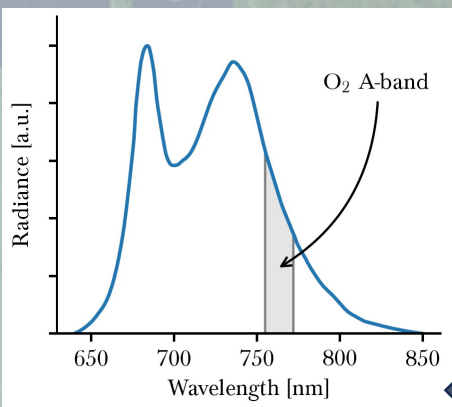


# MicroCarb

## Solar Induced Fluorescence

MicroCarb is a joint mission between the UK Space Agency and CNES that will measure sources and sinks of carbon, the principal greenhouse gas driving global warming. The University of Leicester will be using MicroCarb data to derive Solar Induced Fluorescence (SIF).

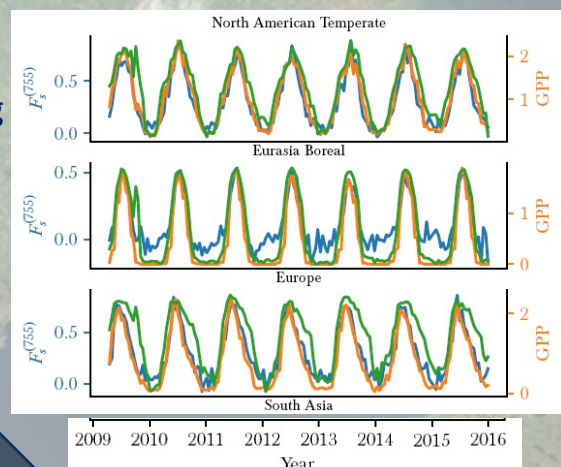
- Photosynthesis is the fundamental process by which carbon is stored in vegetation. This process is also known as Gross Primary production (GPP). Quantifying GPP globally is essential to our understanding of the carbon cycle, and it's influence on climatic changes.
- Remote detection of GPP is particularly challenging due to the overlap with other processes. We seek an alternative way to infer GPP.



- The photosynthesis process is not perfectly efficient. 90% of absorbed solar radiation is utilised to store carbon, the remainder of the energy is dissipated. Part of this dissipated energy (0.6-3.0%) is released in the form of solar induced fluorescence (SIF). As SIF is intrinsically related to GPP, we can utilise satellite observations of SIF to infer global GPP.

The majority of photons emitted in SIF are in the infrared range of the wavelength spectrum (~650 nm to 800 nm)

- Due to the broad spectral signal of SIF in the infrared, there is some overlap with the regions of CO<sub>2</sub> detection, therefore we need to be able to quantify the contribution from this source.
- MicroCarb has 4 measurement bands. The one of interest for the detection of SIF is the O<sub>2</sub> A-band. The spectral range is centred on 764 nm. By looking at only specific regions of the electromagnetic spectrum we can isolate the contributions from SIF and disseminate this from reflected solar radiation.
- The University of Leicester will contribute the operational SIF retrieval for the MicroCarb mission, that will feed directly into the Level 2 CO<sub>2</sub> product.



SIF (blue) compared with GPP (orange) for different latitudinal regions. Green is NDVI, a measure of leaf coverage. Note the similar seasonality in SIF and GPP.