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Simulating Climate Change in Ireland

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At the Meteorology & Climate Centre at University College Dublin, we are using the CLM-Community's COSMO-CLM Regional Climate Model (RCM) and the WRF RCM (developed at NCAR) to simulate the climate of Ireland at high spatial resolution.

To address the issue of model uncertainty, a Multi-Model Ensemble (MME) approach is used. The ensemble method uses different RCMs, driven by several Global Climate Models (GCMs), to simulate climate change. Through the MME approach, the uncertainty in the RCM projections is quantified, enabling us to estimate the probability density function of predicted changes, and providing a measure of confidence in the predictions.

The RCMs were validated by performing a 20-year simulation of the Irish climate (1981-2000), driven by ECMWF ERA-40 global re-analysis data, and comparing the output to observations. Results confirm that the output of the RCMs exhibit reasonable and realistic features as documented in the historical data record.

Projections for the future Irish climate were generated by downscaling the Max Planck Institute's ECHAM5 GCM, the UK Met Office HadGEM2-ES GCM and the CGCM3.1 GCM from the Canadian Centre for Climate Modelling. Simulations were run for a reference period 1961-2000 and future period 2021-2060. The future climate was simulated using the A1B, A2, B1, RCP 4.5 & RCP 8.5 greenhouse gas emission scenarios.

Results for the downscaled simulations show a substantial overall increase in precipitation and wind speed for the future winter months and a decrease during the summer months. The predicted annual change in temperature is approximately 1.1°C over Ireland. To date, all RCM projections are in general agreement, thus increasing our confidence in the robustness of the results.