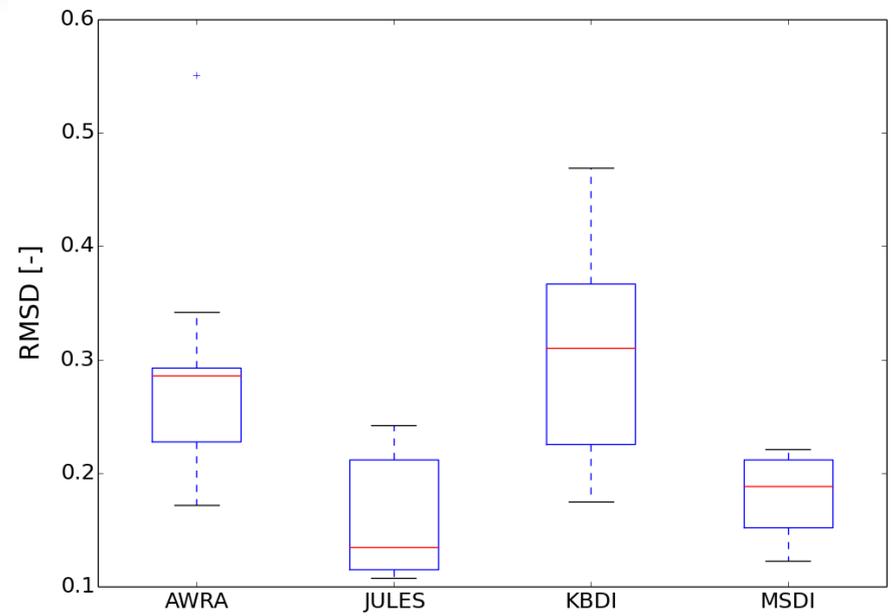
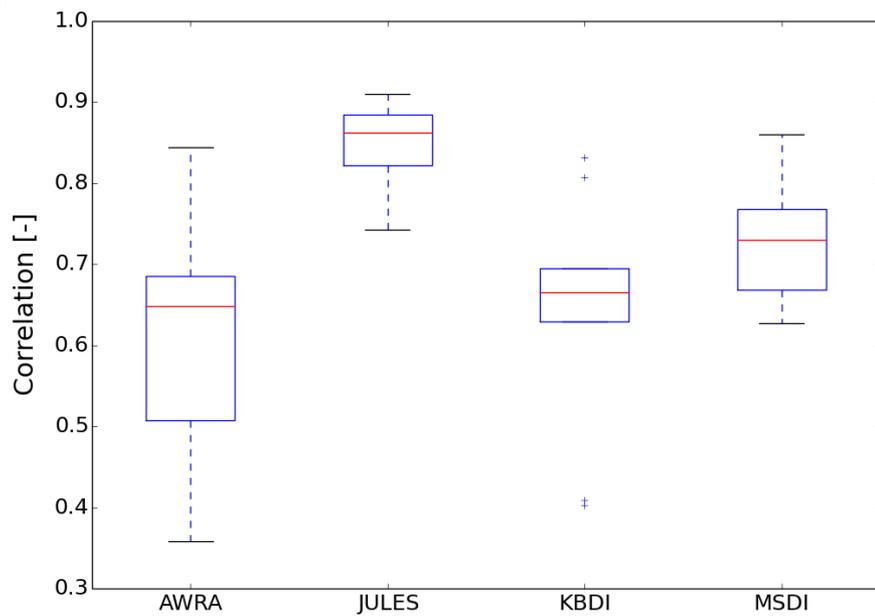
OzFlux



OzNet

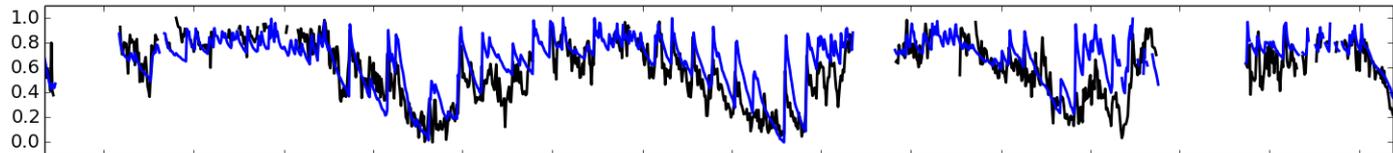
In-situ Observations

bnhcr.com.au

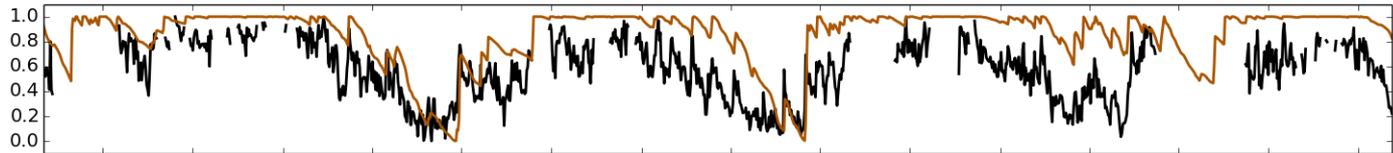


CosmOz Hydrological Network - Site: Tumbarumba

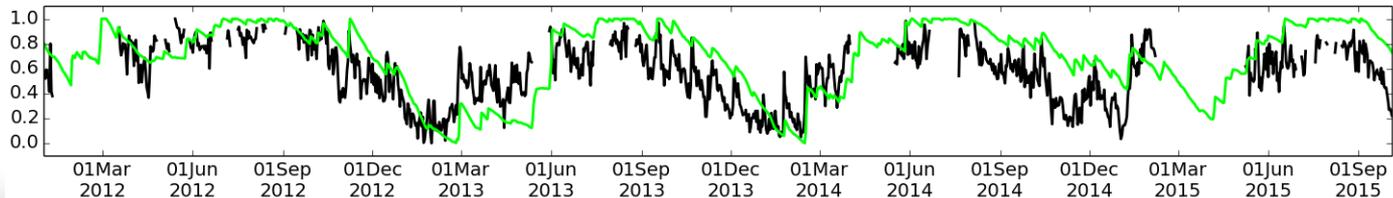
JASMIN



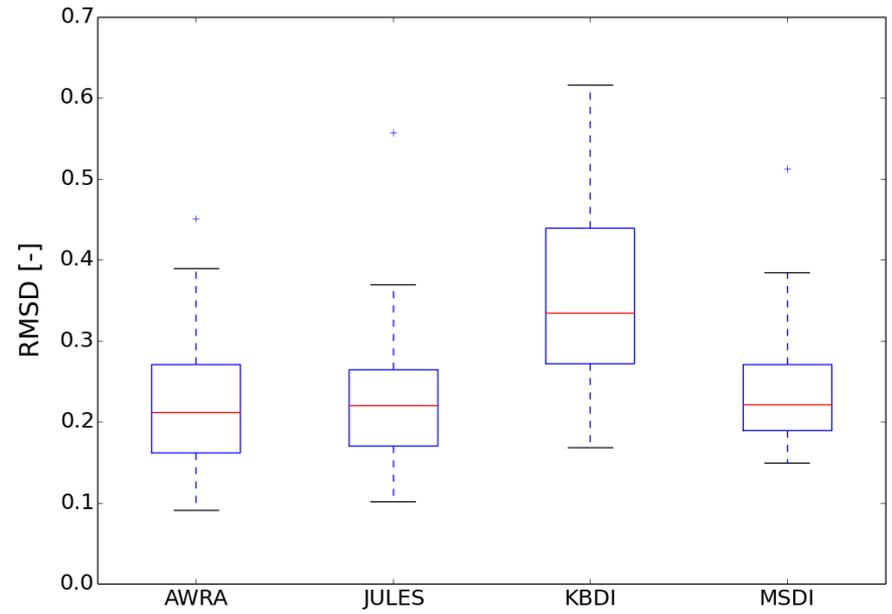
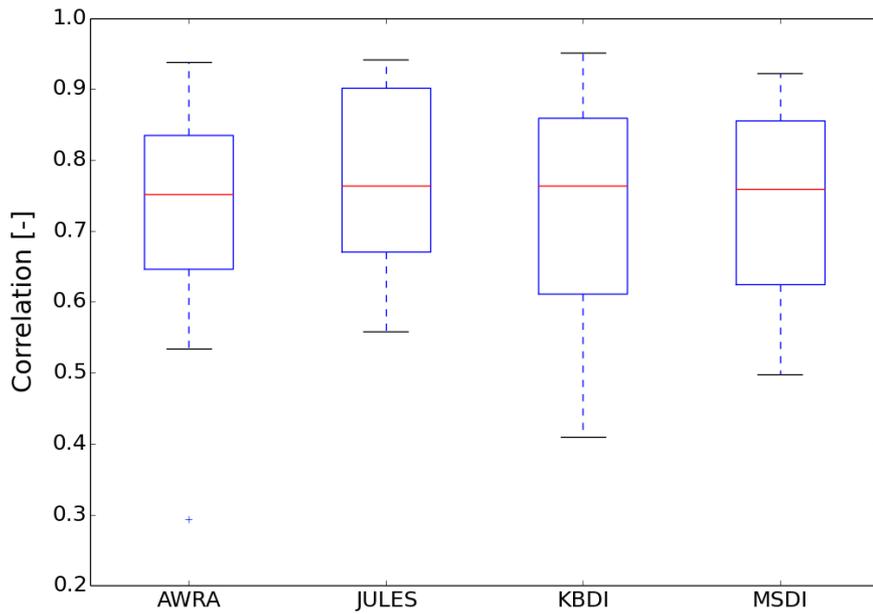
KBDI



MSDI

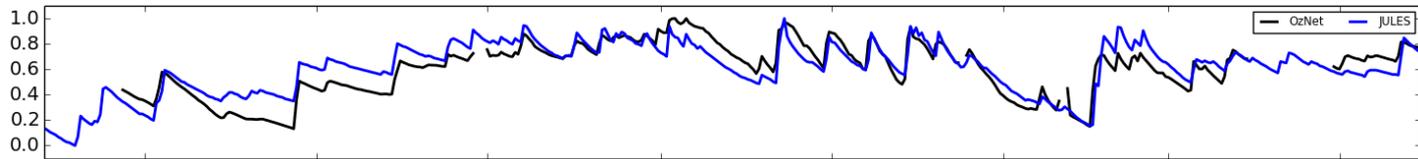


CosmOz: Surface

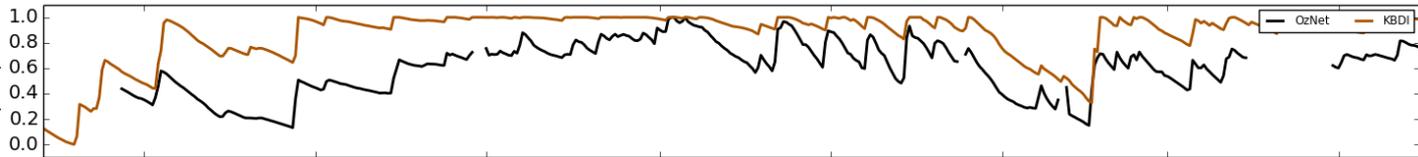


OzNet Hydrological Network - Site: a2

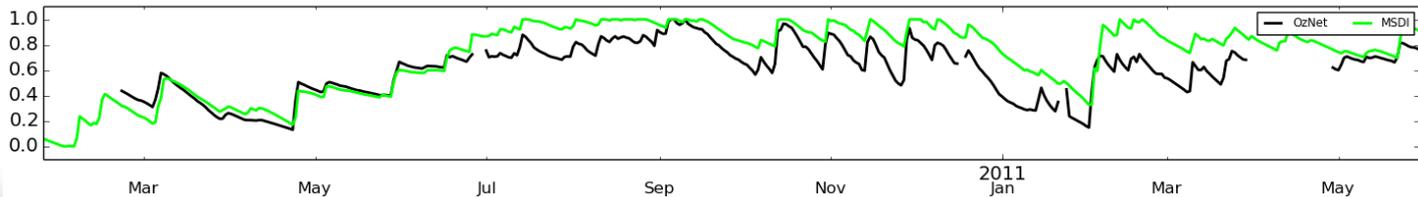
JASMIN



KBDI

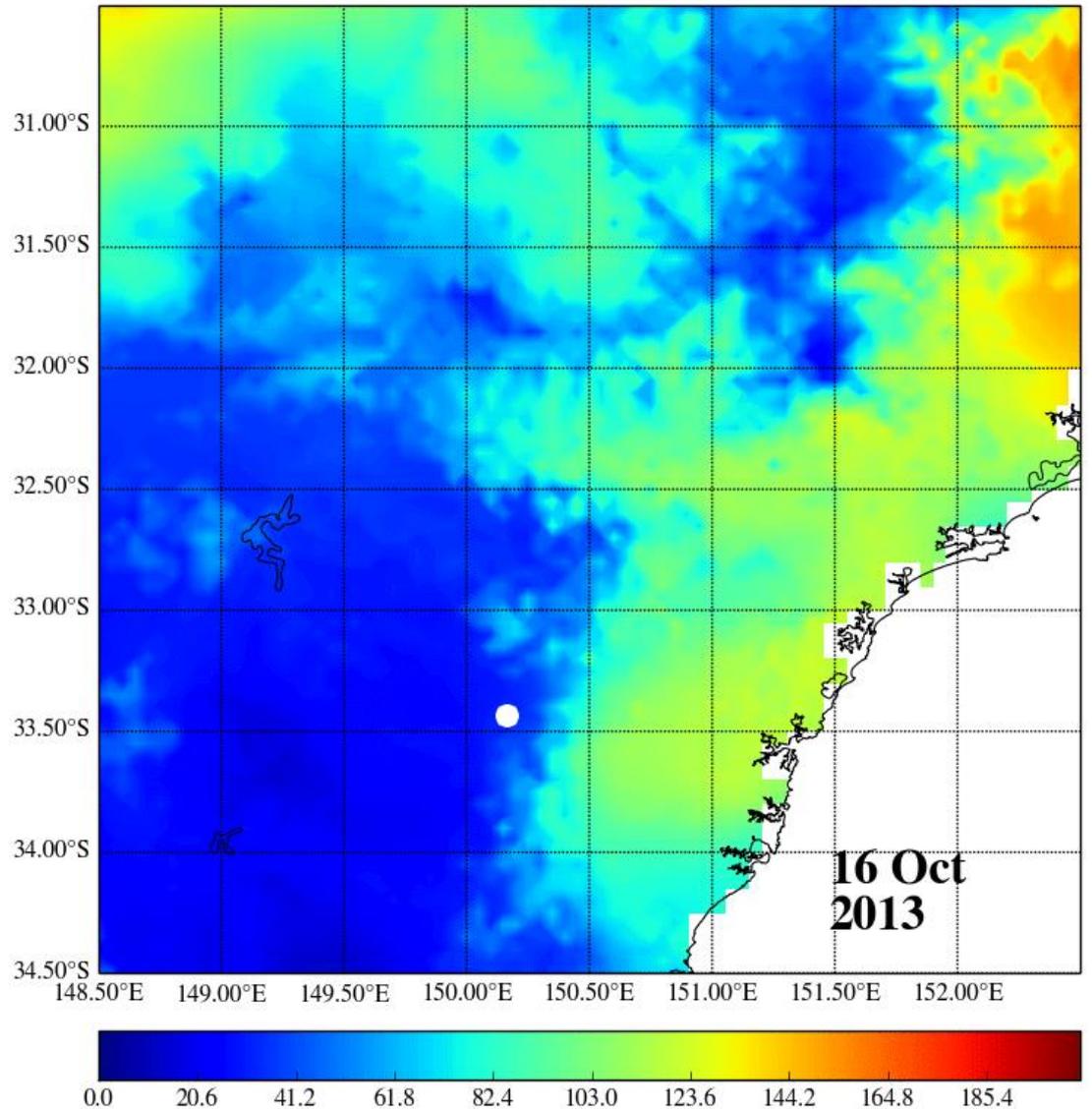
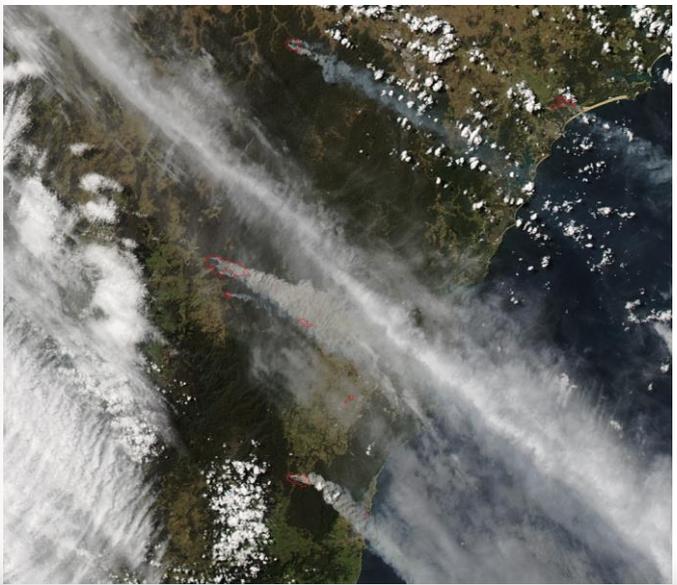
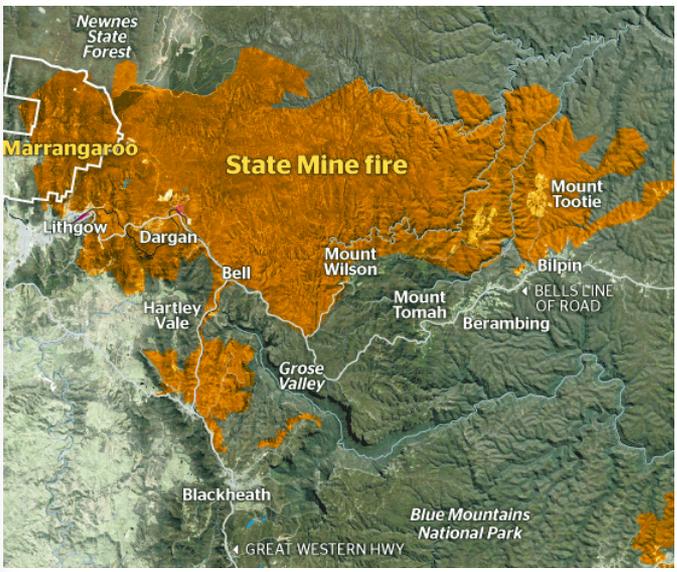


MSDI



OzNet: 90 cm

State Mine fire

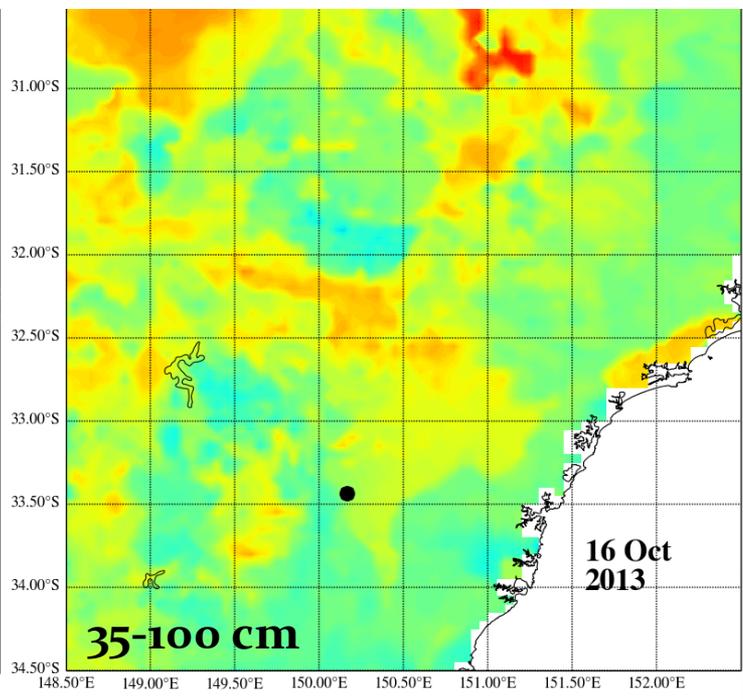
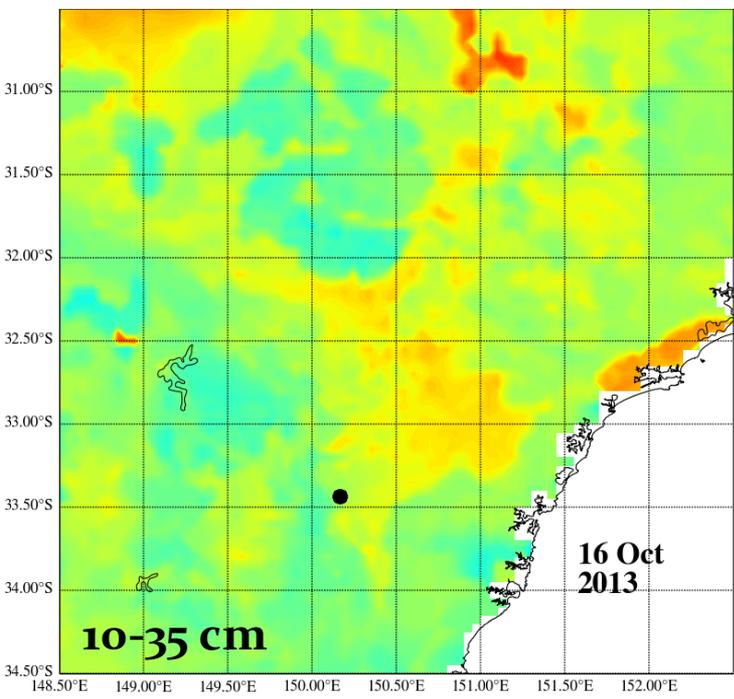
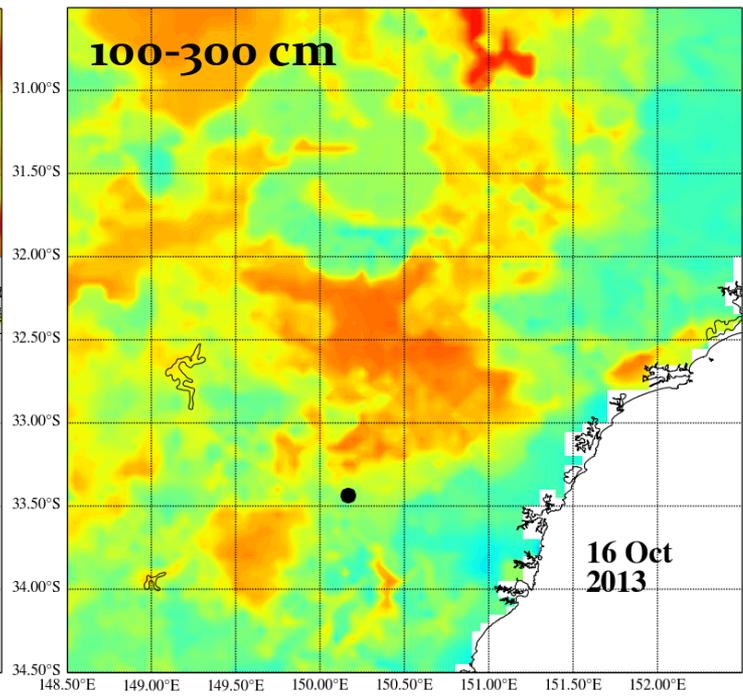
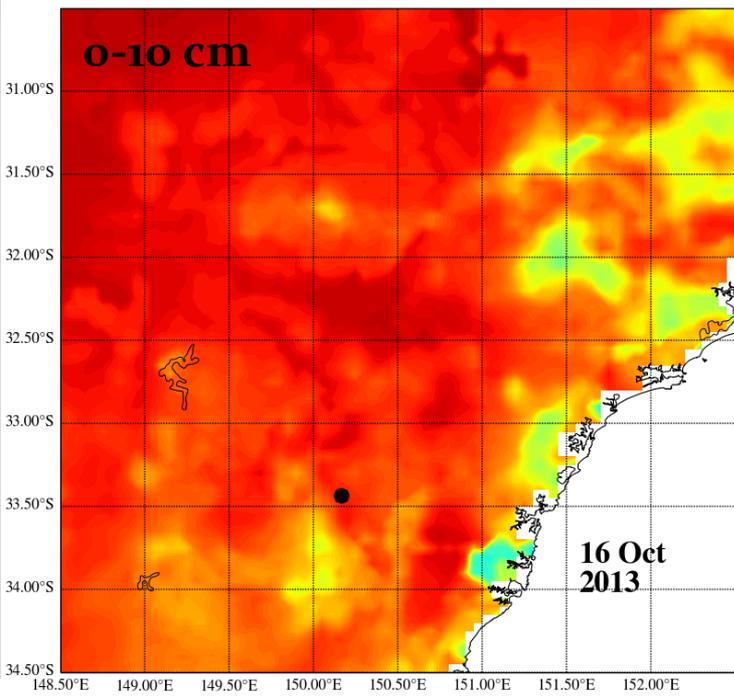


Wet

KBDI

Dry

JASMIN



Dry

0.0

**State
Mine
Fire**

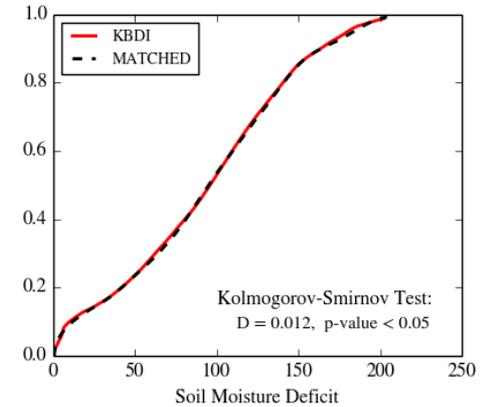
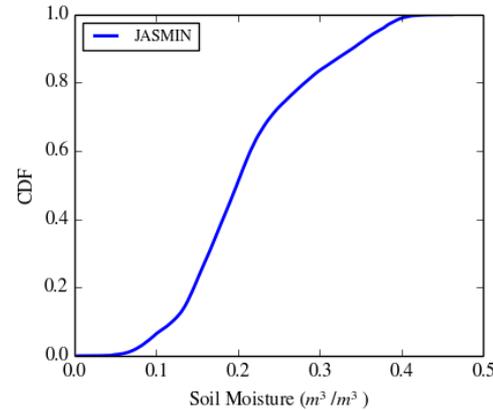
Wet

0.6

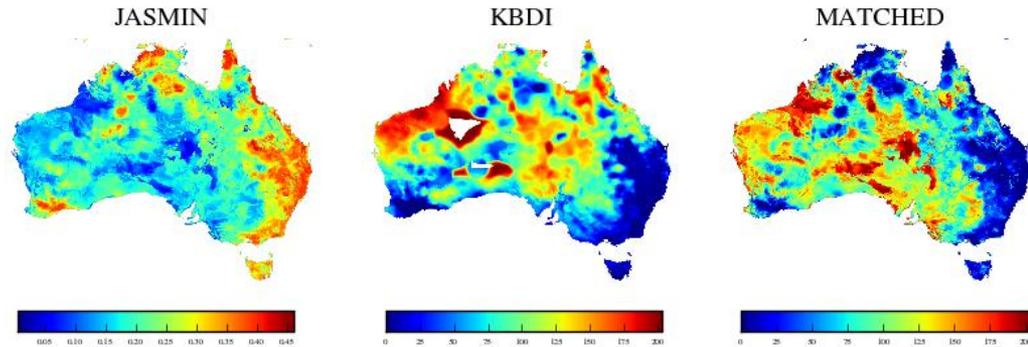
**Note: Soil
Moisture!**

Re-scaling

- Various rescaling methods.
- E.g.:
 - Minimum-Maximum
 - Mean-Variance
 - CDF Matching
- On-going work.
- End-user involvement.
- Case studies
- Routine display of images on registered user website.

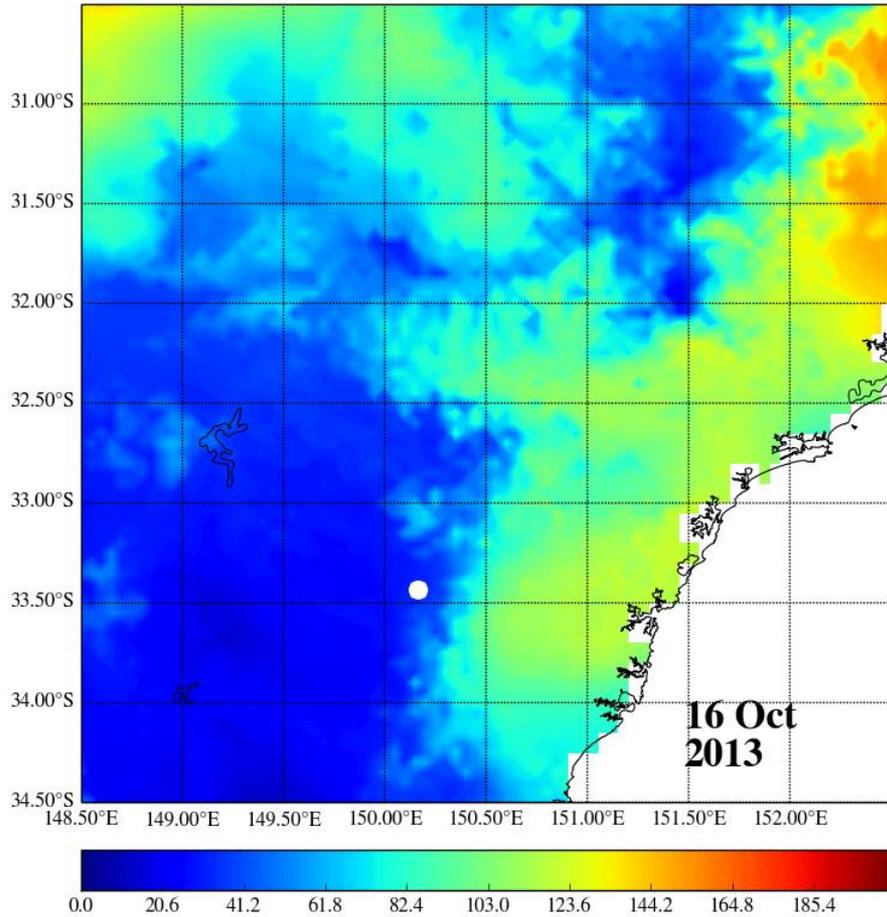


JASMIN scaled to KBDI on 15-Dec-2011

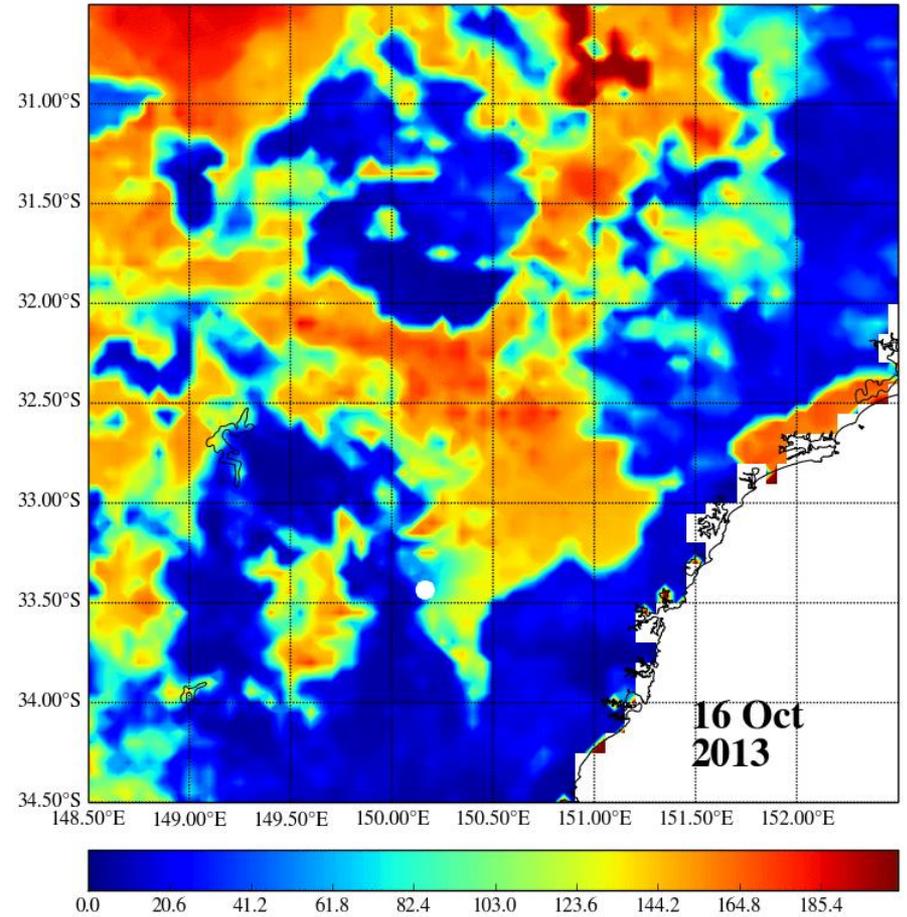


State Mine Fire

KBDI



JASMIN CDF Matched to KBDI



Conclusions & Future Work

- An accurate, high resolution 5+ years soil moisture dataset for Australia has been developed.
 - Jules based Australian Soil Moisture Information system

JASMIN

- Verification shows that the JASMIN has greater skill
- We will assimilate satellite based soil moisture and land temperature using the NASA Land Information System (LIS) framework.
- We can downscale soil moisture to higher resolution (~ 1km).

Immediate Plans and Trials

- Match JASMIN to KBDI / MSDI.
- Comparison & evaluation period against the current operational system this summer.
- Evaluation based on case studies of fire occurrence.
- The evaluations also include Drought Factor (DF) calculation.
- Raw soil moisture layers (4) could be available to potential pilot of NFDERS.

Acknowledgments

- BNHCRC
- All end-users
- Peter Steinle, Jeff Kepert, David McJannet, Jeff Walker, Adam Smith, Chun-Hsu Su
- Monash University & University of Melbourne for OzNet
- CSIRO for CosmOz
- OzFlux team

THANKS, ANY QUESTIONS?

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