

Panoply Instructions for WRFV4

Updated: February 2023

Preliminaries

- Choose the appropriate version of Panoply for your OS; download and install by following the instructions:
<https://www.giss.nasa.gov/tools/panoply/download/>
 - For Mac OS computers with Intel hardware, choose “use native filechooser”
 - If you are running a newer Mac OS computer with Apple M1/M2 chips, choose “requires M1/M2 Mac with ARM64 Java”
- Note that you may need to have Java 11 JRE/JDK installed for Panoply to work
 - However, as of this document, Panoply 5.2.3 is able to run on a Macbook Pro 2016, running macOS Monterrey and Java 8
 - The newest versions of Java can be found and downloaded from here:
<https://www.oracle.com/ca-en/java/technologies/downloads/#java19>
- *****Panoply only recognizes files that are suffixed with expected file formats, i.e. NetCDF files suffixed with .nc**
 - By default, wrfout* files are NOT suffixed with .nc; consequently, Panoply won't be able to open them without renaming
 - Rename all wrfout files by adding “.nc” at the end, e.g.

```
mv wrfout_d01_2018-12-20_23:00:00 wrfout_d01_2018-12-20_23:00:00.nc
```

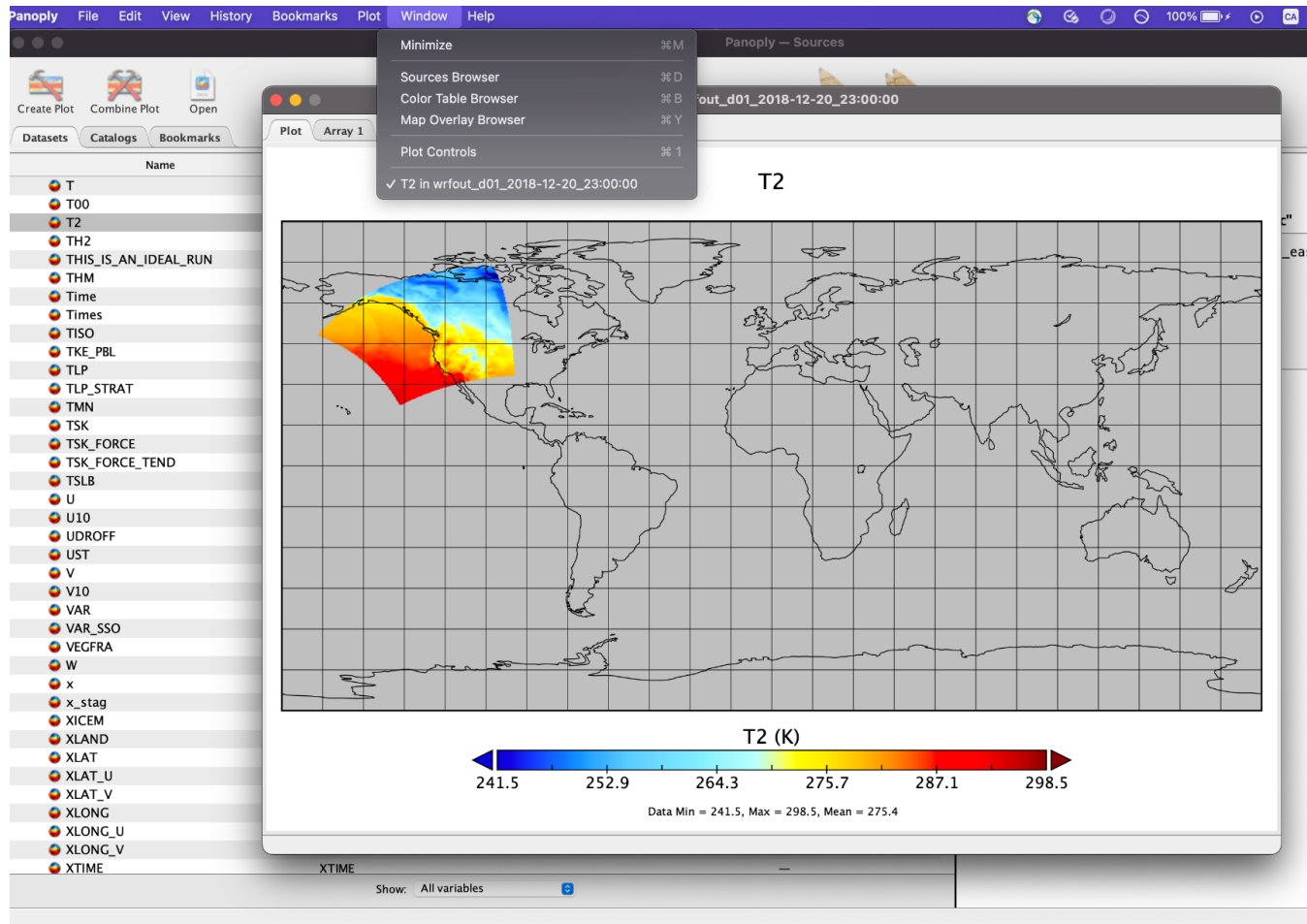

The screenshot shows the Panoply Sources window with a list of variables. The variable 'T2' is selected. A 'Create Plot' dialog box is open, showing options for creating a plot from the variable 'T2'. The dialog box has the following text: 'More than one type of plot can be created from the variable 'T2'. What type would you like to create?'. The options are:

- Georeferenced Longitude-Latitude color contour plot
- Georeferenced Zonal Average line plot
- Color contour plot using south_north for X axis and west_east for Y axis
- Line plot using south_north for the horizontal axis

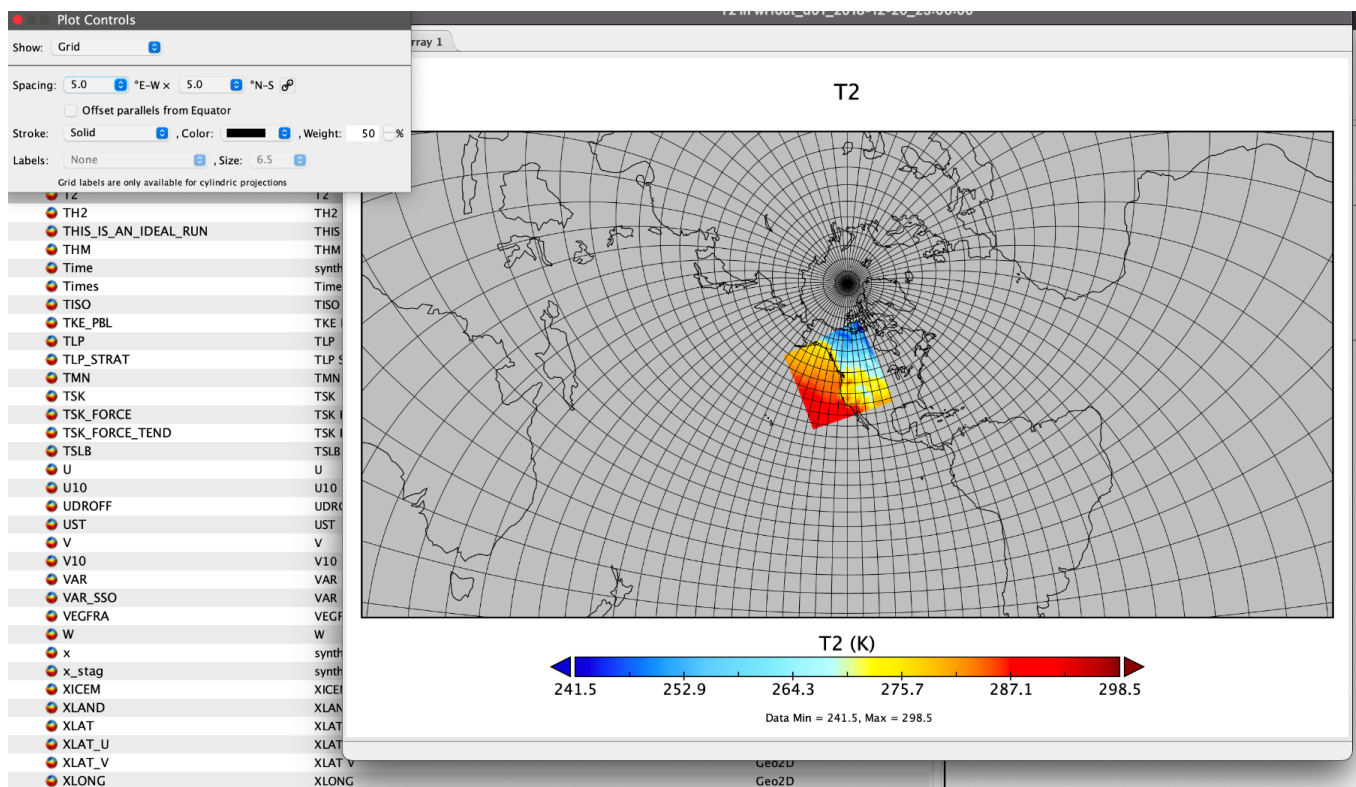
The 'Create' button is highlighted. In the background, the variable list includes 'T2' and 'T2' is selected. The 'Type' column for 'T2' is 'Geo2D'. The 'Variable "T2"' section on the right shows the following code:

```
float T2(Time=1, so
:FieldType = 104;
:MemoryOrder = "X
:description = "T
:units = "K";
:stagger = "";
:coordinates = "X
```

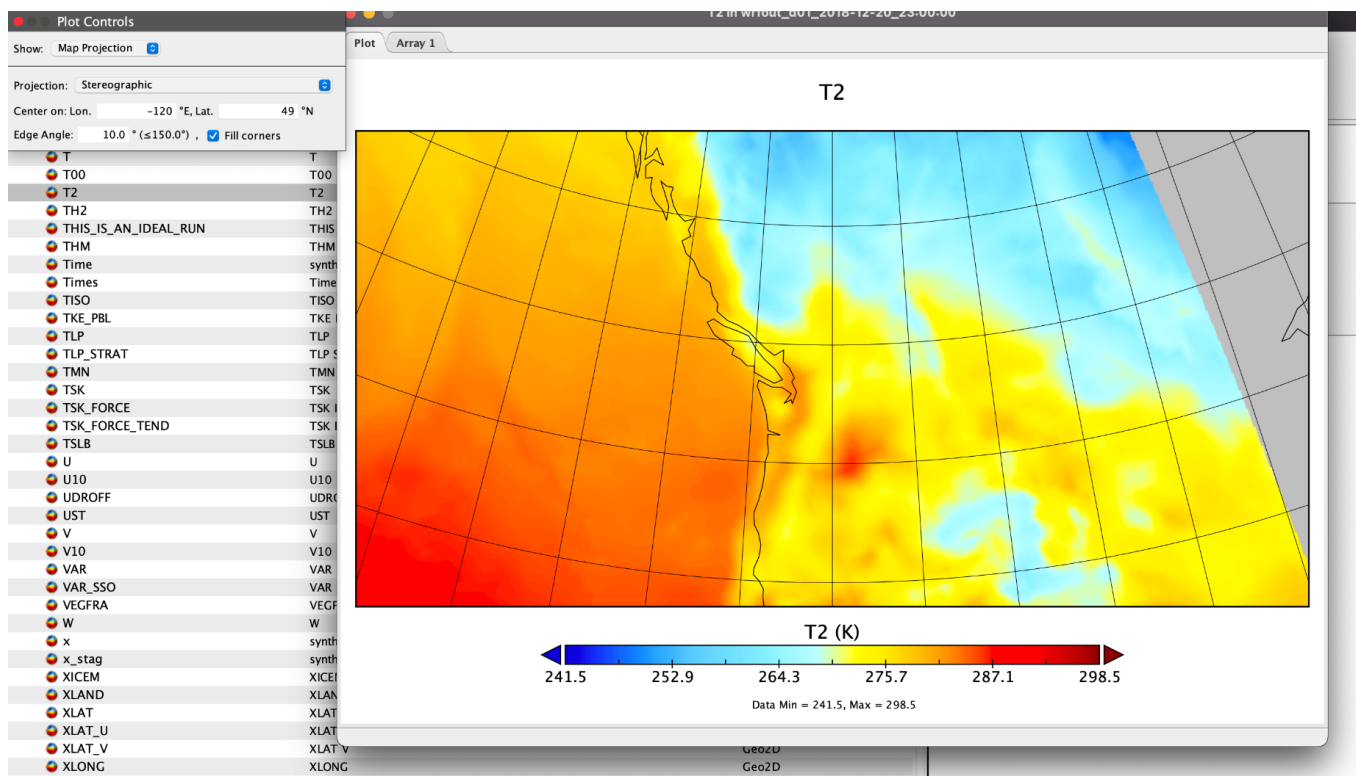
- Scroll down, and choose “T2” —> select the first option “Georeferenced Longitude-Latitude color contour plot”, and select Create



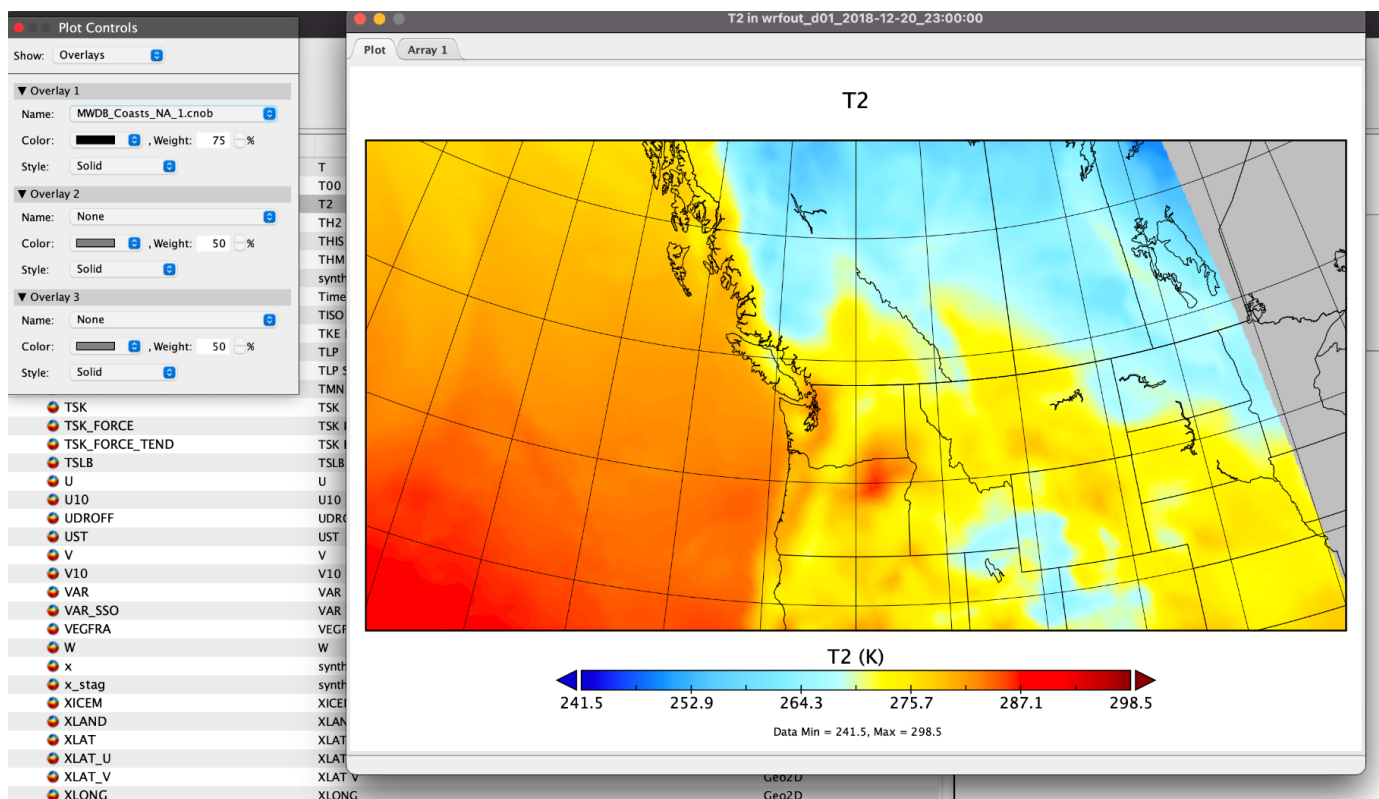
- You should now see your T2 color-filled contour plot appear, with the polar-stereographic domain projected onto an equirectangular map (hence the “tilt” of your domain)
- At the top, select “Window > Plot Controls” to enable configurations for the plot



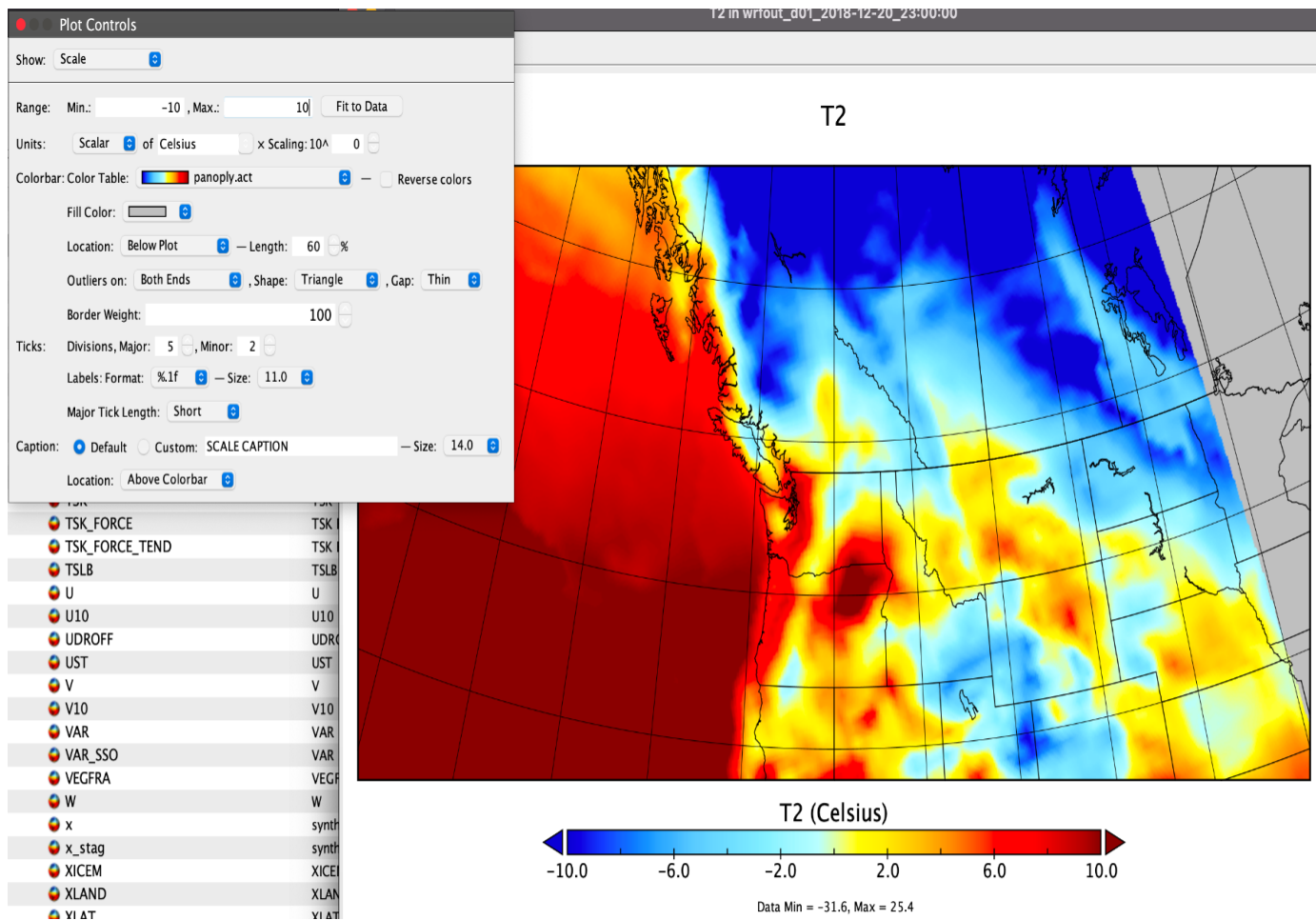
- With Plot Controls, you can configure what your plot looks like
- The “Show” dropdown menu allows you to access different portions of the configuration
- The figure above shows the effects of selecting “Grid” and changing the “Spacing” of the latitude and longitude grid lines
 - Note that the plotted base projection was changed earlier (not shown) due to selecting the Stereographic projection under “Map Projection”
 - The next page shows the effects of changing the Map Projection and the zoom



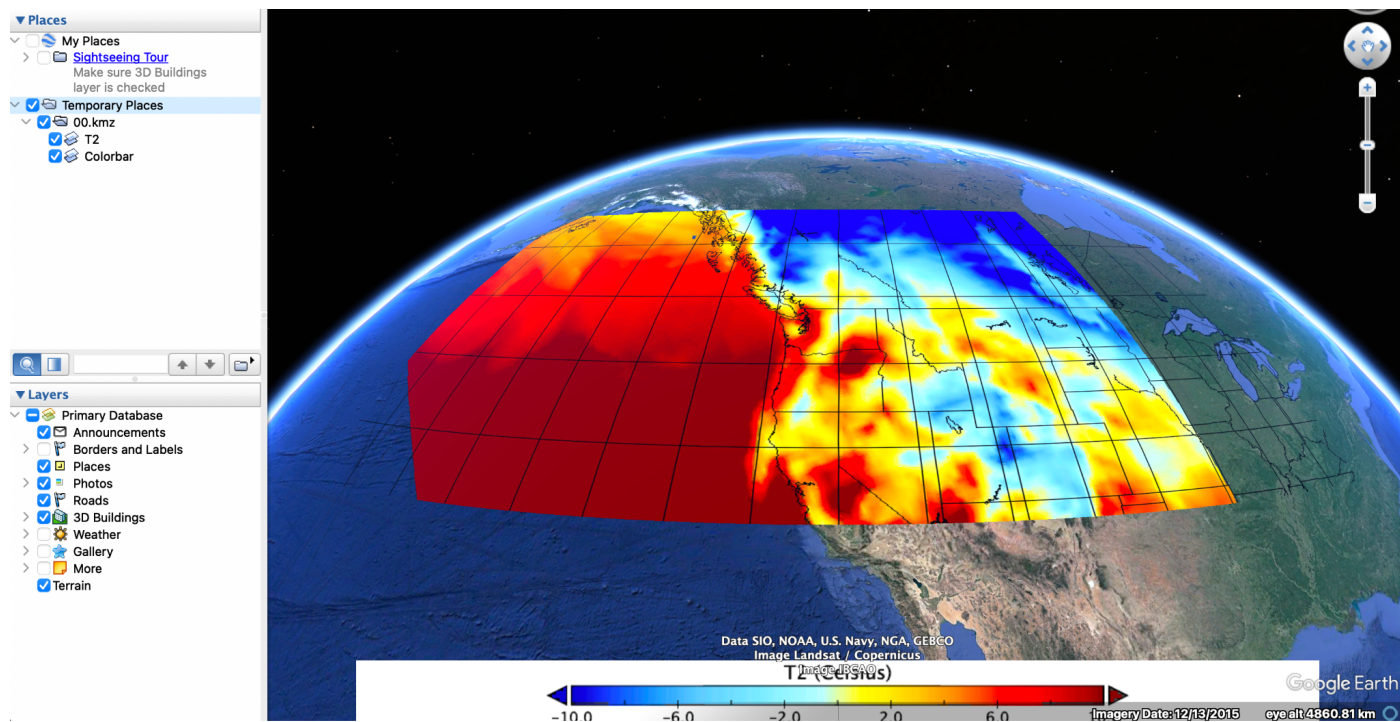
- Under Map Projection in the “Show” dropdown, you can change the Projection to Stereographic, and also define the center latitude and longitude of the map
- “Edge Angle” determines the zoom of the map...the **lower** the number, the **higher** the zoom



- You can add political boundaries and higher-res coastlines in the “Overlays” option of the “Show” dropdown
- In “Overlay 1”, in the “Name” dropdown, select “MWDB_Coasts_NA_1.cnob” —> this will produce the North American national and sub-national boundaries, as well as a better coastline



- To change the colormap and units of the variables, go to “Scale” in the “Show” dropdown
- Here, you can change the range of the data, as well as the units (e.g. click on the “K” next to “Units” and change to “Celsius”)
 - In regards to the data range, “Fit to Data” will automatically adjust the range to the minimum and maximum of the variable
- Note on animations: unlike IDV, Panoply will only support animation creation if multiple time steps are contained within a single netcdf file
 - To create an animation, in the top left, select File > Export Animation
 - The animation generation will use the configuration you provided when customizing your individual plots for all of the frames (i.e. projection, zoom, colormap, etc.)



- You can also export your image as a .kmz (File > Export KMZ), and open with Google Earth...see what you get!

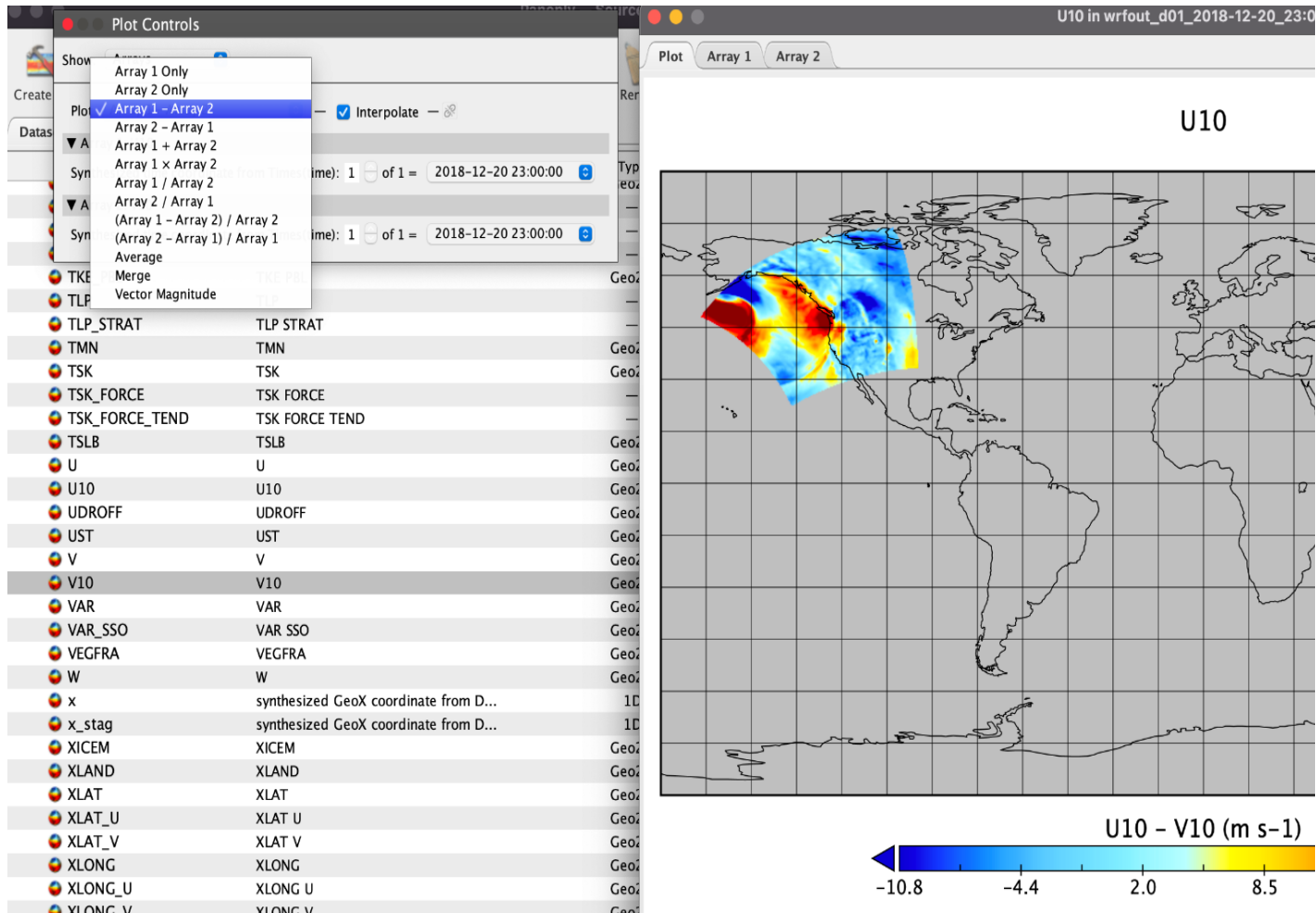
Plot Combinations and Vectors

The screenshot shows the Panoply software interface. On the left, a table lists datasets with columns for Name, Long Name, and Type. The 'U10' dataset is selected. A 'Combine Plot' dialog box is open, asking 'In which existing plot should I combine the variable?' and showing 'U10 in wrfout_d01_2018-12-20_23:00:00' as the selected option. On the right, the 'Variable V10' information panel shows the file path and the following code:

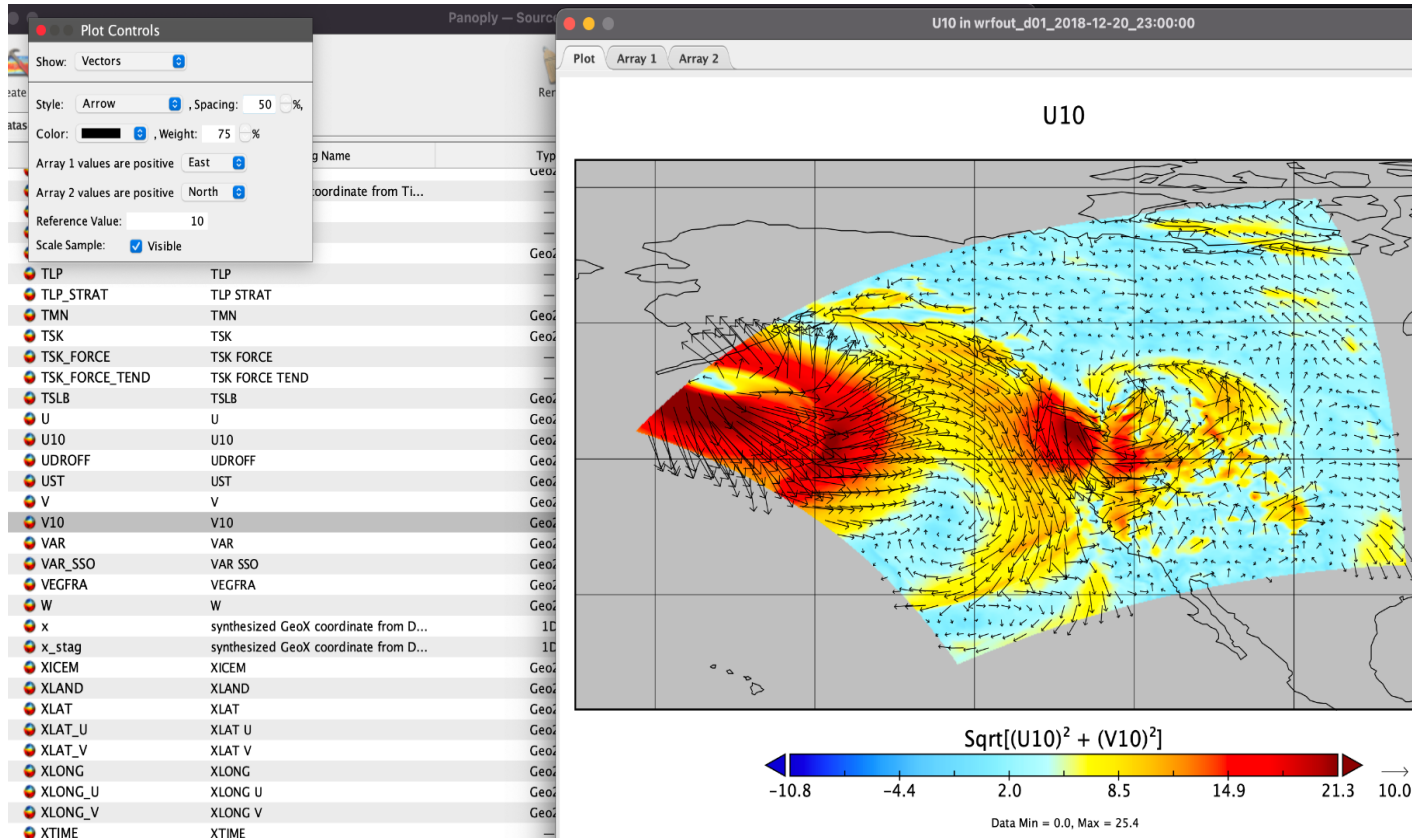
```
float V10(Time=1, south_north=120, west_ea
:FieldType = 104; // int
:MemoryOrder = "XY ";
:description = "V at 10 M";
:units = "m s-1";
:stagger = "";
:coordinates = "XLONG XLAT XTIME";
```

The background shows a map of the North Pacific region with a color-coded plot of U10 wind speed.

- To plot vectors of U10 and V10, first plot U10 as normal (like plotting T2)
- Then, select V10, but do not click “Create Plot” —> instead, select “Combine Plot”, and choose the shown option to merge the plot with U10



- By default, combining plots will subtract the two fields; instead, we want to compute vectors
 - In the “Show” dropdown of Plot Controls, select “Arrays”
 - Then under the “Plot” dropdown, choose “Vector Magnitude”
 - This will now change the plot to show wind vectors, as well as wind speed as a color-filled contour



- The plot above was zoomed into the domain by holding right click on the mouse, and dragging it over the area of interest
- Under “Plot Controls” → “Show” → “Vectors”, you can configure the vectors as you please
 - Try reducing “Spacing” to increase the density of plotted vectors, and “Reference Value” to change the base length of the vectors

Transects

The screenshot shows the Panoply Sources window with a list of variables. A 'Create Plot' dialog box is open, displaying the following options:

- Georeferenced Longitude-Latitude color contour plot
- Georeferenced Zonal Average line plot
- Color contour plot using **south_north** for X axis and **bottom_top** for Y axis
- Line plot using **bottom_top** for the **horizontal** axis

The 'Create' button is highlighted in blue.

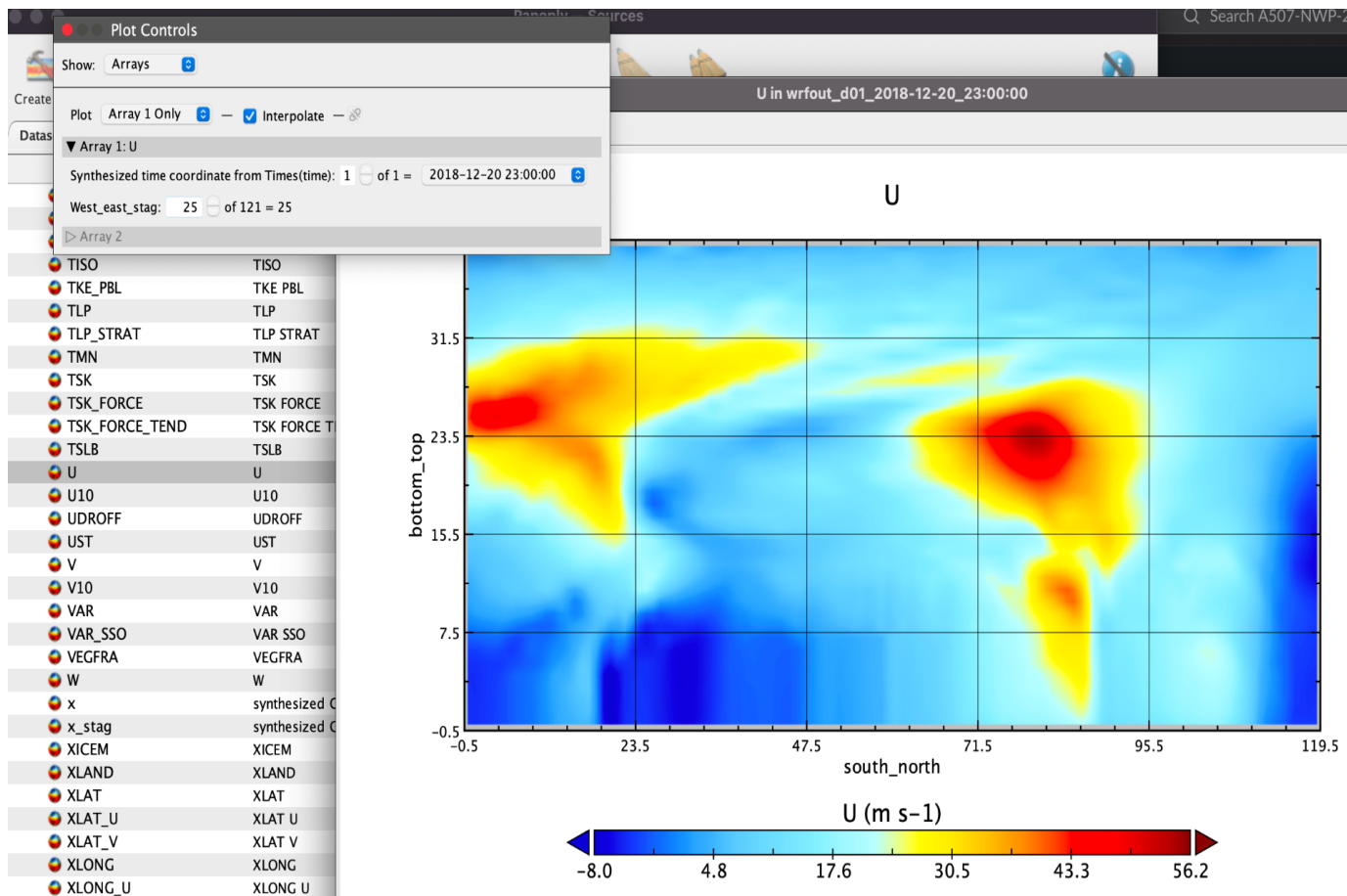
Name	Long Name	Type
THM	THM	Geo2D
Time	synthesized time coordinate from Ti...	—
Times	Times	—
TISO	TISO	—
TKE_PBL	TKE PBL	Geo2D
TLP	TLP	—
TLP_STRAT	TLP STRAT	—
TMN	TMN	Geo2D
TSK	TSK	Geo2D
TSK_FORCE	TSK_FORCE	—
TSK_FORCE_TEND	TSK_FORCE_TEND	—
TSLB	TSLB	—
U	U	Geo2D
U10	U10	Geo2D
UDROFF	UDROFF	—
UST	UST	—
V	V	Geo2D
V10	V10	Geo2D
VAR	VAR	—
VAR_SSO	VAR_SSO	—
VEGFRA	VEGFRA	—
W	W	Geo2D
x	synthesized GeoX coordinate from D...	1D
x_stag	synthesized GeoX coordinate from D...	1D
XICEM	XICEM	Geo2D
XLAND	XLAND	Geo2D
XLAT	XLAT	Geo2D
XLAT_U	XLAT U	Geo2D
XLAT_V	XLAT V	Geo2D
XLONG	XLONG	Geo2D
XLONG_U	XLONG U	Geo2D
XLONG_V	XLONG V	Geo2D
XTIME	XTIME	—
y	synthesized GeoY coordinate from D...	1D
y_stag	synthesized GeoY coordinate from D...	1D

```

Variable "U"
In file "wrfout_d01_2018-12-20_23:00:00.nc"
float U(Time=1, bottom_top=40, south_north
:FieldType = 104; // int
:MemoryOrder = "XYZ";
:description = "x-wind component";
:units = "m s-1";
:stagger = "X";
:coordinates = "XLONG_U XLAT_U XTIME";

```

- Select U in the variable list (3D U-wind), and create a “Color contour plot using...” —> but change set the X axis as “south_north” and Y axis as “bottom_top”



- We now get a color-filled contour of U along a vertical slice, across latitudes
- We can choose the longitudinal position of our slice by choosing “Arrays” in Plot Controls, and incrementing (or selecting) “West_east_stag”