

# The effect of typhoon translation speed and landfall angle on the maximum surge height along the coastline

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## Abstract

Storm event is one of major issues in South Korea due to devastating damage at its landfall. A series of statistical study on the historical typhoon records consistently insist that the typhoon translation speed (TS) is on slowdown trend annually, and thus provides an urgent topic in assessing the extreme storm surge under future climate change. Even though TS has been regarded as a principal contributor in storm surge dynamics, only a few studies have considered its impact on the storm surge. The landfall angle (LA), another key physical factor of storm surge also needs to be further investigated along with TS. This study aims to elucidate the interaction mechanism among TS, LA, coastal geometry, and storm surge synthetically by performing a series of simulations on the idealized geometries using Delft3D FM. In the simulation, various typhoons are set up according to different combinations of TS and LA, while their trajectories are assumed to be straight with the constant wind speed and the central pressure. Then, typhoons are subjected to make landfall over a set of idealized geometries that have different depth profiles and layouts (i.e., open coasts or bays). The simulation results show that: (i) For the open coasts, the maximum surge height (MSH) increases with increasing TS. (ii) For the constant bed level, a typhoon normal to the coastline resulted in peak MSH due to the lowest effect of the coastal wave. (iii) For the continental shelf with different widths, the slow-moving typhoon will generate the peak MSH around a small LA as the shelf width becomes narrow. (iv) For the bay, MSH enlarges with the ratio of  $L/E$  (the length of main-bay axis /gate size) dropping, while the greatest MSH is at  $L/E=1$ . These findings suggest that a fast-moving typhoon perpendicular to the coastline over a broad continental shelf will likely generate the extreme storm surge hazard in the future, as well as the slow-moving typhoon will make an acute landfall over a narrow continental shelf.

**Keywords :** Idealized scenarios, Storm surge, Translation speed, Landfall angle

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