



Global monitoring of sun-induced fluorescence from space: status and challenges

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Sun-induced chlorophyll fluorescence (SIF) is an electromagnetic signal emitted by the chlorophyll-a of assimilating plants in the 650-850 nm spectral range. The SIF emission has a mechanistic link to photosynthesis and responds instantaneously to perturbations in environmental conditions such as light and water stress, which makes it a powerful proxy for plants' photosynthetic activity.

Global measurements of SIF from space have been available since late 2011 from four different atmospheric satellite missions (chronologically, GOSAT, SCIAMACHY, GOME-2 and OCO-2). The potential of the derived SIF data sets to represent the photosynthetic activity of different ecosystems, including large crop belts worldwide, the Amazon rainforest and boreal evergreen forests has been demonstrated in the relatively short life-time of global SIF data.

Despite the demonstrated potential of SIF data as a proxy for global terrestrial gross primary production, current observations are partly hampered by a coarse spatial resolution or the lack of spatial coverage. For this reason, great expectations are put on the upcoming TROPOMI instrument onboard the Copernicus' Sentinel 5-Precursor mission launched in October 2017 and currently delivering the first test data sets. TROPOMI measures with daily global coverage, a spatial resolution between 3 and 7 km and continuous spectral coverage of the visible and near-infrared part of the spectrum. The recent selection of FLEX as the ESA Earth Explorer 8 to be launched around 2022 and several upcoming geostationary missions (TEMPO, Sentinel-4 and GeoCARB, covering Europe and the Americas) with potential for SIF retrievals complete an exciting near-future scenario for the monitoring of SIF from space.

In this contribution, we will provide an overview of recent developments in the global monitoring of SIF and will introduce the near-future observational scenario, with especial emphasis on the first SIF data sets becoming available from TROPOMI.