EMS Annual Meeting Abstracts
Vol. 21, EMS2024-621, 2024, updated on 13 Dec 2024
https://doi.org/10.5194/ems2024-621
EMS Annual Meeting 2024

Converting a high-level air temperature and wind speed to a reference level ones: Application to the Ieodo Ocean Research Station

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Air temperature and wind speed observed at reference levels (the former 2 m and the latter 10 m) are essential for validating a performance of meteorological models as well as for parameterizing a boundary-layer processes such as air-sea momentum and heat interactions. This study developed a converting method for wind speed and air temperature observed at a higher level to ones at a reference level, the methods were applied to the data at the Ieodo Ocean Research Station (I-ORS), Korea. The I-ORS is located in the northeast part of the East China Sea, and more than half of typhoons affecting the Korean Peninsula pass near the station. The I-ORS measures wind speed and temperature at 41.4 m and 35.7 m, respectively. Obstacle correction factors was applied to the observed wind speed to reflect the effect of station structure on wind. Then, wind speeds at a reference level with the use of wind speed observed over the rooftop level (41.4 m) was computed by applying the log-wind profile, neural drag coefficient assumption, and power-wind profile methods. The retrieved wind speeds were compared with the observed one at 10 m during the special experiment period. The coefficients for the methods were determined. Air temperature at 2m from the temperature observed at sea surface and rooftop level (35.7 m) was calculated by applying a power-temperature profile. The optimal power for the power profile was determined as different values according to day and night by minimizing errors. 80% of the retrieved temperatures fell within a mean bias less than 0.5°C, while 95% fell within a mean bias less than 1.0°C. The results are expected to contribute to parameterize the air-sea momentum and heat interaction in terms of air temperature and wind speed under strong wind over ocean surfaces.

Key words: Ieodo Ocean Research Station (I-ORS), reference level temperature, reference level wind speed, air-sea momentum and heat interaction

Acknowledgements: This work is funded by the Korea Hydrographic and Oceanographic Agency (KHOA) and National Institute of Meteorological Sciences (NIMS).