



Diurnal Variation of Solar-Induced Chlorophyll Fluorescence of Winter Wheat

Xin Zhang (1), Jianjun Wu (2), Leizhen Liu (3), and Wenhui Zhao (4)

(1) Beijing Normal University, Faculty of Geographical Science, China (201621480010@mail.bnu.edu.cn), (2) Beijing Normal University, Faculty of Geographical Science, China (jjwu@bnu.edu.cn), (3) Beijing Normal University, Faculty of Geographical Science, China (leizhenliu@163.com), (4) Beijing Normal University, Faculty of Geographical Science, China (201731480017@mail.bnu.edu.cn)

Abstract: Solar-induced chlorophyll fluorescence (SIF) has been widely used as an indicator for photosynthesis of vegetation to monitor the vegetation at the ground, high altitude and satellite scale because it is sensitive to vegetation, and easy to be measured and to facilitate the non-destructive detection in large areas. It is very important to study the diurnal variation of SIF as a basis for understanding SIF. In this study, winter wheat was used as the experimental object. The daytime SIF data from the jointing to heading stages were obtained by using spectrometer. The relationship between diurnal variation of SIF and photosynthetically active radiation (PAR), and the diurnal variations of SIF under different weather and soil water conditions were investigated. The results showed that the diurnal variation of SIF had a positive correlation with the PAR, and the correlation coefficient reached 0.9. In sunny days, the diurnal variation of SIF had a similar variation, which showed a single peak. It usually peaked at about 12 o'clock, showing a symmetrical distribution. The SIF values of winter wheat gradually increased from 6:00-12:00, and decreased during the period of 12:00-18:00. In cloudy days, because the SIF was affected by the light condition, the diurnal variation of SIF showed irregular fluctuation with small ranges. Based on the water control experiment, it was found that the diurnal variation of SIF was sensitive to soil moisture through the comparison of the ranges of SIF values before and after irrigation. The peak of SIF decreased rapidly after irrigation, and then gradually increased and stabilized. The results of this study provide a reference for the application of SIF, especially in the detection of plant growth, health and other physiological conditions.

Key words: Solar-induced chlorophyll fluorescence, Diurnal variation, Photosynthetically active radiation, Winter wheat