

Takahashi, C., Y. Imada, and M. Watanabe, 2022: Influence of the Madden-Julian Oscillation on wintertime extreme snowfall and precipitation in Japan. *J. Meteor. Soc. Japan*, **100**, 257-283.

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Plain Language Summary: The Madden-Julian Oscillation (MJO) is the most dominant mode of tropical intraseasonal variability and can modulate extratropical weather. Here, we investigate the influences of the MJO on the occurrence probability and spatial distribution of wintertime extreme snowfall and precipitation in Japan, which has not been clarified so far, based on a large-ensemble dataset of global and regional model simulations. The MJO significantly modulates the occurrence probability of extreme snowfalls on the Sea of Japan side and Kanto region and extreme precipitation on the Pacific Ocean side. We reveal the physical processes driving the extremes associated with the MJO. This study suggests that good representation in models and monitoring of the MJO help improve the predictability of wintertime extreme precipitation and snowfall in Japan.

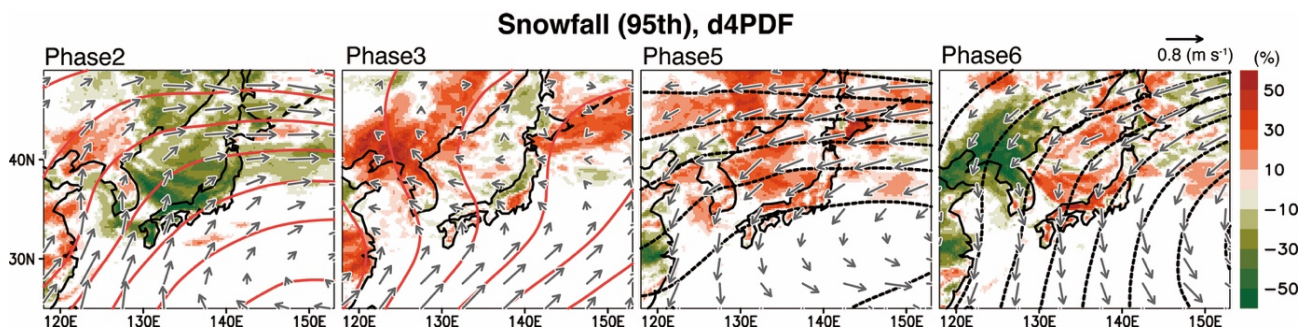


Figure 1. Percentage changes (shaded) in the probability of extreme snowfall exceeding the 95th percentile values with respect to winter climatological PDF for the MJO phases (phases 2, 3, 5 and 6) in d4PDF. Contours represent the composite of 10–80 day filtered 850-hPa stream-function anomalies (intervals of $3 \times 10^5 \text{ m}^2 \text{ s}^{-1}$). Red (black) lines indicate positive (negative) values. The vectors show the composite of 10–80 day filtered 850-hPa wind anomalies.

Highlights:

- We could quantify and elucidate the geographical distribution of the probability of wintertime extreme snowfall and precipitation in Japan related to the MJO.
- The active MJO over the Maritime Continent and western Pacific intensifies cold air intrusion from Siberia into Japan associated with more frequent blocking over East Siberia, causing extreme snowfall in the Sea of Japan side.
- The Kanto extreme snowfall is partly attributable to cold air inflow from the MJO-induced blocking-type circulations.
- The active MJO convection over the Indian Ocean and west of the Maritime Continent stimulates the development of explosive south-coast cyclones due to enhanced moisture flux convergence, leading to extreme precipitation on the Pacific Ocean side and extreme snowfall in Kanto.