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Microclimate Exposures of Surface-Based Weather Stations: Implications For The Assessment of Long-Term Temperature Trends

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ABSTRACT

The U.S. Historical Climate Network is a subset of surface weather observation stations selected from the National Weather Service cooperative station network. The criteria used to select these stations do not sufficiently address station exposure characteristics. In addition, the current metadata available for cooperative network stations generally do not describe site exposure characteristics in sufficient detail. This paper focuses on site exposures with respect to air temperature measurements. A total of 57 stations were photographically surveyed in eastern Colorado, comparing existing exposures to the standards endorsed by the World Meteorological Organization. The exposures of most sites surveyed, including U.S. Historical Climate Network sites, were observed to fall short of these standards. This raises a critical question about the use of many Historical Climate Network sites in the development of long-term climate records and the detection of climate trends. Some of these sites clearly have poor exposures and therefore should be considered for removal from the Historical Climate Network. Candidate replacement sites do exist and should be considered for addition into the network to replace the removed sites. Documentation as performed for this study should be conducted worldwide in order to determine the extent of spatially nonrepresentative exposures and possible temperature biases.
