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The use of multi-model ensembles from global climate models for impact assessment of climate change

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The IPCC 4th Assessment Report was based on large datasets of projections of future climate produced by eighteen modelling groups worldwide who performed a set of coordinated climate experiments in which numerous global climate models (GCMs) have been run for a common set of experiments and various emission scenarios. These datasets are freely available form the IPCC Data Distribution Centre (www.ipcc-data.org) and can be used by the research community to assess the impact of changing climate on various systems of interest including impacts on agricultural crops and natural ecosystems, biodiversity and plant diseases. Multi-model ensembles (MME) emphasize the uncertainty in climate predictions resulting from structural differences in the global climate model design as well as uncertainty to variations of initial conditions or model parameters. This paper describes a methodology based on a stochastic weather generator for linking MME of predictions from GCMs with process-based impact models to assess impacts of climate change on biological or ecological systems. The latest version of the LARS-WG weather generator is described which allows seamlessly generating daily site-specific climate scenarios worldwide by utilising local daily weather and MME from GCMs. Examples of impacts on wheat in Europe, based on MME, are discussed, including changes in severity of drought and heat stress around flowering.