EGU22-1254
https://doi.org/10.5194/egusphere-egu22-1254
EGU General Assembly 2022

Ocean Interaction and the Intensity Evolution of Two High-Impact Super Typhoons: Hagibis (2019) and Haiyan (2013)

Ii Lin[1], Robert F. Rogers[2], Hsiao-Ching Huang[1], Yi-Chun Liao[1], Derrick Herndon[3], Jin-Yi Yu[4], Ya-Ting Chang[1], Jun A. Zhang[2,5], Christina M. Patricola[6,7], Iam-Fei Pun[8], and Chun-Chi Lien[1]

[1]Dept. of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan (iilin@as.ntu.edu.tw)
[2]NOAA/AOML Hurricane Research Division, USA
[3]Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin, USA
[4]Dept. Of Earth System Science, UC Irvine, USA
[5]Cooperative Institute for Marine and Atmospheric Studies, University of Miami, USA
[6]Department of Geological and Atmospheric Sciences, Iowa State University, USA
[7]Climate and Ecosystem Sciences Division, Lawrence Berkeley National Laboratory, USA
[8]Inst. of Hydrological and Ocean Sciences, National Central University, Taiwan

Devastating Japan in October 2019, Supertyphoon (STY) Hagibis was an important typhoon in the history of the Pacific. A striking feature of Hagibis was its explosive RI (rapid intensification). In 24 h, Hagibis intensified by 100 kt, making it one of the fastest-intensifying typhoons ever observed. After RI, Hagibis's intensification stalled. Using the current typhoon intensity record holder, i.e., STY Haiyan (2013), as a benchmark, this work explores the intensity evolution differences of these 2 high-impact STYs.

We found that the extremely high pre-storm sea surface temperature reaching 30.5□C, deep/warm pre-storm ocean heat content reaching 160 kJ cm^{-2}, fast forward storm motion of ~8 m s^{-1}, small during-storm ocean cooling effect of ~ 0.5□C, significant thunderstorm activity at its center, and rapid eyewall contraction were all important contributors to Hagibis's impressive intensification. There was 36% more air-sea flux for Hagibis's RI than for Haiyan's.

After its spectacular RI, Hagibis's intensification stopped, despite favorable environments. Haiyan, by contrast, continued to intensify, reaching its record-breaking intensity of 170 kt. A key finding here is the multiple pathways that storm size affected the intensity evolution for both typhoons. After RI, Hagibis experienced a major size expansion, becoming the largest typhoon on record in the Pacific. This size enlargement, combined with a reduction in storm translational speed, induced stronger ocean cooling that reduced ocean flux and hindered intensification. The large storm size also contributed to slower eyewall replacement cycles (ERCs), which prolonged the negative impact of the ERC on intensification.