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Sun-Induced Chlorophyll Fluorescence Auto-Measurement Equipment (FAME) Designed for Use at Eddy Covariance Flux Sites

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The foundation of our biosphere and civilization rests on the food and energy produced by plants using sunlight. Currently there are no readily available instruments capable of continuous and unattended monitoring of plant photosynthesis and physiological stresses in natural environments. To fill this instrument gap, we have therefore developed a prototype field-deployable system for measuring sun-induced chlorophyll fluorescence (SIF) at leaf, individual plant, or canopy-scales: Fluorescence Auto-Measurement Equipment (FAME). Sun-induced chlorophyll fluorescence is emitted from the core of the photosynthetic machinery of plants and is a vital signal of photosynthesis and physiological stress. FAME is based on a number of hardware and software innovations that make it unprecedented in terms of data quality, acquisition rate, versatility, extensibility, and ease of operation. It is a high-performance integration of software and hardware technologies. It is particularly suited for use at eddy flux sites for two reasons. First, FAME permits the measurement of additional environmental variables (e.g., broadband radiation, temperature, humidity etc.)—that are critical to the interpretation of SIF observations —at the same instant as the spectral information. Second, FAME can be easily integrated into existing data acquisition systems. The FAME prototype was successfully deployed at the Missouri Ozark AmeriFlux (MOFLUX) site in September, 2016. We will present the first results of analyses of SIF measurements obtained so far at the MOFLUX site.