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# Climate Change's Influence on June 2009 Extreme Precipitation Event Over Southeast Austria

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During 22-24 June 2009, Austria witnessed a rampant rainfall spell that spread across populated areas of the country. High-intensity rainfall caused 3000+ landslides in Feldbach, and property damages worth €10,000,000 in Styria itself. Numerous synoptic-scale studies indicated the presence of a cut-off low over the Adriatic and excessive moisture convergence behind the extreme event. In a warmer climate change scenario, such an extreme precipitation event may become more intense due to higher water holding capacity of air with increased temperatures, but this reasoning may not be so straightforward considering the complex physics of precipitation.

Precipitation, as a natural atmospheric phenomenon, is dependent upon the dynamic and thermodynamic characteristics of the atmosphere. While it is safe to say that the thermodynamic characteristics of the atmosphere are relatively easier to simulate with confidence using available global models, the same cannot be said about the dynamics. This can be blamed on the chaotic non-linear behaviour of the atmosphere and problem in resolving sub-grid scale processes that reduce the model accuracy for longer spatial scales.

CCLM regional model is used to study this extreme precipitation event. Our setup uses IFS data to calculate initial and boundary conditions for the simulations of the 'present' case where our attempt is to recreate the event over the same location as the original event. Further we use CMIP5 global climate models (at the RCP8.5) scenario. In particular, these will be applied in the 'surrogate climate change' method. Here, the climate change signals are calculated by computing the difference between the thermodynamic fields of the CMIP5 simulations for the future and the past. These climate change signals are applied to the original fields to obtain the 'changed' fields which are used to calculate new initial and boundary conditions resembling a climate-change future. A similar approach is to be applied for the 'past' case simulations.

The idea behind this experimental setup is to establish a 'storyline' for the event as it would have occurred in the past, present and the future. The storyline approach provides an alternative to the

traditional probabilistic approach for assessing risk enhancement and can serve to study responses of different mechanisms to climate change. The storyline approach also helps in decision-making as event-oriented risk management is easy for people to perceive and respond to. An associated landslide modelling study, which uses the precipitation output of our simulations as input, looks into the probable increased risks of landslides in the region and will directly aid the lives of those living in Southeast Austria.