REMOTE SENSING OF THE IMPACT OF FLASH DROUGHT ON VEGETATION DYNAMICS OVER EAST ASIA

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Abstract: In contrast with conventional drought, which is mainly driven by lack of precipitation, flash drought in the hydro-climate community usually includes abnormally high temperatures, winds, and/or incoming radiation that leads to abnormally high evapotranspiration rates. A flash drought is characterized by its rapid onset and arouses widespread concerns due to its devastating impacts on vegetation health, food security, and ecosystem and environmental sustainability without sufficient early warnings. Flash droughts occur more often than perceived and can cause major agricultural losses if they are not predicted and detected in a timely manner. To date, flash droughts have typically been identified by examining large and rapid changes in one or more metrics that reflect changes in sub-surface soil moisture. This study investigated the remote sensing-based vegetation dynamics based on the joint distribution of positive temperature anomaly (e.g., heatwave) and soil moisture deficits during several extreme events of flash drought with different climates and vegetation conditions over East Asia. In this study, flash drought detection was presented based on the satellite-derived drought index Evaporative Stress Index (ESI). ESI is used as an early warning indicator for rapidly-occurring flash drought based on high-resolution vegetation property datasets retrieved from the Moderate Resolution Imaging Spectroradiometer (MODIS). Here we identify flash drought events by considering the declining rate of soil moisture and the drought persistency, and the linkage between vegetation dynamics and characteristics of vegetation, for example, gross primary productivity (GPP), soil moisture and evapotranspiration associated with flash drought.

Keyword: flash drought, vegetation dynamics, soil moisture, evapotranspiration, gross primary productivity