Increase in Tropical Cyclone Intensity and Ocean Subsurface Warming in the Western North Pacific Ocean

Chen, Yu-Hsin

The Western North Pacific Ocean is the most active and hazardous tropical cyclones (TCs) region in the world. Each year, 20-30 TCs (also called typhoons) impose severe threats to a billion population and mega volume (US $5 billion per year, Peduzzi et al. 2012) of economical activities in Asia. It is thus of great importance to examine the long-term variability of these TCs. In this research, I examined 21 years (1993-2013) of TC records over the Western North Pacific TC Main Development Region (MDR, 4–21°N, 122–170°E). It was found that there is an ongoing increase in typhoon intensity and the averaged intensity has increased by 10%. Also, in November 2013, a record-breaking supertyphoon, Haiyan, was observed. Haiyan's peak intensity reached 170 kts, an astonishing high intensity ever observed in the global TC records. Haiyan subsequently devastated the Philippines with more than 6000 lives claimed and economic loss of $US 1.5 billion. The possible environmental atmospheric and ocean factors which contribute to such increase in intensity are examined. The three most important factors to TCs intensification were examined, namely the atmospheric vertical wind shear, sea surface temperature and subsurface warm layer thickness (depth of the 26? isotherm). It was found that the subsurface warm layer was the most important factor to favor the intensification of supertyphoon Haiyan and the averaged increase in typhoon intensity. As the Western North Pacific MDR is undergoing significant warming (Pun et al. 2013), there is an increase in energy supply for TC intensification.

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