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Interactive comment on "Comparing the impacts of 2003 and 2010 heatwaves in NPP over Europe" *by* A. Bastos et al.

Anonymous Referee #2

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General comments:

Bastos and colleagues compare the impacts of the 2003 and 2010 heat waves in vegetation activity for Western and Eastern Europe. This work is supported by remote sensing based estimates of net photosynthesis (PsN) and net primary productivity (NPP) from MODIS and climate data from ERA-Interim and the GPCC project. The stronger impacts are observed in Eastern Europe for 2010, where the affected regions are far more extensive than in the 2003 heat wave in Western Europe. The relative impacts in primary production are also higher in Eastern Europe, where on average productivity is lower. These reductions seem associated to significantly higher anomalies in temperature and reductions in water availability at deeper soil layers in 2003 (East) and mostly to high temperatures in 2010 (West). The differences in magnitude and

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apparent driving factors of anomalies make it an interesting contribution. However, despite an interesting matter, the analysis provides insufficient insights into the underlying mechanisms of vegetation responses to the two heat waves:

– Like acknowledged, in the core of the remotely sensed PsN data is a radiation use efficiency model driven by phenology dynamics and modeled instantaneous responses of photosynthetic activity and respiration to changes in climate. How much of the observed response can be see in changes in phenology (more observation based) or attributed to instantaneous responses to changes in climate (sensitive to model parameterization)? Are the responses in the fraction of absorbed photosynthetically active radiation (FPAR) consistent with PsN and NPP? What is the contribution of the environmental stresses in to anomalies in NPP? Exploring the effects on FPAR should be shedding some light on these differences.

– The interpretation of effects in autotrophic respiration is not straightforward from using PsN or NPP. For an intention to derive implications in vegetation behavior in this regard would be important to distinguish between NPP and GPP (Jung et al., 2011).

– These two years were particularly intensive also in terms of fire activity, as the authors also acknowledge. Significant losses in PsN and NPP can also be attributed to reductions in FPAR caused by fire activity. This impact cannot be disentangled in the current analysis. The isolation of burned areas could help: 1) attribute losses in vegetation activity due to fire activity; and 2) interpreting the changes in productivity based on phenological and physiological responses to climate. Clarifying these aspects would lead to a better understanding of the differences between Eastern and Western responses of vegetation to heat waves. Addressing potential implications would significantly improve the discussion and conclusion sections.

Particular comments (minor):

P15895, L23: “withing” → within?

BGD

10, C6998–C7000, 2013

Figure 2: In this plot indeed seems that the relative effect of the heat wave of 2003 is lower than the relative loss in PsN in 2010 at the annual scale. This difference appears much smaller if only looking at the period between June to August. Is this the case?

Figure 9: “P_anom” is not shown in the figure, although would be very interesting.

REFERENCES:

Jung, M., et al. (2011), Global patterns of land-atmosphere fluxes of carbon dioxide, latent heat, and sensible heat derived from eddy covariance, satellite, and meteorological observations, J Geophys Res-Biogeo, 116.

Interactive comment on Biogeosciences Discuss., 10, 15879, 2013.