

Detection of vegetation LUE based on chlorophyll from hyperspectral data

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Abstract: Photosynthetic efficiency is very important, and not yet generally assessable by remote sensing. Much research has proved the possibility of the separation of solar-induced chlorophyll fluorescence (ChlF) from the reflected hyperspectral data. As the ‘probe’ of plant photosynthesis, it is possible to detect photosynthetic light use efficiency (LUE) by the separated solar-induced ChlF. A diurnal experiment was carried out on winter wheat on Apr. 18, 2008, and the canopy radiance spectra and leaf LUE data were measured synchronously. The solar-induced chlorophyll fluorescence signals at 760nm and 688nm were separated from the reflected radiance spectral based on Fraunhofer lines in two oxygen absorption bands. The result showed that LUE was negatively correlated to the separated chlorophyll signals. The statistical models for LUE based on the solar-induced chlorophyll fluorescence values at 688 nm and 760 nm bands had correlation coefficients (R^2) of 0.64 and 0.78, respectively. In addition, photochemical reflectance index (PRI) was also linked to LUE, and a statistical model for LUE based on PRI has a correlation coefficient (R^2) of 0.66. The presented method provides a novel solution for monitoring LUE from remote sensing data.

Key Words: Photosynthetic light use efficiency (LUE), fluorescence, Fraunhofer line, spectra, photosynthesis

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