**Terrain-influenced Local Wind Forecasting for the Sasebo Typhoon Haven: Improved Empirical Techniques**

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**Abstract**

 Although the Sasebo, Japan harbor is usually a “typhoon haven” from tropical cyclone (TC) winds due to terrain-blocking effects, in rare cases damaging winds occur that may be attributed to terrain channeling. An empirical parametric model technique is developed and tested that includes consideration of the TC wind structure, land frictional effects, and terrain influences affecting the maximum wind speeds in the harbor when TCs pass within 200 nautical miles of Sasebo. The terrain influence is represented by two sets of wind direction-dependent acceleration factors. The first set, which is directly from the ratio of the local wind to the adjusted parametric wind for TCs passages during 2003-2010, provides mean values that represent the terrain blocking and channeling effects, but the variability with wind direction may be suspect. The second set derived from a large sample of reanalysis winds not limited to TCs has better variability properties, but is not easily related to just the TC passages. A new nomogram modified to include TC wind structure has higher estimates of Sasebo sustained winds for some TC tracks that may be related to terrain influences, but is limited due to the number of TC structure estimates in the developmental sample. These empirical models have the advantage of ease and low cost for future use in also estimating the combined uncertainty in the local winds in Sasebo harbor due to TCs. These empirical techniques offer an alternate method than numerical models or Monte Carlo methods for specifying the uncertainty in local winds in landfalling or near-landfalling tropical cyclones.

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