

MOTIVATION

This work aims to assess the impact of extreme events occurred in three different regions of Mediterranean on vegetation productivity and carbon uptake.

DATA

Period 2001-2019.

- MOD17A2 v6 GPP and PsN at 500m resolution, 8-day time step.
- ESA CCI Soil Moisture v04.7 at 0.25° x 0.25°, monthly data.
- Burned areas FIRE CCI v5.1 at 250m resolution, monthly data.

PERSISTENCY OF DRY CONDITIONS

Negative GPP anomalies (Fig.1) lasted more than 3 or more months over: ~40% of the IB territory during the drought 2005 drought episode, with particular incidence on western regions. ~35% of the IG region during the 2007 drought event, where some localized spots the dry conditions over vegetation lasted up to 6-7 months. ~25% of the FR territory during 2006 dry episode.

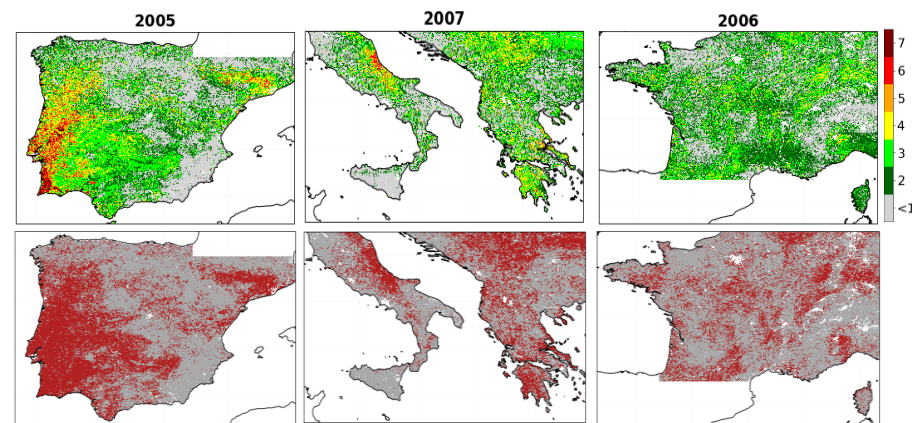


Fig.1 Persistency of vegetation stress between April and October for each study case. The number of months between April and October (top panels) and the regions which had 3 or more months (bottom panels) with GPP anomalies lower than respective regional threshold are determined for IB2005 (left panels), IG2007 (central panels) and FR2006 (right panels).

METHODOLOGY

- Definition of a regional threshold of GPP anomalies based on the spatial mean value of GPP standard deviation computation (Table 1).
- Dry conditions persistency and productivity disturbances assessed over the pixels with 3 or more months (out of 7) with GPP monthly anomalies lower than the regional threshold.

Table 1 GPP threshold for each of study area

	IB	IG	FR
GPP Threshold	-0.018	-0.024	-0.025

PRODUCTIVITY DISTURBANCES

Soil moisture deficits during late winter and spring of 2005 in IB affects vegetation productivity during several consecutive months.

The severe drought event of 2007 in IG occurred in summer clearly offset the high productivity of vegetation in spring, strongly reduced the ecosystem's activity.

The 2006 episode over FR had higher impacts during summer months.

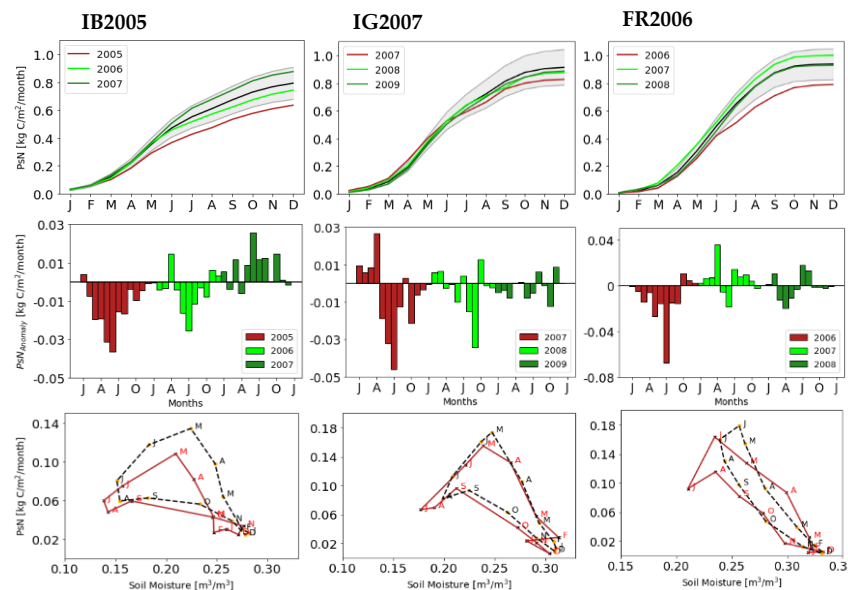


Fig.2 PsN accumulated monthly during the year of extreme event and two following years (top panels), monthly PsN average anomalies (central panels) and PsN & SM seasonal cycles (bottom panels) for IB2005 (left panels), IG2007 (central panels) and FR2006 (right panels).

STUDY CASES – BURNED AREAS

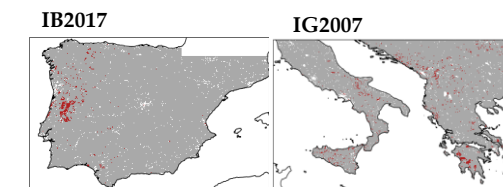


Fig.3 Detected burned areas through FIRE CCI product for IB in 2017 (left) and IG in 2007 (right).

CARBON UPTAKE LOSSES

Despite fires represent much less influence on carbon uptake compared to drought events, the fire season of 2017 on IB and 2007 over IG led to serious reductions on plant's carbon uptake, not only during the year of fires occurrence but either on the two following years of recovery (Table 3).

Table 2 Departure of yearly carbon uptake losses from median 2001-2019 caused by selected climatic extreme events. Values are expressed in TgC/year.

EXTREME EVENTS	Year of Extreme Event	1 st Year of Recovery	2 nd Year of Recovery
IB2005	-39.88	-12.51	20.73
IG2007	-13.47	-5.80	-4.10
FR2006	-26.52	11.12	-1.58

Table 3 Departure of yearly carbon uptake losses from median 2001-2019 caused by selected fire seasons. Values are expressed in TgC/year.

FIRE SEASONS	Year of Extreme Event	1 st Year of Recovery	2 nd Year of Recovery
IB2017	-0.93	-1.28	0.15
IG2007	-1.39	-1.05	-0.42

FINAL REMARKS

- Droughts and fires breed severe losses on carbon uptake during long periods.
- Most extreme events impacts inhibited the recovery of vegetation productivity during several months, amplifying the losses on carbon uptake.