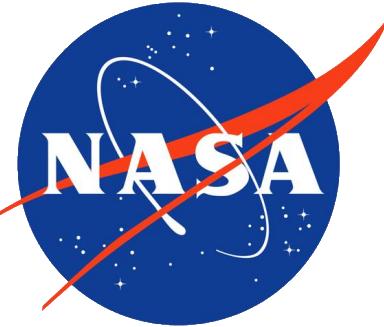


# Introduction to the POWER Project

2022 ASA-CSSA-SSSA International Annual Meeting

November 2022





# Prediction Of Worldwide Energy Resources (POWER)

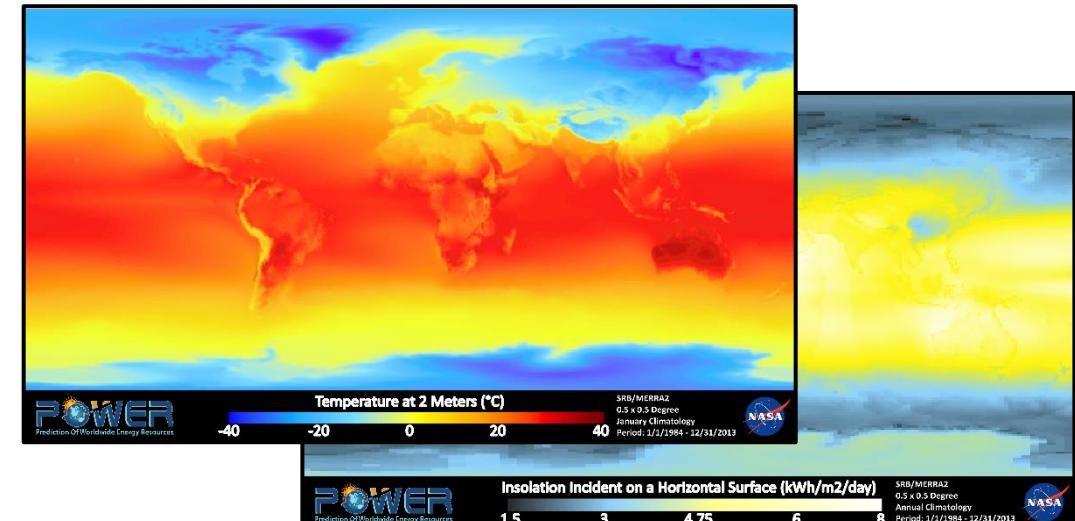
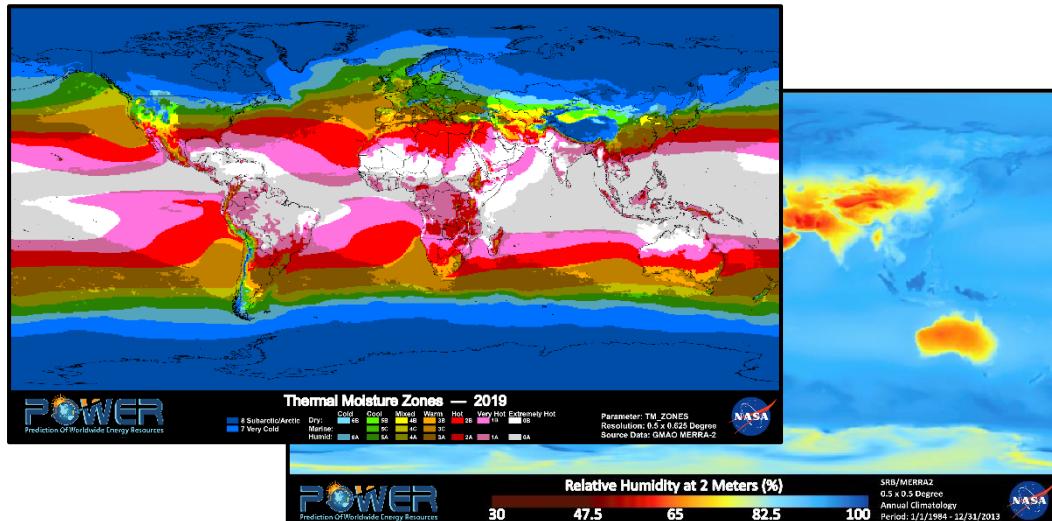
Aiming to improve the nation's public/private capability for integrating environmental data from NASA Earth Observations, analysis and modeling, particularly information related to surface solar irradiance, to support increased **renewable energy development, building energy sustainability, and agroclimatology applications**.

<https://power.larc.nasa.gov/>

**Team Leads:** Dr. Paul W. Stackhouse, Jr. & Dr. Falguni Patadia – National Aeronautics and Space Administration (NASA)

**Team Members:**

Bradley Macpherson, Madison Broddle, Chequel McNeil, Christopher Higham, Claire Baldacci, & A. Jason Barnett – Booz Allen Hamilton (BAH)  
Taiping Zhang, Colleen Mikovitz, Bradley Hegyi, & Neha Khadka – Science Systems and Applications, Inc. (SSAI)



*Trade names and trademarks are used in this presentation for identification only. Their usage does not constitute an official endorsement, either expressed or implied, by the National Aeronautics and Space Administration.*



# What is POWER's role in the community?

- ***Public open discovery, efficient access, and convenient distribution*** of NASA Earth Observations data through an integrated services suite.
  - POWER provides data products from source data that is also available through Earthdata Search
  - Data available via POWER is available as Analysis Ready Data (ARD) with value added and customized formats
- ***Interaction and Feedback*** from professional community members and organizations ***guides specific content*** for societal benefit areas.
- ***Key partnerships*** with scientific data providers and user groups provides actionable community feedback for ***improved future data products***.



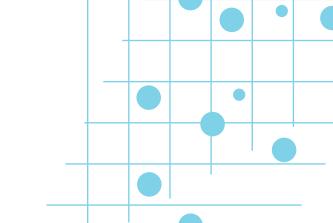


# What are POWER's Impacts on the Community?





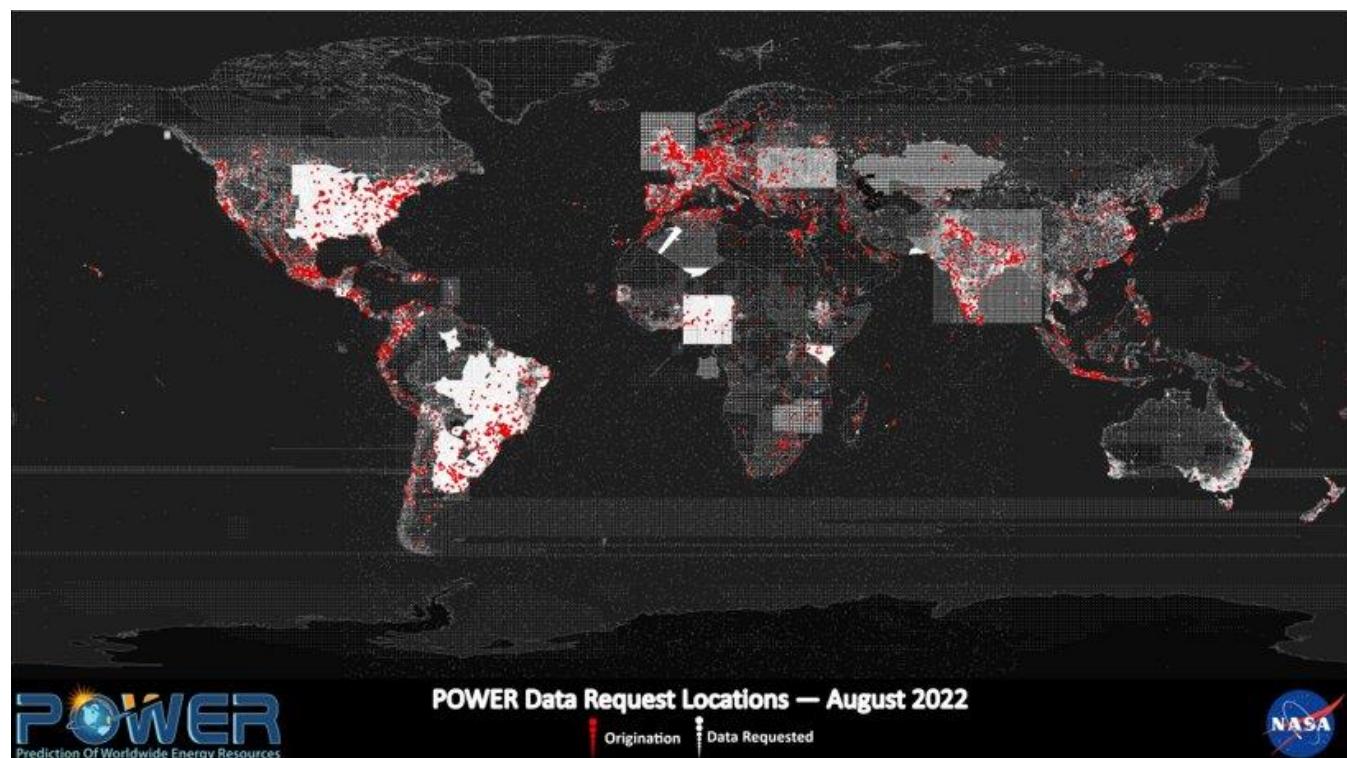
# POWER's User Metrics



Access to the POWER Web Services is free and anonymous, but we collect a variety of metrics to assess usage.

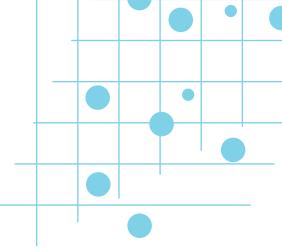
- Metrics include: data sources, access methods, user's approximate location, the user's data location, and server performance information, etc.
- POWER fulfills 4+ million data requests for over 17,000 unique users per month
- The POWER metadata object on [NASA's Open Data Portal in the Earth Science category](#) is number two (2) with 54,0017 views!
- On [NASA ArcGIS Online the POWER project](#) has one of the highest viewed content items with over 1,433,000 views!

Before Geospatial Services		After Geospatial Services	
1999/06/01 to 2018/05/01		2018/05/01 to Present	
Requests	35,988,533	Requests	237,937,342
Data Volume	3,612 GB	Data Volume	31.17 TB
<i>*The data volume is available from 6/01/2019.</i>		Unique Users	560,189





# POWER's Data Distribution Improvements



*2014 to 2018*

## ASCII/Text Files

MHT2M 1981 01 -26.72 -29.42 -28.52 -26.65 MHT2M 1981 02 -32.48
-37.81 -36.88 -39.83 -48.71 -48.48 -48.13 -36.62 -36.48 -35.68 -34.87 -33.86 -34.85 -34.39 -34.72 -35.86 -39.98 -38.88

Web accessible data access

Fast response time for data requests

Parameter structure:

- 64,800 (180 x 360) ASCII Files
- 259,200 (360 x 720) ASCII Files

*2018 to 2021*

## NetCDF



- CF Compliant
- Time Series Chunked
- Limited File Compression
- Multiple Parameters in File
- Common Variables/Dimensions
- Data Update by Data Parameter
- Direct Data Access via OPeNDAP

*2021 to Present*

## Zarr (Cloud Optimized)



~10TB+ Managed Archive

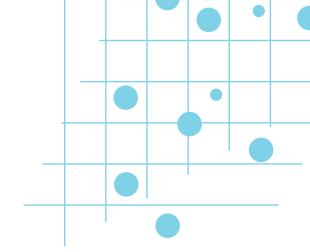
- Time Series Chunked
- Advanced File Compression
- Folder/File Based Parameters
- Common Variables/Dimensions
- Optimized for Cloud Storage and Disks
- Independently Editable Metadata as JSON
- Data Update by All Parameters Concurrently
- Direct Access via Cloud-Based Storage



Open Data  
on AWS Data  
Exchange



# POWER's Analysis Ready Data (ARD) – Access Methods

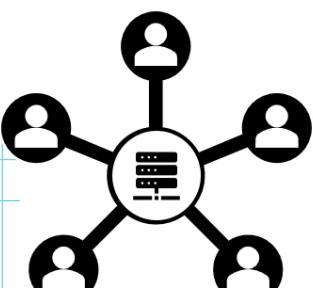


POWER provides an integrated services suite to efficiently access environmental data, pre-computed analysis reports for management of energy production, and monitoring energy efficiently systems, as source data for modeling software.

- POWER enhances data discovery, access, and distribution as Analysis Ready Data (ARD) for direct application of inputs to decision support tools, modeling and forecasting packages, and as inputs to scientific research is provided via multiple services:
  - [Application Programming Interface \(API\)](#)
  - [AWS Open Data Registry \(S3 Hosted\)](#)
  - [Geospatial Feature & Image Services](#)
  - [OPeNDAP Services](#)



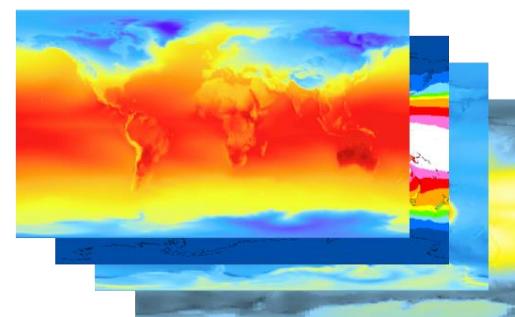
## APIs



The screenshot shows the "Registry of Open Data on AWS" interface. It displays the "NASA Prediction of Worldwide Energy Resources (POWER)" dataset. The dataset is described as "POWER's Analysis Ready Data (ARD) Datasets". It includes sections for "Description", "Resources on AWS", and "Amazon Resource Name (ARN)". The "Resources on AWS" section lists "aws.amazon.com/power-analysis-ready-database" and "aws.amazon.com/power-odr-access-request". The "Amazon Resource Name (ARN)" section lists "arn:aws:lambda::power-analysis-ready-database" and "arn:aws:lambda::power-odr-access-request".

## AWS ODR

## Geospatial Services

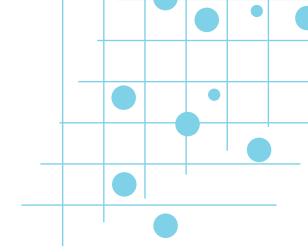


## OPeNDAP

The screenshot shows the "OPeNDAP" dataset viewer for the "/POWER/" directory. It displays a table of datasets with columns for "Name", "Last Modified", "Size", "DAP Response", and "Links". The table shows two entries: "annual/" last modified 2021-12-17T18:57:51Z and "monthly/" last modified 2021-12-17T18:57:48Z. Below the table, there is a section titled "OPeNDAP Home (1.1.6.2)" with a message about improving Earth understanding and a link to "NASA Web Privacy Policy". At the bottom, there is a "Dataset Viewers" section and a "Contact Support" link.



# POWER's Application Programming Interfaces (API)



The POWER Application Programming Interfaces (API) delivers Analysis Ready Data (ARD) for inputs to decision support tools, modeling and forecasting packages, and as inputs to scientific research by providing:

- Complete access to entire database without any other services
- Direct integration into external applications; users can submit a request and a response will be returned without leaving their application!
- User specified subsets converted into user community specific units and provides formats like ASCII, ICASA, CSV, GeoJSON, NetCDF, and more!

**Data Requests:** ~140,000 a Daily

**Follow Open Standards:** OpenAPI, GeoJSON, and more!

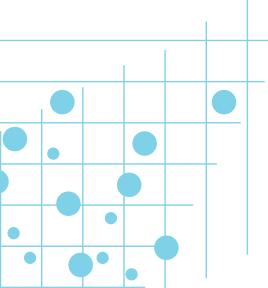
**Links:**

- <https://power.larc.nasa.gov/api/pages/>
- <https://power.larc.nasa.gov/docs/services/api/>

The screenshot shows the "POWER Hourly API" documentation page. At the top, there is a navigation bar with the "POWER" logo, a dropdown menu labeled "Select a definition" set to "Hourly", and a "More" button. Below the header, the title "POWER Hourly API" is displayed with a version number "v2.2.22" and an "OAS3" link. A URL "https://power.larc.nasa.gov/api/temporal/hourly/openapi.json" is provided. A brief description states: "The API allows hourly data requests of POWER Analysis Ready Data (ARD)." Under the "Data Requests" section, there is a "GET /api/temporal/hourly/point Single Point Data Request". In the "Configuration Settings" section, there is a "GET /api/temporal/hourly/configuration Configuration Settings Request". A "More documentation" link is located at the bottom right.

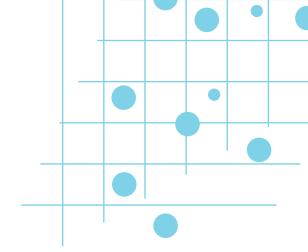
## Example API Request:

`https://power.larc.nasa.gov/api/temporal/daily/point?start=20210801&end=20210830&longitude=-4.75&latitude=-4.750&&community=ag&parameters=ALLSKY_SFC_SW_DWN,T2M`





# POWER Data in the Cloud



POWER is a part of a [NASA Space Act Agreement](#) with EOSDIS Earthdata.

- This Space Act enables direct data store access via cloud-based services.
  - Allowing users to directly access the POWER Analysis Ready Data (ARD) of ~8.5TB
  - The ARD grows at ~.5 TB/Year
  - The data is:
    - Cloud and Analysis Optimized
    - Have Community-Driven Parameters
    - Machine Learning Ready
  - Enable interactive tutorials with large amounts of data
- The POWER data archive is listed in the AWS Open Data Portal (sustainable data initiative).

<https://registry.opendata.aws/nasa-power/>

The screenshot shows the AWS Open Data Portal homepage. At the top, there's a navigation bar with links for Contact Us, Support, English, My Account, Sign In, and Create an AWS Account. Below the navigation is a banner titled "Open Data on AWS" with the subtext "Share any volume of data with as many people as you want". A prominent orange "Contact us" button is visible. The main content area features a dark background with a blue digital circuit board pattern. To the right, there's a video player window titled "AWS PUBLIC DATASETS: UNLOCKING THE POTENTIAL OF OPEN DATA IN THE CLOUD". Below the video, a section titled "AWS Partner Story: NASA" includes a quote from Bryan Walls, Imagery Experts Deputy Program Manager, NASA, stating, "We now have an agile, scalable foundation on which to do all kinds of amazing things. Much like with the exploration of space, we're just starting to imagine all that we can do with it." The NASA logo is in the top right corner of the story section.



# Geospatial Feature & Image Services

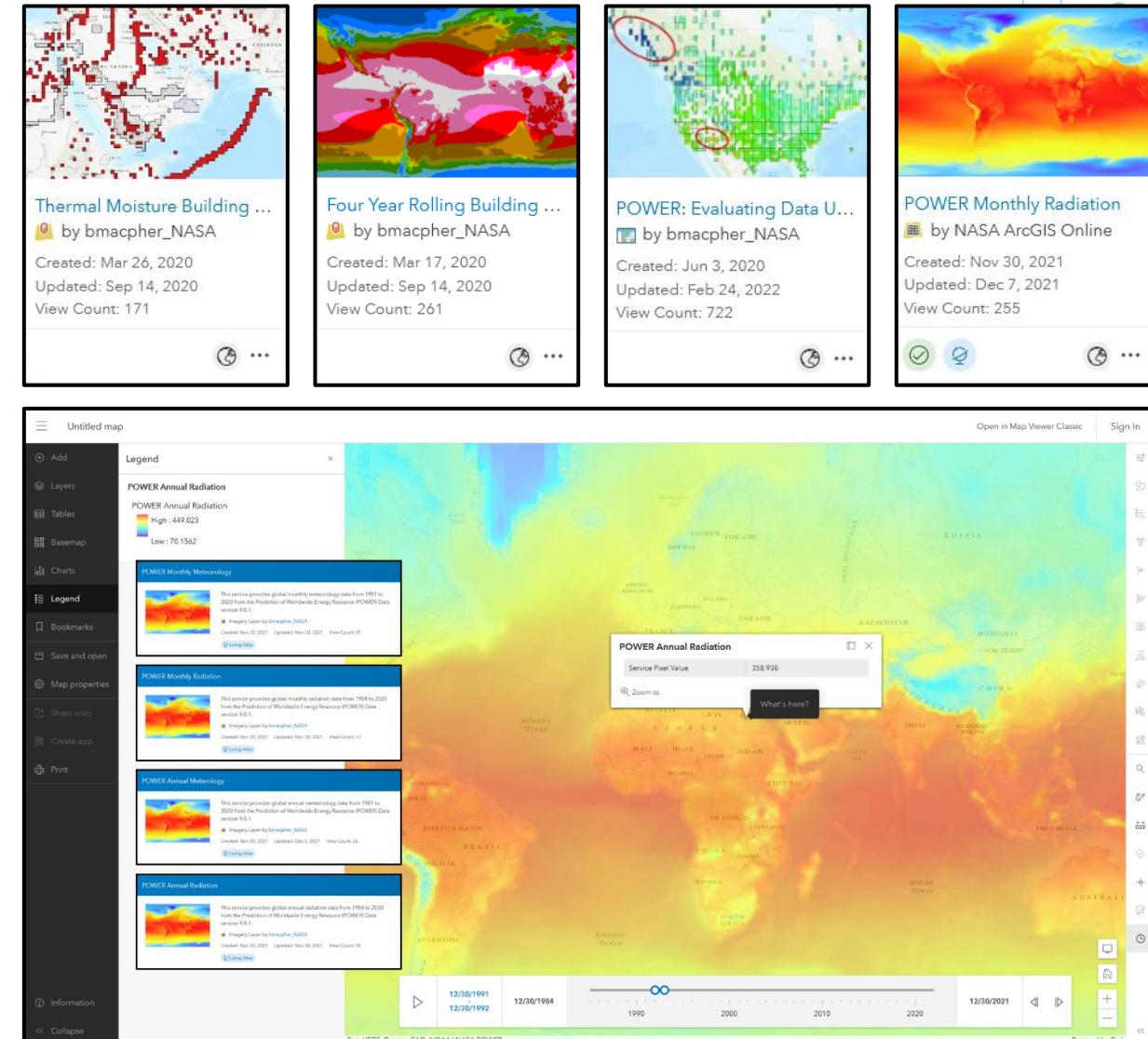
POWER provides Esri® ArcGIS Image and Feature Services that allow users to efficiently interact with the POWER data in Geographic Information System (GIS) applications and related tools.

- **Image Services:** new image services for annual radiation, annual meteorology, monthly radiation, and monthly meteorology.
- **Feature Services:** global long-term ASHRAE® building climate thermal-moisture zones, 4-year rolling thermal zones, and period differences

## Available on:

- [Esri Living Atlas of the World](#)
- [NASA ArcGIS Online \(AGOL\)](#)
- [ASDC ArcGIS Enterprise](#)

Hyperlink: [NASA AGOL - POWER](#)





# Use Case: NASA POWER Data in Crop Model Applications

Examples using POWER data in Decision Support System for Agrotechnology Transfer (DSSAT)

The University of Florida is working in West Africa:

## Senegal River Valley

- Modeling rice yield prediction
- Estimating rice maturity dates
- Harvest progression over time

## The Ministry of Agriculture in Ethiopia

- Modeling the maize yield response to Nitrogen fertilizer intervention for intervention decisions
- Using Historical (34 year) and Near Real Time solar and weather data from NASA POWER

DSSAT Version 4.8.0

File Codes Model Applications Tools & Data Training Development Download News&Blog Support

DSSAT Version 4.8 (April 2022) | Free of charge! DSSAT v4.8 is now available! Request your Download

Experiment	Description	Modified
DTSP8502.RIX	EFFECTS OF APPL. N & ENVIR. ON RICE	9:00:00, Sat, 1 May 2021
IRMZ8601.RIX	IRRI, MUNOZ JAN 86 UREASE INHIBITORS	9:00:00, Sat, 1 May 2021
IRP18001.RIX	IRRI, LOS BANOS, IRRIG. & N STUDY, 1980	9:00:00, Sat, 1 May 2021
IRPU8501.RIX	IRRI, PILA JAN 85 UREASE INHIBITORS 1SN	9:00:00, Sat, 1 May 2021
PULU0001.RIX	PAU, LUDHIANA, WATER BALANCE STUDIES, 2000	9:00:00, Sat, 1 May 2021
UAFD0011.RDX	PLANT DENSITY * NITROGEN 2000 UAF PAKISTAN	9:00:00, Sat, 1 May 2021
UAFD0012.RDX	PLANT DENSITY * IRRIGATION 2000 UAF PAKISTAN	9:00:00, Sat, 1 May 2021

What is DSSAT?

D ecision Support System for Agrotechnology Transfer (DSSAT) is software application program that comprises dynamic crop growth simulation models for over 42 crops. DSSAT is supported by a range of utilities and apps for weather, soil, genetic, crop management, and observational experimental data, and includes example data sets for all crop models. The crop simulation models simulate growth, development and yield as a function of the soil-plant-atmosphere dynamics. DSSAT has been applied to address many real-world problems and issues ranging from genetic modeling to on-farm and precision management to regional assessments of the impact of climate variability and climate change. DSSAT has been used for more than 30 years by researchers, educators, consultants, extension agents, growers, private industry, policy and decision makers, and many others in over 174 countries worldwide. [Learn more...](#)

Request DSSAT

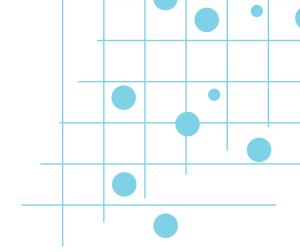
DSSAT is Free of charge! Request to download your own copy today!

> DSSAT Version 4.8 released in May 2021. [Download DSSAT v4.8](#)

> DSSAT Version 4.7.5 released in April 2019. [Download DSSAT v4.7.5](#)



# Want to Learn More? Check out POWER's StoryMap!



The POWER Team has developed an Esri® ArcGIS StoryMap.

- Through text, GIFs, videos, and interactive map content, viewers can become more familiar with the project.
- By scrolling through the StoryMap, users learn more about the POWER Project, its data sources, how to access POWER data, POWER's communities and users, and how to discover more POWER-related information.
- Link: <https://arcg.is/0Xe851>

The Prediction of Worldwide Energy Resources (POWER) Project

Provides solar & meteorological data from NASA research for support of renewable energy, building energy efficiency, & agricultural needs.

The NASA POWER Team @ NASA Langley Research Center

Radiation Data

Source	Start	End	Status	Latency	Description
GEWEX SRB 4.0	1984/01/01	2000/12/31	Inactive	N/A	Satellite analysis from global cloud imagers (from geosynchronous and polar orbiters satellites) using radiative transfer lookup tables.
CERES SYN1deg	2001/01/01	2021/07/01	Active	150 Days	Satellite analysis from CERES convolved with MODIS for some and TOA fluxes, then uses radiative transfer model input from geosynchronous satellites and other inputs to produce surface fluxes.
FLASHFlux V4	2021/07/02	2021/07/29	Active	1 Day	Satellite analysis of CERES (reflected solar) and MODIS (cloud imager) measurements (on Terra and Aqua satellites).

Meteorology Data

Source	Start	End	Status	Latency	Description
GMAO MERRA-2	1981/01/01	2021/07/01	Active	300 Days	Atmospheric reanalysis with assimilated observations (1-2 months behind real time).
GODAS 5.12.4 FP-IT	2021/07/02	2021/07/05	Stop	0 Days	Atmospheric reanalysis with assimilated observations with less assimilated observations, available within a few days of real-time.

Evaluating Data Uncertainty

You can scroll through this Map Journal to learn more about how POWER evaluates biases in its meteorological data.

POWER Users Map

The POWER Project improves the accessibility and usage NASA Earth Observations (EO) supporting community research in three focus areas:

1. Renewable Energy
2. Sustainable Building
3. Agroclimatology

POWER supports communities with:

- Public open discovery, efficient access, and convenient distribution of NASA Earth Observations data through an integrated services suite.
- Societal benefit area specific content guided by interaction with and feedback from professional community members and organizations.
- Key partnerships with scientific data providers and user groups providing actionable and community feedback for improved future data products.

POWER Users

- Community
- Renewable Energy
- Sustainable Buildings
- Agroclimatology



# Where is the POWER Documentation?

The POWER Documentation consists of four main sites that are built for both mobile and desktop use:

- **Homepage:** the project overview with links to all POWER resources.
- **Dashboard:** a series of dynamic web pages that provide real-time status information on data processing.
- **API Pages:** the API landing pages that use the OpenAPI specification to create interactive pages for the API endpoints.
- **Methodology Docs:** the projects documentation and methodology providing accurate and detailed information to users.

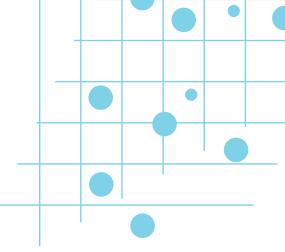
<https://power.larc.nasa.gov/>  
<https://power.larc.nasa.gov/docs/>

The collage displays several components of the POWER website:

- Dashboard:** Shows "Processing Background" with sections for Overview and Warning. It also displays "Solar Data" and "Meteorology Data" tables with details like Name, Date (Last), Status, and Years.
- Methodology Documents:** A page titled "The POWER Project" supported by NASA Earth Science's Applied Sciences Program, featuring "POWER's Enhanced Features" such as Data Methodology, Data Services Documentation, and Data Access Tutorials.
- Globe Visualizations:** Two large, colorful global maps showing energy-related data, likely solar insolation or meteorological parameters, with color-coded regions indicating different values.

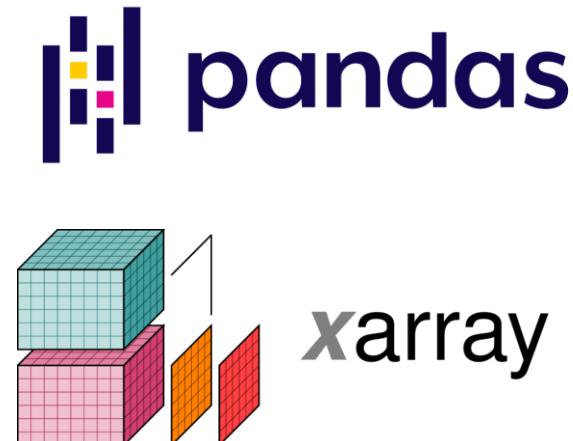
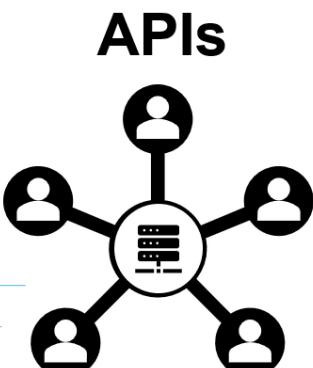


# Data Access and Analysis Demo Using Jupyter Notebooks



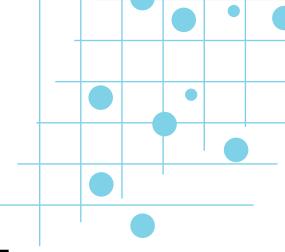
The POWER services and data access methods provides efficient access to POWER datastore:

- POWER API data access
- Direct Datastore access from AWS S3 (Zarr access)
- Example use-case of monthly anomalies
  - Pandas, Xarray formats in Python





# Demo Notebook: Direct API Access



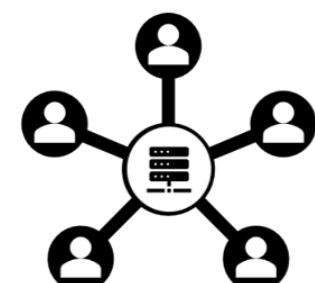
```
▼ Construct the API URL ⓘ  
This fills the base_url based on the inputs provided.  
  
[6]:  
base_url = r"https://power.larc.nasa.gov/api/temporal/{temporal}/point?Time=LST&parameters=(parameters)&community=RE&longitude={longitude}&latitude={latitude}&start=(start)0101&end=(end)1231&format=JSON"  
query_url = base_url.format(temporal=temporal, parameters=", ".join(parameters), start=start, end=end, latitude=latitude, longitude=longitude)  
print ("Here is the API URL:", query_url)  
  
Here is the API URL: https://power.larc.nasa.gov/api/temporal/daily/point?Time=LST&parameters=ALLSKY_SFC_SW_DWN,CLRSKY_SFC_SW_DWN,ALLSKY_SFC_LW_DWN,CLRSKY_SFC_LW_DWN&community=RE&longitude=-0.461389&latitude=51.4775&start=20010101&end=20011231&format=JSON  
  
Request Data  
  
This requests the data from the POWER API URL and convert the JSON response to a Python dictionary object.  
  
[7]:  
%%time  
main_response = requests.get(url=query_url, verify=True, timeout=30) # Fix this to have timeout.  
json_response = json.loads(main_response.text)  
Wall time: 3.02 s  
  
Turning the API response Dictionary and into a Pandas DataFrame.  
  
[8]:  
df = pd.DataFrame.from_dict(json_response['properties']['parameter'])  
  
if temporal == 'hourly':  
    df.index = pd.to_datetime(df.index, format='%Y%m%d%H')  
elif temporal == 'daily':  
    df.index = pd.to_datetime(df.index, format='%Y%m%d')  
  
df = df.replace(-999.0, 0)  
df.head()  
  
[8]:  
ALLSKY_SFC_SW_DWN CLRSKY_SFC_SW_DWN ALLSKY_SFC_LW_DWN CLRSKY_SFC_LW_DWN  
2001-01-01      0.77      1.14    310.71    270.59  
2001-01-02      0.46      1.13    328.62    269.72  
2001-01-03      0.81      1.18    290.86    256.02  
2001-01-04      0.28      1.14    322.09    265.77  
2001-01-05      0.42      1.14    312.04    257.60  
  
[10]:  
metadata = pd.DataFrame.from_dict(json_response['parameters'])  
metadata  
  
[10]:  
ALLSKY_SFC_SW_DWN CLRSKY_SFC_SW_DWN ALLSKY_SFC_LW_DWN CLRSKY_SFC_LW_DWN  
units          kW-hr/m^2/day          kW-hr/m^2/day          W/m^2          W/m^2  
longname  All Sky Surface Shortwave Downward Irradiance  Clear Sky Surface Shortwave Downward Irradiance  All Sky Surface Longwave Downward Irradiance  Clear Sky Surface Longwave Downward Irradiance
```

## Retrieve & read data from request

- Build url using string format method, variables
- Execute the request, receive the output
- JSON > Dict > Pandas
- Handle date and null values
- Metadata!

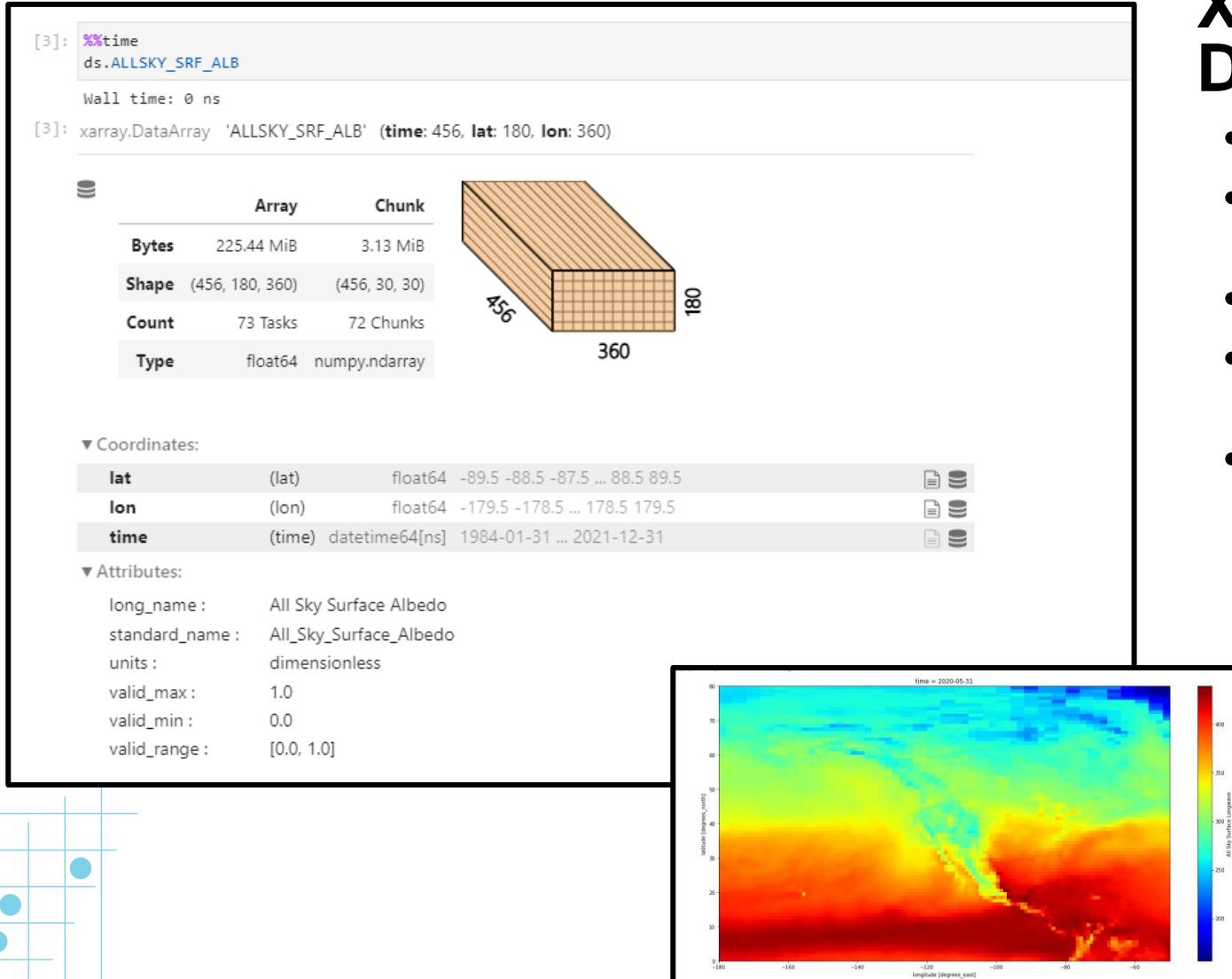
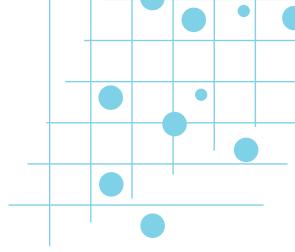


APIs





# Demo Notebook: Data Access - Zarr

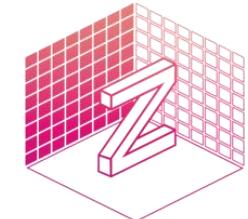


## Xarray: Multidimensional Dataset

- Like pandas, xarray is built off numpy
- More powerful than 2-dimensional Pandas DataFrame
- Perfect for reading 3D data from zarr
- Dask chunks data, references it where the Zarr resides
- Xarray dataset from zarr uses less memory than a Pandas DataFrame



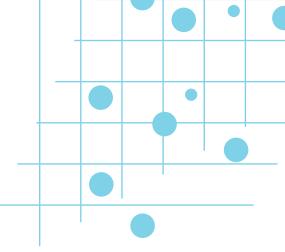
xarray



dask Zarr



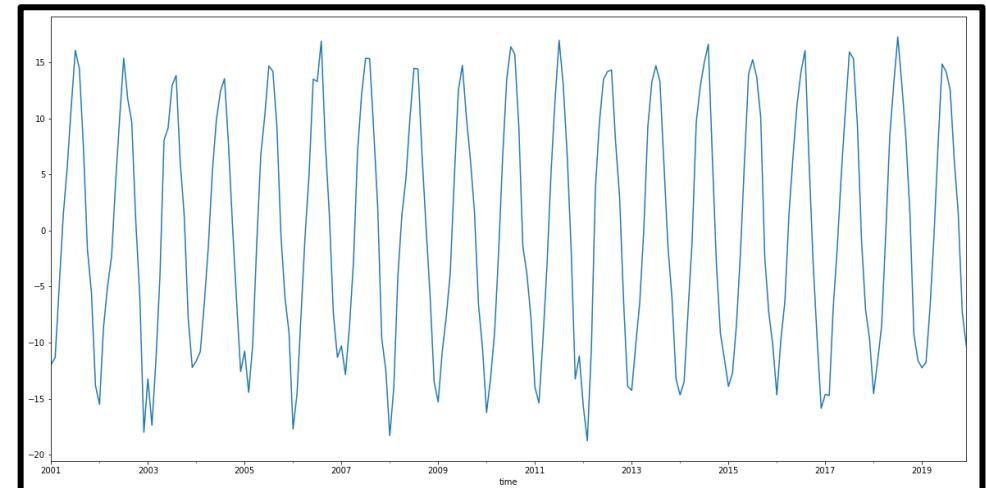
# Demo Notebook: Use Case Scenario – Monthly Anomalies



```
[5]: def make_anomalies(series: pd.Series) -> pd.Series:  
    ...  
  
    This function creates monthly anomalies.  
  
    series: the pandas series to compute the anomalies (required)  
    ...  
  
    monthly = series.resample('M').mean() # Avg for each individual month  
  
    monthly_mean = monthly.mean() # 12.024  
  
    return monthly - monthly_mean  
  
[6]: anomalies = make_anomalies(df[parameter])  
anomalies.head(12)  
  
[6]: time  
2001-01-31   -11.955329  
2001-02-28   -11.329753  
2001-03-31   -4.982426  
2001-04-30    1.349961  
2001-05-31    5.692090  
2001-06-30   11.127961  
2001-07-31   16.060155  
2001-08-31   14.422413  
2001-09-30    7.503961  
2001-10-31   -1.677910  
2001-11-30   -5.577039  
2001-12-31   -13.844362  
Freq: M, Name: T2M, dtype: float64
```

## Anomalies: Average difference from the mean.

- Calculate MONTHLY Average from Jan2001 to Dec2019
- Calculate the OVERALL Average temp for the entire time range! (12°C)
- Find the difference for each month in the range



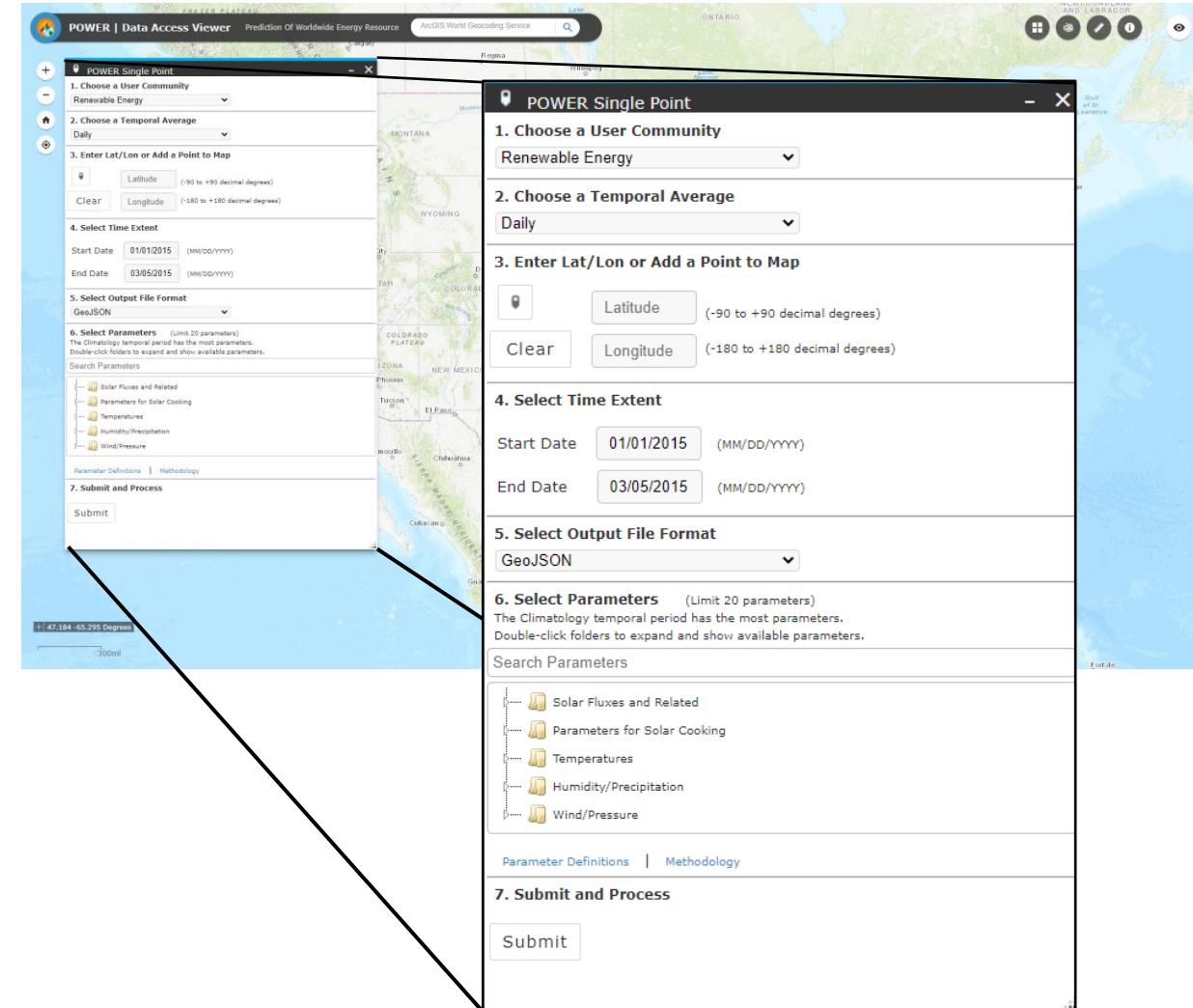


# What is the POWER Data Access Viewer (DAV)?

- Provides a front-end web map with a simple user interface via integrated widgets that is responsive and built for mobile and desktop use.
- Allows users to select community specific parameters, units, time periods, and the output formats to efficiently retrieve data from the Application Programming Interface (API).
- Enables users to follow a set of questions and without programming knowledge, to create the API request URL and download the requested data.

<https://power.larc.nasa.gov/data-access-viewer/>

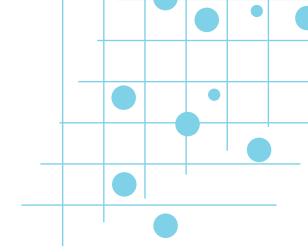
- [DAV Quick Start Guide](#)
- [DAV User Guide](#)





# POWER's Data Access Viewer (enhanced)

Leveraging [Esri's Calcite Design System](#) to implement new user-driven requirements.



Parameter Selection

User Community: Renewable Energy

Temporal Level: Hourly

Latitude: 39.57

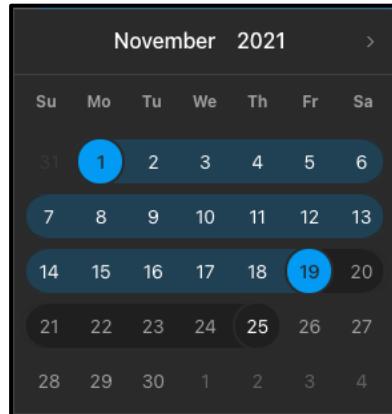
Longitude: -113.08

Time Period: 12/1/2021 to 12/3/2021

Format: JSON

Parameters: Temperature at 2 Meters (selected), All Sky Surface Shortwave Downward Irradiance

Submit



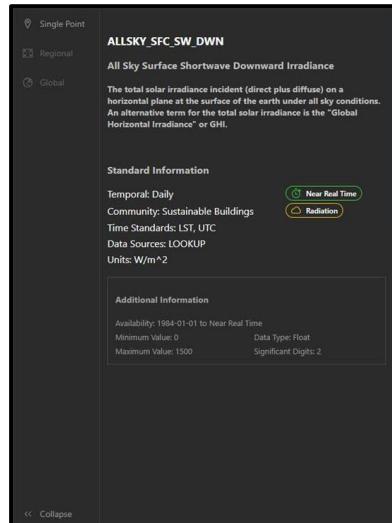
Advanced Parameters:

Time Standard: Local Solar Time (LST)

Wind Elevation: 98.491

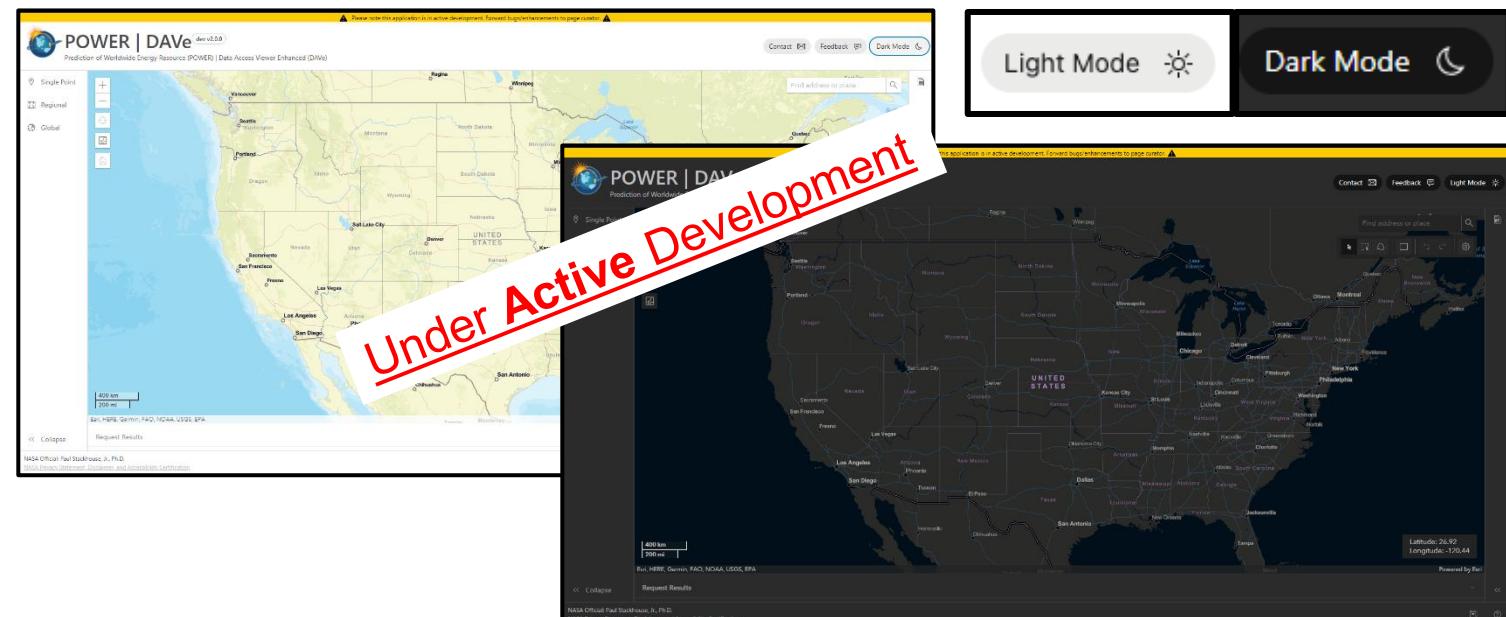
Wind Surface: 20-m broadleaf and needleleaf trees (75% coverage)

Pressure Correction: 5,596.228



Annual Cooling, Dehumidification, and Enthalpy Design Conditions

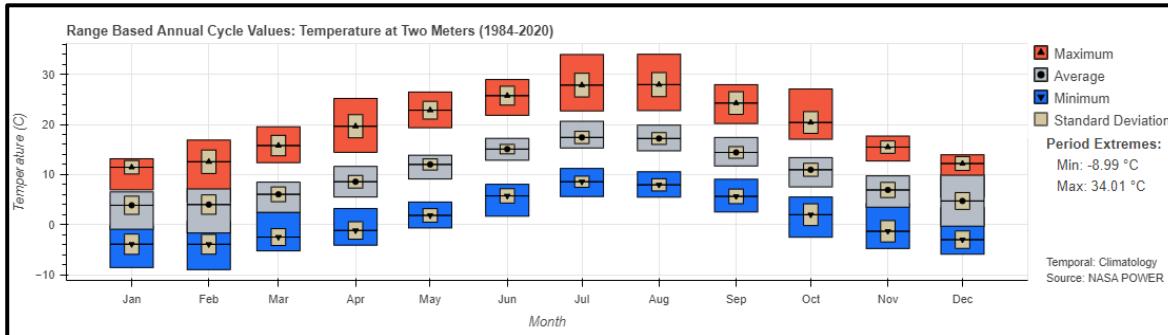
Hottest Month	Hottest Month DB Range	Cooling DB/MCWB				Evaporation WB/MCDB				MCWS/PCWD to 0.4% DB				
		0.4%		1%		2%		0.4%		1%		2%		
		DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCWS	PCWD
7	16.6	37.0	Ø	35.6	Ø	34.3	Ø	21.4	Ø	20.5	Ø	19.6	Ø	Ø
Dehumidification DP/MCDB and HR														
0.4%		1%		2%		0.4%		1%		2%		Extreme Max WB		
DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB
37.0	12150.0	Ø	13.2	11290.0	Ø	12.0	10440.0	Ø	Ø	Ø	Ø	Ø	Ø	24.5



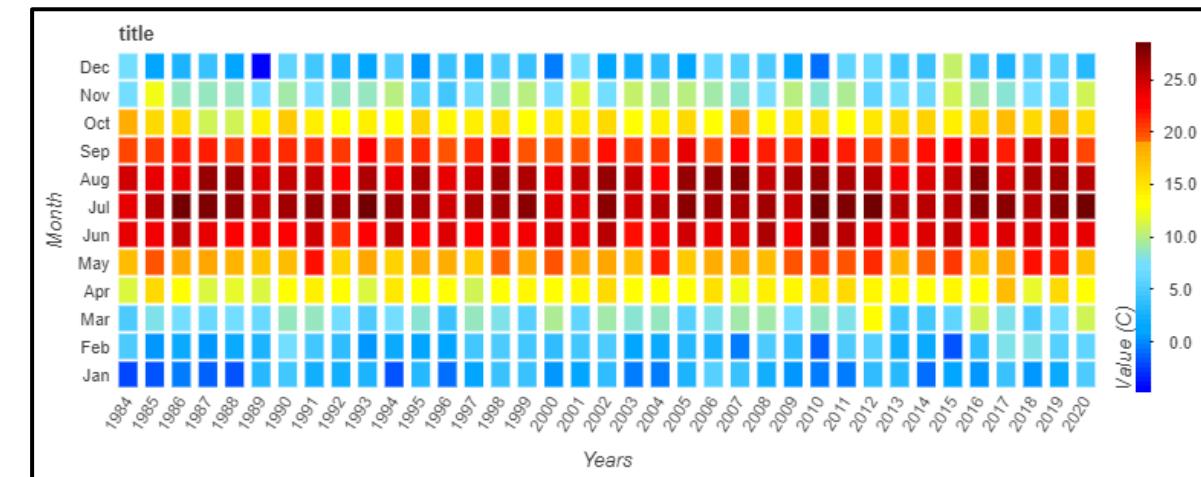


# Climate Means and Variability – DAVe Plot Template Examples

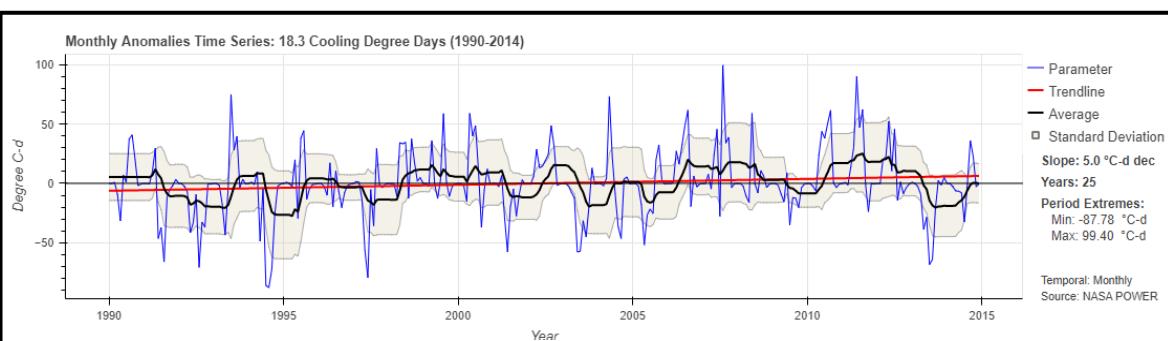
## Range Based Annual Cycle



## Heatmap: Climatological Days or Annual Based

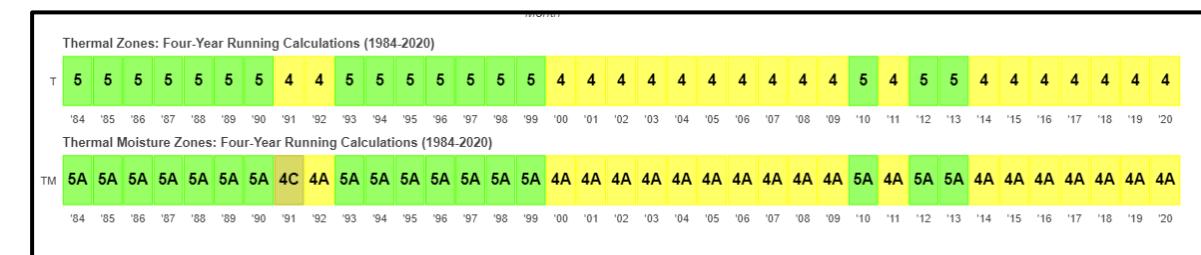


## Temporal Variability with Statistics\*



\*Can have advanced statistics integrated.

## Rolling 4-Year Thermal Zones



The plot types are currently available in Anomalies report from the DAV to streamline the developed actives and save time since they have been vetted and approved by the POWER Team.



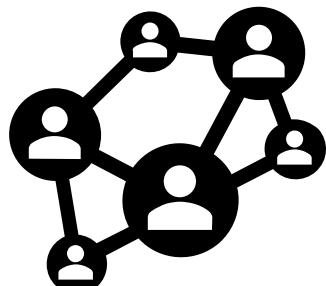
# Want to Get Involved with POWER?

The POWER Project loves to hear about and showcase projects that have used POWER data.

- The team keeps a list presentations, papers, and projects that have used POWER Data.
- <https://power.larc.nasa.gov/docs/references/publications/>

POWER is interested in working with or supporting projects from the following sectors:

- U.S. Government
- External Governments
- Intergovernmental
- Commercial
- Education
- Non-profit
- Start-ups
- App development

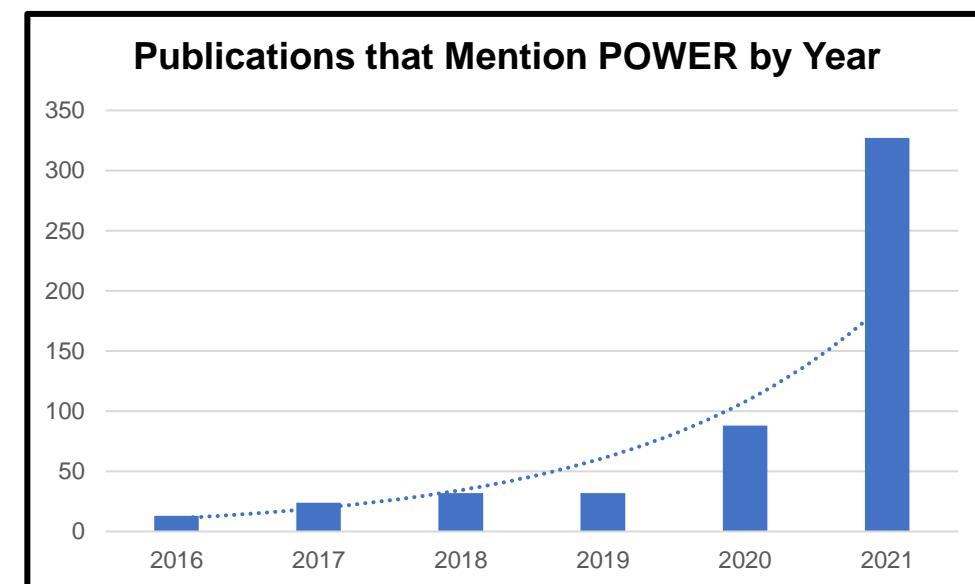


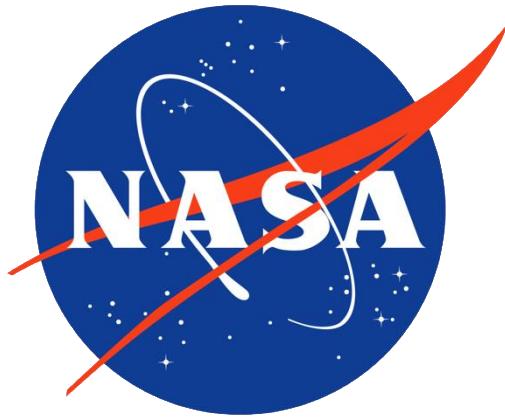
The team also loves to hear feedback on POWER's data and applications. You can reach out to the POWER team direct via our email: [larc-power-project@mail.nasa.gov](mailto:larc-power-project@mail.nasa.gov)



This QR code leads to POWER's "Contact Us" information, as seen below.

The screenshot shows the POWER website's contact section. At the top, there is a header with the NASA logo and the text "NASA Prediction Of Worldwide Energy Resources". Below the header, there are links for "DATA ACCESS", "DOCUMENTATION", "RESOURCES", "ABOUT", and "CONTACT". The main content area has a blue background with the text "You are a part of our community!". At the bottom, there is a "Contact Information" section with the text "NASA Langley Research Center (LaRC) Hampton, VA (USA)" and an email address "larc-power-project@mail.nasa.gov".





# Thank you!

Website: <https://power.larc.nasa.gov>

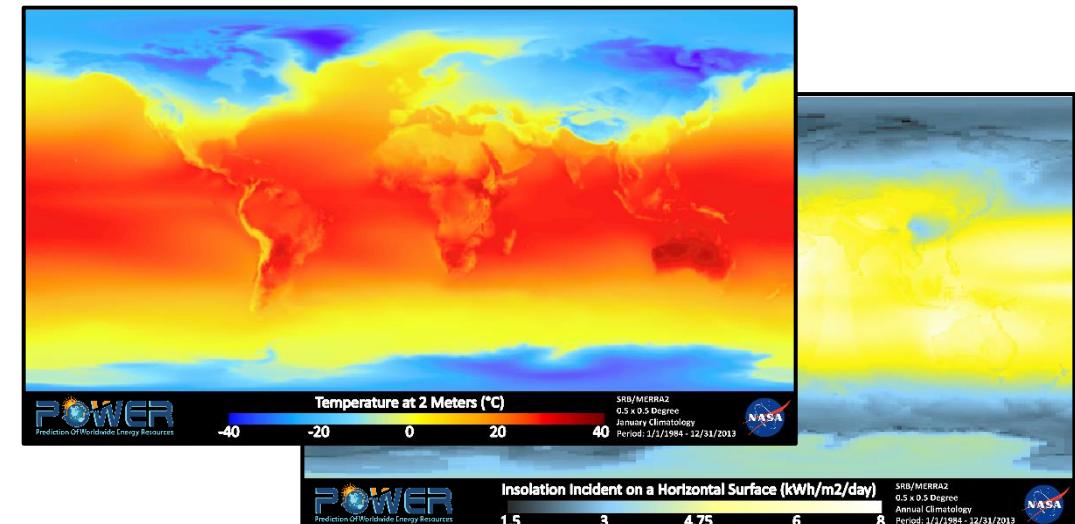
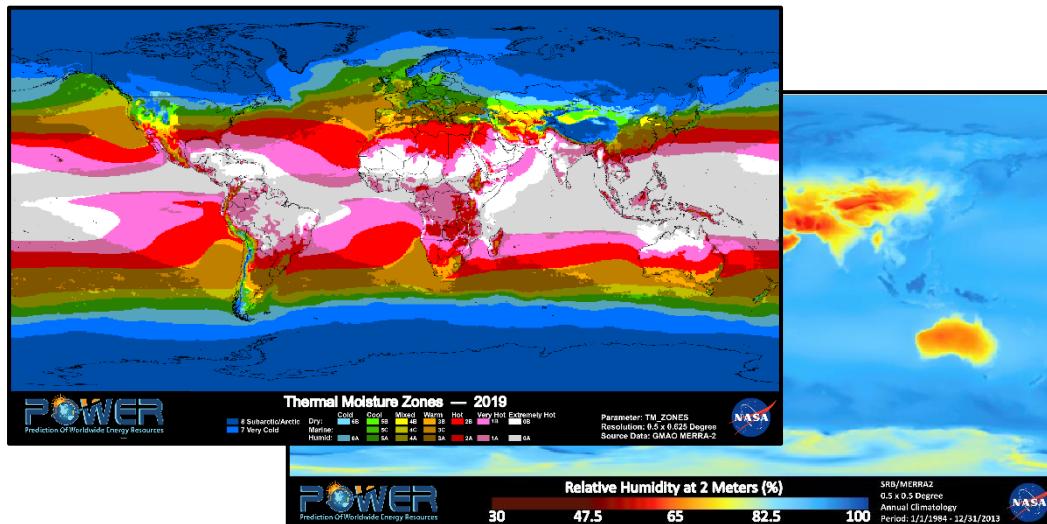
Email: [larc-power-project@mail.nasa.gov](mailto:larc-power-project@mail.nasa.gov)

- The POWER Team loves to hear from our users, and we're happy to answer any questions you might have about how to use our data or our applications.

**Principal Investigator:** Dr. Paul W. Stackhouse, Jr. – National Aeronautics and Space Administration (NASA)

## Co-Investigators:

- Bradley Macpherson, Madison Broddle, Claire Baldacci, Chequel McNeil, Christopher Higham & A. Jason Barnett – Booz Allen Hamilton (BAH)
- Taiping Zhang, Colleen Mikovitz, Bradley Hegyi, & Neha Khadka – Science Systems and Applications, Inc. (SSAI)



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