16:30 Wheat yield sensitivity to climate change across a European transect for a large ensemble of crop models

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The sensitivity of a 26-member ensemble of process-based wheat simulation models to perturbations in baseline temperature and precipitation was examined to construct impact response surfaces (IRS) of simulated yields. These show the yield response of the models to systematic changes to the 1981-2010 baseline in temperature (ranging from -2 to +9°C) and precipitation (-50 to +50%). IRSs were calculated for spring and winter wheat yields at four contrasting sites in Europe: southern Finland, Germany (winter wheat in the west; spring wheat in the east) and north-eastern Spain. Simplified assumptions were made about CO_2 level, management and soils with the aim to distinguish differences in model response attributable to climate. Results indicate that the simulated absolute yield levels vary considerably between models under baseline and perturbed conditions. Across the ensemble, there is general agreement among models that the dominant sensitivity shifts from north to south along the transect. Hence, wheat yields are more sensitive to temperature changes at the Finnish site, sensitive to a combination of temperature and precipitation at the German sites, and more sensitive to precipitation at the Spanish site. Yields benefit from cooling at the latter sites, while temperatures are close to optimal for the baseline in Finland. Reasons for these site-specific patterns of response can be inferred, in part, from differences in baseline climate, soils, local cultivars and management practices. Standardized anomalies of annual modelled yields match observed regional yield anomalies more closely for spring wheat in Germany than at other sites, due in part to better resolved observations. The IRS approach offers promise in portraying model behaviour under changing climate, as well as other advantages for analysing and comparing results from multi-model ensemble simulations.

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