A world map with a grayscale background representing land and water. Numerous small colored dots (red, orange, yellow, green) are scattered across the map, indicating the locations of flux measurements. The density of these dots varies by continent and region.

2007

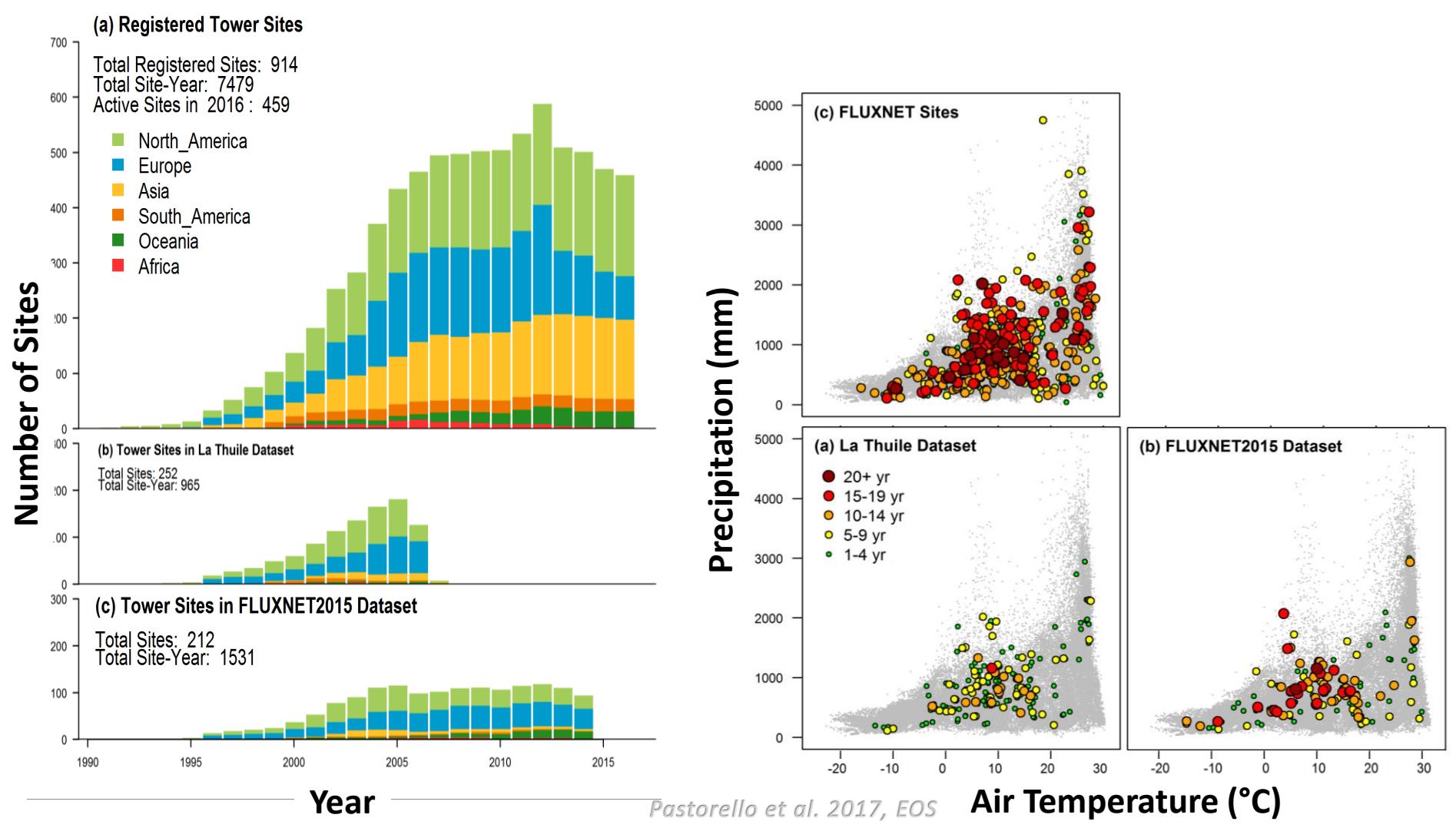
● 20+ yr
● 15-19 yr

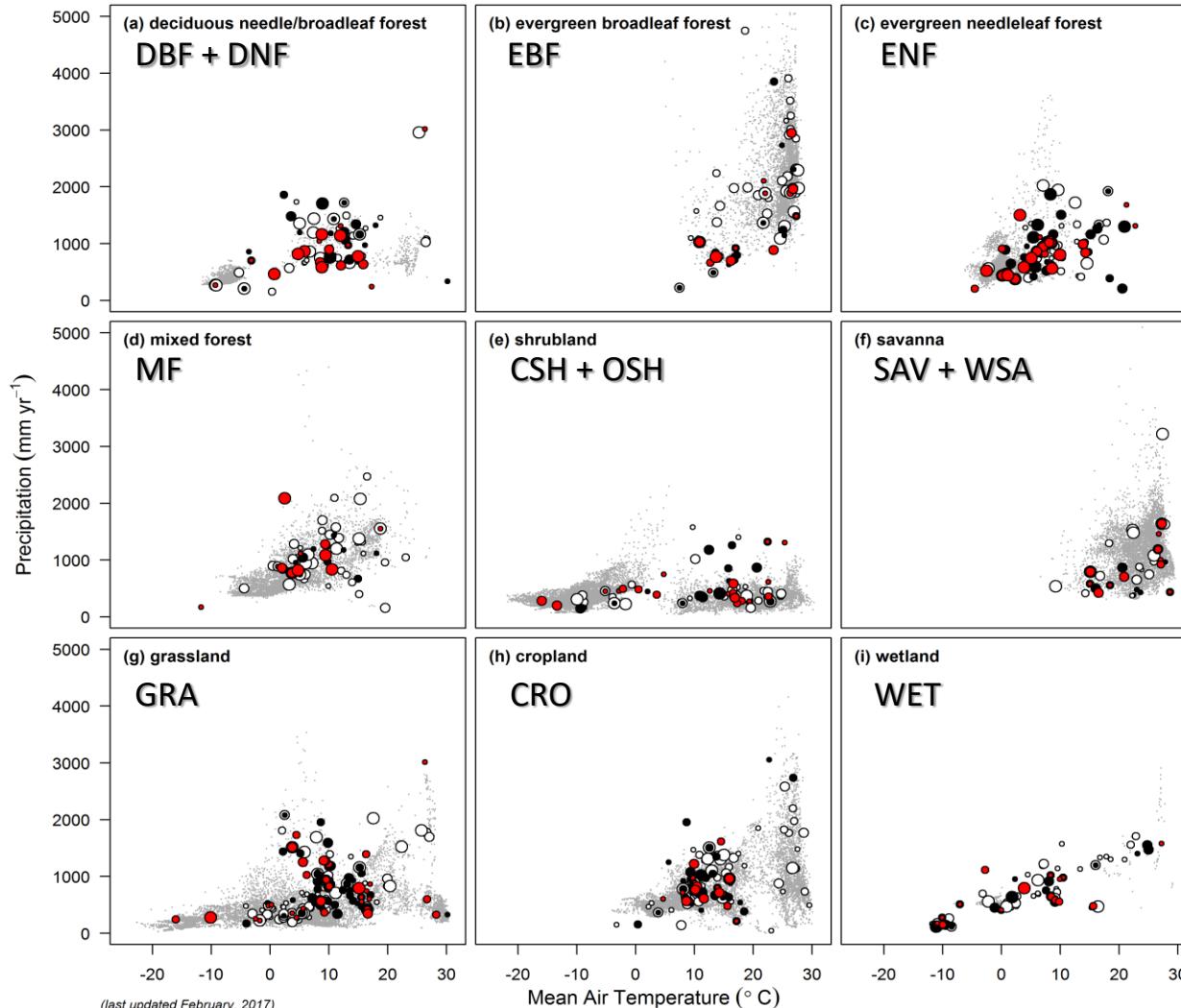
Flux Everywhere, All of the Time ?

2017

● 20+ yr
● 15-19 yr
● 10-14 yr
● 5-9 yr
● 1-4 yr

Housen Chu, Dennis Baldocchi, UC Berkeley
FLUXNET Contributors





Site Operation

Data Available (Network)

FLUXNET2015

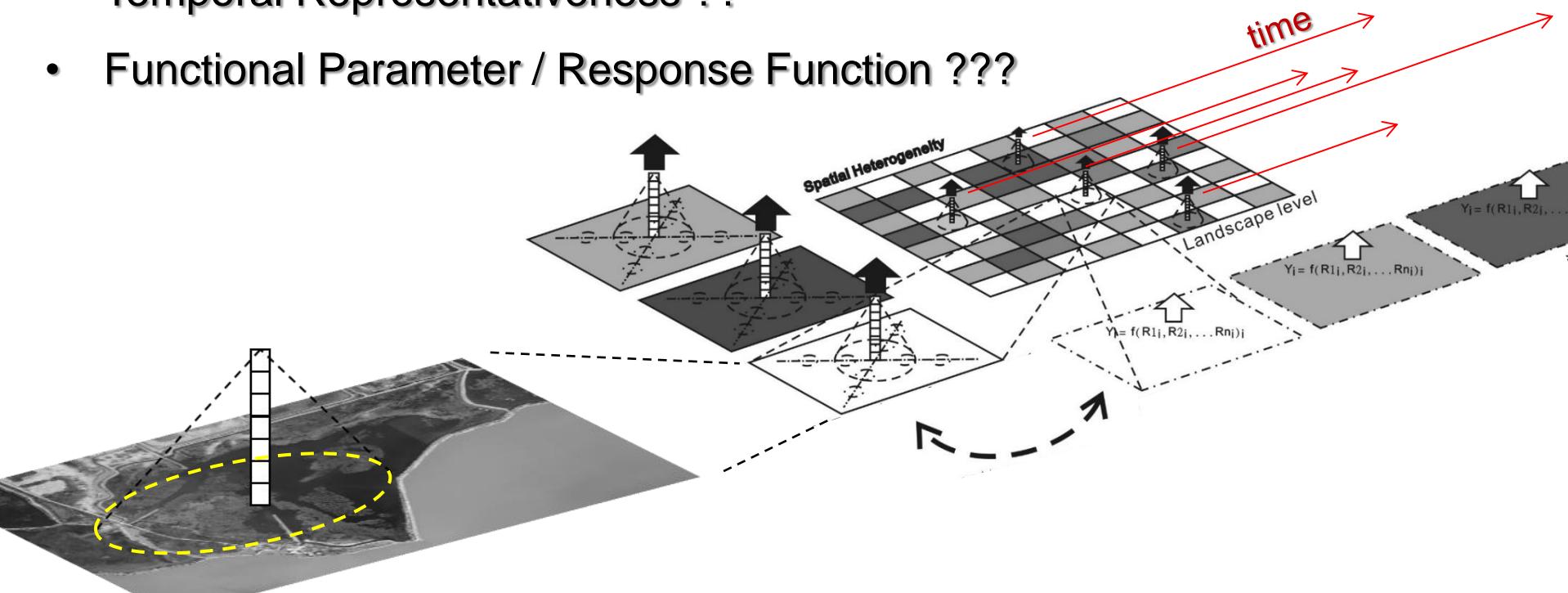
- 15+ yr
- 10-14 yr
- 5-9 yr
- 1-4 yr

- 15+ yr
- 10-14 yr
- 5-9 yr
- 1-4 yr

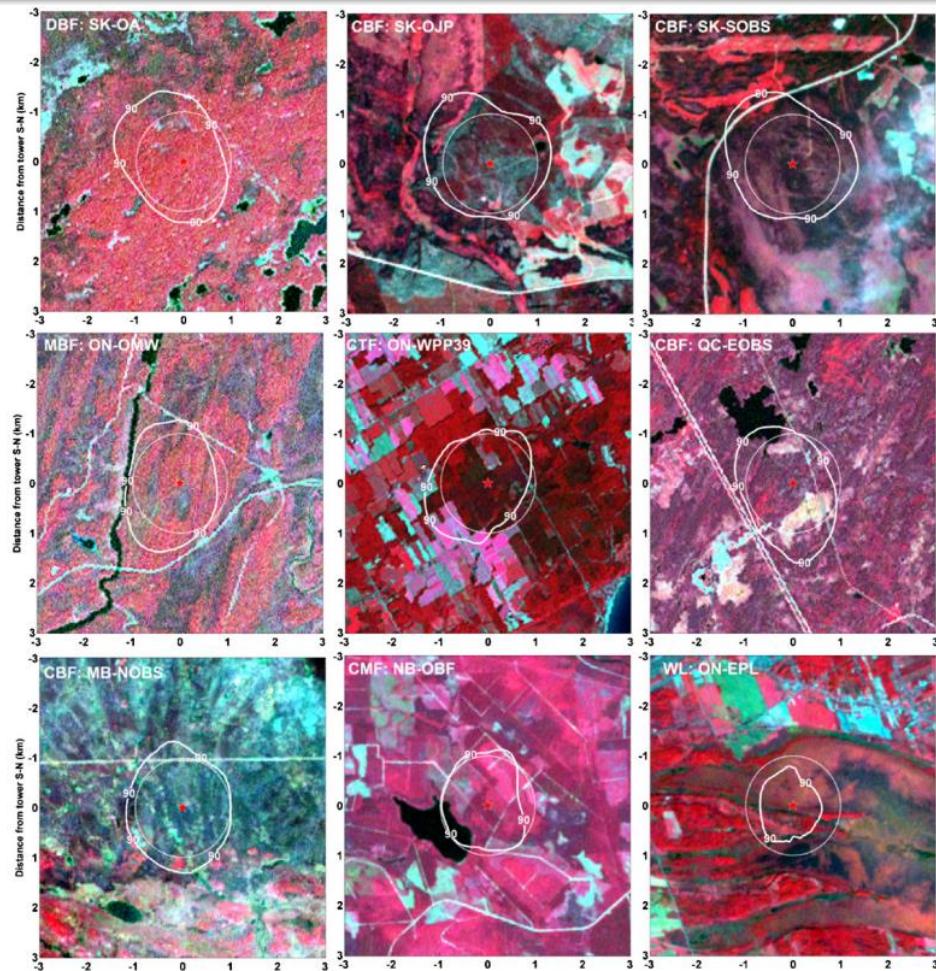
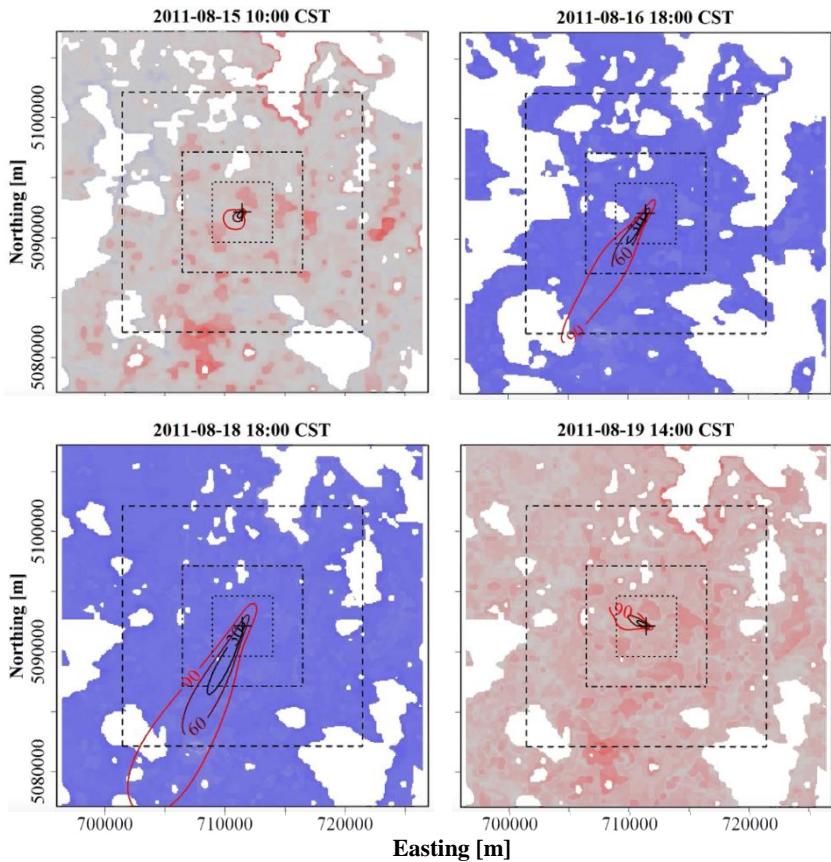
- 15+ yr
- 10-14 yr
- 5-9 yr
- 1-4 yr

Flux Everywhere, All of the Time ?

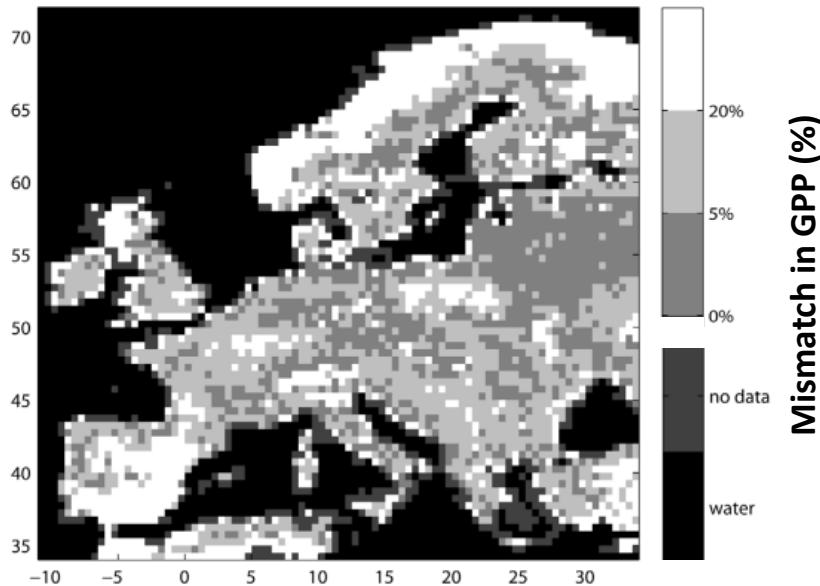
- Footprint-to-Grid Representativeness ??
- Grid-to-Grid Representativeness ?
- Temporal Representativeness ??
- Functional Parameter / Response Function ???



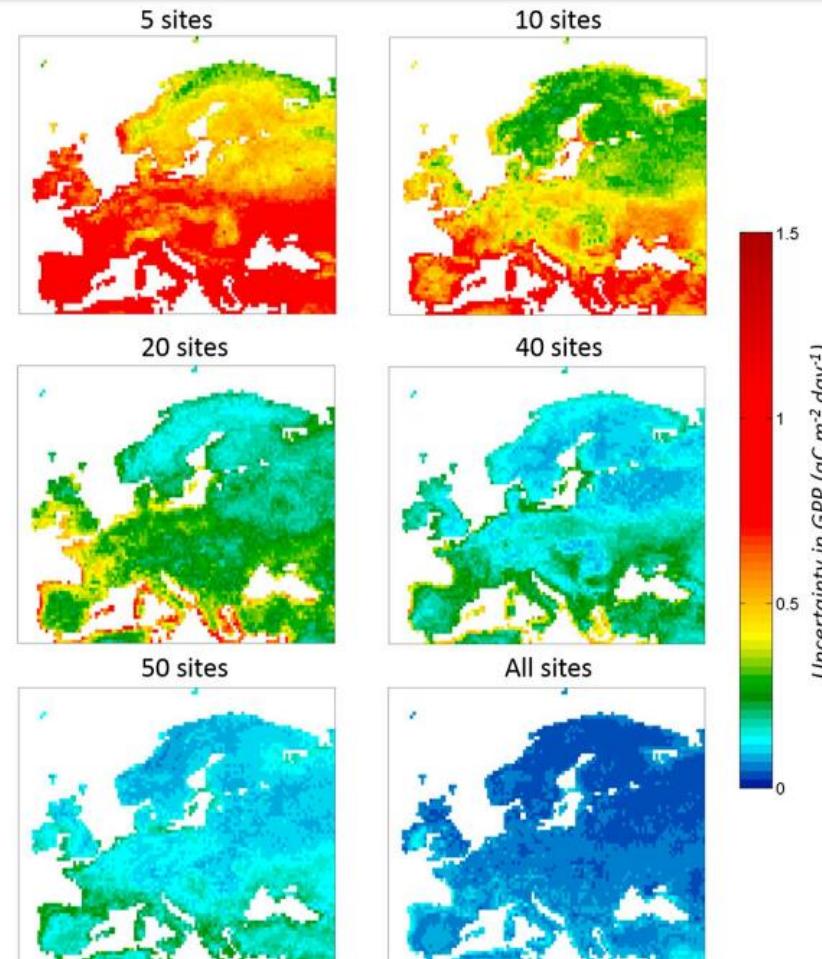
Footprint-to-Grid Representativeness

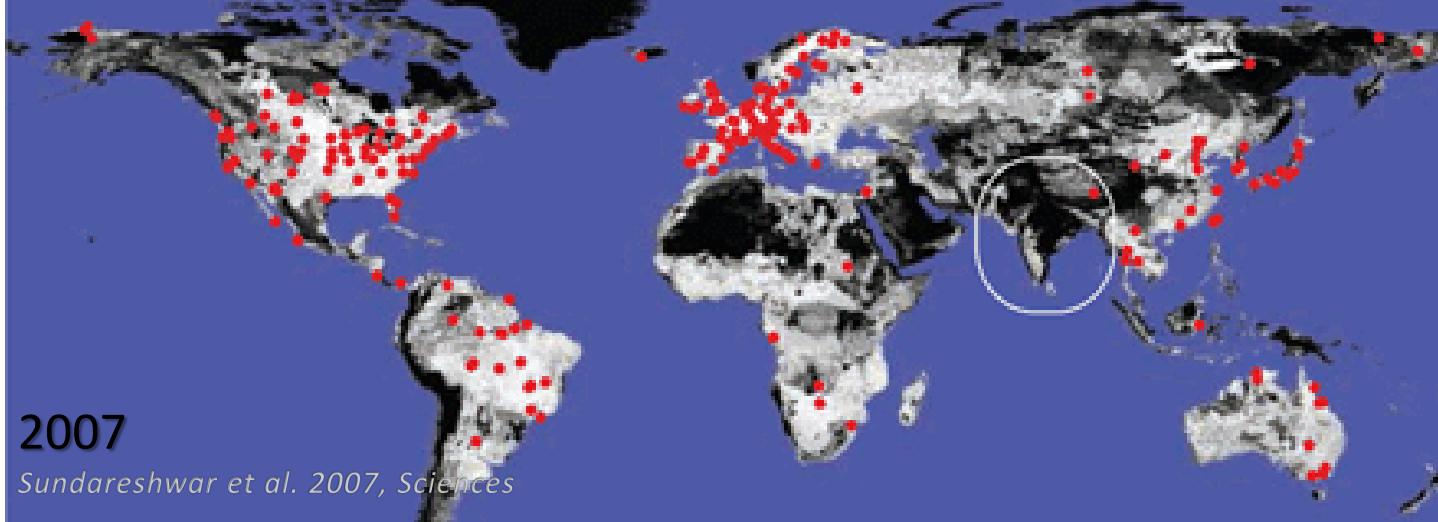


Grid-to-Grid Representativeness



Mismatch in GPP (%)



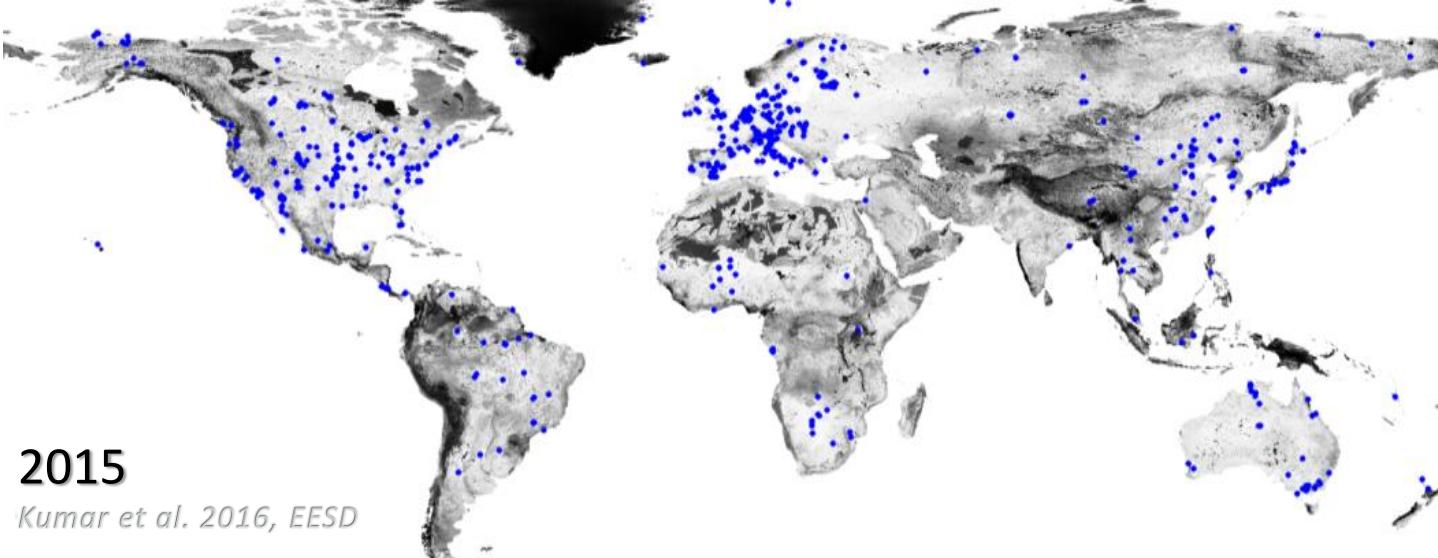


Driver-based
Representativeness

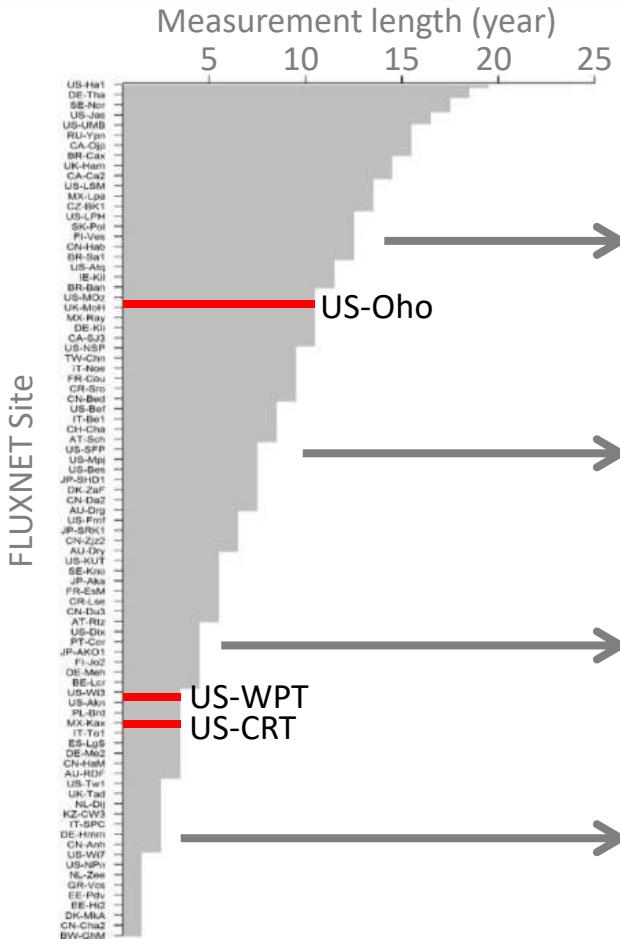
Well
represented

Poorly
represented

● ● FLUXNET sites



Temporal Representativeness

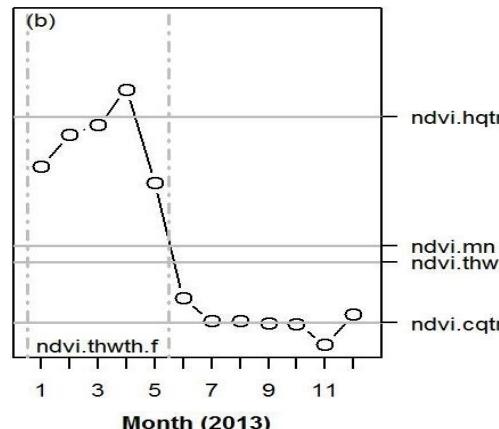


Driver-based Representativeness

(Hargrove et al. 2003; Sulkava et al., 2011)

CRU TS, ERA-Interim, GIMMS (1982-2013)

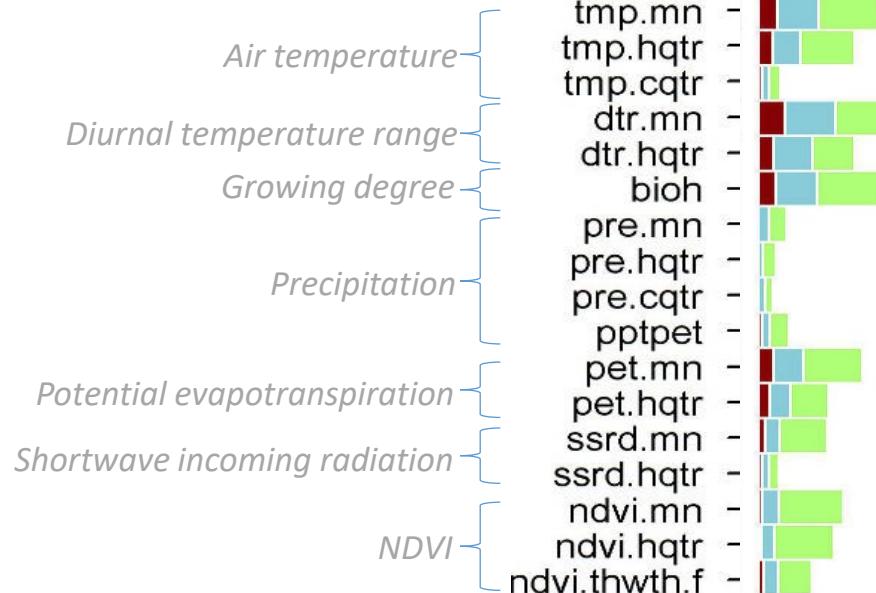
- Air temperature (tmp)
- Precipitation (pre)
- Diurnal temperature range (dtr)
- Potential evapotranspiration (pet)
- Shortwave incoming radiation (ssrd)
- Normalized Difference Vegetation Index (ndvi)

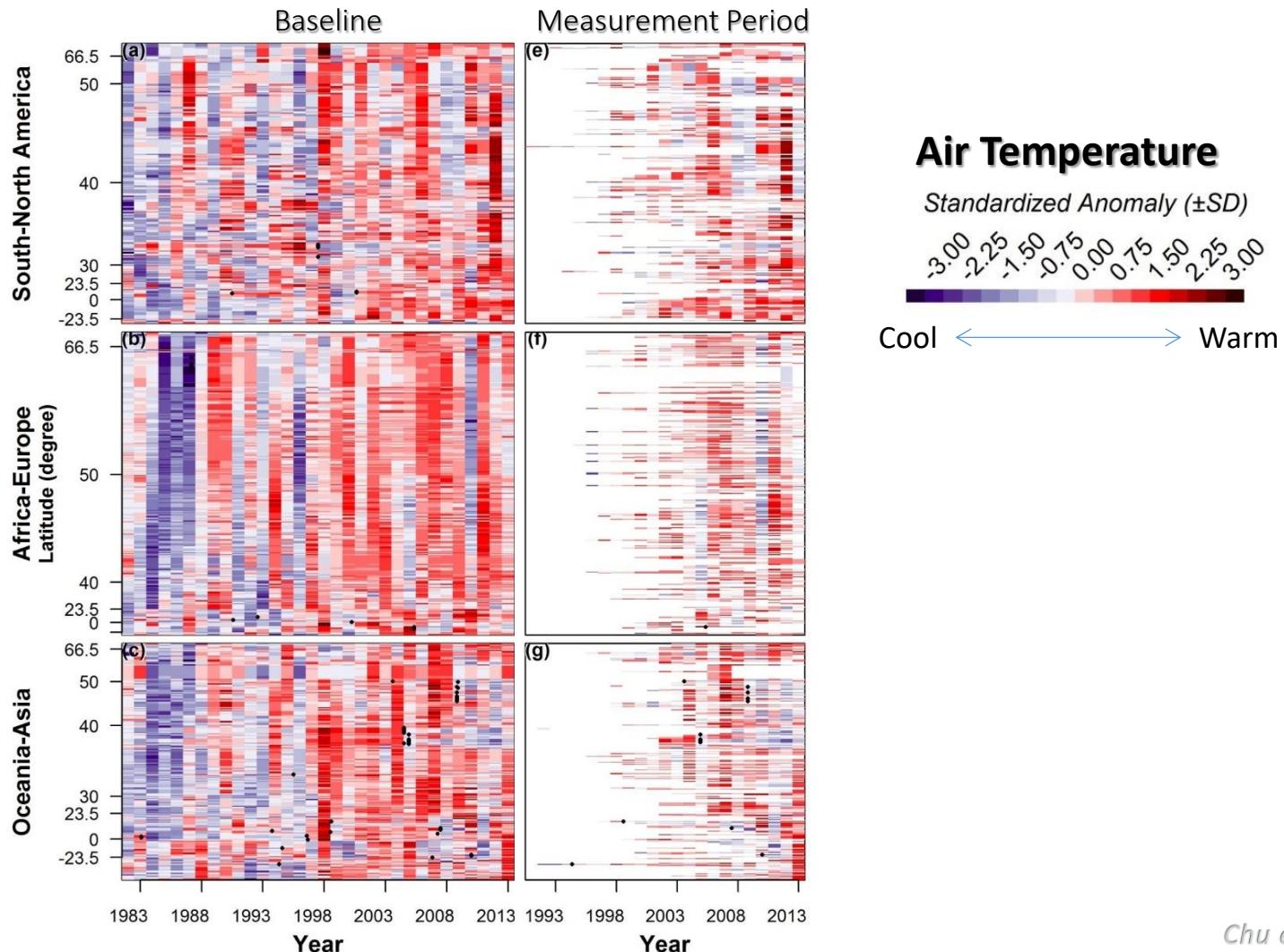


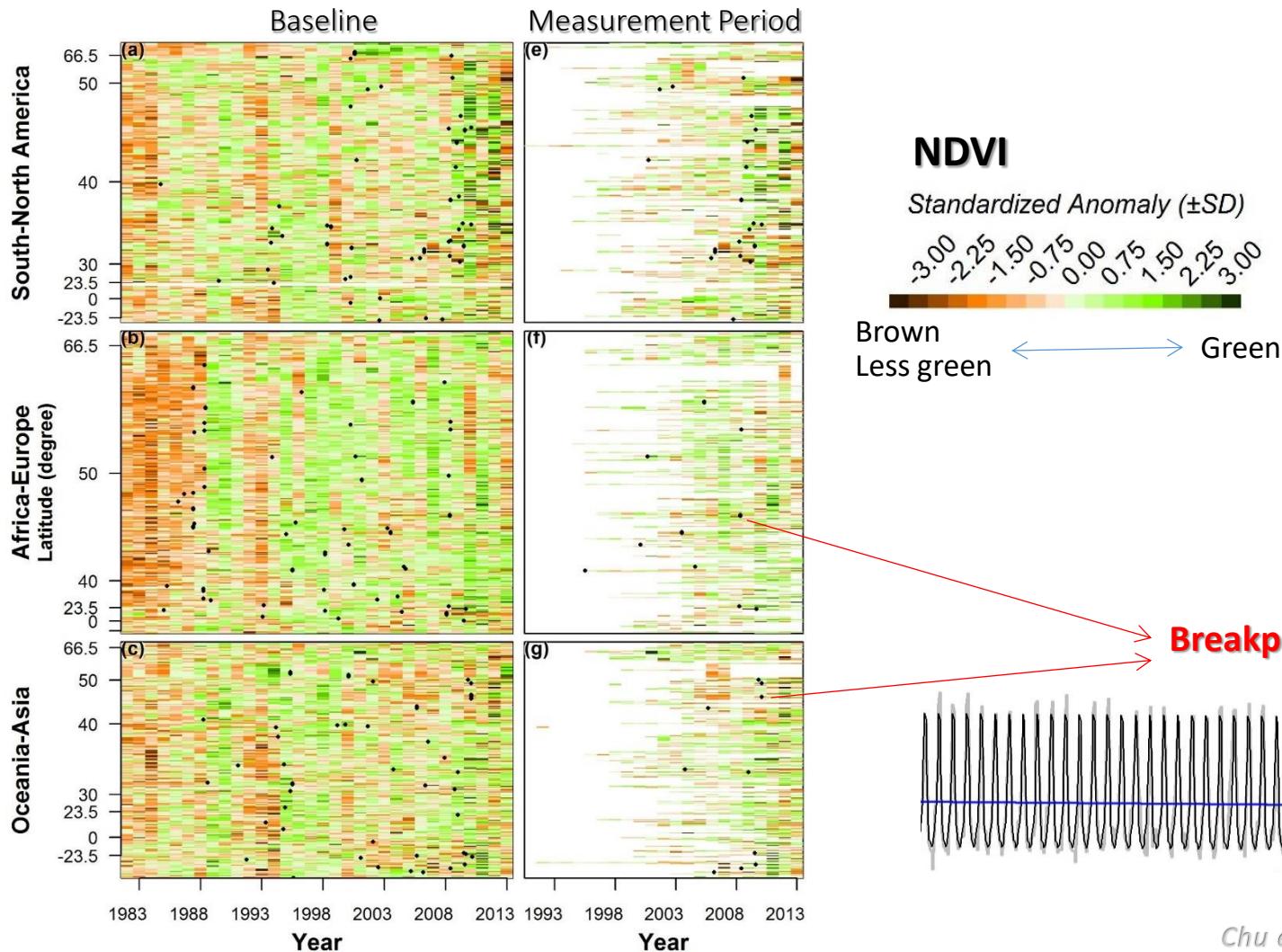
Univariate Analysis

– Equality of Means & Variance

- unequal mean only
- unequal variance only
- unequal mean and variance

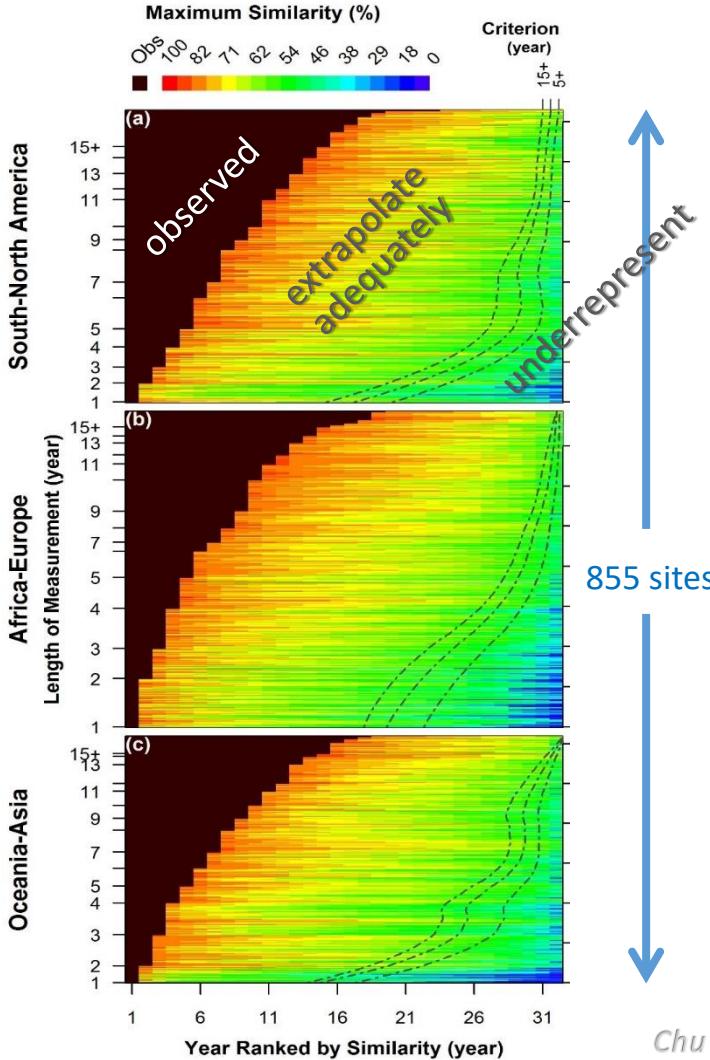
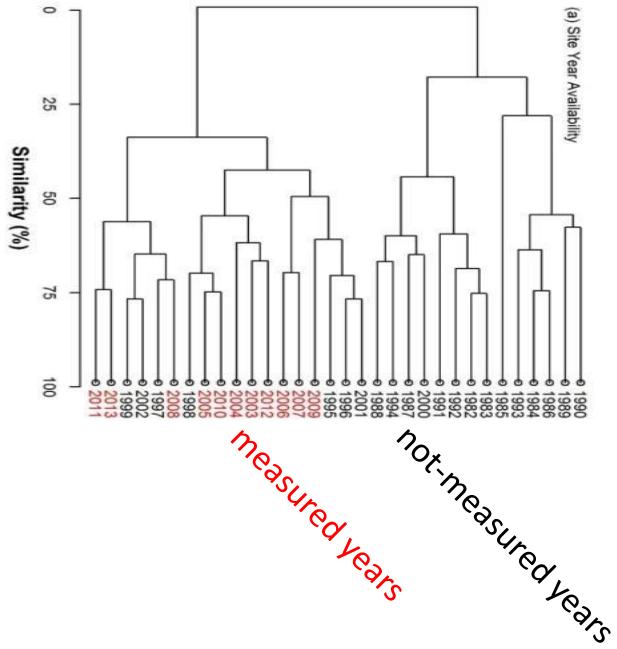




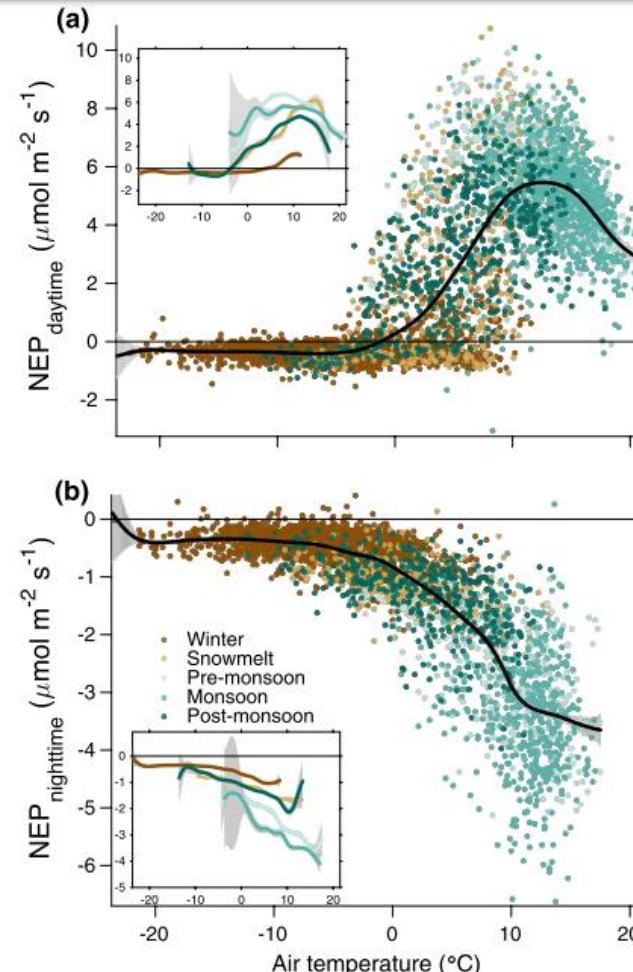
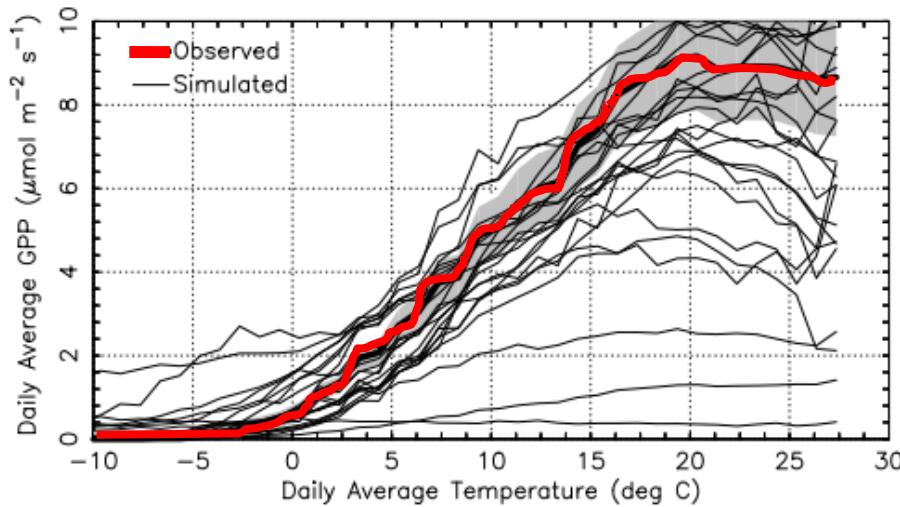


Multivariate Cluster Analysis

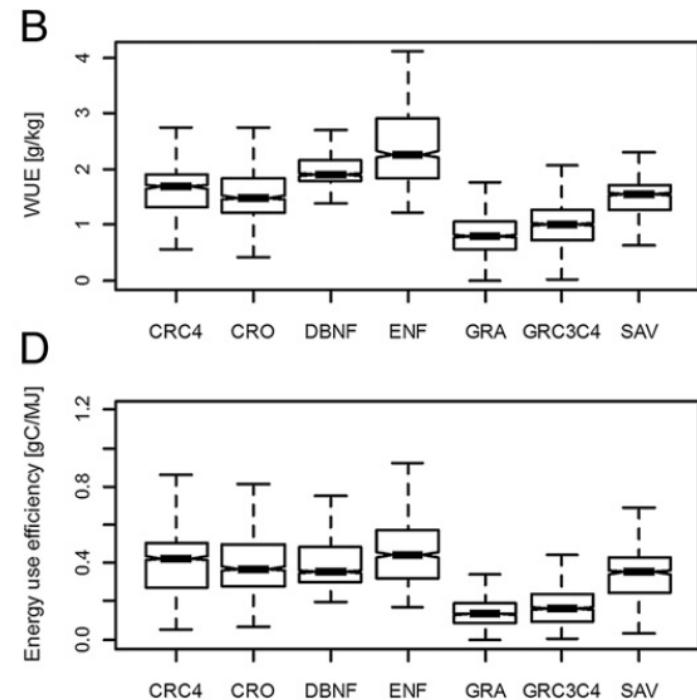
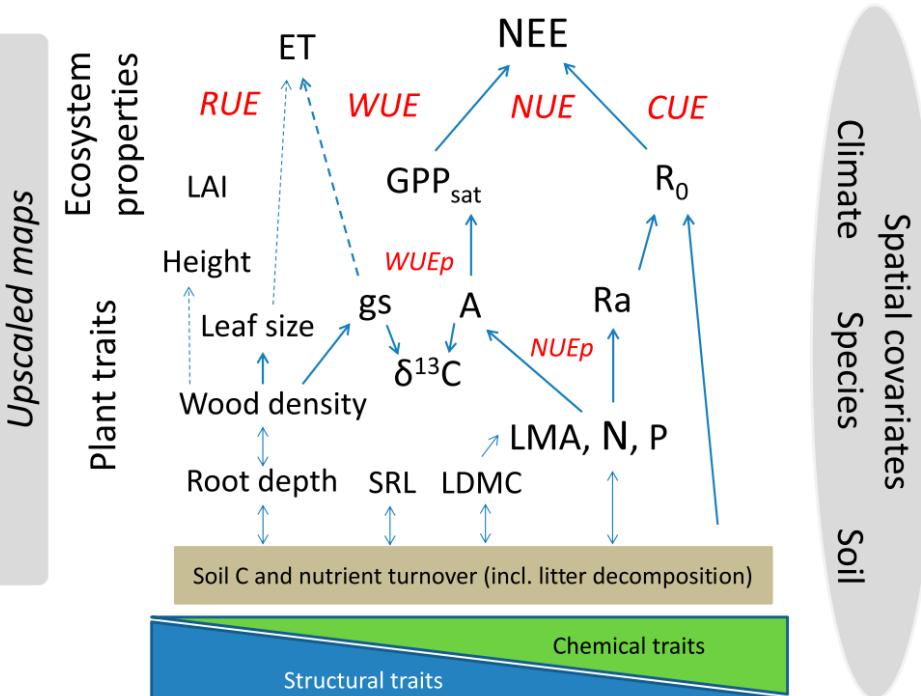
– Similarity in Multidimensional Space



Response Function



Functional Parameter

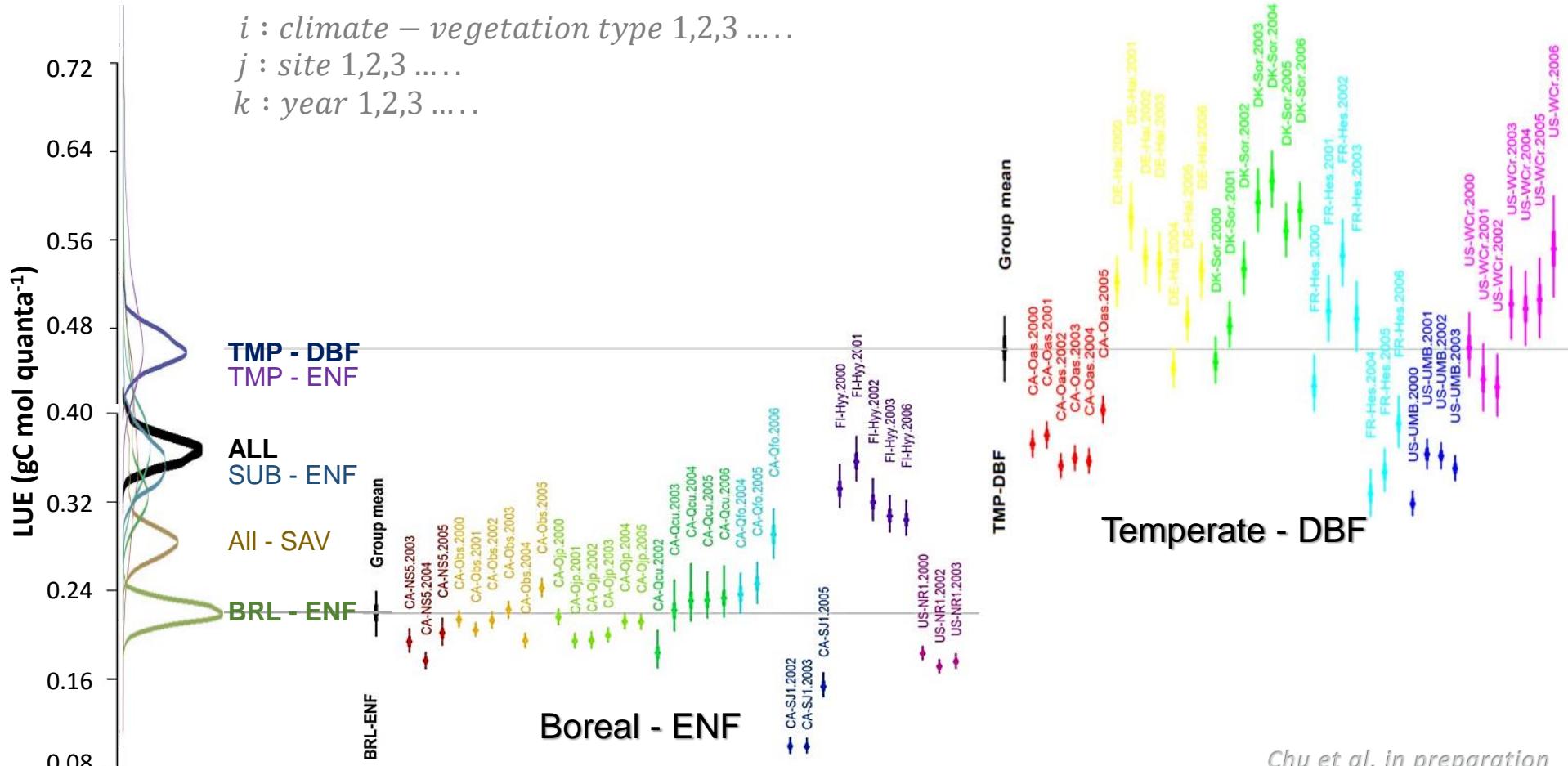


$$GPP_{ijk} = LUE_{ijk} \cdot \varphi_{ij}(T_a) \cdot \varphi_{ij}(VPD) \cdot \varphi_{ij}(T_s) \cdot f(LAI, PPFD)$$

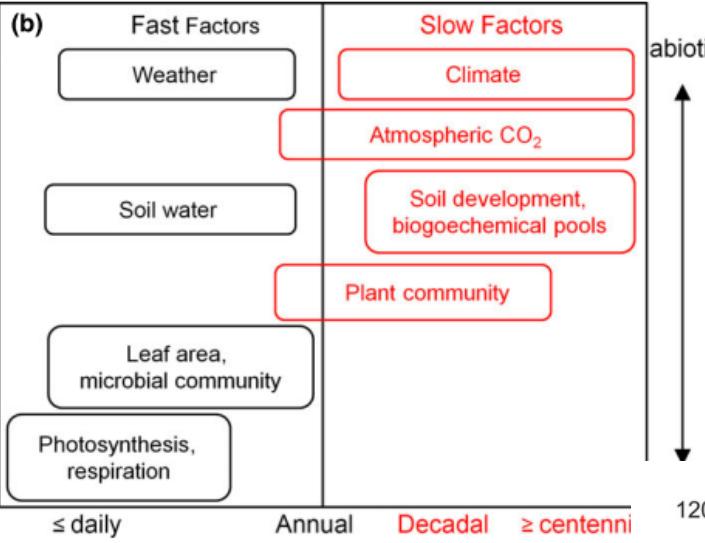
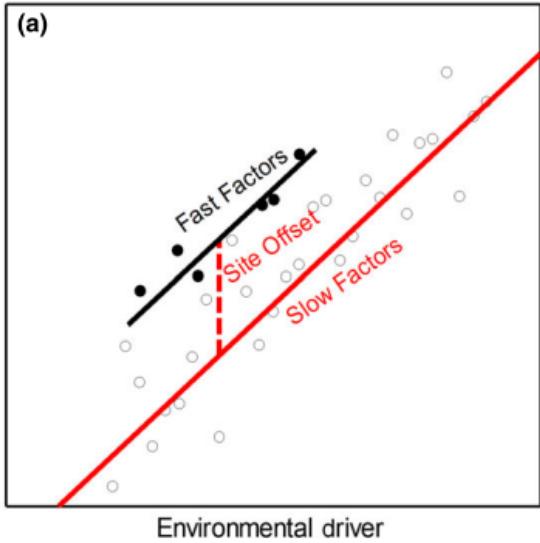
i : climate – vegetation type 1,2,3

j : site 1,2,3

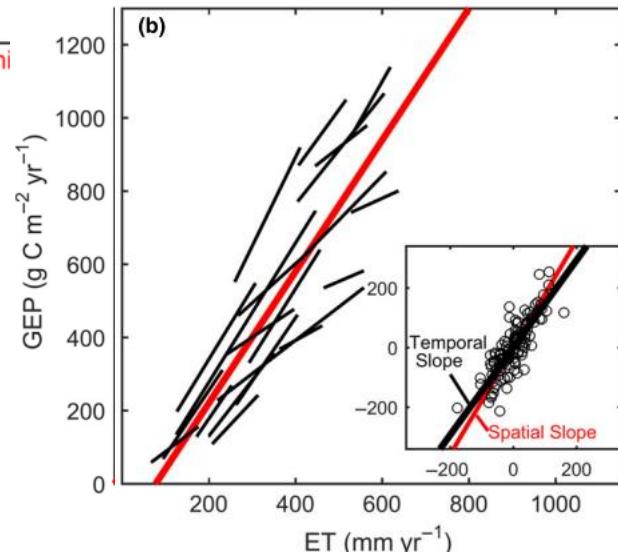
k : year 1,2,3

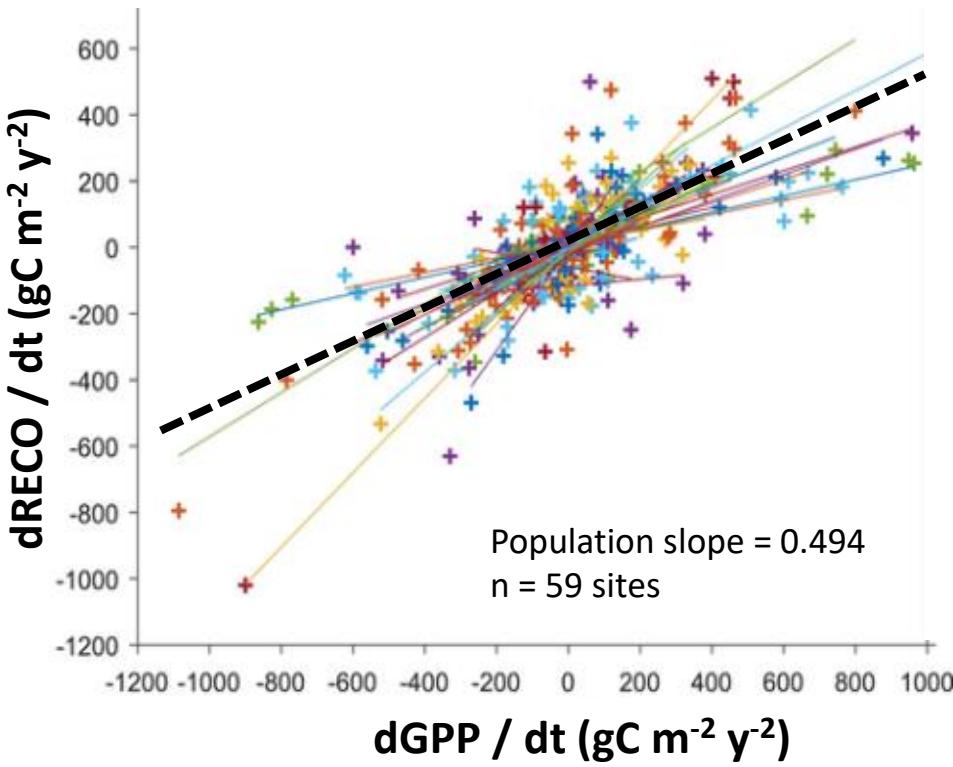
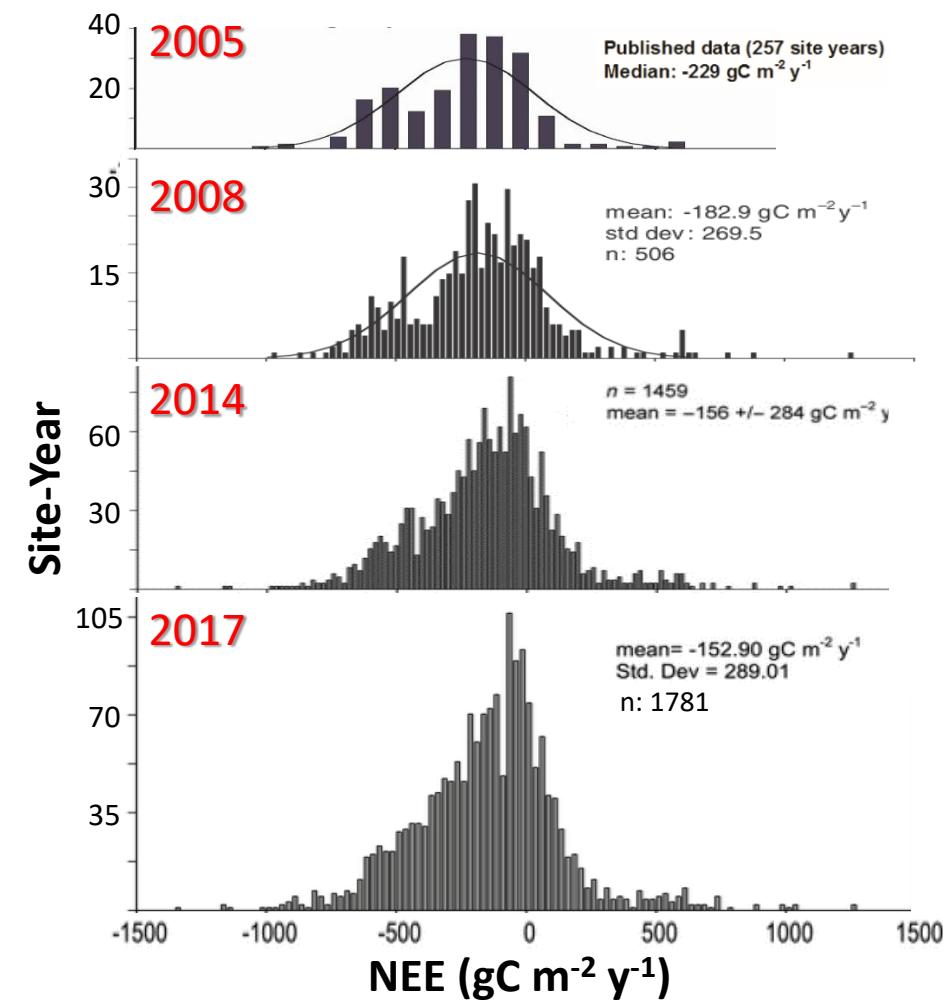


CO₂ Flux



Space-for-Time Substitution?





Baldocchi 2008, 2014; Baldocchi et al., 2017 AGFM

Acknowledgements

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Berkeley
UNIVERSITY OF CALIFORNIA



BERKELEY LAB



OAK RIDGE
National Laboratory

Oz Flux

ICOS
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