

The purpose of this problem set is to familiarize you with how to produce customized mean and anomaly climate/weather maps using NOAA's Earth System Research Laboratory (ESRL)/Physical Science Division (PSD) online interactive web page (www.esrl.noaa.gov/psd). On the ESRL/PSD main page, go to Products Menu → Plotting & Analysis. Click on "Daily Composites" and go from there. Alternatively, a direct link is on the class home page under Homework → Problem Set 1. Instructions on how to use the ESRL/PSD online interactive web page are appended below.

I. Questions:

1. Construct and print mean and anomaly maps for the day you were born for sea-level pressure, surface air temperature, 500-hPa geopotential height, and 200-hPa vector winds.
2. Repeat (1) for the season in which you were born. Define seasons as follows: Winter (DJF), Spring (MAM), Summer (JJA), Fall (SON).
3. Interpret your results physically. Comment on the nature of the weather and climate patterns and anomalies at the time of your birth. Be sure to mention specific geographical regions and use specific numerical values.
4. Construct standardized anomaly 500-hPa geopotential height and 250-hPa vector wind maps for the Northern Hemisphere for DJF for **one** teleconnection index of your choice (choose from the Arctic Oscillation, AO; North Atlantic Oscillation, NAO; or Pacific-North American Index, PNA). Choose a standardized anomaly threshold of either +1.5 or -1.5. Use the maps you generate to answer these questions (hint: you may have to recall knowledge gained from Atm 210 and Atm 211 to answer these questions):
 - a) Relate the vector wind anomalies to the geopotential height anomalies. How are the two related?
 - b) Hypothesize why you were asked to do this during the winter instead of the summer. How and why might the vector wind and geopotential height anomalies be different between the two seasons?

II. Instructions for the use of the ESRL/PSD interactive web page:

1) To answer questions 1-3:

A few hints on setting various options. Choose color to view your plots, but select the black and white option for printing if you lack access to a color printer. Choose 150-200% for "Scale Plot Size", select **USA** for region, pick "Shading Type→ Shade w/overlying contours," and check "yes" for contour labels.

2) To answer question 4:

Go to the "PSD Interactive Plotting and Analysis Page" used to answer questions 1-3. Choose the first link "**Monthly/Seasonal Composites**"(or go to class webpage).

Choose Dec (Feb) for beginning (ending) month of the season.

Under "OR Years from values in time series" (6th line down), choose one of the following time series.

- a. AO (Arctic Oscillation)
- b. NAO (North Atlantic Oscillation)
- c. PNA (Pacific North American Index)

Under "type of comparison," choose "standardized anomaly" and choose either "greater than or equal to value" or "less than or equal to value".

Under the standardized anomaly "value to composite on" right above type of comparison, enter either 1.5 (if you choose "greater than or equal to") or -1.5 (if you choose "less than or equal to").

Choose "Northern Hemisphere" for the map projection.

For all other user-specified switches choose the ones you used to answer questions 1-3.

Note: In answering question 4, you are creating composite maps of all the months when standardized values of the teleconnection index of your choice is greater than (or less than) 1.5 (or -1.5) for DJF between 1948 and 2011. The act of compositing allows you to hone in on characteristic large-scale features associated with the particular phase of the teleconnection index you chose (smaller-scale features get smoothed out in the compositing process).