

Data Acquisition, Materials, and Methods

All versions of the Daymet algorithm, including this Version 4 R1, use as its core input daily observations of minimum temperature, maximum temperature, and precipitation from a network of ground-based weather stations. The surface weather input observations for processing Daymet were obtained from the NOAA National Centers for Environmental Information's Global Historical Climatology Network (GHCN)-Daily dataset (Menne et al., 2012a). Three separate input station files were generated for the continental North America, Puerto Rico, and Hawaii study areas and these three spatially distinct areas were applied separately through the Daymet algorithm.

GHCN-Daily Version Download Dates:

- Daymet V4 for years 1980 - 2019 (or 1950 - 2019 (Puerto Rico only)) used GHCN Daily version 3.27 downloaded on February 5, 2020.
- Daymet V4 for year 2020 used GHCN Daily version 3.28 downloaded on February 14, 2021.
- Daymet V4 for year 2021 used GHCN Daily version 3.28 downloaded on February 16, 2022.
- Daymet V4 R1 for year 2020 used GHCN Daily version 3.29 downloaded on October 6, 2022.
- Daymet V4 R1 for year 2021 used GHCN Daily version 3.29 downloaded on September 18, 2022
- Daymet V4 R1 for year 2022 used GHCN Daily version 3.29 downloaded on February 11, 2023
- Daymet V4 R1 for year 2023 used GHCN Daily version 3.31 downloaded on February 18, 2024

The Daymet approach to estimating daily surface weather parameters at locations lacking instrumentation is based on a combination of interpolation and extrapolation, using inputs from multiple instrumented sites and weights for each site that reflect the spatial and temporal relationships of the estimation location to the instrumental observations. The approximate number of instrumental observations to use for each estimation is defined as a parameter for each of the primary Daymet variables. As part of a series of algorithm modifications intended to improve robustness in regions of very low station density, the Daymet V4 algorithm drops the iterative station density calculation and instead defines a search radius for each estimation location which is sized to capture exactly the average number of input stations, based on pre-calculated arrays of station distances. Given the pre-processed input station observations and the pre-calculated station lists and interpolation weights for each location in the estimation grid, two separate workflows are used to produce the primary Daymet output variables: one for the daily temperature variables (Tmax and Tmin) and another for the daily precipitation variable (Prcp).

The Daymet Version 4 methodology and dataset is described in Thornton, et al. (2021).

In addition to daily maximum and minimum temperature and daily total precipitation, the Daymet data record includes estimates of other important surface weather quantities that are not routinely observed, or are available as observations from only a small fraction of the temperature and precipitation observing stations. These secondary output variables are daily total shortwave radiation (Srad), daily average water vapor pressure (VP), duration of the daylight period (daylength), and a simple estimate of accumulated snowpack, measured as snowpack water equivalent (SWE). The daylength estimate is based on geographic location and time of year. Estimates for the other secondary variables (Srad, VP, and SWE) are derived from the primary temperature and precipitation variables on the basis of theory and empirical relationships, as further described in Thornton et al. (2021).