

The U.S. Climate Reference Network (USCRN) System – The Gold Standard for Surface Climate Observations

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Long-term, high-accuracy, stable environmental observations are essential to define the state of the global integrated Earth system, its history, and its future variability and change. Scientifically acceptable observations for climate analyses include: (1) operational weather observations when appropriate care in collection and archival methodologies has been exercised to establish sufficiently high accuracy for climate purposes; (2) limited-duration observations collected as part of research investigations to elucidate chemical, dynamical, biological, or radiative processes that contribute to maintaining climate patterns or to their variability; (3) high-accuracy, high-precision observations to document decadal-to-centennial changes; and (4) observations of well-recognized and scientifically acceptable climate proxies which are non-instrumental but nevertheless sufficiently controlled as to ensure numerical high-precision values that are scientifically valid. The data have been collected and normalized to extend the instrumental climate record to remote regions and back in time to provide information on climate change at millennial and longer time scales.

The U.S. Climate Reference Network (USCRN) is a network of 114 stations developed, deployed, managed, and maintained by the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) in the continental United States for the express purpose of detecting the national signal of climate change. The USCRN program began fielding stations in 2001, and the vision of the program is to maintain a sustainable high-quality climate observation network that 50 years from now can with the highest degree of confidence answer the question: How has the climate of the nation changed over the past 50 years? These stations were designed with climate science in mind. Three independent measurements of temperature and precipitation are made at each station, insuring continuity of record and maintenance of well-calibrated and highly accurate observations. The stations are placed in pristine environments expected to be free of development for many decades. Stations are monitored and maintained to high standards, and are calibrated on an annual basis. In addition to measurements of surface temperature and precipitation, these stations also measure solar radiation, surface skin temperature, and surface winds. Since 2009 the network has been augmented by the implementation of triplicate measurements of soil moisture and soil temperature at five depths, as well the installation of atmospheric relative humidity sensors. Experimental stations have been located in Alaska since 2002 and Hawaii since 2005, providing network experience in polar and tropical regions; furthermore, as part of the most recent International Polar Year and in partnership with Roshydromet (the Russian Federation's Federal Service For Hydrometeorology and Environmental Monitoring), a USCRN station was installed in Tiksi in the Russian Arctic to help further advance the need for reference surface climate observations in high latitude regions. Deployment of a complete 29 station USCRN network into Alaska began in 2009. While the network is managed by NOAA/NCDC, the on-going operation and continuous improvements in the system would not be possible without the work done in partnership with NOAA's Atmospheric Turbulence and Diffusion Division. Data from all stations in addition to all system documentation is available from the USCRN website at <http://www.ncdc.noaa.gov/crn/>.

The USCRN fulfills this need for obtaining long-term sustainable and robust climate observations that are necessary to document long-term climate change trends for the U.S. and possibly as an extension internationally to other nations if resources are available. The USCRN concept was developed at the end of the 1990s and began being implemented around 2001. A continuous improvement program for USCRN was begun in 2008 with the completion in 2011 of the installation of new soil moisture, soil temperature, and relative humidity sensors at all USCRN stations in the conterminous U.S. This presentation will document the progress made by the USCRN Program towards providing the vital and extremely high quality surface climate data and information necessary to aid in characterizing national trends in climate., and will outline plans for the next few years.

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