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Storyline approach for the analysis of the 2012 drought in Serbia and possible future similar events

Milica Tasic, Vladimir Djurdjevic, Ivana Tasic, and Irida Lazic

University of Belgrade, Faculty of Physics, Meteorology, Belgrade, Serbia (milica.tasic@ff.bg.ac.rs)

In 2012, Serbia experienced one of its warmest and driest years on record. The summer of 2012 marked the highest temperatures recorded since meteorological measurements began in Serbia, in relation to the reference period from 1991 to 2020. Throughout the summer, the entire country faced severe drought conditions persisting until the end of November. Serbia's agriculture is very vulnerable to drought - an estimated annual economic loss is approximately 2 billion euros due to extreme 2012 drought. Recent studies emphasize the value of the storyline approach in offering a comprehensive and manageable framework for evaluating environmental, societal and economic risks associated with climate change. Considering the potential for more intense climate events resulting from climate change, we decided to apply the storyline approach, to determine what future events similar to drought 2012 might look like and how they are influenced by different climate change scenarios. We constructed drought metrics based on precipitation deficit, following the method proposed by van der Wiel et al. [1], and with the use of the EOBS dataset. Analyzing future scenarios involved creating a meteorological analogue to the 2012 drought, using single model large ensemble historical and future scenario simulations from CMIP6 database - the MPI-M Earth System Model version 1.2, for different SSP scenarios. This analysis offers insights into different storylines, aiding the assessment of climate risks and the potential impacts of hypothetical drought scenarios.

The summer of 2012 was extraordinarily warm, and, as previous studies show significant changes in temperature extremes during the summer season in Serbia, we included analyses of temperature anomalies during the summer. Additionally, to create more comprehensive storylines, our study involves analyzing large-scale atmospheric patterns. Our results show an increase in drought severity in a warmer future, offering an enhanced understanding of how extreme events like the 2012 drought (or more severe) are changing measurably due to climate change, and provide examples of potential impacts, in order to raise public awareness about the potential consequences of future climate change in Serbia.

[1] van der Wiel, K., Lenderink, G. and de Vries, H., 2021. Physical storylines of future European drought events like 2018 based on ensemble climate modelling. *Weather and Climate Extremes*, 33, p.100350.