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Plain Language Summary: This study evaluated future changes in tropical cyclone (TC) precipitation over Japan using an ensemble projection generated by a non-hydrostatic regional climate model with a horizontal resolution of 5 km (NHRCM05). The total TC precipitation does not change significantly, while the frequency of extreme TC precipitation increases due to the intensification of TC precipitation rate. The increase of water vapor and the intensification and structural changes of the TCs contribute to the increase of TC precipitation rate.

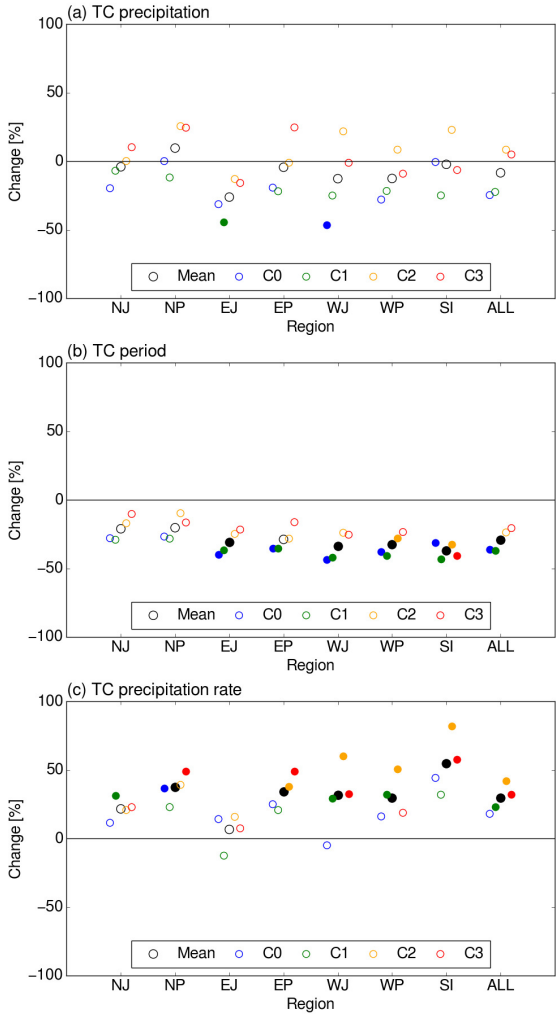

Figure 1. Future changes in (a) annual TC precipitation (%), (b) annual TC period (%), and (c) TC precipitation rate (%) defined as 100 × (future/present − 1), for each region projected by NHRCM05. NJ: Japan Sea side of northern Japan. NP: Pacific Ocean side of northern Japan. EJ: Japan Sea side of eastern Japan. EP: Pacific Ocean side of eastern Japan. WJ: Japan Sea side of western Japan. WP: Pacific Ocean side of western Japan. SI: Nansei Islands. ALL: whole of Japan. 'Mean' denotes the ensemble mean, and C0, C1, C2, and C3 denote individual ensemble members. Filled circles denote statistically significant changes (5% level).

- NHRCM05 reproduces TC precipitation and TC intensity more accurately than a general circulation model with a horizontal resolution of 20 km.
- The total TC precipitation shows no significant change due to a balance between a reduction of TC approaching Japan and an increase of TC precipitation rate.
- The frequency of extreme TC precipitation increases significantly because the intensification of the TC precipitation rate overcomes the reduction of TC number.