

OCEAN CONTROL OF TYPHOON PEAK INTENSITY

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Dominant climatic factors controlling the lifetime peak intensity of typhoons are determined from six decades of Pacific typhoon data, using a Bayesian uncertainty analysis to confirm robustness of the results. None of the climatic metrics related to the atmosphere that were tested (including vertical shear of horizontal winds, low-level vorticity, mid-level vertical velocity and moisture, and sea-level pressure) present a significant correlation with the seasonally averaged lifetime peak intensity of typhoons. We find that upper ocean temperatures in the low-latitude northwestern Pacific (LLNWP) and sea surface temperatures in the central equatorial Pacific control the seasonal average lifetime peak intensity by setting the rate and duration of typhoon intensification, respectively. An anomalously strong LLNWP upper ocean warming has favored increased intensification rates and led to unprecedentedly high average typhoon intensity during the recent global warming hiatus period, despite a reduction in intensification duration tied to the central equatorial Pacific surface cooling. Continued LLNWP upper ocean warming as predicted under a moderate [that is, Representative Concentration Pathway (RCP) 4.5] climate change scenario is expected to further increase the average typhoon intensity by an additional 14% by 2100.

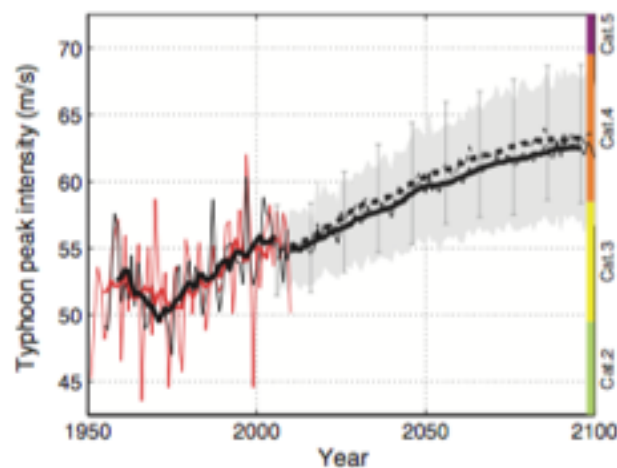


Figure 1. Observed and projected typhoon lifetime peak intensity. Observed (thin red), predicted (1950-2009, thin black), and projected (2006-2100, thin black) seasonal mean typhoon lifetime peak intensity (m/s) and their 9-year running mean (thick curves).

Two projections are given: one (solid) considers both changes in SST and subsurface stratification with continuous gray shading showing error bars, and the other (dashed) ignores changes in subsurface stratification with error bars shown discretely for years 2006, 2016, ..., and 2096. The colors on the right y axis denote the range of typhoon intensity from category 2 up to category 5 based on the Saffir-Simpson hurricane scale.