

Proposing a Practical Health-based Heat Warning System

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Abstract

The objective of this work was to evaluate the potential of Wet-Bulb-Globe-Temperature (WBGT) to be used as the heat-stress indicator in a heat warning system. WBGT considers four important heat-stress related parameters, namely temperature, relative humidity, wind speed, and solar radiation. Numerous evidences have supported that it is closed related to heat stress experienced by humans.

The feasibility of using WBGT as the basis of a heat warning system was evaluated based on cross-examination of theoretical formula, measurements from community-based field campaigns, and modeling outputs. WBGT monitoring with WBGT monitors was conducted in nine communities in Taiwan, which was compared with formula calculations based on CWB meteorological observations. WBGT observations were further compared with the forecast results of WBGT using WRF. The threshold of heat warning system using WBGT were also evaluated with mortality and hospital records in Taiwan.

It was found that good correlation of WBGT observations from monitors and formula calculations based on CWB meteorological observations, indicating that it is practical to use CWB observation to calculate WBGT for the whole island. In addition, the comparison of observations and forecast results also showed good agreement. Moreover, by evaluating mortality and hospital records in Taiwan, proper thresholds of WBGT for a heat-health warning system were obtained.

In conclusion, this work demonstrated that it is feasible to provide WBGT with current CWB observations and forecast WBGT with current WRF model. The proper threshold of WBGT for a heat warning system was also proposed. With health-based evidences, WBGT is a much better indicator for a heat-health warning system. To avoid missing the actual high heat-stress days with only temperature as an indicator, we strongly recommended that CWB adopt WBGT as the indicator to establish a health-based heat warning system in Taiwan to reduce health risks in hot days.

Key word: health adaptation, heat-health indicator, WBGT forecasting, WBGT monitoring