



Land Monitoring

Using ICOS fluxnet data in the Copernicus Land Monitoring Service – examples from the global and local component

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EU Copernicus programme



- EO programme led by EC based on satellite data and data from Earth.
- Independent operational information system for environment, climate and civil security.
- 3 components:
 - Information services
 - Space component
 - In situ component
- Full free and open access to data.
- <https://www.copernicus.eu>



Copernicus Land Monitoring Service (CLMS)

We provide geographical information on land cover and its changes, land use, ground motion, vegetation state, water cycle and earth surface energy variables for both Europe and the entire globe.

All products are free of charge and can be used for any purpose.

Information:

<https://land.copernicus.eu>

Dataspace and viewer:

<https://dataspace.copernicus.eu>

 Credits



Full-coverage Land Cover & Use

Global and pan-European land cover and land use inventories complemented by layers on vegetated and non-vegetated land cover characteristics



Land Cover & Use in Priority Areas

Tailored land cover, land use and crop type information for specific areas in Europe and worldwide vulnerable to environmental changes



Bio-geophysical Variables

Consistent long-term time series of qualified bio-geophysical products describing the status and evolution of the land surface around the globe



Ground Motion Data

Information on the natural and anthropogenic ground motion throughout Europe



Land Satellite Mosaics

Satellite images from Copernicus and commercial satellites monitoring land surface conditions



Reference and Validation Data

Ground-based observation and geospatial reference data used in CLMS product creation or validation

Datasets - Global

- GPP & NPP: Gross and Net Primary Productivity [g C/m²/day]
- GDMP & DMP: (Gross) Dry Matter Production [kg DM/ha/day]
- Dekadal (1-10, 11-20, 21-end of month)
- Datasets:
 - 300 m V1, 2014 – present, based on Proba-V & Sentinel-3 OLCI
 - 300 m V2 → available Q2/2026
 - 1 km V2, 1999 – 06/2020, based on SPOT-VGT & Proba-V



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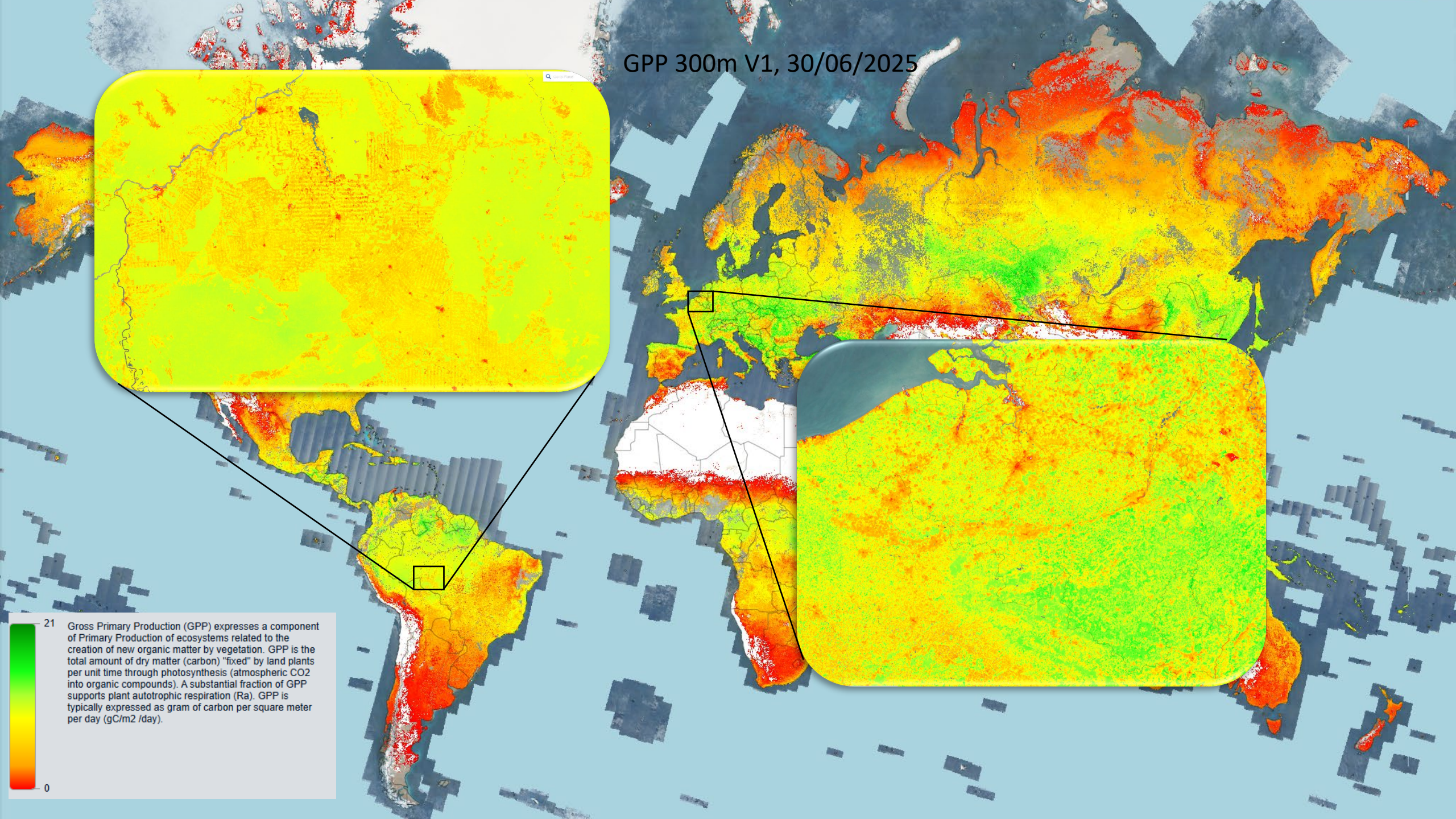
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GPP 300m V1, 30/06/2025



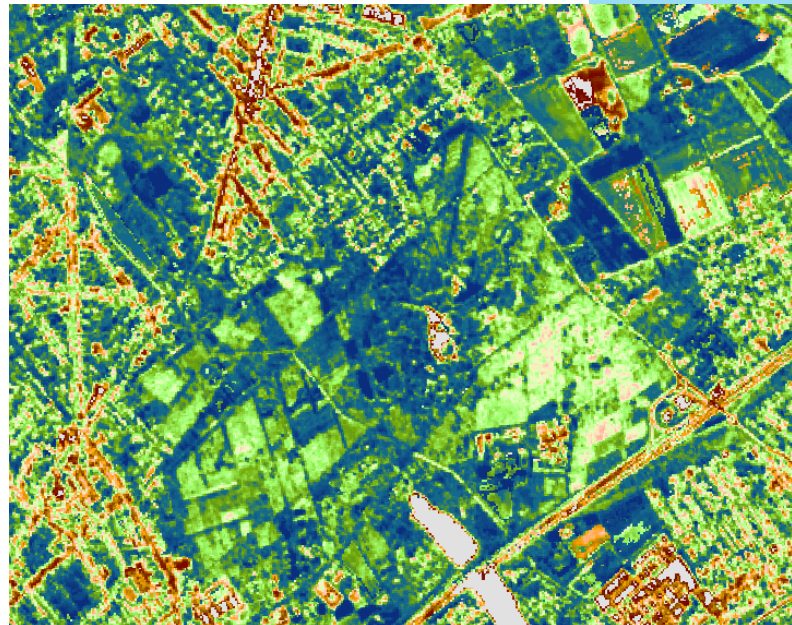
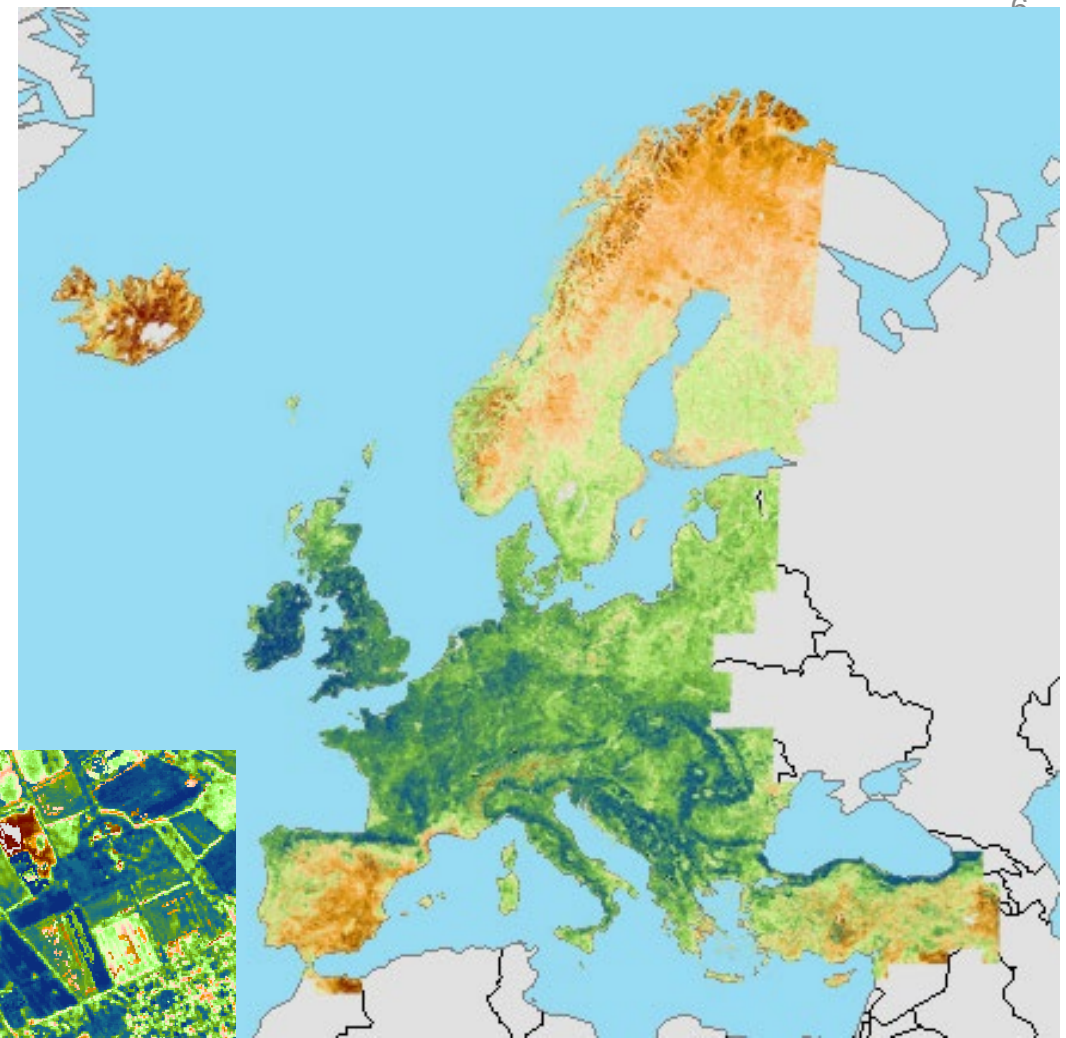
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Gross Primary Production (GPP) expresses a component of Primary Production of ecosystems related to the creation of new organic matter by vegetation. GPP is the total amount of dry matter (carbon) "fixed" by land plants per unit time through photosynthesis (atmospheric CO₂ into organic compounds). A substantial fraction of GPP supports plant autotrophic respiration (R_a). GPP is typically expressed as gram of carbon per square meter per day (gC/m² /day).

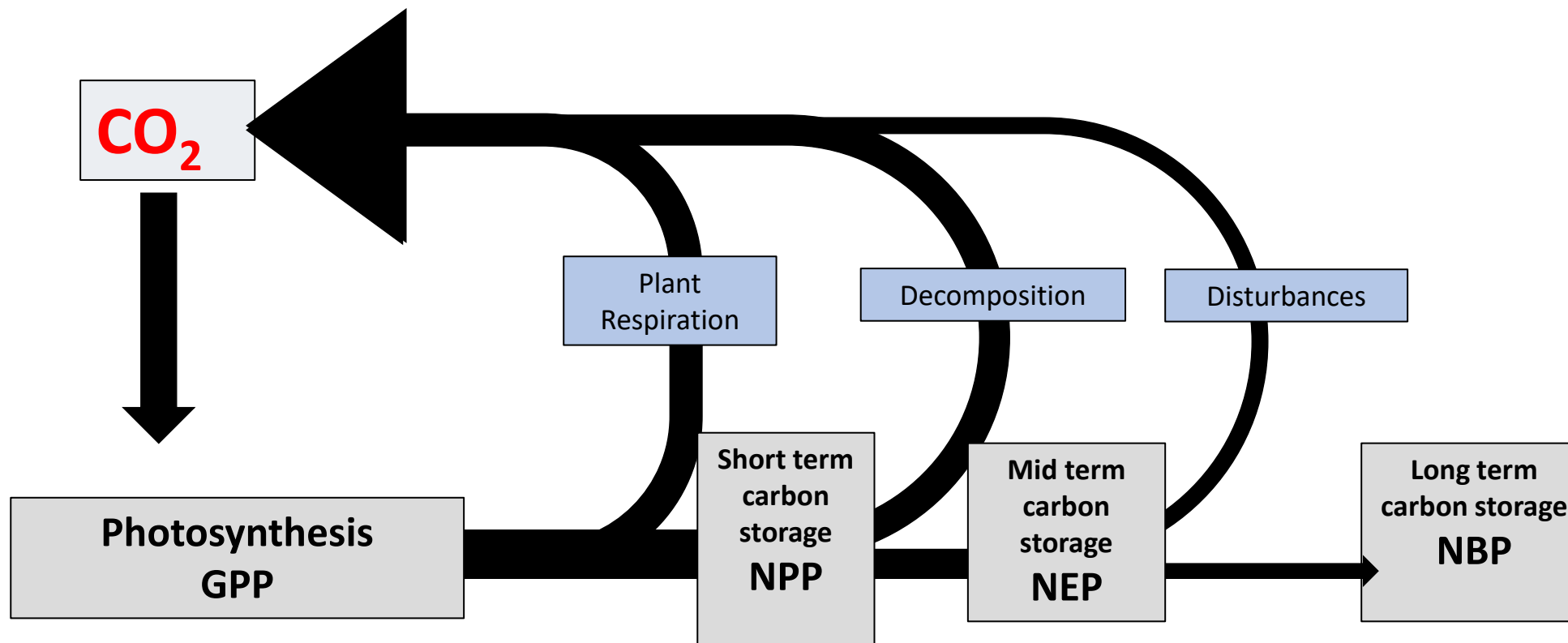
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Datasets – Pan-European

- *IN DEVELOPEMENT*
- 10 m resolution
- 2017 – present
- GPP [gC/m²/day]
 - 5-daily product
- NPP [gC/m²/day]
 - Annual product



ICOS GPP data for calibrating and validating the Copernicus Gross Primary Productivity products



GPP model=Light Use Efficiency model

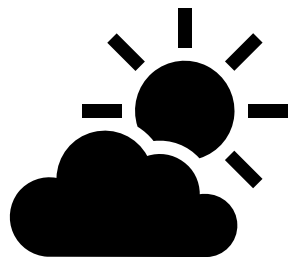


Gross Primary Production

(GPP):

Quantify the actual
photosynthesis rate

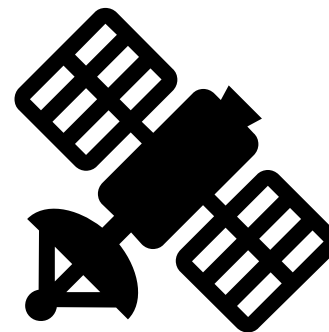
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PAR:

Estimate PAR via incoming solar
radiation

&



fAPAR

Observations how much light is
actually intercepted by vegetation

&



Light Use Efficiency (LUE)

Maximum LUE term (i.e.
efficiency with which
vegetation performs
photosynthesis when no
limitation for vegetation
growth) → ICOS GPP data

Additional terms:

- T effect
- CO2 fertilization term
- Drought stress term

Meteo data

Optical satellite imagery

Various data sources



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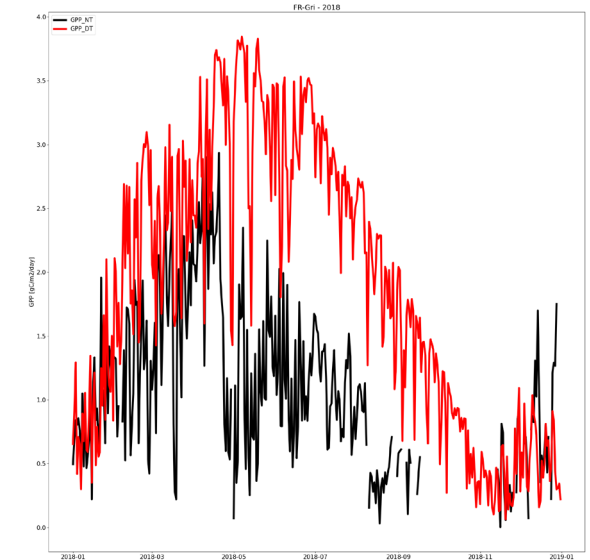


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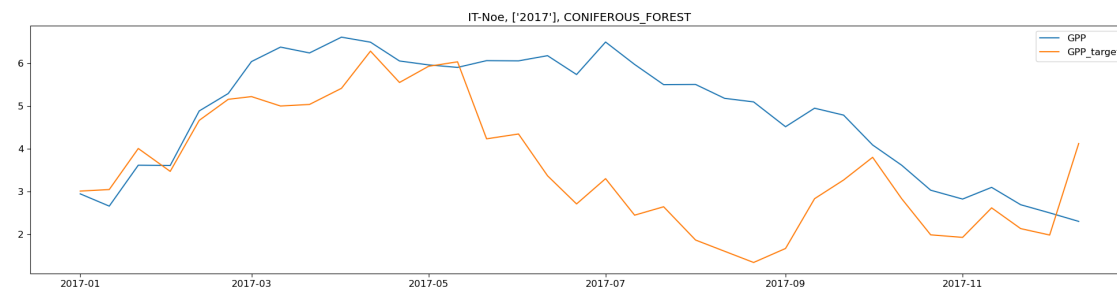
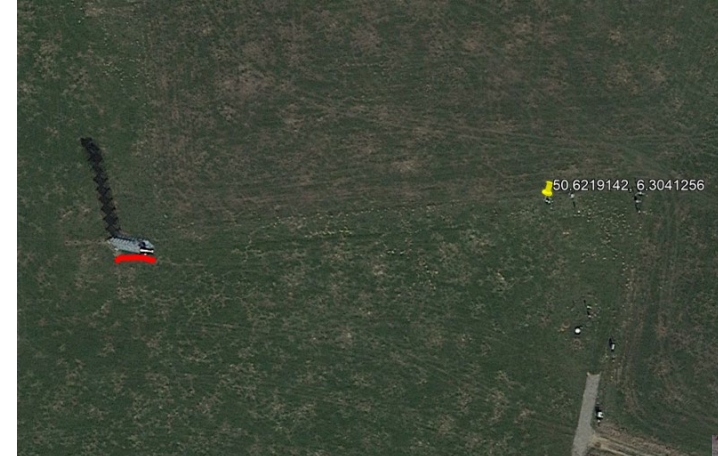
Data pre-processing

- Additional pre-processing of ICOS L2 GPP data (ETC_L2 archive and Fluxnet archive product are used)
 - Negative GPP datapoints removed
 - Continuous constant GPP datapoints are removed
 - Datapoints with big differences between night versus daytime GPP are removed (z-score approach)
 - Only datapoints with quality control>0.8 are retained



Further considerations

- Location of tower → important to have correct lat/lon coordinate to be able to get correct satellite pixels
- Flux footprint → example tower near the sea





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Questions?

Get in touch

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