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# Increased quasi-resonant amplification and persistent summer weather extremes in multimodel climate projections with high emissions and aerosol forcing

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High-amplitude quasi-stationary atmospheric Rossby waves with zonal wave numbers 6-8 associated with the phenomenon of quasi-resonant amplification (QRA) have been linked to persistent summer extreme weather events in the Northern Hemisphere. QRA is not well-resolved in current generation climate models, however, necessitating an alternative approach to assessing their behavior. Using a previously-developed fingerprint-based semi-empirical approach, we project future occurrence of QRA events based on a QRA index derived from the zonally averaged surface temperature field, comparing results from CMIP5 and CMIP6 (Coupled Model Intercomparison Project). There is a general agreement among models, with most simulations projecting substantial increase in QRA index. Larger increases are found among CMIP6-SSP5-8.5 (42 models, 46 realizations), with 85% of models displaying a positive trend, as compared with 60% of CMIP5-RCP8.5 (33 models, 75 realizations), with a reduced spread among SSP5-8.5 models. CMIP6-SSP3-7.0 (25 models, 28 realizations) simulations display qualitatively similar behavior to SSP5-8.5, indicating a substantial increase in QRA events under business-as-usual emissions scenarios, and the results hold regardless of the increase in climate sensitivity in CMIP6. Also, the aerosol forcing plays a substantial role in CMIP5 and CMIP6 models; a reduction in aerosol loading reduces Arctic amplification, and mitigates potential increases in QRA-related persistent extreme weather events. Our analysis suggests that anthropogenic warming will likely lead to an even more substantial increase in QRA events (and associated summer weather extremes) than indicated by past analyses.