

Monzones en el planeta

Australian-Maritime Continent Monsoon

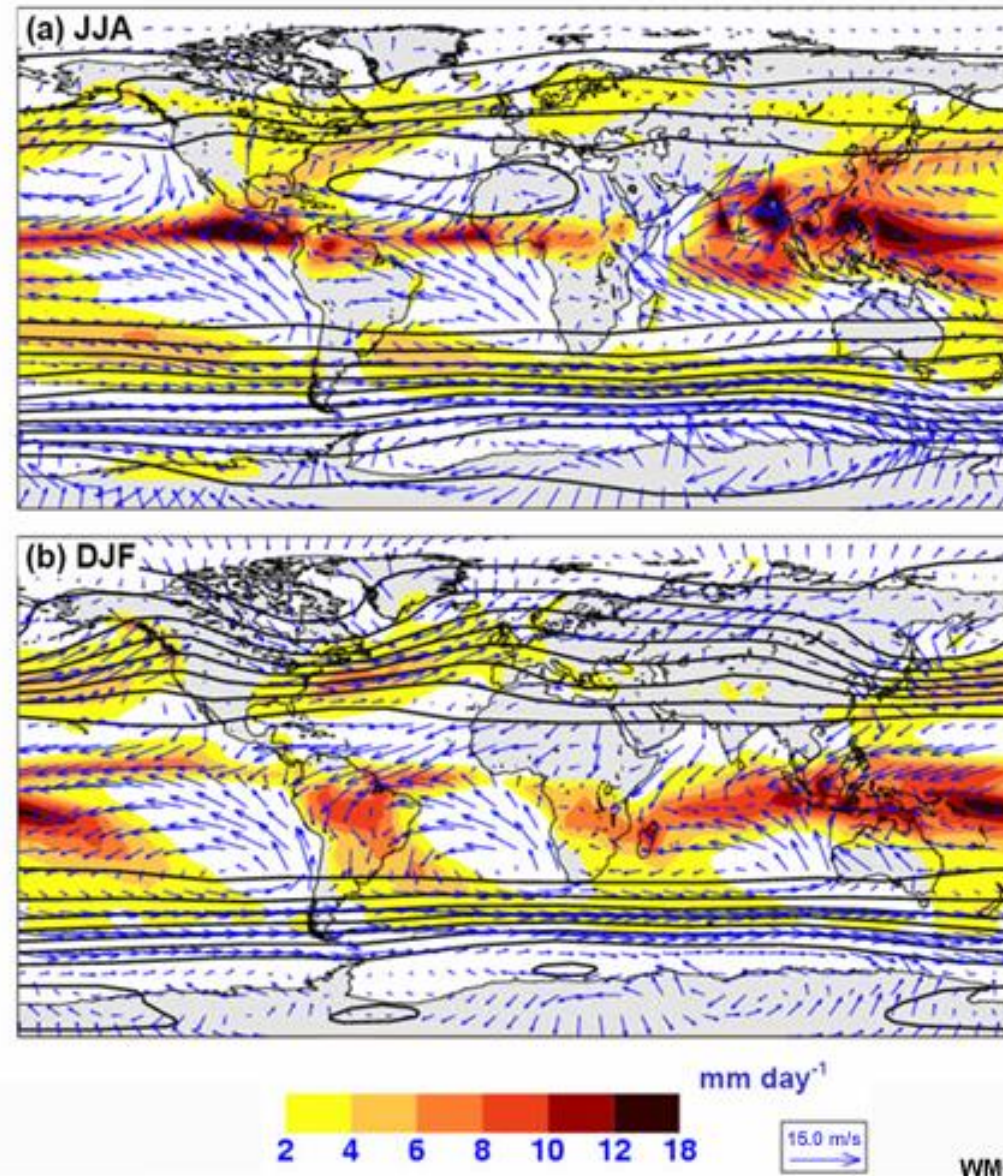
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Climatology

Mean precipitation (shaded), 925 hPa horizontal wind vectors, and 500 hPa geopotential heights (contours)

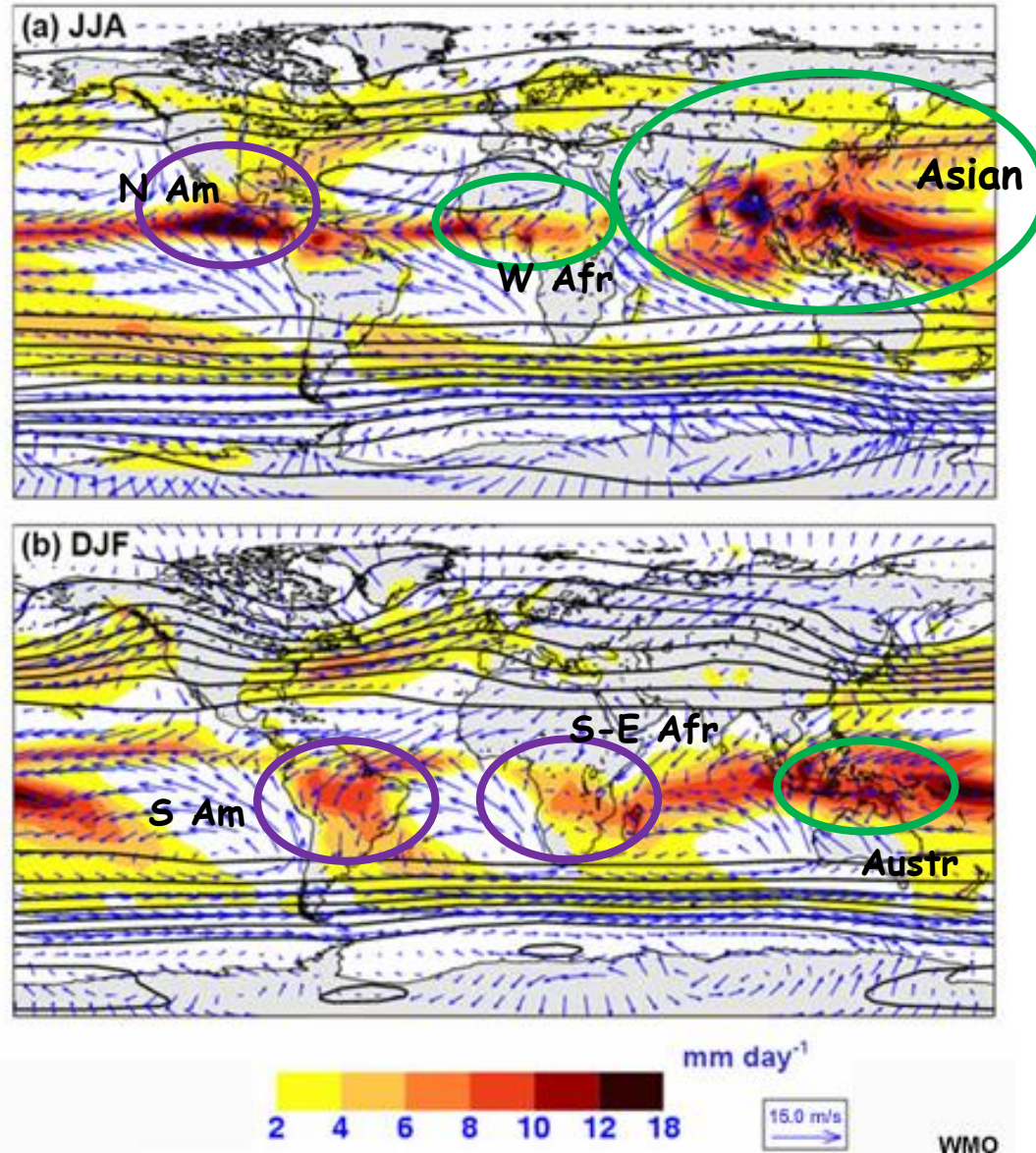


1979-1999 Precipitation from Xie and Arkin (1997); 1962-2001 wind and geopotential height from ERA-40.

http://www.goes-r.gov/users/comet/tropical/textbook_2nd_edition/media/graphics/seasonal_mean_precipitation.jpg

Climatology

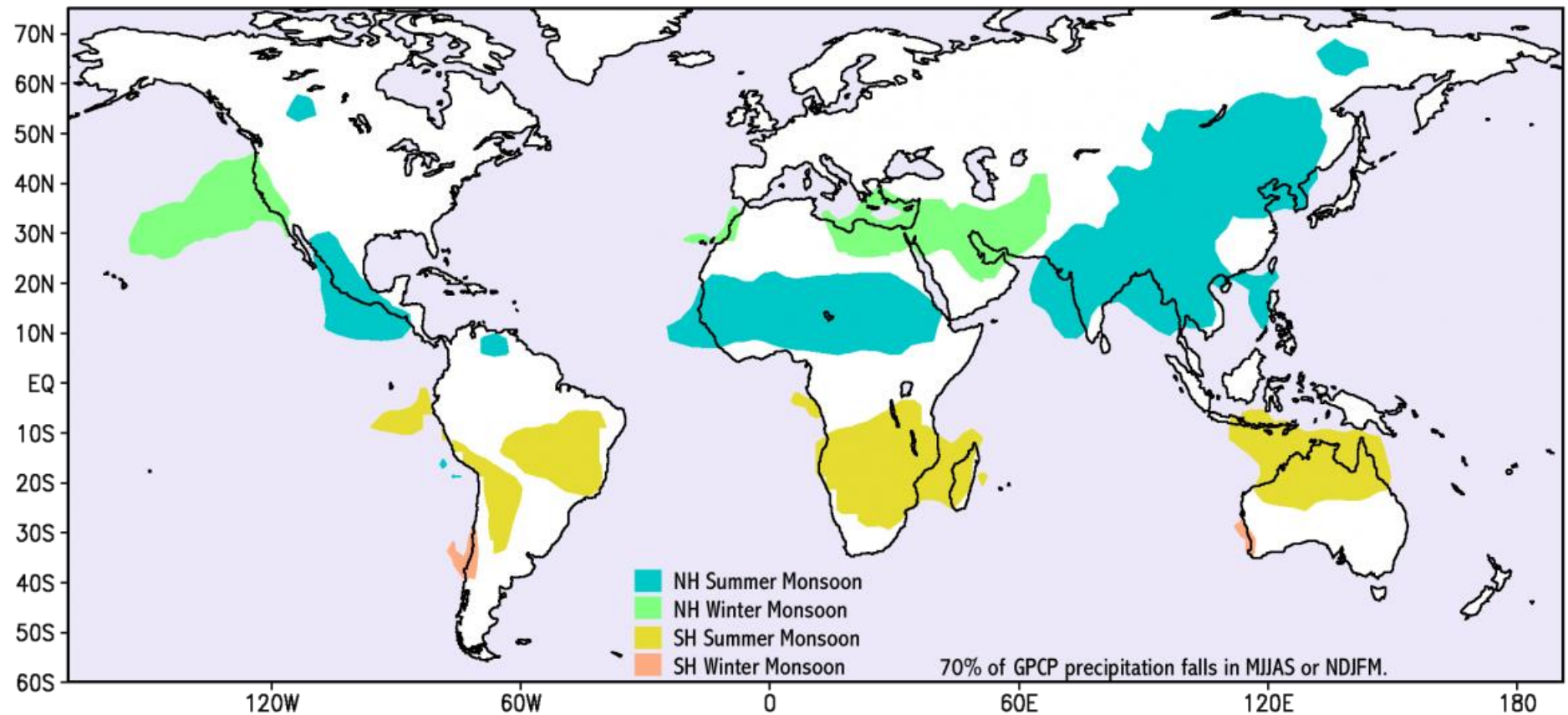
Mean precipitation (shaded), 925 hPa horizontal wind vectors, and 500 hPa geopotential heights (contours)



Monsoon:
Reversal of
winds
(classical def);
Winter - dry
Summer - rain

1979-1999 Precipitation from Xie and Arkin (1997); 1962-2001 wind and geopotential height from ERA-40.

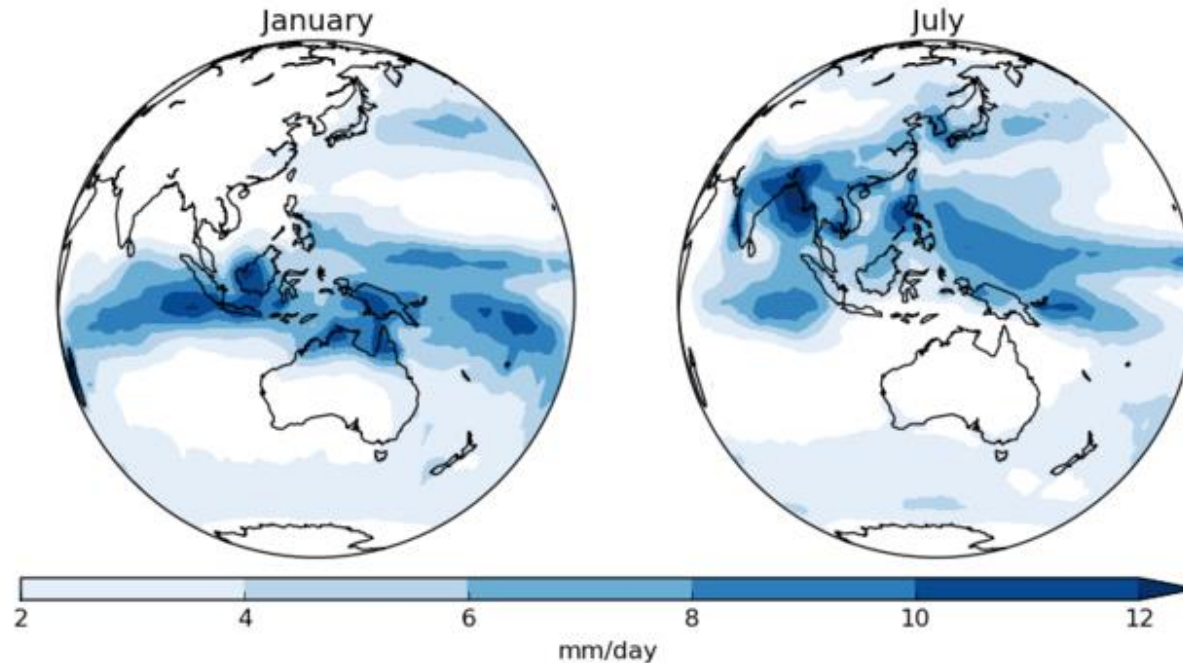
http://www.goes-r.gov/users/comet/tropical/textbook_2nd_edition/media/graphics/seasonal_mean_precipitation.jpg



Regions where at least 70% of annual precipitation occurs in the 5-month seasons indicated.

Another one of many possible definitions of monsoon regimes around the globe. (Data : GPCP 2.5 1979-2008 by P. Dirmeyer
<http://www.clivar.org/clivar-panels/monsoons>)

The Australian-Maritime Continent Monsoon



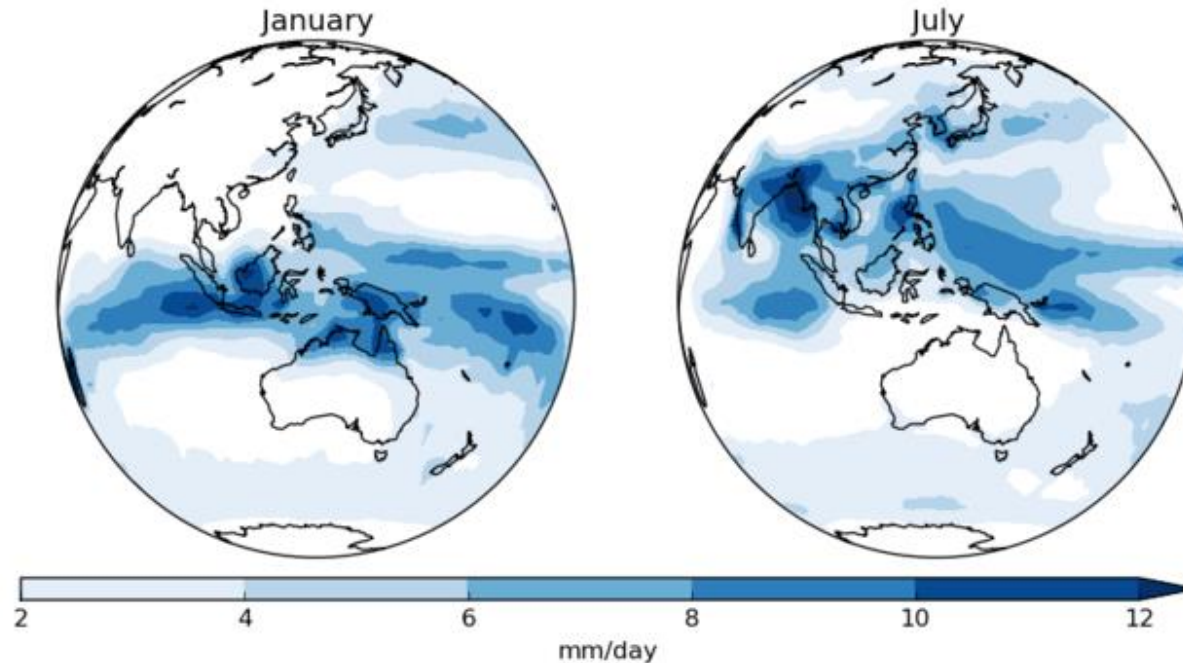
Rainfall daily averages (1979-2008) for the months of January (left) and July (right).

NOAA/OAR/ESRL PSD (<http://www.esrl.noaa.gov/psd/>)

<http://theconversation.com/explainer-what-is-the-australian-monsoon-69411>

- ✓ The monsoon influences the climate in northern Australia. Active phases of the monsoon bring heavy rainfall to the region.
- ✓ The socio-economical importance of the monsoon as a water source for the country.

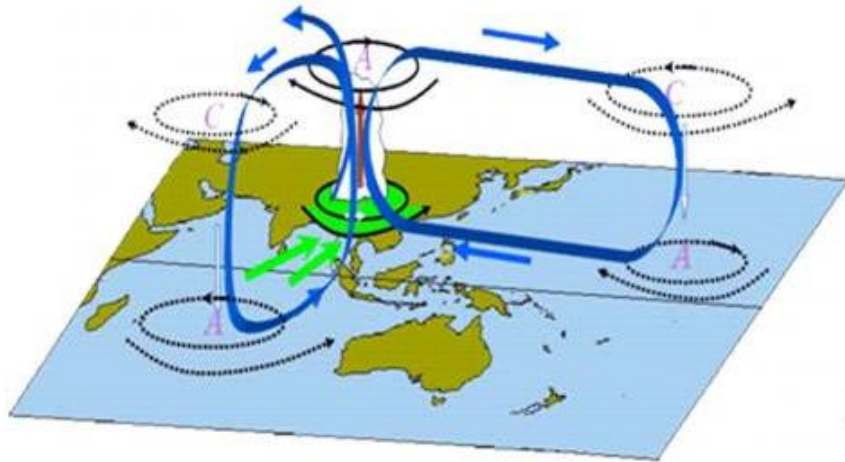
The Australian-Maritime Continent Monsoon



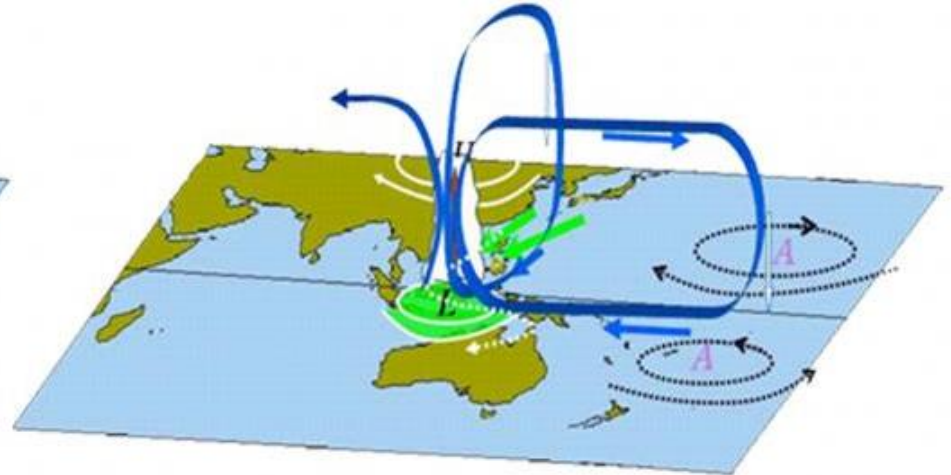
- ✓ The monsoon cycle follows the maximum solar heating as it shifts from its boreal summer location in Asia to the Maritime Continent and northern Australia.
- ✓ The north-south temperature gradient between the cold Asian land mass and the warm Maritime Continent strengthens cross-equatorial winds.

The Australian-Maritime Continent Monsoon

Northern Summer Broad-Scale Circulation



Northern Winter Broad-Scale Circulation



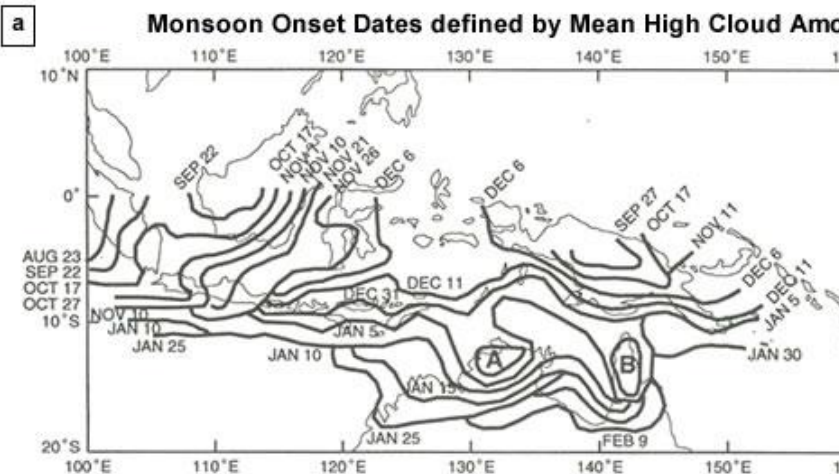
<http://www.clivar.org/asian-australian-monsoon>

- ✓ JJA: a cyclonic circulation with ascent over Southeast Asia centered on Myanmar and precipitation over India-Malaysia-Indonesia
- ✓ As the seasons progress the cyclonic circulation shifts southeastwards from Southeast Asia to north of Australia during DJF, bringing precipitation over North Australia/Maritime Continent.

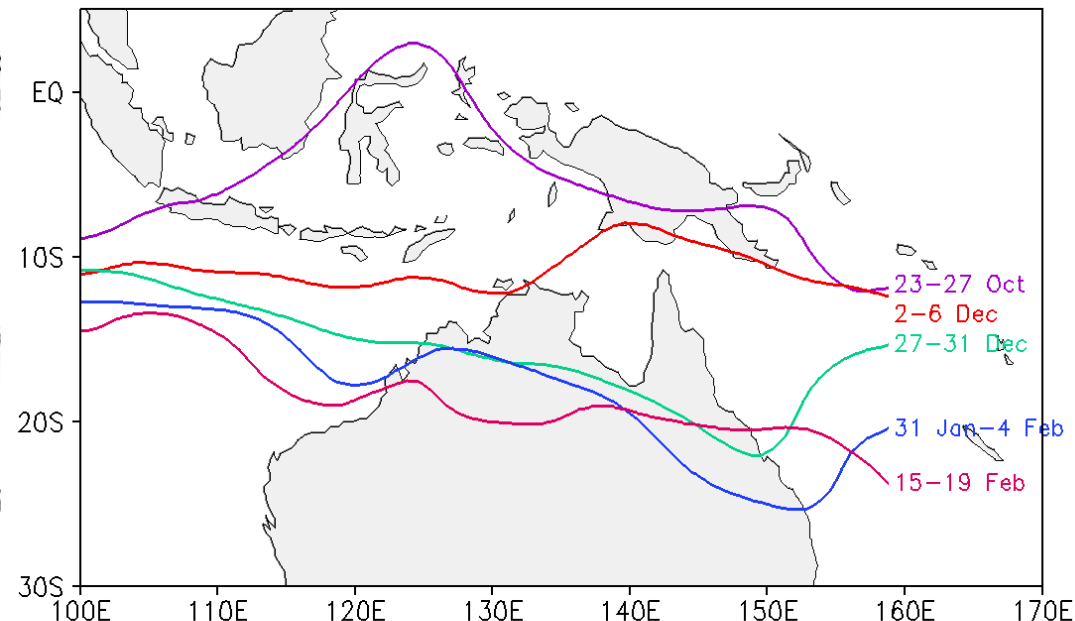
- <https://www.youtube.com/watch?v= fihEwMC83E>

The Australian-Maritime Continent Monsoon

- ✓ Its onset begins over Malaysia in late August and reaches its southernmost extent in early February over northern Australia
- ✓ The initial monsoon onset in Australia, as defined by the reversal of the winds, normally occurs in late December around Darwin.



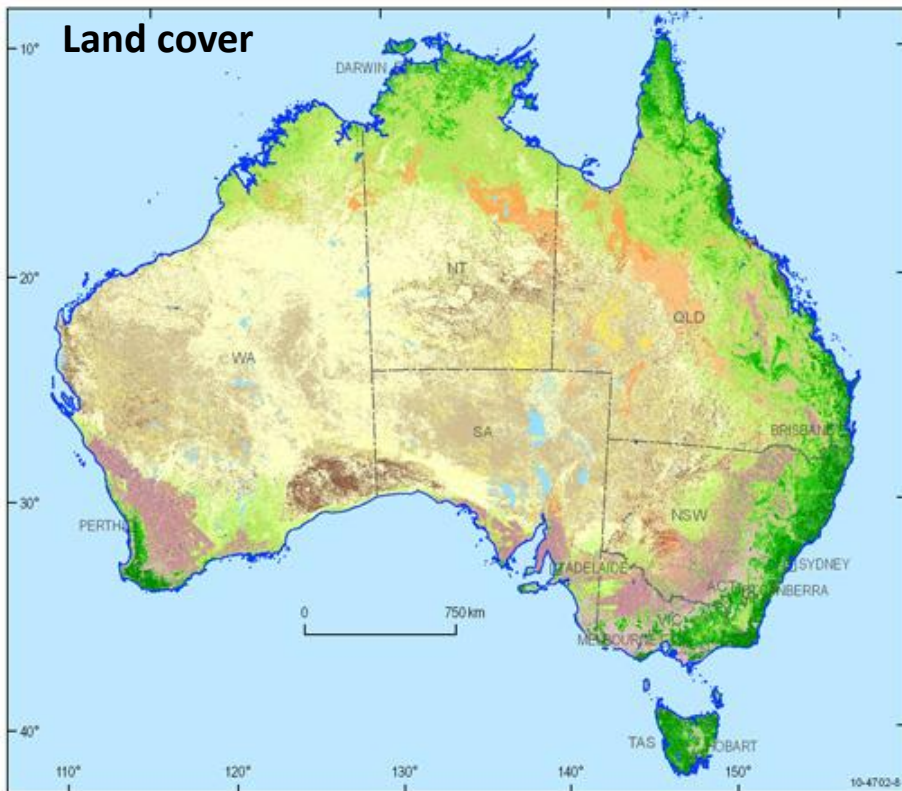
Onset Dates of the Australian Summer Monsoon



Data Source: Climatological (1979–2007) CMAP Precipitation

Criterion: $P \geq 5\text{mm/day}$

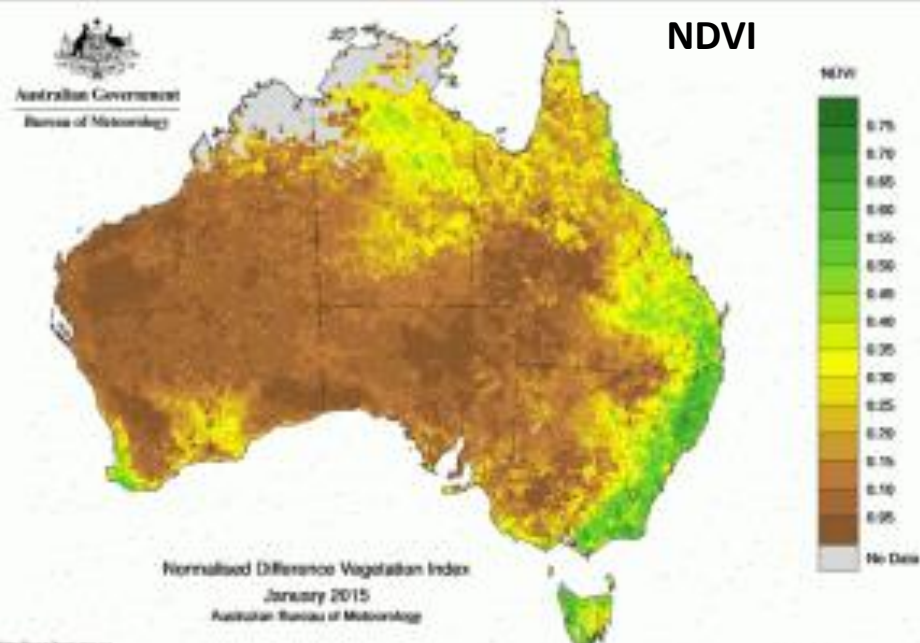
Land cover



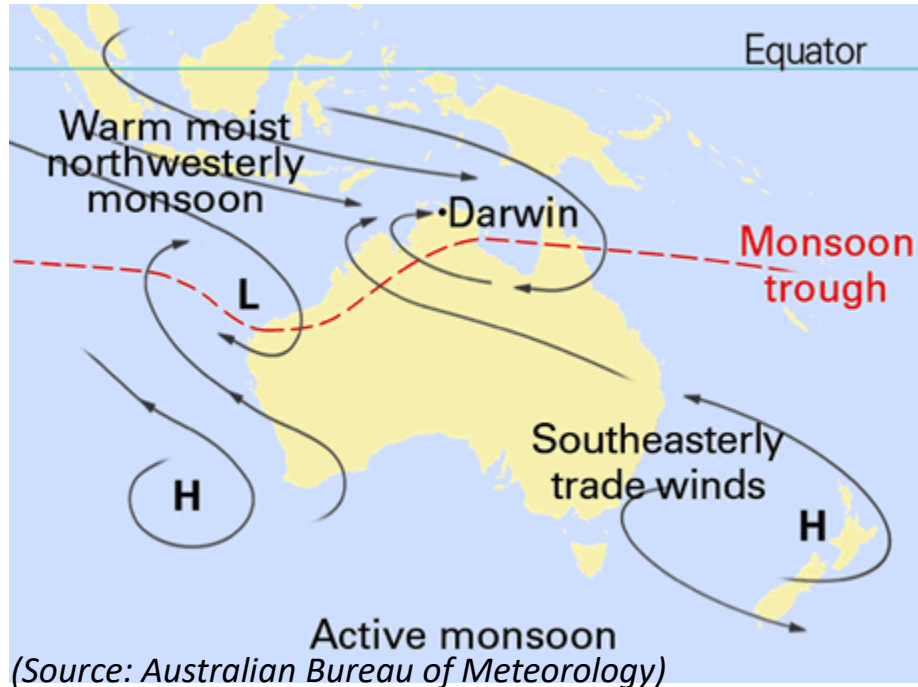
Precipitación media anual



NDVI



The Australian-Maritime Continent Monsoon



✓ Australia heats up as the DJF summer comes -> low pressure -> the monsoon trough moves over northern Australia, associated with influx of moist air from the surrounding oceans.

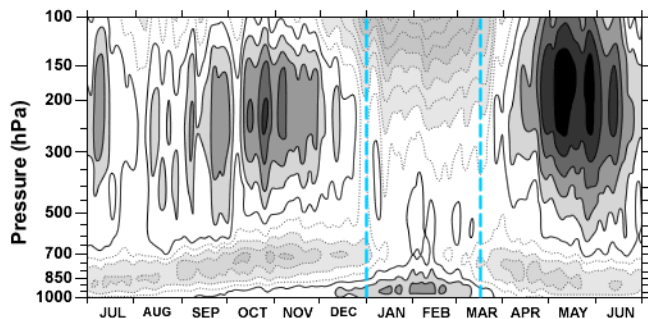
- ✓ **The monsoon trough:** portion of the ITCZ as depicted by a line on a weather map showing the locations of minimum sea level pressure. It is a convergence zone between the wind of the southern and northern Hemispheres.
- ✓ The monsoon trough is positioned over northern Australia in the austral summer, and moves northward during the austral winter.

The Australian-Maritime Continent Monsoon

- ✓ Much of the precipitation in the Maritime continent is produced by mesoscale convective systems forced by sea/land breezes or large-scale disturbances.
- ✓ Tropical cyclone formation is also favored in the monsoon trough during the active monsoon

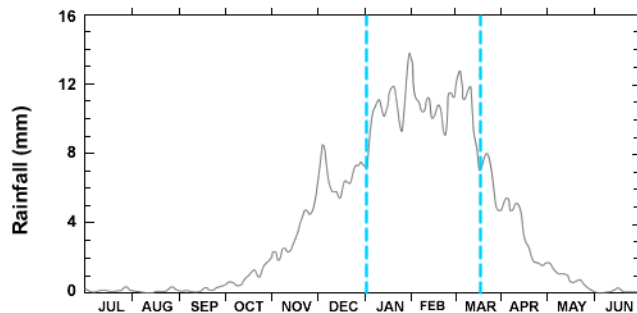
Mean Daily Zonal Winds and Precipitation at Darwin, Australia

b Zonal Wind



- ✓ Northern Australia: prevailing surface wind from the east or southeast.

c 6 Station Average Rainfall



- ✓ During active monsoon the winds shift to become westerly or northwesterly at the surface.

[Animation of the Asian-Australian Monsoons](#)

Drosowsky 1996

Mean daily zonal winds (b) and precipitation (c) at Darwin Australia.

The Australian-Maritime Continent Monsoon

Monsoon rainfall variability?

- ✓ The tropical oceans just to the north of Australia: Warmer-than-average SST and greater evaporation contributed to an early onset of monsoon
- ✓ ENSO (Monsoon inter annual variability):
 - ✓ Later than normal onsets are often associated with El Niño conditions in the Pacific,
 - ✓ while La Niña is usually associated with an early onset.
- ✓ Future impacts of the climate change over the monsoon?
Open Question...