Geophysical Research Abstracts
Vol. 19, EGU2017-10926, 2017
EGU General Assembly 2017

Modeling the influence of the BRDF characteristics of vegetation on the retrieval of solar-induced chlorophyll fluorescence under different illumination conditions

Xinjie Liu (1,2) and Liangyun Liu (1)

(1) Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing, China (liuxj@radi.ac.cn), (2) German Research Center for Geosciences, Helmholtz Centre Potsdam, Potsdam, Germany

The Fraunhofer Line Discrimination (FLD) principle is the main approach used for the retrieval of solar-induced chlorophyll fluorescence (SIF). The basic assumption of the FLD principle is that the apparent reflectance spectra without SIF in-filling are smooth in the region of the absorption bands. However, in fact, this assumption is not valid due to the so-called "direct radiation in-filling" effect caused by the non-linear contribution of direct and diffuse radiation at the oxygen absorption bands, which are widely used for ground-based SIF retrieval. In this study, we first analyzed the physical mechanism of the direct radiation in-filling effect on the oxygen absorption bands and found that the bias in the SIF retrieval caused by the direct radiation in-filling effect at the O_2-A band was less than 20% based on the use of a simulated dataset. Secondly, we established a simple correction model of the direct radiation in-filling effect. We found that the direct radiation in-filling effect at the O_2-A band was directly proportional to the difference between the reflectance of the direct and diffuse radiation, and that the coefficient of proportionality was well correlated with the diffuse-to-global radiation ratio in the form of a quadratic function. The coefficient of determination (R-squared) for this correlation was 0.97. Finally, the model was validated using both simulated and field datasets. The validation results show that the bias in the SIF retrieval caused by the direct radiation in-filling effect can be efficiently corrected using the model proposed in this paper. This study thus provides a possible approach to estimating and correcting for the direct radiation-infilling effect using prior knowledge of the BRDF characteristics of direct and diffuse radiation for specific targets.