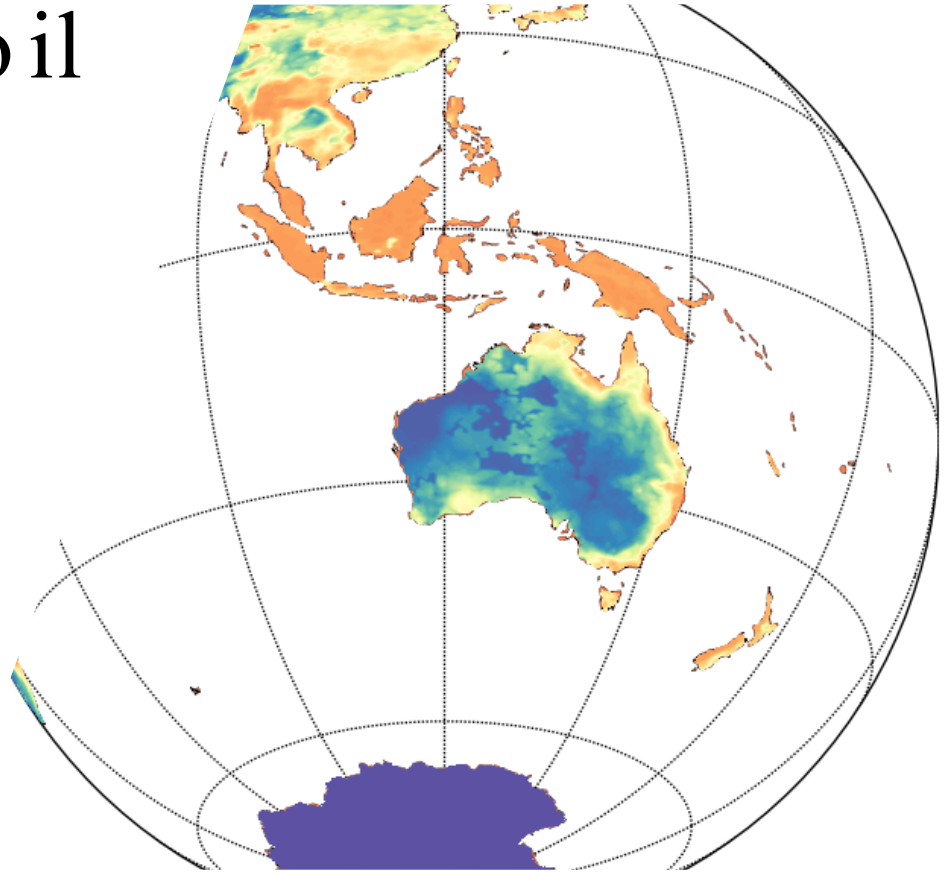
JASMIN: A high-resolution soil moisture analysis for fire prediction



AFAC / **2019**

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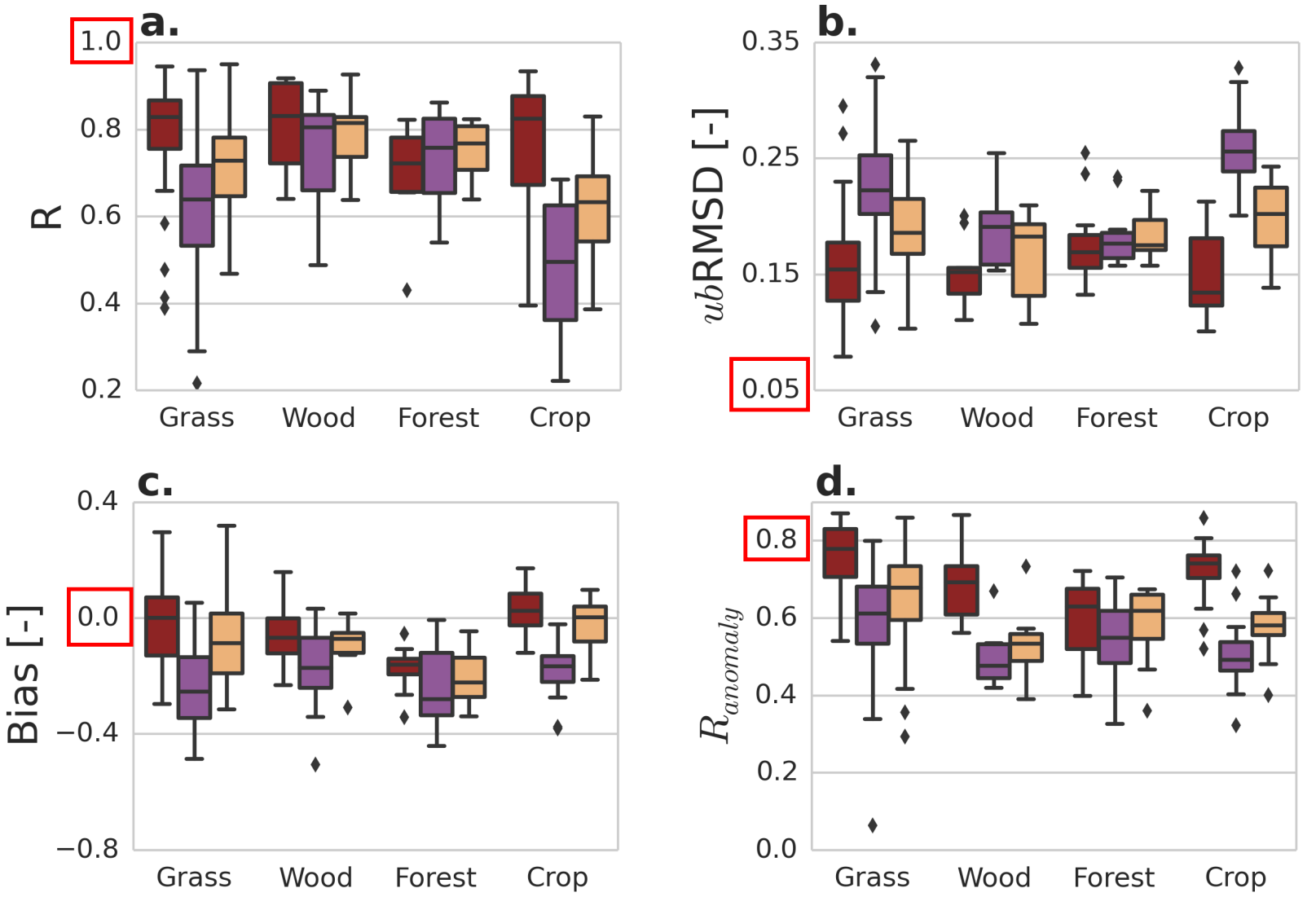
Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

JASMIN

JULES based **A**ustralian **S**oil **M**oisture **IN**formation

- **JULES: Joint UK Land Environment Simulator**
  - Physics based land surface model.
  - Used in BoM's weather and seasonal forecasting models.
  - In active development
- **JASMIN**
  - High resolution (5 km).
  - Daily (valid at 00 UTC).
  - 4 soil layers.
  - 0–10; 10-35; 35–100; 100–300 (in cm)
  - Data from 2010 onwards.



Bias:
-ve = wet bias
+ve = dry bias

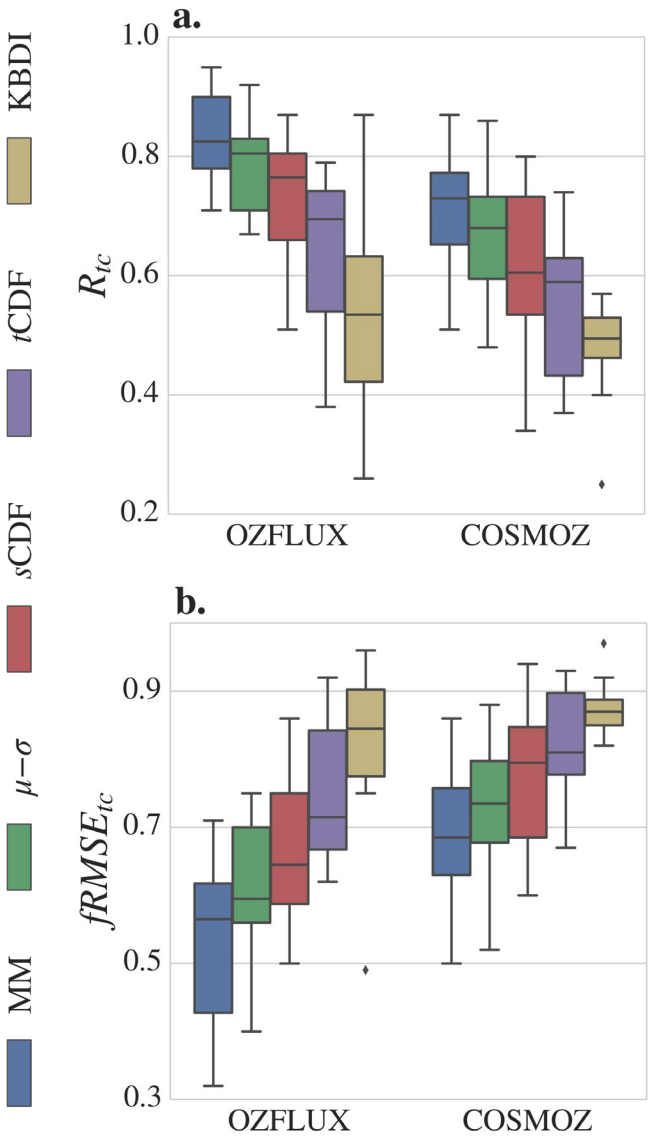
JASMIN
KBDI
SDI

Number of sites under:
- Cropland = 12, Forest = 12,
- Woodland = 9, Grassland = 27

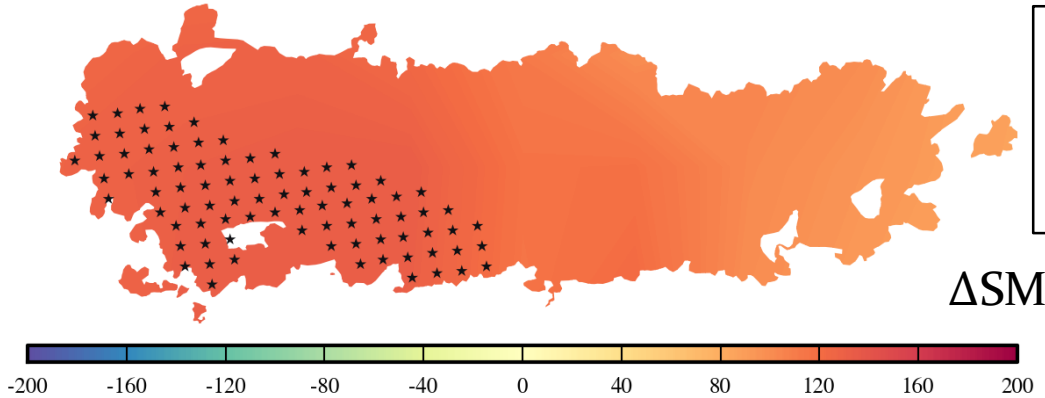
Calibration of JASMIN

For easier utilization of JASMIN

- Utilization of JASMIN in existing operational frameworks.
- Moisture content (Kg m $^{-2}$) → moisture deficit (0 – 200 mm).
- The calibration methods applied here are:
  - minimum-maximum (MM) matching,
  - mean-sd (μ–σ) matching, and
  - cumulative distribution function (CDF) matching

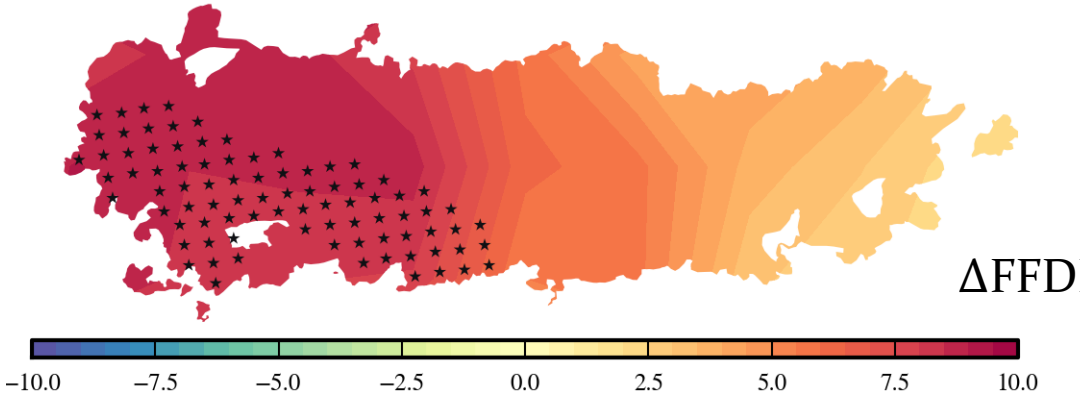


tCDF = temporal CDF | sCDF = spatial CDF



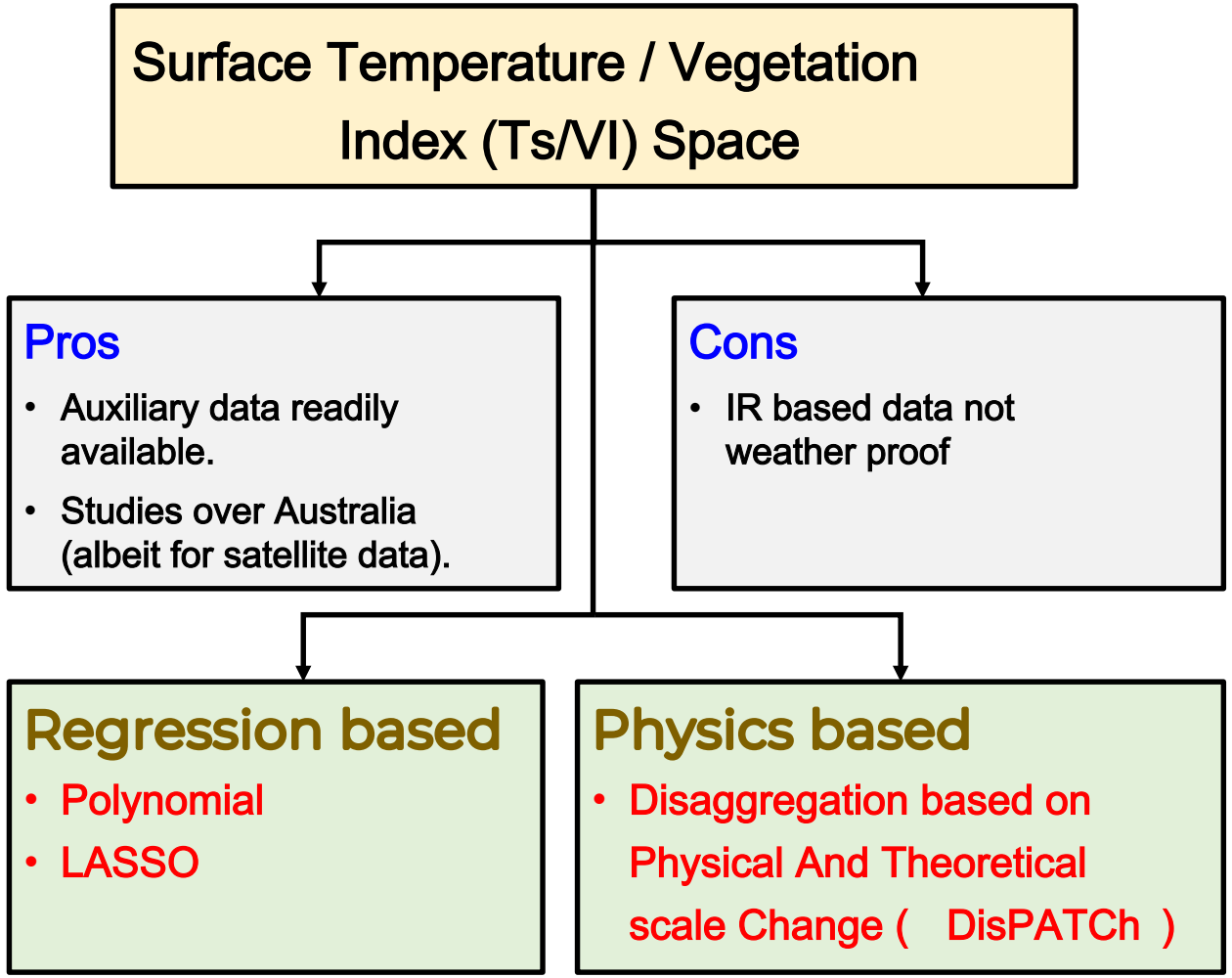
SMD = Soil Moisture Deficit
FFDI = Forest Fire Danger Index
MM = Minimum-Maximum Matching
★ = MODIS hot spots

$\Delta SMD = SMD_{JASMIN\ [MM]} - SMD_{KBDI}$

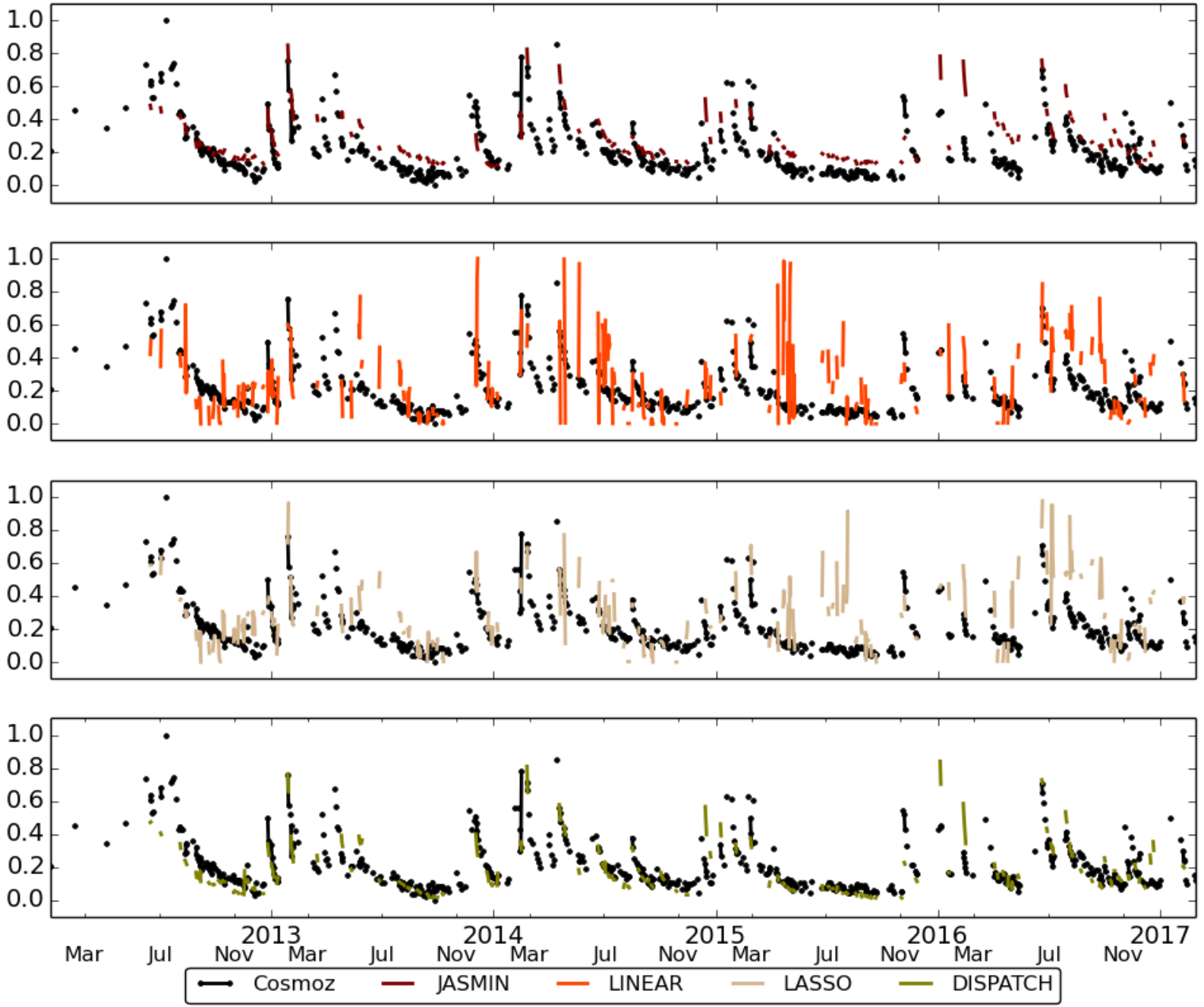


$\Delta FFDI = FFDI_{JASMIN\ [MM]} - FFDI_{KBDI}$

Downscaling



Timeseries: Weany Creek, QLD



Skill: Downscaling

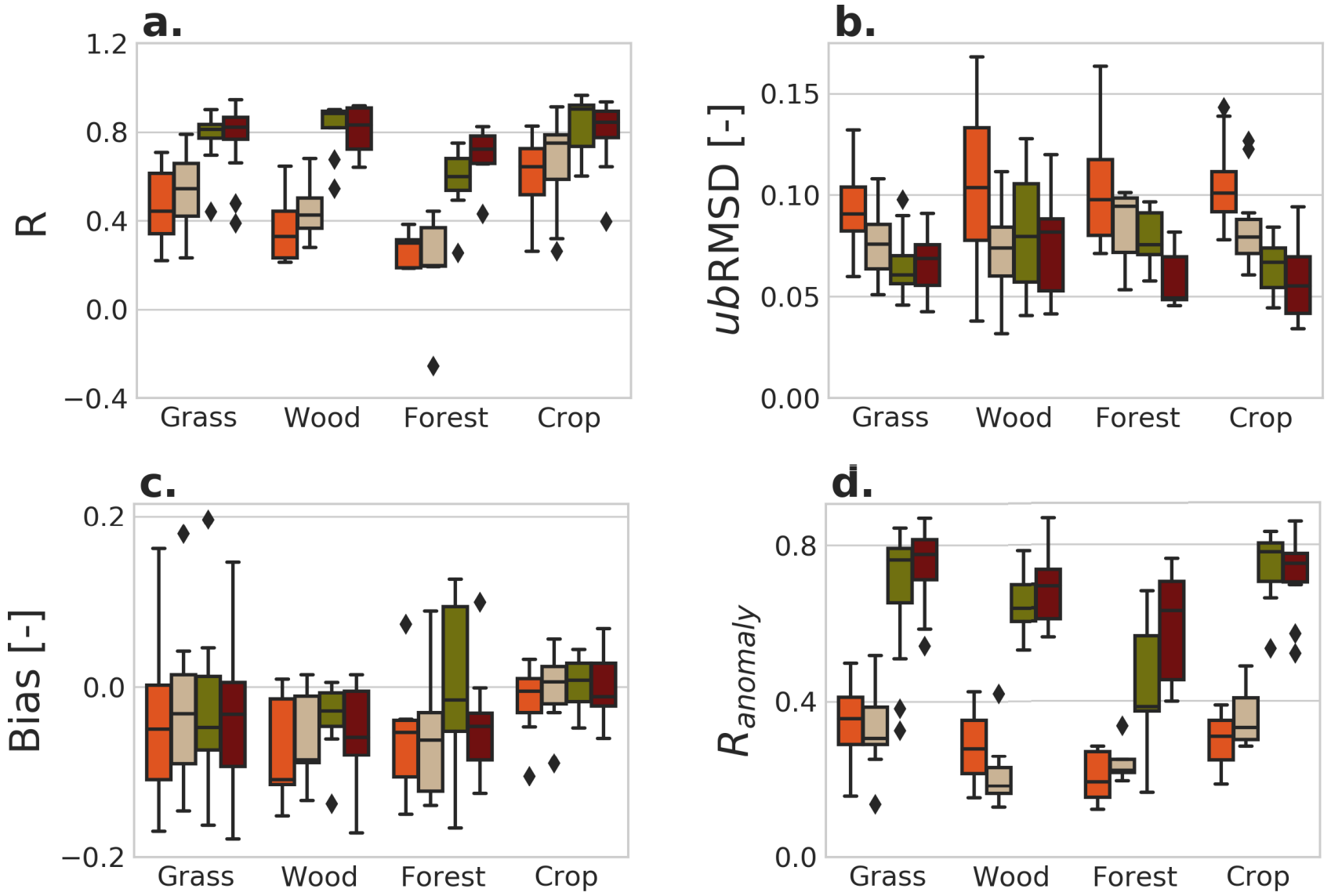
DisPATCh consistently good!

Number of sites under:

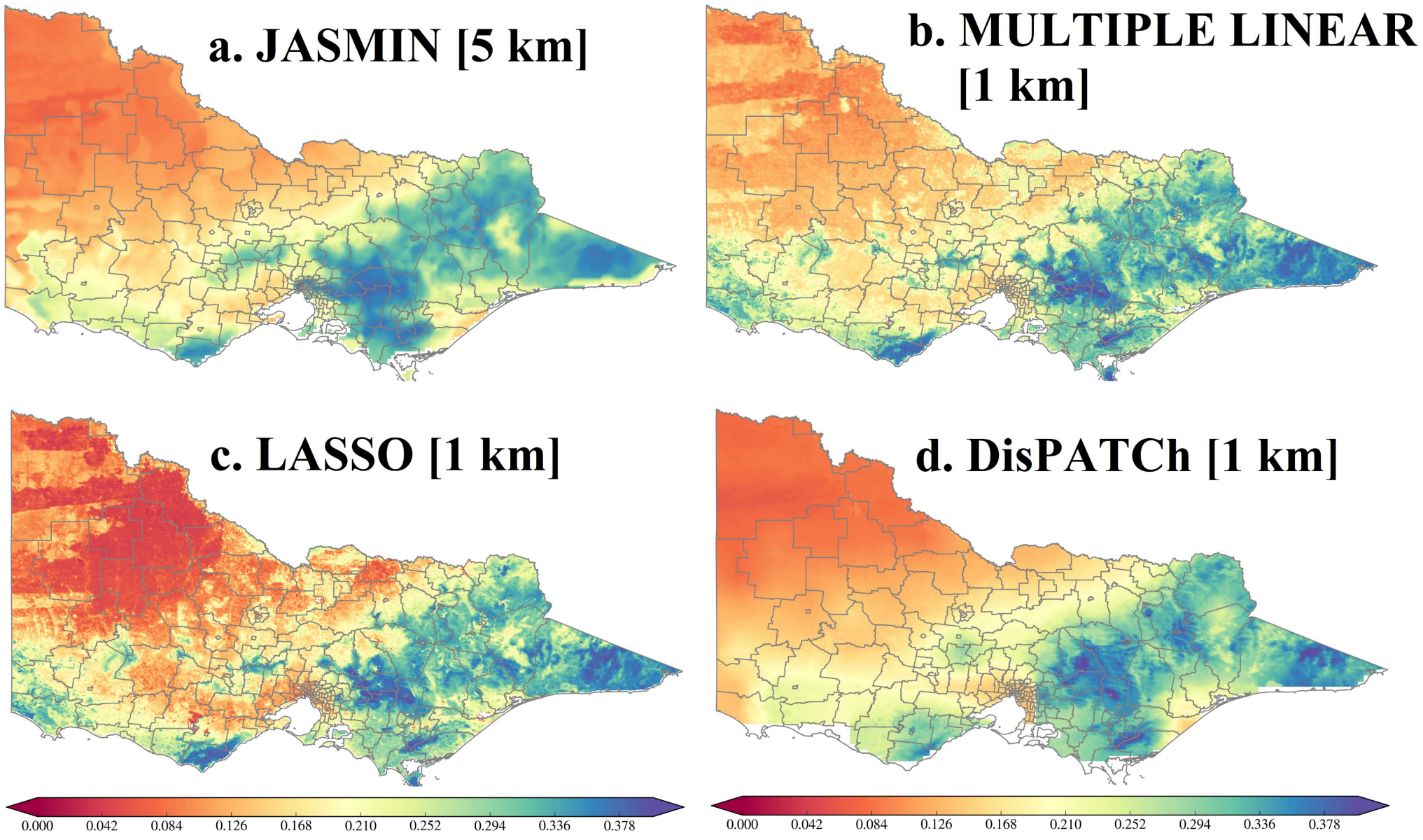
- Cropland = 12,
- Forest = 12,
- Woodland = 9,
- Grassland = 27

LINEAR
LASSO
DISPATCH
JASMIN

Bias:
-ve = wet bias
+ve = dry bias



Seasonal Mean: MAM



Utilization Activities

Vinod's Research Page

logan.bom.gov.au/~vinodk/index.html

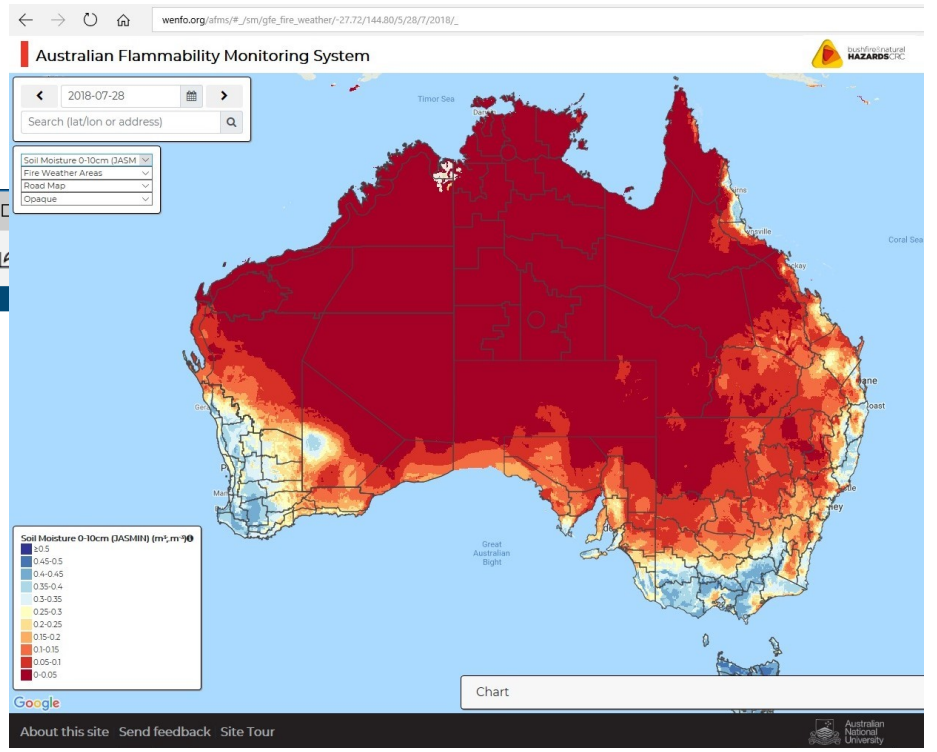
ACCESS
The Australian Community Climate Earth-System Simulator

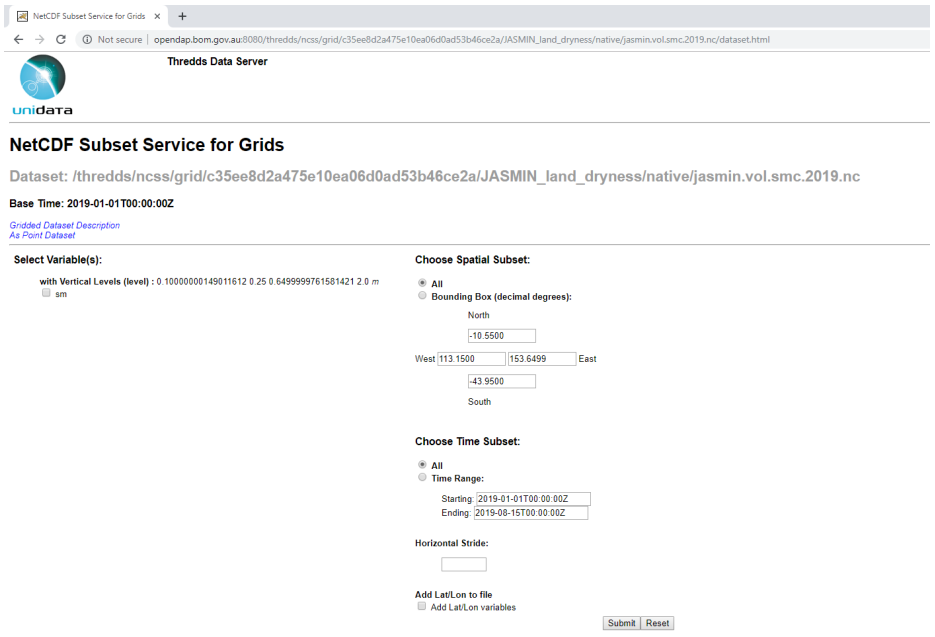
PROJECT: LAND DRYNESS ESTIMATE FOR FIRE DANGER RATINGS

PROJECT DETAILS	PRODUCTS	USEFUL LINKS
Aim / Description	JASMIN	BoM's Rain Radars
Team	Keetch-Byram Drought Index	BoM's Satellite Image
Contact	Mount's Soil Dryness Index	BoM's NWP Products
	Satellites	Bushfire & Natural Hazards CRC

Bureau's Home Page

Disclaimer: All products given here are experimental. The Bureau of Meteorology accepts no responsibility for actions taken on the basis of these products.





Summary

JASMIN

- 5 km resolution, daily
- Better skill than traditional indices
- Can address gaps in existing methods (e.g., multiple soil layers).

Utilization

- Calibration.
- AFMS.
- THREDDS.
- BoM internal web -page

Downscaling

- Can provide surface SM at 1 km resolution.
- Preserve spatial patterns.
- Varying temporal skill between methods.
- Skill comparable with earlier studies.

Future plans

- Soil moisture – fuel moisture relationship.
- JASMIN within NASA's Land Information System (LIS) framework..
- JASMIN in NFDRS.
- JASMIN SM forecasting.

Thank you

Acknowledgements

- BNHCRC
- All end -users.
- Peter Steinle , Chun -Hsu Su, Nathan Eizenberg .
- Monash University & University of Melbourne for OzNet .
- CSIRO for CosmOz .
- TERN for OzFlux .

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