

Tropics





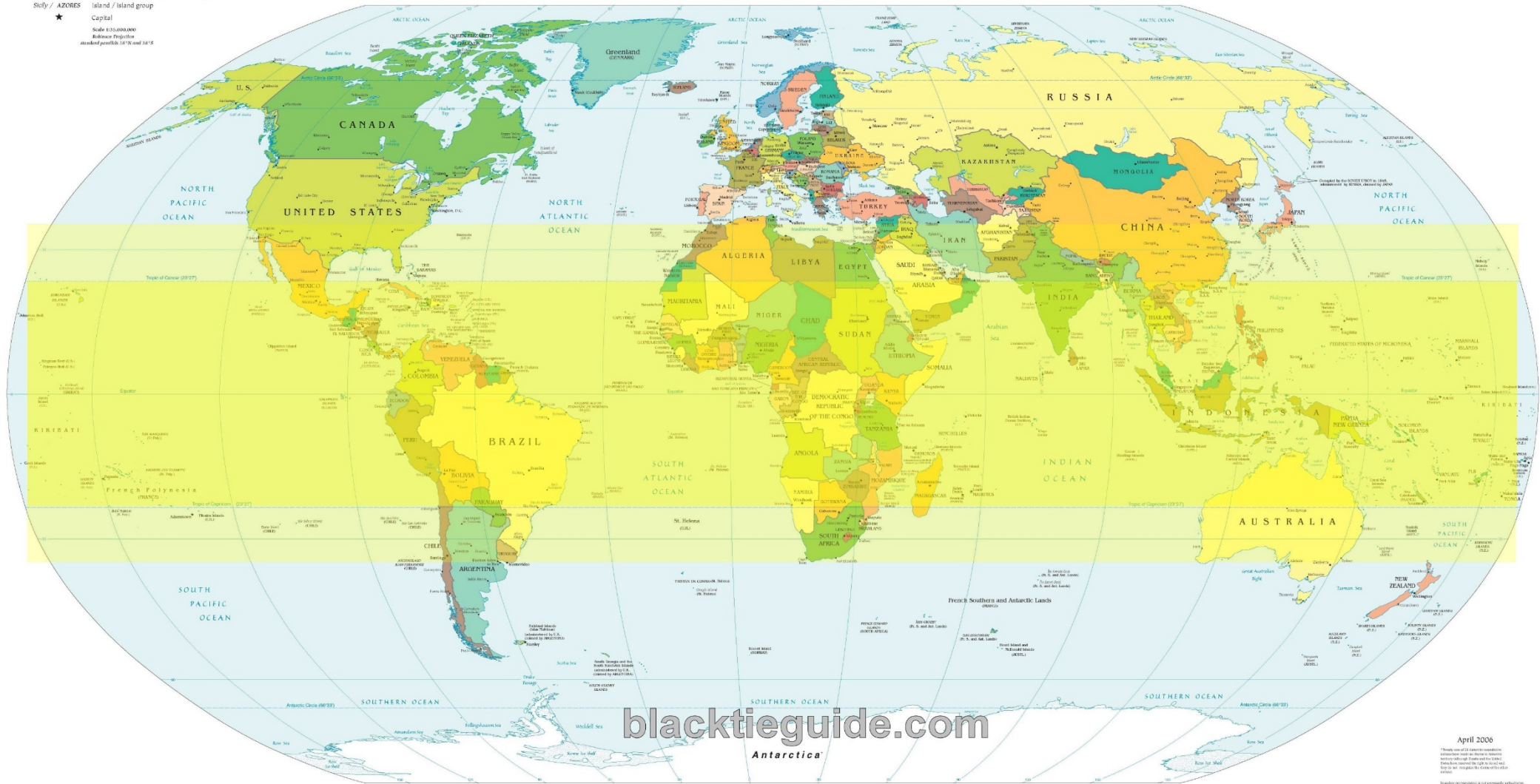
# Tropics

Why do we care?

- It affects the weather all around the globe
- More than a third of our planet

# Political Map of the World, April 2006

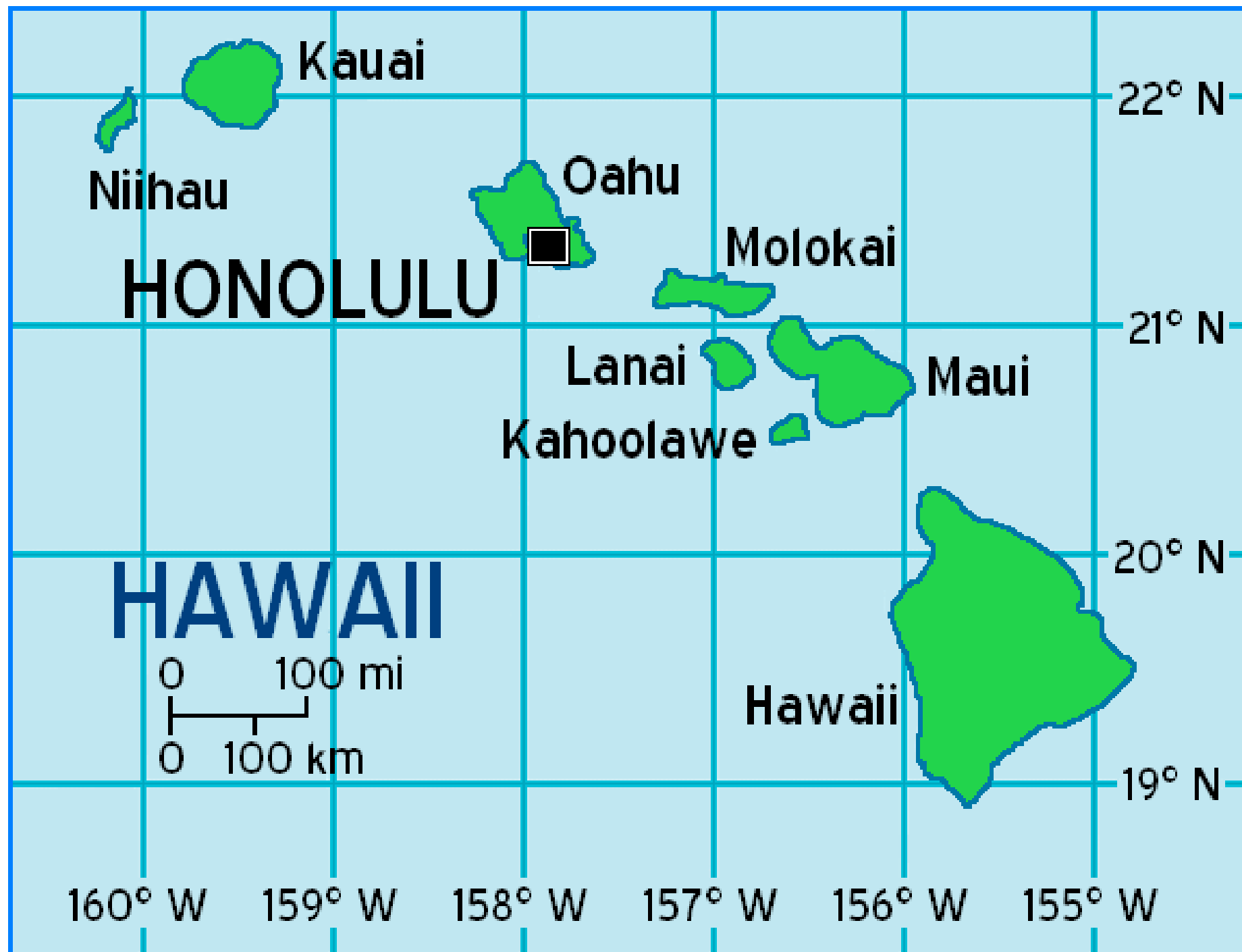
- AUSTRALIA Independent state
- Bermuda Dependency or area of special sovereignty
- Stylized AZORES Island / Inland group
- ★ Capital
- Scale 1:50,000,000
- Billioner Population
- Standard position 10°N and 10°E



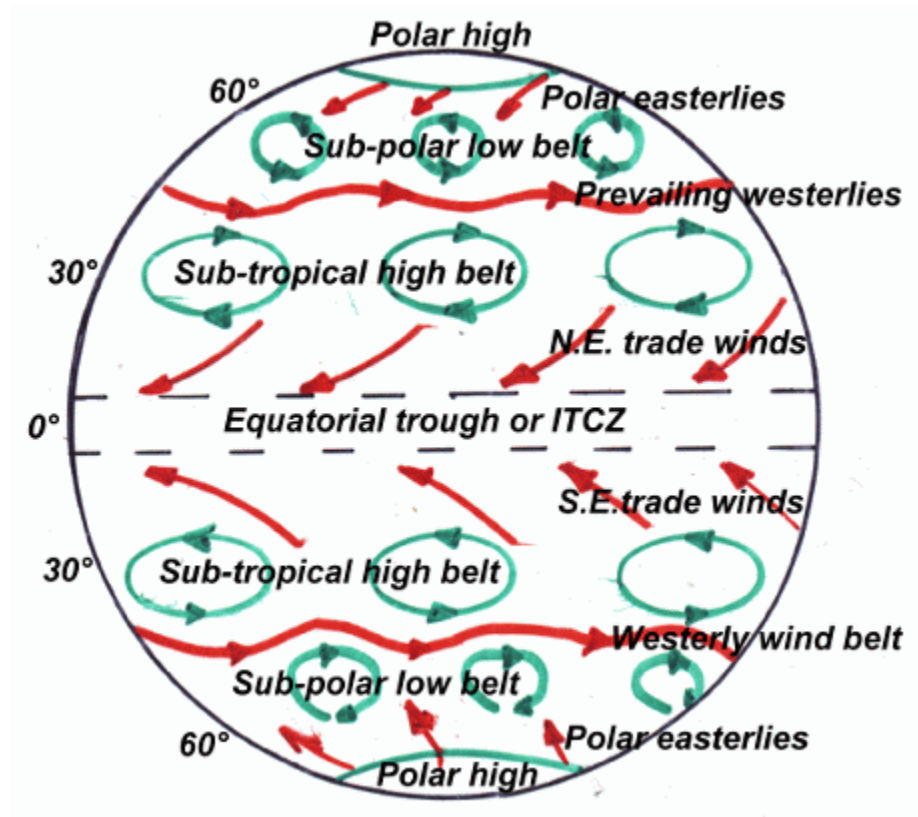
blacktieguide.com  
Antarctica

TROPICS
  SUBTROPICS

April 2006  
\*Based on a set of latitude coordinates  
 determined from the 1980s to 1990s  
 using satellite data. The map is not  
 intended to be used for navigation.  
 It is a simplified representation of the world's  
 climate zones.



# General circulation – trade winds

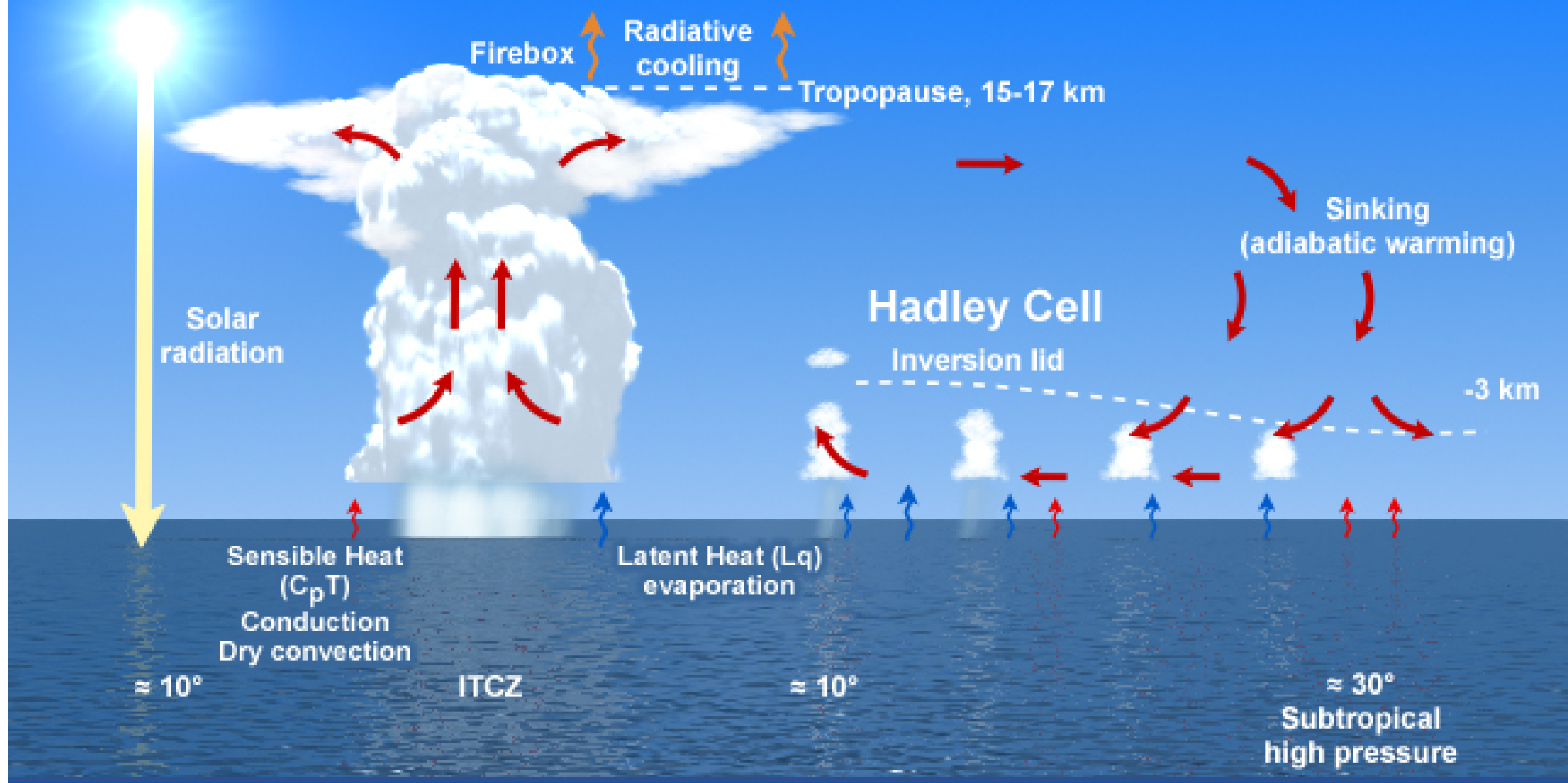


Trade winds – what kind of weather do they bring to Hawaii?

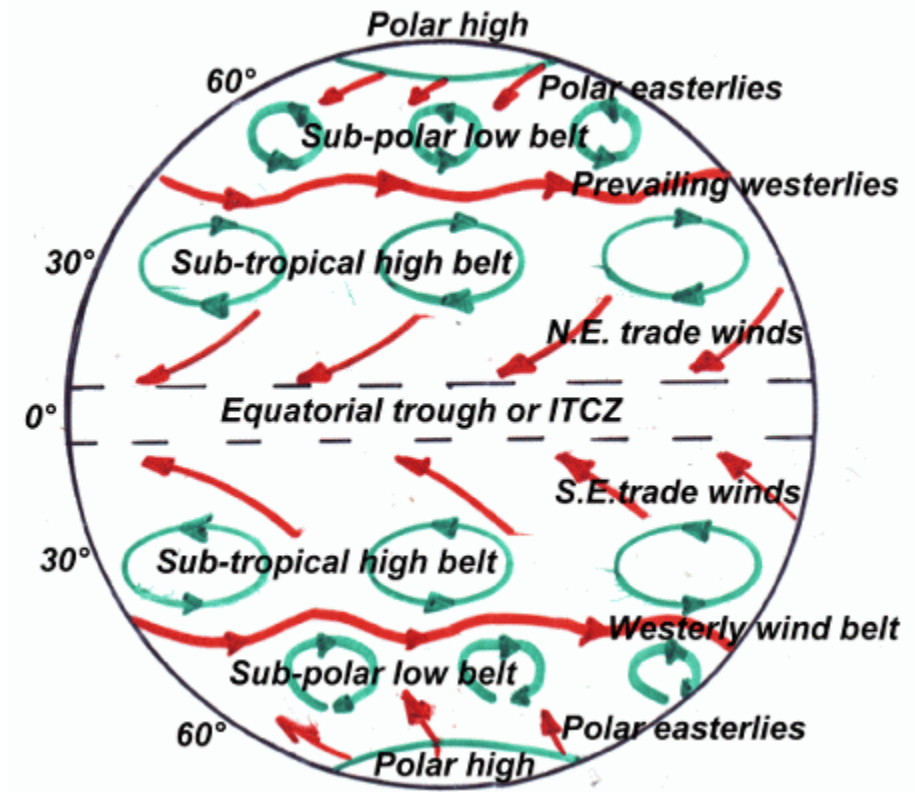




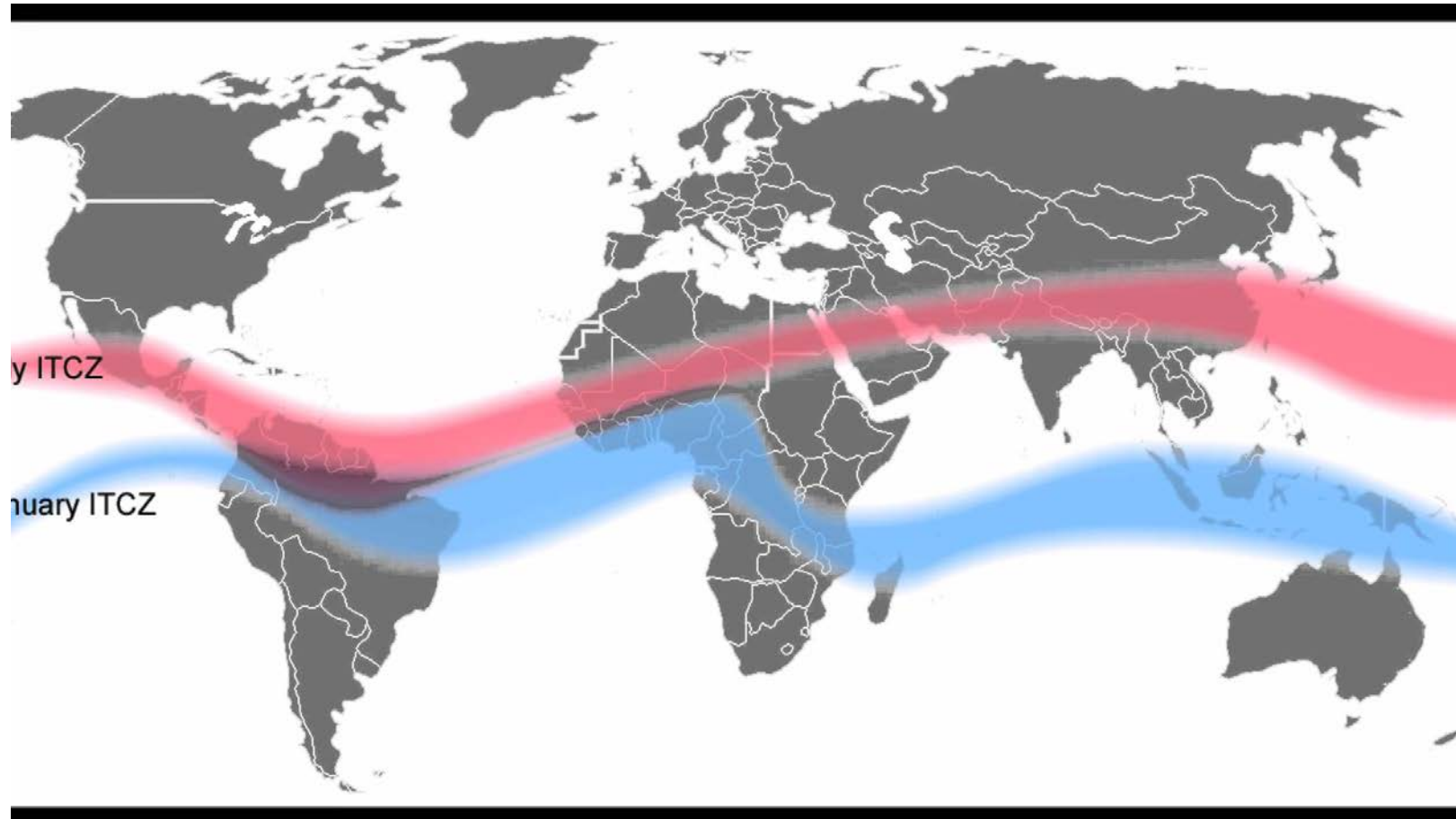
# Energy Transport and Circulation in the Tropics



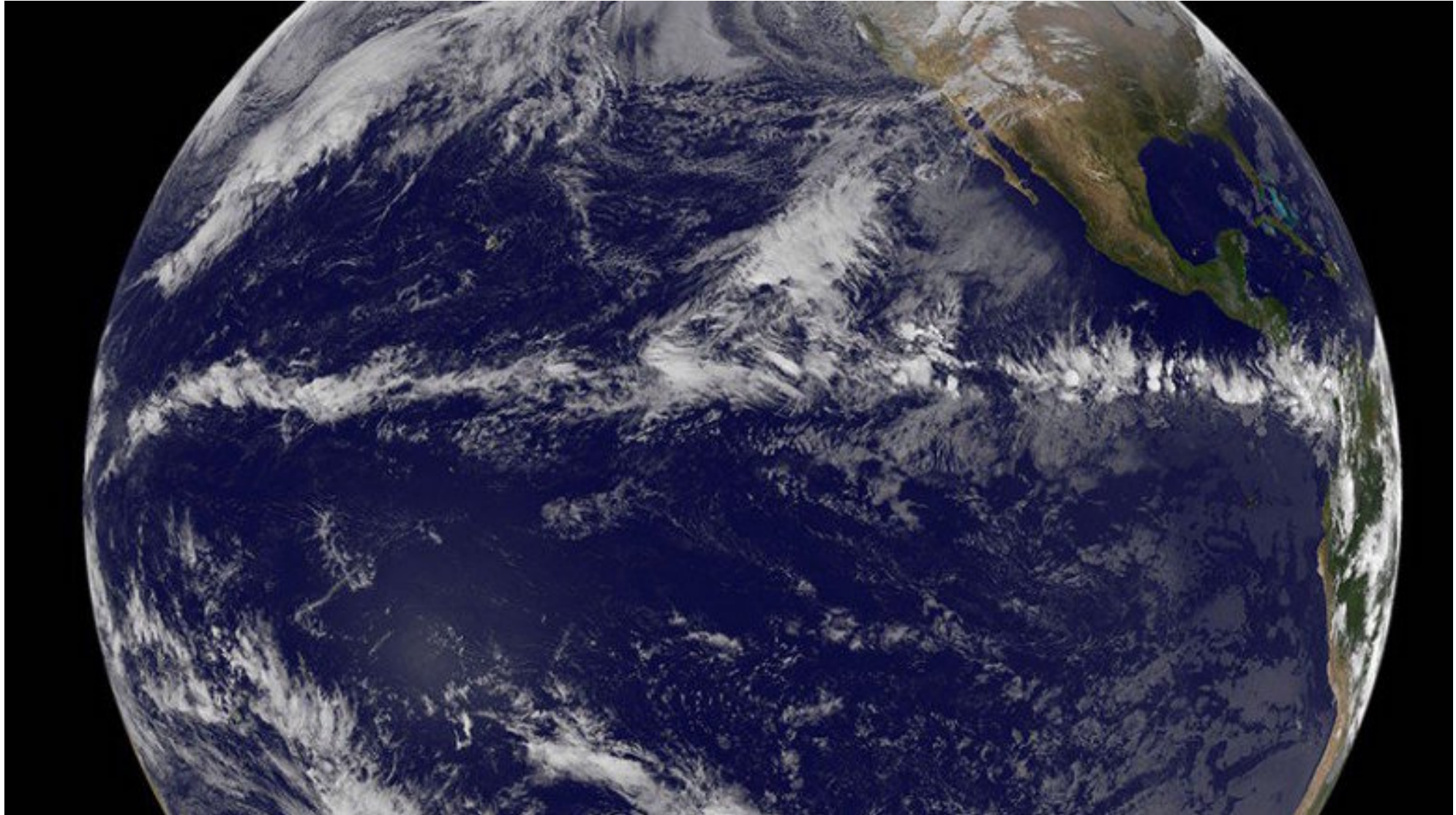
# General circulation – ITCZ



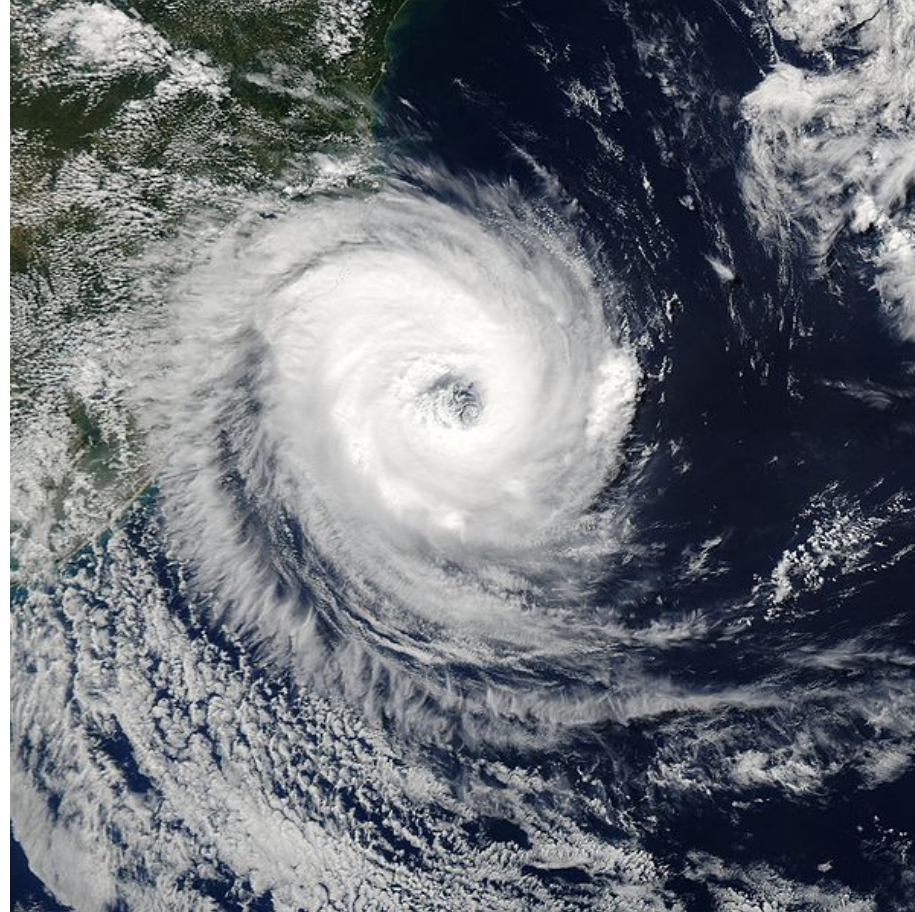
# Intertropical convergence zone - ITCZ



ITCZ from the satellite image



Google tropical disturbances...



# What else lives in the tropics?

- Intertropical convergence zone (ITCZ)
- Easterly waves, hurricanes
- El Nino/La Nina
- Walker circulation
- Madden-Julian oscillation
- Other equatorially trapped waves

# El Niño–Southern Oscillation ENSO

- *ENSO* is an irregularly periodic variation in winds and SST (sea surface temperature) over the tropical eastern Pacific Ocean
- It affects climate of much of the tropics and subtropics and further
- The warming phase of the SST is [El Niño](#) (high surface pressure in the western Pacific)
- The cooling phase of the SST is [La Niña](#) (low surface pressure in the western Pacific)

Southern Oscillation refers to the atmospheric component: H during El Niño, L during La Niña in W Pacific, the other way in E Pacific

# El Nino – La Nina

- <https://www.youtube.com/watch?v=WPA-KpldDVc>



# El Nino

- Warming of the ocean surface or above-average SST in the central and eastern tropical Pacific Ocean.
- Warming causes a shift in the atmospheric circulation
- Rainfall is reduced over Indonesia and Australia
- Rainfall and tropical cyclone formation increases over the tropical Pacific Ocean
- The low-level surface trade winds, which normally blow from east to west along the equator, either weaken or start blowing from the other direction.

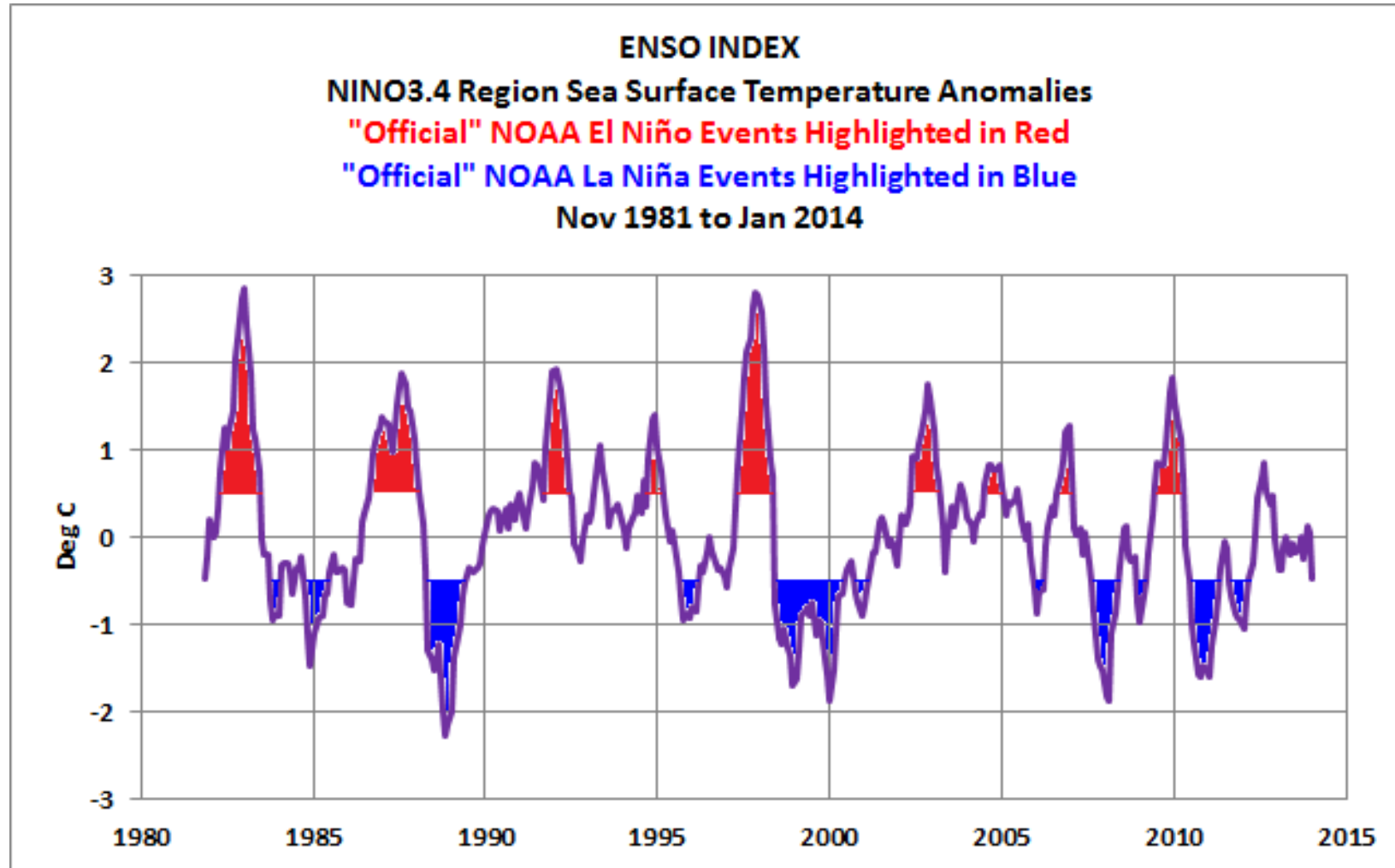
# La Nina

- cooling of the ocean temperatures in the central and eastern tropical Pacific Ocean due to increased upwelling
- strong easterlies, i.e. trade winds
- above-average precipitation across the northern Midwest, the northern Rockies, Northern California, and the Pacific Northwest's southern and eastern regions
- precipitation in the southwestern and southeastern states, as well as Southern California, is below average
- development of many stronger-than-average hurricanes in the Atlantic and fewer in the Pacific

# Walker circulation

- Atmospheric component of ENSO
- It is caused by the PGF (pressure gradient force) that is a result from a H system over the eastern Pacific Ocean, and a L over western Pacific
- Weakened or reversed Walker circulation results in *El Niño* (ocean surface warmer than average)
- Strong Walker circulation results in a *La Niña* (ocean temperatures cooler than average)

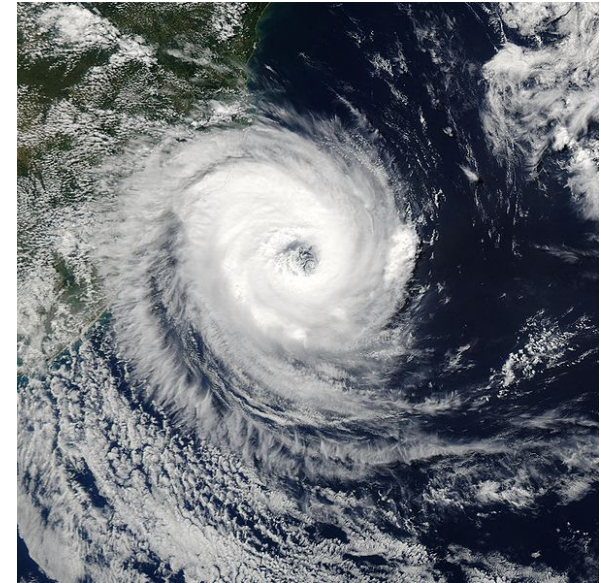
# Occurrence of El Nino – La Nina



**Bob Tisdale**

# Hurricanes

- <https://www.youtube.com/watch?v=zP4rgvu4xDE>
- [https://www.youtube.com/watch?v=SSx\\_gisp24w](https://www.youtube.com/watch?v=SSx_gisp24w)
- <https://www.youtube.com/watch?v=bafyc-hkArw>



# Tracking hurricanes

- <https://www.nhc.noaa.gov/?atlc> - Atlantic
- or
- <https://www.nhc.noaa.gov/?epac> – Pacific

(depression, storm, hurricane)

## Tropical Depression

- Wind speed: less than 63 km/h
- Occurs when a group of thunderstorms come together in a clearly defined low-pressure area.

## Tropical Storm

- Wind speed: 64-118km/h
- A low-pressure area with rotating circulation of winds.

## Category 1

- Wind speed: 119-153km/h
- No real damage to buildings or structures; damage to trees and caravans; some coastal flooding.

## Category 2

- Wind speed: 154-177km/h
- Some roof damage and broken windows; damage to trees and caravans; flooding of low-lying areas due to storm surge.

## Category 3

- Wind speed: 178-209km/h
- Some structural damage to buildings and sheds; caravans are destroyed; flooding occurs near the coast and areas less than 2m above sea level.

## Category 4

- Wind speed: 210-249km/h
- Structural damage to roofs and buildings; flooding near the shoreline and major erosion of beaches; evacuation of people may be required.

## Category 5

- Wind speed: 250+ km/h
- Roofs blown off many buildings and sheds blown over; flooding near the shoreline and areas less than 5m above sea level; mass destruction may be required.