Relationship in anomalous changes in solar-induced chlorophyll fluorescence to the environmental factors for last 10 years

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Solar-Induced Fluorescence (SIF) has been used to estimate the ecosystem photosynthesis (GPP) recently by Satellite remote sensing (Frankenberg et al., 2011 GRL; Guanter et al., 2012 RSE) and by ground observations (Daumard et al., 2010 IEEE TGRE; Porcar-Castell, 2011 Phys Plant). The advantage in using the SIF is to be able to detect the photosynthetic activity on multiple scales. To examine the potential relationship in anomalies between SIF and environmental factors including the VI, we investigated them from the currently available satellite data from GOME-2 (Joiner et al., 2009) and other observation-based datasets including the CRU from UEA, CarbonTracker (Clavelies et al., 2014) and multiple climatic teleconnection indices (NiNo3, SOI, NAO etc.) for 10 years from 2007 to 2016.

High correlations between SIF and both NDVI and inversed land Carbon flux emerged in Australia, Middle of North America, S&W of Africa, NW India, which correspond to grass & shrub lands. This suggests that the photosynthesis in drier and less productive ecosystems showed directly positive reactions to leaf biomass change increase probably due to simple canopy structure.

In terms of teleconnection indices, the relationships between the globally averaged values were unclear overall. Specifically, the SIF anomaly showed clearly positive and negative responses to both $T_{surface}$ and NiNO3 anomalies in northern and southern hemispheres, respectively, on contrary to unclear globally positive response to Precipitation’s one

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