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Uncertainties in Regional to Global Variability in Drought and Implications for Future Projections

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Drought has important consequences for water availability, agriculture, and ecosystems. The impacts of drought are particularly problematic in developing regions where subsistence farming is prevalent, and vulnerability of local populations is highest. There is some evidence regionally that drought is becoming more prevalent due to climate change, and this is expected to accelerate over many regions during the 21st century. Our recent work has shown, however, that previous estimates of global changes in drought based on simple models forced by precipitation and temperature alone have likely been overestimated, and that changes in the full surface water and energy balance must be taken into account. Nevertheless, there still remain many uncertainties derived from the observational data record and output from more sophisticated models. Observational evidence at large scales, such as satellite remote sensing is often subject to short-term records and inhomogeneities, and ground based data are sparse and discontinuous in many regions. Reliance on model output is also subject to errors in the model physics and parameter uncertainty. This presentation will show the observational and model evidence for changes in drought at regional to global scales, with a focus on the interplay between precipitation and atmospheric evaporative demand and its impact on the terrestrial water cycle and drought. The work is based on multi-model, multi-forcing, global land surface simulations and the evaluation of drought variability in the context of the uncertainties. We also discuss the ability of CMIP5 climate models to reproduce historic estimates of drought variability and sensitivities with atmospheric feedbacks, and the implications for their future projections.