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Translating the October 2014 flood event in western Norway into the future

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At the end of October 2014, an atmospheric river reached the West Coast of Norway, producing large amounts of precipitation and consequently, devastating floods in several valleys. With the vulnerability of the local communities as main motivation, this study started by discussing with different stakeholders (municipalities, hydropower companies, meteorological service, television channels and state authorities) what information they wished to have in hand to be better prepared for a future, and potentially more intense, precipitation event caused by atmospheric rivers. Taking a "tales" approach, we aim at gaining a more realistic picture of how a specific future weather extreme at the West Coast of Norway might look like, rather than providing an estimation of the probability of future extreme precipitation in that region.
With the same modelling chain used routinely for weather prediction by the Norwegian Meteorological Institute, we perform a high-resolution ensemble with the regional numerical weather prediction model AROME MetCOop (spatial resolution of 2.5 km) for the October 2014 event. For the operational weather forecasts, the AROME MetCOop model is driven by the ECMWF forecasts, but here, we drive the model with simulations of an analogue of the October 2014 event in the EC-EARTH global Earth System model (spatial resolution of 25 km) under present and future climate conditions. One focus of this study is to evaluate how EC-EARTH and AROME MetCOop simulate the event compared to a re-analysis and high-resolution gridded observations. Finally, to better illustrate how a future flood might look like, we use a hydrology model to compute the river discharge in the river catchment of interest using the present and future simulations downscaled with AROME MetCOop. For the operational discharge forecasts, a lumped daily HBV model is used. For this study we calibrate a distributed HBV model on hourly observations on a 1x1 km scale. To test the model chain that will be used in this study, the HBV model will be validated with the forecast that was provided for the October 2014 event. The end results will be distributed by standard (weather prediction) communication channels of the Norwegian Meteorological Institute and thus, will be easily accessible by end-users for analyzing the impact of the events in the future and support decision-making on hazard prevention and control.