

Report for the year 2021 and future activities

SOLAS Taiwan

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First things first...Please tell us what the IPO may do to help you in your current and future SOLAS activities. ?

PART 1 - Activities from January 2021 to Jan/Feb 2022

1. Scientific highlight

The scales and the numbers of tropical cyclones (TC) might increase under global warming, as a warm surface ocean helps to intensify the TC. Understanding the role of the ocean on the development of the TC is critical to have a more accurate forecast. Supertyphoon (STY) Haiyan devastated the Philippines with ca. 6,000 deaths in 2013. In 2019, the STY Hagibis, also the largest and the second-costliest typhoon on record in the Pacific (Mireille in 1991 ranks the first), poorly damaged Japan. These two STY had the same striking feature that intensified rapidly after interacting with the warm surface ocean. For instance, Hagibis explosively intensified from 60 to 160 knots in 24 hours, making it one of the fastest-intensifying typhoons ever observed. This study summarized the works related to the intensification of these two STY, suggesting that extremely high prestorm sea surface temperature, deep and warm prestorm ocean heat content, fast forward storm motion, small during-storm ocean cooling effect, significant thunderstorm activity at the center, and rapid eyewall contraction were the critical factors for a TC to impressively intensify to be a STY. Meanwhile, the induced cooling and slower eyewall replacement under size enlargement hindered the TC intensification. Using Haiyan and Hagibis as examples, this study demonstrated the factors controlling the rapid intensification of the STY, benefiting the study of the STY formation and forecasting.

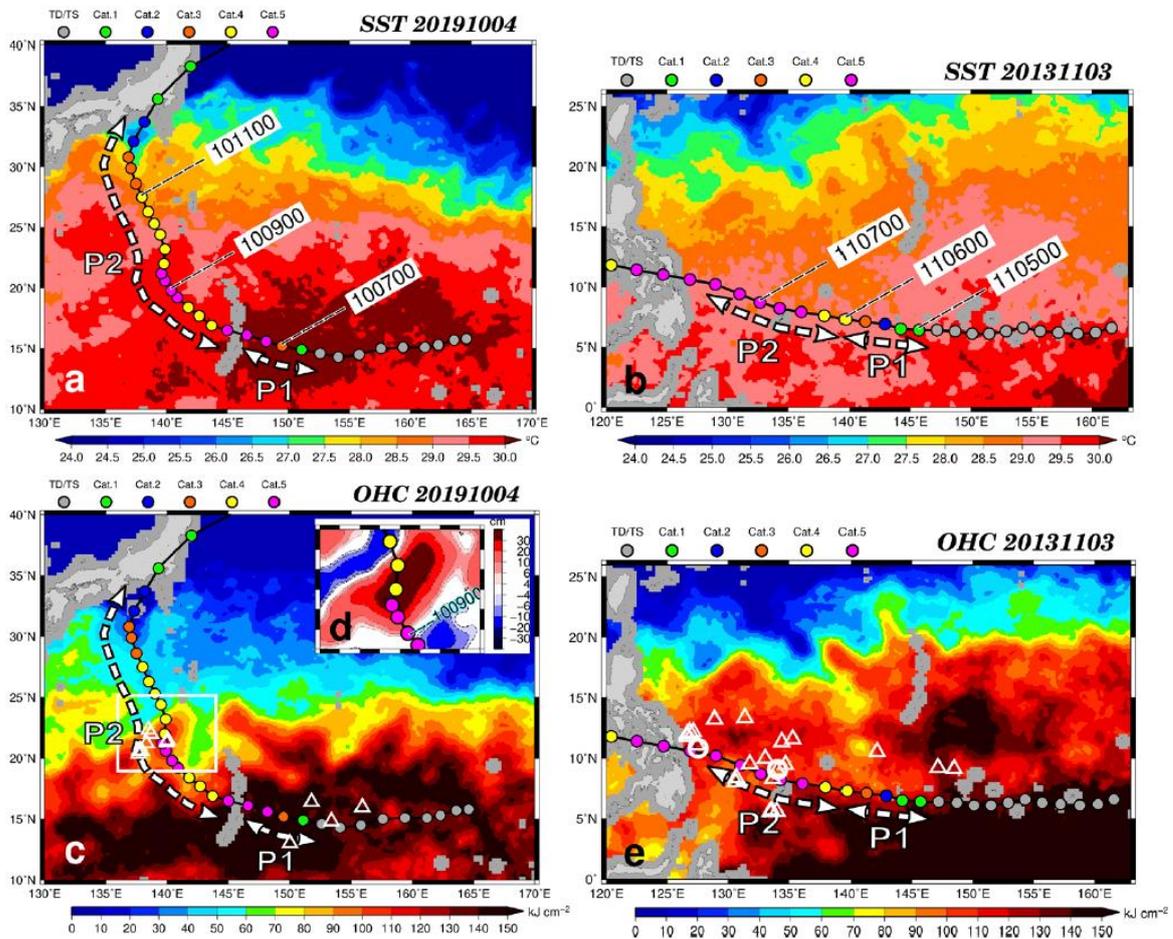


Figure: Pre-TC sea surface temperature (2 days before category 1) for (a) Hagibis and (b) Haiyan, as well as the (c, e) ocean heat content. Panel d shows the distributions of the satellite sea surface height anomaly.

Citation: I.-I. Lin et al. 2021. A tale of two rapidly intensifying supertyphoons: Hagibis (2019) and Haiyan (2013). *Bulletin of the American Meteorological Society*, 102 (9), E1645-E1664.

2. Activities/main accomplishments in 2021 (e.g., projects; field campaigns; workshops and conferences; model and data intercomparisons; capacity building; international collaborations; contributions to int. assessments such as IPCC; collaborations with social sciences, humanities, medicine, economics and/or arts; interactions with policy makers, companies, and/or journalists and media).

A one-year-based project, “From aerosols towards understanding of the influences of a harbor-industry city on the air quality, climate changes, environmental ecosystem and their social impacts”, of the SOLAS in Taiwan has been funded by the Ministry of Science and Technology (MOST) of Taiwan between 2021/8/1 and 2022/7/31.

Led by the Taiwan representative and the Aerosol Science Research Center at the National Sun Yat-sen University, an integrated three-year proposal “Aerosol · Land · Ocean · Human · Air - From the characteristics of aerosols in a harbor-industrial-urban city to probe the impacts of air pollution towards atmosphere and marine ecosystem and its social impacts” was submitted to the MOST at the end of 2021. The integrated 3-year proposal covers a wide range of research interests, such as atmospheric chemistry, marine chemistry, marine ecosystem, management, social education, social culture and interactions, popular science promotion...etc.

3. List SOLAS-related publications published in 2021 (only PUBLISHED articles).

If any, please also list weblinks to models, datasets, products, etc.

1. Lin, I. -I., Rogers, R.F., Huang, H.C., Liao, Y.C., Herndon, D., Yu, J.Y., et al. (2021). A tale of two rapidly intensifying super typhoons Hagibis (2019) and Haiyan (2013). *Bulletin of the American Meteorological Society*, 102(9), E1645-E1664.
2. Hung, K.N., Yuan, C.S., Lee, C.E., Le, I.R., Yeh, M.J., Soong, K.Y., et al. (2021). Spatiotemporal distribution and long-range transport of atmospheric speciated mercury at three remote islands in Taiwan Strait and South China Sea. *Atmospheric Research* 248: 105193.
3. Chen, S.H., Huang, C.C., Kuo, Y.C., Tseng, Y.H., Gu, Y., Earl, K., et al. (2021). Impacts of Saharan Mineral Dust on Air-Sea Interaction over North Atlantic Ocean Using a Fully Coupled Regional Model. *Journal of Geophysical Research-Atmospheres*, 126(4): e2020JD033586
4. Chen, H.Y., and Huang, S.Z. (2021). Composition and supply of inorganic and organic nitrogen species in dry and wet atmospheric deposition: Use of organic nitrogen composition to calculate the Ocean's external nitrogen flux from the atmosphere. *Continental Shelf Research*, 213: 104316.
5. Tseng, Y.L., Wu, C.H., Yuan, C.S., Bagtasa, G., Yen, P.H., and Cheng, P.H. (2021). Inter-comparison of chemical characteristics and source apportionment of PM2.5 at two harbors in the Philippines and Taiwan. *Science of the Total Environment*, 793: 148574.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2021? If yes, who? How did you engage?

PART 2 - Planned activities for 2022 and 2023

1. Planned major national and international field studies and collaborative laboratory and modelling studies (incl. all information possible, dates, locations, teams, work, etc.).

Aerosol ∖ Land ∖ Ocean ∖ Human ∖ Air (ALOHA) is the central theme of the SOLAS in Taiwan in the coming years. We expect to start the submitted proposal "Aerosol ∖ Land ∖ Ocean ∖ Human ∖ Air (ALOHA) - From the characteristics of aerosols in a harbor-industrial-urban city to probe the impacts of air pollution towards atmosphere and marine ecosystem and its social impacts" on 1st August 2022. Our members come from various departments, including National Universities, Academia Sinica, National Museum of Marine Biology and Aquarium...etc. SOLAS in Taiwan keeps strong collaborations with the UCSD, and we welcome international collaborations.

2. Events like conferences, workshops, meetings, summer schools, capacity building etc. (incl. all information possible).

Two to three regular meetings and workshops will be organized by the Taiwan representative in 2022. The upcoming meeting is scheduled in June of 2022 in the Taiwan Geosciences Assembly.

3. Funded national and international projects/activities underway.

Fundings are expected to come mainly from the MOST of Taiwan, and partly from the National Sun Yat-sen University, as well as different industry-academia cooperative research projects of the participants.

4. Plans/ ideas for future national or international projects, programmes, proposals, etc. (please indicate the funding agencies and potential submission dates).

SOLAS in Taiwan works closely with the UCSD. Both sides are seeking the opportunity to have a joint-international project. However, the progress is behind schedule since 2020 due to the influence of the pandemic.

Worth mentioning, our core member, C.C. Wang (the director of the Aerosol Center of the National Sun Yat-sen University), published two papers related to the aerosol and the spread of respiratory viruses in *Science* with the co-authors in the UCSD between 2020 and 2021.

Wang, C. C. *, Prather, K.A.*, Sznitman, J., Jimenez, J.-L., Lakdawala, S.S., Tufekci Z., Marr L.C. (2021): Airborne transmission of respiratory viruses, *Science*, 373, eabd9149.

Prather, K.A. *, Wang, C. C., Schooley, R. T. (2020): Reducing transmission of SARS-CoV-2, *Science*, 368, 1422-1424.

The collaborations will keep going, and we welcome collaborations.

5. Engagements with other international projects, organisations, programmes, etc.

The integrated 3-year proposal includes the collaborations between Taiwan SOLAS and UCSD. Parts of the proposal is planned to be conducted with the Atmospheric Aerosol Research Center, UCSD.

Comments