2017 Dragon 4 Symposium, Copenhagen

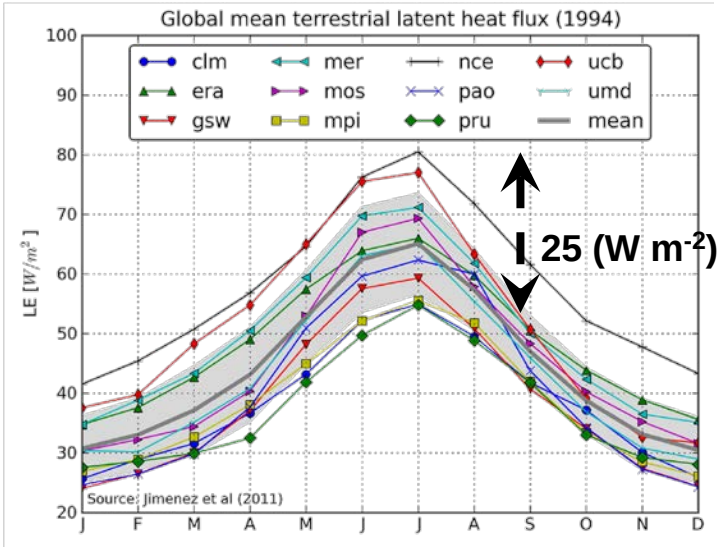
High resOlution Land Atmosphere surface Parameters from Space (HOLAPS)

Jian Peng, Alexander Loew

University of Munich
Max Planck Institute for Meteorology

Background

Uncertainties in global ET estimates



Jiménez et al., (2011)

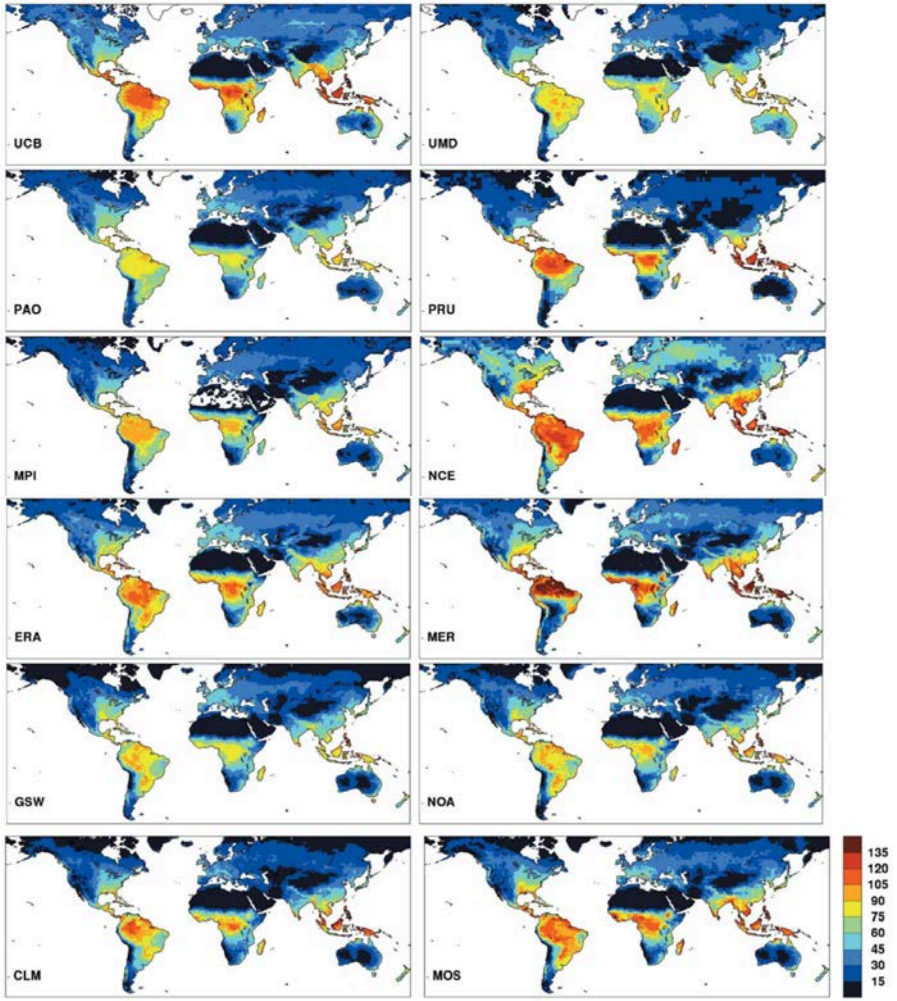


Figure 2. The 1994 yearly averaged Q_{le} (W m^{-2}).

Background

Activities in deriving global ET products

1: GEWEX LandFlux (Global Energy and Water Cycle Experiment)

2: WACMOS (European Space Agency Water Cycle Observation Multi-mission Strategy project)

Simulate and intercompare evaporation models to identify algorithms appropriate for developing a global flux product

1. Penman-Monteith (MODIS)
2. Pristley-Taylor equation (JPL)
3. SEBS (surface energy balance system)
4. Global Land Evaporation Amsterdam Model (GLEAM)

Background

Agricultural and Forest Meteorology 187 (2014) 46–61

Contents lists available at ScienceDirect

Agricultural and Forest Meteorology

journal homepage: www.elsevier.com/locate/agrformet

Multi-site evaluation of terrestrial evaporation models using FLUXNET data

A. Ershadi[a,*], M.F. McCabe[b], J.P. Evans[c,d], N.W. Chaney[e], E.F. Wood[e]

[a] School of Civil & Environmental Engineering, University of NSW, Sydney, NSW, Australia
[b] Water Desalination and Reuse Centre, King Abdullah University of Science and Technology (KAUST), Jeddah, Saudi Arabia
[c] ARC Centre of Excellence for Climate Systems Science, University of NSW, Sydney, Australia
[d] Climate Change Research Centre, University of NSW, Sydney, Australia
[e] Department of Civil and Environmental Engineering, Princeton University, Princeton, NJ, USA

Geosci. Model Dev., 9, 283–305, 2016
www.geosci-model-dev.net/9/283/2016/
doi:10.5194/gmd-9-283-2016

Geoscientific Model Development

The GEWEX LandFlux project: evaluation of model evaporation using tower-based and globally gridded forcing data

M. F. McCabe[1], A. Ershadi[1], C. Jimenez[2], D. G. Miralles[3], D. Michel[4], and E. F. Wood[5]

[1]Division of Biological and Environmental Sciences and Engineering, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
[2]Estellus, Paris, France
[3]Department of Earth Sciences, VU University Amsterdam, Amsterdam, the Netherlands
[4]Institute for Atmospheric and Climate Sciences, ETH Zurich, Zurich, Switzerland
[5]Department of Civil and Environmental Engineering, Princeton University, Princeton, NJ, USA

The validation experiments against in situ measurements indicate that there is no single best-performing algorithm across all biomes and climate conditions!

Hydrol. Earth Syst. Sci., 20, 803–822
www.hydrol-earth-syst-sci.net/20/803
doi:10.5194/hess-20-803-2016

The WACMOS-ET project – Part 1: Tower-scale evaluation of four remote-sensing-based evapotranspiration algorithms

D. Michel[1], C. Jiménez[2,3], D. G. Miralles[4,5], M. Jung[6], M. Hirschi[1], A. Ershadi[7], B. Martens[5], M. F. McCabe[7], J. B. Fisher[8], Q. Mu[9], S. I. Seneviratne[1], E. F. Wood[10], and D. Fernández-Prieto[11]

[1]Institute for Atmospheric and Climate Science, ETH Zürich, Zürich, Switzerland
[2]Estellus, Paris, France
[3]LERMA, Paris Observatory, Paris, France
[4]Department of Earth Sciences, VU University Amsterdam, Amsterdam, the Netherlands
[5]Laboratory of Hydrology and Water Management, Ghent University, Ghent, Belgium
[6]Max Planck Institute for Biogeochemistry, Jena, Germany
[7]Division of Biological and Environmental Sciences and Engineering, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
[8]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA
[9]Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, Montana, USA
[10]Department of Civil and Environmental Engineering, Princeton University, Princeton, New Jersey, USA
[11]ESRIN, European Space Agency, Frascati, Italy

Correspondence to: D. Michel (dominik.michel@env.ethz.ch)

The WACMOS-ET project – Part 2: Evaluation of global terrestrial evaporation data sets

D. G. Miralles[1,2], C. Jiménez[3], M. Jung[4], D. Michel[5], A. Ershadi[6], M. F. McCabe[6], M. Hirschi[5], B. Martens[2], A. J. Dolman[1], J. B. Fisher[7], Q. Mu[8], S. I. Seneviratne[5], E. F. Wood[9], and D. Fernández-Prieto[10]

[1]Department of Earth Sciences, VU University Amsterdam, Amsterdam, the Netherlands
[2]Laboratory of Hydrology and Water Management, Ghent University, Ghent, Belgium
[3]Estellus, Paris, France
[4]Max Planck Institute for Biogeochemistry, Jena, Germany
[5]Institute for Atmospheric and Climate Science, ETH Zurich, Zurich, Switzerland
[6]Division of Biological and Environmental Sciences and Engineering, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
[7]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA
[8]Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, Montana, USA
[9]Department of Civil and Environmental Engineering, Princeton University, Princeton, New Jersey, USA
[10]ESRIN, European Space Agency, Frascati, Italy

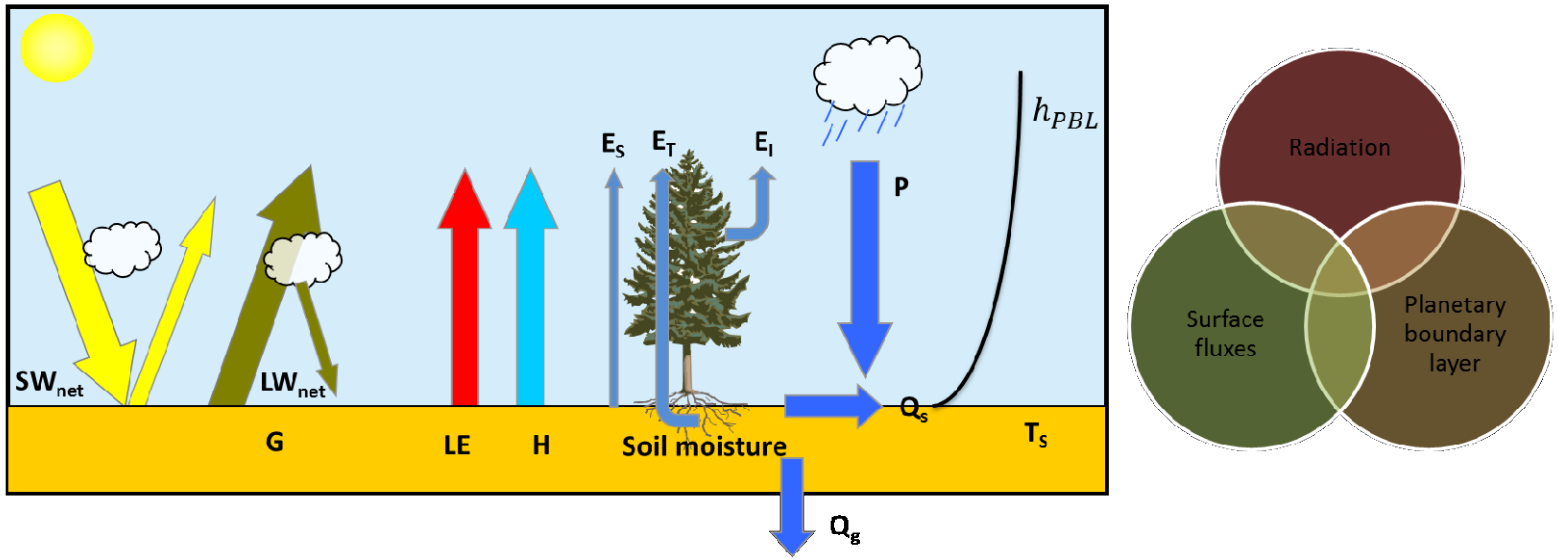
Correspondence to: D. G. Miralles (diego.miralles@vu.nl)

HOLAPS

High resOlution Land Atmosphere surface Parameters from Space (HOLAPS)

Loew et al., (2016), Peng et al., (2016)

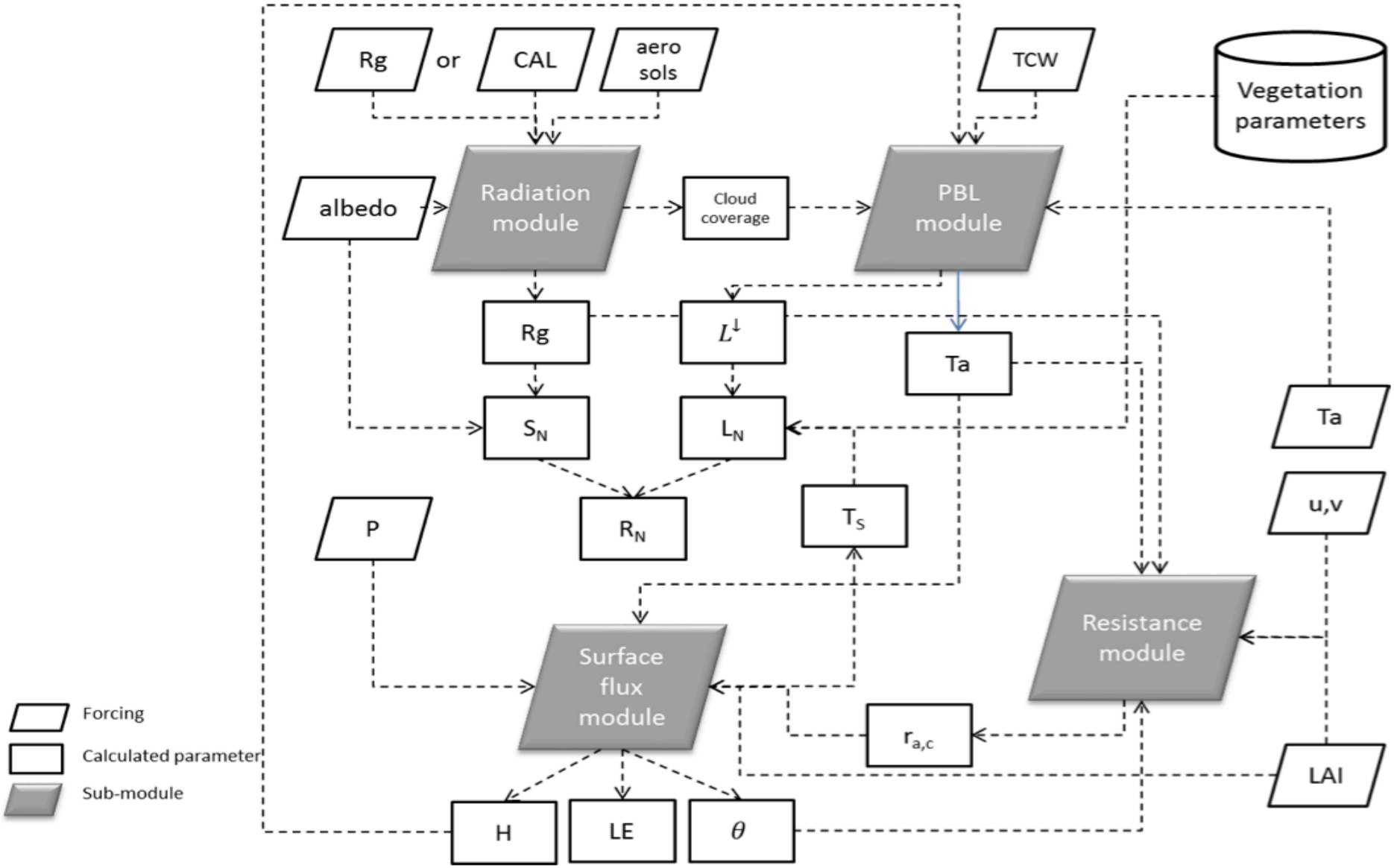
:



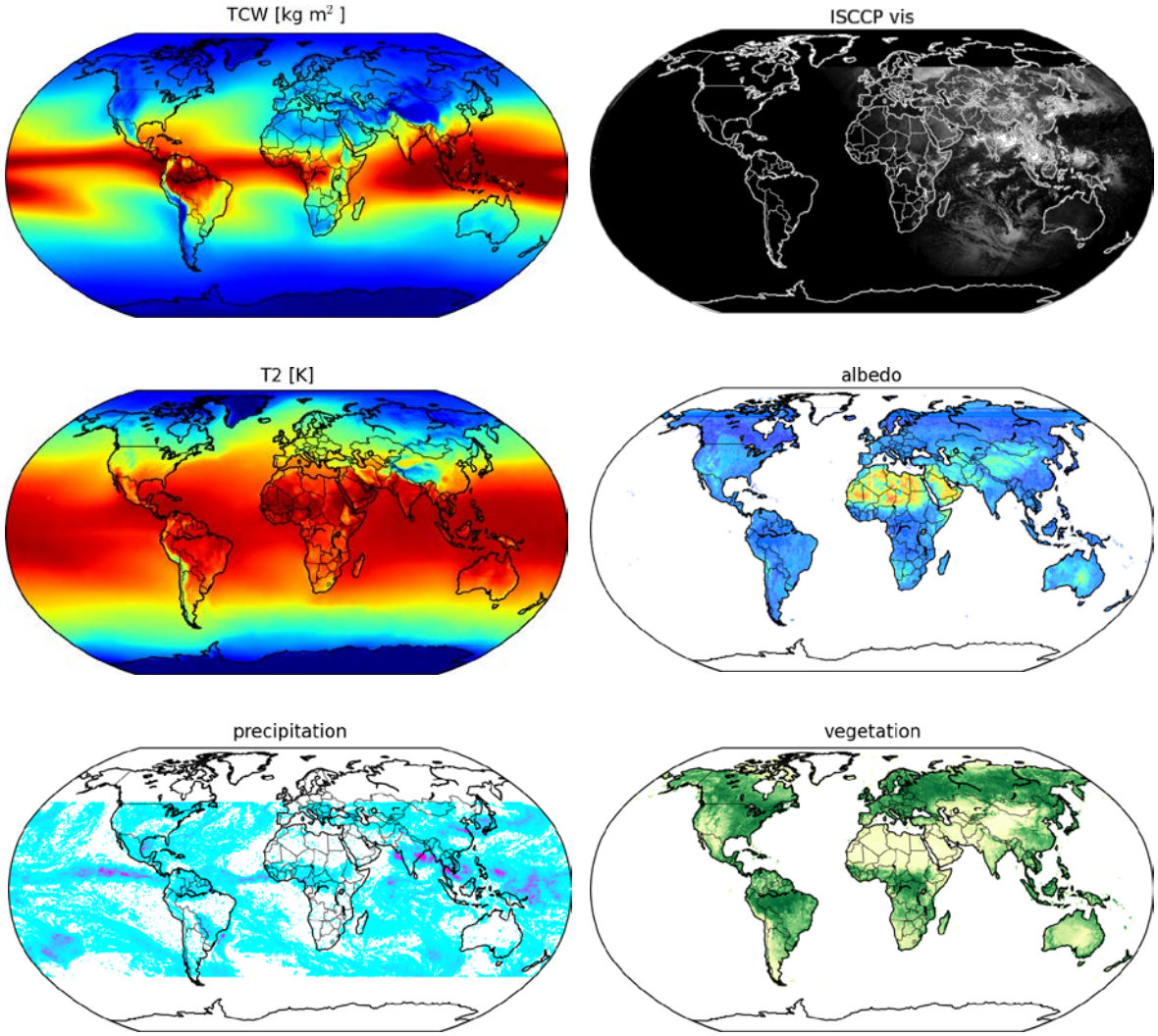
!

HOLAPS drivers and estimated surface fluxes and modules

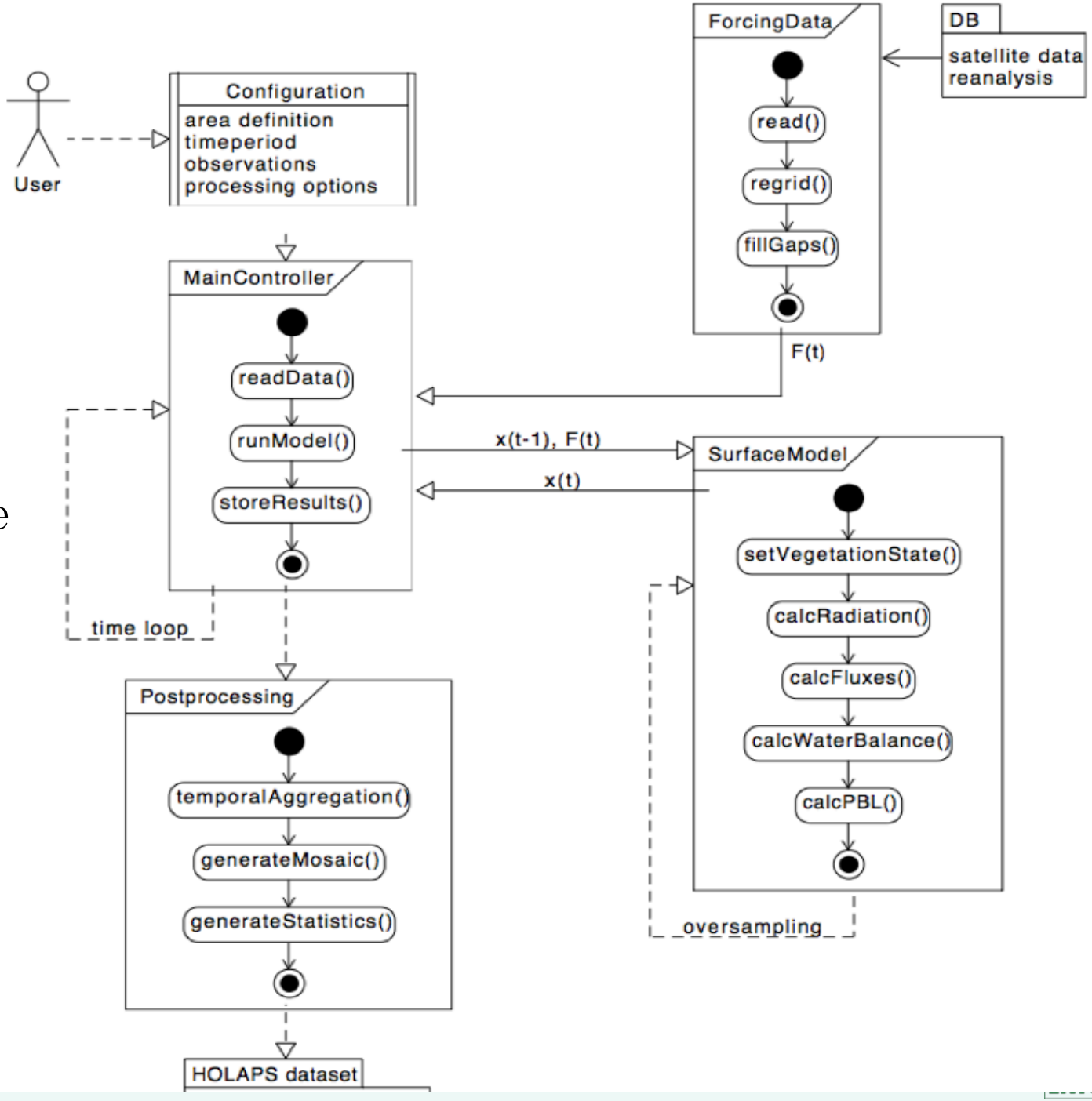
HOLAPS framework



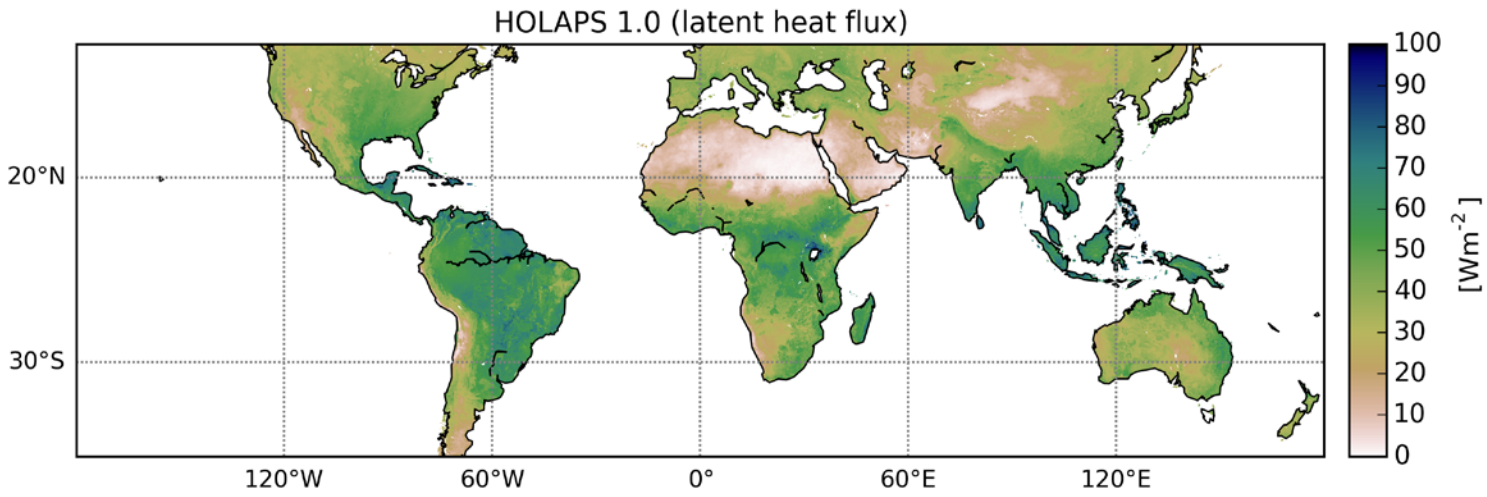
Main forcings



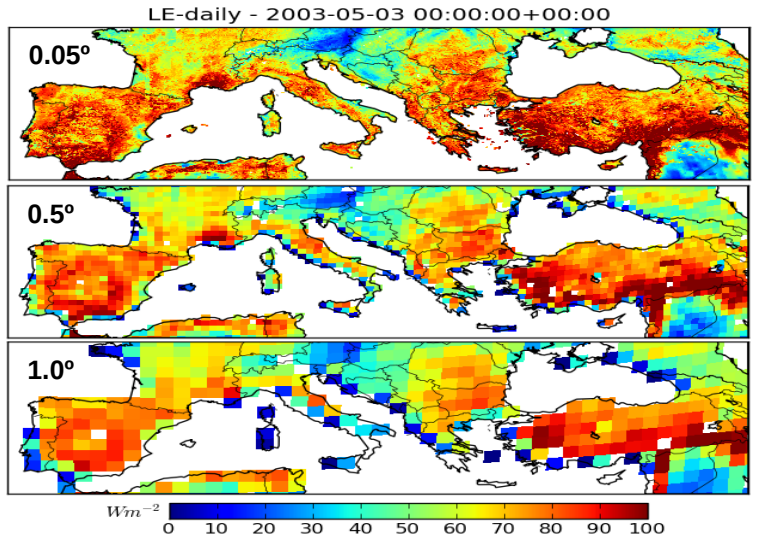
HOLAPS runtime environment



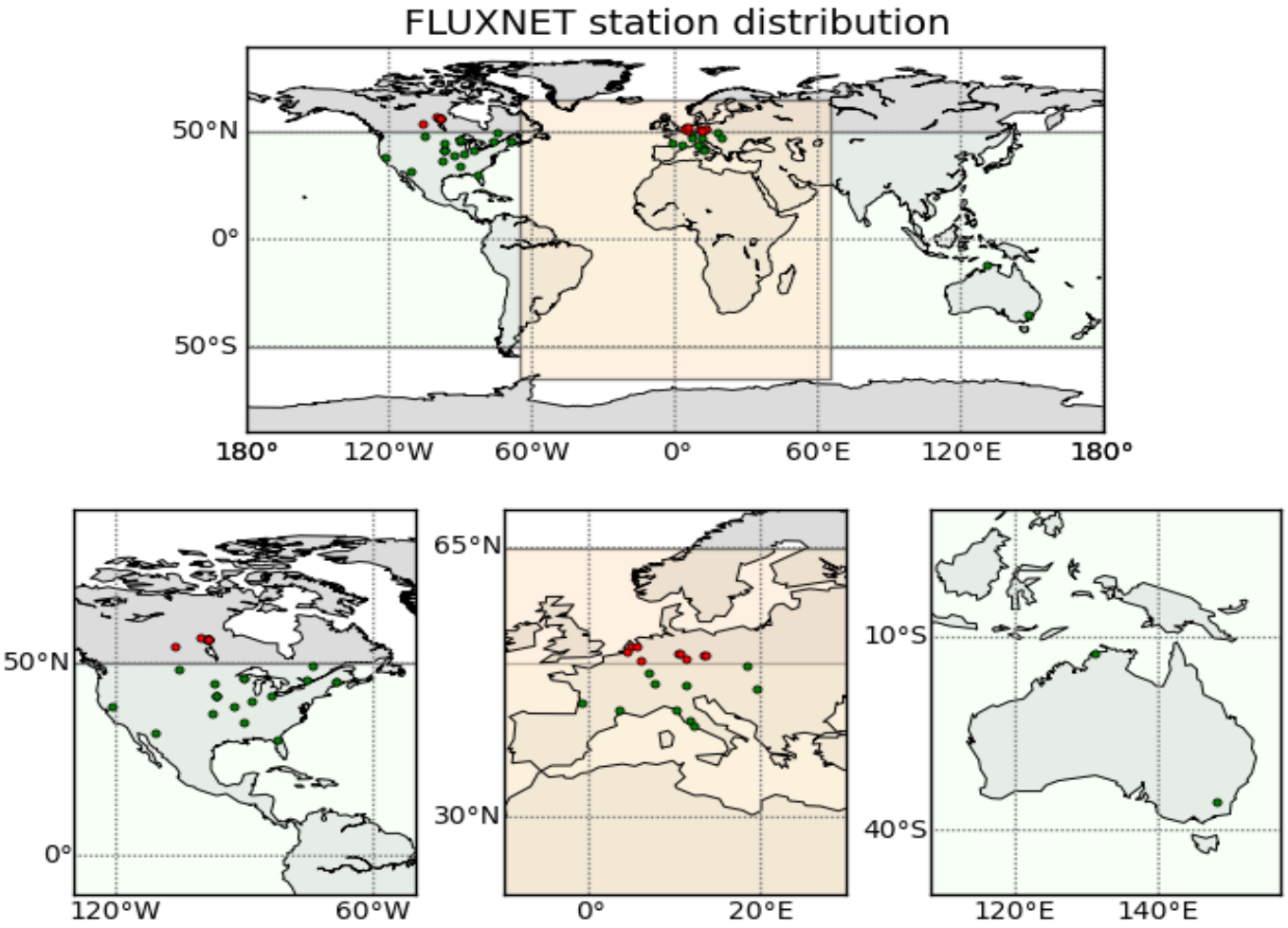
HOLAPS dataset V1.0



- Half hourly
- 5 km spatial resolution
- Cover time from 2001 - 2005



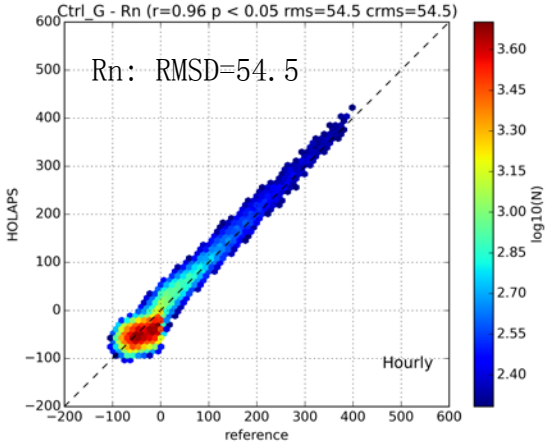
Evaluation and uncertainty assessment

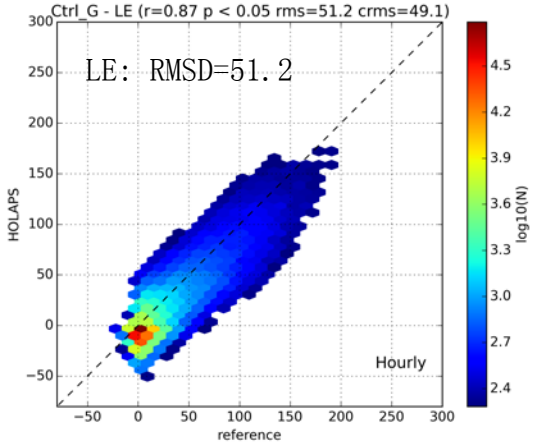


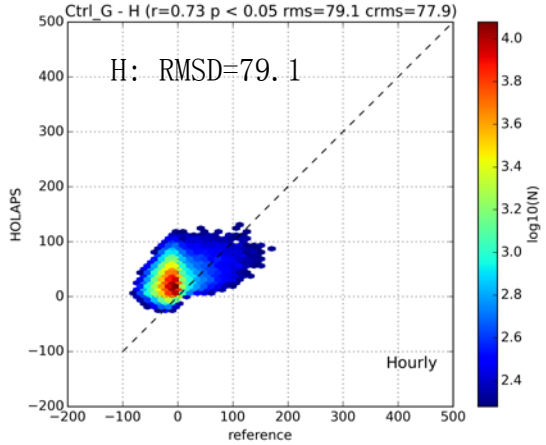
Experiments settings

Coverage	Experiment	Number of		Precipitation		Radiation		Temperature		Wind speed	
		stations	years	F	S	F	S	F	S	F	S
Global	CTRL_G	48	101	x		x		x		x	
Metosat disk	CTRL_M	19	37	x		x		x		x	
	METEOSAT_M	19	37	x			x	x		x	
	GRIDSAT_M	19	37	x			x	x		x	
Global	GRIDSAT_G	48	101	x			x	x		x	
±50°	CTRL_50	30	61	x		x		x		x	
	GRIDSAT_50	30	61	x			x	x		x	
	Tmpa_50	30	61		x	x		x		x	
	Ta_50	30	61	x		x			x	x	
	Wind_50	30	61	x		x		x			x
Metosat disk & ±50°	CTRL_M_50	10	17	x		x		x		x	
	METEOSAT_M_50	10	17		x		x		x		x
	GRIDSAT_M_50	10	17		x		x		x		x

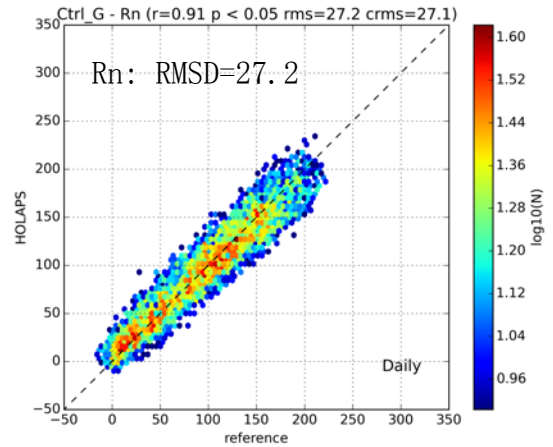
Validation results: Ctrl_G

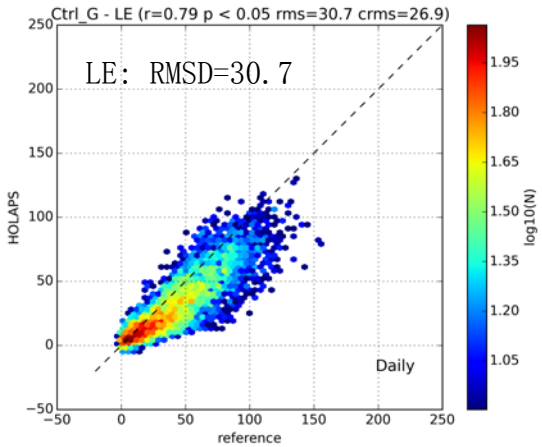


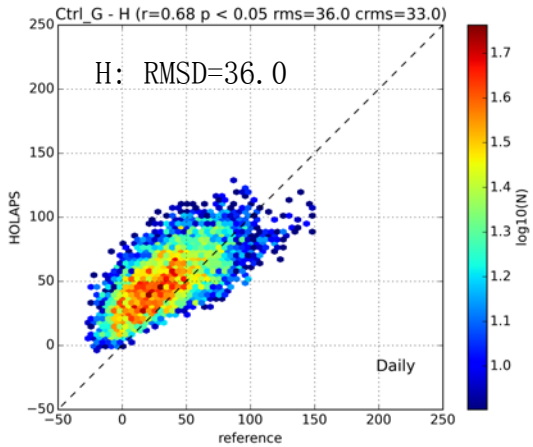




Hourly

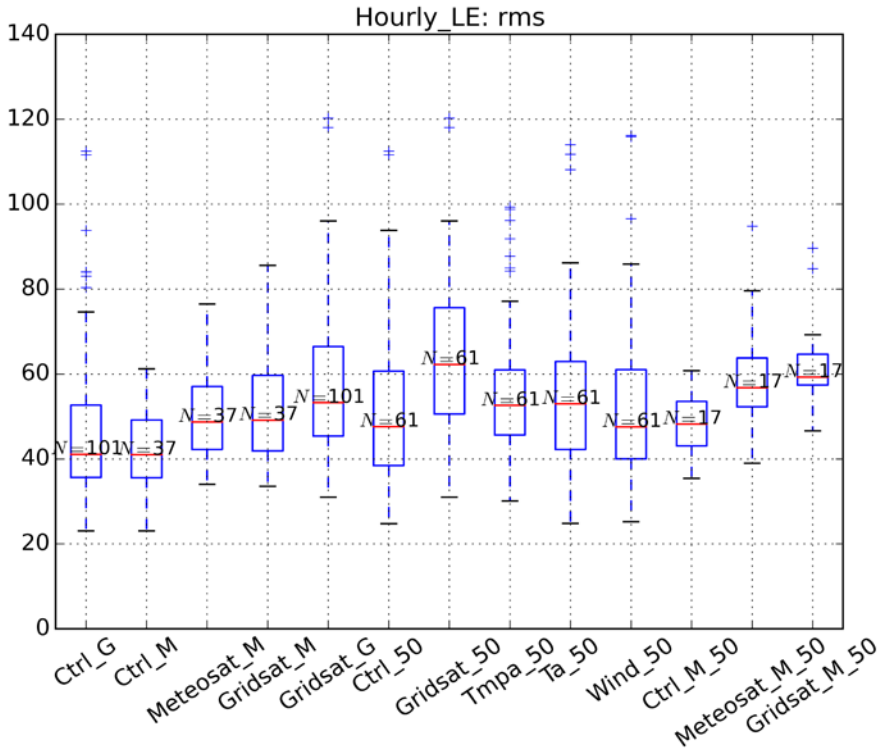


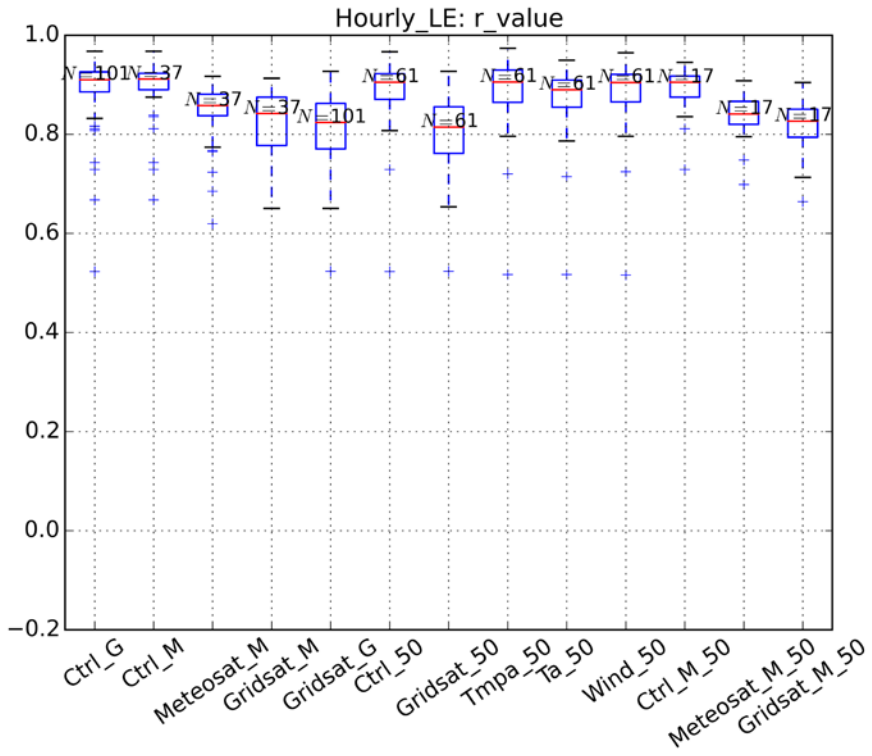




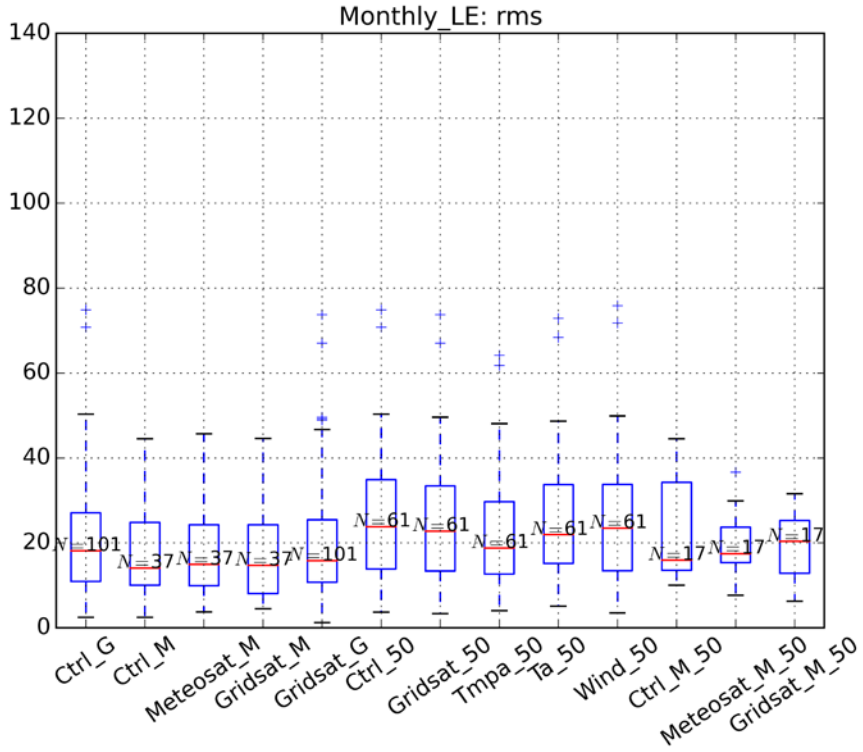
Daily

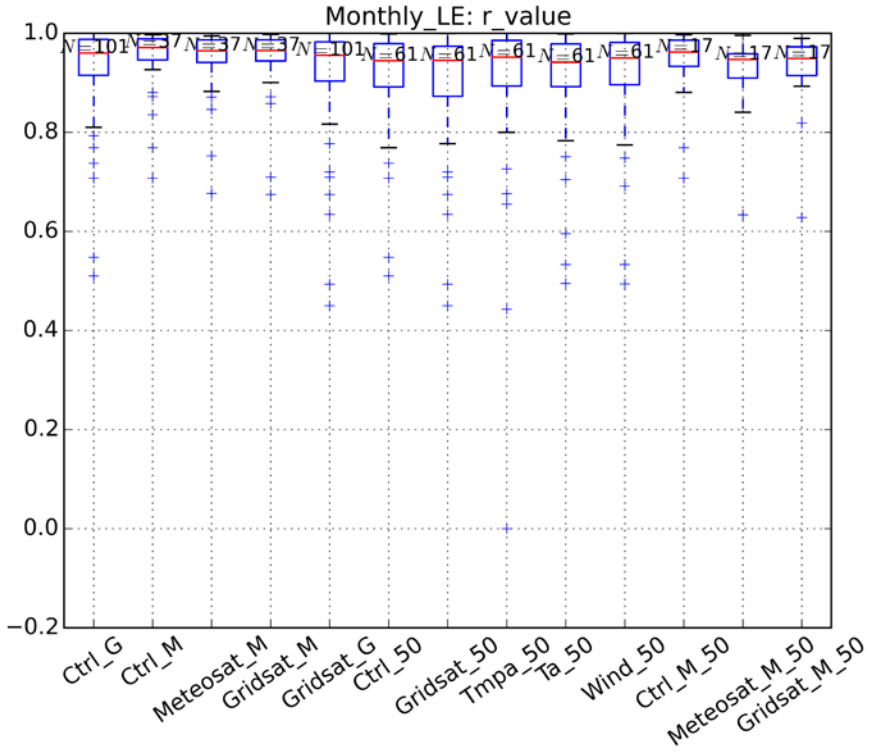
Validation results for all experiments



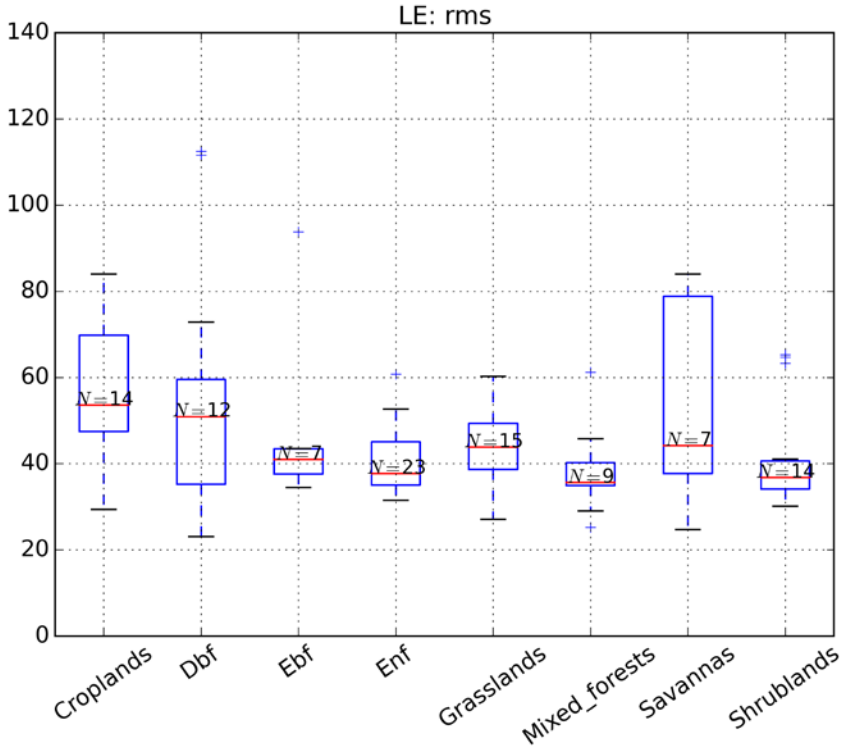


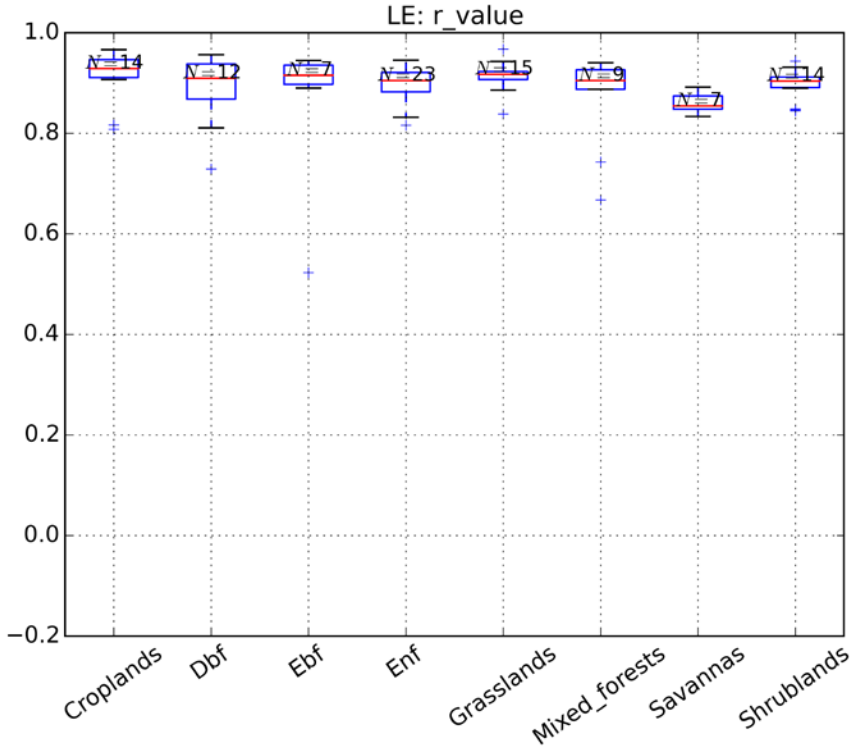
Validation results for all experiments



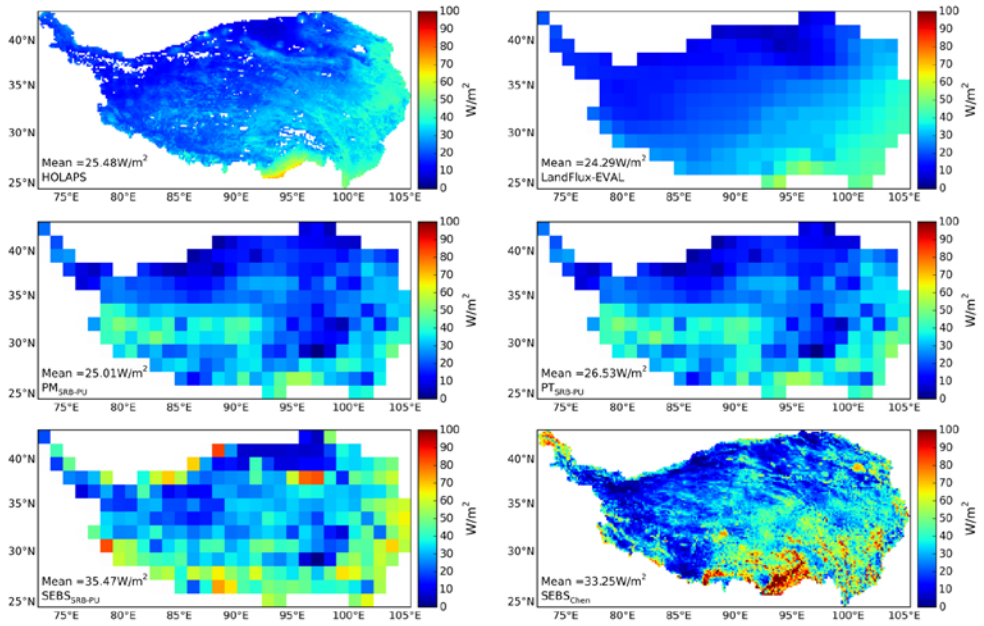


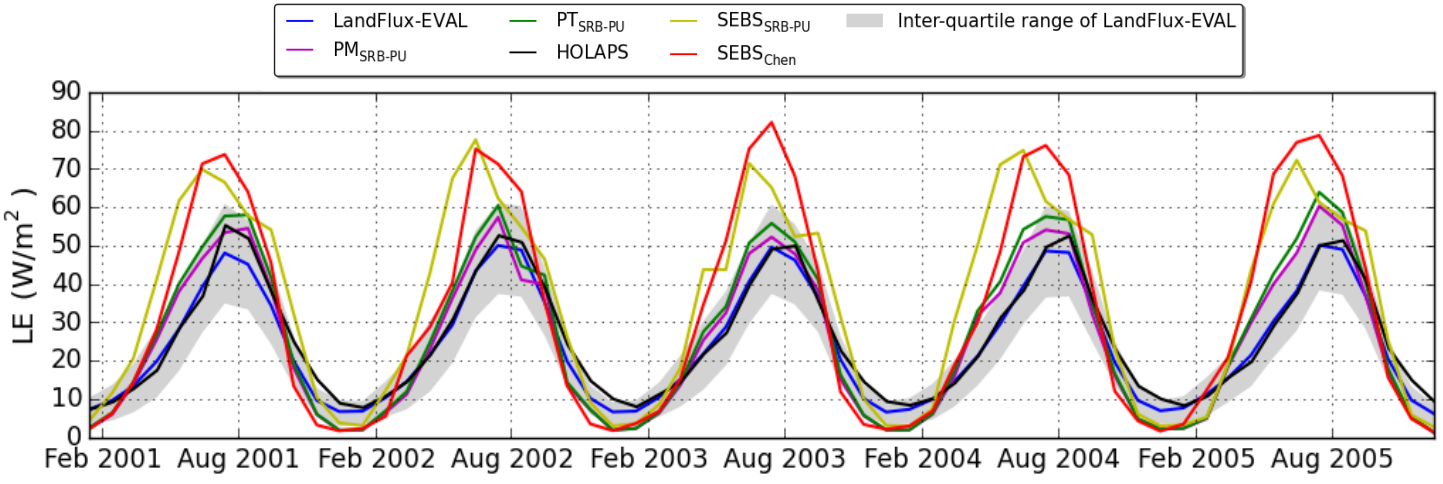
Validation results for all different biomes





Regional study--Tibetan Plateau





Summery

- HOLAPS will be further constrained by assimilating surface soil moisture and skin temperature from thermal data
- The ET schemes over water bodies and snow covered areas will be integrated into HOLAPS
- Constrained surface fluxes using a mixed boundary layer model in combination with the surface flux estimates
- Flexible framework for the generation of high-resolution land surface energy and water fluxes that allows one to use a multitude of different land surface schemes within the same framework.