

# The role of spatial and temporal model resolution in a flood event storyline approach in Western Norway

Nathalie Schaller, J. Sillmann, M. Müller, R. Haarsma, W. Hazeleger, T. J. Hegdahl, T. Kelder, G. van den Oord, A. Weerts and K. Whan EGU Vienna, May 2020



### Motivation

- A physical climate storyline approach is applied to an autumn flood event in the West Coast of Norway caused by an atmospheric river
- Event of interest: October 2014 floods
- Demonstrate the value and challenges of higher spatial and temporal resolution in simulating flood impacts





## **Operational modelling chain**





State Meteorologists





National flood warning

Commercial Partners like renewable energies

Data dissemination server



Courtesy of Malte Müller

- simulations:

#### **EC**–EARTH (global model)







#### Global high-resolution (~25km) atmosphere-only

#### - 6 ensemble members 2002-2006 (obs SST) – 6 ensemble members 2094-2098 (RCP 4.5, ΔSST from SRESA1B)





~25km

#### EC-EARTH (global model)

- Global highsimulations:
  - 6 ensemble members 2002-2006 (obs SST)
  - 6 ensemble members 2094-2098 (RCP 4.5,  $\Delta$ SST from SRESA1B)
- Select most extreme event in October for West Coast, for PRESENT and FUTURE
- 2 events x 10 initial condition perturbations = 20 simulations at ~25km resolution with EC-EARTH



Global high-resolution (~25km) atmosphere-only









 Boundary conditions from EC-EARTH to run AROME-MetCoOP (2.5km)





#### **HBV** distributed / lumped

- HBVIump as used by stakeholder NVE to assess effect of higher spatial resolution
- HBVdist to assess effect of higher temporal resolution



°CICERO

### Cumulative precipitation in West Coast region in EC-Earth and AROME



Present

Time (hours)



8



#### Precipitation change FUTURE-PRESENT





### **Results: HBVIump (effect of spatial resolution)**

 Streamflows generally higher in AROME compared to EC-Earth • Future event streamflows higher for Røykenes but not for Flåm







### **Results: HBVdist (effect of temporal resolution)**





#### Peak streamflows more realistic with hourly vs daily input (both AROME)

### Conclusions

- precipitation amounts
- Peak streamflows therefore higher when using AROME input in HBV model
- Hourly input further produces higher streamflows compared to daily input
- hits every catchment



• EC-Earth & AROME simulate extreme precipitation event caused by AR realistically

• In AROME simulations, precipitation occurs more localised than in coarser EC-Earth simulations: some catchements are not hit, but those that are experience larger

Streamflow peaks on average higher in a future climate BUT not every future event





### nathalie.schaller@cicero.oslo.no

- cicero\_klima
- cicero.oslo.no W
- cicerosenterforklimaforskning f



### **Atmospheric rivers detection**

Atmospheric river: long narrow and transient corridor of anomalously strong horizontal water vapor transport

#### Topography





#### Oct-Nov-Dec 99th percentile daily precipitation

