he global NPP dependence on ENSO: La-Niña and the extraordinary year of 2011

Ana Bastos, Universidade de Lisboa*

The terrestrial ecosystems are one of the main global carbon sinks, being responsible for the removal of approximately 25% of fossil fuel emissions from the atmosphere. In turn, the ecosystems' activity is limited by climate constraints such as temperature, water availability and radiation (Nemani et al., 2003). The increasing strength and future behaviour of this sink is still an on-going debate (Zhao and Running, 2010; Ahlstrom et al., 2012) due to high interannual variability observed and uncertainties on the global sink response to climate variability (Ballantyne et al. 2012).

Remotely sensed Net Primary Production (NPP) datasets are a valuable tool to assess geographical and temporal variability on the carbon uptake by vegetation Since 2000, the Moderate Resolution Imaging Spectroradiometer (MODIS) has been used to retrieve a global NPP product which now comprises 12 years of data (2000-2011) with global coverage at 1km resolution (Zhao and Running, 2010).

In 2011 the highest global NPP anomaly, higher than 1.5Pg, was observed on the MODIS record. This extraordinary high global NPP anomaly, which was registered especially in the southern hemisphere, followed a decade of apparent decreasing trend (Zhao and Running, 2010). 2011 also registered one of the strongest La-Niña events on the instrumental record that brought generally cooler conditions, heavy rainfall on many regions of the southern hemisphere and was associated to high water retention on soils (Blunden and Arndt, 2012). Our goal is, therefore, to evaluate the reasons for such productivity enhancement (namely the role of the La-Niña event) and its relationship with climate variability.

Results indicate that high global anomaly was mainly driven by very high anomalies observed in the southern hemisphere, mostly in arid to semi-arid regions receiving much higher amounts of rain than average. At the same time, cooler than average temperatures were observed, which reduced soil water loss by evaporation. Furthermore, a strong correlation between NPP anomalies and El-Nino/Southern Oscillation is found in some of these regions and appears to drive a large fraction of global NPP anomalies.