

**Dataset Characteristics**  
Spatial Resolution ..... 1km x 1 km  
Temporal Resolution ..... Daily  
Years Available ..... 1980 – present  
Spatial Region ..... North America, Puerto Rico, Hawaii

Daymet Variables	
maximum temperature	°C
minimum temperature	°C
shortwave radiation	W/m <sup>2</sup>
vapor pressure	Pa
snow water equivalent	kg/m <sup>2</sup>
precipitation	mm/day
day length	s/day

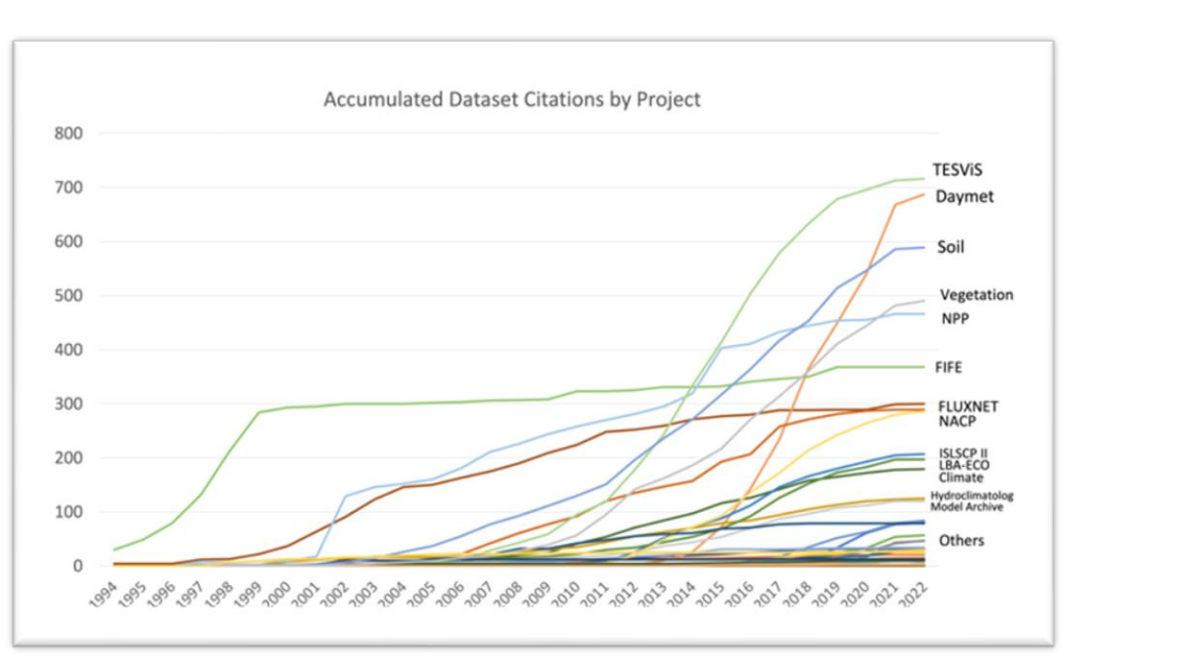
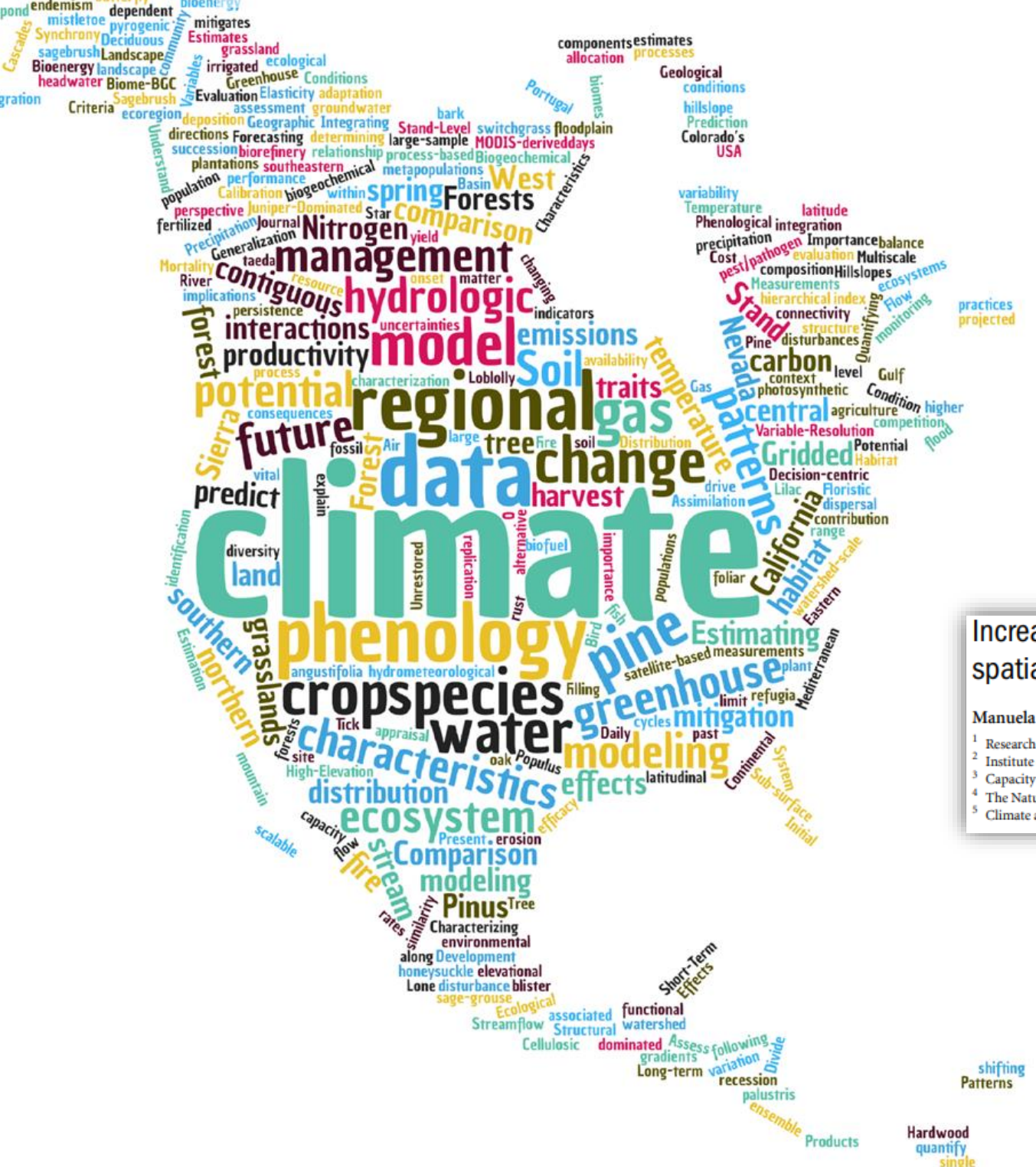
A subset of Daymet variables shown as annual climatologies for 2019.

## Introduction

**The Data:** Daymet (Thornton *et al.*, 2020; Thornton *et al.*, 2021) is a 40+-year meteorological dataset at a fine-scale spatial (1km) and temporal (daily) resolution for North America, Hawaii, and Puerto Rico. Model inputs are a DEM, derived horizon files, a land water mask, and daily observations from ground-based meteorological stations (Menne *et al.*, 2012)

**Impact:** With initial support from NACP\* and made public in 2011, the Daymet daily surface weather product is one of the 50 most downloaded datasets across the NASA Earth Science Data and Information System (ESDIS) Project. It ranks as one of the most highly cited datasets within the ORNL DAAC.

The word cloud was created from a year subset of publication titles that reference and use the Daymet dataset.



**Climatic drivers and ecological impacts of a rapid range expansion by non-native smallmouth bass**  
Mark A. Kirk • Bryan M. Maitland • Brian T. Hickerson • Annika W. Walters • Frank J. Rabolt

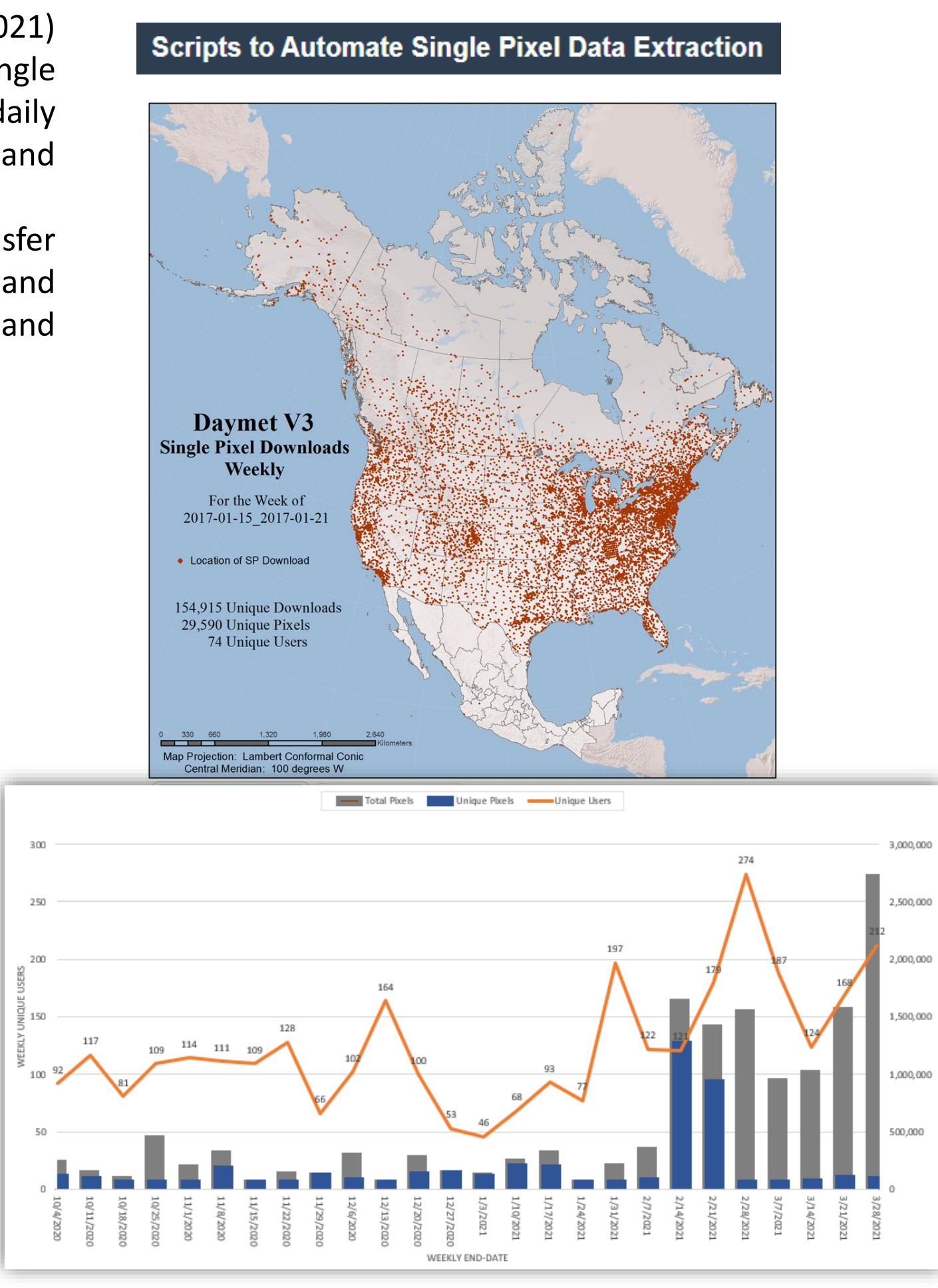
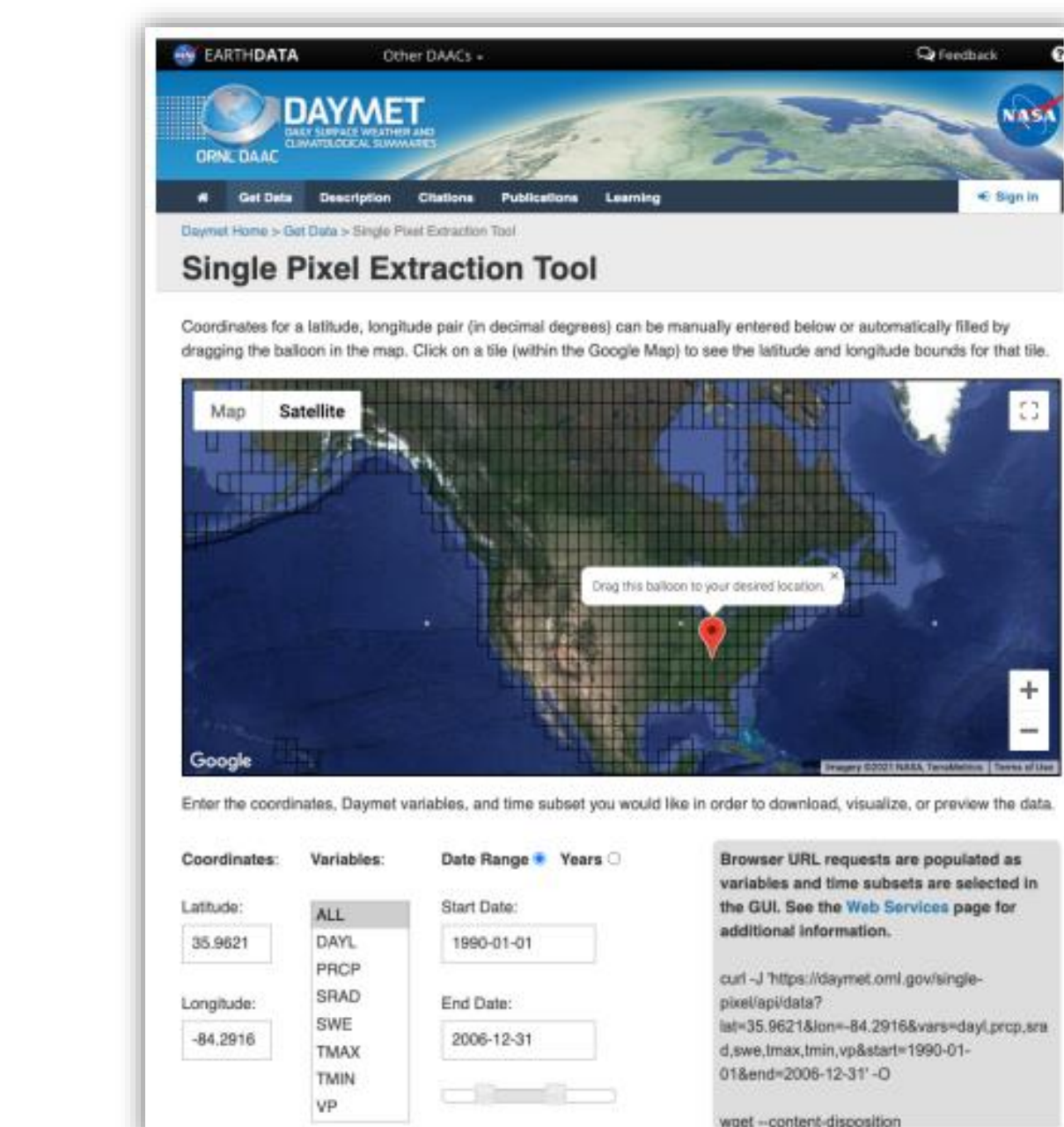
Increasing importance of temperature as a contributor to the spatial extent of streamflow drought  
Mamouda I. Branner • Daniel L. Swain • Eric Gilliland and Andrew W. Wood

\* Research Applications Laboratory, National Center for Atmospheric Research, Boulder, CO, United States of America  
\* Institute of the Environment and Sustainability, University of California, Los Angeles, CA, United States of America  
\* Center for Climate and Weather Extremes, National Center for Atmospheric Research, Boulder, CO, United States of America  
\* The Nature Conservancy of California, San Francisco, CA, United States of America  
\* Climate and Global Dynamics Laboratory, National Center for Atmospheric Research, Boulder, CO, United States of America

**ARTICLE**  
Radial growth decline of white spruce (*Picea glauca*) during hot summers without drought: preliminary results from a study site south of a boreal forest border  
Andrei Lapenis, George Robinson, and Gregory Lawrence

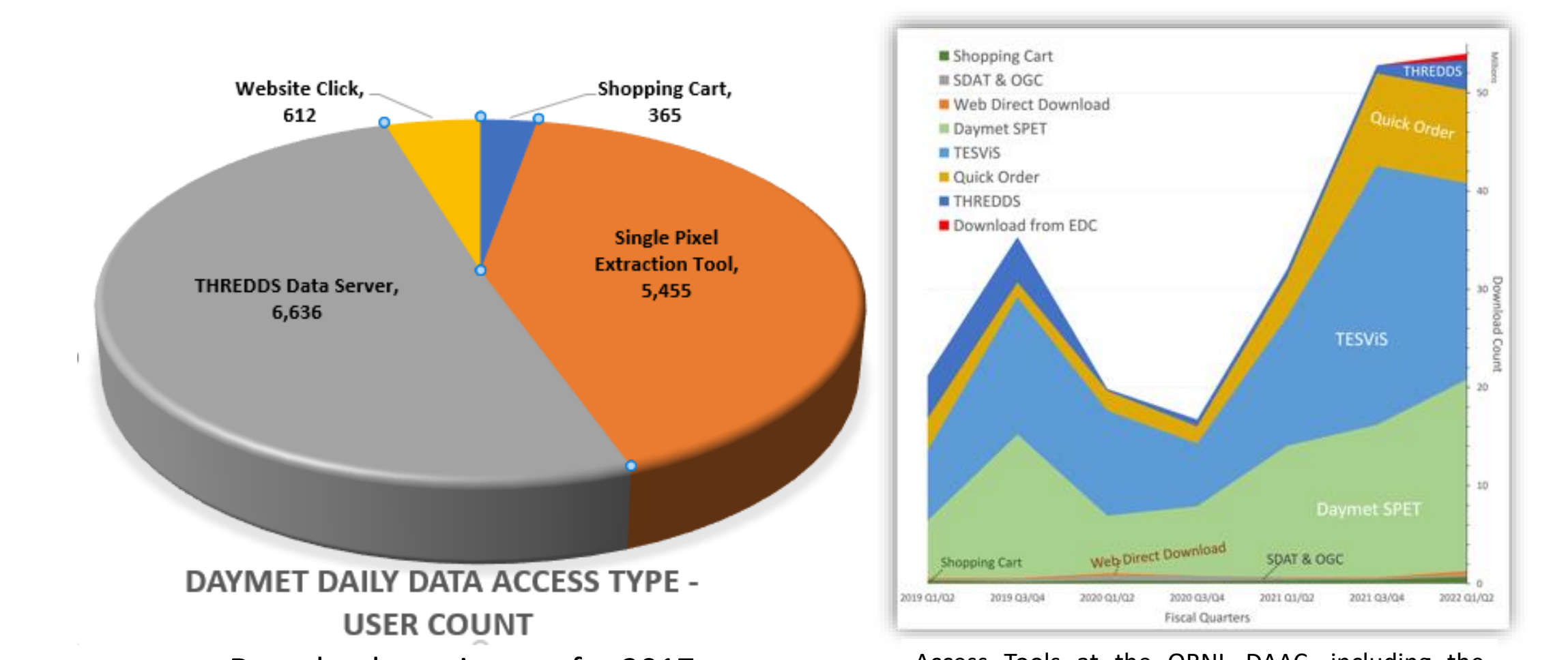
The Single Pixel Extraction Tool (Devarakonda *et al.*, 2021) data access option allows a user to specify a single geographic point by latitude and longitude to obtain daily Daymet data in a tabular format of selected variables and time range for the corresponding pixel.

A Web Services API based on REST URL transfer architecture allows browser viewing (both table and graph form) or CSV file download through command utilities such as Wget and cURL.



## Specialized Tools and Web Services

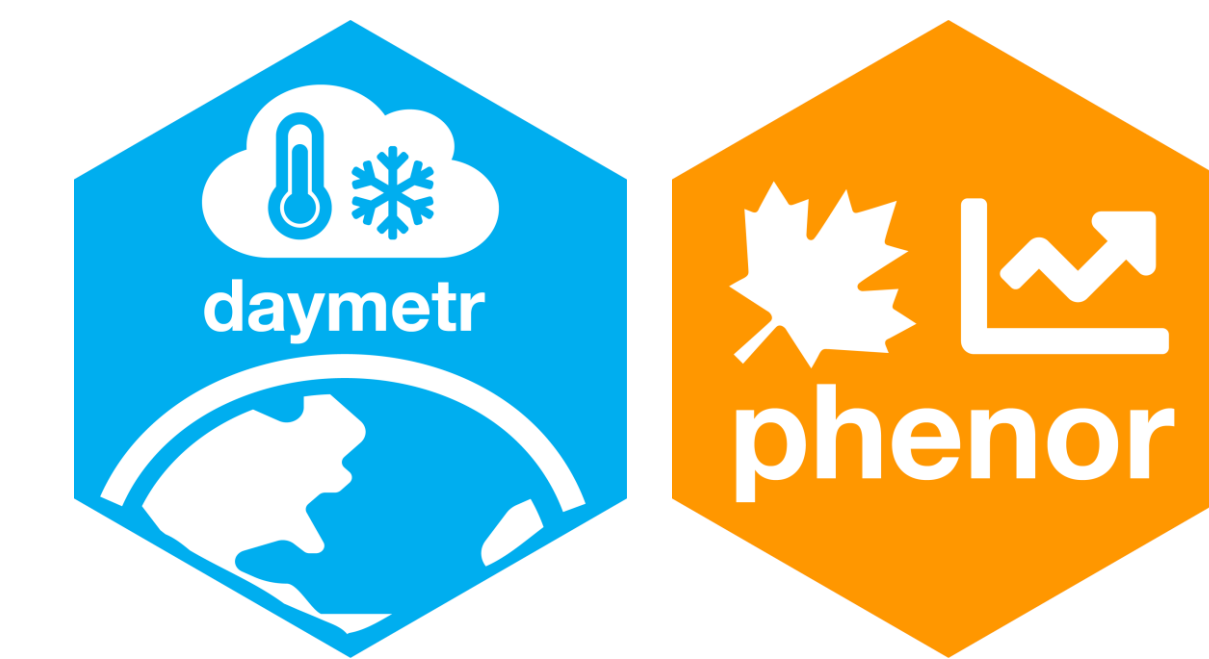
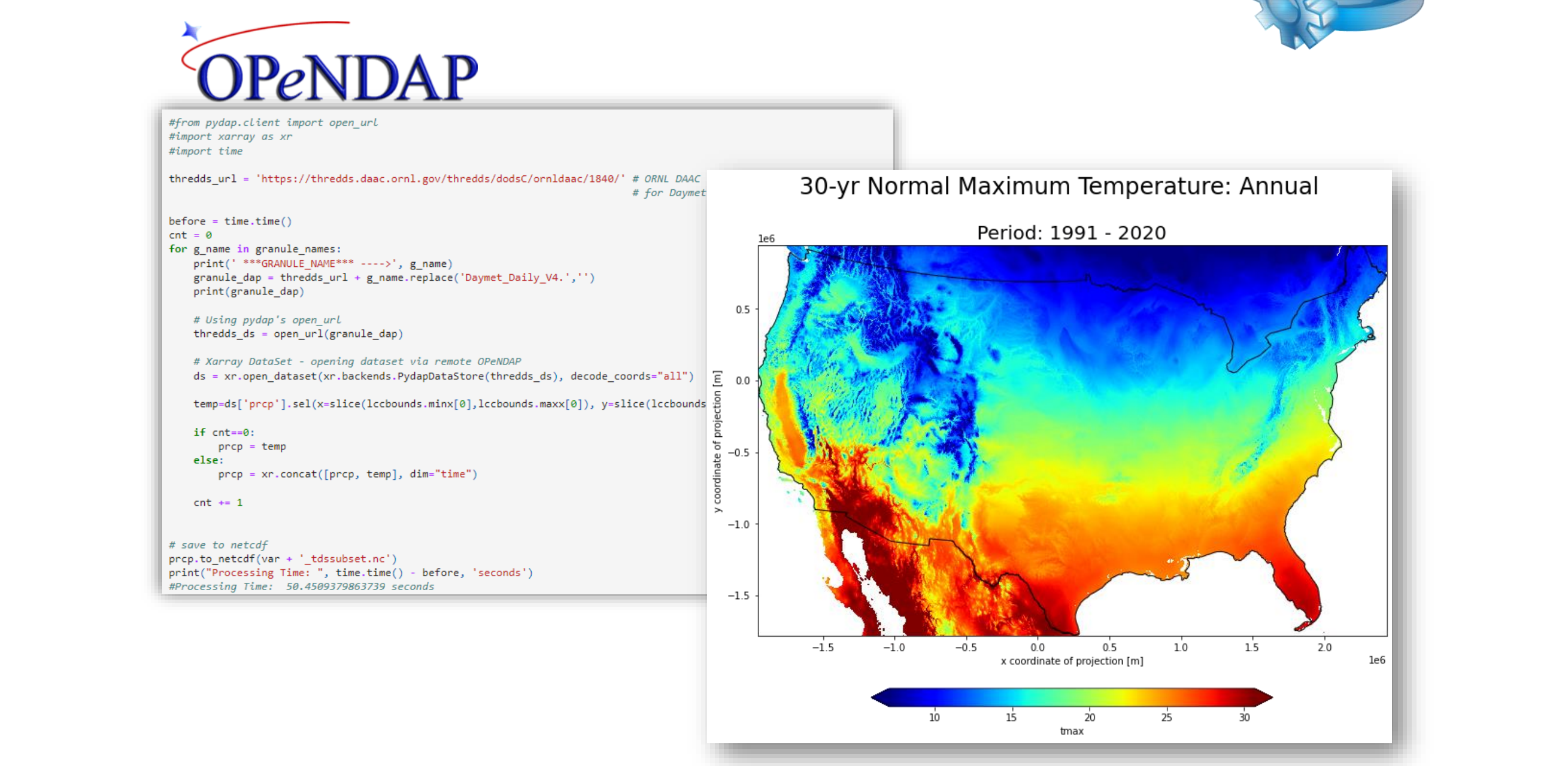
**Open Access:** Machine interoperability and programmatic access to Daymet provide data retrieval options for users. The two most heavily used access methods are through a customized tool and API (The Single Pixel Extraction Tool (SPET)) and the THREDDS Data Server (TDS) web service.



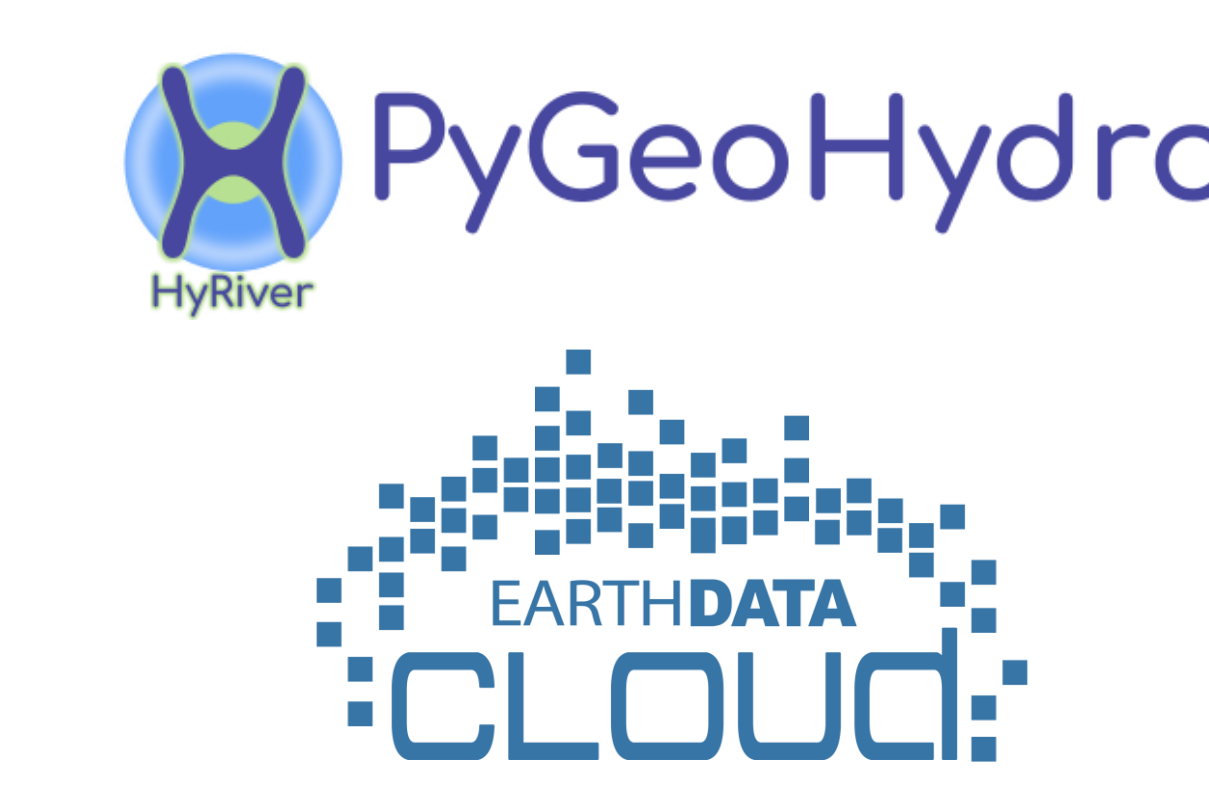
Access Tools at the ORNL DAAC, including the Daymet Single Pixel Extraction Tool, are used by more people and account for the majority of data delivery requests

The ORNL DAAC utilizes Unidata's THREDDS Data Server (TDS) to discover and serve multidimensional scientific datasets such as the Daymet dataset. These open, standards-based data and protocols allow access by outside agencies that provide higher-level analysis and data access based on specific user community needs.

- Advantages of providing standardized, multidimensional data through a Data Server include:
1. Direct and programmatic download capability via HTTPS
  2. Spatial and Temporal subsets through the NetCDF Subset Service (NCSS)
  3. Remote access data protocols: OPeNDAP, OGC WMS and WCS



daymetr and phenor, written and maintained by Dr. Koen Hufkins, provide a programmatic interface to Daymet web services. These allow for easy downloads directly in an R workspace and provide a phenology modelling framework in R.



PyGeoHydro, created by Taher Chegini, contains a package, PyDaymet, which allows access to Daymet for daily climate data both for a single pixel and as gridded data. PyGeoHydro is designed to aid in hydroclimate analysis through web services.

NASA Earthdata is supporting DAAC's and researchers as datasets, along with tools and services, are migrating to the cloud.

## Open Science

Researchers, agencies, and educators take advantage of open access to develop programmatic interfaces and web services to Daymet data, creating higher-lever domain specific frameworks in an open-source, open-science environment.

Due to Daymet's high ESDIS usage, the ORNL DAAC's Earthdata Cloud migration started with Daymet as a primary focus. Working with ESDIS, the ORNL DAAC is improving cloud-optimized file formats, cloud-based web access, and developing learning resources to support the research community.

Thornton, M.M., R. Shrestha, Y. Wei, P.E. Thornton, S. Kao, and B.E. Wilson. 2020. Daymet: Daily Surface Weather Data on a 1-km Grid for North America, Version 4. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1840>

Thornton, P. E., R. Shrestha, M. Thornton, S.-C. Kao, Y. Wei, and B. E. Wilson. 2021. Gridded daily weather data for North America with comprehensive uncertainty quantification. Scientific Data 8. <https://doi.org/10.1038/s41597-021-00973-0>

Menne, M. J., Durre, I., Vose, R. S., Gleason, B. E. & Houston, T. G. 2012. An Overview of the Global Historical Climatology Network-Daily Database. Journal of Atmospheric and Oceanic Technology 29, 897–910, <https://doi.org/10.1175/jtech-d-11-00103.1>

\* <https://www.nacarbon.org/nacp/data.html#>  
<https://nacarbon.org/nacp/detail.html?itemID=263&itemType=product&itemProgID=3&itemName=Daymet%20Data%20Product>

Ranjeet Devarakonda, Kavya Guntupally, Michele Thornton, Yaxing Wei, Debjani Singh, and Dalton Lunga. 2021. FAIR Interfaces for Geospatial Scientific Data Searches. <https://doi.org/10.1145/3486640.3491391>



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