# Homework #2 Solutions

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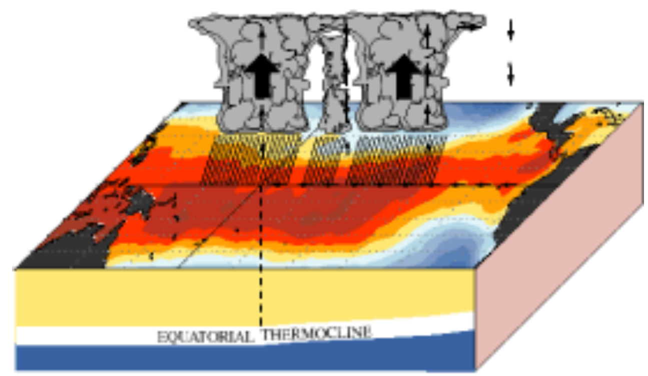
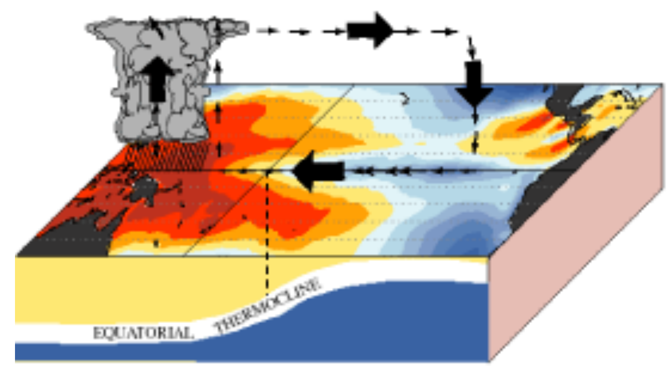
# Problem 1

- Southern Oscillation Index is represented by pressure differences between two points (Darwin, Australia and Tahiti)
  - Calculation determined by comparing SLP anomalies at Tahiti – SLP anomalies at Darwin
  - Measures strength of the Walker Circulation
  - SOI low during El Nino and high during La Nina

# Problem 2

- Bjerknes feedback is the positive feedback related to the shift that ENSO has on the Walker circulation and SSTs in the Pacific
  - El Nino: easterly trade winds weaken or reverse over equator allowing warmer SSTs to shift east to central and Eastern Pacific due to less upwelling. This results in the development of convection further east, which shifts the walker circulation further east. The weaker zonal SST gradient reduces easterly winds further and the positive feedback continues. Thermocline is shallower in West Pacific and deeper East Pacific
  - La Nina: easterly trade winds strengthen which causes warmer SSTs to remain further west and increase upwelling over East Pacific. Walker circulation shifts west and enhances subsidence over East Pacific. The increased zonal SST gradient further strengthens easterly flow which continues positive feedback cycle  Thermocline is deeper in West Pacific and shallower in East Pacific



# Problem 3

- Delayed Oscillator theory
  - Both Kelvin and Rossby waves produced by westerly wind burst on the dateline at the equator
    - Downwelling Kelvin wave travels east and brings warm water to East Pacific to South American coastline (El Nino like conditions occur)
    - Upwelling Rossby wave travels slower to the west and brings off equatorial cool water to Asian coastline
    - Downwelling Kelvin wave reflects off coastline as Downwelling Rossby Wave while upwelling Rossby wave reflects off coastline as upwelling Kelvin wave
    - Upwelling Kelvin wave travels faster to the east and replaces warm water anomalies to cool water anomalies as it makes the thermocline shallower (La Nina conditions)
    - Thus the initial westerly wind burst that causes El Nino eventually leads to La Nina conditions as waves reflect off land as opposite type waves.