POSTER 25

벼논에서 관측된 태양유도 엽록소 형광물질과 총1차생산량의 일간 그리고 계절에 따른 관계에 대하여

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Relationship between Sun-induced Chlorophyll Fluorescence and Gross Primary Production at Diurnal and Seasonal Scales, a Case Study in A Rice Paddy

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Sun-induced chlorophyll fluorescence (SiF) is a radiation flux emitted by chlorophyll molecules, and is increasingly used as a proxy for canopy photosynthesis. While ground-based, airborne, and satellite observations have demonstrated a strong linear relationship between SiF and gross primary production (GPP) at seasonal scales, their relationships at short temporal scales remain unclear. In this study, canopy SiF, GPP, and absorbed photosynthetically active radiation (APAR) were continuously monitored over an entire growing season in a rice paddy. The relationship between GPP and SiF, as well as corresponding light use efficiencies (LUEp = GPP/APAR, LUEf = SiF/APAR) were examined both at seasonal and diurnal scales. In addition, the responses of LUEp and LUEf to environmental conditions, including temperature, vapor pressure deficit, and diffuse PAR proportion, were assessed at different growing stages. We found a strong correlation between seasonal patterns of daily mean SiF and GPP ($R = 0.92$, $p < 0.001$), and half-hourly SiF showed a significant relationship ($p < 0.05$) with GPP on 63 out of 97 available days. We also found that when linking instantaneous SiF with GPP, the relationship varied considerably at different growing stages and illumination conditions. At a seasonal scale, daily mean LUEf significantly tracked temporal variations

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in daily mean LUEp ($R = 0.69$, $p < 0.001$). However, LUEf only showed significant diurnal correlations with half-hourly LUEp on 25 out of 89 available days over the whole growing season. Furthermore, we found that LUEp and LUEf showed opposing responses to diurnal temperature and VPD variations at the rice ripening stage. This study highlights the complexity of the relationships between GPP and SiF at high temporal resolution and has important implications for linking remotely sensed SiF observations with terrestrial photosynthesis.