

New drought indices from the assimilation of satellite data

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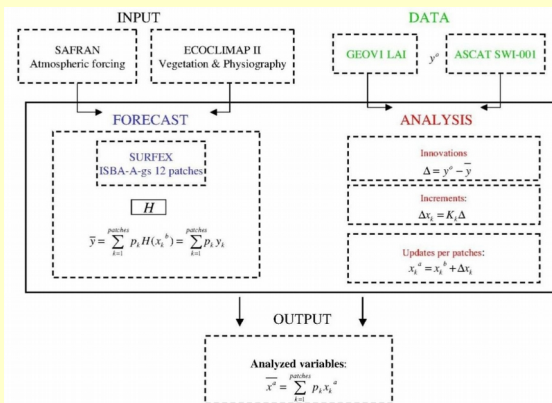
The current agricultural drought indicators produced by Météo-France are derived from digital simulations of soil moisture produced by the SURFEX modelling platform.

In the framework of the FP7 IMAGINES European project, a research was conducted in order to assess the impact on the **monitoring of agricultural droughts** of the **integration of satellite data into SURFEX**.

A data assimilation system (**LDAS-France**) was implemented to this end. It provides simulations of the biomass and leaf area index of straw cereals and grasslands over France.

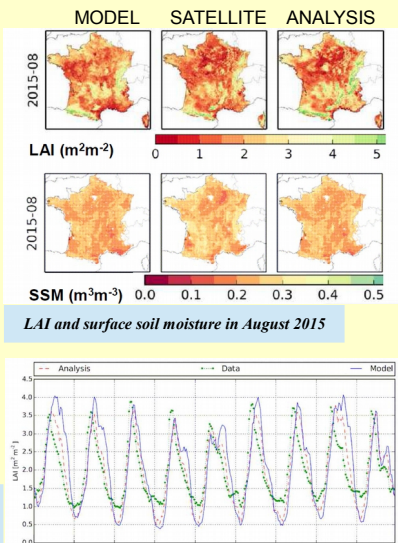
It is shown that these simulations can be improved through the assimilation of satellite products distributed in near-real-time by the Copernicus Global Land service

(<http://land.copernicus.eu/global/>).



Flow chart of the data assimilation algorithm

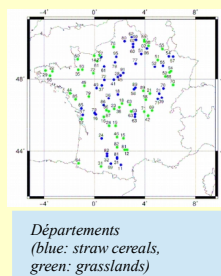
Impact of assimilating LAI and SWI-001 on the simulated LAI and root-zone soil moisture: monthly average values over France of LAI from 2007 to 2015; (blue line) model, (green circles) satellite product, (red dashed line) analysis.



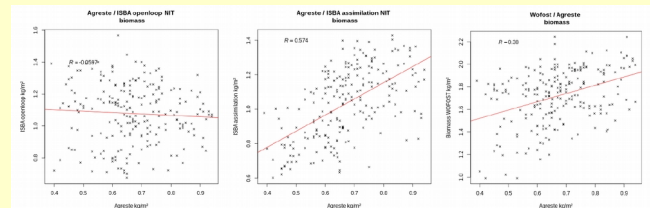
LAI and surface soil moisture in August 2015

With & without satellite data

Reference in situ observations of the agricultural yields (Agreste) of **straw cereals** and **natural grasslands** show that using satellite data, a significant correlation between the maximum annual above-ground biomass simulated by SURFEX and the agricultural yield at the scale of administrative units (départements) can be achieved. Without satellite data, very low correlations are observed.



Départements
(blue: straw cereals,
green: grasslands)



Impact of assimilating LAI and SWI-001 on the simulated above-ground biomass: SURFEX or LDAS-France or WOFOST (JRC) vs. agricultural statistics for winter wheat

Drought indices

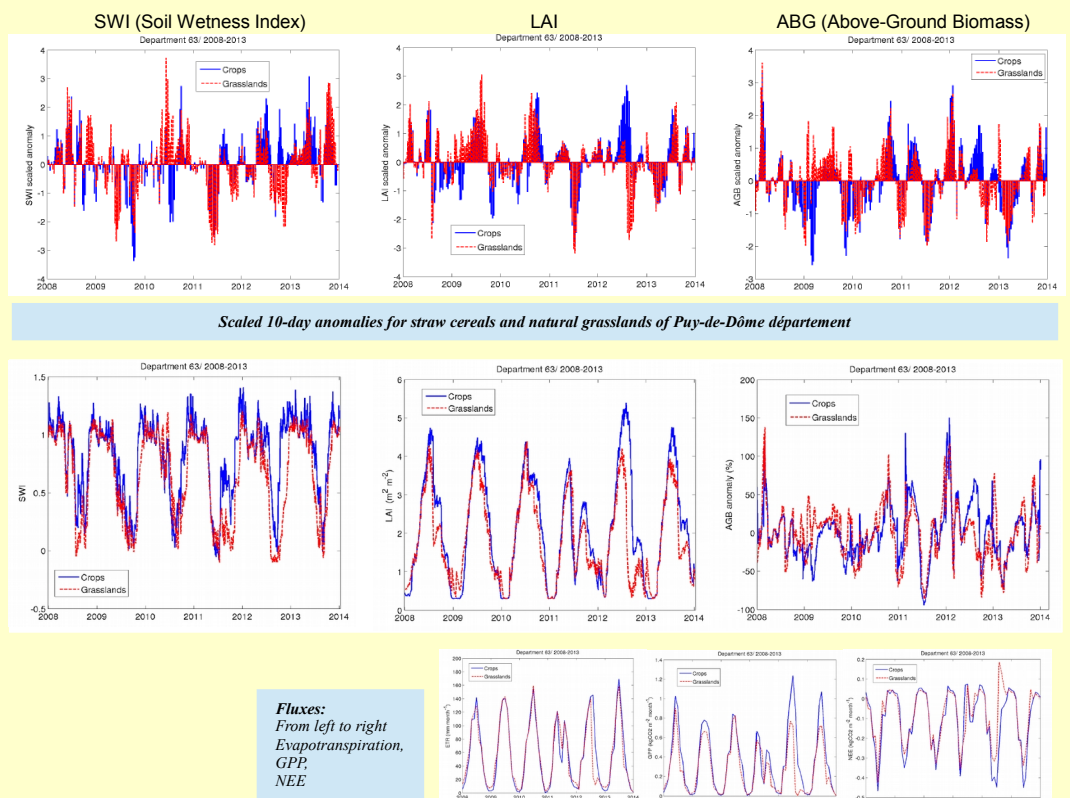
New 10-day drought indicators, complementary to soil moisture, can be derived from the leaf area index and from the above-ground biomass of vegetation.

Vegetation-related indicators (LAI and above-ground biomass 10-day scaled anomaly) are less erratic than the soil moisture indicator (scaled SWI anomaly).

The three indicators provide distinct information and are complementary.

The analysed indicators are able to distinguish distinct behaviors of straw cereals and natural grasslands. Note the 2011 spring drought.

These demonstration drought monitoring products for the 2008-2013 period are freely available on the project web site (<http://fp7-imagines.eu/>) for 45 administrative units for cereals and for 48 administrative units for grasslands.



Scaled 10-day anomalies for straw cereals and natural grasslands of Puy-de-Dôme département

Fluxes:
From left to right
Evapotranspiration,
GPP,
NEE

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