

CABLE Benchmarks

Scope

- Global scale AMIP and uncoupled
 - Variables (AMIP): surface air T, Tmax, Tmin, precip, Interhemispheric CO₂
 - Variables (AMIP + offline): ET, radiation, NEE/GPP?, LAI, snow cover
 - Metrics: seasonal means, time correlation, RMSE, SD distributions?
 - Which driving products, space and time resolution, other experimental constraints?
 - Which obs-based evaluation products?
- Australian continent
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- Point-based
 - Variables: latent, sensible fluxes, NEE, WUE, Leaf-stem allometry
 - Which sites?
- Transpose AMIP
- Single column model
- Technical testing
 - MPI vs serial - any differences
 - ACCESS forcing vs AMIP - any differences
 - restart vs continuous run

Slides today

- Global scale AMIP and uncoupled
 - Mean seasonal near surface air T, Tmax, Tmin, precip (AMIP) – Ruth Lorenz
 - Mean seasonal ET, radiation – Ruth Lorenz
 - Interhemispheric CO₂ gradients – Rachel Law
 - Global snow cover; forcing issues offline – Vanessa Haverd
 - MPI GPP, MODIS LAI, soil, biomass data, leaf N:P ratio – Yingping Wang
 - Gridded global fluorescence – Alex Norton
 - Umplot – Lauren Stevens
- Australian continent
 - NARcliM grid, WRF – Claire Carouge
- Point-based
 - 20 PLUMBER sites; OzFlux suite – Gab Abramowitz
 - Leaf-stem allometry – Vanessa Haverd

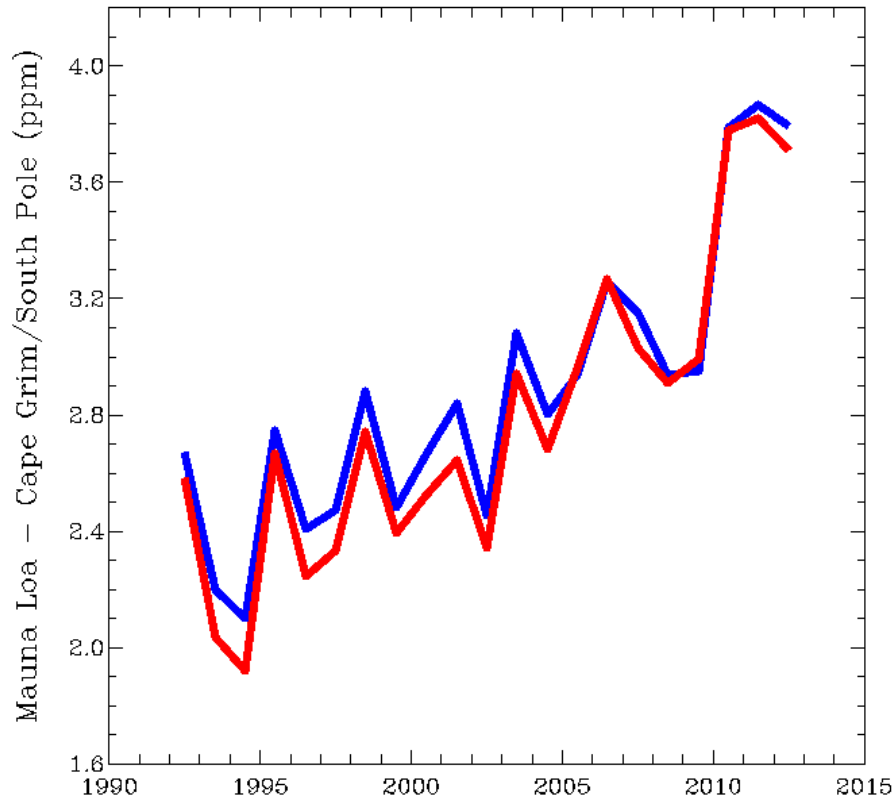
CABLE in ACCESS testing

- Mean seasonal climate, global maps
- ERAinterim, GPCP (Precipitation), HadGHCND (Tmax, Tmin), GLEAM (ET), LandFlux EVAL (ET), CERES (Radiation) etc.

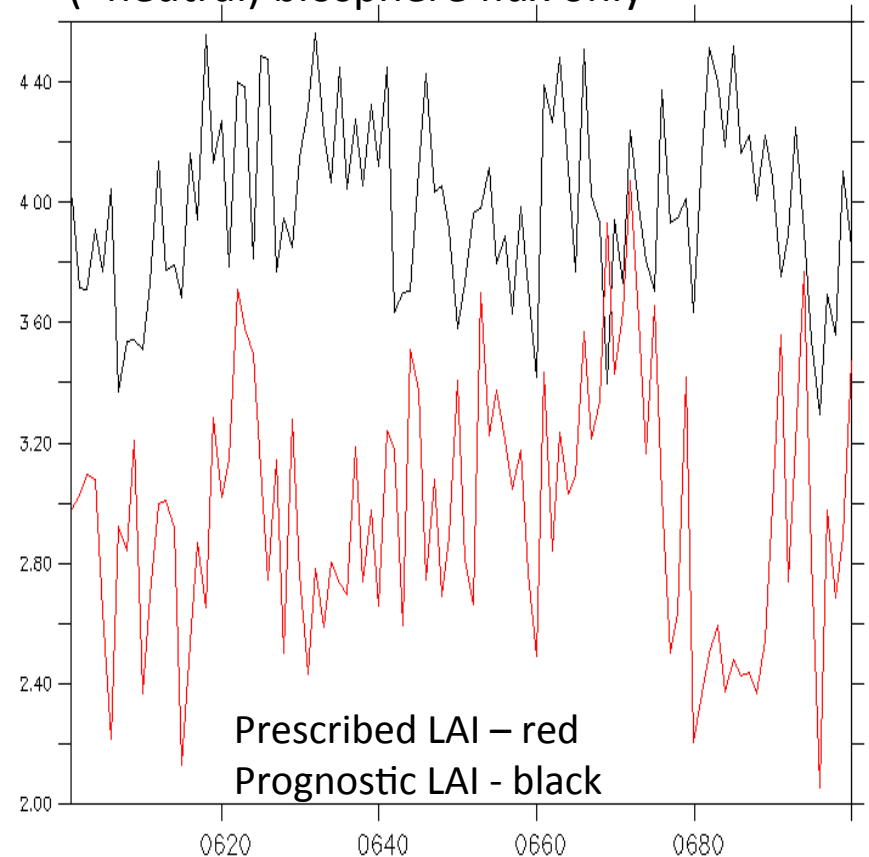
Atmospheric carbon dioxide for bench-marking

- Law, Kowalczyk, Wang, Using atmospheric CO₂ data to assess a simplified carbon-climate simulation for the 20th century, Tellus, 58B, 427-437, 2006.
- **Seasonal cycle**, growth rate, spatial distribution, diurnal cycle

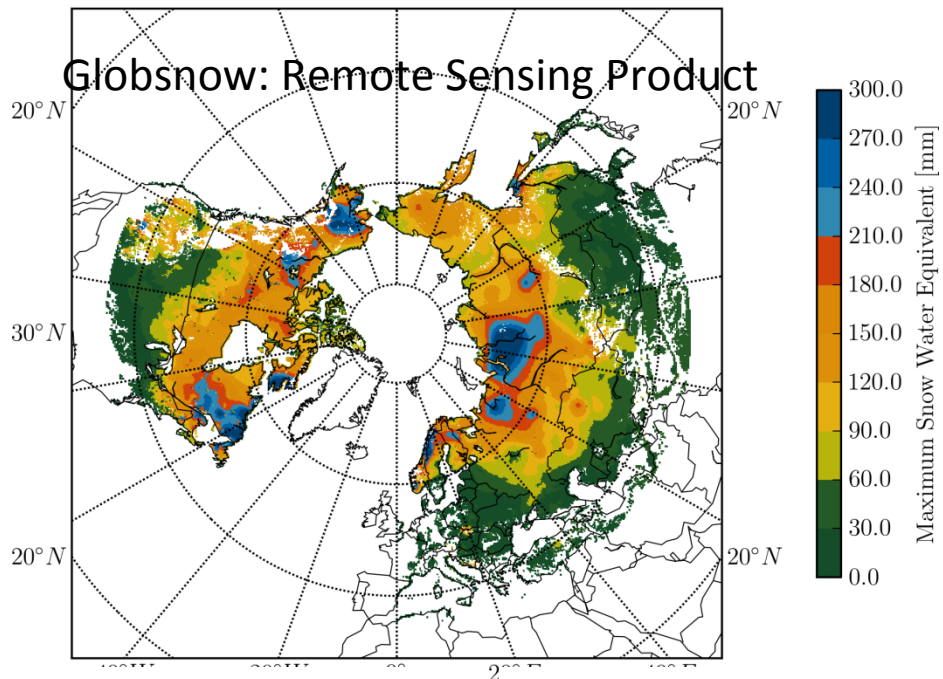
Observed annual mean
intehemispheric CO₂ gradient



ACCESS-ESM1 annual mean
interhemispheric gradient, pre-industrial,
(~neutral) biosphere flux only



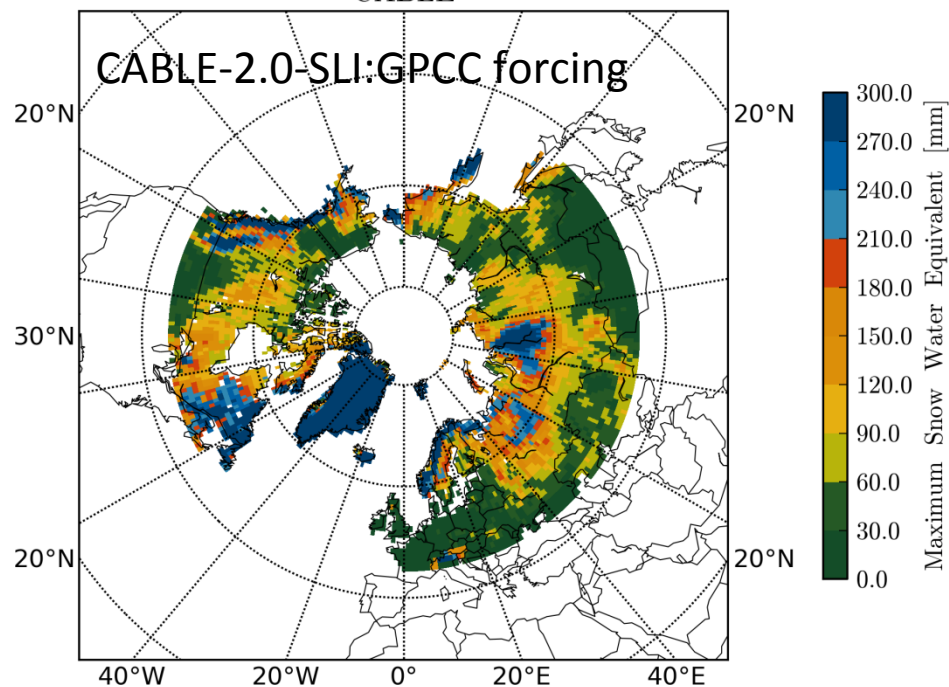
GlobSnow: Remote Sensing Product



GSWP snowfall too high over large regions

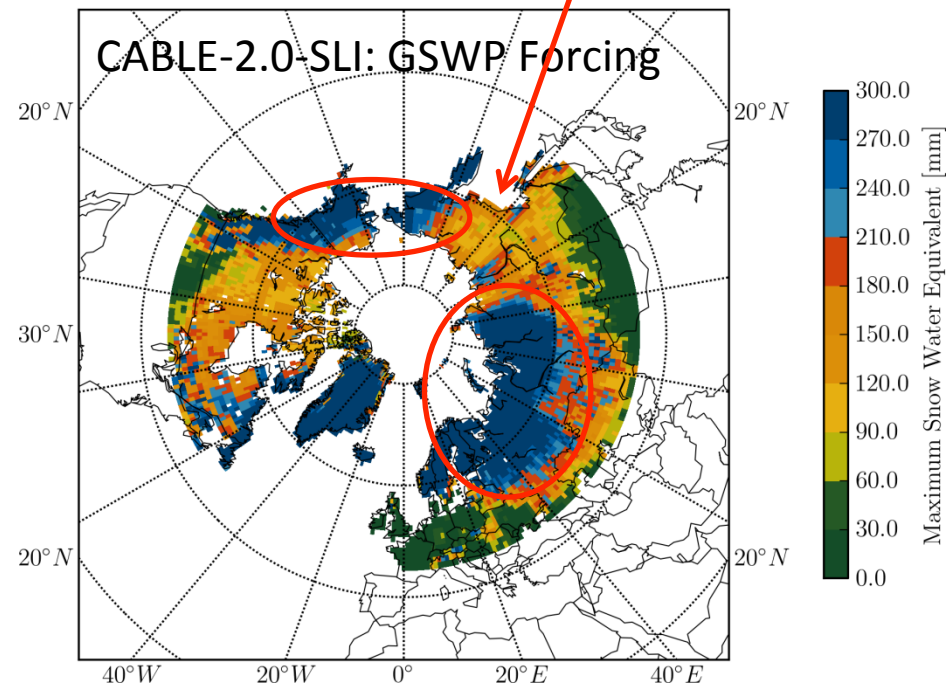
CABLE

CABLE-2.0-SLI: GPCC forcing



CABLE

CABLE-2.0-SLI: GSWP Forcing



Benchmarking test

MPI GPP, ET dataset

MODIS LAI dataset

Global soil data

Tropical vegetation biomass data

Latitudinal variation of leaf N:P ratio (Reich dataset)

Towards the Use of Satellite Chlorophyll Fluorescence

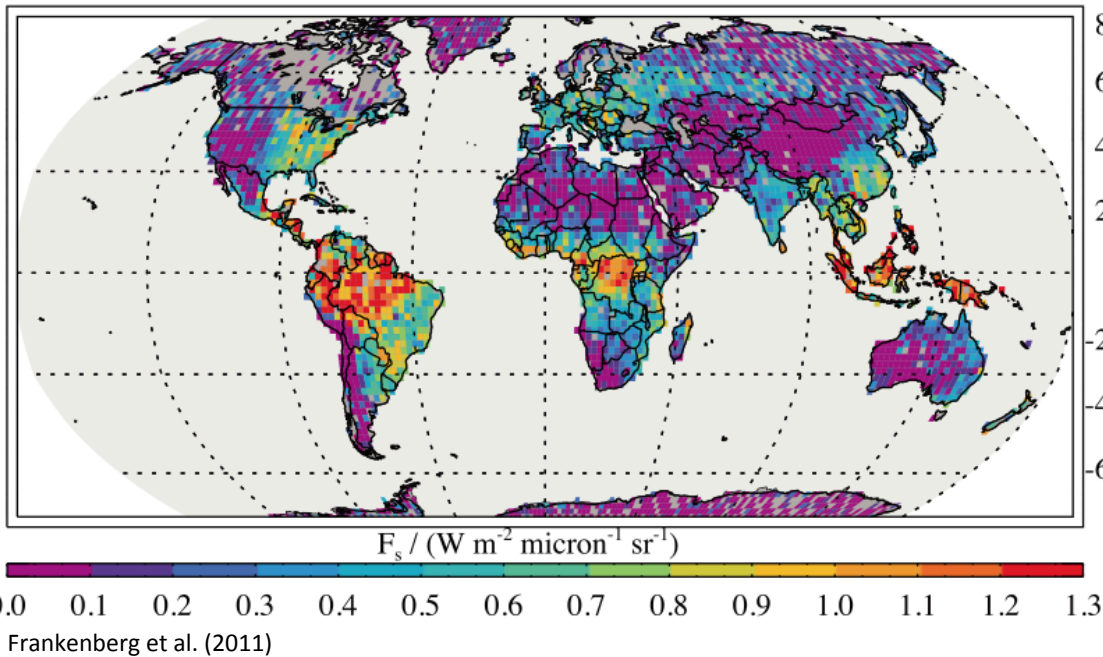
THIS STUDY:

- Gridded satellite fluorescence data
- Global simulations of CABLE across the observed period
- Utilizing a data assimilation approach

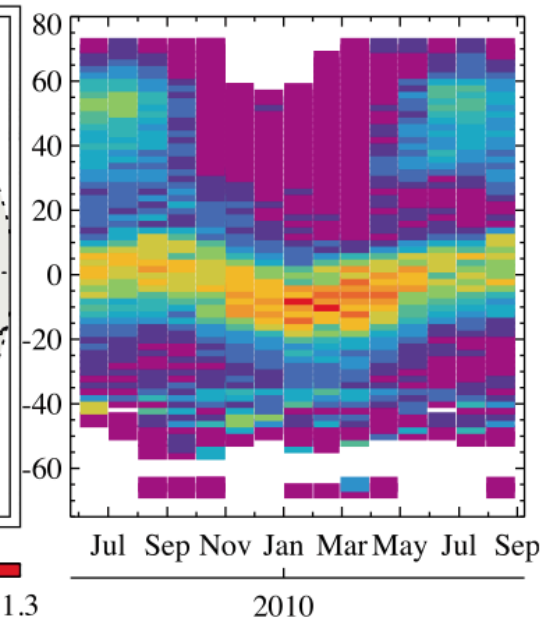
BENCHMARKING:

- Performance targets
- Benchmark reference simulations
- Performance metrics
- Model improvement

A Chlorophyll a fluorescence at 755 nm, June 2009 through May 2010 average



B Timeseries



UMPLOT

UMPLOT is a post processing and plotting tool for ACCESS AMIP and coupled runs.

It produces a range of plots automatically and is easy to setup and run as it uses a namelist file.

A C-Shell script controls the running of NCL scripts, all of which are in the SVN repos.

*Currently runs on Cherax but with a little effort can run on an NCI machine.

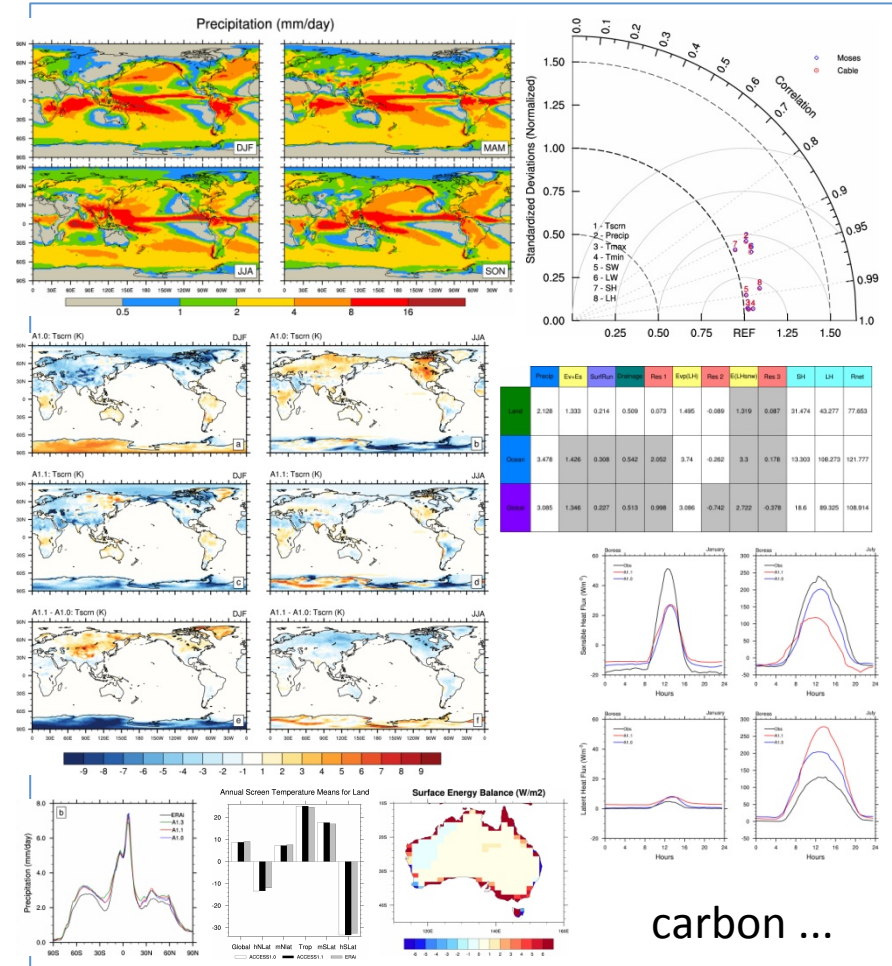
Documentation can be found on the wiki:

<https://trac.nci.org.au/trac/cable/wiki/OnlineScripts>

Please add your scripts to:

<https://trac.nci.org.au/trac/cable/wiki/CableScripts>

Lauren Stevens, O&A



Benchmarking in LIS

Currently using NARClIM map.

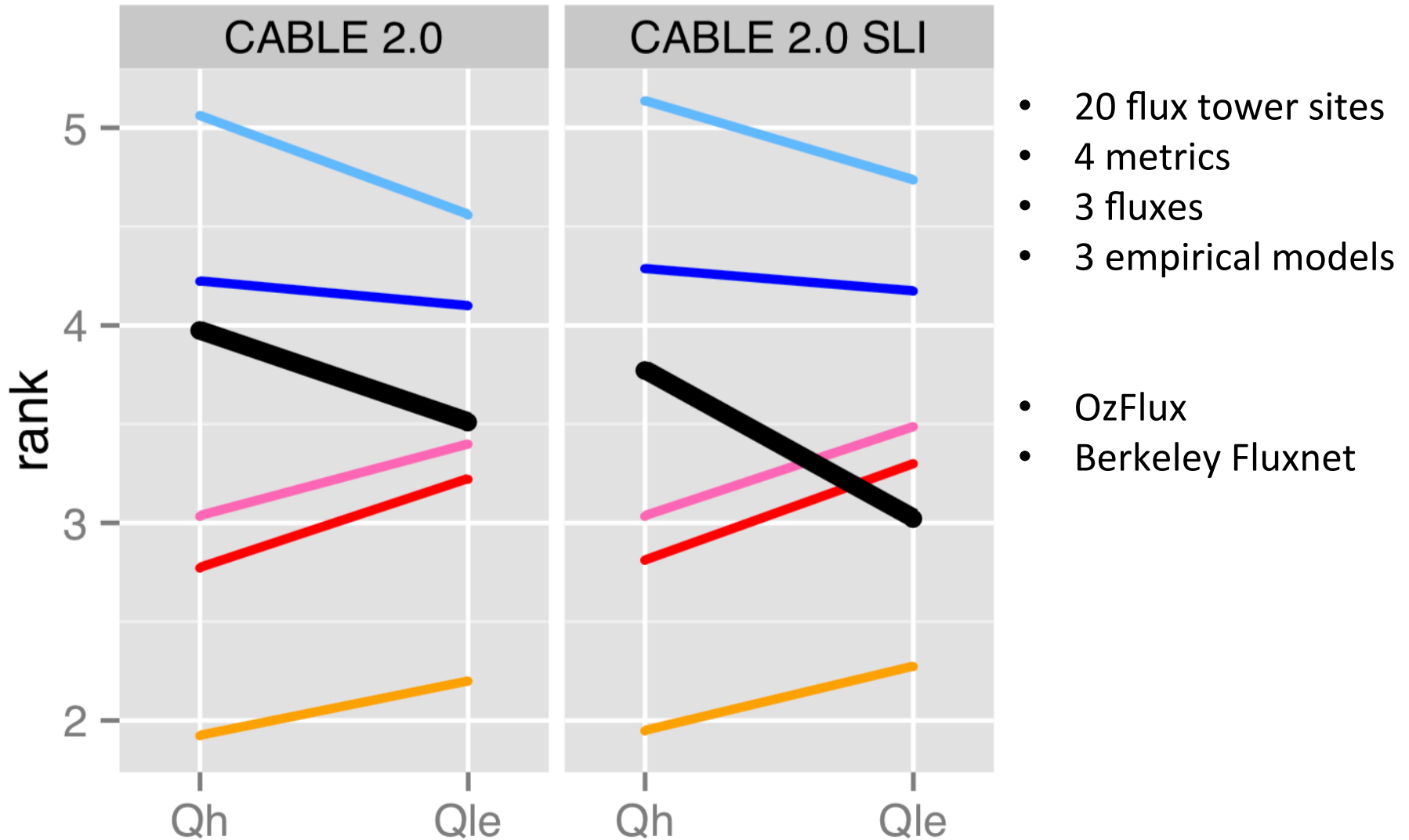
- ❖ 50km resolution.
- ❖ Domain centered on Australia. Borders set far away over ocean.
- ❖ 30 years offline spin-up followed by 5 years coupled run with WRF.
- ❖ Offline atmospheric forcing from Princeton University.
- ❖ WRF options are based on NARClIM options.

Running specific tests when needed:

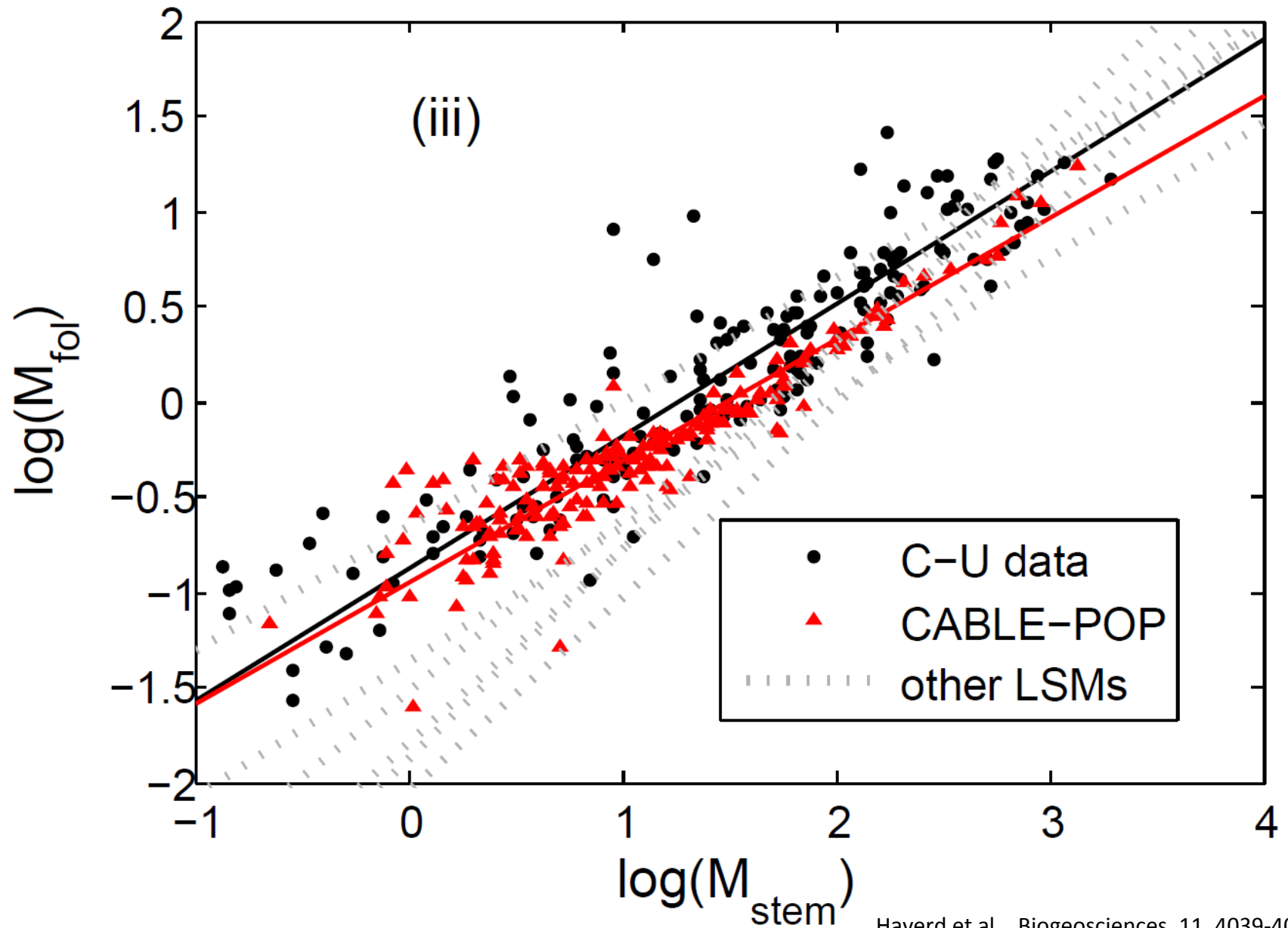
- ❖ restart vs. continuous
- ❖ serial vs. parallel

→ Small tests need to be better defined and automatised.

Benchmark suggestion - reproduce PLUMBER rank



Leaf-Stem Allometry from Biomass Compartments Database (Teobaldelli 2008)



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Global scale AMIP and uncoupled

- Variables (AMIP): surface air T, Tmax, Tmin, extreme indices, precip, atmospheric CO₂, Rikus work?,
- Variables (AMIP + offline): ET, radiation, NEE/GPP?, LAI, snow cover, soil moisture, radiative surface temperature, WUE, mortality?
- Metrics: seasonal means, time correlation, RMSE, SD distributions (global maps), correlation with ENSO/IOD?,
- Driving products: ERAinterim, GSWP2, GPCC, GSWP3?, Mark Decker, ACCESS offline,
- Eval products (AMIP): GPCP (Precipitation), HadGHCND (Tmax, Tmin),
- Eval products (AMIP + offline): GLEAM (ET), CERES (Radiation), MPI (ET, GPP), MODIS (LAI), ??? (tropical veg biomass), Reich dataset (leaf N:P ratio), GOSAT (fluorescence), ESA (soil moist, >late 70s, surface), MODIS (albedo), GLOBALVIEW (CO2), HRST (point soil T vertical profiles), UNEP gris-arendal (permafrost extent), Foster-Davy (NH gridded snow depth), CALM (permafrost depth, point based),
- Constraint data:
- space and time resolution?

Australian continent

- As above, + streamflow? Cape Grim CO₂?, TERN transects?, NATT, FFDI
- Additional constraint data? TERN,
- Space and time resolution different? Masked catchment simulations,
- Variables (AMIP): near surface air T, T_{max}, T_{min}, precip
- Variables (AMIP + uncoupled): ET, radiation, streamflow, NEE/GPP?
- Metrics: seasonal means, time correlation, RMSE, SD distributions?
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- Which obs-based evaluation products?

Point-based

- Variables: latent, sensible fluxes, NEE, WUE, Leaf-stem allometry, TERN, urban MIP,
- Which sites?
- Eval products: OzFlux, Fluxnet (Berkeley release), Teobaldelli (Leaf-Stem Allometry)