

Relationship between Non-dimensional Roughness Length and Wave Age investigated using Tower-based Measurements

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Abstract

Wind and wave data observed at a coastal tower are analyzed to investigate wave dependence of the sea-surface wind stress. The eddy correlation method is utilized to derive the wind stress from wind velocity components measured by a sonic anemometer. Only the data which satisfied criteria for the near-neutral stratification, the local equilibrium between wind and waves, and the aerodynamically rough flow, were selected.

In a composite data set collected from previous studies, there has existed lack of data at a range of wave age between laboratory and open ocean waves. It is shown that the present data set fill the gap and make it possible for us to discuss continuity from laboratory to open ocean. Distribution of the data points shows consistent trend with the composite data set including data from laboratory experiments to open sea observations, and also with proposed formula indicating positive dependence of the wind stress on the wave age. Systematic differences from the formula indicating negative dependence deduced from field data sets by previous studies are discernible.