Remote sensing for Water modelling

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Photo: Jim Crow Creek catchment, central Victoria JIM4373 (© Alison Pouliot)

www.bom.gov.au/water/landscape
AWRA-L: The Australian Water Resources Assessment Landscape model

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National, daily time-step, 5 km resolution

Inputs
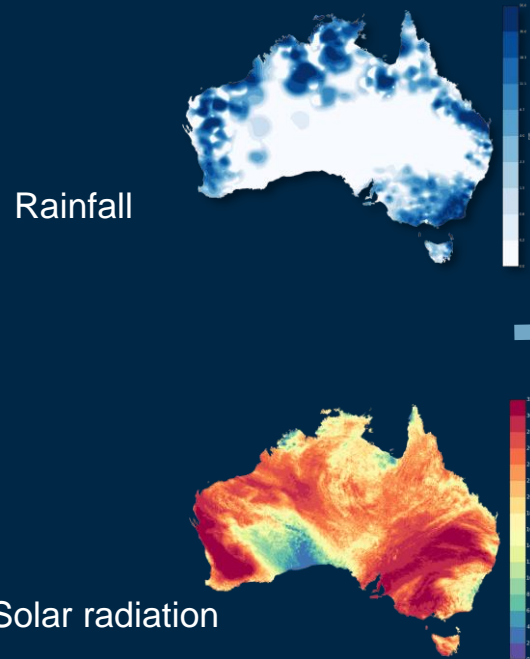
Model analysis
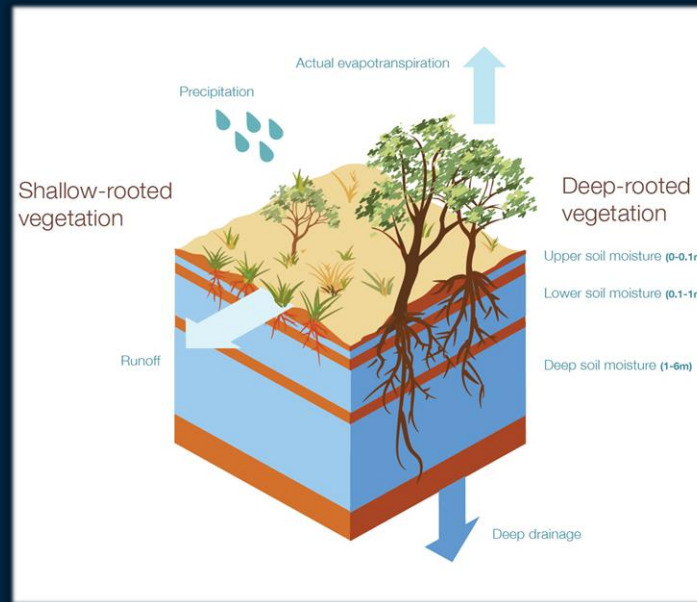
Outputs

Actual evapotranspiration

Deep drainage

Rainfall

Solar radiation
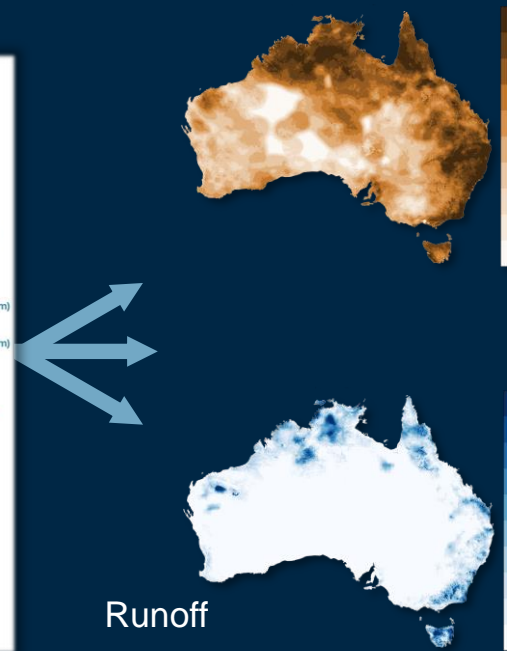
Runoff
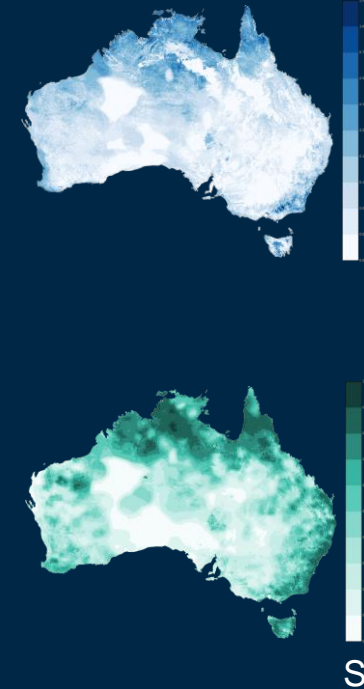
Soil moisture

AWRA-L running operationally within the Bureau since 2016
AWRA v6 used since 2018
Gridded Soil moisture, Evapotranspiration, Runoff & Deep drainage
Evaporation and Evapotranspiration Products (modelled, FAO56, Pan, Lake, Morton areal)

CSIRO

Past to present : www.bom.gov.au/water/landscape

Monitoring/reporting
Statements, NWA, Water In A...

• Water Utilities: e...

Search: Location, Catchment or Latitude, Longitude   Locate

Month ← Jan →
Year   ← 2020 →

Aggregation
Day | **Month** | Year

○ Precipitation
○ Soil moisture ∧
   ○ Root zone soil moisture
   ○ Upper soil moisture
   ○ Lower soil moisture
   ○ Deep soil moisture
   ❶ More Information
   ⬇ Download Data
○ Runoff
○ Evapotranspiration ∨
○ Deep drainage

Displaying: Deep soil moisture, January 2020

Deep soil moisture
- Highest 1%
- Very much above average
- Above average
- Average
- Below average
- Very much below average
- Lowest 1%

Values
Actual | **Relative**

Point | Catchment
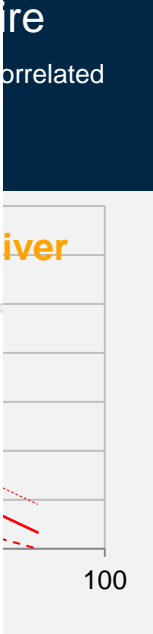
SHOALHAVEN RIVER Monthly Deep soil moisture

Jan-2006 Jan-2008 Jan-2010 Jan-2012 Jan-2014 Jan-2016 Jan-2018 Jan-2020

1 10 30 70 90 99   Modelled Value   Month/Year to date
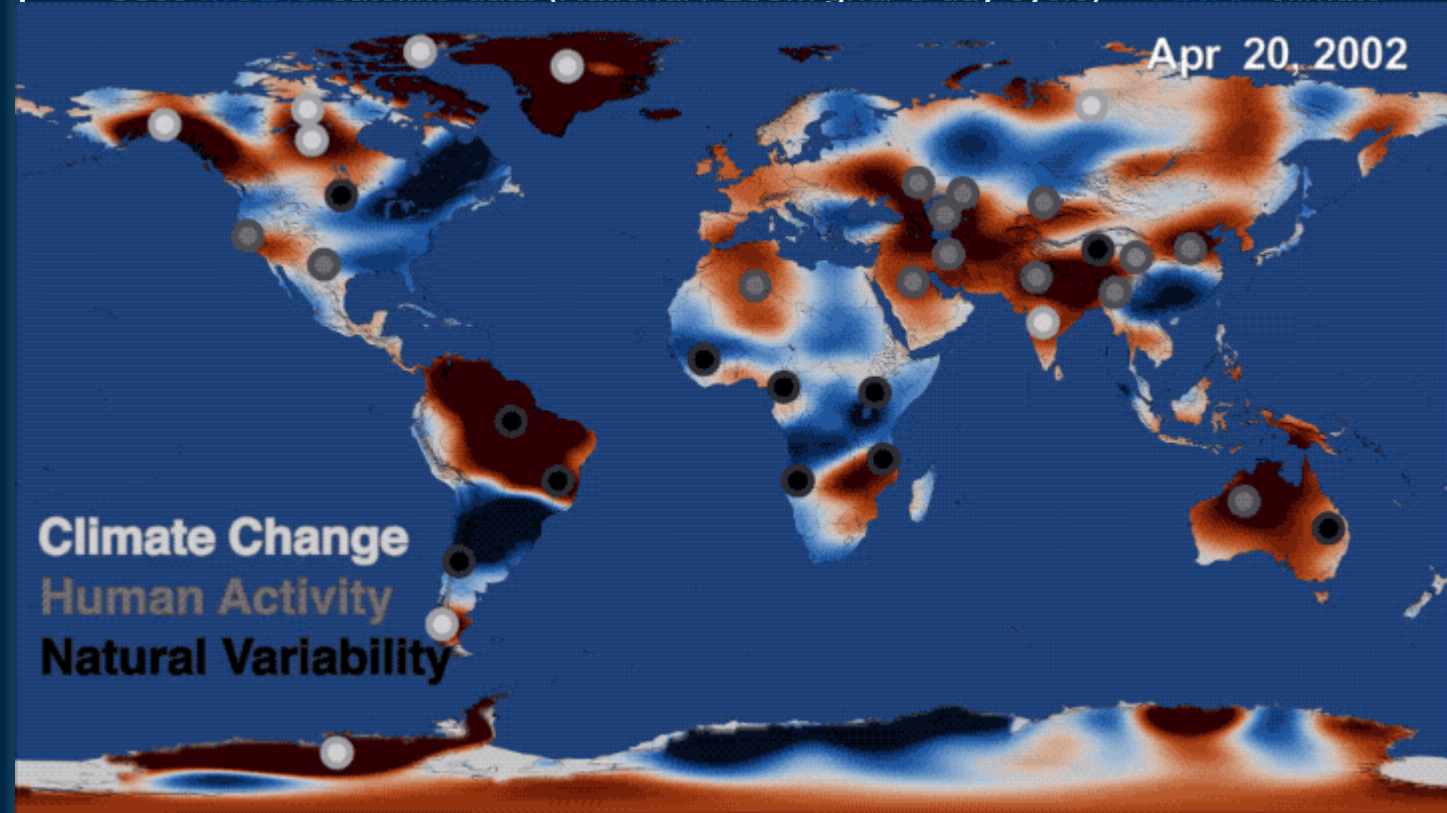
Percentiles (%) over 1911-2016

Development and testing

- CSIRO/BoM development 2009-2016

- Calibrated to catchment streamflow, satellite CMRSET **ET and AMSRE soil moisture**

- **Evaluate water balance**:

  – **Ground based:** Streamflow, Soil moisture, Recharge, ET

  – *SPACE!* **GRACE** Water storage, soil moisture, ET, *MODIS* vegetation

Calibration/Validation catchments and calibration regions

Legend

CMRSET Satellite Evapotranspiration product

- Uses MODIS satellite data (National / 250m grid/ 8-day cycle) + AWAP climate

Apr 20, 2002

Climate Change
Human Activity
Natural Variability
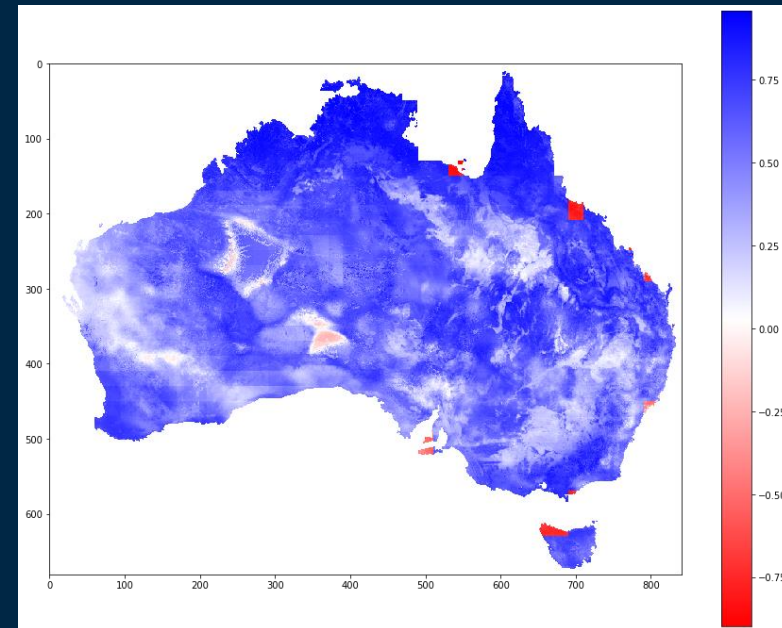
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Development underway

- Better drought and recharge performance

- Better flood and fire performance

- Approach:
  - Calibration to GRACE
  - Calibration to vegetation

GRACE has large pixels – treat catchments/coast with care

Weighting
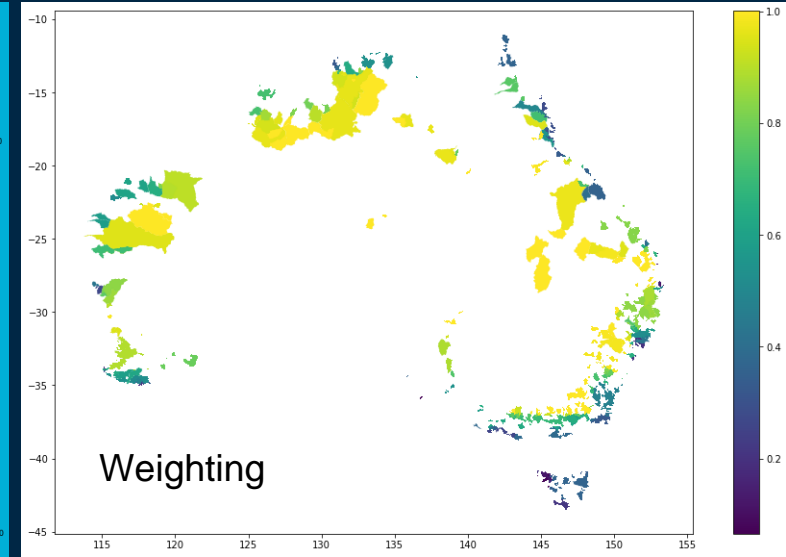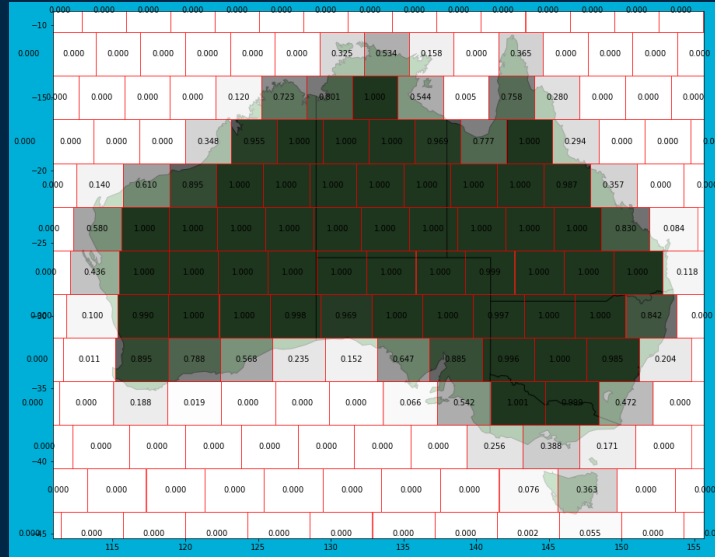
Correlations: GRACE vs AWRA-L after calibration

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GRACE vs AWRA Total Water storage (mm)

Development underway

- Better drought and recharge performance

- Better flood and fire performance

- Approach:

  - Calibration to GRACE

  - Calibration to vegetation

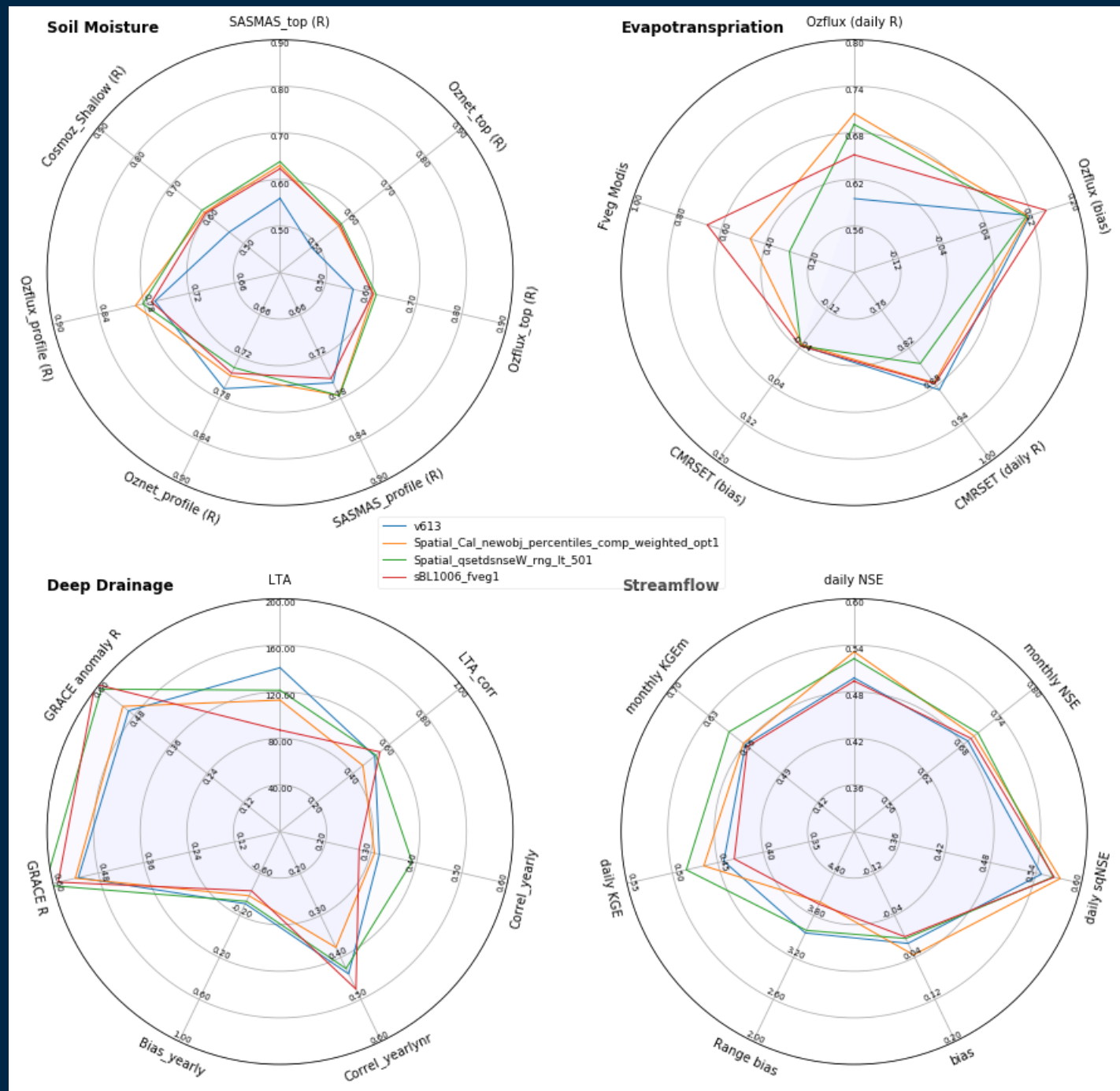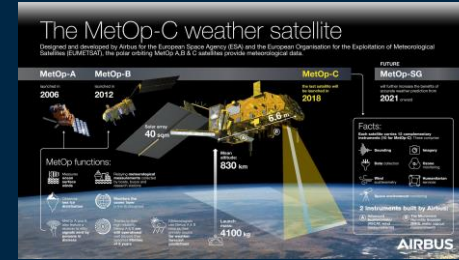Incorporating MODIS fraction of vegetation in calibration

RMSE   Before   After

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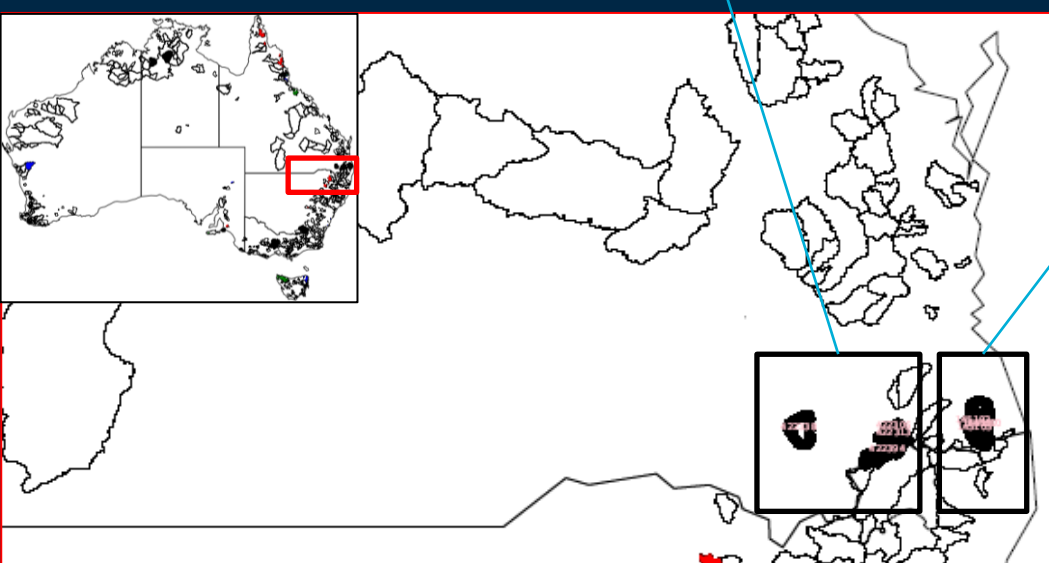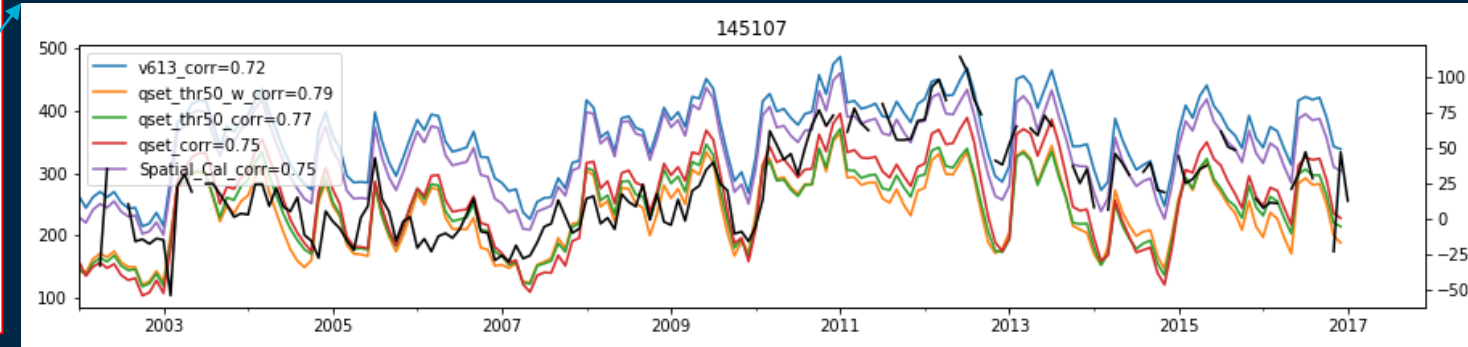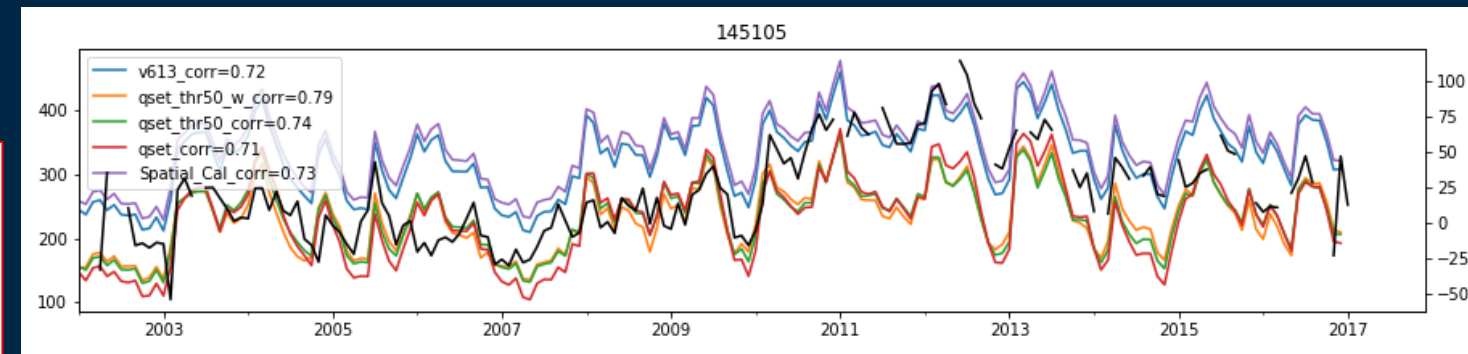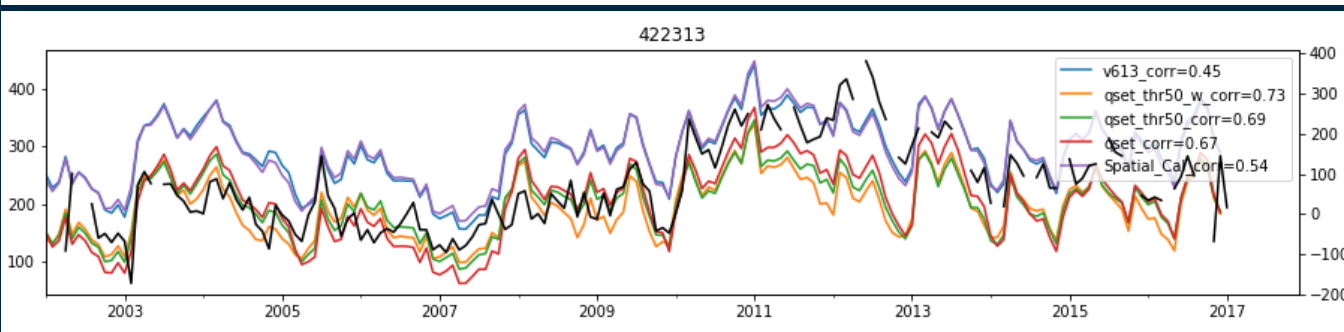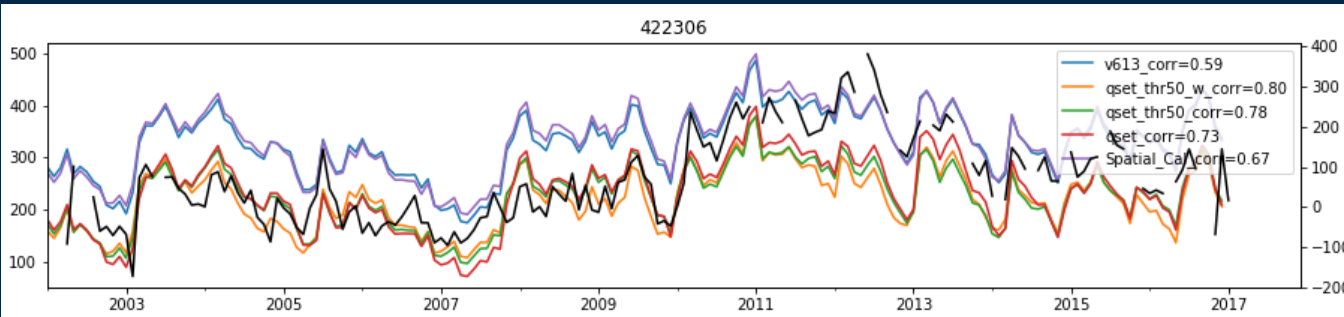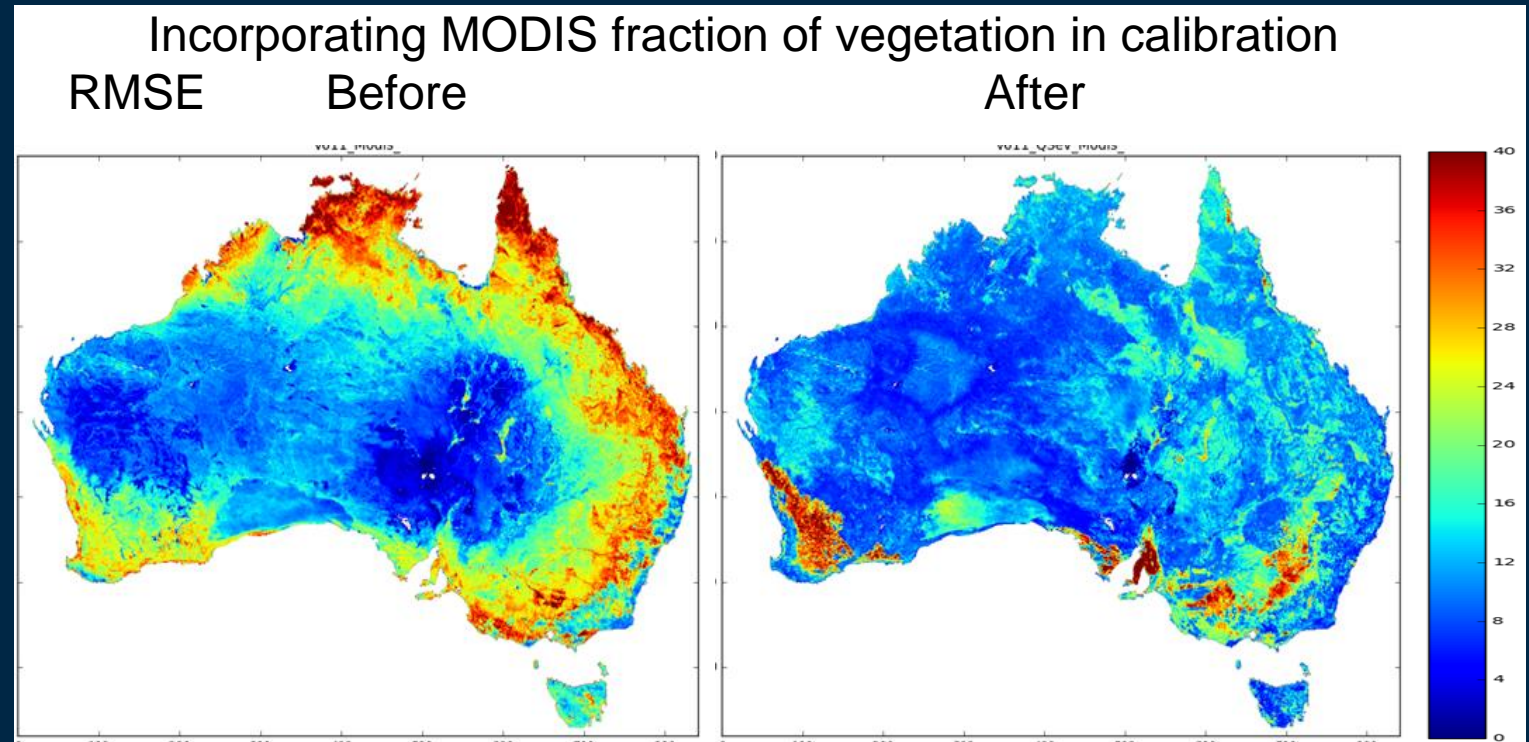
Evaluating the water balance

- You cant have everything

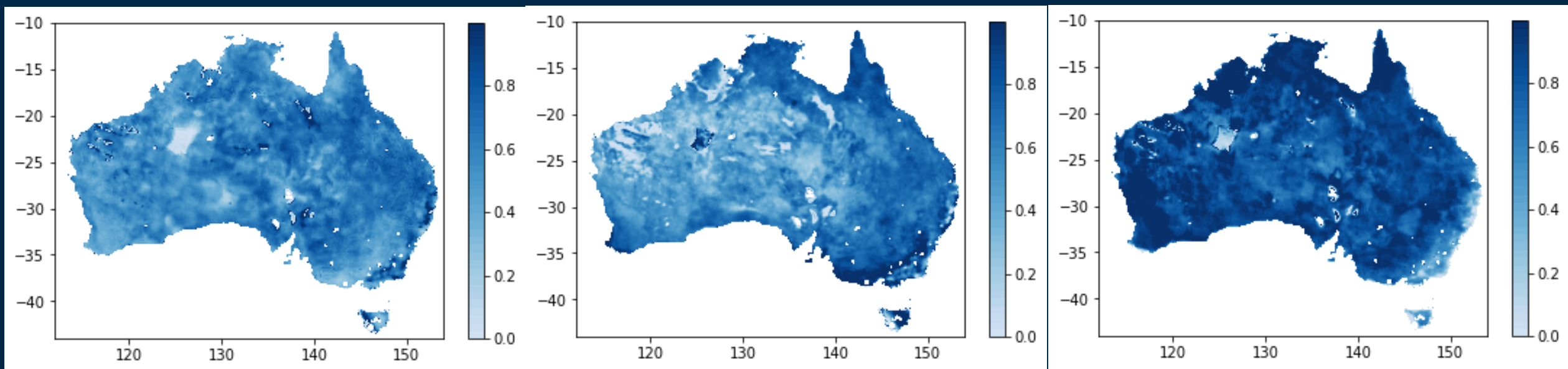# Operational Assimilation of ASCAT and SMAP soil moisture for forecasting!

Triple Collocation: Luigi Renzullo and Siyuan Tian @ ANU

Temporal Soil Moisture data correlations with "truth"

AWRA   **ASCAT**   **SMAP**

Thanks

BoM: Ashkan Shokri, Greg Keir, Greg Kociuba
Wendy Sharples, Stuart Baron-Hay & Dev team, Adam Smith
Chantal Donnelly, Rob Pipunic, Julien Lerat, Elisabeth Vogel,
Louise Wilson, David Wright, Alison Oke & many others.

**CSIRO:** Jai Vaze, Neil Viney, Russell Crosbie, Tim McVicar many others

Universities: Luigi Renzullo, Siyuan Tian, Albert van Dijk and others

BoM are committed to working together with our customers, either through user engagement or partnering to accelerate product development. Please let us know what you would like to see available to support your work.
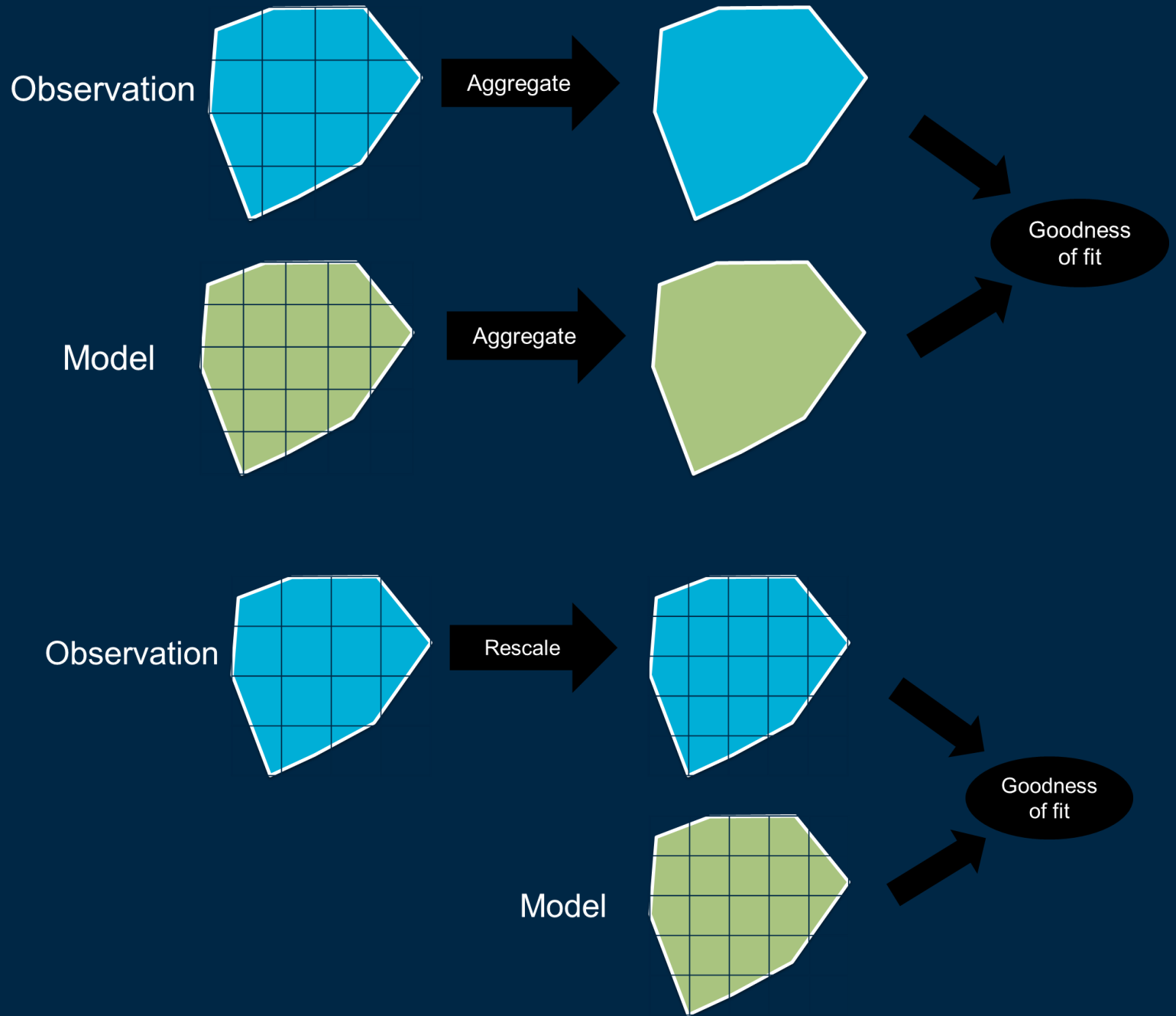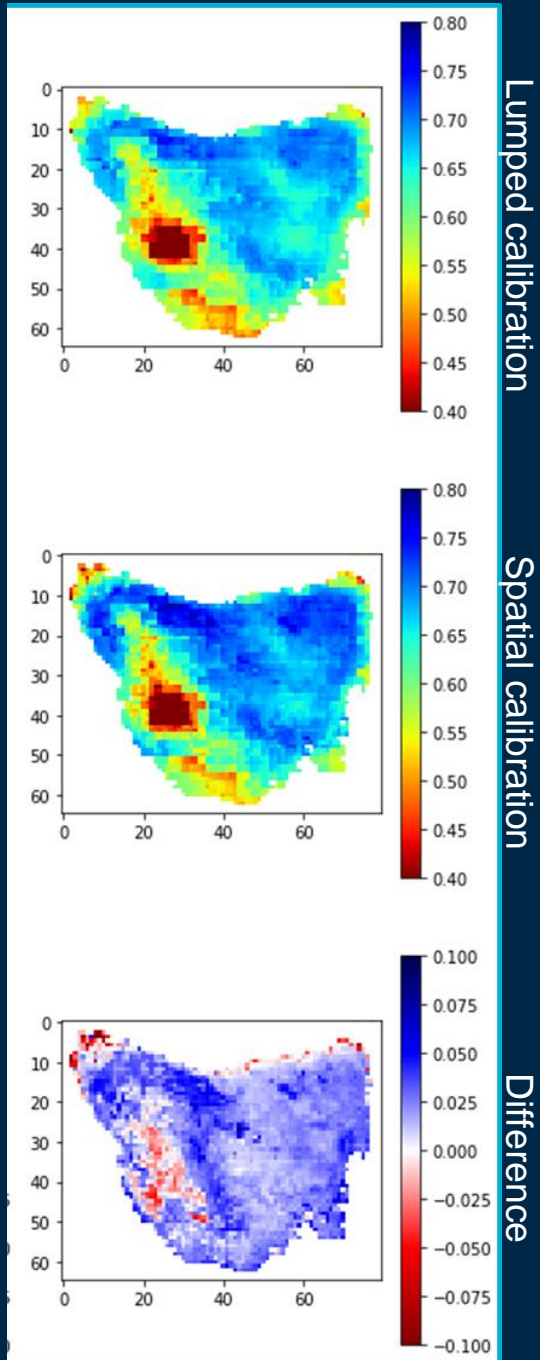
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Upcoming/underway:

1. Urban areas
2. spatial calibration inc. veg
3. routing
4. trial 1km rather than 5km
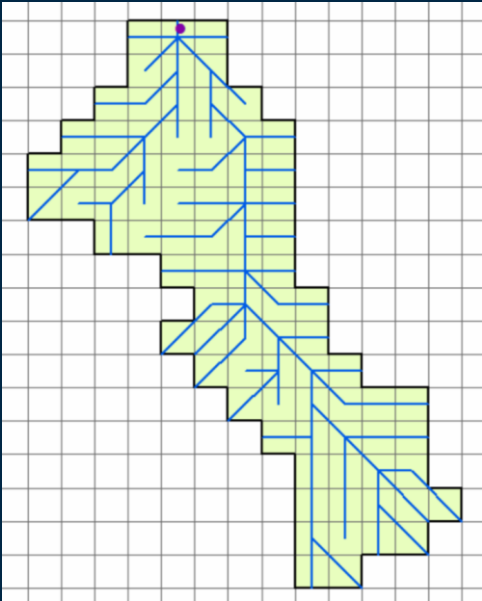
Model	NSE
AWRA-L	0.73
AWRA-L routing	0.83

Calibration catchments

Correlation maps of spatial and lumped calibrations for (2000-2014) and evaluated for (2007-2014)