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On-ground field test of in-situ solar irradiation correction technique using dual thermistors

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Upper-air temperature is known as one of most important essential climate variables (ECVs) for weather forecasting and study of climate change. Usually radiosondes equipped with many sensors are used to monitor the upper-air environments in world wide. However the solar heating of temperature sensors has been a main reason of temperature error and thus many trials have been done to reduce or eliminate the solar heating effects.
Recently, through the measurement of relative temperature difference of dual thermistors having different emissivity installed in sensor boom, it has been proposed that this technique can correct the in-situ temperature change of radiosonde due to solar heating and/or radiation cooling. Temperature correction can be done by measurement of as-read temperatures of dual thermistors and in turn calculation of solar irradiation and then finally extraction of the true correction values. Calculation of solar irradiation mainly depends on the pre-determined calibration method performed at the ground level laboratory by varying pressure, temperature, ventilation under well controlled solar irradiance. From this ground level calibration, the correction formula is obtained and applied.
In order to prove the effectiveness of dual thermistor technique, field test system is setup on ground outside. This system is composed of two sensor booms having two thermistors having different emissivity of which one is as-received (denoted as white) and the other is coated with high emissivity carbon paste (denoted as black), a pyranometer, an ultrasonic wind anemometer, a barometer and two set of screens installed with temperature and humidity sensors in both. Temperature measured by thermometer inside the screen will act as the reference air temperature. All sensors were calibrated by KRISS, a national metrology institute of Korea, before installation. This system will be exposed to natural environment from morning to night for several months, and the measured and calculated irradiance will be compared. Eventually the solar corrected temperature will be compared with the reference temperature measured in the screen. From these tests, it is expected to verify the effectiveness of dual thermistor radiosonde (DTR) technique.