



Supplement of

Mechanism of storm surge induced by low-pressure systems along the northern coast of Kyushu, Japan

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This PDF provides supplementary figures referred to in the main text.

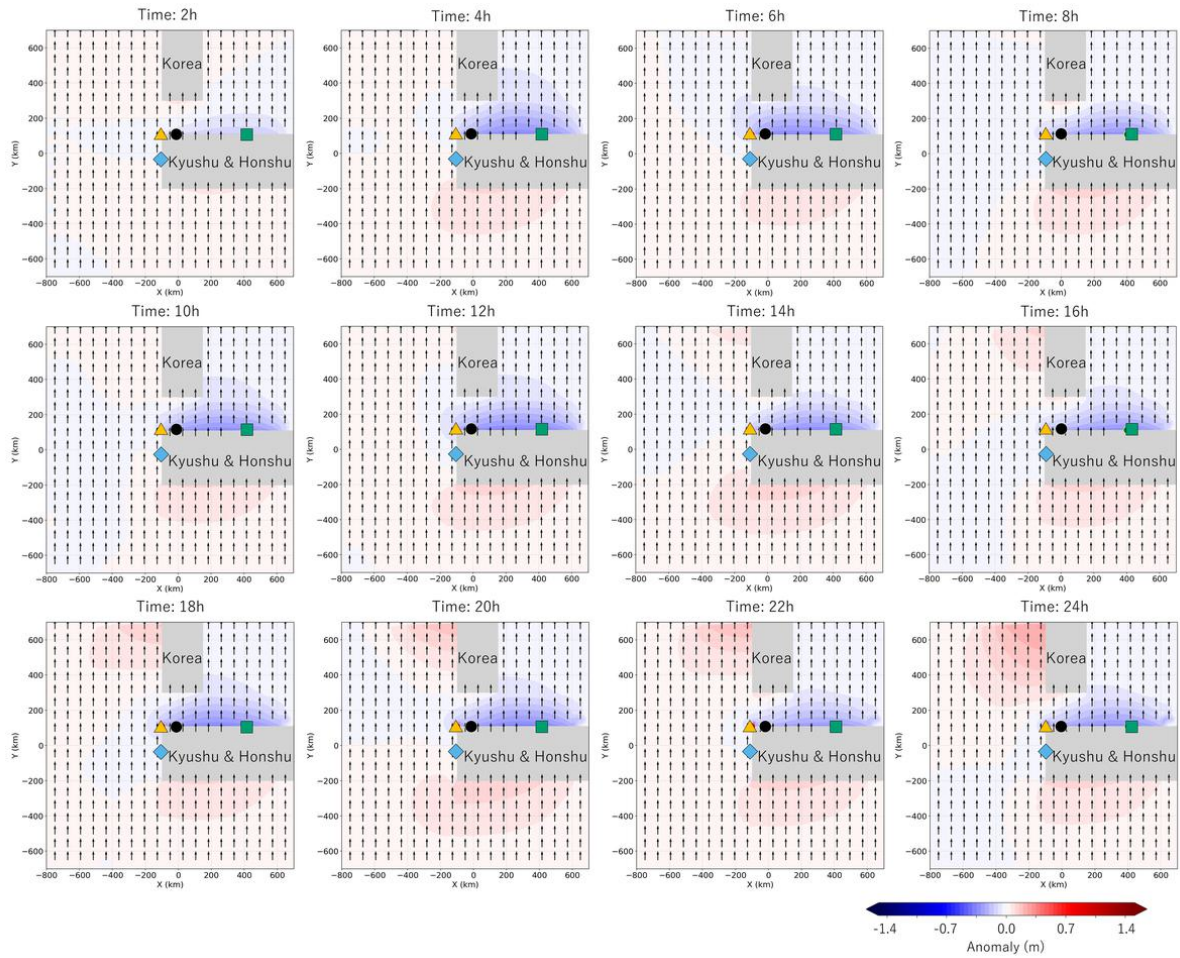


Fig. S1: Sensitivity experiment for the idealized steady-wind case without the Coriolis effect ($f = 0$). Under otherwise identical conditions to the steady northward-wind experiment shown in Fig. 13 of the main text, the non-rotating case does not reproduce the pronounced coastal surge anomalies or the associated eastward alongshore propagation. Instead, a quasi-steady negative anomaly persists along the northern coast, including at the Hakata Bay-equivalent location. Compared with the rotating case in the main text, this result indicates that the amplification mechanism fundamentally relies on rotation-driven dynamics, including Ekman transport and the coastal-trapped wave response.

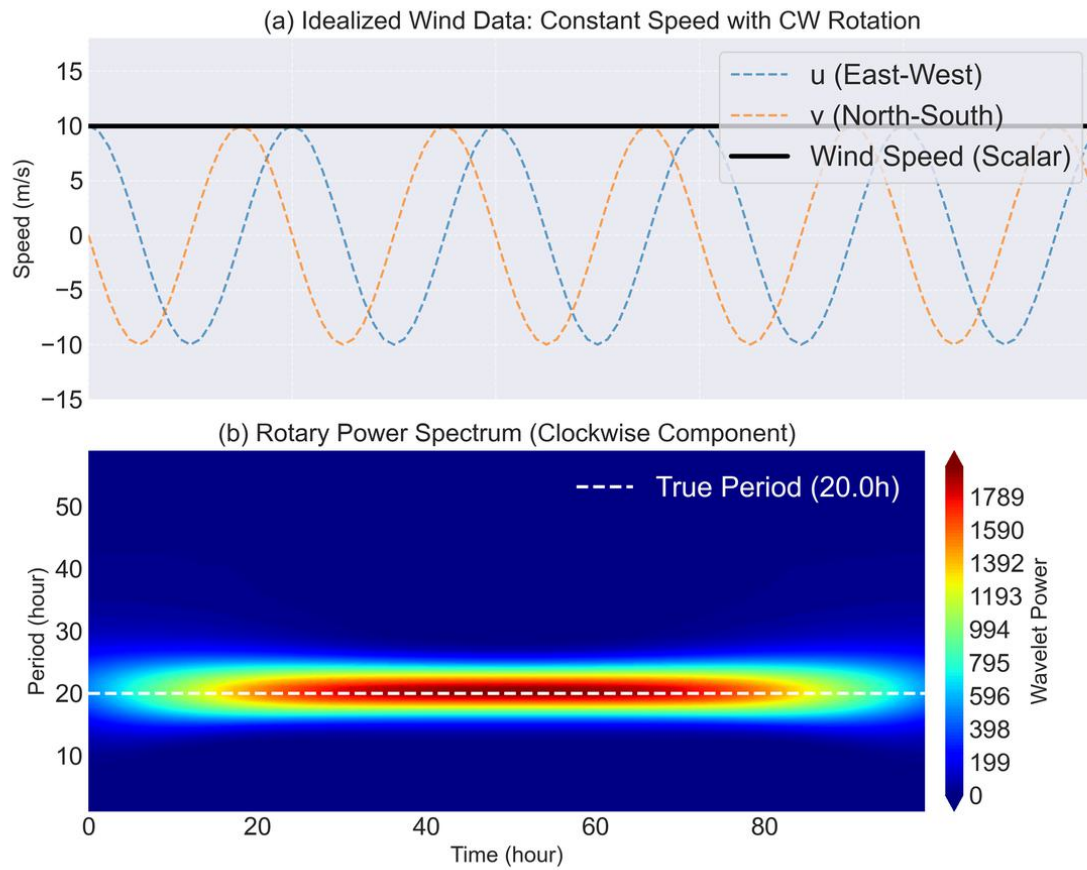


Fig. S2: Validation example of the rotary wavelet analysis using an idealized clockwise-rotating wind with constant scalar wind speed. (a) Time series of the east-west and north-south wind components and the constant scalar wind speed. (b) Rotary power spectrum for the clockwise component. A clear spectral maximum appears at the imposed rotation period (20 h) even though the scalar wind speed does not vary, confirming that the analysis captures rotational variability of wind direction rather than merely fluctuations in wind-speed magnitude.

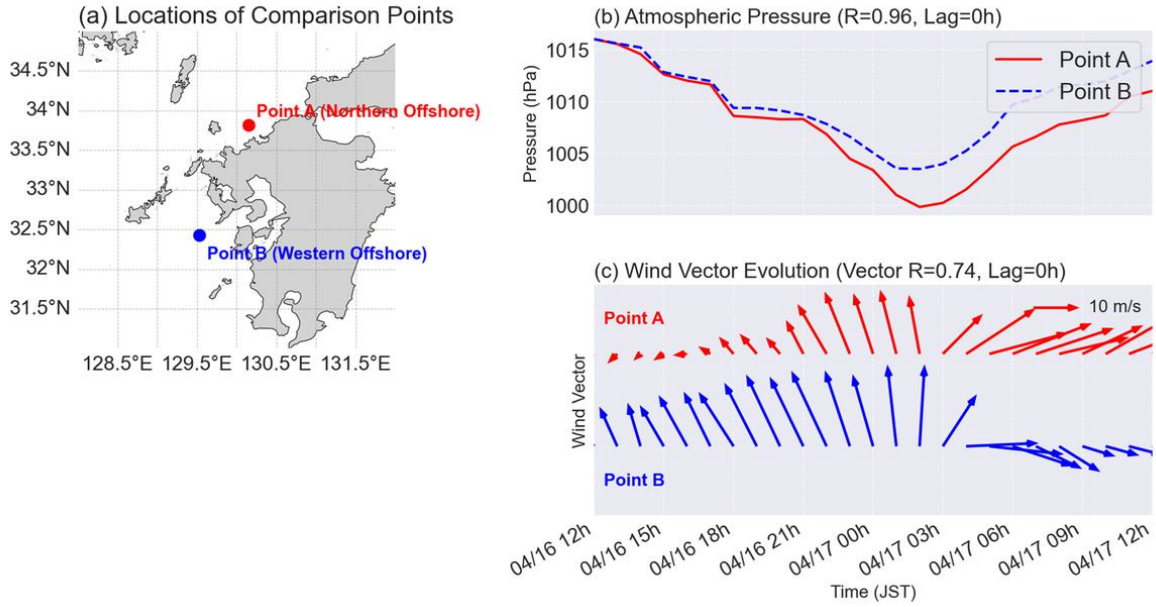


Fig. S3: Comparison of the temporal evolution of atmospheric pressure and surface wind vectors at two representative offshore locations in the realistic-model domain. Panel (a) shows the comparison points, and panels (b) and (c) show the corresponding pressure and wind-vector evolution during the April 2016 event. Although local differences in wind magnitude are present, the large-scale temporal evolution of the meteorological forcing—particularly the clockwise rotation of the wind associated with the passage of the low-pressure system—is broadly coherent between the two locations. This supports the use of spatially uniform forcing in the idealized experiments as a first-order simplification for isolating the rotation-driven mechanism discussed in the main text.