New drought indices from the assimilation of satellite data

Jean-Christophe Calvet, Alina Barbu, David Fairbairn
(CNRM - Météo-France, CNRS)

The current agricultural drought indicators produced by Meteo-France are derived from digital simulations of soil moisture produced by the SURFEX modeling 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).

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.

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 website (http://fp7-imagines.eu/) for 45 administrative units for cereals and for 48 administrative units for grasslands.

Contact: jean-christophe.calvet@meteo.fr