EGU21-6614, updated on 28 Oct 2021
https://doi.org/10.5194/egusphere-egu21-6614
EGU General Assembly 2021

Flash Drought and Heat Waves: An Overview of Cascading and Compound Events

Taylor Grace[1], Jordan Christian[1], and Jeffery Basara[1,2]
[1]School of Meteorology, University of Oklahoma, Norman, OK, United States of America
[2]School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK, United States of America

Flash droughts and heat waves have substantial impacts on agriculture, socioeconomics, and human health. The combined influence of these two events exacerbate the damage to several sectors. The positive feedback between drought and heat waves has been previously studied, but the connection between flash drought and heat waves (or record temperatures) has only been investigated to occur roughly at the same temporal period. Further understanding the compound and cascading impacts of flash droughts and heat waves could potentially enhance monitoring and/or predictability of flash drought events benefiting subseasonal-to-seasonal forecasts, minimize human mortality, and prevent agricultural yield loss. We present a novel approach to analyzing compound and cascading impacts from the flash drought-heat wave relationship by investigating multiple case studies (e.g., 1950s drought event, 2011-2012 U.S. flash drought, and 2019 U.S. flash drought). Several reanalysis datasets were utilized to examine the intensity, temporal duration, and spatial extent relationships between flash drought and heat wave conditions during the case study events. We define heat waves using the following framework which incorporates classifications employed in previous studies; one classification is dependent on a relative threshold (i.e., 95th percentile) applied to daily maximum and minimum temperatures, whereas the second part of the definition utilizes heat index under the same relative threshold. In order for a heat wave event to begin, this definition must hold true for three or more consecutive days for a specified spatial method. Our flash drought analysis incorporated a percentile methodology based on standardized evapotranspiration stress ratio (SESR). Comparison between intensity, spatial extent, and temporal duration relationships for compound and cascading events were of particular focus for this study. A mixture of compound and cascading events were found within one flash drought study (i.e., 2011-2012 flash drought). As such, we further hypothesize that the intensity and temporal duration will differ between compound and cascading events. Yet, we expect the spatial extent to remain positively correlated as shown from previous studies.