

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

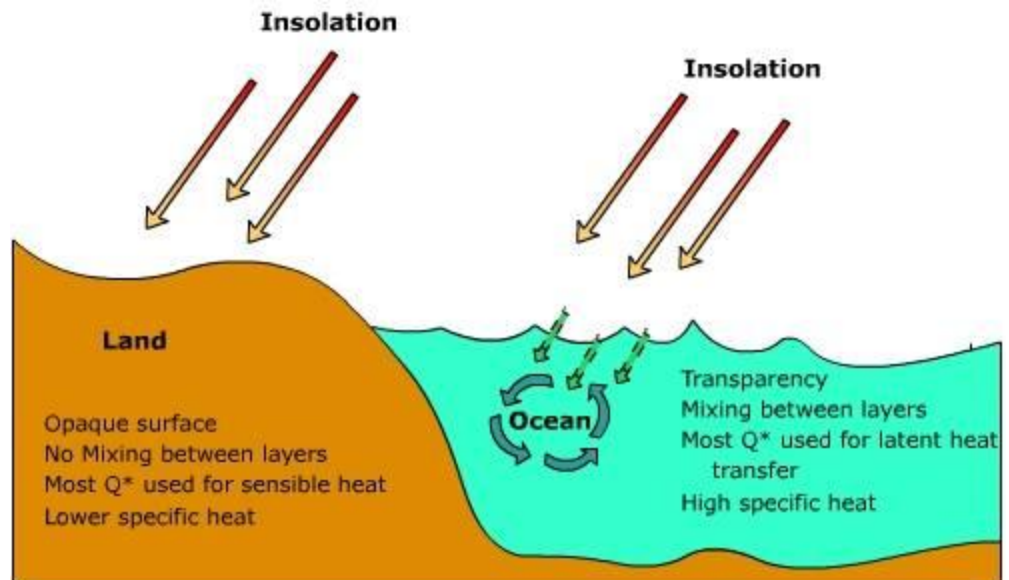
- Official lowest recorded temperature:
-128.5°F (-89.2°C) at Vostok, Antarctica, July 21, 1983
- Official highest recorded temperature:
135.8°F (57.7°C) at Al Aziziyah, Libya, Sept. 13, 1922
- “Official” temperatures are recorded in a shaded area—temperatures in direct sunlight can be much hotter

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



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

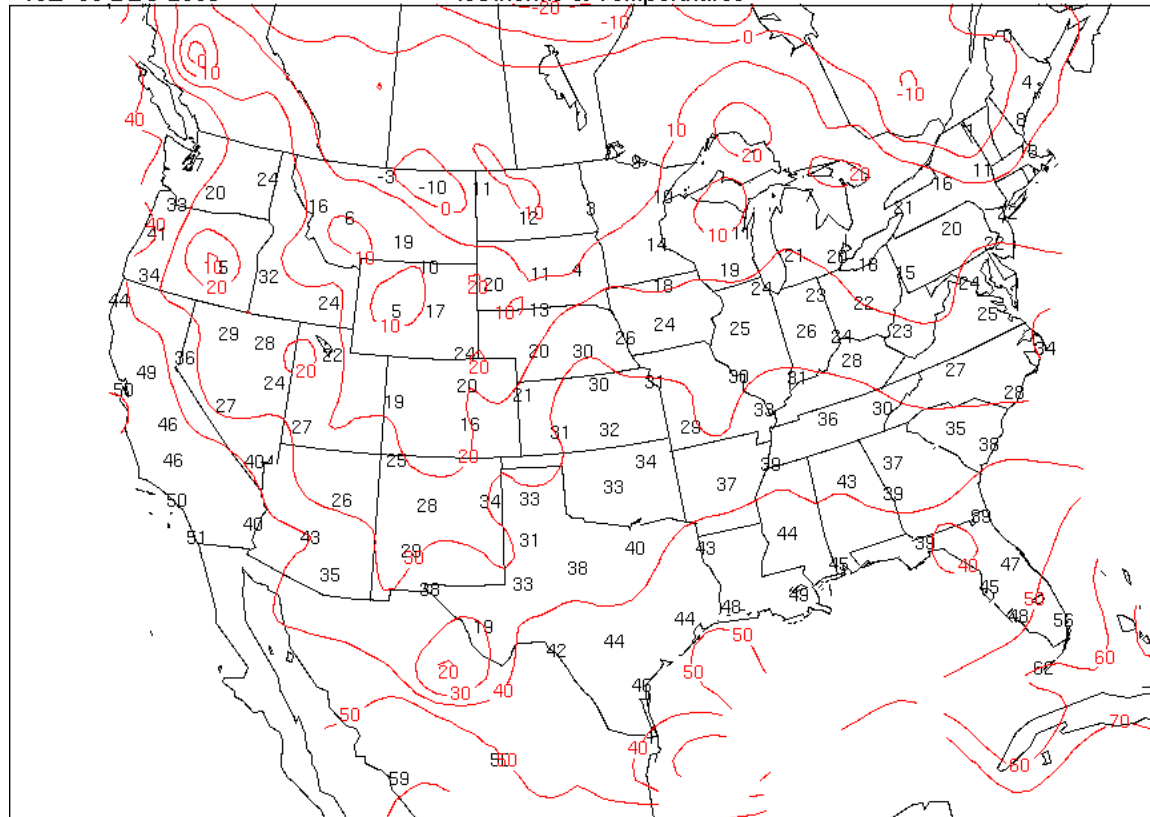
- Going up high mountains produces changes in temperature patterns similar to going from equator toward the poles
[Quito vs. Guayaquil, Ecuador]
- Snow-capped Andes
- Snows of Kilimanjaro (Africa)
loss of snow cover in recent decades
used as evidence of global warming

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”]

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Isotherms & Temperatures

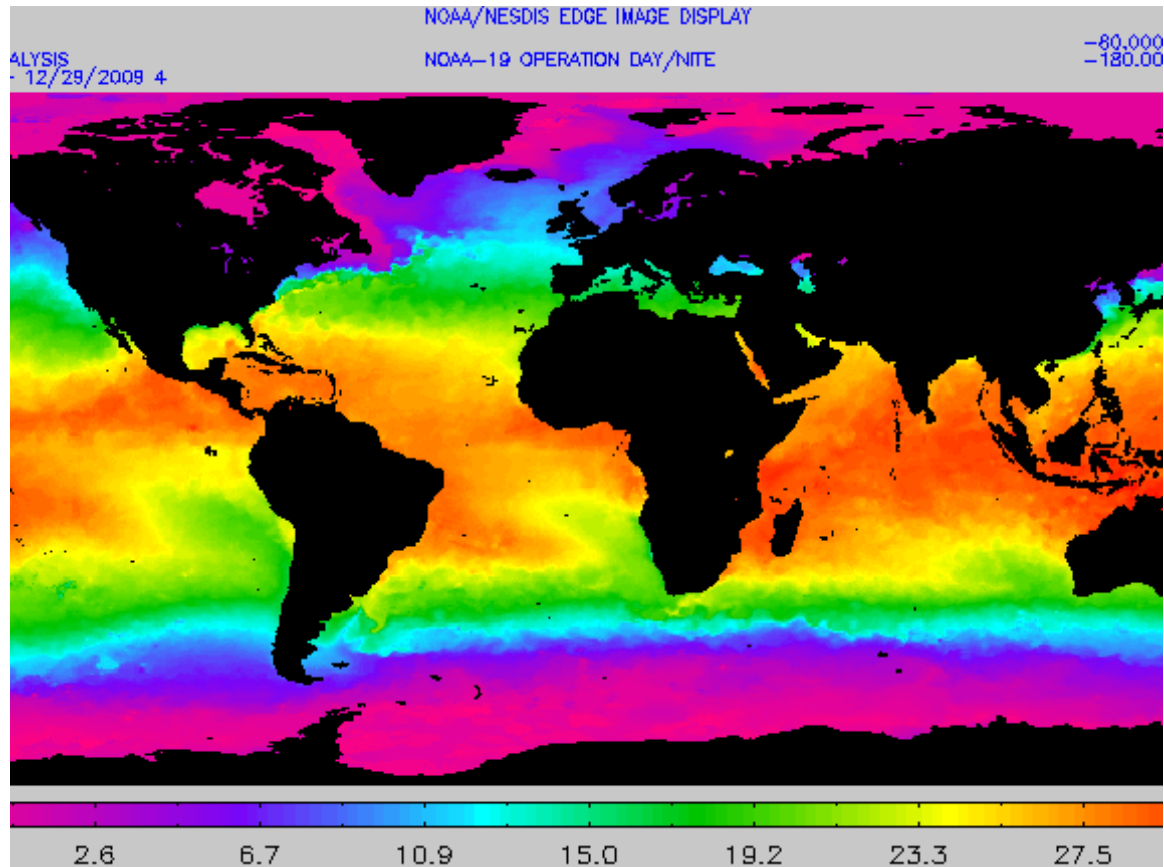


NCEP/NWS/NOAA

Red - Isotherms (10F)

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