

FLUXNET2015

Updating the Fluxnet data available for ORCHIDEE

Variables in LaThuile

Meteorological forcing data (needed to drive ORCHIDEE offline)

Tair	K	Near surface air temperature
Qair	kg/kg	Near Surface specific humidity
PSurf	Pa	Surface pressure
Wind_N	m/s	NS northward wind component
Wind_E	m/s	NS eastward wind component
Rainf	kg/m ² s	Rainfall rate
Snowf	kg/m ² s	Snowfall rate
SWdown	W/m ²	Surface incident shortwave radiation
LWdown	W/m ²	Surface incident longwave radiation

Quality checks: tair_qc, qair_qc, psurf_qc, wind_n_qc, Wind_e_qc, Rainf_qc, Snowf_qc, SWdown_qc, LWdown_qc

Fluxes

NEE	gC/m ² /tstep	Net Ecosystem Exchange
GPP	gC/m ² /tstep	Gross Primary Production
Reco	gC/m ² /tstep	Ecosystem Respiration
LE_f	W/m ²	Latent Heat Flux
H_f	W/m ²	Sensible Heat Flux
G_f	W/m ²	Soil Heat Flux
Ts1_f	degC	Soil Temperature (upper layer)
Ts2_f	degC	Soil Temperature (lower layer)
SWC1_f	VOL%	Soil Water Content (upper layer)
SWC2_f	VOL%	Soil Water Content (lower layer)
PPFD_f	umol m ⁻² s ⁻¹	Photosynthetic Photon Flux Density
Rn_f	W m ⁻² Net	Radiation
Epot_f	mm/hour	Potential Evapotranspiration
gsurf_f	mmol m ⁻² s ⁻¹	Canopy conductance
FAPAR%		Fraction of Absorbed Photosynthetically Active Radiation

Variables extracted from FLUXNET2015

The meteorological data was gap-filled by N. Vuichard for the whole 1989-2014 period. The relevant years of gap-filled data have been extract and combined with the Fluxnet data (data downloaded Feb 2019) to create netCDF files. The fluxes extracted are as follows:

NEE	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	Net Ecosystem Exchange	NEE_VUT_REF
GPP	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	Gross Primary Production	GPP_NT_VUT_REF
GPPalt	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	Gross Primary Production (DT)	GPP_DT_VUT_REF
Reco	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	Ecosystem Respiration	RECO_NT_VUT_REF
Recoalt	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	Ecosystem Respiration (DT)	RECO_DT_VUT_REF
[carbon]_se	$\text{gC.m}^{-2}.\text{tstep}^{-1}$	[carbon] standard error	*_SE (instead of REF)
LE_f	W.m^{-2}	Latent Heat Flux	LE_F_MDS
LE_fC	W.m^{-2}	Latent Heat Flux (corrected)	LE_CORR
H_f	W.m^{-2}	Sensible Heat Flux	LE_F_MDS
H_fC	W.m^{-2}	Sensible Heat Flux (corrected)	LE_CORR
G_f	W.m^{-2}	Soil Heat Flux	G_F_MDS,
Ts1_F	degC	Soil Temperature (1st layer)	TS_F_MDS_1
Ts#_f	degC	Soil Temperature (nth layer)	TS_F_MDS_#
SWC1_f	VOL%	Soil Water Content (1st layer)	SWC_F_MDS_1
SWC#_f	VOL%	Soil Water Content (nth layer)	SWC_F_MDS_#
PPFD_f	$\text{umol.m}^{-2}.\text{s}^{-1}$	Photosynthetic Photon Flux Density	PPFD_IN
Rn_F	W.m^{-2}	Net Radiation	NETRAD
CO2_f	$\text{umolCO}_2 \text{ mol}^{-1}$	CO2 mole fraction	CO2_F_MDS

Names and units kept as similar as possible to the LaThuile files.

Note Epot_f, gsurf_f and FAPAR are not in this new set.

About the “alternative” fluxes

CARBON

NT and DT stand for two different algorithms used to partition NEE.

Night data (NT, Reichstein et al 2005) are used to parameterize a respiration model that is then applied to the whole dataset to estimate RECO. GPP is then calculated as difference between RECO and NEE.

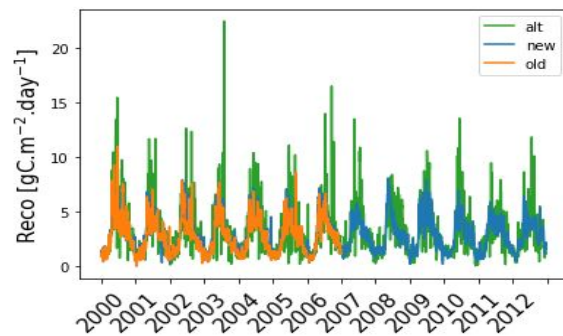
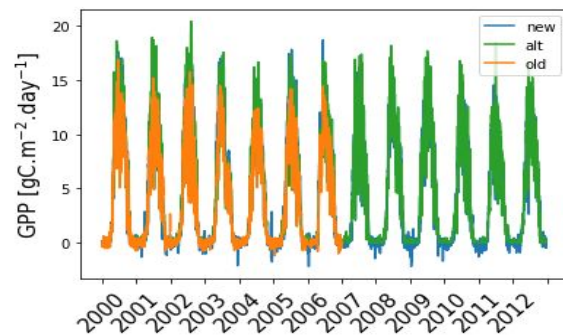
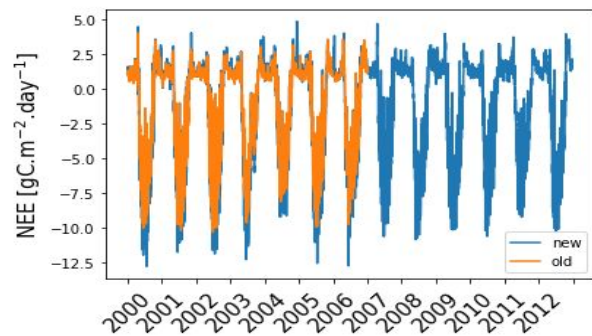
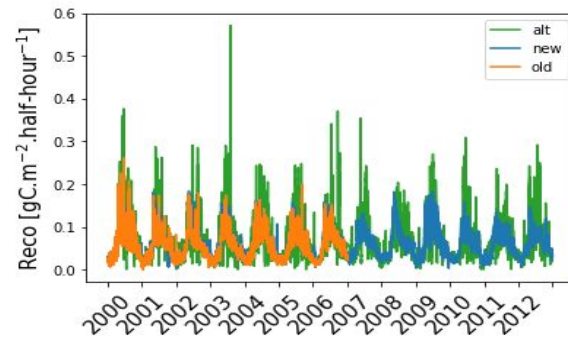
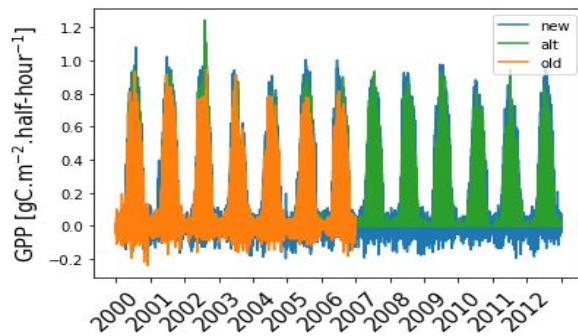
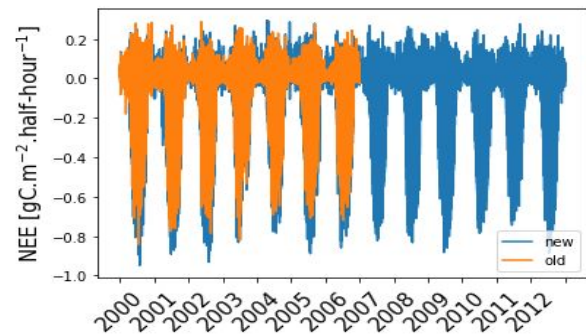
Daytime data (DT, Lasslop et al 2010) are used to parameterize a model where NEE is function of both GPP and RECO; in this way both the components are estimated by the model.

Note that in calculating these fluxes, 40 realizations were made with REF being the most representative. As a result, and also due to random error, closure of the C balance is **not** mathematically guaranteed.

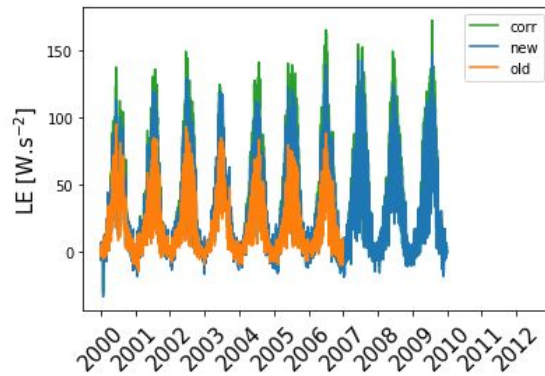
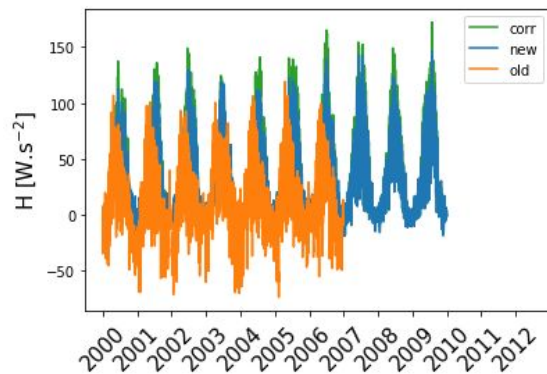
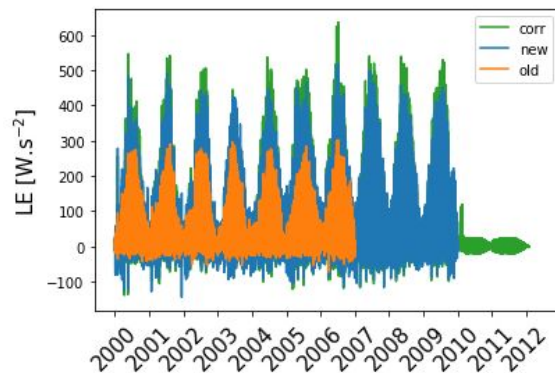
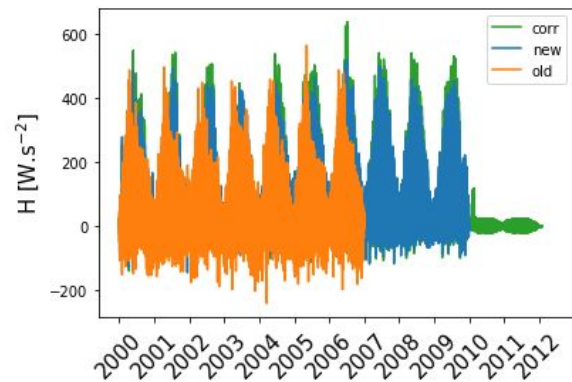
ENERGY

An energy balance corrected version of LE and H is provided, based on the assumption that bowen ratio is correct.

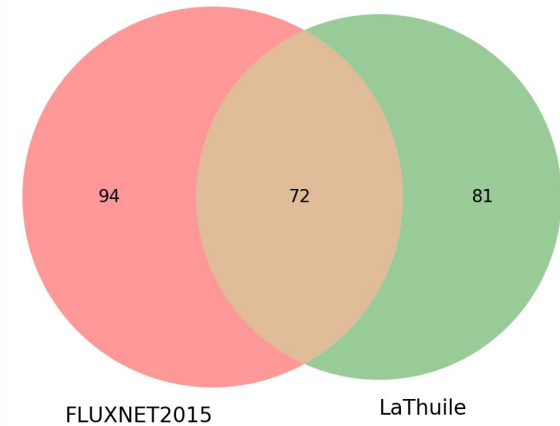
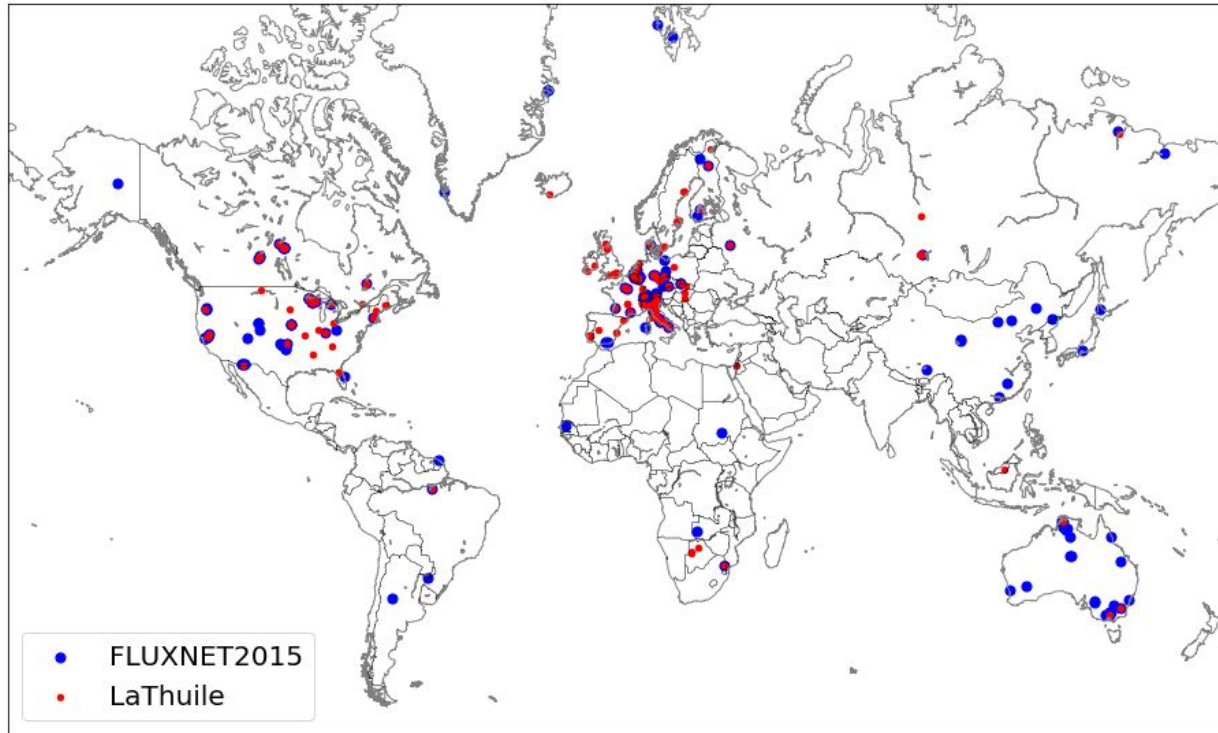
Example at DE-Hai



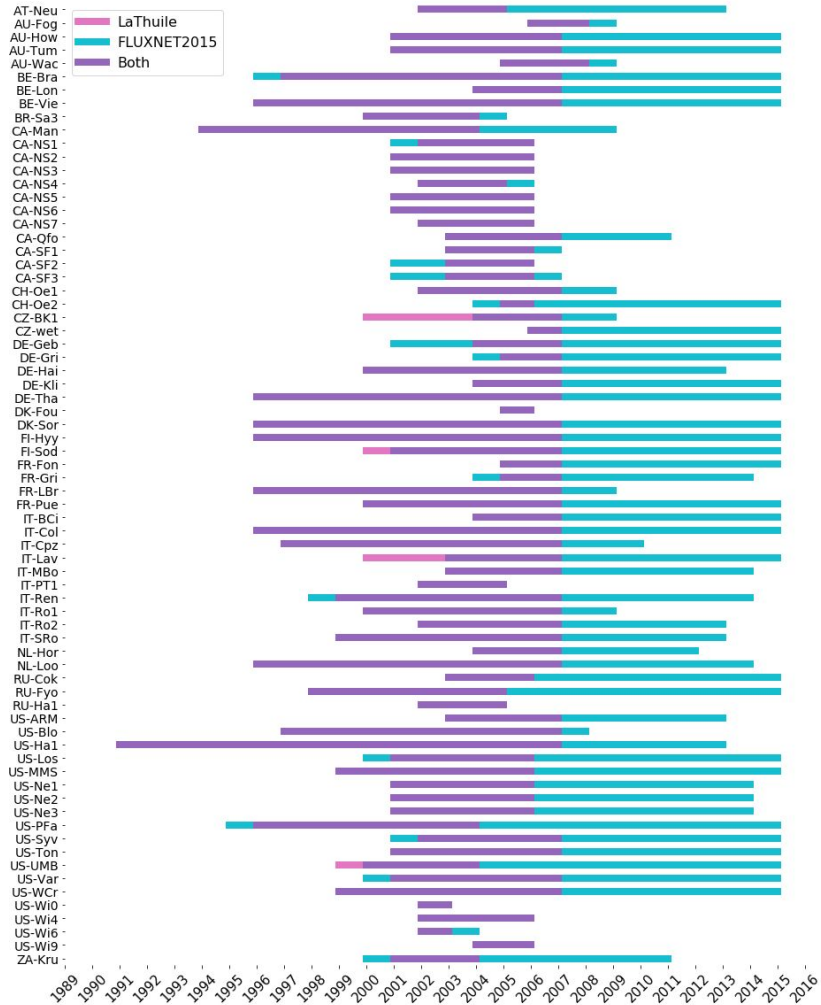
DE-Hai (cont)



FLUXNET2015 vs LaThuile



For the sites in both datasets...



Data policy

The data downloaded is Tier 1. As such, the dataset should be acknowledged as follows:

“This work used eddy covariance data acquired and shared by the FLUXNET community, including these networks: AmeriFlux, AfriFlux, AsiaFlux, CarboAfrica, CarboEuropeIP, CarboItaly, CarboMont, ChinaFlux, Fluxnet-Canada, GreenGrass, ICOS, KoFlux, LBA, NECC, OzFlux-TERN, TCOS-Siberia, and USCCC. The ERA-Interim reanalysis data are provided by ECMWF and processed by LSCE. The FLUXNET eddy covariance data processing and harmonization was carried out by the European Fluxes Database Cluster, AmeriFlux Management Project, and Fluxdata project of FLUXNET, with the support of CDIAC and ICOS Ecosystem Thematic Center, and the OzFlux, ChinaFlux and AsiaFlux offices.”

For the ORCHIDEE shared space

Proposed strategy:

Three data folders: one LaThuile, one FLUXNET2015, one both (symbolic links - prioritising FLUXNET2015 data)

Three fluxnet.card for ensemble runs

README files stressing the fair use policy

For transforming IGBP to PFTs: As with the LaThuile, the dominating fraction will be set to 1 and WET, SAV, WSA, CSH, OSH, MF sites will be omitted from fluxnet card. An attempt was made to classify CRO and GRA sites based on the (not very explicit) information on the website.

Useful links

The distribution of the FLUXNET2015 Dataset is done via: <http://fluxnet.fluxdata.org/>

For support and information about the dataset, please contact: fluxdata-support@fluxdata.org

Information about the FLUXNET2015 Dataset: <http://fluxnet.fluxdata.org/data/fluxnet2015-dataset/>

Information about the data processing for the FLUXNET2015 Dataset:

<http://fluxnet.fluxdata.org/data/fluxnet2015-dataset/data-processing>

Information about the data variables for the FLUXNET2015 Dataset:

FULLSET (complete set of variables): <http://fluxnet.fluxdata.org/data/fluxnet2015-dataset/fullset-data-product>

SUBSET (selected set of variables): <http://fluxnet.fluxdata.org/data/fluxnet2015-dataset/subset-data-product>

Data policy and acknowledgements for the FLUXNET2015 Dataset: <http://fluxnet.fluxdata.org/data/data-policy/>