Towards the Next Version of Daymet – Gridded Daily Weather Data for North America

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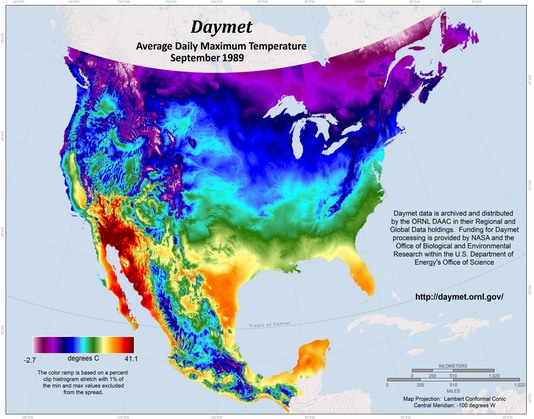
Introduction

The Daymet data set covers the extent of the conterminous United States, Mexico, and Southern Canada to 52 degrees N. Daily gridded (1 km x 1 km) data are available for 7 ecologically significant variables (maximum and minimum temperature, precipitation, shortwave radiation, vapor pressure, snow water equivalent, and day length) for the time period 1980 – 2013. Each subsequent year of data is processed at the start of the next new year when weather station input data are of archive quality.



A Daymet monthly climatology showing the current spatial distribution of the data set. Average daily maximum temperature for September 1989.

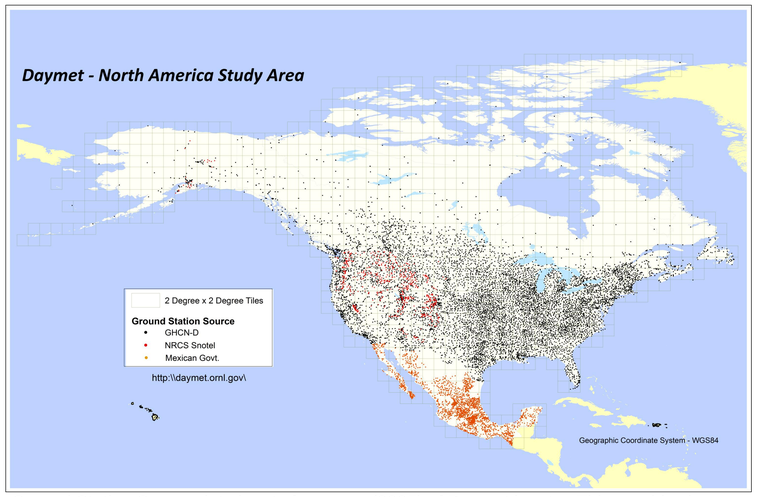
Algorithm Improvements

The very small number and wide spacing of stations at high latitudes (>52 degrees N), presents a major obstacle to any interpolation and extrapolation methods. The original Daymet algorithms were designed for operation within the conterminous United States, where the network of stations is relatively dense. Expansion of the Daymet domain to cover all of North America required changes to accommodate both very dense and very sparse data regions.

Approaches to fill missing data were modified, reassessing the local station network on each day to ensure an adequate number of good observations were included in predictions.

Iterative station density algorithms were also modified. The dependency of stations from a 3x3 tile region was lifted allowing a larger search radius in regions of very low station density.

Tests with and without the inclusion of horizontal gradient detection showed that even for the very low station densities of the boreal and Arctic zones in Alaska and Canada, prediction skill was higher when horizontal gradients were included in the predictions.



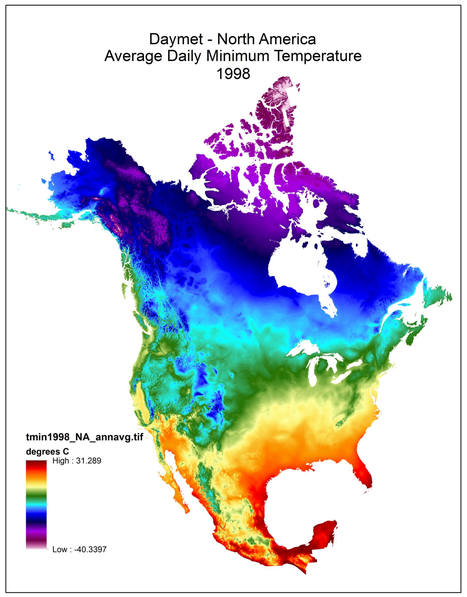
Ground Station Source data inputs for a year (2005) of Daymet inputs. This graphic shows the complexity of station data density for the whole North American continent in the context of the Daymet 2 degree x 2 degree tiling routine. Algorithm improvements allow the station inputs to come from a broader region with the run frequency of the station selection changed from yearly to daily, to address nodata occurrences.

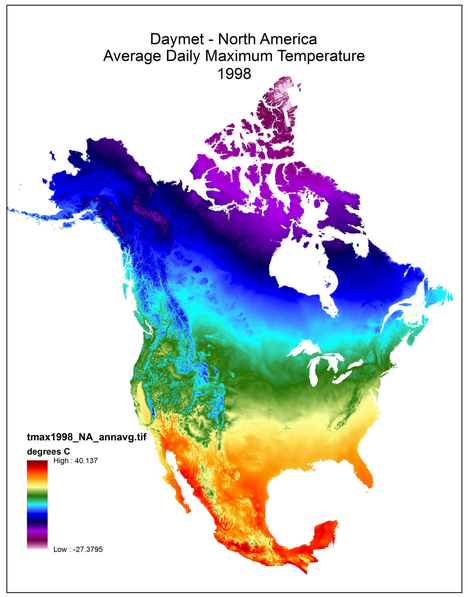
Next Version

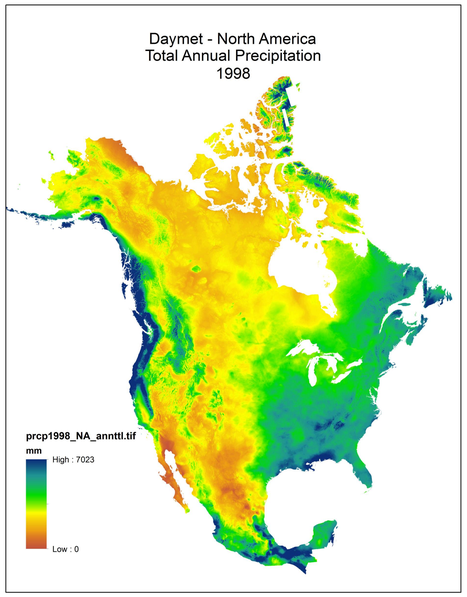
With the algorithm improvements, a next version of Daymet is on the horizon. A total reprocessing of the 1980 – present data set is planned in 2015. In addition to the enhanced algorithm, updated inputs including the latest SRTM DEM, MODIS land/water mask, and a complete reprocessing of station data inputs to Daymet specifications will occur to ensure the best in data quality and provenance.

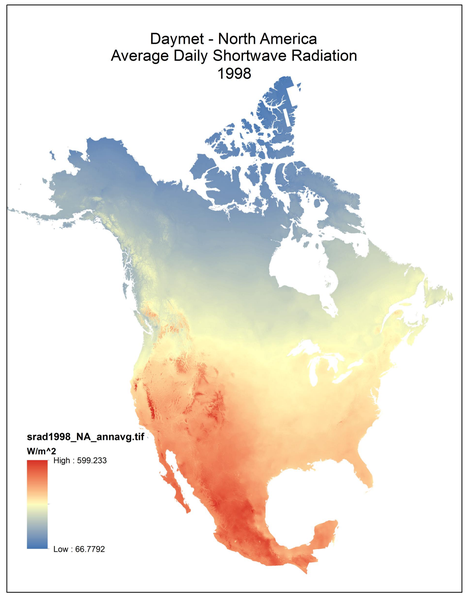
Preliminary Results

The images below show results from the current state of the Daymet model improvements for sparse and dense areas of station availability.









Get Daymet Data

Visit the ORNL DAAC Daymet website www.daymet.ornl.gov, for current and future distribution of Daymet data.