GMES Fast Track Service Land

LAI remote sensing products and simulated LAI: an inter-comparison over France

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European Commission Fast Track Service Land within the GMES initiative in FP-7

Introduction : land carbon CIS

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Geoland2 land carbon Core Information Service

- *More details in J.-C. Calvet talk this afternoon.*

Modelling + data assimilation to generate products : water and CO_2 fluxes LAI, Soil moisture .

- Global scale (ECMWF)
- Regional scale : Hungary (OMSZ), Netherlands (KNMI) , **France** (Météo-France).

The ISBA-A-gs model (within SURFEX) has been run over France to study the seasonal cycle, and inter-annual variability of LAI, CO2, H20.

Comparison with ORCHIDEE model

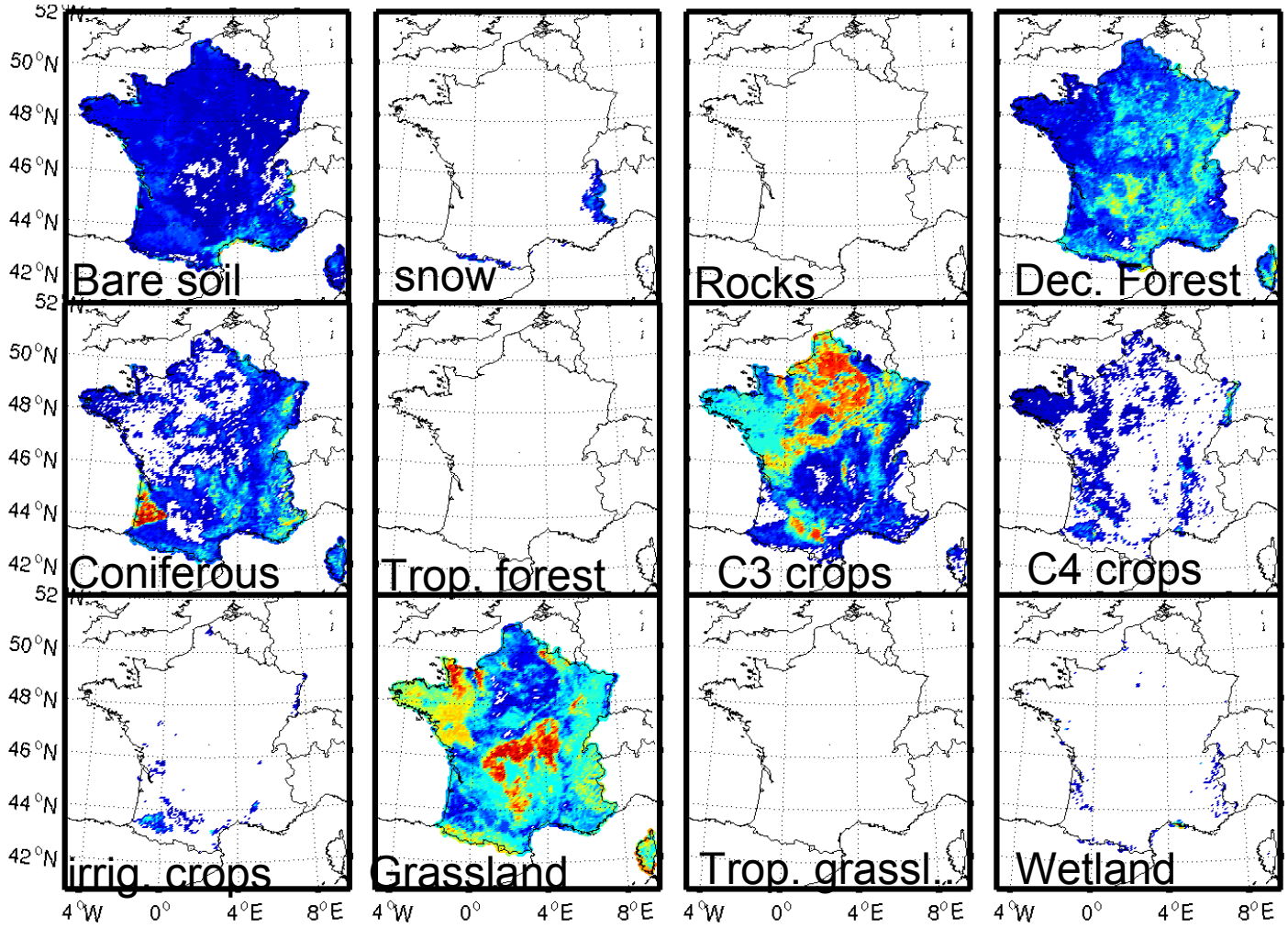
LAI remote sensing products are used

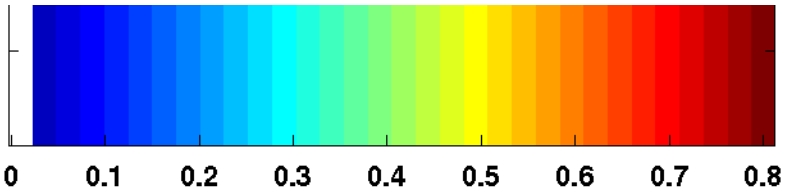
1. as observation to evaluate the models.
2. to drive a SEKF data assimilation scheme

Simulation set-up

- **Atmospheric forcing : SAFRAN (1994-now)**
  - hourly time step, 8 km resolution,
  - Combination of model and observations.
- **Land cover map : ECOCLIMAP II**
  - developed at CNRM, provides land cover map + model parameters)
  - 300 ecosystems types classified in 12 PFT
- **Land surface models : SURFEX v5.1 (ISBA) and ORCHIDEE**
  - Both are used in climate models, but are here used as offline models.
  - Each pixel, contains up to 12 vegetation types. The fluxes are computed for each vegetation types then aggregated.
  - Models used the same forcing and the same land cover map
  - Both models runs with theirs default (global) parameters.
- **LAI CYCLOPES and MODIS LAI (C5) products provided during the CARBOFRANCE project**

ECOCLIMAP II Cover fraction

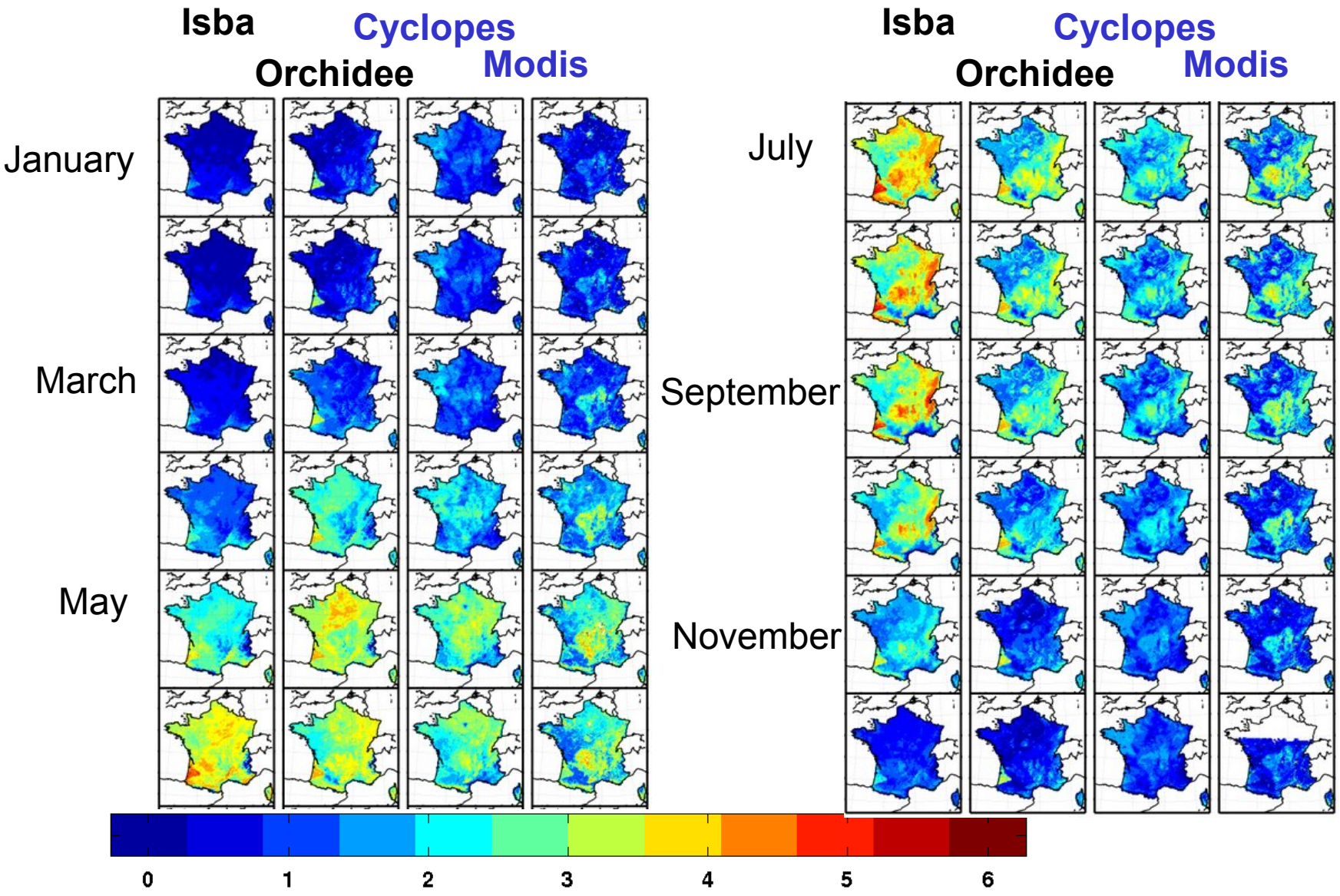




Main PFTs :

Grassland :	32 %
C3 crops :	24 %
Dec. Forest:	20 %
Bare soil :	11 %

Average LAI (avg. 2000-2007) : 4 sources



Spatial correlation

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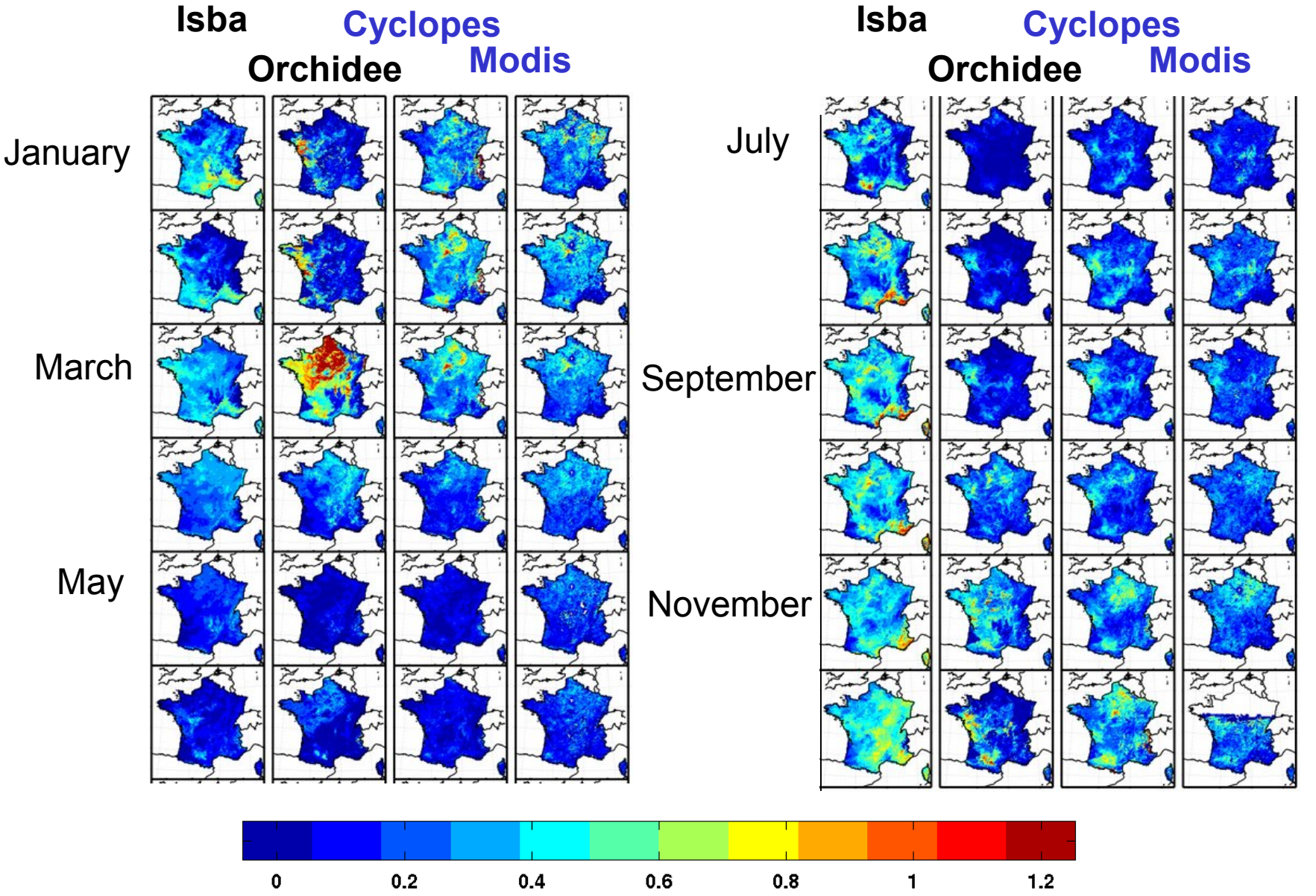
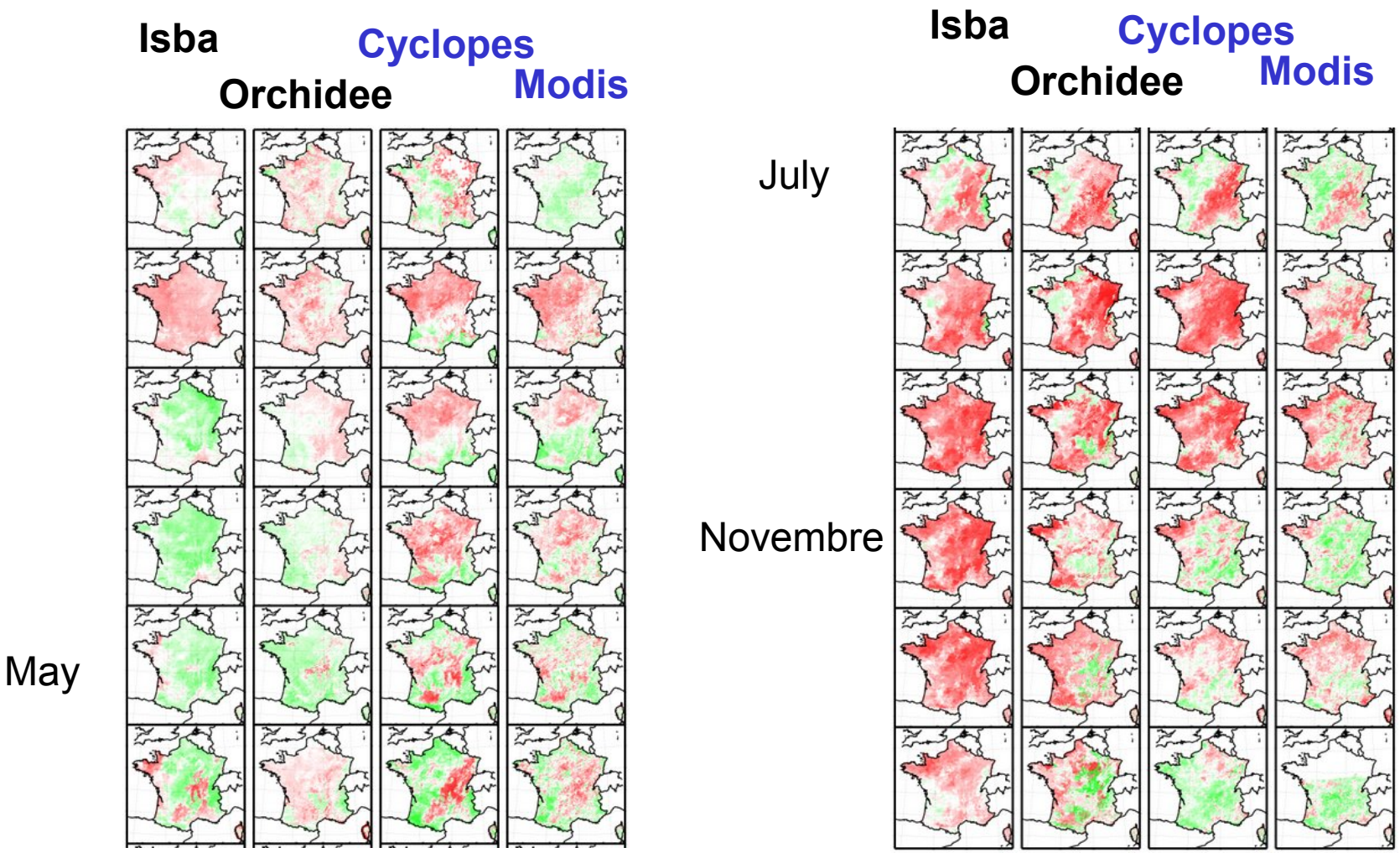
R^2	**Model/*Satellite***				**Model/ Model**	***Satellite/ Satellite***
	ORCHIDEE/ *CYCLOPES*	ORCHIDEE/ *MODIS*	ISBA/ *CYCLOPES*	ISBA/ *MODIS*	ISBA/ ORCHIDEE	*CYCLOPES/ MODIS*
DJF	0.00	0.07	0.00	0.09	0.58	0.16
MAM	0.25	0.09	0.12	0.07	0.37	0.37
JJA	0.51	0.58	0.53	0.36	0.46	0.57
SON	0.17	0.22	0.25	0.18	0.43	0.42

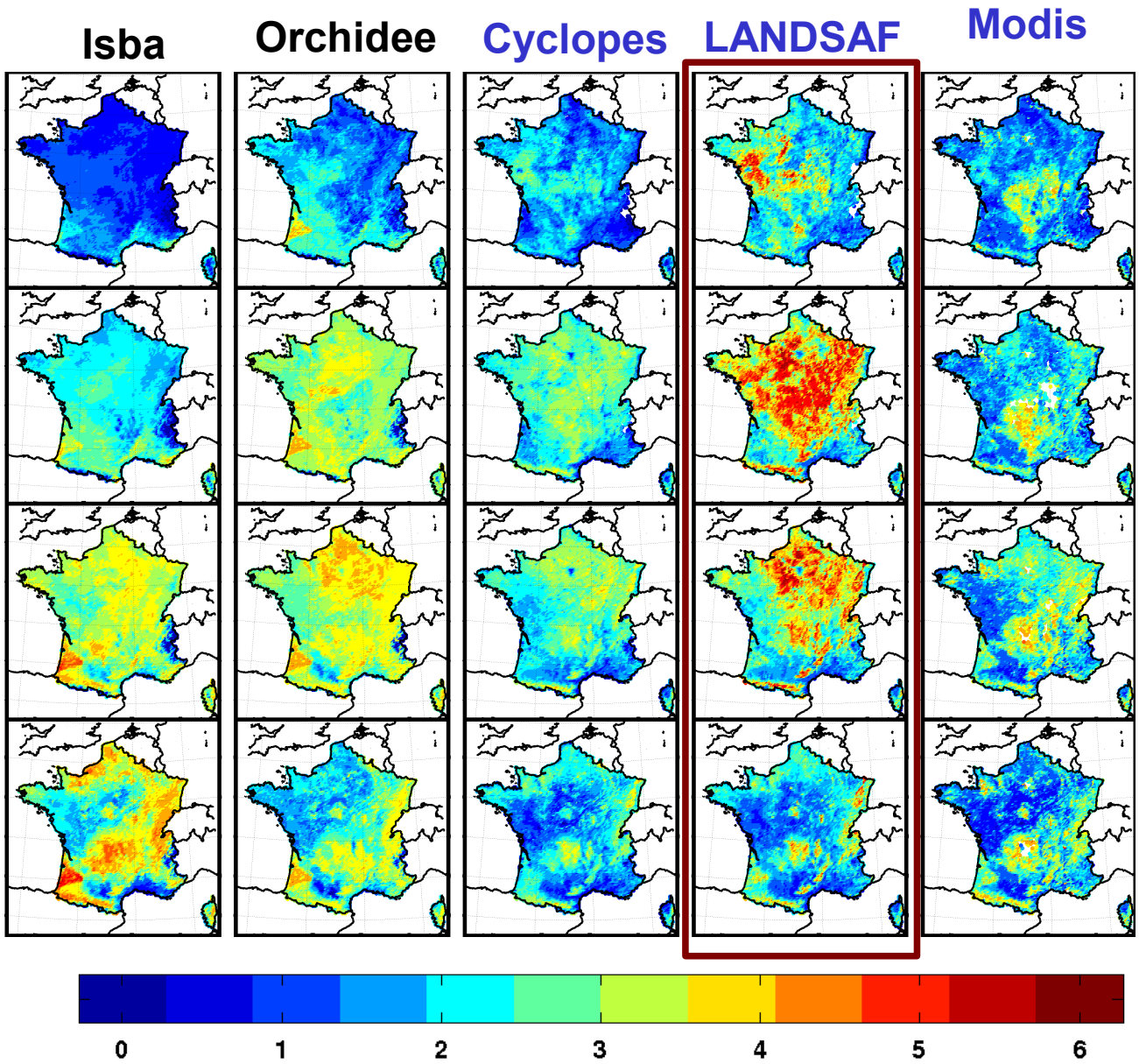
Interannual Variability 2000-2007 : 4 sources



LAI anomaly for 2003 drought/Heatwave in France



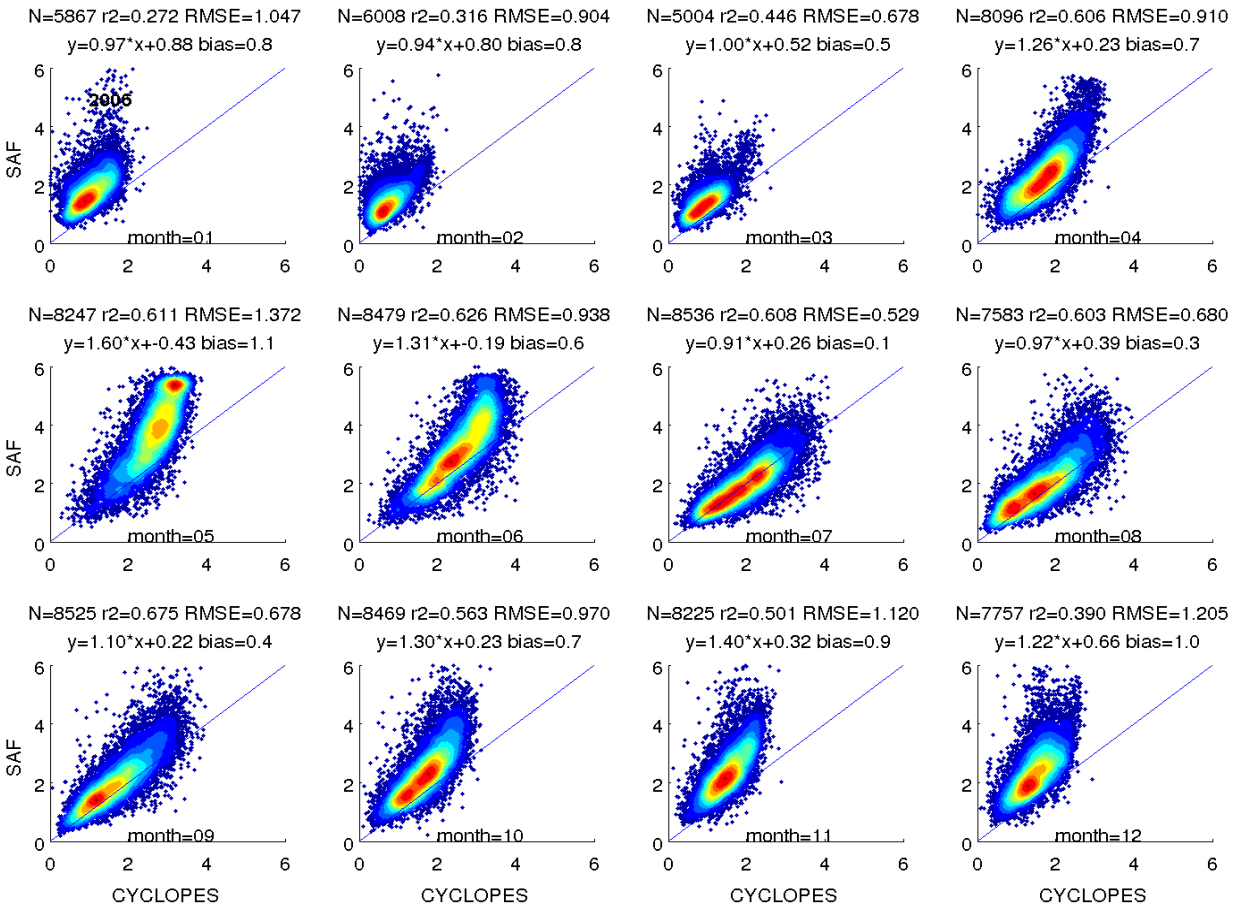
Comparison with LAI- LANDSAF 2006



Thanks to D.Carrer & F.Camacho for providing these data

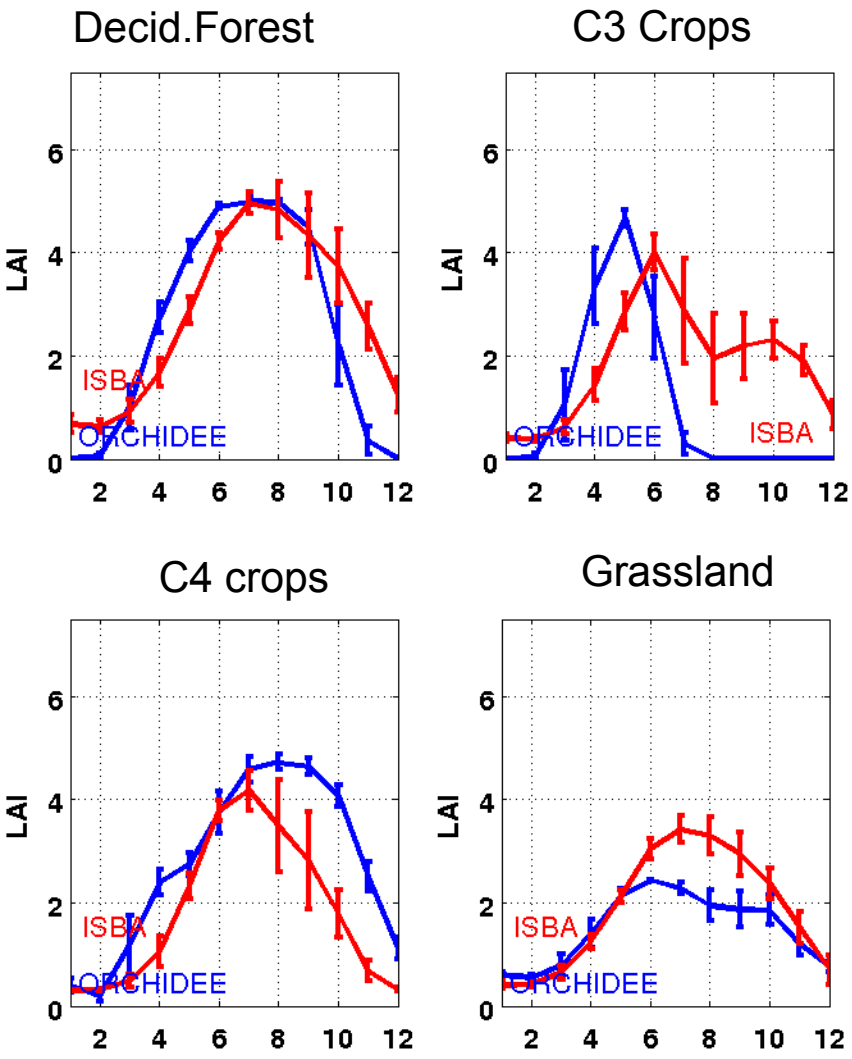
Monthly Scatterplot 2006 LANDSAF/CYCLOPES

June



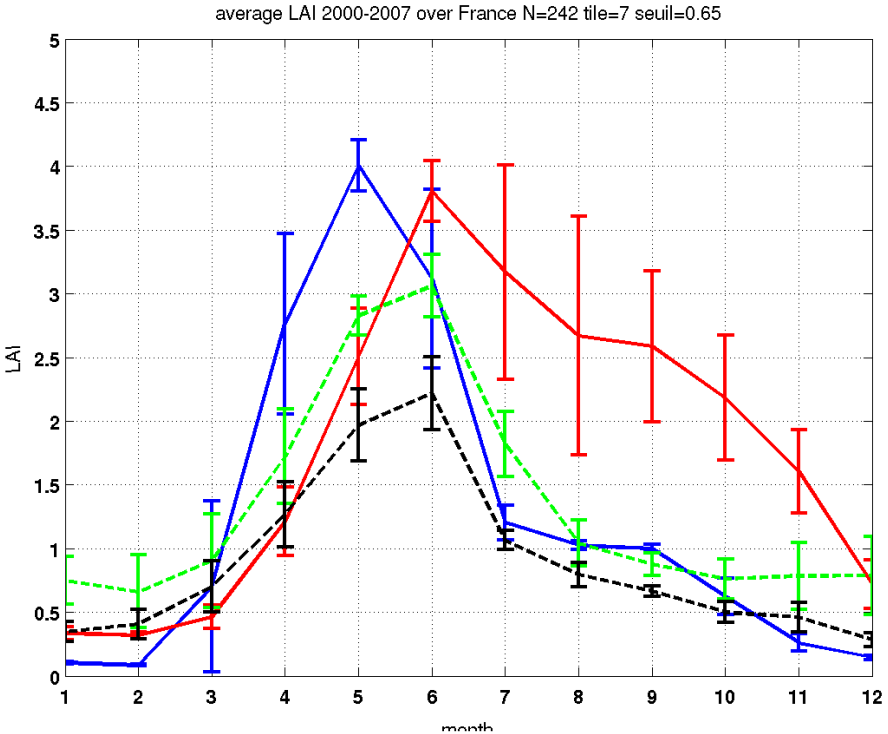
August

LAI per plant functional type average over France

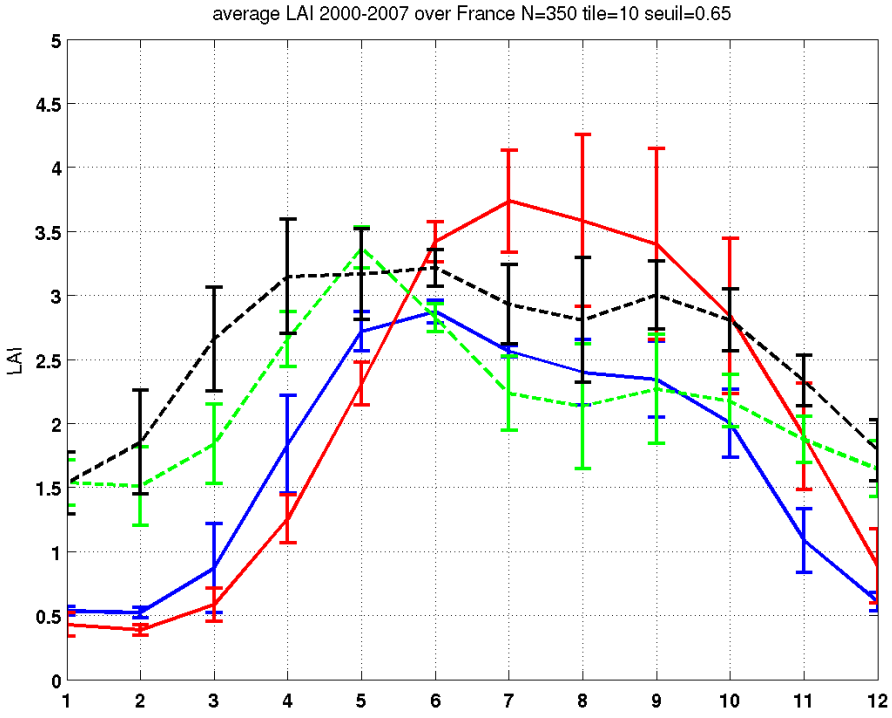


How to compare with the remote sensing product ?

LAI for PFT C3 crops and grassland



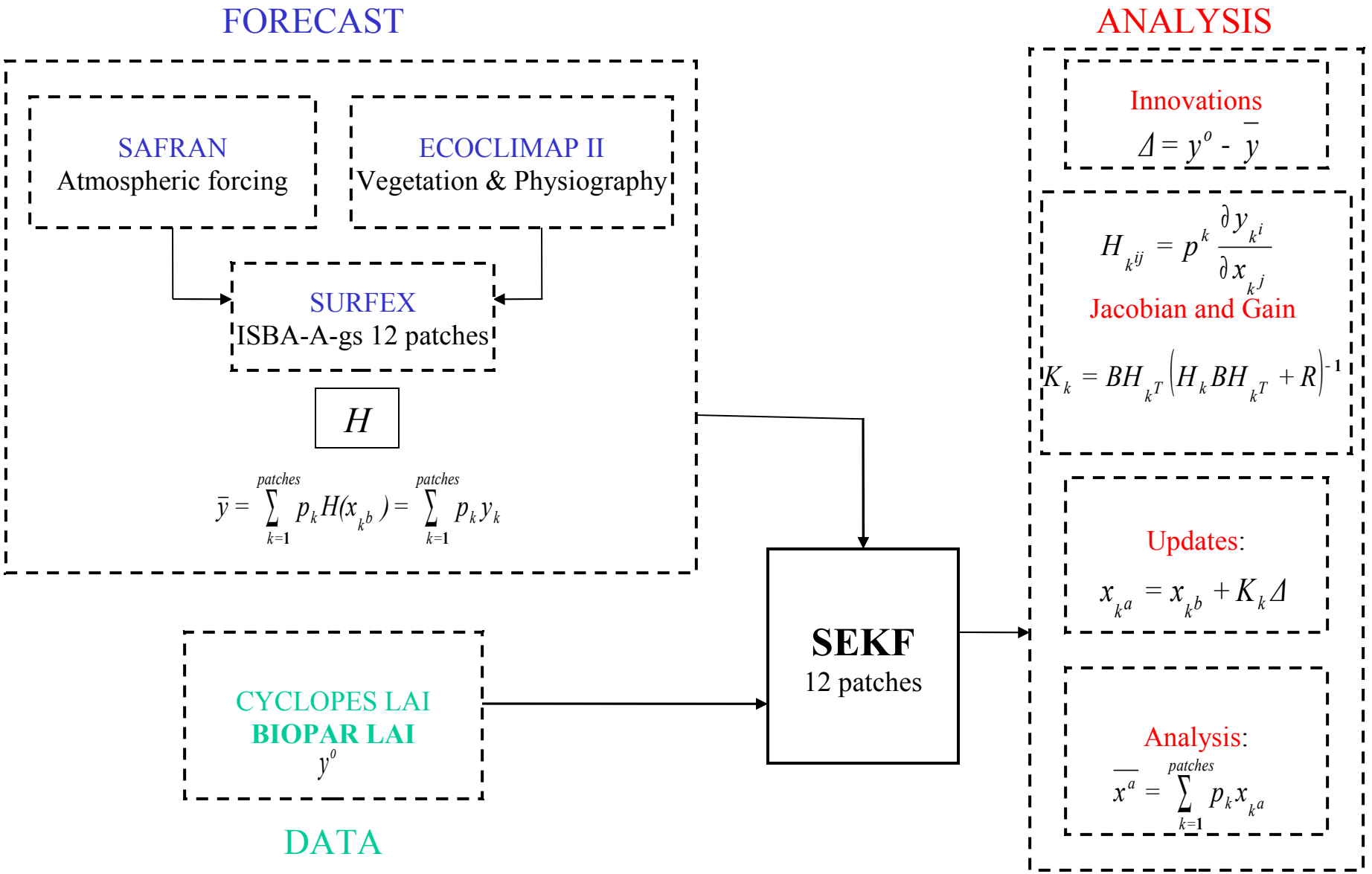
C3 crops (Wheat,…)



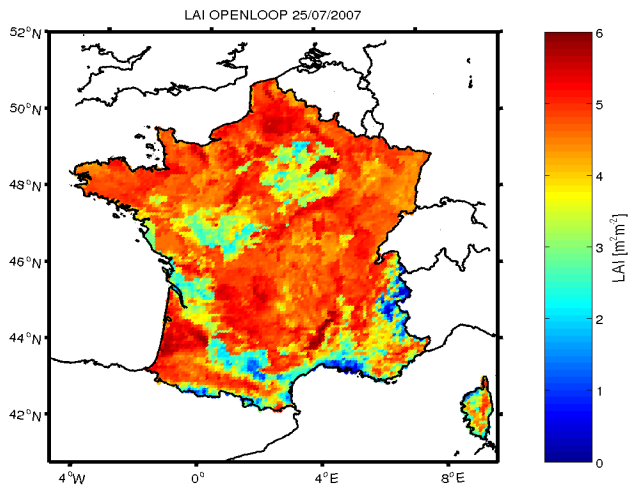
Grassland

Over the France domain, we select the « pure » pixel : at least 65 % of the main Vegetation type. About 300 points for C3 crops and grassland.

Data Assimilation system



Assimilation of LAI CYCLOPES: senescence season



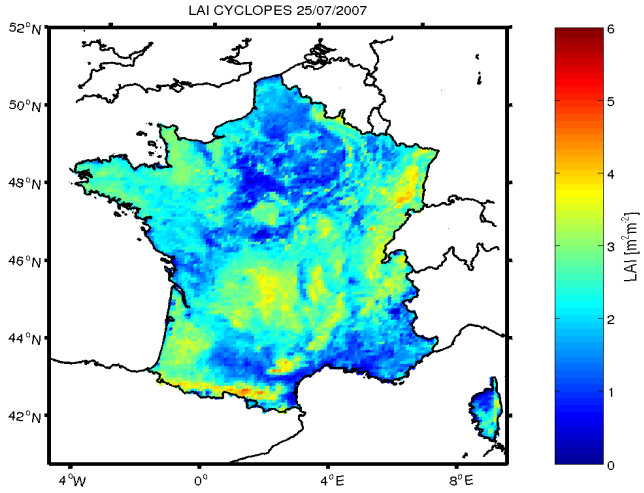
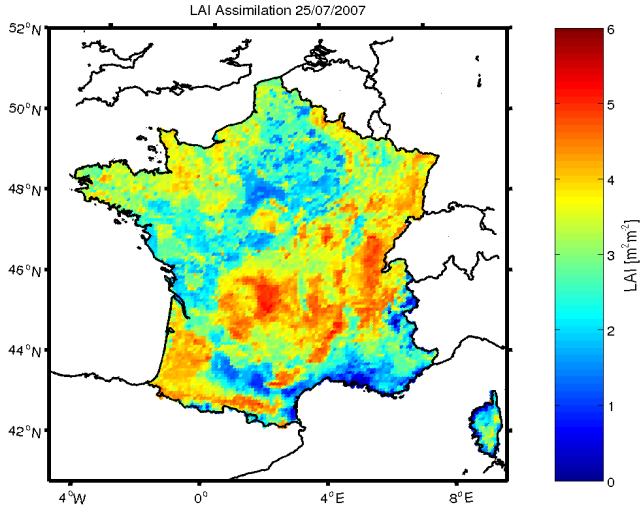


Figure 3 – Simulated, observed and assimilated LAI on 25.07.2007.



Generally, the model exhibits large values, while CYCLOPES shows a limited dynamic range of retrieved LAI.

In the end of July the assimilation reduces the bias by half.

Conclusion – Future work

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Conclusions :

- Using SURFEX, We produce a >15-year high resolution simulation of LAI, and H20 and CO2 fluxes over France. Differences in simulated fluxes are smaller than for LAI. Demonstrator of the data assimilation system using the CYCLOPES data.
- Marked spatial differences between LAI sources.
- General agreement for the 2003 drought.
- For the year 2006, the LAND-SAF LAI has a spatial structure similar to the CYCLOPES products and a earlier maximum.

Near future

LAI Data assimilation

use of the BIOPAR/GEOV1 LAI products.

- *First results : higher max. values than CYCLOPES, corr. Similar*

- Improvement of the model (radiative transfert (with fAPAR), photosynth.)
- SURFEX V6.0 with slow carbon pools (soil carbon).

www.gmes-geoland.info

Thank you for your attention!