

MAST 467/667: Introduction to Polar Oceanography (Fall 2021)
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Workshop/Homework-5: Graphing Profile Data, Exploring Regional Data

Data: Ocean Melts Greenland (OMG) at <https://omg.jpl.nasa.gov/portal/>

Introduction. For our fifth workshop we will produce first graphics and explore the data in assigned regions.

Goal. Extract profile(s) with selected properties (year, location, depth, or just cast number) and plot their properties as a function of depth or location.

Assignment. Expand on prior work using either gawk, MatLab, or RStudio to produce a vertical profile of temperature and salinity at a known location. The subsequent instructions are written with RStudio. Some tasks may best be performed using either gawk or your command shell script nasa.cmd with which you created output.dat

1_How many airborne XCTD profiles do you have in your assigned study area? [See <http://muenchow.cms.udel.edu/classes/Arctic/links.html> for which region you are responsible for.]

One way to do this is to include the following code snippet into your pos.awk code inside pos.awk [alternatively, you write yourself another awk script to extract just the locations and then count the number of lines that pass these conditionals:]

```
if ( lat >= 78 && lat <= 83 && lon >= -90 && lon >= -50)
  { do something like printing this line to file }
```

where the “&&” represents a logical “AND” to a set of multiple conditionals. I usually create myself a list of location data as an overview of the entire data set that looks like

```
1 -55.2361 67.4045 08/11/2021 13:26
2 -57.4083 67.1970 08/11/2021 13:46
3 -58.6098 67.7455 08/11/2021 14:01
4 -59.4640 68.5990 08/11/2021 14:20
5 -57.2428 68.7924 08/11/2021 14:38
6 -57.1544 68.2694 08/11/2021 14:50
...
```

A useful one-liner is

```
gawk 'END{print NR}' input
```

which counts the number of lines in file input and displays the last one after all lines were read via the END command.

2_Can you plot a single profile, that is, temperature $T=T(z)$ and salinity $S=S(z)$? Perhaps the codes I posted at

<http://muenchow.cms.udel.edu/classes/Arctic/Test.html>

would be useful for RStudio users.

3_For the same profile, can you plot $T=T(S)$ as a symbol whose color may represent another variable like the depth?

4. Can you extract the deepest depth for each profile in your area in a given year?

5_Can you post this depth as a color coded symbol on a map?

6_Can you display all profiles on top of each other that have a depth that is (a) less 300m and (b) more than 300m?

7_Can you repeat the above for, but plotting the temperature versus the salinity and color code depth or latitude or longitude to discern spatial patterns in how the data or waters are distributed?

There is no one fixed way that one has to do these tasks, but they all involve clever selection of tools, codes, and software platform that you should adapt from prior codes that you have written.