What controls temperatures?

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Many factors control what the temperature is at a location

- LATITUDE
- SEASON
- Land vs. water surfaces
- Geographic locations
  - windward/leeward
  - north-facing/south-facing
- Altitude
- Cloud cover and albedo
Temperature Extremes

• Official lowest recorded temperature:  
  -128.5°F (-89.2°C) at Vostok, Antarctica, July 21, 1983

• Official highest recorded temperature:  
  135.8°F (57.7°C) at Al Aziziyah, Libya, Sept. 13, 1922

• “Official” temperatures are recorded in a shaded area—temperatures in direct sunlight can be much hotter
Latitude and Season

- In general, temperatures are warmer toward the equator and cooler toward the poles.
- In general, temperatures are warmer in the summer and cooler in the winter.
- These patterns result from more direct (higher overhead) rays between the Tropics and around the time of the summer solstice.
- But other factors also affect temperatures.
Land vs. water

- Air is heated or cooled by the surface below it.
- Land warms up more rapidly and cools down more rapidly than water
  Land has a lower “specific heat”
- This means that the **temperature range** over land areas is greater

http://ure_water_bodies_p_1.html
www.uwsp.edu/geo/faculty/ritter/geog101/textbook/temperature/temperat
Northern vs. Southern Hemispheres

• Northern hemisphere is about 61% water and 39% land
• Southern hemisphere is about 81% water and 19% land
• Greater range of temperature in northern hemisphere
• Southern hemisphere shows smaller annual temperature variations
Geographic Factors

• Coastal locations where wind blows toward shore (windward) have smaller variations than coastal locations where wind blows offshore (leeward)
  [Eureka, CA vs. New York, NY]

• Windward locations on N-S mountain range vs. leeward locations
  [Seattle vs. Spokane on opposite sides of Cascades]
Altitude

- Going up high mountains produces changes in temperature patterns similar to going from equator toward the poles [Quito vs. Guayaquil, Ecuador]
- Snow-capped Andes
- Snows of Kilamanjaro (Africa) loss of snow cover in recent decades used as evidence of global warming
Cloud Cover and Albedo

• Albedo – fraction of insolation reflected back to space
• Clouds have high albedo, so less energy gets to the surface
  lower temperatures on cloudy days
• Clouds act like a blanket to reduce re-radiation higher nighttime temperatures when cloud-covered [“radiative cooling”]
Isotherms – lines of equal temperatures

Weather forecasters use isotherm patterns to help predict and explain weather conditions.
Color-coded isotherms show sea surface temperature patterns