

Storylines of projected climate changes around Japan associated with upper troposphere and stratosphere responses

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Climate changes around Japan associated with upper troposphere and stratosphere responses of global warming during December-January-February were investigated using the storyline approach and the Coupled Model Intercomparison Project 5 dataset. Climate change was calculated by subtracting the 1959–1990 mean in historical simulations from the 2068–2099 mean in the Representative Concentration Pathways 8.5. Four storylines in plausible future climates were discussed by considering two remote indices representing tropical amplification (tropical upper tropospheric temperature changes) and stratospheric vortex strength. Stratosphere-troposphere connections in terms of zonal wind responses are most pronounced in the storyline of high tropical amplification with strong stratospheric vortex in which the subtropical jet shifts substantially northward. The multimodel mean displays more (less) precipitation in the northern (southern) parts of Japan, while the storyline of high (low) tropical amplification with strong (weak) stratospheric vortex shows increasing (decreasing) precipitation in most parts of Japan. Projected precipitation changes around Japan depend heavily on the storyline adopted and the degree of global warming in these two storylines. Alternatively, precipitation changes depend mostly on the overall strength of global warming with minor influences from storylines in the case of low (high) tropical amplification with strong (weak) stratospheric vortex.

Keywords: storyline, troposphere stratosphere interaction