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Forecasting the weather
- ensemble techniques
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Obtain High Resolution Climate Information by Regional Climate Simulation for Bergen-Hardanger Region

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Bergen-Hardanger region has highly complex topography. The Norwegian Sea is at its west. The region has numerous mountains. The highest Hardanger mountain, about 2400 m, is at east. The region's climate adaption management requires related information at high spatial and temporal resolution. These information are provided mainly to the regional transport and construction sectors.

Because of its ability to perform long term high resolution simulations and its better physics representations, RCM WRF is applied to downscale reanalysis data and GCM's climate simulations. Two sets of experiment are carried out. The first set of experiment is to test the WRF model stability and performance at 1 km x 1 km horizontal resolution. The model runs with NCAR/NCEP reanalysis data as initial and boundary conditions. The simulation is performed continuously for a month (December 2003) by using 30sec USGS and MODIS landuse data. The purpose is to examine the landuse effects on simulated surface wind and temperature at minimum and cross zero point. The simulated surface wind and temperature also have reasonable spatial distribution for the finest domain. This model run can be treated as a historical winter climate simulation in the region in order to verify the WRF model physics, especially at 2 bridge sites (Sotra and Hardanger). The WRF simulation for September 2003 can be regarded as simulation in normal climate condition. The simulated T2 (Hardanger) and wind (Sotra) have a general agreement with the observations. Minimum T2 at Sotra is several degrees over estimated, and U10 at Hardanger is also over estimated in late September. WRF model will also simulate a historical very large wind storm event to verify if the model can capture such climate features. The second experiment is to downscale NORESM1-M historical and climate scenario realizations to project the surface wind and temperature in mid 21st century. NORESM1-M is developed based on NCAR's CCSM4 with modified cloud module and a new ocean model. The horizontal spatial resolution is 1.9x2.5 degree with 26 vertical hybrid pressure levels. The ESM produces large amount of variables of atmosphere, land, and ocean. The WRF model is forced by the selected ESM's forcing fields at every 12 hours, except SST which is supplied every 24 hours. The WRF model's physics schemes are the same as those in the first experiment. The initial simulation is carried out for a month. The downscaled wind speed at the sites of two bridges show reasonable magnitude and distribution. Low surface temperature is found in the finest domain by WRF-NORESM simulation. This is possibly due to the low temperature in the initial condition caused by ESM's internal variability. More simulations are necessary in order to project the future surface climate forcings and to reduce sampling effects of the ESM's internal variability.