EGU21-8309
https://doi.org/10.5194/egusphere-egu21-8309
EGU General Assembly 2021

Applying a storyline approach to explore the impact of future Atmospheric River induced floods in western Norway

Trine Jahr Hegdahl[1], Kolbjørn Engeland[1,2], Malte Müller[3], and Jana Sillman[4]
[1]Norwegian Water Resources and Energy Directorate (NVE), Hydrological Modelling, Oslo, Norway (tjh@nve.no)
[2]University of Oslo (UiO), Oslo, Norway
[3]Norwegian Meteorological Institute (METNorway), Oslo, Norway
[4]Center for International Climate Research (CICERO), Oslo, Norway

Atmospheric rivers (AR) are responsible for the most extreme precipitation events causing devastating landslides and floods in western Norway. In this study an event-based storyline approach is used to compare the flood impact of extreme AR events in a warmer climate to those of the current climate. The four most extreme precipitation events were selected from 30 years of present and future climate simulations from the high-resolution global climate model, the EC-Earth model. For each of the four events, EC-Earth was rerun creating 10 perturbed realizations. A regional convective permitting weather prediction model, AROME-MetCoOp, was used to further downscale the events, and thereafter the operational Norwegian flood-forecasting model was used to estimate the flood levels for 37 catchments in western Norway. The magnitude and the spatial impact were analyzed, and different hydrological initial conditions, which affect the total flooding, were analyzed.

The results show that more catchments were affected with larger floods in the future climate events compared to the current climate events. In addition, the combination of multiple realizations of meteorological forcing and different hydrological initial conditions, for example soil saturation and snow storage, were important for the estimation of the maximum flood level. The meteorological forcing had the highest overall effect on flood magnitude; however, varying and depending on event and catchment. Finally, operational flood warning levels were used to visualize the difference between future and current climate flood events. Applying a setup similar to the one used operationally and relating the future events to known current events associated with ARs, enables a common reference and ease communication with end-users and decision makers.