

Objective Identification of Tropical Cyclones with Severe Storm Surge Potential for the North-west Pacific

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Objective Identification of Tropical Cyclones with Severe Storm Surge Potential for the North-west Pacific

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Storm surges caused by tropical cyclones can significantly impact on coastal areas in East Asia, including megacities e.g., in China. To inform effective adaptation and mitigation planning, a robust storm surge hazard assessment is essential. Unfortunately, the real frequency-intensity distribution of relevant storm-surge levels can only be estimated with large uncertainty based on limited historical observations.

This study demonstrates the successful development of a two-step, objective and automated identification and selection approach of storm-surge relevant TCs for large model data sets where no ground truth verification is possible. In our approach, we combine for the first time two established identification and tracking tools originally developed for extra-tropical cyclones and storms and apply these to identify tropical cyclones. In the first step, we adapted the widely used Murray & Simmonds (1991) University of Melbourne tracking scheme (MS-Track) to the specific conditions of TC tracking in the North-west Pacific. In the second step, we apply the windstorm tracking tool WiTRACK to TC-induced severe wind fields to provide and attach the potential storm-surge relevant information in addition to just the core track provided by the MS-Track.

By validating our results with ERA5 reanalysis data and IBTrACS, we show that our method is simple yet has a well comparable performance in detecting and assessing relevant TC events than more complex tracking approaches. Based on this performance this approach is well-designed and specifically intended to specific applications in CAT modelling approaches, e.g. for the creation of physically consistent event sets for storm surges.