

Accessing and Using Weather Station Observations

Real-time Weather Monitoring & Browsing Historical Observations:

Preferred Mobile Method (Davis Weatherlink):

Pros & cons

- Pros:
 - available on almost any [web browser](#) or mobile device for free from [Google Play Store](#) and [Apple Appstore](#)
 - Large font - easy to see weather at a glance, even with poor eyes and a lot of glare
 - Intuitive
- Cons:
 - Can only see historical extremes through a query system. Full historical data are not available
 - map interface does not emphasize microclimates at a glance
 - phones might be a major distraction in the classroom
 - requires an account - free of charge, but could be annoying
 - a private company (Davis) may change its interface or revoke access at any time, so lesson plans based on the app may become moot
 - Only has obs from Davis weather stations

Preferred Web Browser Method ([NOAA Weather & Hazards](#)):

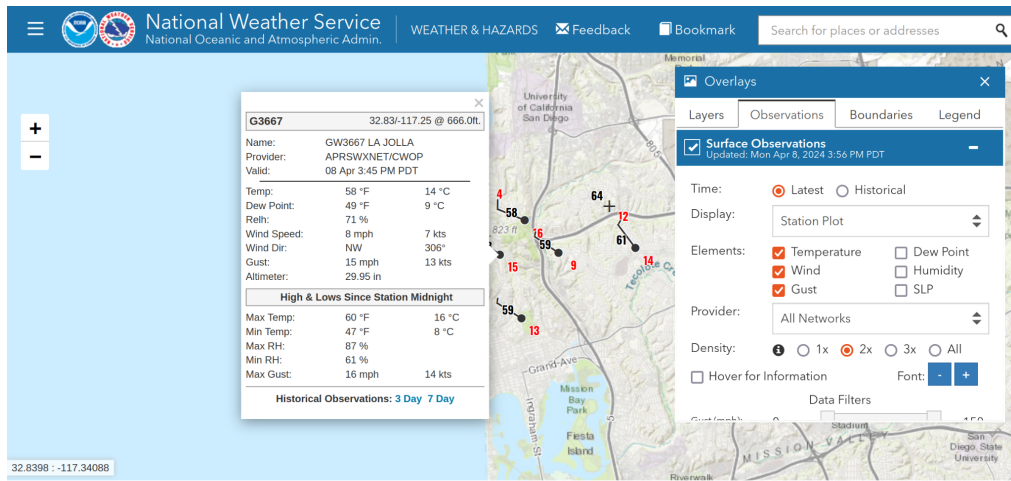
Pros & Cons:

- Pros:
 - Public, government website
 - No need for an account
- Cons:
 - *If you wish to download a long record, you may only access 30 days from here. This is insufficient for studying the current year to date or the climate*

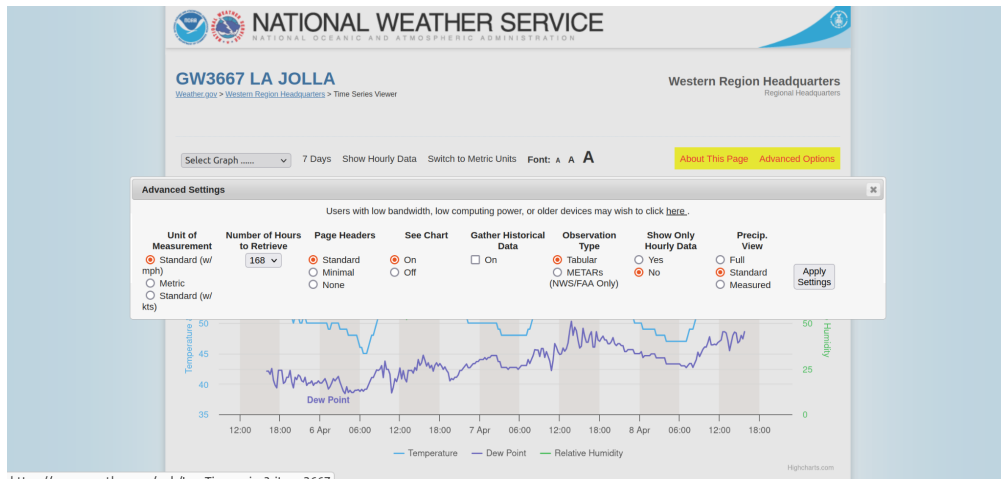
- Not easy to use on a mobile device

How to access:

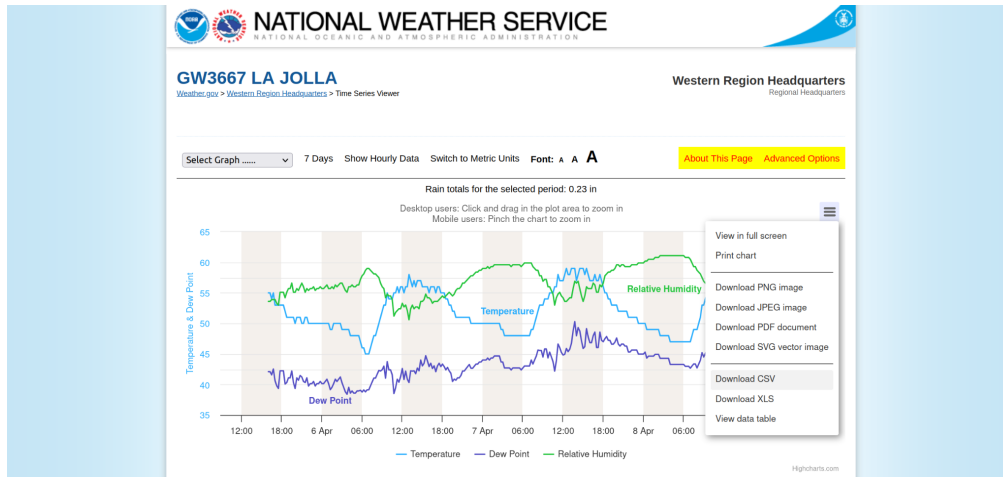
1. Go to <https://www.wrh.noaa.gov/map/>
2. Zoom in to your preferred station, click on the station, and create a 3-7 day plot



3. On the plotting page, you can toggle variables, access historical data, and even make the time window as long as 30 days; see “Advanced Options”



4. If you want to download the data for yourself, there are a couple of options for downloading tables of data



Secondary Web Browser Method (MesoWest):

Pros & cons

- Pros:
 - available to anyone for free
 - no sign-in required
 - Map interface clearly shows microclimate of San Diego at a glance
 - Government-University partnership websites rarely change; lesson plans can be iteratively improved over many years
 - Graphs and data for specific 24 hour periods are easy to view and download; last 24 hours are viewable by default and users can toggle to any date (such as the warm Santa Ana Christmas day of 2022(?))
 - Well suited to case studies of days with interesting weather
- Cons:
 - Website is heavy and can be slow on many computers
 - Awkward to handle on mobile - Mesowest is accessed most easily from a web browser on a desktop, laptop, or large tablet, which would not work in all classrooms

Viewing Weather in the Context of Climate

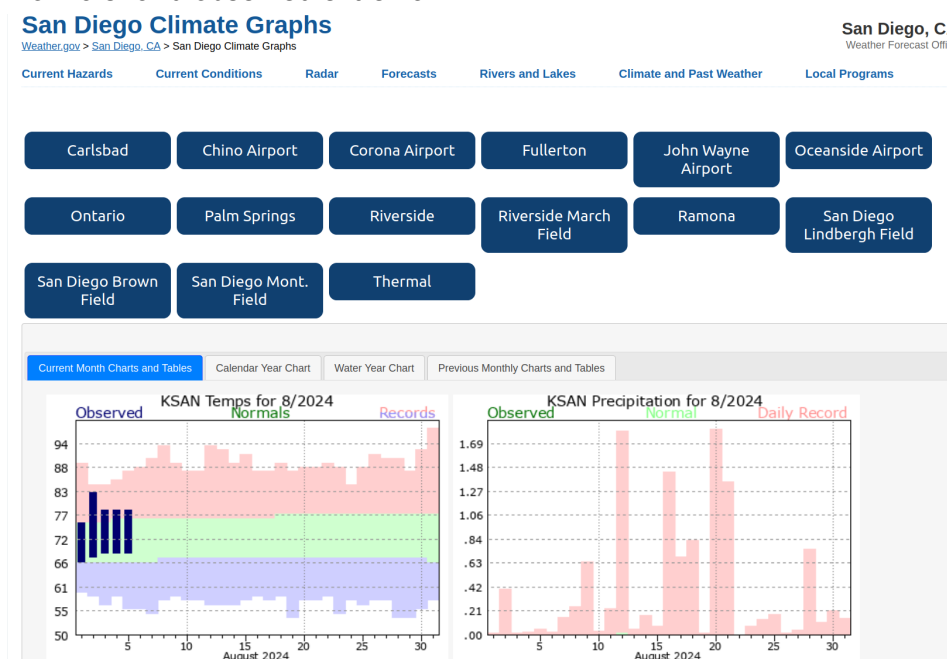
[Preferred Browser Method \(NWS San Diego Climate Graphs\)](#)

Pros and Cons:

- Pros:
 - Numbers are very meaningful in terms of the climate
- Cons:
 - Not immediately clear how the "normals" are calculated and over what period
 - Annual plots only extend back to the year 2000 at KSAN
 - Annual plots before 2007 do not seem to load
 - Uses pre-made, cached images
 - Only temperature and precipitation are available
 - Not that many stations available
 - Not obvious to ignorant users how to access similar plots for other regions. You can modify the URL to change to the 3-letter NWS area code and access plots for the rest of Socal (and beyond), but this fracturing of pages seems illogical.

How to access:

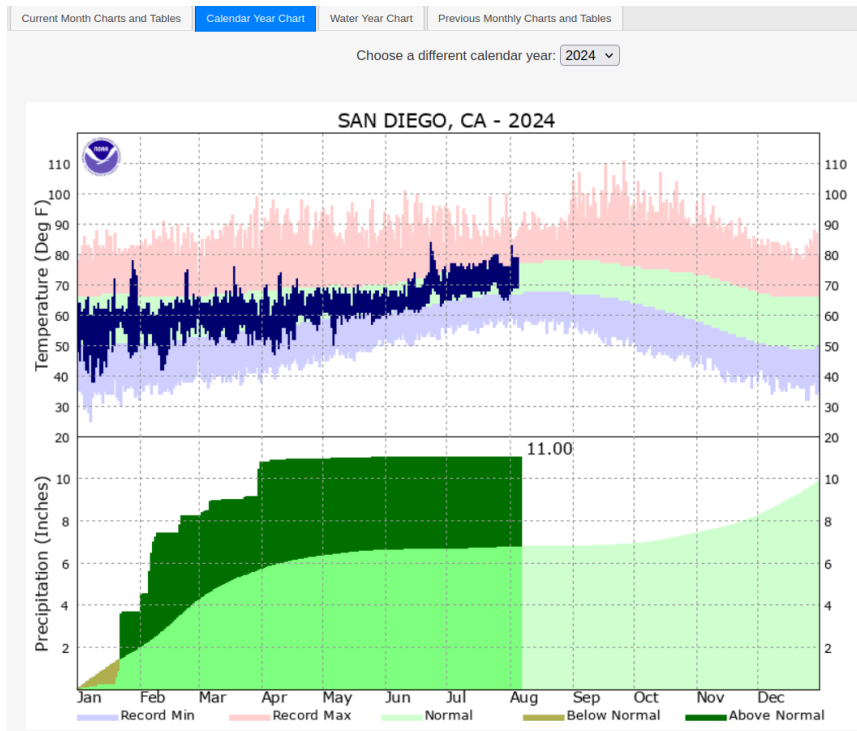
1. Visit <https://www.weather.gov/sgx/cliplot>
 - a. Notice the "sgx" in the URL? This is NWS's code for San Diego. Change this to "lox" to access the same plots for the Los Angeles Office.
 - b. The landing page shows the daily observations for this month in the context of "normals" and observed extrema:



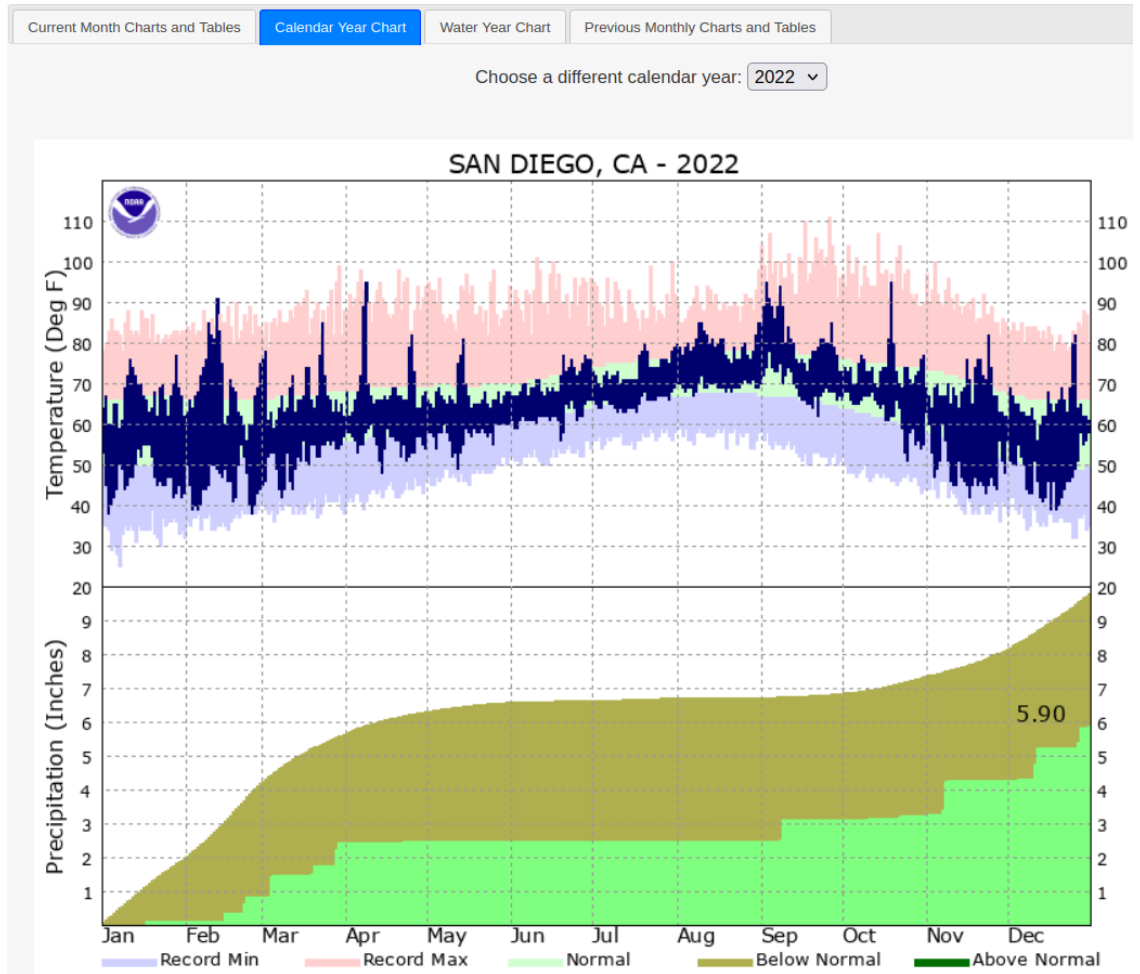
- c. On the upper panel, you can toggle to different stations around the county.
- d. If you scroll down, you can see a climatology table:

KSAN 08/2024												
Date	Observed Low (F)	Observed High (F)	Normal Low (F)	Normal High (F)	Record Low (F)	Year	Record High (F)	Year	Observed Precipitation (inches)	Normal Precipitation (inches)	Record Precipitation (inches)	Year
1	67	76	67	76	60	1944	90	1972	T	0.00	0.01	1991
2	68	83	67	76	59	1944	85	2018	0.00	0.00	0.40	1852
3	69	79	67	76	57	1888	85	2018	0.00	0.00	0.01	2006
4	69	79	67	77	59	1880	86	1971	0.00	0.00	0.02	1961
5	69	79	67	77	56	1912	88	1961	0.00	0.00	0.05	1926
6	M	M	67	77	56	1912	89	1884	M	0.00	0.02	1983
7	M	M	67	77	55	1894	91	2018	M	0.00	0.15	1983
8	M	M	68	77	58	1944	94	1936	M	0.00	0.25	1936
9	M	M	68	77	59	1916	90	2018	M	0.00	0.64	1908
10	M	M	68	77	58	1894	88	2018	M	0.00	0.03	1945
11	M	M	68	77	58	1894	88	2018	M	0.00	0.23	2021
12	M	M	68	77	57	1894	94	1991	M	0.01	1.80	1873
13	M	M	68	77	57	1892	93	1994	M	0.00	0.05	1992
14	M	M	68	77	57	1892	90	1994	M	0.00	0.17	1983
15	M	M	68	77	58	1880	92	1884	M	0.00	0.07	1918
16	M	M	68	77	59	1881	88	1983	M	0.00	1.44	1977
17	M	M	68	77	58	1932	88	1992	M	0.00	0.69	1977
18	M	M	68	78	59	1932	90	1986	M	0.00	0.83	1945
19	M	M	68	78	54	1884	88	1986	M	0.00	0.01	1933
20	M	M	68	78	58	1912	89	1897	M	0.00	1.82	2023
21	M	M	68	78	58	1916	89	1982	M	0.00	1.35	1854
22	M	M	68	78	59	1916	90	1972	M	0.00	T	2009
23	M	M	68	78	55	1878	89	1968	M	0.00	0.07	1853
24	M	M	68	78	58	1899	85	1985	M	0.00	0.13	1885
25	M	M	68	78	57	1906	89	1985	M	0.00	0.18	1935
26	M	M	68	78	58	1890	92	1981	M	0.00	0.01	1994
27	M	M	68	78	58	1881	91	1915	M	0.00	0.04	1894
28	M	M	68	78	54	1887	91	2009	M	0.00	0.76	1951
29	M	M	68	78	54	1895	88	2009	M	0.00	0.11	1912
30	M	M	68	78	56	1880	93	1909	M	0.00	0.21	1875
31	M	M	67	78	58	1942	98	1955	M	0.00	0.14	1967
Average:	68.4	79.2	67.7	77.4					Total: 0.00	Total: 0.01		

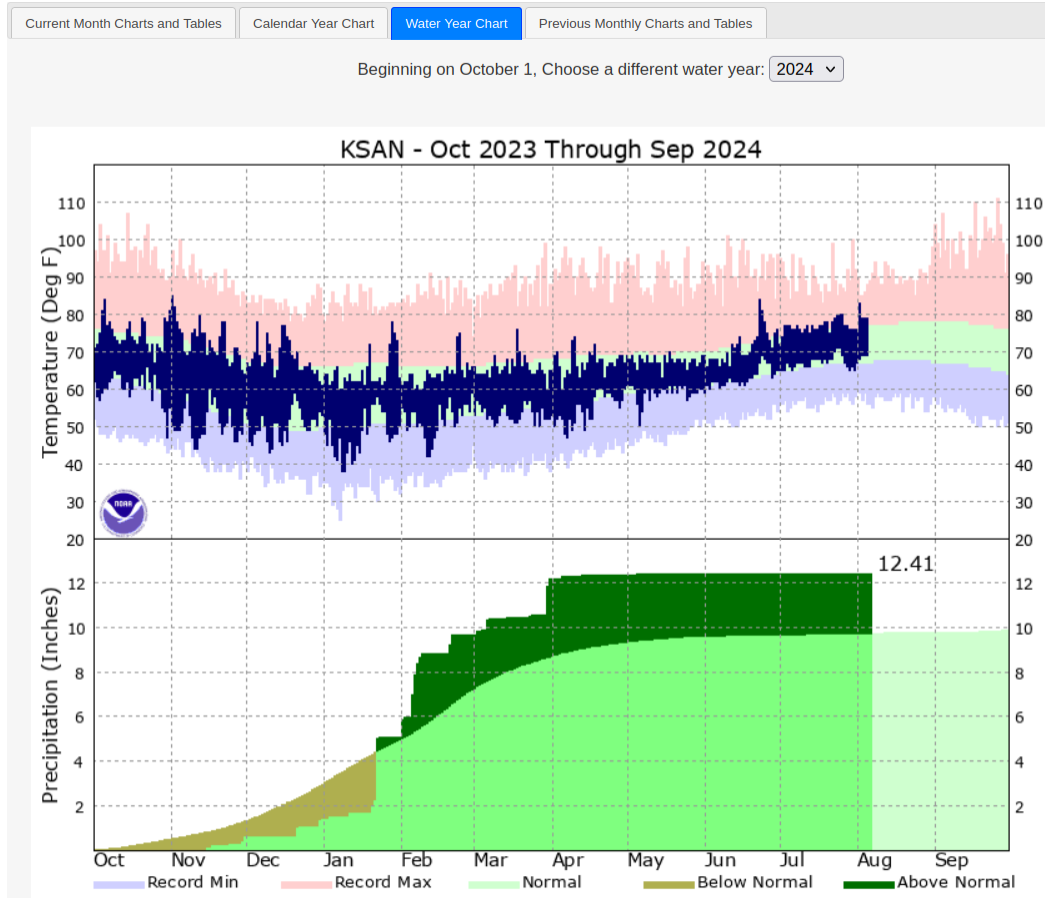
2. Just above the plots, you can switch to an annual view:



- Here, we see the temperature in the context of the annual cycle
- We can see heatwaves and, roughly, how severe they were
- We can get coastal heatwaves in February hotter than any day in the following Summer:



3. The water year chart much more meaningful for precipitation than the calendar year chart. This is because the calendar year bifurcates our rainy season.



- a. We can see how a rainy season (water year) is dependent on a few key events and that the average accumulation curve is not representative of any year (unlike for annual cycle for temperature)

Data access for climate records:

Preferred Method (Synoptic data viewer):

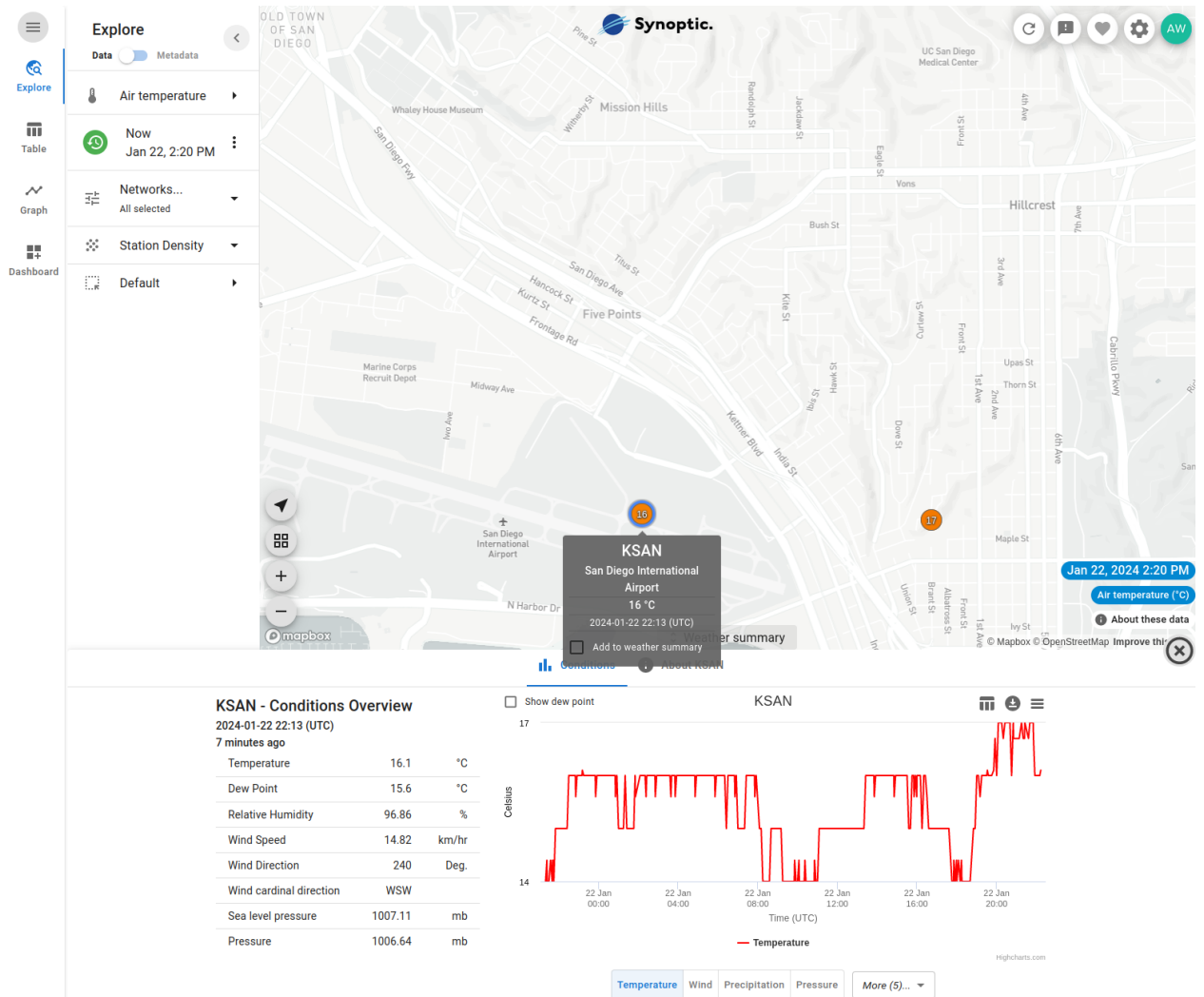
Pros & Cons:

- Pros:
 - Data files are in a standard format (none or minimal adjustment needed)
 - Entire record of a weather station (after 1997 or so) is accessible
 - The long-term record of any station found on a MesoWest map (to our knowledge) can be accessed
 - Includes solar radiation observations, which cannot be found on Findu
- Cons:
 - Must make an account with Synoptic
 - Synoptic is a private company, so the level of free access or methods for accessing could change at any time

How to access:

NB: It is not difficult to download data this way, but making an account and waiting for a data request might take some time. It is recommended that a teacher download the data before it is needed for a class.

1. Create an account with [synoptic](#)
 - a. I will not provide instructions for this part, as the webpage should walk you through. The exact format and arrangement of the webpages does change over time.
2. From the homepage, navigate to the [Synoptic data viewer map](#)
3. Zoom in to your weather station and click on it. You might need to zoom in closer than you expect. I am using the airport (KSAN) as an example.



4. On the top right of the current conditions plot, there is a download button. Click it.
5. Select the time period and variables you are interested in. Click “Request Data”
 - a. Each station will have a different collection of variables
 - b. During the daylight savings period, the time is 7 hours ahead of San Diego. Otherwise, it is 8 hours ahead. For example, if you download the data from 2024-01-22, the service will retrieve the last 8 hours of 21 January and cut off the last 8 hours of 22 January (at least from the point of view of somebody in San Diego). In any case, if you are interested in a weather event lasting a few days, it is not a bad idea to request the whole week centered on it.

i The provisional data available here are intended for diverse user applications. For data required for a court of law or regulatory purposes, review the information available from [the NCEI](#) or consult a CCM www.nicm.org.
Review our [data disclaimer](#) for details.

Make a new download request. [Learn more!](#)

Downloading data from

KSAN San Diego International Airport [Change](#)

Dates

☒ UTC

Start Earliest: 1997-04-12

End Latest: Today

2024-01-21 00:00

2024-01-22 12:00

Variables

The following variables can be downloaded from this station. Not every observation will contain all variables.

[Select All](#) [Clear All](#)

Units: ☒ Metric ☐ English

- | | |
|---|---|
| ☐ Altimeter (Pa) | ☒ Temperature (°C) |
| ☒ Relative Humidity (%) | ☒ Wind Speed (m/s) |
| ☒ Wind Direction (Deg) | ☒ Wind Gust (m/s) |
| ☐ Sea level pressure (Pa) (2 measurements) | ☐ Weather conditions (code) |
| ☐ Cloud_layer_3 height/coverage (code) | ☐ Pressure Tendency (code) |
| ☐ Cloud_layer_1 height/coverage (code) | ☐ Cloud_layer_2 height/coverage (code) |
| ☒ Visibility (Statute miles) | ☐ Raw observation (text) |
| ☐ 6 Hr High Temperature (°C) | ☐ 6 Hr Low Temperature (°C) |
| ☒ Peak_Wind Speed (m/s) | ☒ Ceiling (Meters) |
| ☐ Pressure change (code) | ☒ 24 Hr High Temperature (°C) |
| ☒ 24 Hr Low Temperature (°C) | ☒ Peak_Wind Direction (Deg) |
| ☐ metar_origin (?) | ☒ Pressure (Pa) |
| ☒ Wind cardinal direction () | ☐ Weather condition () |
| ☐ Weather summary () | ☐ Cloud layer 1 () |
| ☐ Cloud layer 2 () | ☐ Cloud layer 3 () |
| ☐ Wind chill () | ☒ Dew Point (°C) |
| ☐ Heat index () | |
| Precipitation | |
| ☒ Precipitation 1hr (mm) | ☒ Precipitation 3hr (mm) |
| ☒ Precipitation 6hr (mm) | ☒ Precipitation 24hr (mm) |

Review and Request

Downloading 18 variables from KSAN

[Request Data](#)

6. Download the data.

 aweyant@ucsd.edu Sign out AW

New Download

Downloads (2)

Docs

 The provisional data available here are intended for diverse user applications. For data required for a court of law or regulatory purposes, review the information available from [the NCEI](#) or consult a CCM www.nicm.org.
Review our [data disclaimer](#) for details.

Your recent completed and in-progress data downloads. [Learn more about getting your downloads](#)

Station & Dates			Status	Download
KSAN	2024-01-21 > 2024-01-22	18 variables	complete (40.8 KB) expires in 3 days	Download Get Link

7. You should be able to open it in any typical spreadsheet software such as LibreOffice Calc, MS Excel, or Google Sheets. There is a useful header and information about units of measurement on each column. If you upload it to Google Sheets and share it with your students, they should be able to access it on their own.

Scratch (ignore)

Preferred Method (Synoptic API):

Pros & Cons:

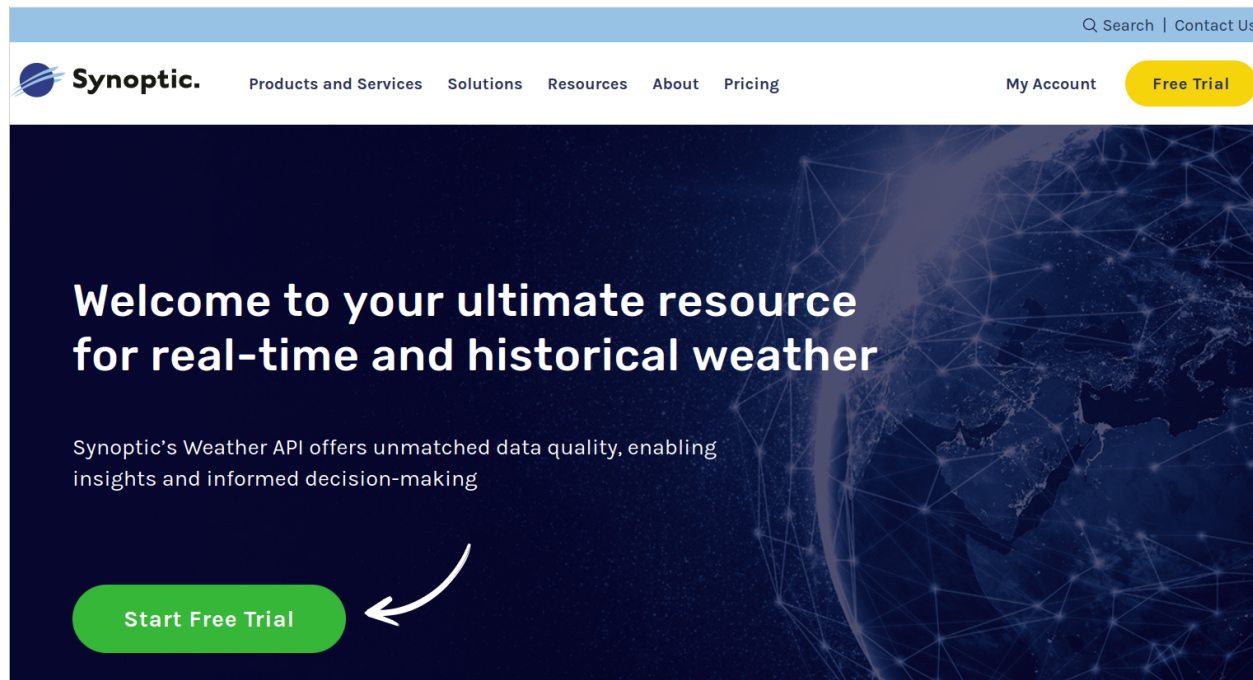
- Pros:
 - Data files are in a standard format (none or minimal adjustment needed)
 - Entire record of a weather station is accessible
 - The long-term record of any station found on a MesoWest map (to our knowledge) can be accessed
 - Includes solar radiation observations, which cannot be found on Findu
- Cons:
 - Must make an account with Synoptic
 - Synoptic is a private company, so the level of free access or methods for accessing could change at any time

How to access:

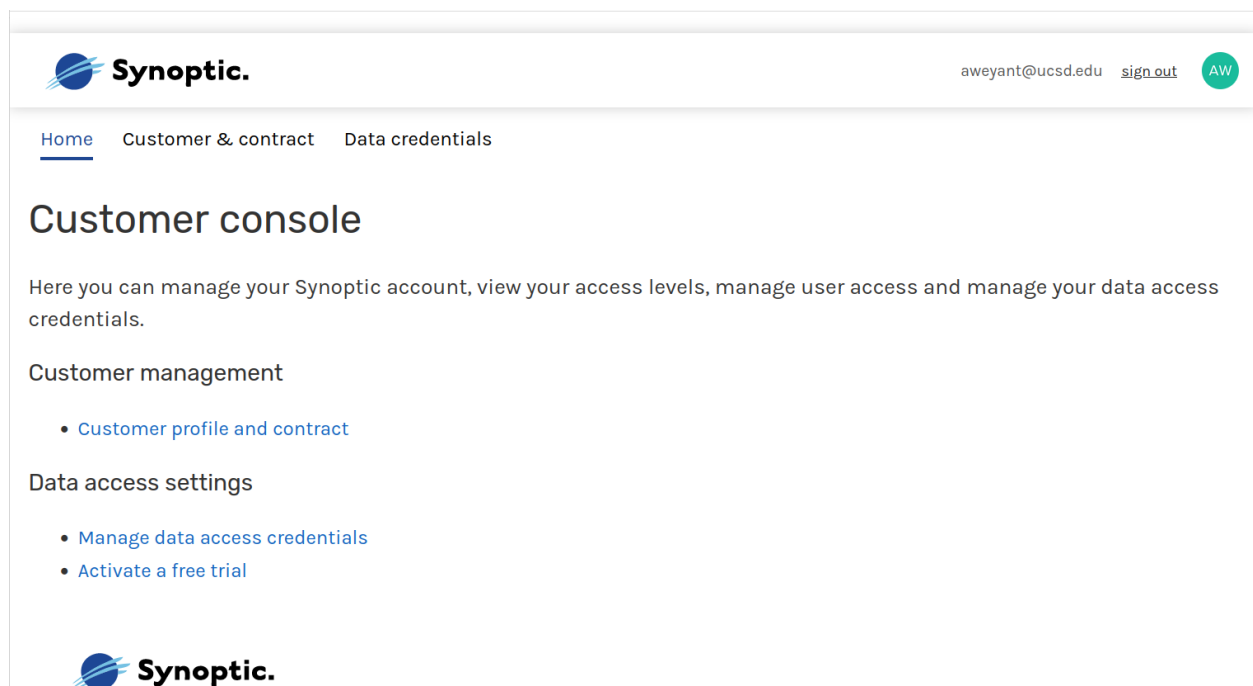
NB: For anything other than a class of self-motivated and independent highschoolers in a statistics/data science class, it should fall on the teacher to download the data before the lesson and share it with the class.

Background and Goal: Mesowest (a public-university partnership data viewer and portal) outsourced their bulk data downloading service to a private company, Synoptic. Synoptic seems to mostly be oriented towards developers and “power users”, which is quite unfortunate. **Our immediate goal is to craft a rather long but readable URL (web address) which constitutes a request for data.** We will need to take some notes to make this URL. Once you have the URL, accessing and downloading data should not be difficult.

8. Create an account with [synoptic](#)
 - a. I will not provide instructions for this part, as the webpage should walk you through. The exact format and arrangement of the webpages does change over time.
9. Obtain a “public token” (instructions valid as of 2024-01-22)
 - a. On the [landing page](#), click “My Account”



- b. From the account screen, click “data credentials” or “manage data access credentials”



- c. Under “Public Tokens”, create a token (a long, alpha-numeric code to identify your account). **Copy this token and paste it into a new word document.**

10. Collect the info we need for the data request

- a. Public token (from the previous step)

- b. “Station Selection Parameters” (in our case, the Station ID or “stid”)
- c. Start and end times
 - i. YYYYMMDDTTTT format (e.g. 202401221359 for 22 Jan 2024 at 1:59pm)
 - ii. The timezone for the request is the Coordinated Universal Time (UTC). San Diego is 7 hours behind this during the daylight savings period (~Summer) and 8 hours behind this under standard time (~Winter). If I wanted the weather obs for 22 January 2024 in San Diego, I would write start=202401220800 and end=2024010230800. Note the 8 hour offset.
- d. Names of variables we want to download
 - i. Do not include this to retrieve all variables
 - ii. The list of variables we recommend:

Alternative Method (“Scraping” a Table from Findu):

Pros & cons

- Pros:
 - Free access for all users
 - Format does not change over time
 - Long-term records available for many (not all) weather stations going back to at least the year 2000
- Cons:
 - Format is strange
 - Must download an HTML table and convert it to a more standard format with text editing tools accessed through a command-line interface. Practically, this method is **limited to MacOS and Linux users**.
 - Not sure what would happen to the website when its creator/custodian dies
 - He is a HAM radio enthusiast who has not open-sourced his code for reasons we do not quite understand
 - This might not be a problem, as he seems pretty dedicated to the data being freely accessible on the internet, so a plan for continuity is probably in place
 - Radiation observations are not available - only temperature, humidity, and wind velocity

Method:

<have not written this up - it is not a good method for most people>