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## Measuring, scaling and understanding solar-induced fluorescence from the leaf to the canopy and regional scale –a personal view on the current knowledge to relate canopy SIF to leaf-level regulation and stress response

Thursday 17 October 2024 10:00 (10 minutes)

Remote sensing of solar-induced chlorophyll fluorescence (SIF) was greatly supported by the selection of FLEX to become the 8th Earth Explorer of the European Space Agency (ESA). SIF is considered a powerful approach to monitor plant functioning at larger spatial scales opening the possibility to globally map actual photosynthesis. However, several confounding variables challenge the physiological interpretation of SIF measured with remote sensing instruments.

SIF has been shown to correlate closely with larger scale measurements of gross primary productivity (GPP) and several studies additionally showed that SIF can help to early detect vegetation stress as environmentally induced limitations of photosynthesis. However, many of these larger scale studies are correlation based and only recently mechanistic models became available that aim to translate canopy SIF to the underlying mechanisms of actual photosynthetic regulation.

In the presentation, we will give an overview about recent technological developments to measure SIF along the spatial scale from single leaves to the canopy, field, region and country. In recent years, several nonimaging and imaging instruments became increasingly available. We now can measure SIF at the leaf, close above the canopy, from UAVs, aircrafts, and satellites. This technical progress facilitates the development of a mechanistic understanding that could link leaf regulation to the canopy signal. We will exemplify paths to translate canopy SIF measurements to a mechanistic understanding of actual photosynthesis.

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