Ocean 423 Exercise #3: ENSO and PDO, Due Thursday April 30

You will need two matlab scripts and one data file to do this homework. You can find
them on the web site. Please turn in all plots and answers to the following questions.
The data file is sst_data.mat which contains the DJF sea surface temperature anomaly in
the North Pacific from December 1957 to December 2000. It contains the following
variables
sstnp: sst field on a latitude/longitude grid.
latnp: latitude range of the data
lonnp: longitude range of the data
time: a vector that gives you the years that each sst map is available.

The two scripts are
eof_svd.m
This scripts will calculate EOFs of any two dimensional data
enso_eof.m
This script loads in the data set sst_data.mat, restricts the data to the equatorial region, It
will give you two figures
(i) A map of SST for DJF 1982-1983 and DJF of 1983-1984
(ii) A map of the first EOF and the times series of the first PC
You will want to copy enso_eof.m to another file because you will be modifying it to find
the EOFs of the North Pacific winter time SST in problem 2.

Answer the following questions and make the following calculations:

1. Run enso_eof.m.
a.   What fraction of the variance does the first and second EOF of tropical SST anomaly
explain?
b. Calculate and make a map of the SST anomaly in 1982 and a map for 1983 that is
explained by the first EOF
Hint: To do this, you must take the spatial pattern of the first EOF, and multiply it by its
associated PC in 1982 and by its singular value (located in the matrix L).
c. Do the same as in (2) for the second EOF.
d. 1982-1983 was a very strong El Nino, while 1983-1984 was a strong La Nina. Based
on your answers to a, b and c above including all of the plots that you made, describe
how well you think the first eof of SST in the tropical Pacific explains (or describes) El
Nino and La Nina.

2. Now I want you to modify enso_eof.m to calculate the EOFs in the North Pacific.
Restrict the data range to 20N to 60N and 137.5E to 257.5E. With this new script, make
the figures as you did for enso_eof.m, but this time, use DJF of 1986 and 1987.
a. Repeat 1a for the North Pacific SST.
b. Repeat 1b for 1986 and 1987 for the North Pacific
c. Repeat 1c for 1986 and 1987 for the North Pacific.
d. How well does the first EOF of the North Pacific SST describe the SST fields in 1986
and 1987?