PREFACE

Flash droughts refer to the abrupt depletion of readily available water contents in soil through processes such as temperature, precipitating, and other forms of demand. New research has shown that meteorological conditions a few days before the occurrence of flash droughts are cues for the event, and two categories of flash droughts have been revealed based on the precipitation rates and fluctuations in the evaporative demand.

The combination of subjective Earth observation data, for instance, soil moisture data from remote sensing platforms with machine learning tools can improve understanding of the correlation between flash droughts and soil moisture data. Our underlying hypothesis is that by using soil moisture data from Earth observation satellites joined with meteorological data, and LSM outputs, it is possible to create the basis for early signal and pattern recognition related to flash drought conditions. Random forest neural networks and support vector machines are used among others to identify multivariate relationships between soil moisture precipitation temperatures and other important variables. These objective techniques are useful in identifying non-linear patterns that are more difficult to detect by intuition, besides enhancing the understanding of the processes that lead to flash drought formation. The knowledge of flash drought can help to identify the regions with unfavorable features of soil and anticipate the increase in the frequency of this phenomenon's occurrences as well as the assessment of its effects on plants in various climatic conditions. New and improved ES models should be incorporated in another study to increase knowledge on the chances of surface resistance to elevated CO2 which will also point to the need to examine non-climatic influences on the water demand in the atmosphere for more comprehensive flash drought monitoring and prediction. Combining EO data with machine learning approaches may be a valuable tool in improving the abilities for flash drought monitoring and prediction to create effective early warning systems and risk management in invulnerable areas for sustainable agricultural practice and water resource management.