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Projected changes on quasi-resonant amplification by CMIP5 and CMIP6 toward the persistence in extreme summer weather events

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High-amplitude quasi-stationary atmospheric Rossby waves with zonal wave numbers 6 to 8 associated with the phenomenon of quasi-resonant amplification (QRA) have been linked to persistent summer extreme weather events in the Northern Hemisphere. We project future occurrence of QRA events based on an index derived from the zonally averaged surface temperature field, comparing results from CMIP5 and CMIP6 (Coupled Model Intercomparison Projects) climate projections. Under the scenarios analyzed, there is a general agreement among models, with most simulations projecting a substantial increase in QRA index. Larger increases are found among CMIP6-SSP585 (42 models, 46 realizations) models with 85% of models displaying a positive trend, as compared with as compared with 60% of CMIP5-RCP85 (35 models, 75 realizations), and a reduced spread among SSP585 models. The CMIP6-SSP370 (24 models, 28 realizations) simulations display qualitatively similar behavior to SSP585, indicating a substantial increase in QRA events under business-as-usual emissions scenarios. Our analysis suggests that anthropogenic warming will likely lead to an even more substantial increase in QRA events (and associated summer weather extremes) than our previous analysis of CMIP5 simulations.