

Global warming changes tropical cyclone translation speed

*Munehiko Yamaguchi¹, Johnny C. L. Chan², Il-Ju Moon³, Kohei Yoshida¹, Ryo Mizuta¹

1. Meteorological Research Institute, Japan Meteorological Agency, 2. City University of Hong Kong, 3. Jeju National University

Slow-moving tropical cyclones (TCs) can cause heavy rain because of their duration of influence. Combined with the expected increase in rain rates associated with TCs in a warmer climate, there is growing interest in TC translation speed in the past and future. Observational data since the mid-twentieth century indicate a slowdown of the TC translation speed due to the weakening of the general atmosphere circulation. However, it has also been pointed out that the slowdown may not be a real climate signal and could be due to inhomogeneities in the observational data used. As it is difficult to ascertain the extent of such inhomogeneities, we propose to examine large ensemble numerical simulations from a high-resolution atmospheric general circulation model that is able to simulate the present-day TC frequency and distribution. Here we show that a slowdown trend is not simulated for the period 1951-2011, based on the model historical simulations using specified interannually-varying observed sea-surface temperatures together with observed greenhouse gas concentrations. We also find that the annual-mean translation speed could increase in a future warmer climate. Although previous studies show a large uncertainty in the projections of changes in TC characteristics including its tracks, results from the model used in this study show that the average TC translation speed at higher latitudes becomes smaller in the warmer climate, but the relative frequency of TCs at higher latitudes also increases. Since the translation speed is much larger in the extratropics, the increase in the relative frequency of TCs at higher latitudes compensates the reduction of the translation speed there, leading to a global mean increase in TC translation speed.

Keywords: Global warming, Tropical cyclone, Translation speed