Imaging very high spatial resolution solar-induced chlorophyll fluorescence (SIF) from an uncrewed aerial vehicle (UAS)

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Objectives

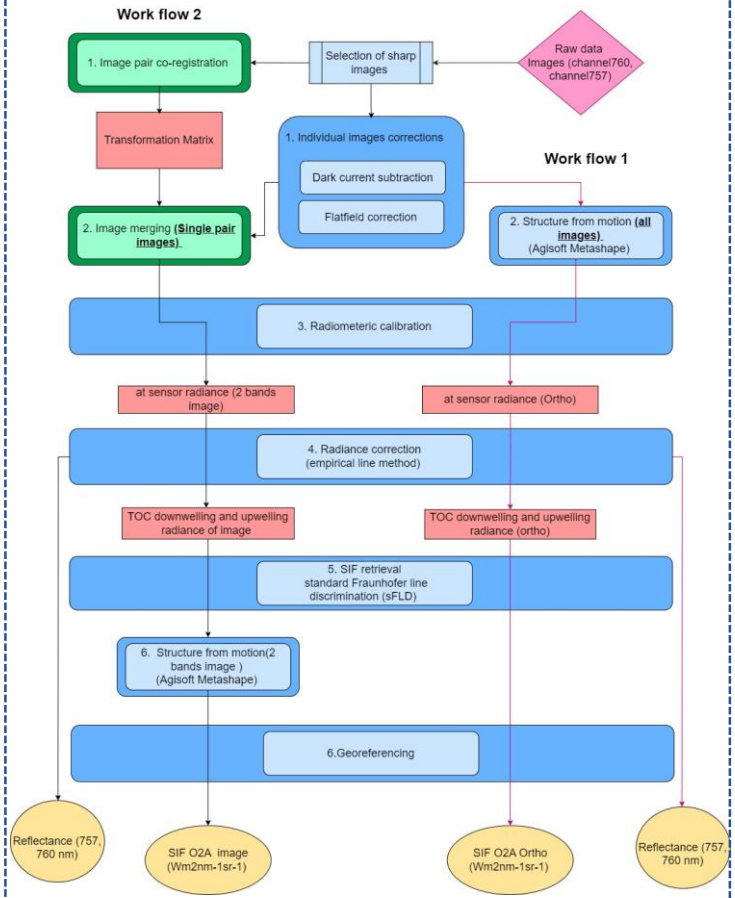
1. Develop a data processing workflow for the SIF dual-camera system SIFcam
2. Create a centimeter-resolution SIF map UAS-based SIFcam imagery
3. Evaluate the system's performance by comparing to FloX and HyPlant imagery
4. Evaluate atmospheric influence on SIF retrieval through altitude-based comparisons (20-80 m)

SIFcam

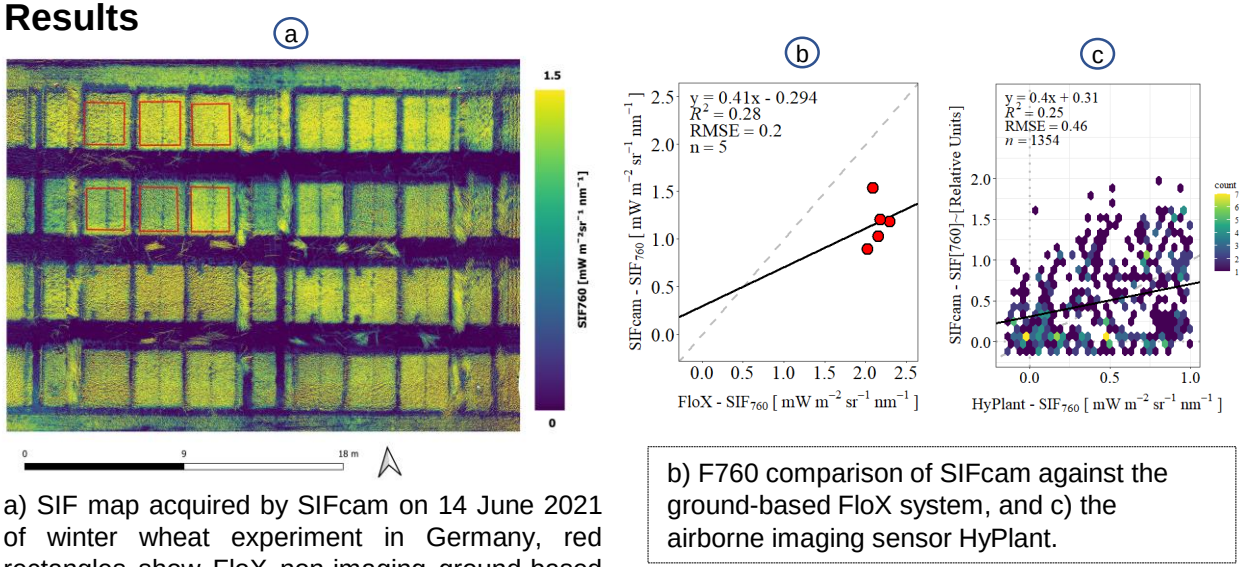
Two ultra-narrowband interference filters with central wavelengths at 757.9 nm (outside band) and 760.7 nm (inside band).

$$SIF_{760} = \frac{Rad_{in} \cdot Irr_{out} - Rad_{out} \cdot Irr_{in}}{Irr_{out} - Irr_{in}}$$

Methodology



Results



a) SIF map acquired by SIFcam on 14 June 2021 of winter wheat experiment in Germany, red rectangles show FloX non-imaging ground-based sampling positions.

b) F760 comparison of SIFcam against the ground-based FloX system, and c) the airborne imaging sensor HyPlant.