Numerical simulations of Typhoon Haiyan in 2013

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Typhoon Haiyan in 2013 was among the strongest ever observed for tropical cyclones globally. The typhoon is characterized by fast translation, rapid intensification and extremely intense intensity at such a low latitude. To understand the behavior of the typhoon and to improve the intensity prediction, numerical simulations were performed by a regional coupled atmosphere-wave-ocean model with a horizontal resolution of 2 km. The effect of sea spray was included in the regional coupled model. Even using the model with a horizontal resolution of 2 km, it was difficult to reproduce rapid intensification of the typhoon and the maximum intensity without the effect of sea spray. An issue on the impact of horizontal resolution of numerical models on the simulation will be addressed. The effect of sea spray was confined to the near-surface boundary layer and led the typhoon to intensify more rapidly. The effect of Haiyan-induced sea surface cooling on the maximum intensity was 10 hPa at the maximum due to the fast translation. In order to understand the effect of translation speed on sea surface cooling and resultant maximum intensity of a typhoon, numerical simulations were performed for Typhoon Mike in 1990 because the track was similar to Haiyan's track. The regional coupled model also simulated intensity changes of Typhoon Mike in 1990 realistically that underwent moderate intensification with the slow translation and large sea surface cooling.

Keywords: Typhoon, Numerical simulation, Sea surface cooling

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