GFD I

Frierson

Lecture 3: 1-9-17

Last time…

- Thermodynamic equation
  - Atmospheric equation can be written in terms of theta, T or rho
  - Approximate oceanic equation:
    - C DT/Dt = Q
- Adiabatic lapse rate: 9.8 K/km for atmos
  - Around 0.15 K/km for ocean
  - Ocean pressures increase 1 bar/10 m

Now you can tell your grandparents…

- Why hot air rises, but air is cold on top of a mountain!

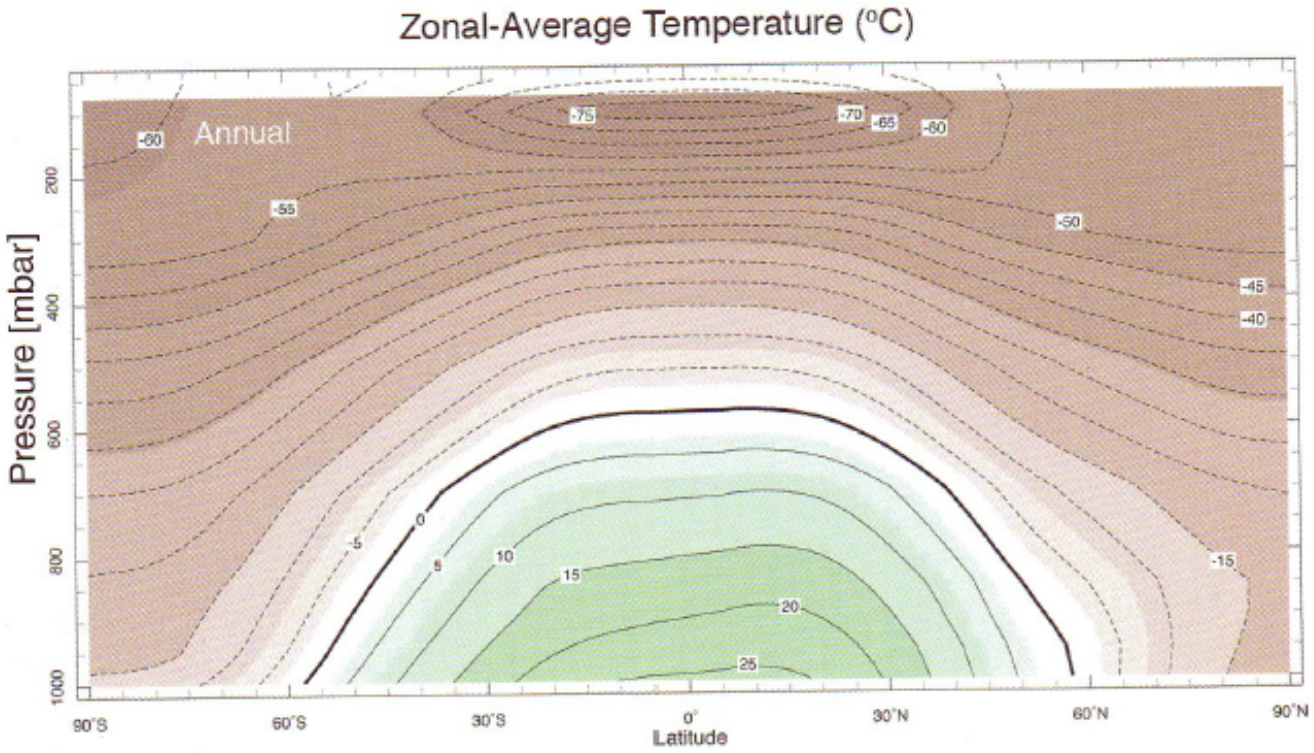
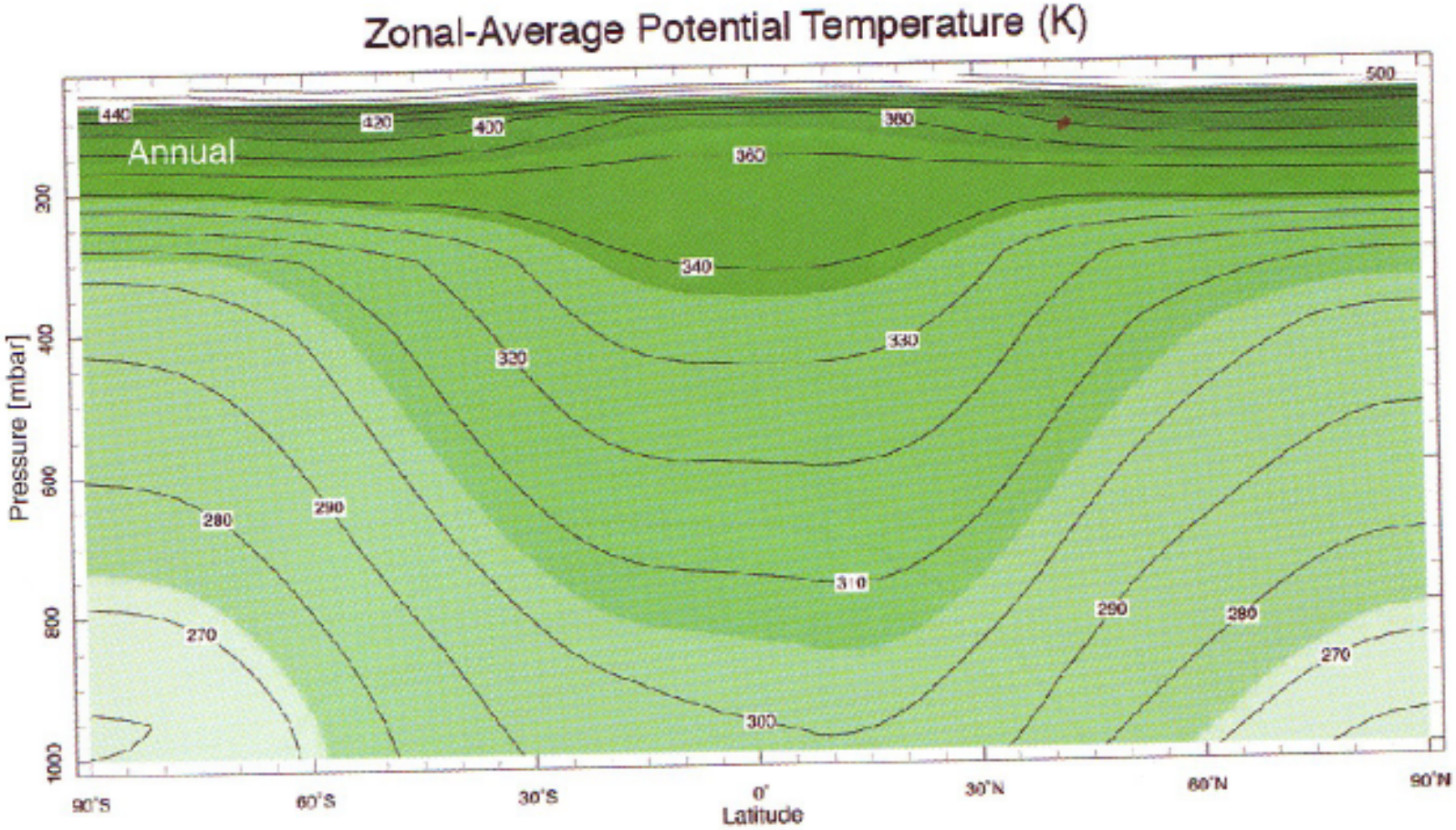


FIGURE 5.7. The zonally averaged annual-mean temperature in °C.


Zonal-Average Potential Temperature (K)
Annual
500
440
420
400
380
360
340
330
320
310
300
290
280
270
Pressure [mbar]
200
400
600
800
1000
90°S
60°S
30°S
0°
30°N
60°N
90°N
Latitude

Density/potential density of seawater

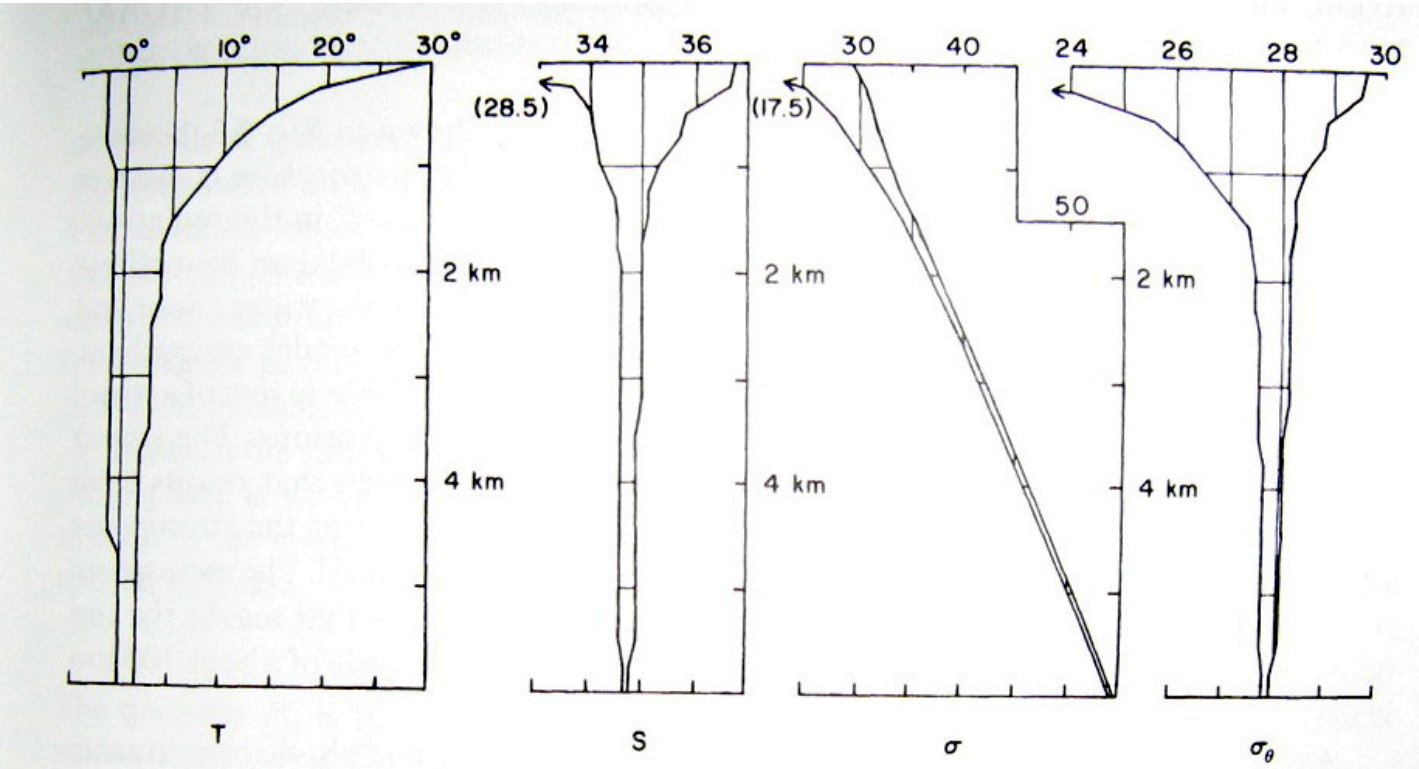
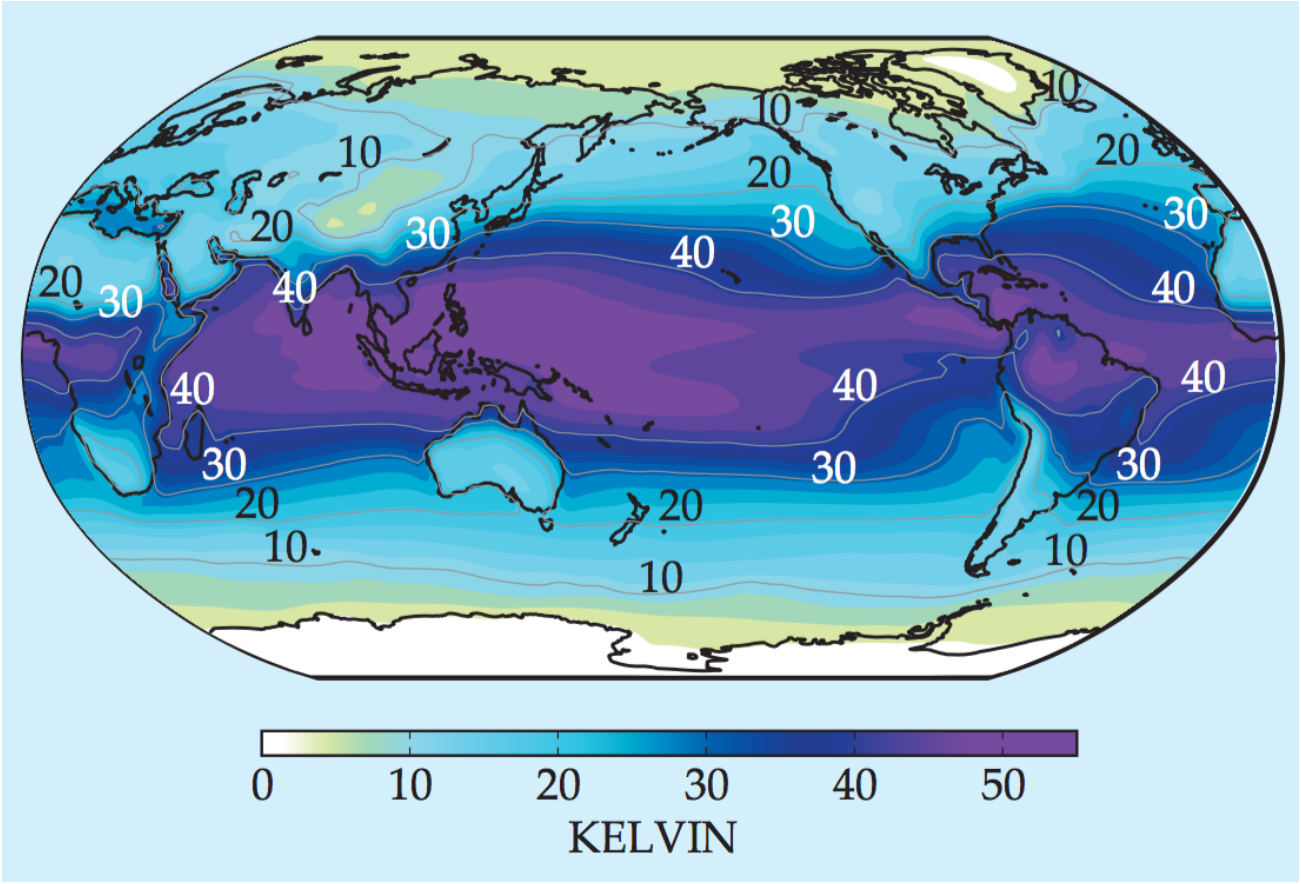


Fig. 3.2. The ranges of temperature T (in °C) and salinity S for 98% of the ocean as a function of depth [From Bryan and Cox (1972)], and the corresponding ranges of density σ and potential density σ_θ (see Appendix 3).

Today

- Buoyancy/static stability
- Moisture
  - Latent heating and equivalent potential temperature

Atmospheric Latent Heat Content



Surface moisture content, in Kelvin (Lq/c_p)