

Identification of Flash Drought Events using Machine Learning Techniques

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Drought is a climatological dry extreme that can have a number of impacts on water resources and agricultural output. To mitigate impacts, many studies have focused on being able to identify and predict droughts. In recent decades, machine learning (ML) has emerged as a useful tool for drought identification and prediction, and ML applications using long-term metrics have found that random forests (RFs), support vector regressions (SVRs), and artificial neural networks (ANNs) have performed best. However, recent attention has demonstrated that long-term drought metrics, such as the Palmer drought severity index (PDSI) and standardized precipitation index (SPI), cannot adequately identify the rapidly developing conditions (~ 1 month) that characterize flash drought. Thus, studies focused on flash drought have yielded a number of indices that accurately represent rapidly evolving conditions using precipitation, soil moisture, evapotranspiration (ET), and potential ET (PET). Further, while much work has been conducted to investigate and identify flash drought events, limited work has been completed using ML techniques. Thus, this study aims to use the 42-year North American Regional Reanalysis (NARR) dataset to identify flash drought using ML techniques. In particular, this study aims to determine whether the previous methods (e.g., RFs, SVRs, and ANNs) retain their performance during rapidly changing environmental conditions on shorter timescales. An additional analysis will be performed to determine how much each flash drought index contributes toward rapid intensification and flash drought identification.