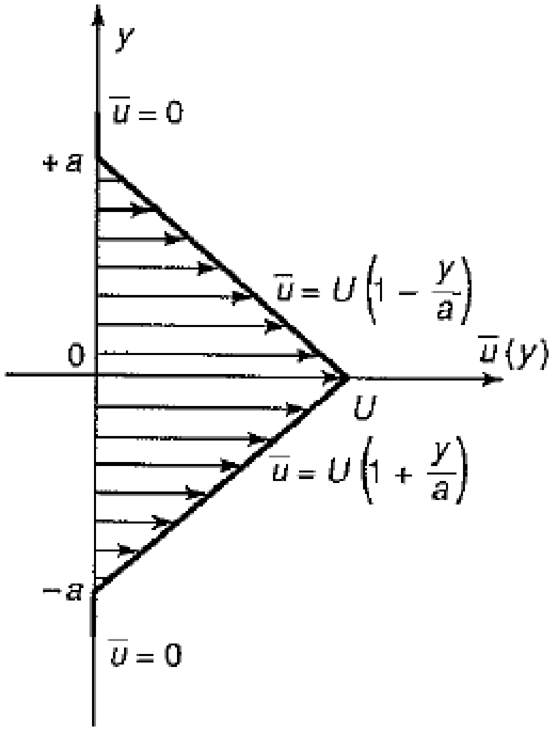
EOSC 579, Assignment #2

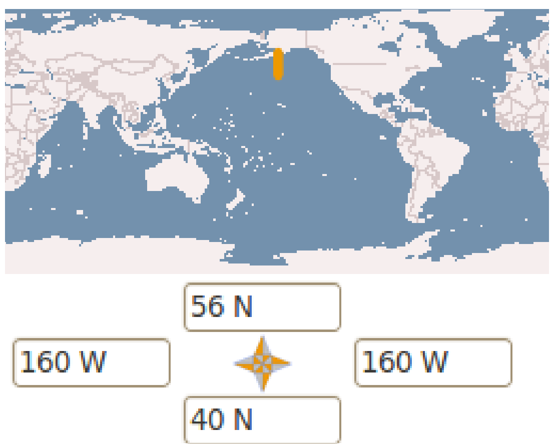
Problem A:

Derive the dispersion relation and establish a précise threshold of stability for the jetlike profile of Figure 7-4.

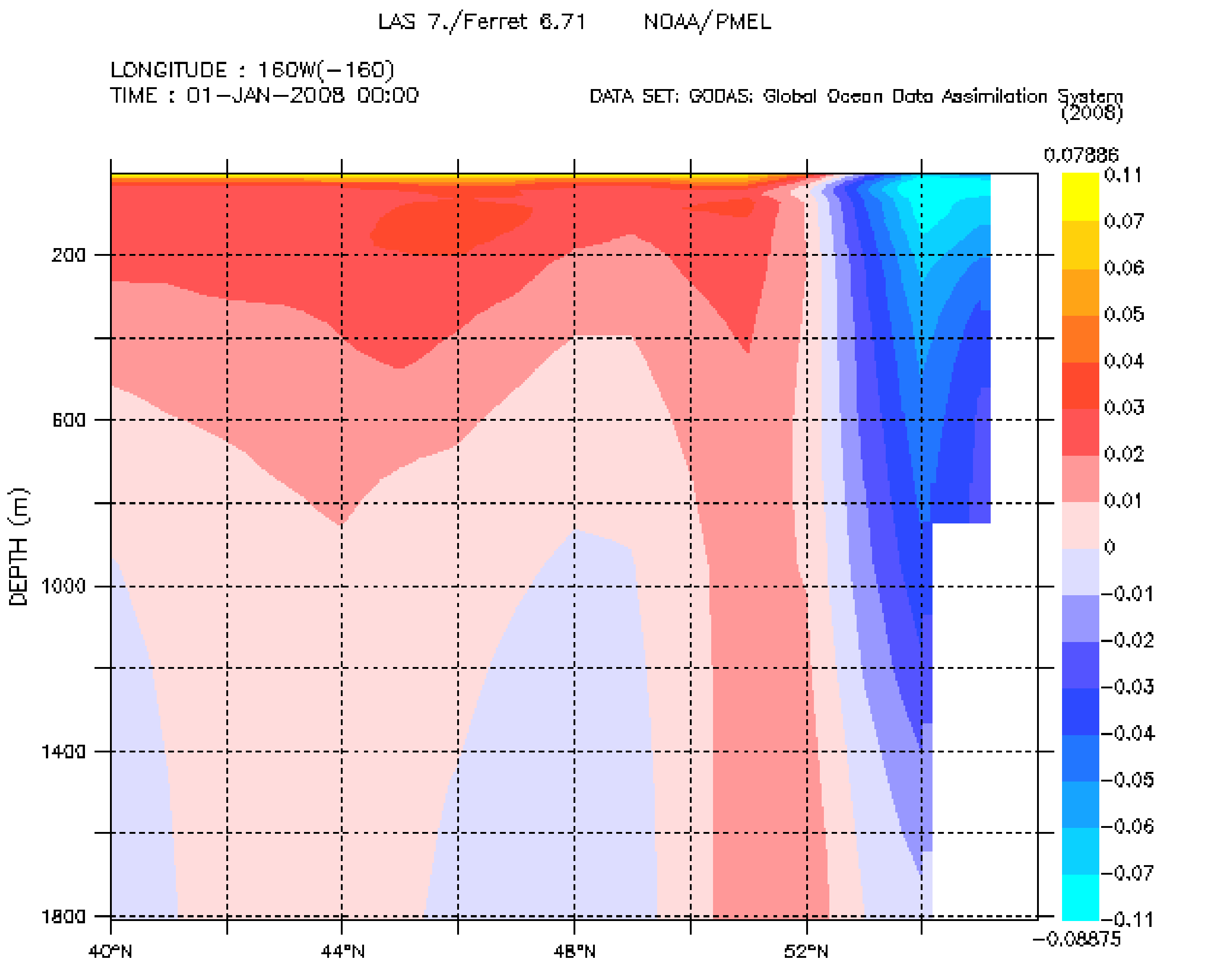


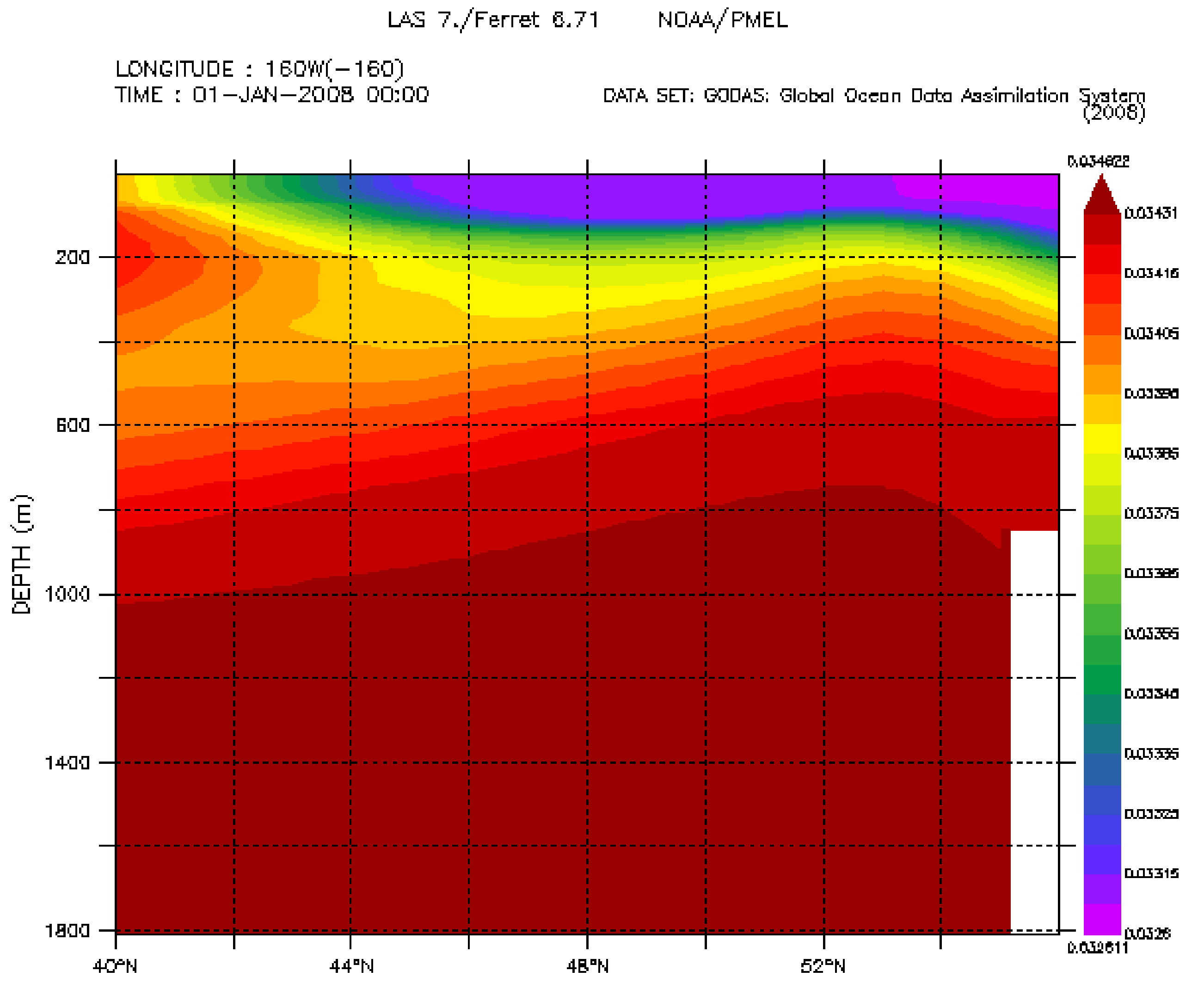
Problem B:

Using the necessary condition for instability, what can you say about the stability of the Alaskan Stream in January 2008, given the following data.
(orange line gives location of data)



Next page, upper plot: East/West velocity in m/s with east velocity positive. lower plot: Salinity/1000, assume a constant temperature of 4°C to calculate density.
A density calculation code can be found at /ocean/sallen/allen/bin/density (just type that on an ocean command line) Enter temperature and salinity.


LAS 7./Ferret 6.71 NOAA/PMEL
LONGITUDE : 160W(-160)
TIME : 01-JAN-2008 00:00
DATA SET: GODAS: Global Ocean Data Assimilation System (2008)
DEPTH (m)
200
600
1000
1400
1800
40°N
44°N
48°N
52°N
0.07886
0.11
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.11
-0.08875


LAS 7./Ferret 6.71 NOAA/PMEL
LONGITUDE : 160W(-160)
TIME : 01-JAN-2008 00:00
DATA SET: GODAS: Global Ocean Data Assimilation System (2008)
DEPTH (m)
200
600
1000
1400
1800
40°N
44°N
48°N
52°N
0.03431
0.03416
0.03405
0.03385
0.03375
0.03355
0.03345
0.03335
0.03325
0.03315
0.0326

Problem C:

4. Consider the geometrical situation shown in Fig. 9.5, where a shallow shelf (of depth $d = 100$ m) is adjacent to a very deep basin. The oceanic stratification may be approximated by a two-layer system, with $N_1 = 2000^{1/2} f$ above a depth $h_1 = 200$ m and $N_2 = 10f$ below. The internal tides produced at the shelf break have a frequency $\omega = \sqrt{2}f$. A string of instruments is placed at a distance $L = 20$ km from the shelf break. At what depth H will the ray shown emanating from the shelf corner intercept the line of instruments? (Ans. 1769 m.) Suppose a strong storm comes along and enough upwelling occurs to bring about a 20% increase in N_1 near the shelf break: calculate the change in H. (Ans 91 m upwards.) Such variations in upper layer structure near the edge of the shelf present one of the difficulties inherent in predicting ray paths and internal wave structure off the shelf. (See for example Hayes and Halpern, 1976a.)