EMS Annual Meeting Abstracts
Vol. 14, EMS2017-665, 2017

Ensemble of Regional Climate Model Projections for Ireland

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The method of Regional Climate Modelling (RCM) was employed to assess the impacts of a warming climate on the mid-21st-century climate of Ireland. The RCM simulations were run at high spatial resolution (∼4km), thus allowing a better evaluation of the local effects of climate change. To address the issue of uncertainty, a multi-model ensemble approach was employed. Through the ensemble approach, the uncertainty in the projections can be partially quantified, thus providing a measure of confidence in the predictions.

The COSMO-CLM and WRF RCMs were used to downscale the Max Planck Institute ECHAM5, UK Met Office HadGEM2-ES, Canadian Climate Centre CGCM3.1 and the EC-Earth consortium GCMs. To account for the uncertainty in future emissions, a number of scenarios (B1, A1B, A2, RCP4.5 and RCP8.5) were used to simulate the future climate.

The projections for mid-century indicate an increase of 1–1.6°C in mean annual temperatures, with the largest increases seen in the east. Warming is enhanced for the extremes (i.e. hot or cold days). Averaged over the whole country, the number of frost days is projected to decrease by over 50%. The projections indicate an average increase in the length of the growing season of over 35 days per year.

Results show significant projected decreases in mean spring and summer precipitation amounts by mid-century. The projected decreases are largest for summer, with “likely” reductions ranging from 0% to 20%. The frequencies of heavy precipitation events show notable increases (approximately 20%) during the winter and autumn months. The number of extended dry periods is projected to increase substantially during autumn and summer.

The energy content of the wind is projected to significantly decrease for the future spring, summer and autumn months. The projected decreases were largest for summer, with “likely” values ranging from 3% to 15%. Results suggest that the tracks of intense storms are projected to extend further south over Ireland relative to those in the reference simulation. As extreme storm events are rare, the research was extended to included analysis of a number of Euro-CORDEX simulations, thus allowing a robust statistical analysis of storm-track projections.

Finally, an overview will be presented on current work to produce sharper estimates of expected climate change in Ireland. This is achieved by increasing model resolution and employing more up-to-date RCMs, GCMs and emission scenarios to simulate the future climate. In particular, the upcoming Met Éireann/ICHEC CMIP6 EC-Earth global projections will be downscaled.