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Performance of regional climate models in simulations of present-day Irish climate: Implications for constructing future scenarios

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Simulations of present-day (1961-1990) climate from 19 regional climate model experiments have been compared to the observed baseline climate for Ireland. These simulations, driven by global climate models, are obtained through the EC PRUDENCE (**P**rediction of **R**egional scenarios and **U**ncertainties for **D**efining **E**uropea**N** **C**limate change risks and **E**ffects) project. The ability to represent the statistics of Irish climate has been assessed, both temporally (comparisons of meteorological year, seasonal mean and seasonal variance) and spatially (seasonal covariation and pattern-analysis) for two key meteorological parameters, that of temperature and precipitation.

For the average meteorological year (30-year averages of each month), mean temperatures are found to be within 1.5˚C of observations, except in winter, when temperatures are overestimated by up to 2.5˚C. Temporal variation is also not well-represented by some models in winter. Conversely, temporal variation in precipitation is most poorly simulated in summer. Seasonal variance is the area in which greatest inter-model variability is shown. Ratio of observed variance to modeled variance ranges from weak (0.5 or less) to very strong (greater than 0.7) in both seasons, and for both parameters.

Spatially, temperature is over-estimated throughout Ireland, by up to 4.6˚C in winter and 2.7˚C in summer in individual grid cells from some models. Precipitation is found to be both under and over-estimated, with grid cell biases ranging from –2.5 mm/day to 4.2 mm/day in winter and from –1.2 mm/day to 1.8 mm/day in summer. While skill at representing the spatial precipitation pattern is found to be very strong in 16 out of 19 experiments in winter, only 2 of those experiments show the same level of skill in summer.

Errors are identified in all individual models, both systematic and random. While using an ensemble average overcomes some of these deficiencies, the optimal approach is to correct systematic errors and minimize the effect of random errors using a weighted ensemble.