ECOPROPHET

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BEODAY MEETING, BEERSEL, 30TH JANUARY 2018

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This project

Title: Improved ECOsystem PROductivity Modeling by Innovative Algorithms and Remotely Sensed PHEnology Indicators

Promotors: Prof. Ivan Janssens & Manuela Balzarolo

Period: 15/12/2016 – 31/07/2021 (56 months)

Funded by BELSPO in the frame of the STEREO III programme

Contract N. SR/00/334

Project website: http://ecoprophet.meteo.be
Project team

Coordinator
University of Antwerp
UA

Belgian partner 1
Royal Meteorological Institute
P1, RMI

International partner 1
Peking University
IP1, PKU

International partner 2
Laboratoire des Sciences du Climat et de l'Environnement
IP2, LSCE

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Nicolas GHILAIN
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Shilong PIAO
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Qiang LIU
Post-doc researcher*
Philippe CIAIS
Ana BASTOS
Fabienne MAIGNAN
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Some definitions

GPP = the total amount of carbon fixed in the process of photosynthesis by plants in an ecosystem.

NPP = Net Primary Production is the amount of carbon uptake after subtracting Plant Respiration (RES) from Gross Primary Productivity (GPP).

NPP = GPP – RES
Motivation

Terrestrial ecosystems provide food, feed, fibre, …

➔ Important to monitor global ecosystem productivity and build better models

➔ R:S-based models & Land surface models
Motivation

Terrestrial ecosystems provide food, feed, fibre, ...

→ Huge uncertainty in global GPP & NPP estimates

GPP:
Beer et al. Science 2010
Motivation

Terrestrial ecosystems provide food, feed, fibre, …

- Huge uncertainty in global GPP & NPP estimates

Overall objective of this project = improve estimates and projections of GPP and NPP

NPP:
Ito, GCB 2011
Motivation

Both R:S-based and Land surface models depend on observations of surface greenness (\textbf{NDVI}, \textbf{fAPAR})

\textbf{R:S-based models}: \( \text{GPP} = \text{PAR}_{\text{in}} \times \text{fAPAR} \times \epsilon \)

\text{NDVI converted into fAPAR}:
(e.g. Myneni & Williams 1994)
Greening of the Earth

Both R:S-based and Land surface models depend on observations of surface greenness (NDVI, fAPAR)

\[ NDVI \neq GPP \]

Jeong, RSE 2017
“Invisible” evergreen phenology

CCI
Gamon et al.,
PNAS 2016

Chlorophyll:Carotenoid Index:

\[ CCI = \frac{(\text{Band 11} - \text{Band 1})}{(\text{Band 11} + \text{Band 1})} \]
Greening of the Earth

e.g. Mediterranean oak forest

Resolve this issue by no longer depending on NDVI

→ Use new RS products that correlate with plant functioning, not with canopy greenness
Specific objectives

Remote sensing
- LSA-SAF from MSG/SEVIRI (DSSF, DSLF, albedo, LAI, FVC)
- Proba-V (albedo, LAI, FVC)
- Sentinel (bands)
- MODIS (bands, LAI, FAPAR)

**Obj. 1 - Best RS indicator of phenology**
P1, P2, P3
New parameterization of phenology modules of LSMS
P2, P3, P4

**Obj. 2 - Better GPP and energy balance products**
P1, P2, P3, P4
Better biomass production estimates
P2, P3, P4

**Obj. 3 - New proxy for GPP**
P1, P3, P4

**Obj. 4 - New biomass production algorithm**
P1, P3, P4

ICOS, FLUXNET, SPECNET, Belair
MARS-JRC
ICOS, FLUXNET

RS based databases
In-situ observations
Validation
Intercomparison
P1: UA; P2: RMI; P3: CUES; P4: LSCE

Biomass production database
Land surface modelling
Functional phenology indices

Test the large variety of new R:S products (Sentinel; PROBA-V)

Identify products that are closely coupled to the phenology of photosynthesis
Database building

Site homogeneity characterization
Dissemination

ICOS Belgium Science Conference, Gembloux (Belgium), 20 October 2017 – Two posters presentation

Project poster

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