Geophysical Research Abstracts
Vol. 20, EGU2018-2598-1, 2018
EGU General Assembly 2018

Satellite chlorophyll fluorescence captures heat stress for the witer wheat in the Indian Indo-Gangetic Plains

Lian Song (1), Luis Guanter (2), Kaiyu Guan (3), Liangzhi You (4), Alfredo Huete (5), and Yongguang Zhang (6)

(1) International Institute for Earth System Science, Nanjing University, Nanjing, China (song-lian@hotmail.com), (2) GFZ German Research Center for Geosciences, Potsdam, Germany (guanter@gfz-potsdam.de), (3) Department of Natural Resources and Environmental Sciences and National Center for Supercomputing Applications, University of Illinois at Urbana Champaign, Illinois, USA (kaiyug@illinois.edu), (4) International Food Policy Research Institute, 1201 Eye Street, NW, Washington, DC, USA (L.YOU@CGIAR.ORG), (5) Plant Functional Biology and Climate Change Cluster, University of Technology Sydney, NSW 2007, Australia (Alfredo.Huete@uts.edu.au), (6) International Institute for Earth System Science, Nanjing University, Nanjing, China (yongguang_zhang@nju.edu.cn)

Extreme high temperature represents one of the most severe abiotic stress limiting crop productivity. However, understanding the crop responses to heat stress is still limited under the increasing heatwaves in both frequency and severity. This is partly due to the lack of timely and effectively monitor of crop responses to extreme heat at a broad scale. In this work, we used the recent available space-borne sun-induced chlorophyll fluorescence (SIF), a new proxy of photosynthesis, along with traditional vegetation indices (NDVI) to investigate the impacts of heat stress on winter wheat in the northwestern India, one of the world's major wheat production areas. High determination coefficient between satellite SIF and crop-yield based net primary production (NPP) at the large level (R2=0.77, whole study area) and the small level (R2=0.61, county scale) indicate that SIF can be a good proxy for the wheat yield. The remarkable consistency between SIF and the heat stress in 2010 during wheat grain-filling and harvesting stage at the spatial and temporal scale demonstrate that SIF has a high sensitivity and can monitor heat stress on wheat timely. As indicated by SIF, the reduce of the yield caused by 2010 heat stress was lower in the northwest of the study area (Punjab) with the intensive or zero-tillage due to the climate smart agricultural (CSA) system.