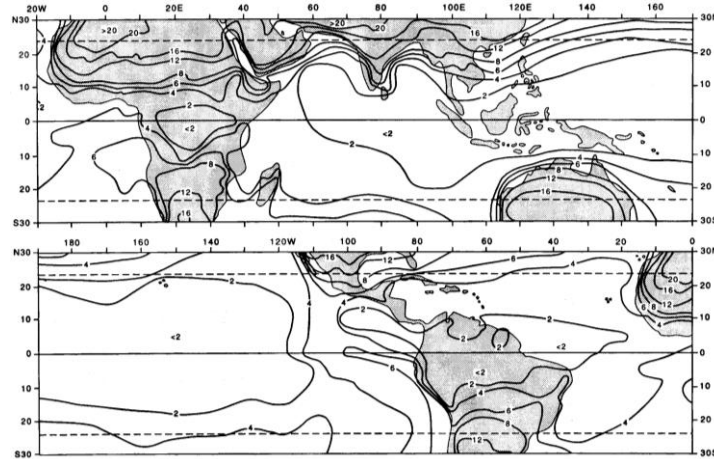


Geog 133 - Tropical Meteorology

Lab 2 – Tropical Temperatures

Q1: The figure below shows the mean annual range of temperatures. What are the two main reasons that temperature differences in the tropics are much smaller than in more northern or southern latitudes? (4 pts)



The Absence of a Cold Season in the tropics relates to low temperature variability.

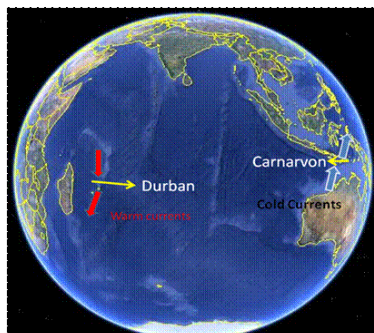
The large presence of cloud coverage in the tropics recycle warm air and moisture from the surface below, affecting temperature variability.

Q2: a. Why does Carnarvon have a colder winter than Durban, even though it is 5° further north than Durban? (See figure below; 2 pts)

Carnarvon has a colder winter due to its proximity to a cool ocean current (East Indian Ocean)

b. Similarly, why do you think Santa Barbara, CA has cooler summer weather than the same latitude on the coast of the eastern United States? (2 pts)

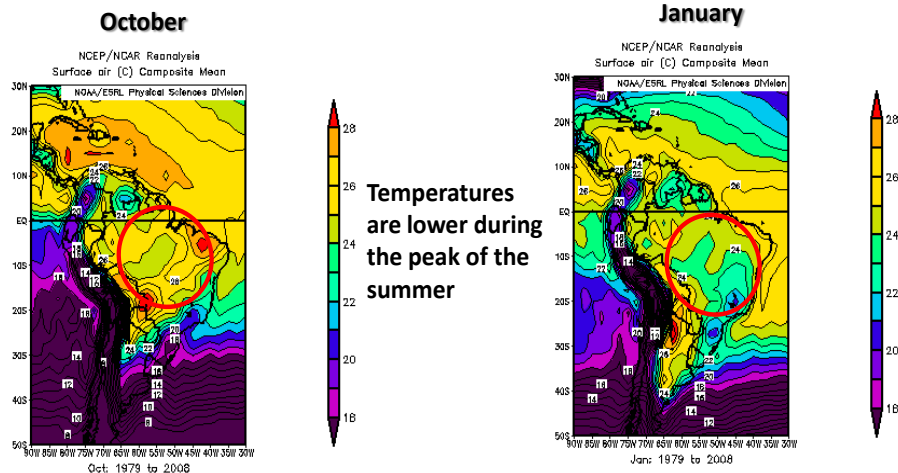
CA is influenced by the cool eastern pacific currents, whereas the East Coast is affected by the warmer current of the western Atlantic (Gulfstream).



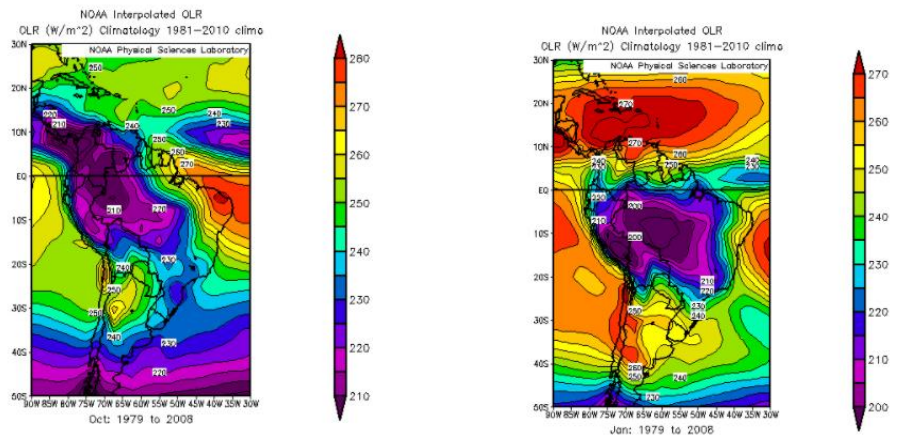
Name: Ian Hinds

Q3: In regions where summer monsoons form (as the example below for South America), increased cloudiness has a significant effect on temperature. Using the two figures below, and using Outgoing Longwave Radiation maps explain how monsoon clouds can contribute to regional temperatures that are lower in the summer than in the spring. (6 pts)

Temperature in tropical monsoon regions: Largely controlled by cloudiness



Note that it is not the case in higher latitudes



In the January graphs, there are lower surface temperatures in the region because of large monsoon cloud coverage in the summer (higher albedo). The clouds reflect much of the Incoming solar radiation, preventing the surface from absorbing direct solar radiation. In the October graphs, the opposite occurs, there is more solar radiation absorbed by the surface due to the absence of monsoons in the spring.

Name: Ian Hinds

Q4: Diurnal range is the difference between daily maximum and minimum temperatures. Examine the figure below.

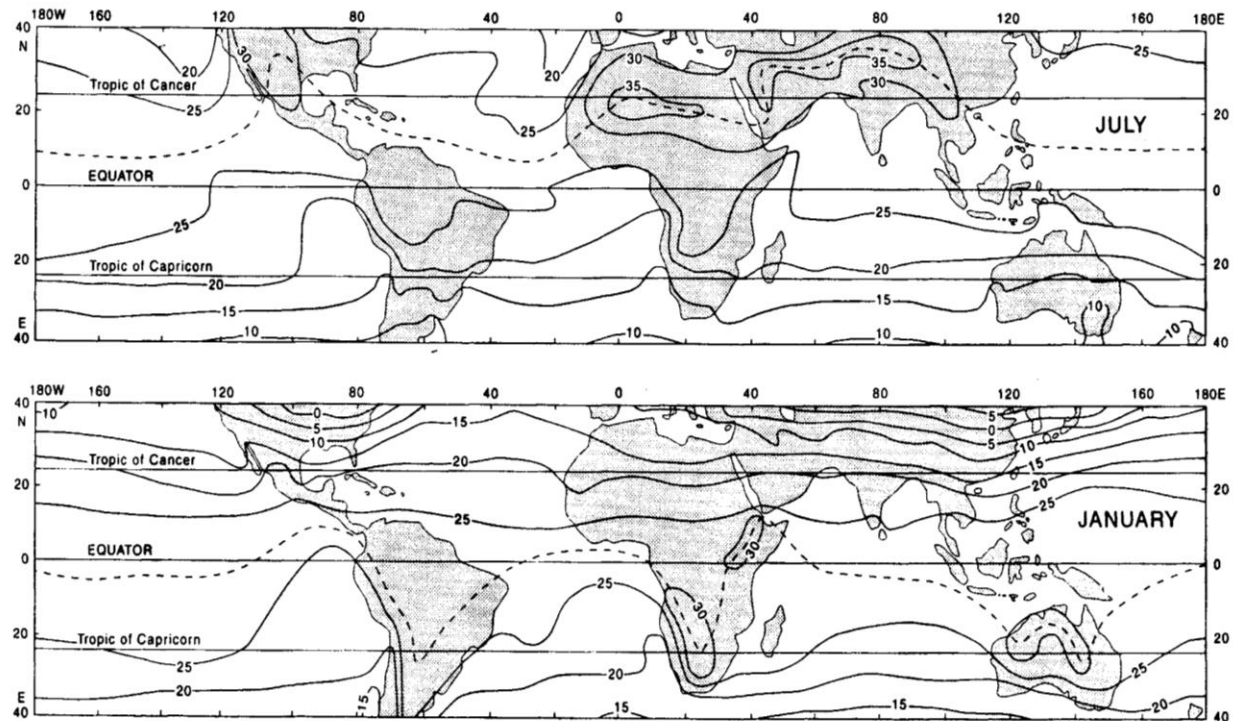


Figure 4.4 Sea level temperatures in July and January (°C) and the position of the thermal equator (temperatures reduced to sea level)

- a. Why do you think diurnal ranges are larger in the interior of South America than along the coasts? (2 pts)

The interior of South America is not influenced by the surrounding oceans and their currents as much as the coasts, and therefore has more temperature variability throughout the day.

- b. Name the three factors that influence diurnal ranges. (3 pts)

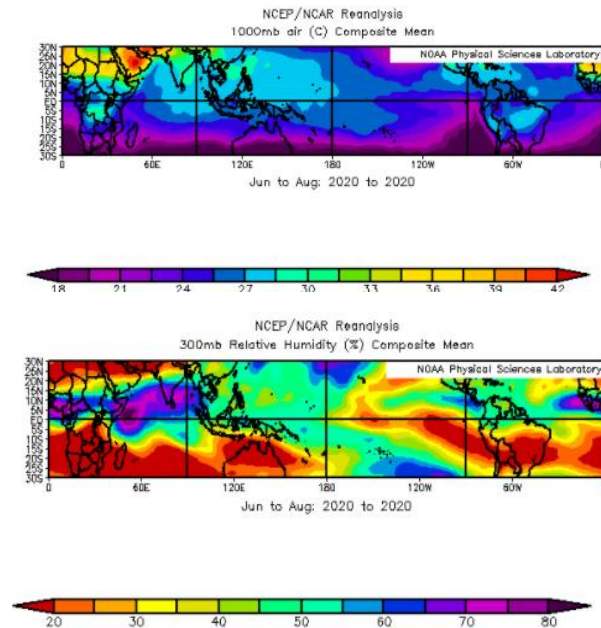
Distance from Oceans, Higher elevations where radiation is strong, Cloud coverage (fewer clouds produce a larger diurnal range)

Q5: Why are mountain tops in tropical regions generally cooler than the surrounding lowlands? (4 pts)

Temperature decreases with height in the troposphere. When mountains scale above clouds, they receive more radiation, but remain cooler than lowlands due to atmospheric temperature consistencies.

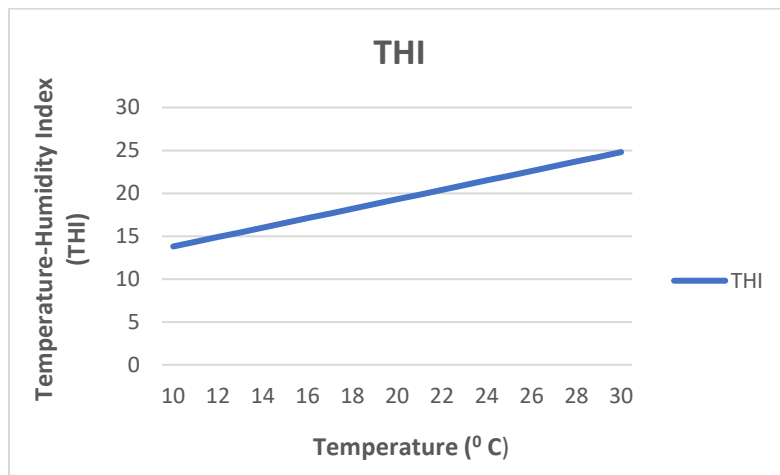
Name: Ian Hinds

Q6: Make a plot of global air temperature and specific humidity for last summer using NOAA website provided above. (4 pts) In which regions would you expect high human thermal discomfort and why? (Hint: Attention to the scales in the colorbars!)



High human thermal discomfort would most likely occur in regions with high relative humidity, especially during the nighttime, because it prevents any perspiration to be evaporated. Regions where temperature and relative humidity are both high will have much higher discomfort indexes. Examples of these regions would be mostly near the Indian ocean, where temperature and RH are both very high during summer months.

Q7: Using Excel or another graphing program, plot the Temperature Humidity Index (THI) for a range of air temperatures from 10°C to 30°C, using a dew point temperature of 15°C. Put temperature on the x-axis and THI on the Y-axis. Choose one of the THI formulas given in your textbook. Interpret the results (4 pts)



According to the graph, Temperature Humidity Index (THI) increases exponentially with increasing temperature. $THI = 0.8t + \frac{rh \cdot t}{500}$

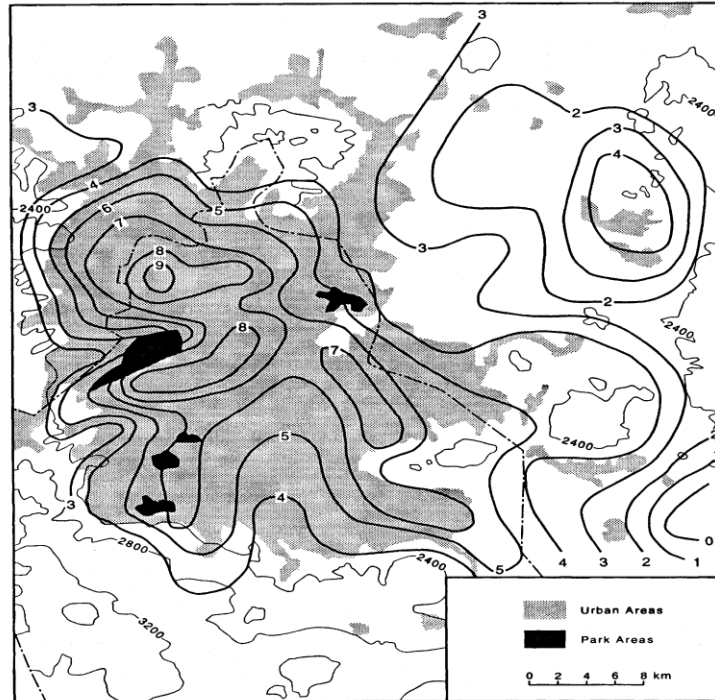


Figure 4.9 Mexico City's heat island. Isotherms are in °C. Note the cool area around central parkland. Reproduced by permission of the World Meteorological Organisation

Q8: Discuss reasons why Mexico City is generally hotter than the surrounding countryside. (5 pts)

Mexico City is a dense urban area and can be associated as an Urban Heat Island. Anthropogenic impacts in the urban area disrupt the natural climate cycle and contribute to a greater local temperature. The infrastructure, landmass alterations, and carbon output from this urban area puts the atmosphere in a polluted state, causing a larger recycle of longwave radiation, thus increasing overall surface temperature. The countryside and parklands have fewer impacts due to the absence of dense human populations.