Introduction to Oceanography
EAS 4300

Homework #6:

Review the chapter on “Ocean circulation”, and the lectures on Meridional Overturning Circulation, ENSO and the Monsoon system

1. Figure 1 shows the mean state for wind stress, sea surface height and temperature along the equatorial Pacific.

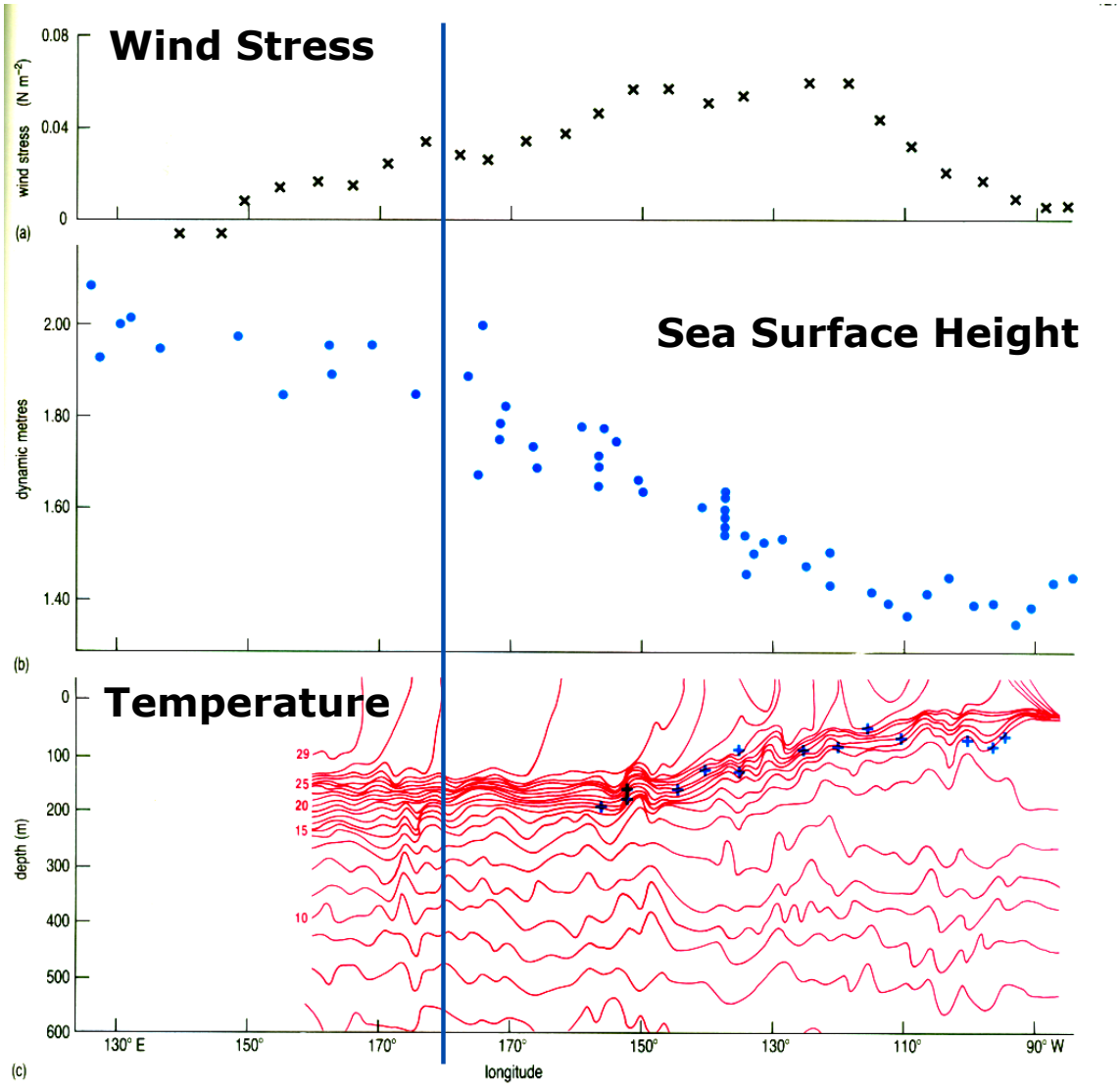
a) Mark the thermocline on Figure 1 and explain the relationship between the trade winds (see wind stress diagram) and the thermocline depth.

b) Explain why the sea surface height is higher on the west and lower on the east?

c) Sketch/draw on paper the the thermocline and Walker cell during normal conditions and during an El Niño.

d) Explain the important ocean/atmosphere feedback that are important during the development of an El Niño

Figure 1.


Wind Stress
wind stress (N m⁻²)
0.08
0.04
0
(a)
Sea Surface Height
dynamic metres
2.00
1.80
1.60
1.40
(b)
Temperature
depth (m)
0
100
200
300
400
500
600
29
25
20
15
10
130° E
150°
170°
170°
150°
130°
110°
90° W
longitude
(c)

2. Figure 2 vertical section of potential temperature and salinity in the Atlantic

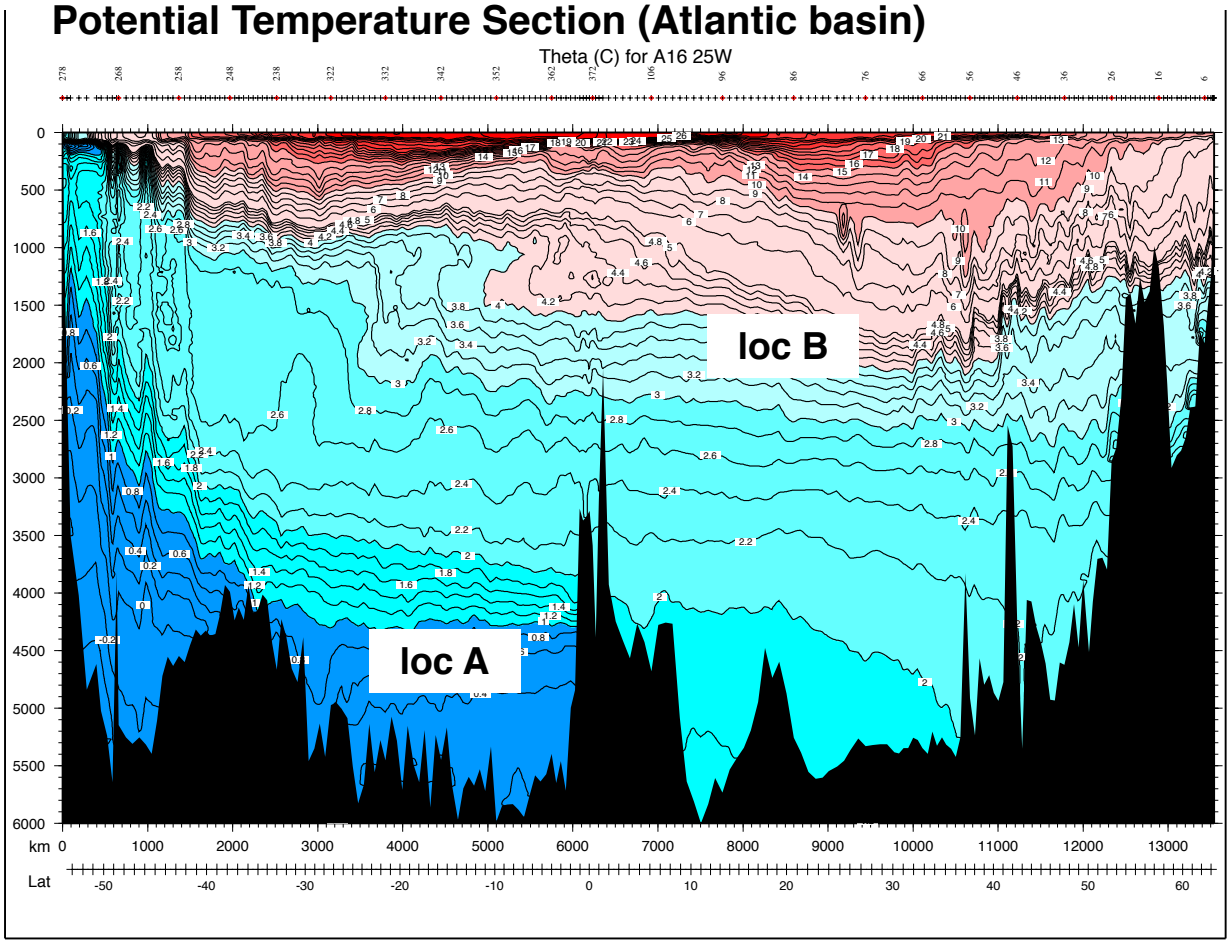
a) Explain the processes that drive higher salinity in the surface waters [0-250m depth] between the latitudes of 30S and 30N. Can these surface very salty waters drive deep convection? (Explain your answer)

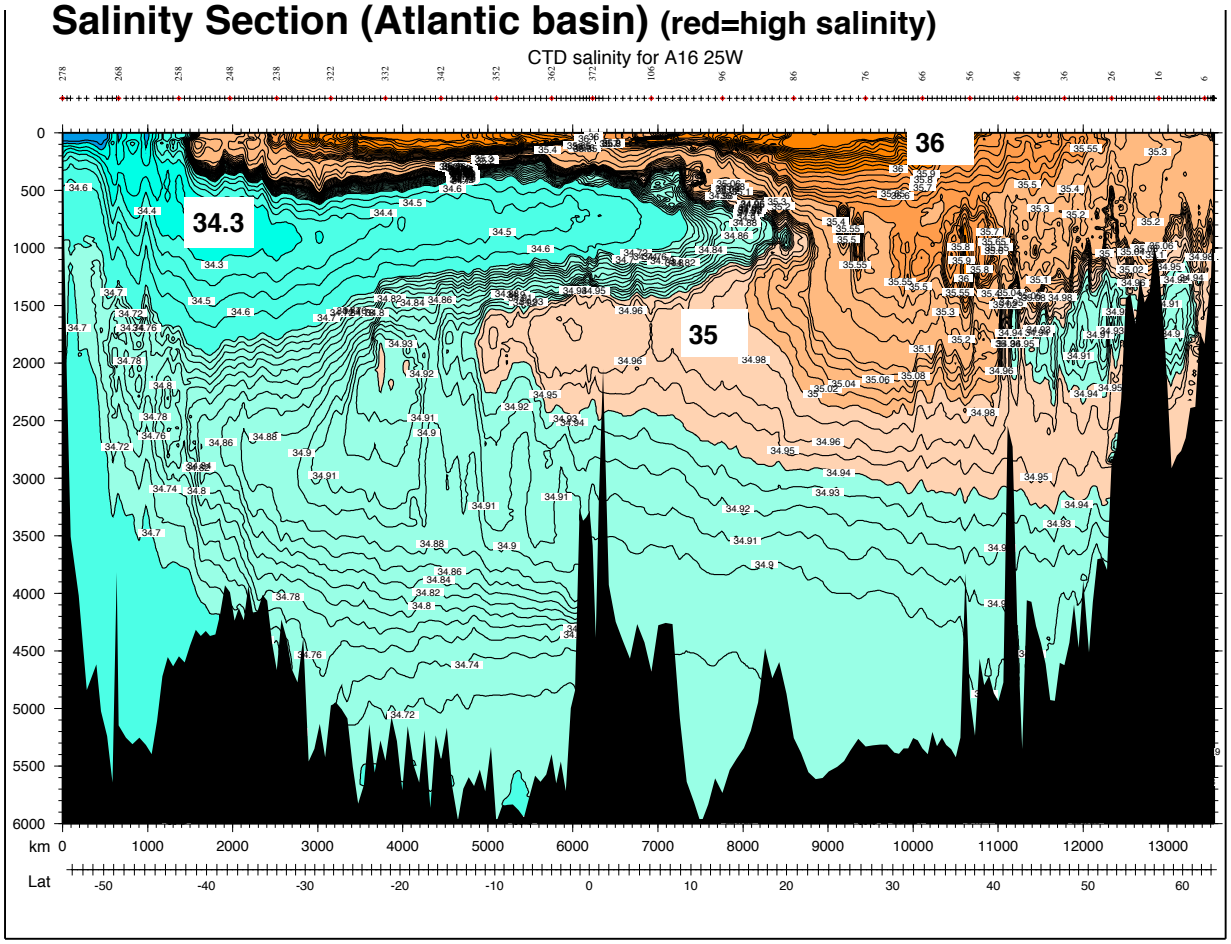
b) Between 1000-1500m depth in the North Atlantic around 40N we find a subsurface maxima in the salinity field. Explain what drives the salinity of this water mass.

c) Based on the salinity section can you isolate and mark the boundary between the Antarctic intermediate water (AAIW) and the North Atlantic deep waters (NADW)?

d) Discuss briefly the main differences in the formation process of the NADW and AABW and these differences are reflected in the temperature and salinity sections at locations A and B (the locations are labeled in the temperature section)?

Figure 2.


Potential Temperature Section (Atlantic basin)
Theta (C) for A16 25W
loc B
loc A
km
Lat


Salinity Section (Atlantic basin) (red=high salinity)
CTD salinity for A16 25W
36
34.3
35
km
Lat