Geophysical Research Abstracts
Vol. 21, EGU2019-13059, 2019
EGU General Assembly 2019

Impact of Weather disturbance on NDVI over Siberia

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Boreal forests are the largest forest carbon sink in the world, and they are broadly regulated by climate change. While former studies mostly concentrated on the impact of climate warming on vegetation, the effect of changes in variability on vegetation is poorly understood. We combine ERA-interim climate reanalysis data set and the latest NDVI data set produced by Global Inventory Monitoring and Modeling Studies (GIMMS) during 1982-2015 to study the links between spring weather disturbance and NDVI over West Siberia and the possible mechanisms of vegetation response to weather disturbance. By employing the empirical orthogonal function (EOF) method, the most principle variation of weather disturbance over West Siberia generally varies in the same phase and centers over West Siberia Plain. The spring NDVI are significantly negative correlation with the principle variation in spring weather disturbance, and this response could last for one to two months. The reasons why the vegetation get worse under severe weather disturbance can be inferred from the shortage of heat and the increase of frost days and the extreme cold days induced by strong spring weather disturbance. Quantitatively, spring GDD in strong weather disturbance years is approximately the same as that in weather disturbance years, while seasonal mean of daily maximum temperature decreases about 30% and other cold indicators increase at least 40% in strong weather disturbance years.Typically, the accumulated low temperature of extreme cold days increases up to 4 times than that in weak weather disturbance years, which may be the vital bridge by which weather disturbance influences vegetation. These findings can be critical in exploring the impact of climate variance on vegetation, ecosystem and carbon cycle.