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Adapting wheat to uncertain future

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This study describes integration of climate change projections from the Coupled Model Intercomparison Project Phase 5 (CMIP5) multi-model ensemble with the LARS-WG weather generator, which delivers an attractive option for downscaling of large-scale climate projections from global climate models (GCMs) to local-scale climate scenarios for impact assessments. A subset of 18 GCMs from the CMIP5 ensemble and 2 RCPs, RCP4.5 and RCP8.5, were integrated with LARS-WG. Climate sensitivity indexes for temperature and precipitation were computed for all GCMs and for 21 regions in the world. For computationally demanding impact assessments, where it is not practical to explore all possible combinations of GCM $\times$ RCP, climate sensitivity indexes could be used to select a subset of GCMs from CMIP5 with contrasting climate sensitivity. This would allow to quantify uncertainty in impacts resulting from the CMIP5 ensemble by conducting fewer simulation experiments. As an example, an in silico design of wheat ideotype optimised for future climate scenarios in Europe was described. Two contrasting GCMs were selected for the analysis, "hot" HadGEM2-ES and "cool" GISS-E2-R-CC, along with 2 RCPs. Despite large uncertainty in climate projections, several wheat traits were identified as beneficial for the high-yielding wheat ideotypes that could be used as targets for wheat improvement by breeders.