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Postprocessing Data from Monitoring Field Spectrometers for the Study of Seasonal Trends in Chlorophyll Fluorescence on Canopy Scale over Grassland

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Remote sensing of sun induced chlorophyll fluorescence (SIF) is applied for non-invasive monitoring of photosynthesis in terrestrial vegetation on various scales. However, the direct understanding of SIF as a proxy for photosynthesis is a field of ongoing research. Tower-based SIF retrieval by field spectrometers for autonomous long-term observation of vegetation aims to gain further insight into ecosystem-specific seasonal dynamics of photosynthesis activity. In this work we investigate quality criteria for long-term SIF measurements collected with FloX monitoring field spectrometers (JB Hyperspectral Devices, Düsseldorf, Germany) based on instrument characteristics, calibration, performance parameters and setup. A typical processing chain for hyperspectral field data is presented. Based on the derived quality criteria, we propose a filtering protocol for the retrieval of SIF data with FloX monitoring field spectrometers. Furthermore, the impact of changing diffuse light ratio on seasonal trends of SIF Yield is investigated and shown to be neglectable within time series. Seasonal trends of midday-mean, filtered, apparent SIF Yield are examined over grassland in Germany during spring 2018. We observed corresponding changes of red SIF Yield, far-red SIF Yield, PRI and NDVI during a severe cold spell event in two experimental sites followed by an episode of recovery. This research indicates that filtered, apparent SIF Yield in combination with PRI and NDVI monitors phenological and physiological changes of grassland at canopy level in response to rising temperatures during spring.