



University of
Reading



LEMON TREE
Land Ecosystem Models
based On New Theory,
obseRvations and
ExperimEnts

An eco-evolutionary optimality-based prognostic leaf area index model in the JULES

Boya Zhou, Timothée Corchia, Wen Yao Gan, I. Colin Prentice, Sandy P. Harrison

Speaker: Boya Zhou

Email: boya.zhou@reading.ac.uk

What is Leaf Area Index (LAI)

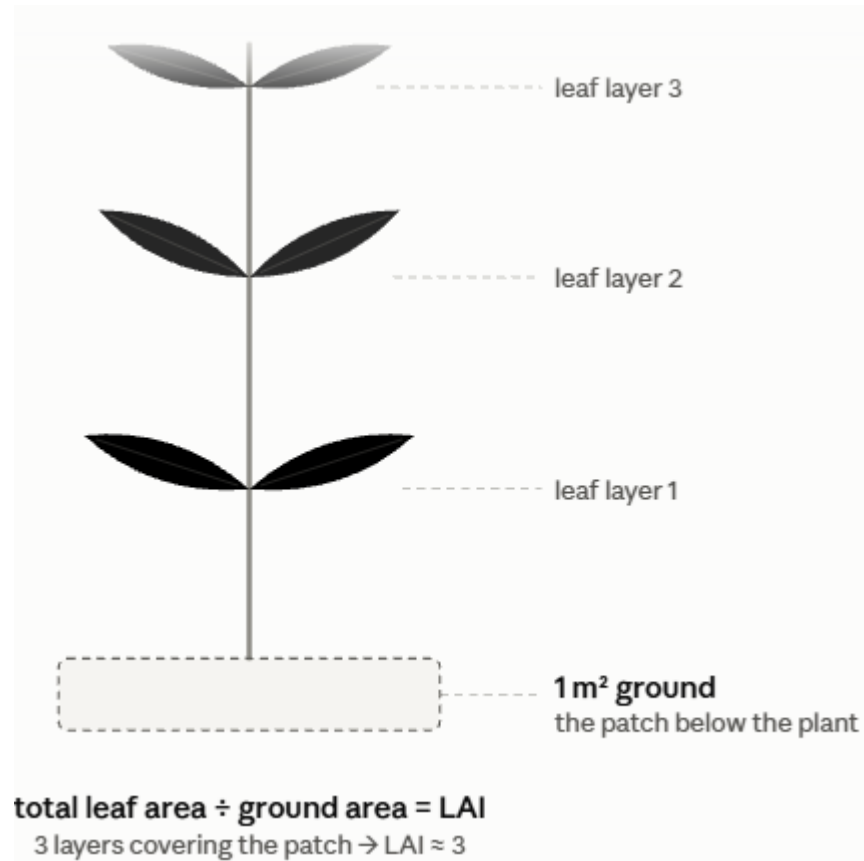


Fig. LAI definition

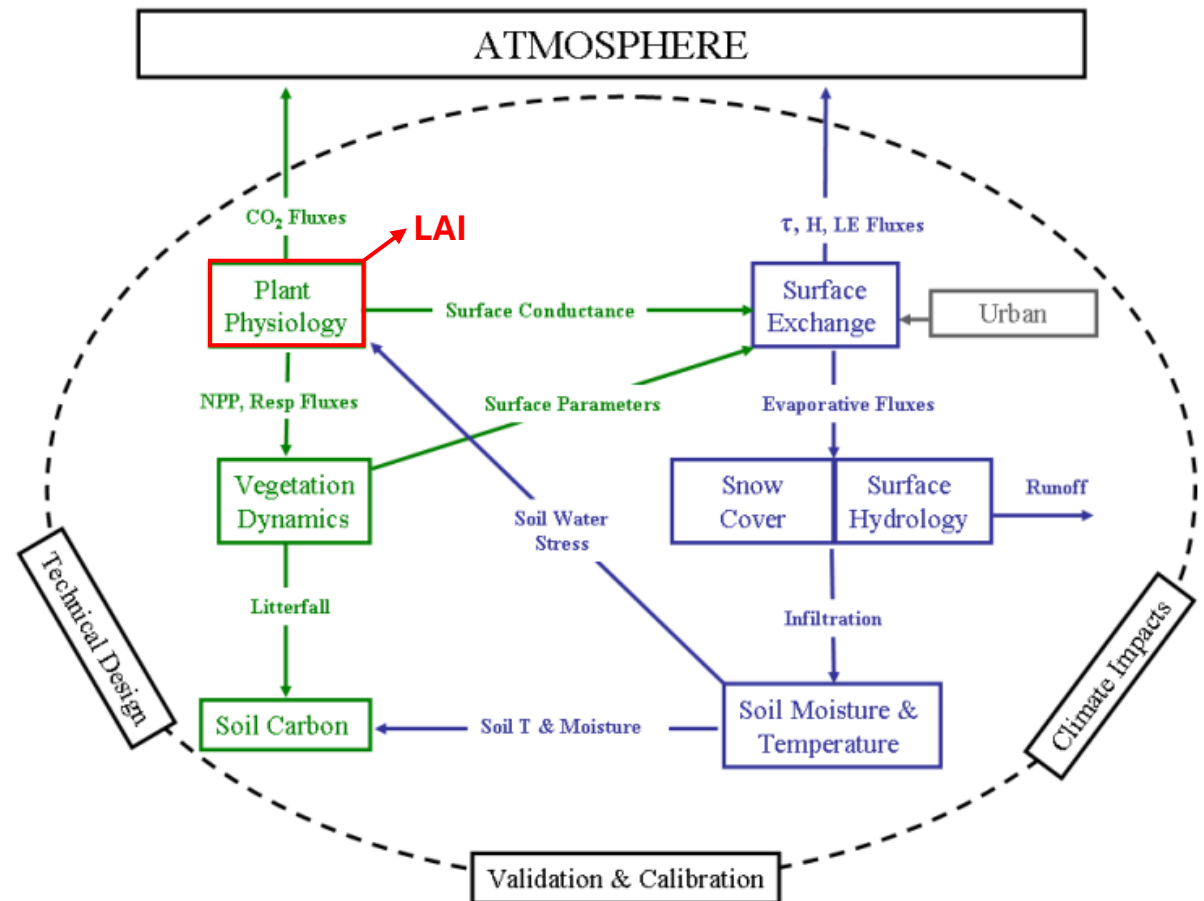
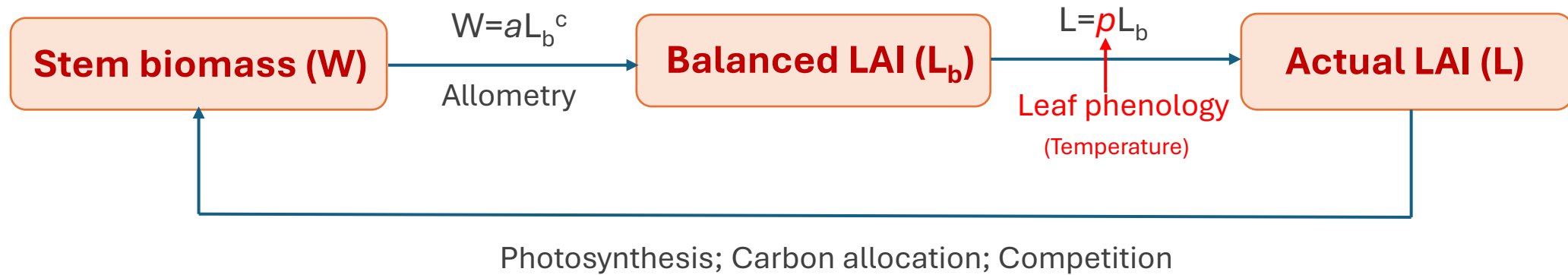


Fig. JULES framework (Best et al., 2011)

Current LAI module in JULES

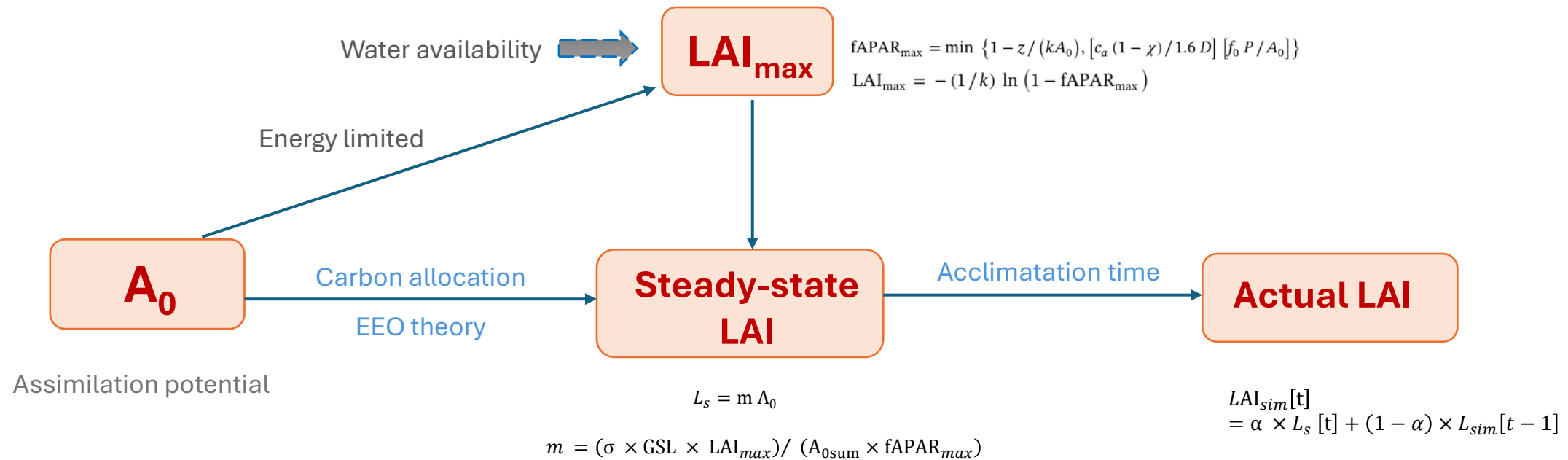


Limitation:

- As result of carbon allocation
- Not direct productivity constraint on target LAI
- PFT-dependent parameter

New LAI model

Hypothesis: Leaves should be displayed when their presence is most beneficial for maximizing light capture and carbon gain.



Differences between two LAI schemes

JULES

- Result of carbon allocation
- Not direct productivity constraint on target LAI
- PFT-dependent parameter (many)



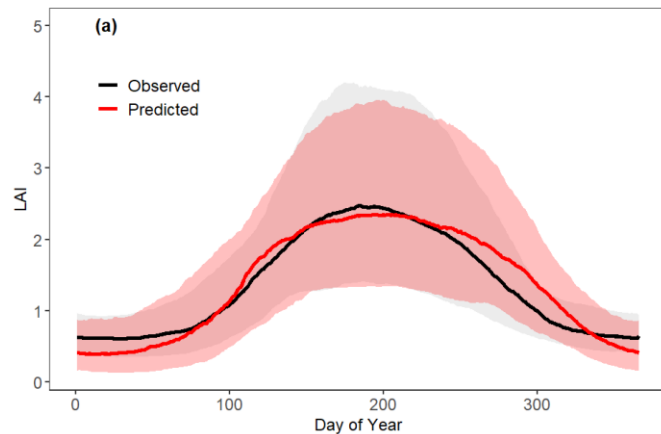
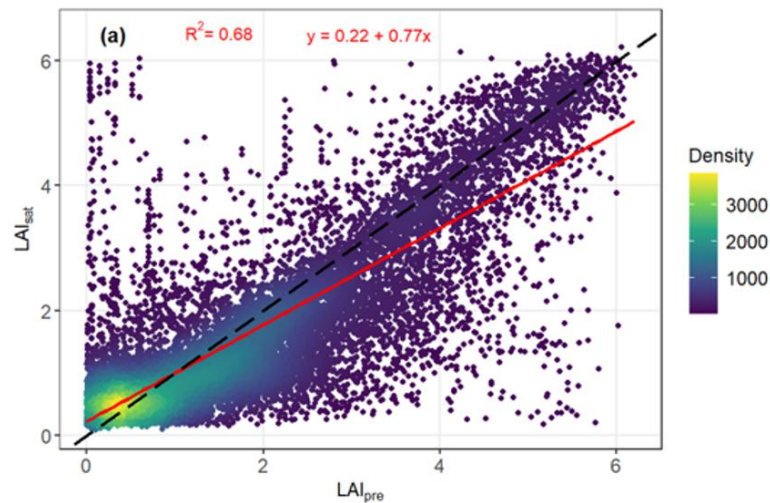
New LAI model

- Direct productivity constraint on target LAI
- No PFT-specific parameter
- Less parameters

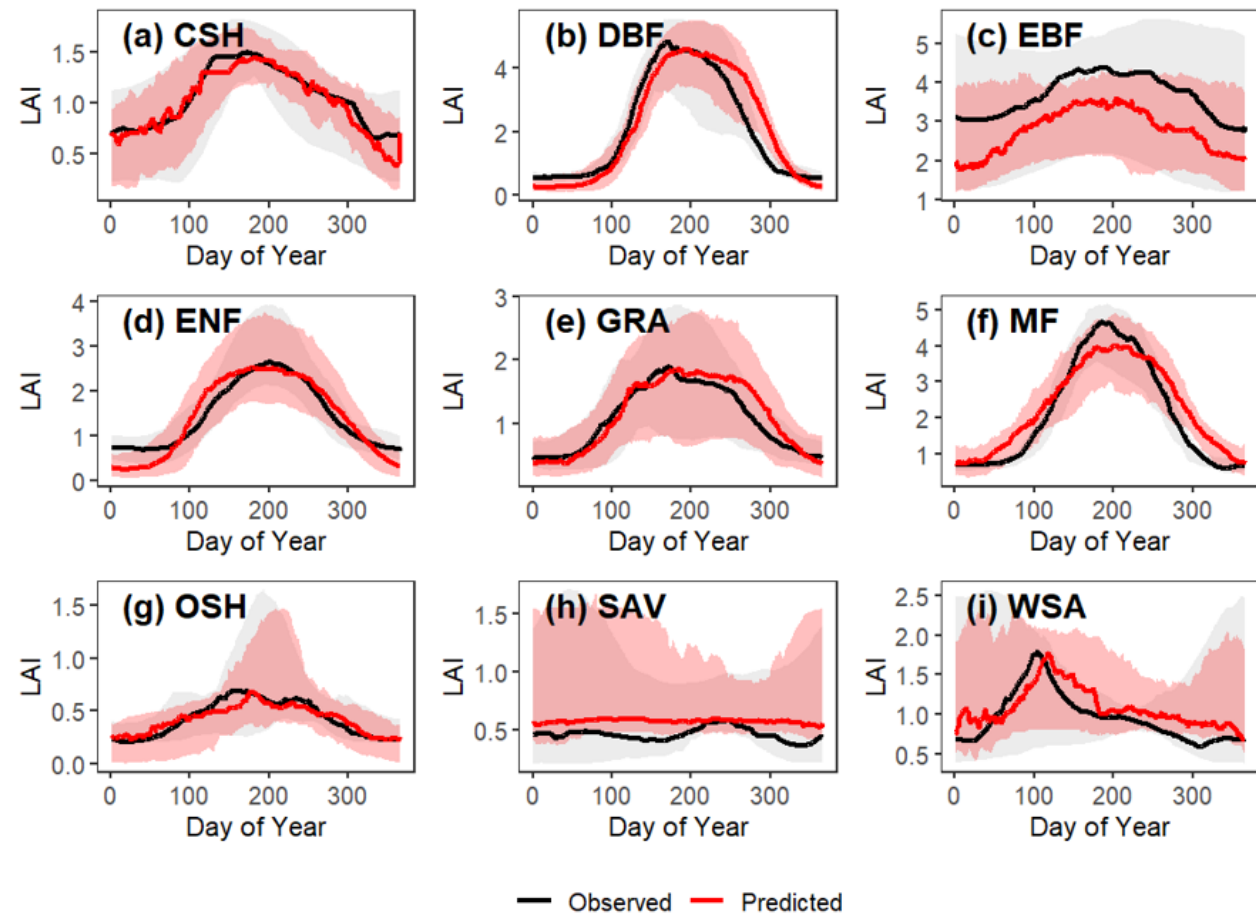


Offline results: PLUMBER sites

Satellite VS Predicted monthly LAI mean values across all sites and years

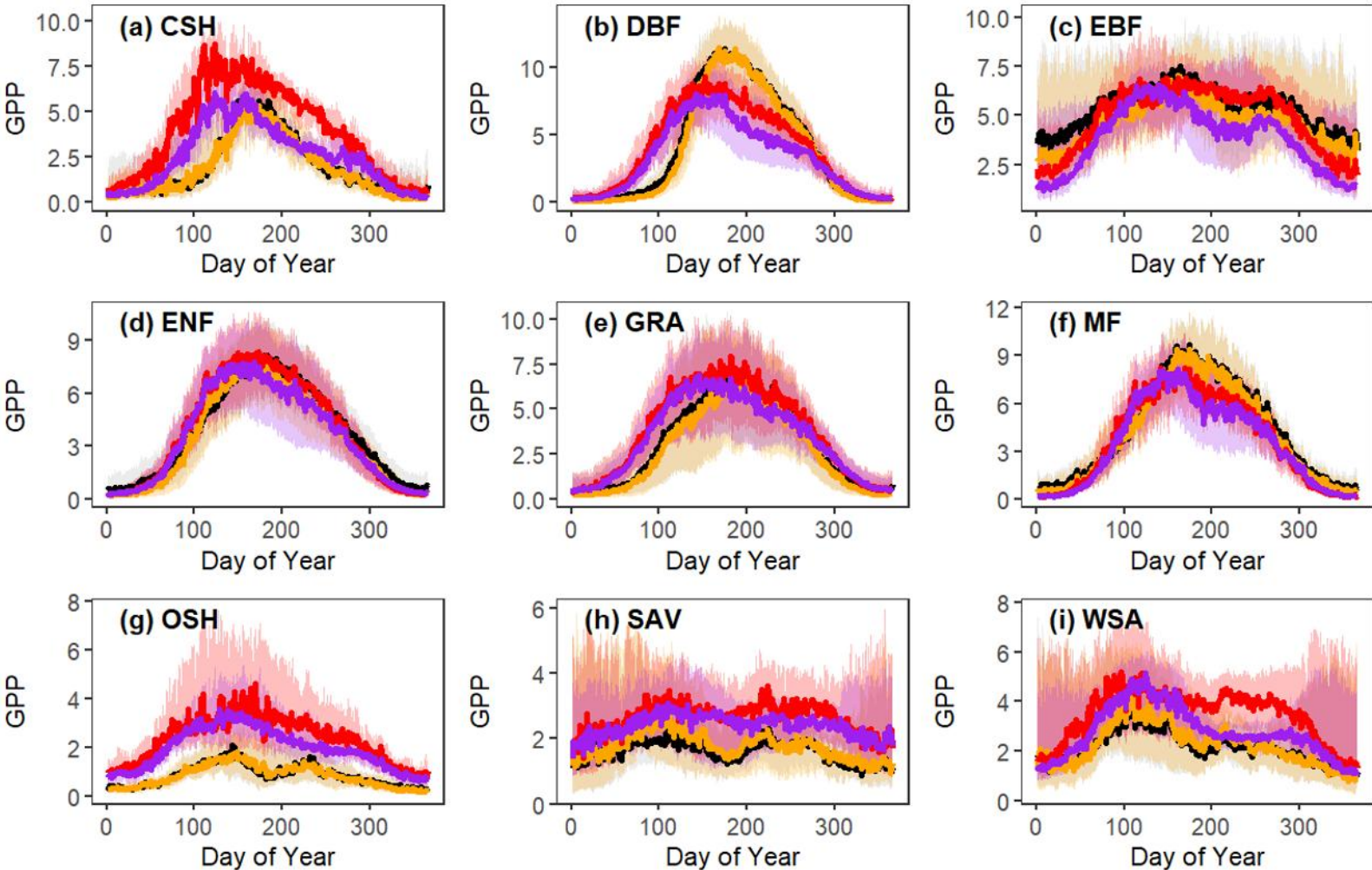


Satellite VS Predicted seasonal LAI patterns for different vegetation types



Offline results: PLUMBER sites

Predicted GPP across
vegetation types under
different P model versions



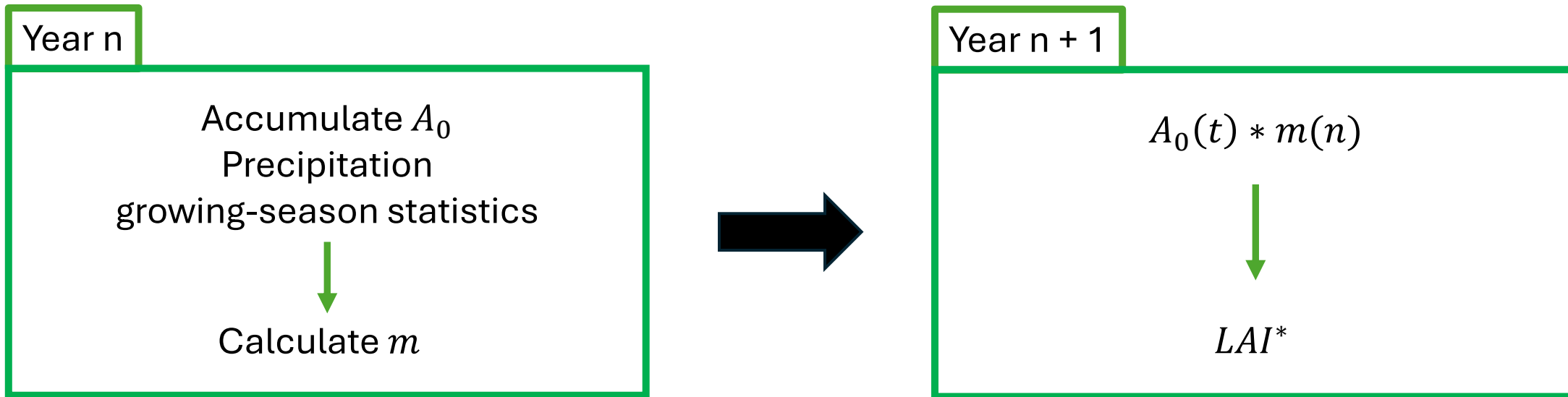
— Observed — Predicted_flux — Predicted_giulia — Predicted_stocker

Implementation in JULES



Timothée Corchia
t.j.corchia@reading.ac.uk

Pmodel is used to estimate Potential GPP (A_0)

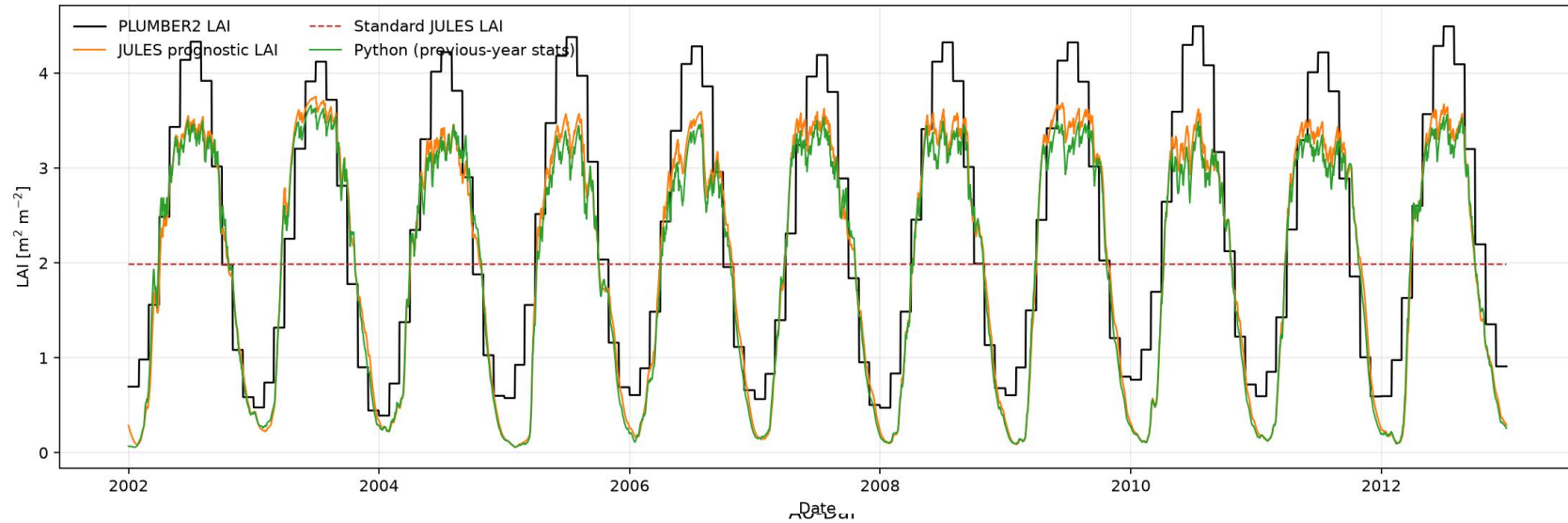


Values accumulated during year n are used to calculate year $m(n + 1)$ parameter

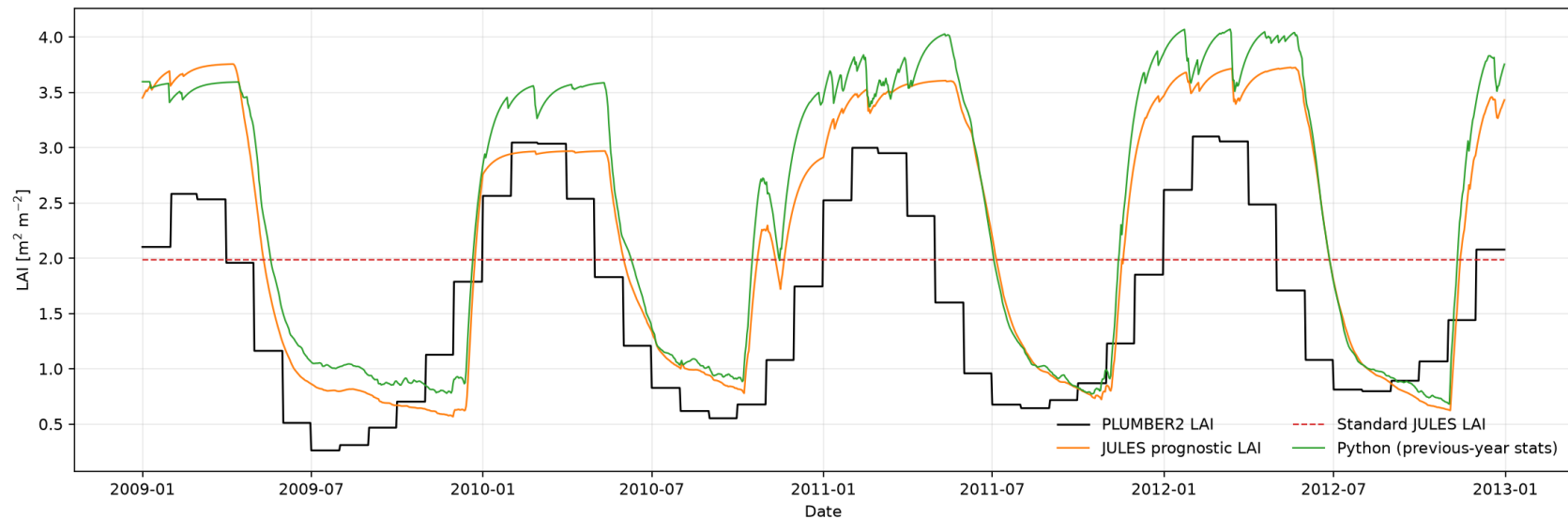
Implementation in JULES



AT-Neu
(47.11,11.3)
Grassland



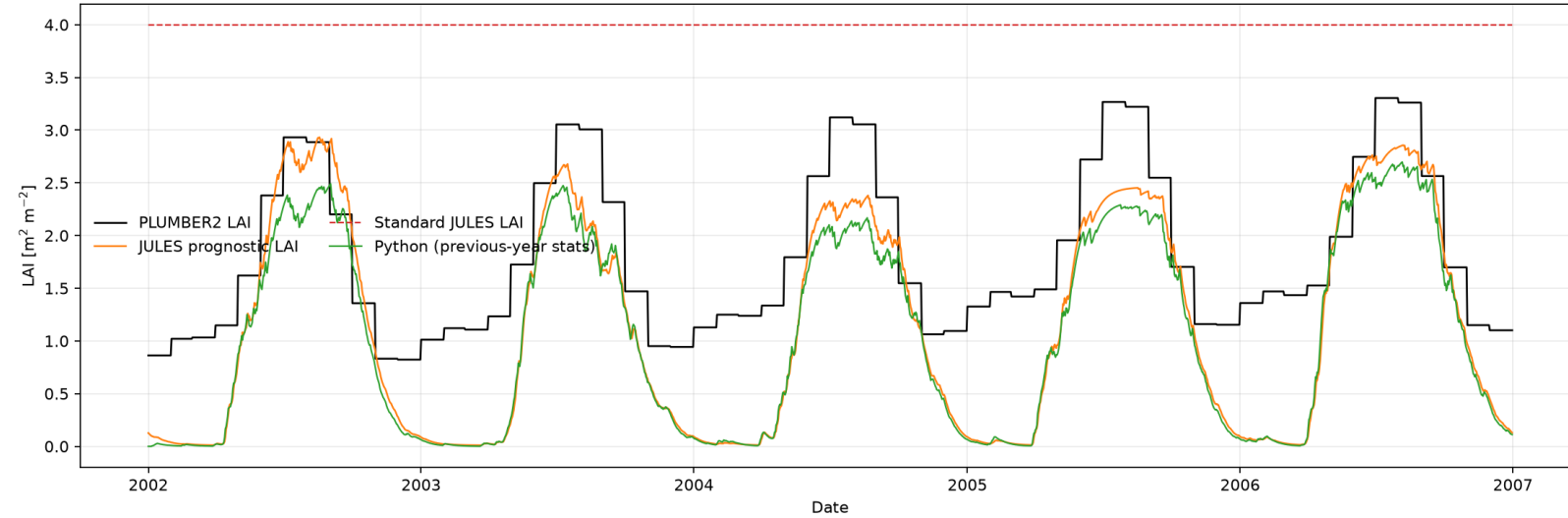
AU-DaP
(-14.06,131.31)
Grassland



Implementation in JULES



CA-Qcu
(49.26,-74.03)
Evergreen needleleaf



Take-home message

A new prognostic LAI scheme:

- Non PFT-specific parameters (Much simpler)
- Well-evaluated at site and global level offline

Implementation in JULES

- Next step: Evaluate at global scale



LEMONTREE

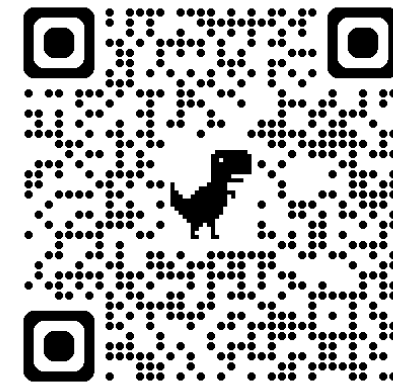
Land Ecosystem Models
based On New Theory,
obseRvations and
ExperiMEnts

Me

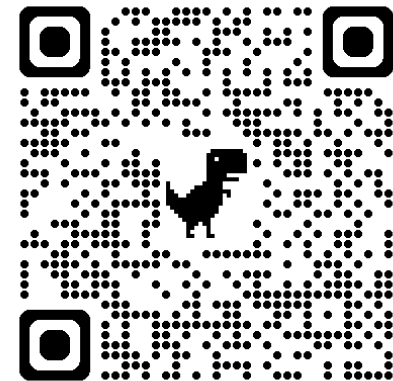


Thanks! Q & A

Corresponding email: boya.zhou@reading.ac.uk



LEMONTREE group QR code



Paper QR code

Offline results: Comparison with Trendy

