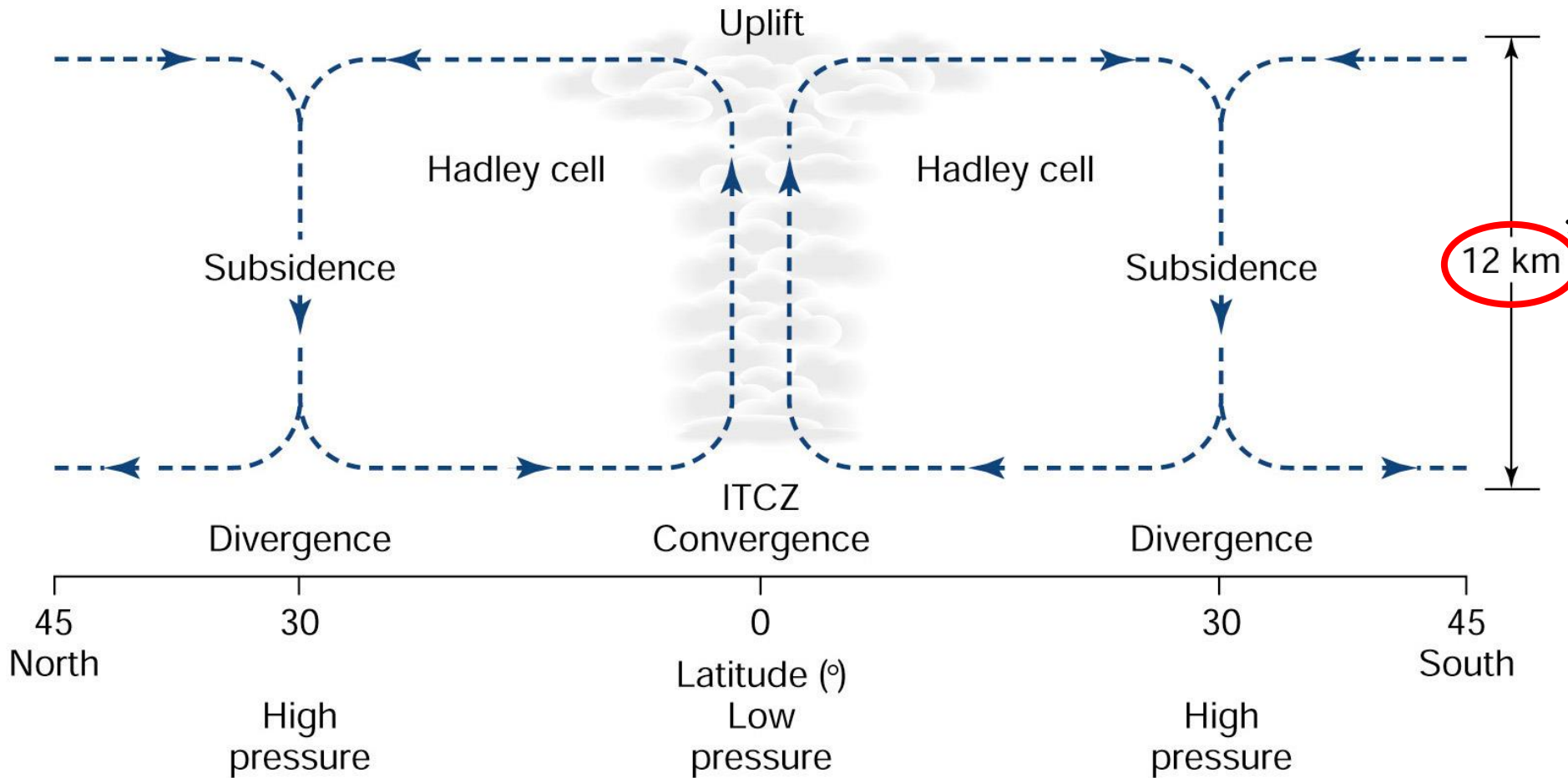


This Week

- Seasonality of Hadley Circulation
- Midlatitude circulation – variable weather
- Land/Ocean Contrasts

Modified Hadley Circulation



Horizontal motions

convergence: coming together
divergence: spreading apart

Vertical motions

upwelling: rising air
subsidence: sinking air

Hadley Circulation Summary

- **Upwelling** in tropics with surface convergence → **ITCZ**
rainy

Hadley Circulation Summary

- **Upwelling** in tropics with surface convergence → **ITCZ** rainy
- ***High altitude*** flow, diverging poleward from tropics; southwesterly to westerly in NH, northwesterly to westerly in SH → “**subtropical JET STREAM**”

Hadley Circulation Summary

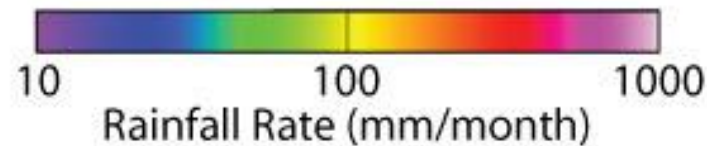
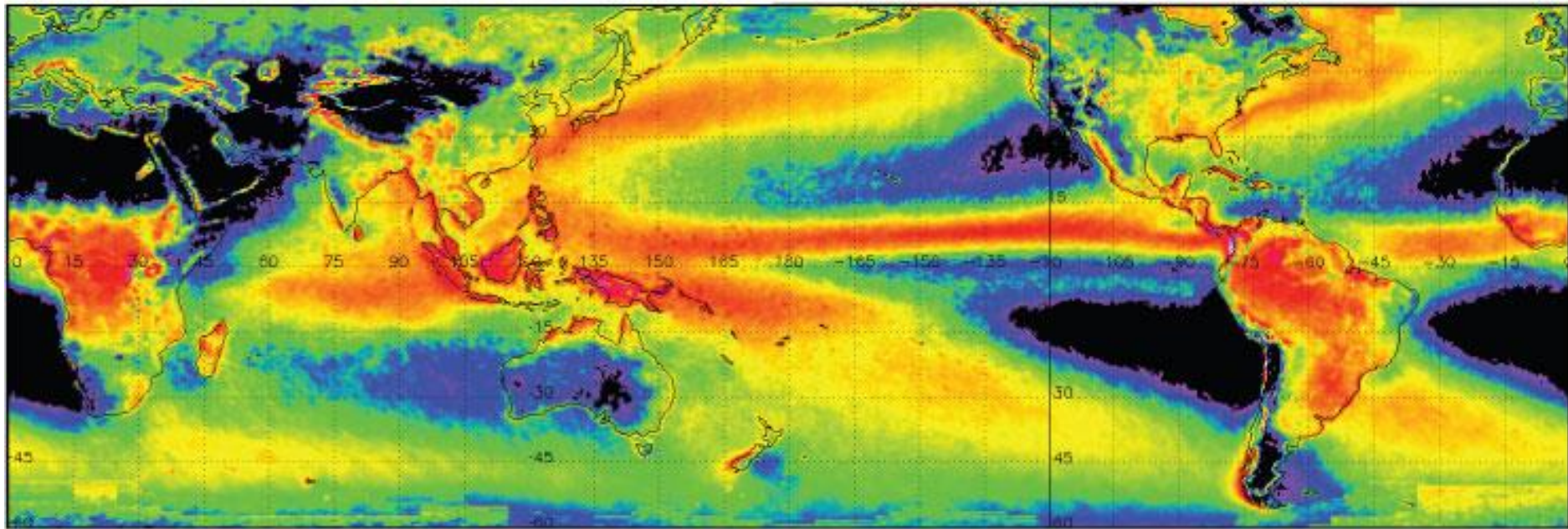
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- Subsiding branches located around 30° N and 30° S → **MAJOR DESERTS**

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- **Upwelling** in tropics with surface convergence → **ITCZ rainy**
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- Subsiding branches located around 30° N and 30° S → **MAJOR DESERTS**
- **Low altitude** flow, converging equatorward is northeasterly to easterly in NH and southeasterly to easterly in SH → tropical “**TRADE WINDS**”

“Seeing” Hadley Circulation: Precipitation

Global Rainfall Rate



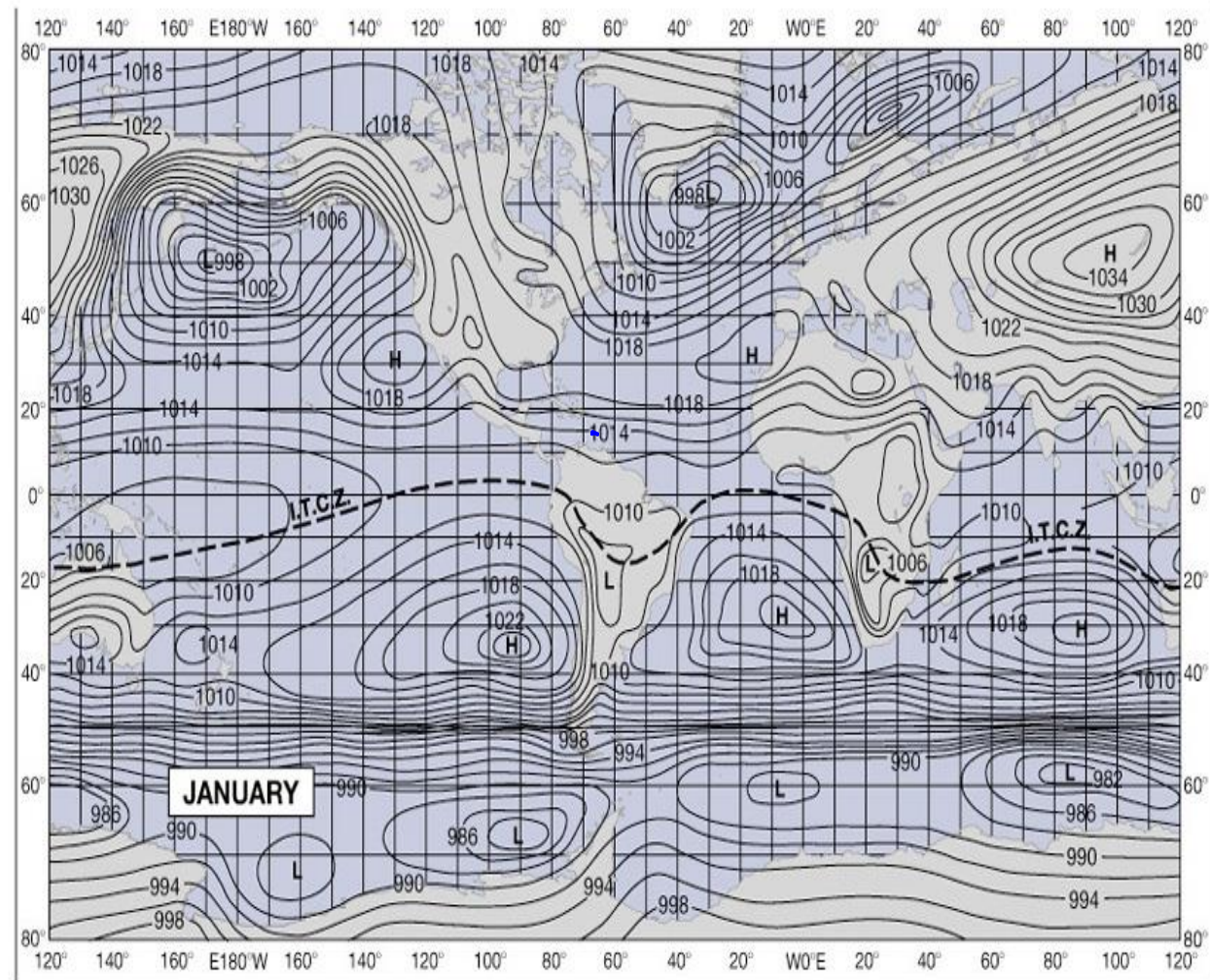
Negri (2004)

“Seeing” Hadley Circulation: Pressure

Average Pressure Contours at Surface

Lines of constant pressure (isobars).

More closely spaced lines: steeper change in pressure

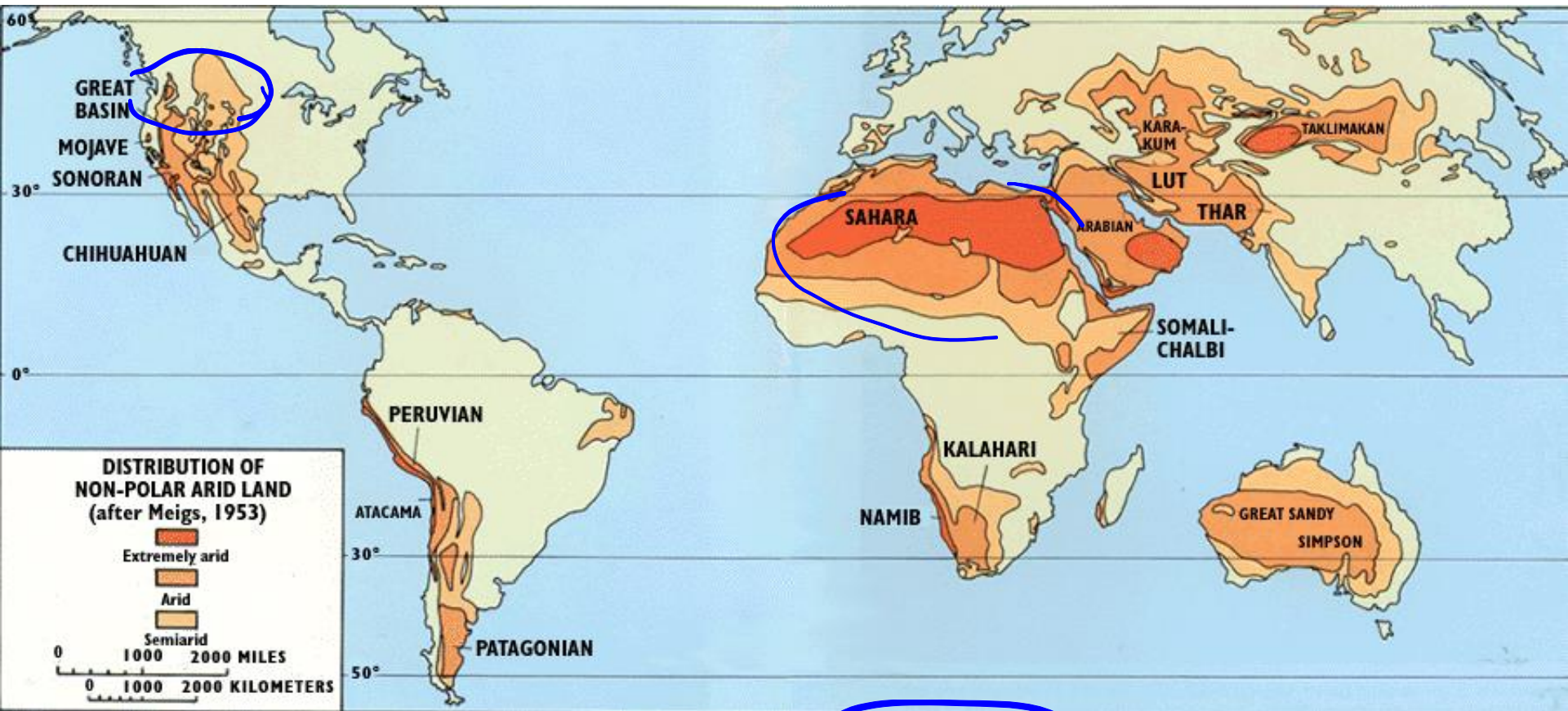


Average Pressure Contours at Surface

More closely spaced
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in pressure



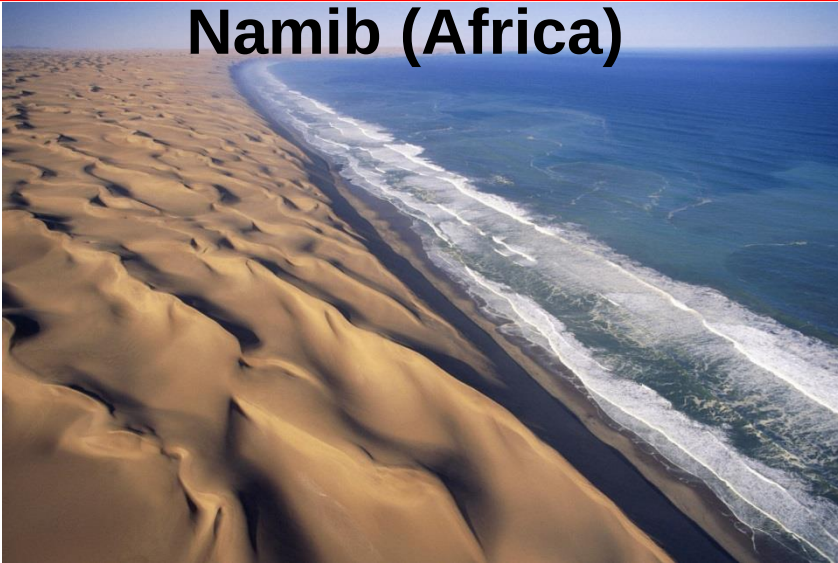
World's Deserts



Not shown: Polar Regions!

Some of the deserts at 30°N/S

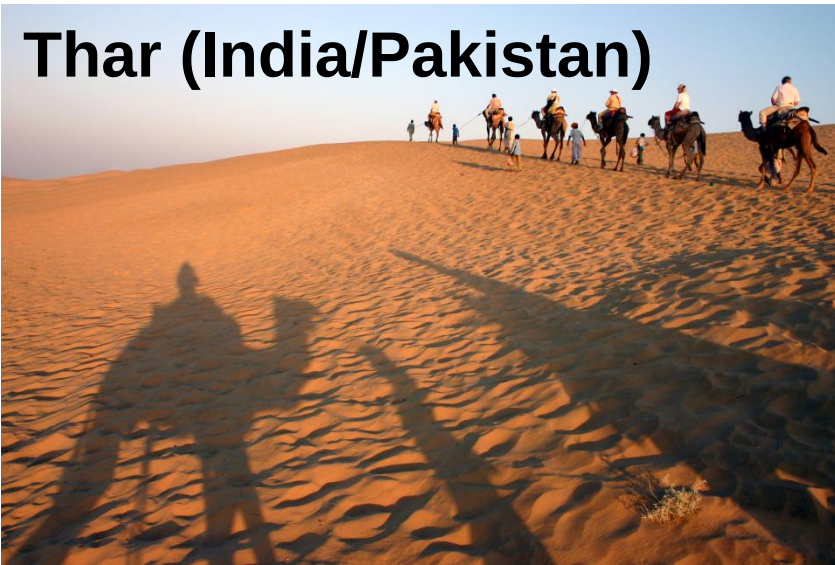
Namib (Africa)



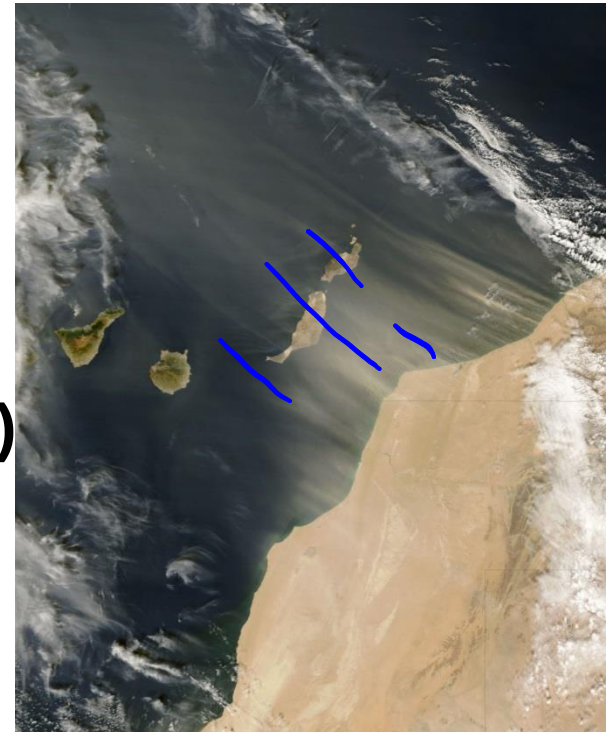
Great Sandy (AUS)



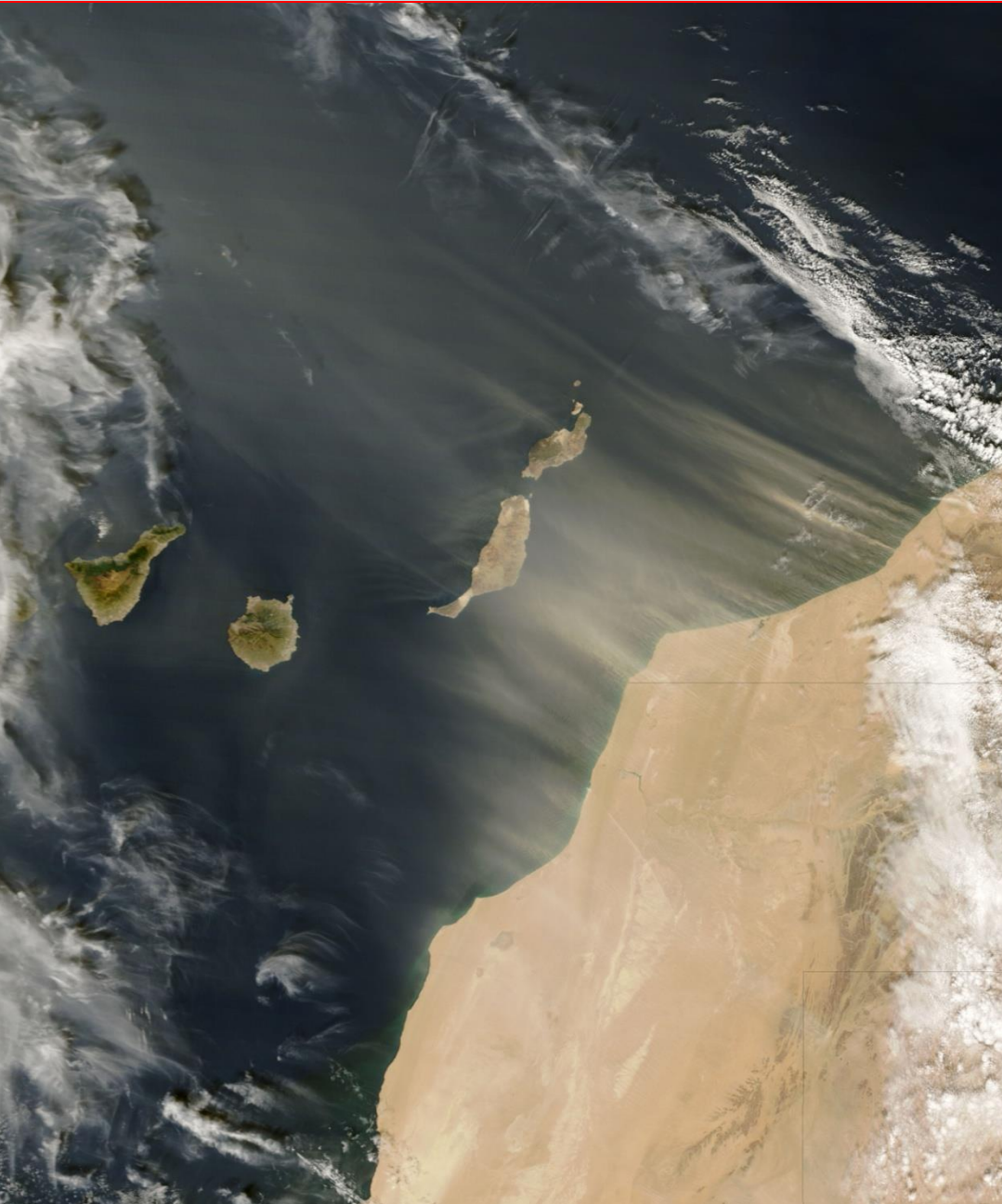
Thar (India/Pakistan)



**Sahara
(N. Africa)**



World's Deserts



Desert dust blows from W. Sahara and N. Morocco over Canary Islands (in picture).

Desert dust is a source of nutrients to ocean and land biota (often $\frac{1}{2}$ a world away).

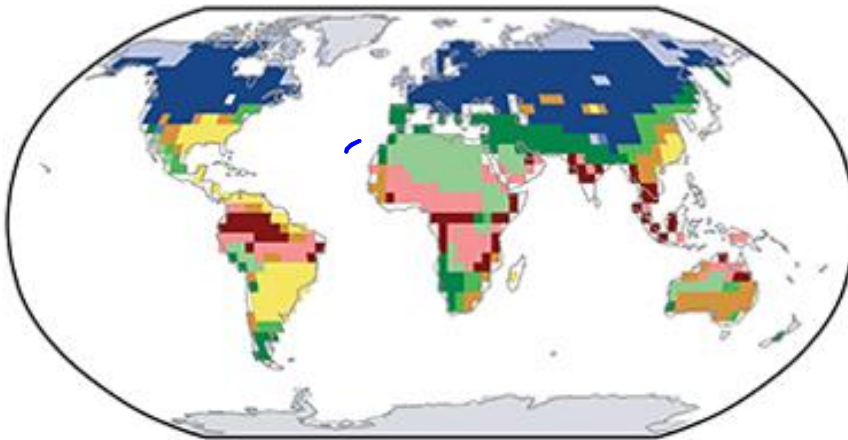
What if the Earth rotated in the opposite direction?

<https://eos.org/articles/reversing-earths-spin-moves-deserts-reshapes-ocean-currents>

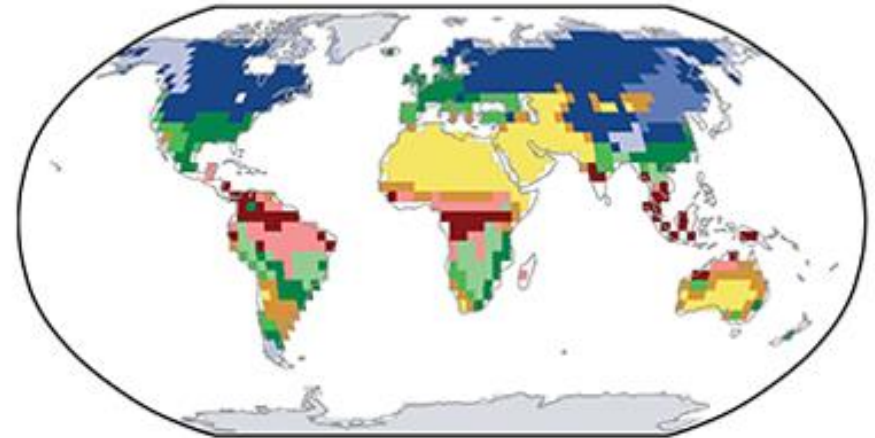
opposite rotation

normal rotation

Earth with Retrograde Rotation



Earth with Prograde Rotation



Main Climates

A: equatorial
B: arid
C: warm temperate
D: snow
E: polar

Precipitation

W: desert
S: steppe
f: fully humid
s: summer dry
w: winter dry
m: monsoonal

Poll Question

W Suppose you wanted to take a February vacation in the sunny and warm tropics. Because you want sunny dry weather you choose



When poll is active, respond at **PollEv.com/joelathornto254**



Text **JOELATHORNT0254** to **22333** once to join



Costa Rica (NH)

Amazonia (SH)



Total Results: 0

Shifting ITCZ?

TRIMM Rainfall

http://eoimages.gsfc.nasa.gov/images/globalmaps/data/mov/TRMM_3B43M.mov

NDVI Global Vegetation

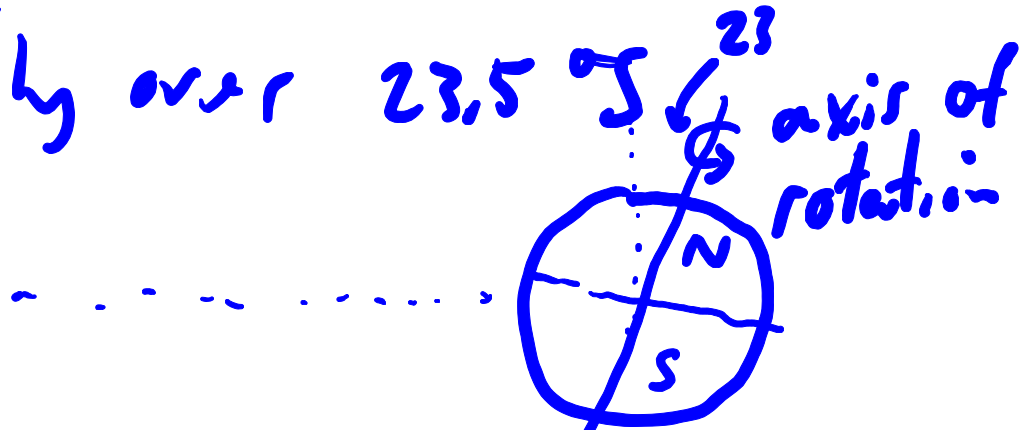
<https://youtu.be/tuKTLB0Soys>

Seasonality

NH during MAY - Sept; receives more solar radiation compared to SH

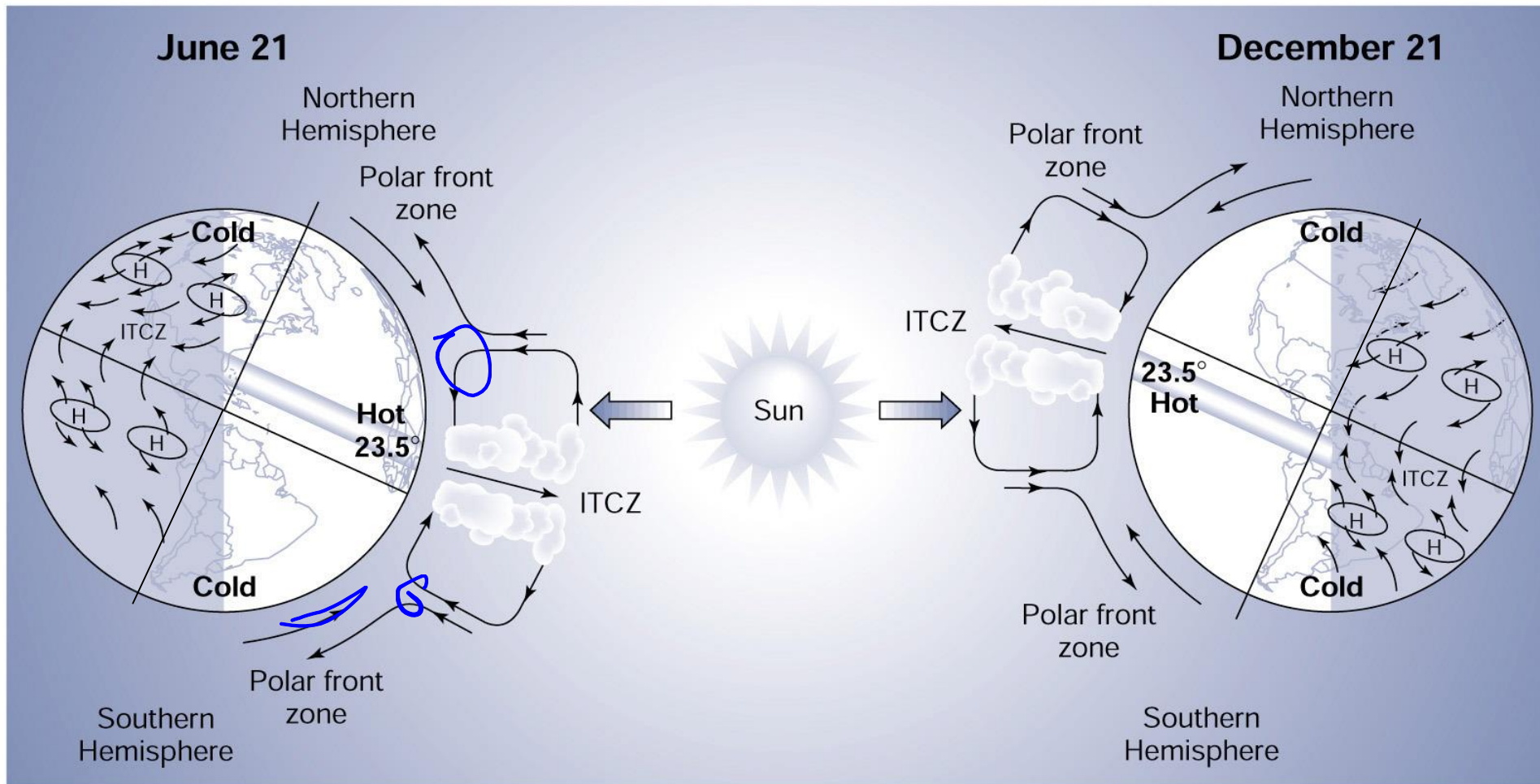
On summer solstice (June 21), sun is directly over 23.5°N latitude (Tropic of Cancer)

On Dec 21 directly over 23.5°S



The ITCZ follows greatest solar flux, bringing rainy weather with it

Seasonal Shift in Hadley Circulation



ITCZ location shifts N-S depending on season.
Leads to wet and dry seasons in the tropics.