Introducing Open-Source Tool for Near-Real-Time Global Flash Drought Monitoring with SMAP

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The increasing frequency and severity of flash droughts pose a threat to global food and water security and seasonal climate forecasts. We introduce a new tool for near-real-time global flash drought monitoring with SMAP leveraging the footprint-scale thresholds of soil hydrologic regimes (energy-limited wet phase, moisture limited transitional, and dry phase) and land-atmospheric coupling strength. We define two complementary indices based on SMAP soil moisture for measuring the *severity* and the *rate of intensification* of drought, namely, Soil Moisture Stress (SMS) and Relative Rate of Drydown (RRD), respectively. SMS and RRD are non-linearly combined to provide FDSI (Flash Drought Stress Index) a composite indicator used for global flash drought monitoring. Several advantages of FDSI include non-reliance on long-term soil moisture records, sensitivity to changing land-surface heterogeneity, land-atmospheric interactions, and evolving meteorological anomalies. FDSI is extensively validated globally across multiple timescales (daily, weekly, and monthly) using a suite of vegetation and meteorological drought indices. We demonstrate the application of FDSI in the mechanistic evaluation of select recent flash droughts across the globe (Northern Great Plains in 2017, South Africa in 2015-2016, and Eastern Australia in 2019-2020), and the onset of the ongoing (since 2020) heatwave induced drought in the western U.S. Through this presentation, we introduce the viewers to the open-source web-based resources for accessing global FDSI estimates and related geospatial parameters.