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Multi-model superensemble projection of seasonal soil drought in the midst of various uncertainties

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Seasonal drought has a serious impact on nature and human society, especially during vegetation growing periods. As climate change alters terrestrial hydrological cycle significantly, it is imperative to assess drought changes and develop corresponding risk management measures for adaptation. According to a series of warming targets proposed by IPCC, researchers have focused on the response of regional droughts to global warming, but with inconsistent conclusions due to the large uncertainties in soil moisture simulation by the climate models, and the difficulty in representing the internal variability of climate system by using multi-model ensemble, etc. As compared with Coupled Model Intercomparison Project Phase 5 (CMIP5) models, the future projection of soil moisture based on the latest CMIP6 shows opposite trends over parts of China. Therefore, we project seasonal soil drought over China by using the superensemble that includes a set of CMIP5 and CMIP6 soil moisture data, high resolution land surface simulations driven by bias-corrected CMIP5 climate forcings, as well as large ensemble (LE) simulation data. We also investigate the influences from internal variability, and model uncertainties in responding to global warming at different levels.