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## Physical storylines of future European drought events like 2018 based on ensemble climate modelling

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The summer of 2018 was exceptionally warm and dry in western Europe. In the aftermath of such extreme weather events, questions arise on the role of climate change in the event and what future events might look like. We present physical storylines of similar future events to answer some of these questions. A storyline approach, focusing on physical processes and plausibility rather than probability, improves risk awareness through its relation with our memory of the observed event and contributes to decision making processes through their user focus. We select analogue events from large ensemble climate model simulations representing 2 °C and 3 °C global warming scenarios, and discuss how event severity, event drivers and physical processes are influenced by climate change. We show that future Rhine basin summer droughts like 2018 will be more severe. Decreased precipitation and increased potential evapotranspiration, caused by higher temperatures and increased incoming solar radiation, lead to higher precipitation deficits and lower plant available soil moisture. Possibly, changes in atmospheric circulation contribute to increased spring drought, amplifying the most severe summer drought events. The spatial extent of the most severe drought impacts increases substantially. The noted changes can partly be explained by changes in mean climate, but for many variables changes in the relative event severity on top of these mean changes contribute as well. Furthermore, the newly developed method is tested for robustness. It showcases that a balance, or compromise, is needed between analogue composite size and analogue extremity. Having a sufficiently large ensemble, such that robust analogues can be created for the observed event under consideration, is essential to provide reliable and robust climate change information.