

# INTRASEASONAL VARIABILITY OF THE SOUTH AMERICAN MONSOON

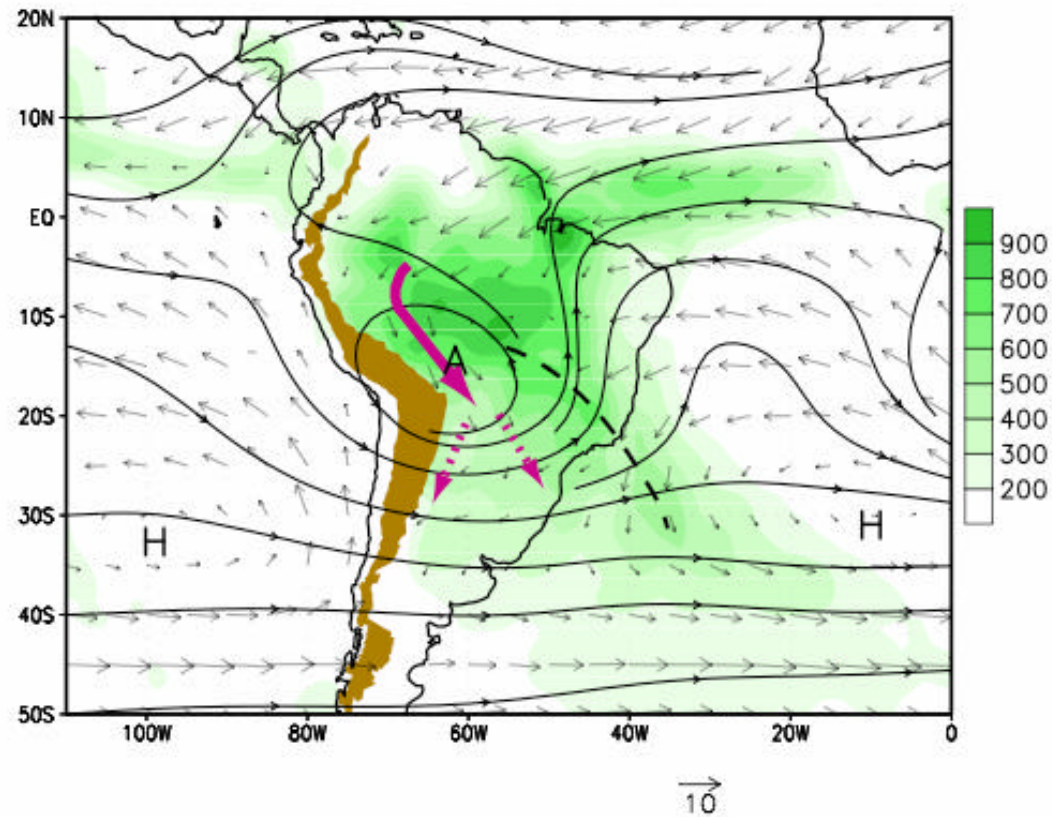
## Topics

Westerly and easterly wind regimes  
The diurnal cycle of rainfall in different regimes  
Simulations with the UCLA AGCM

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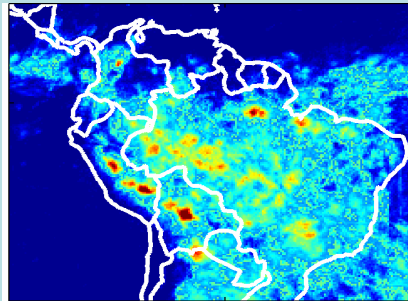
## The South American Monsoon System



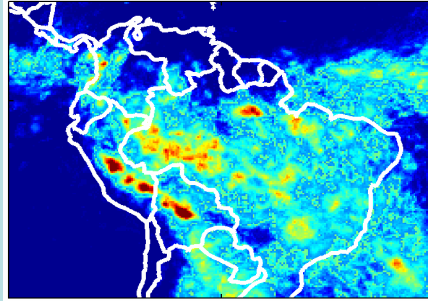
Mean (1979-1995) December-February 925 hPa vector wind (m/s), 200 hPa streamlines, and merged satellite estimates and station observations of total precipitation (shading). Circulation data are taken from the NCEP/NCAR reanalysis archive. The position of the Bolivian High is indicated by "A". The subtropical surface high pressure centers are indicated by "H"s. Precipitation amounts are in mm. The brown shading corresponds to surface elevations of greater than 500 m. The purple arrows indicate the location of the low level jet.

# PERSIANN Diurnal Rainfall (DJF 2002)

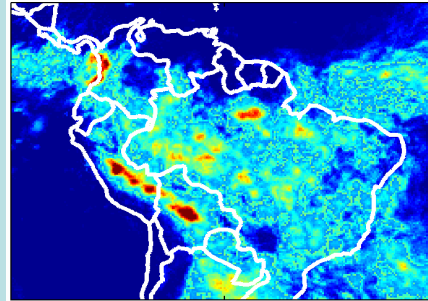
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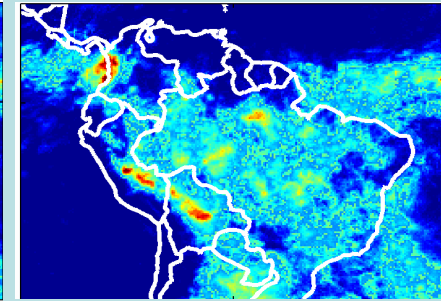
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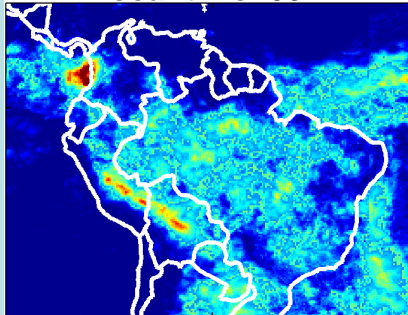
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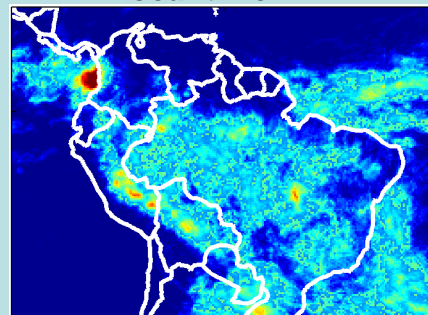
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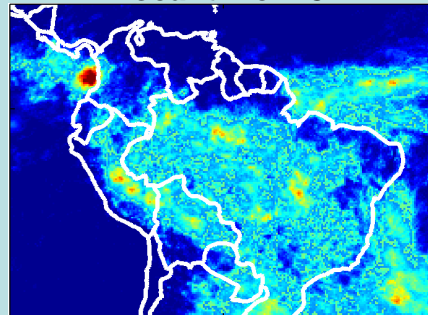
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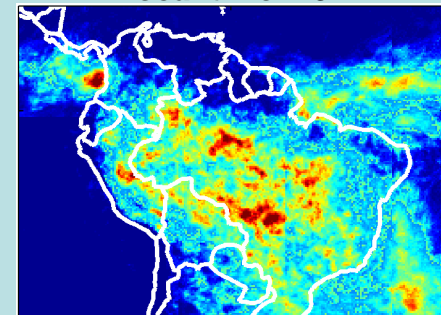
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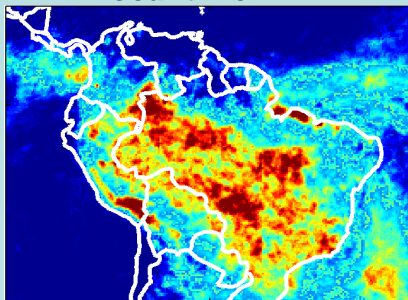
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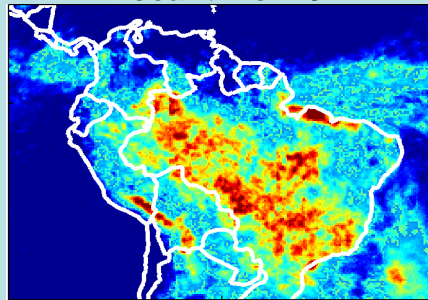
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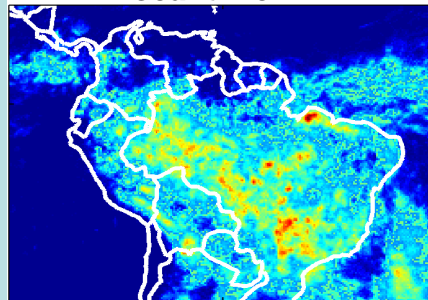
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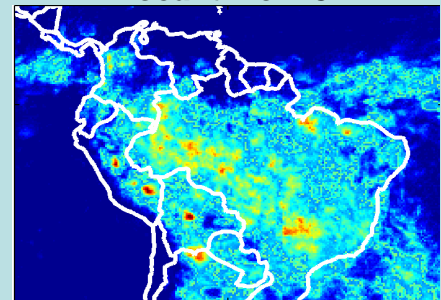
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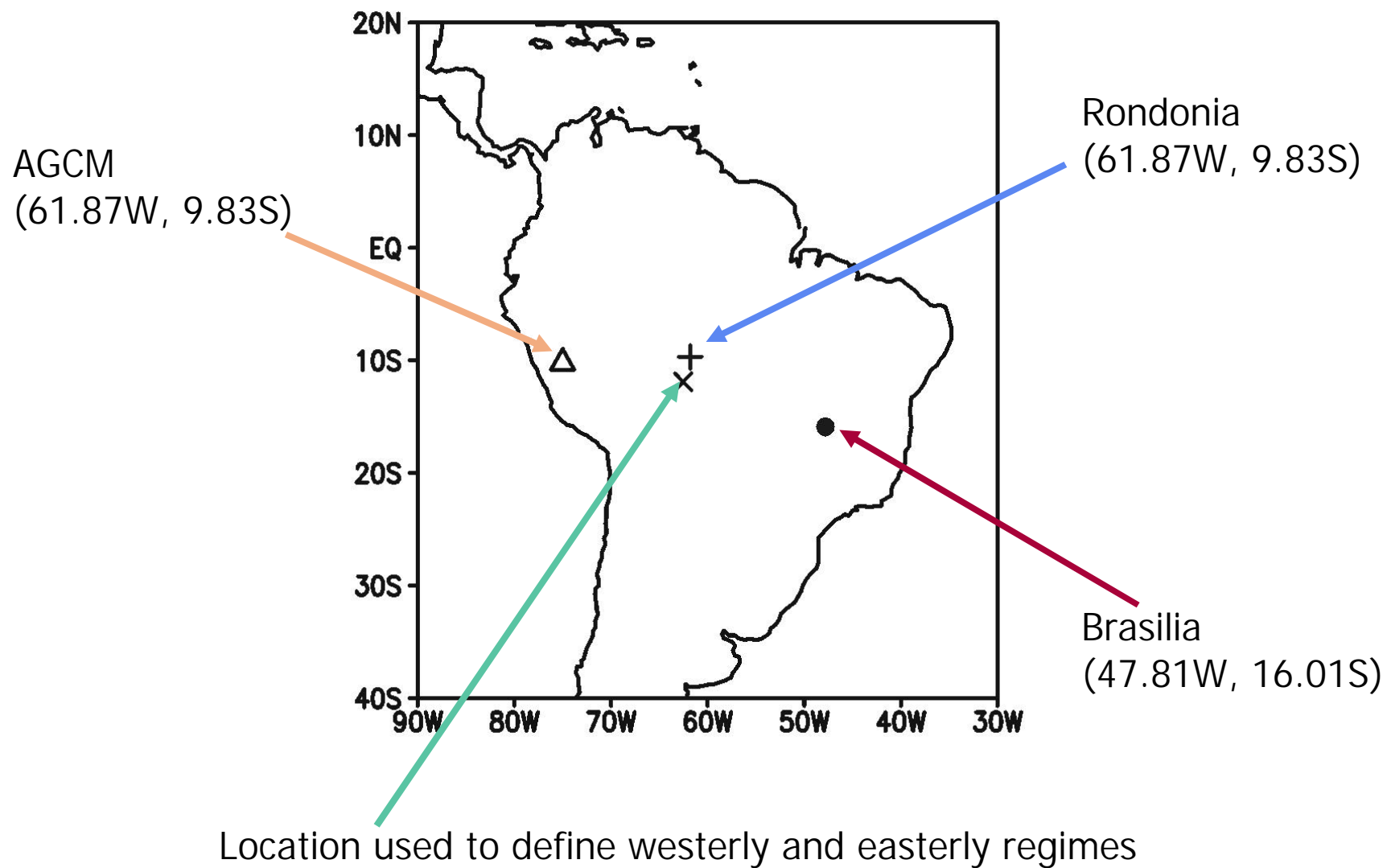
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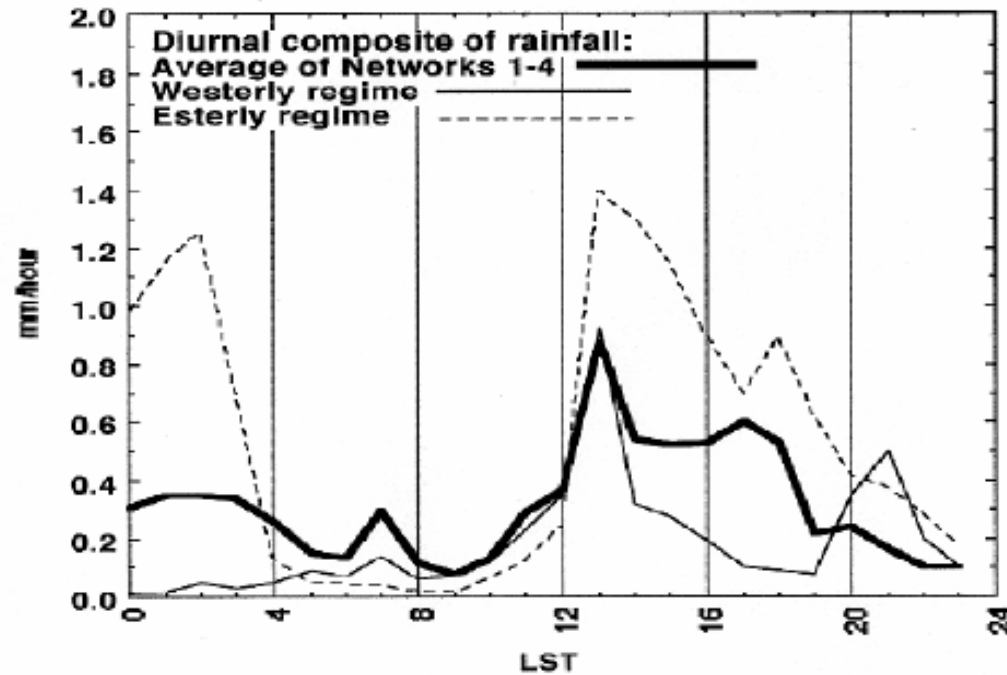
*Local time: 23 hr*



# Key locations in this study



## Mean observed precipitation in Rondonia








**Figure 6** - Mean diurnal cycle of rainfall for networks 1-4 (full thick line), average of the westerly regime (thin full line), and easterly regime (thin broken line). Values are in mm/hour and time is LST.

Marengo et. al (2005)

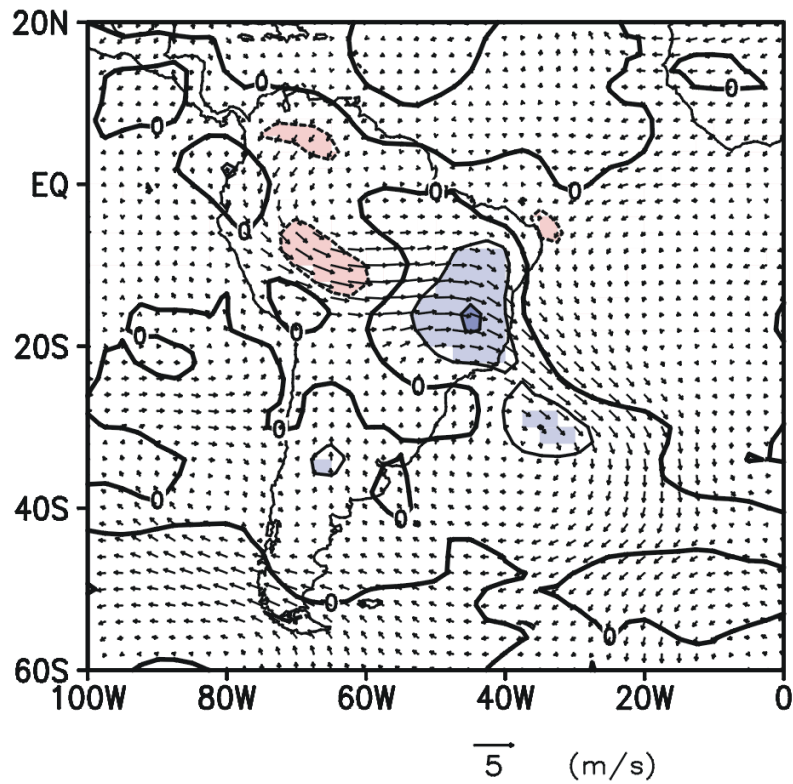
**Westerly (easterly) regime: Winds below 850 mb from west (east) during at least three consecutive days**

**Table 1. List of the days belonging to easterly and westerly regime in NCEP/NCAR Reanalysis. The year listed corresponds to the last month of the DJF period. (\* Year chosen for composite. Total westerly days for composite are 136 and total easterly days for composite are 59. )**

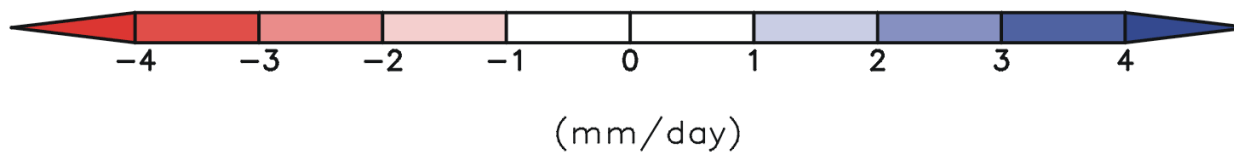
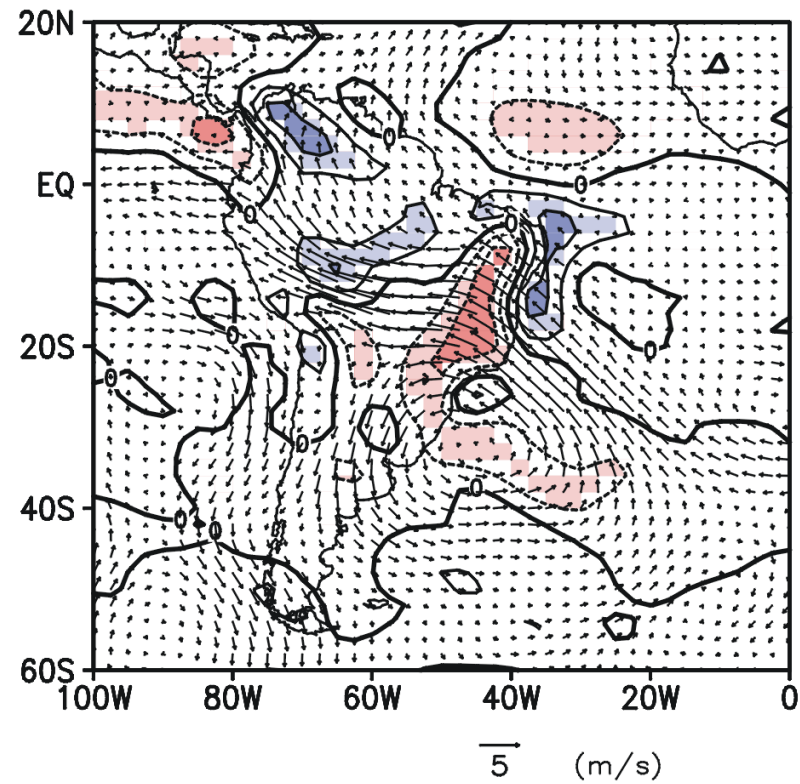
	year	days of westerly	days of easterly	year	days of westerly	days of easterly
	1981*	50	20	1993	53	0
	1982	46	0	1994	76	0
	1983	60	0	1995	65	0
	1984	41	0	1996	67	4
	1985	44	6	1997	57	0
	1986*	31	11	1998	39	0
	1987*	12	11	1999*	22	9 
	1988	66	0	2000	65	0
	1989	70	0	2001	49	0
	1990	60	0	2002	31	5
	1991	49	0	2003*	21	8 
	1992	53	0	2004	59	0

# 850mb Velocity and Precipitation Anomaly (NCEP Reanalysis)

## Westerly Regime

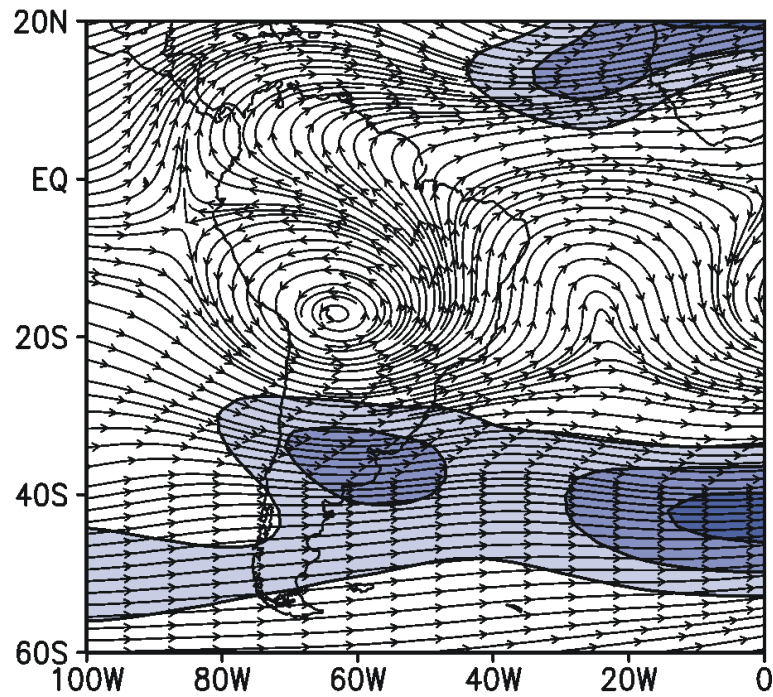


## Easterly Regime

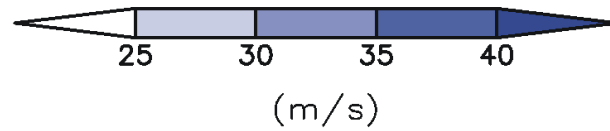
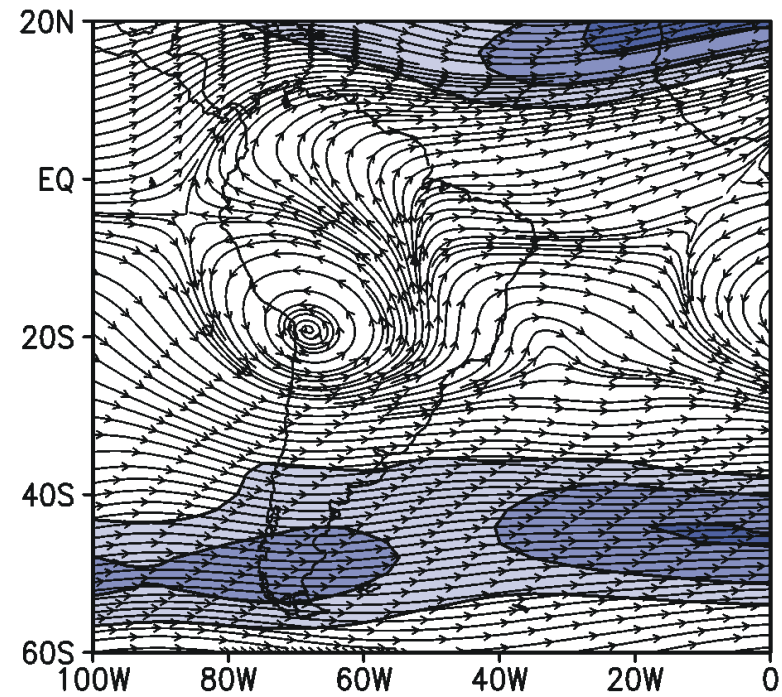


# 200mb Streamline and Windspeed (NCEP Reanalysis)

## Westerly Regime



## Easterly Regime

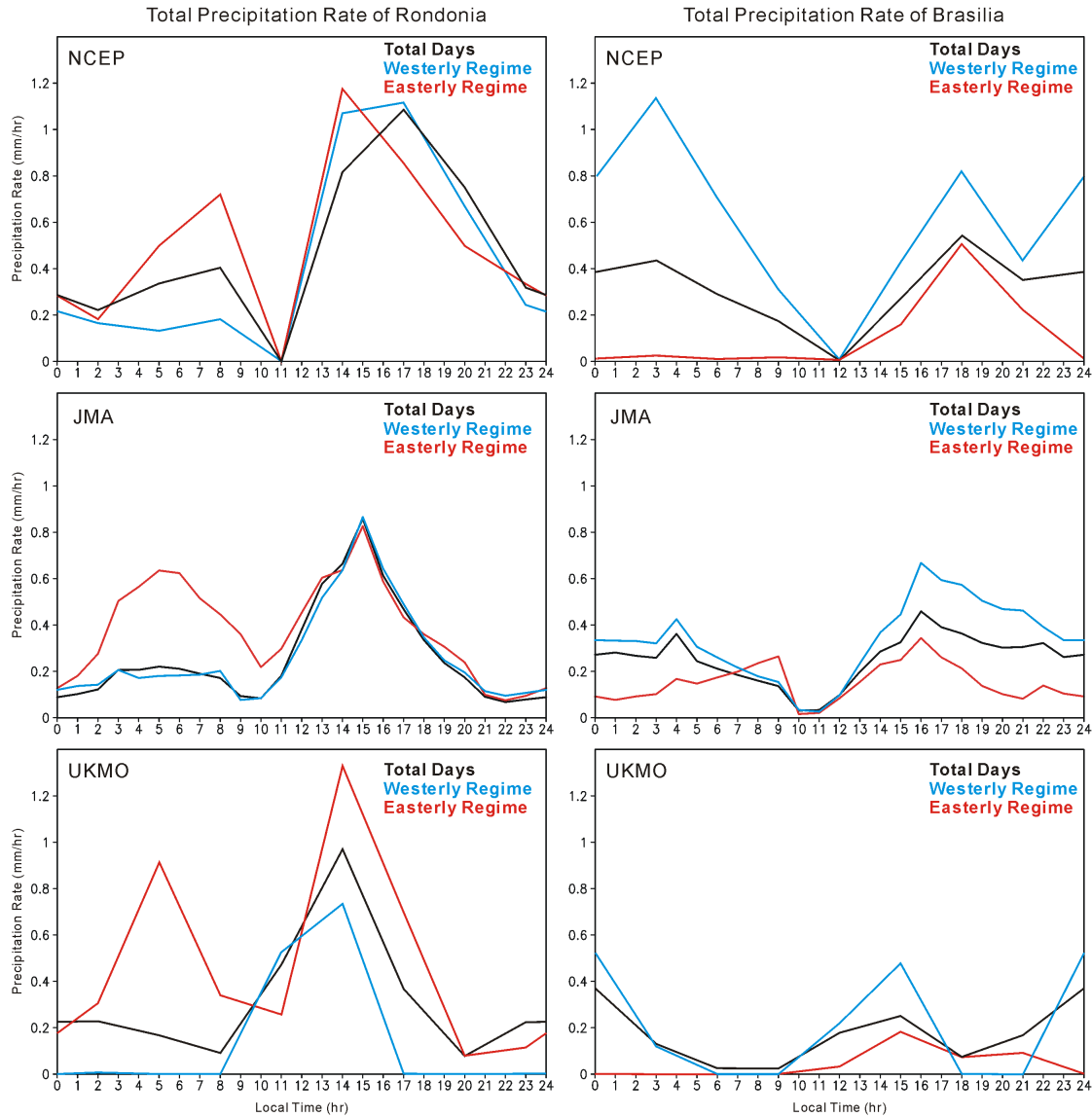




# Diurnal cycle of precipitation (CEOP MOLTS)

## Rondonia

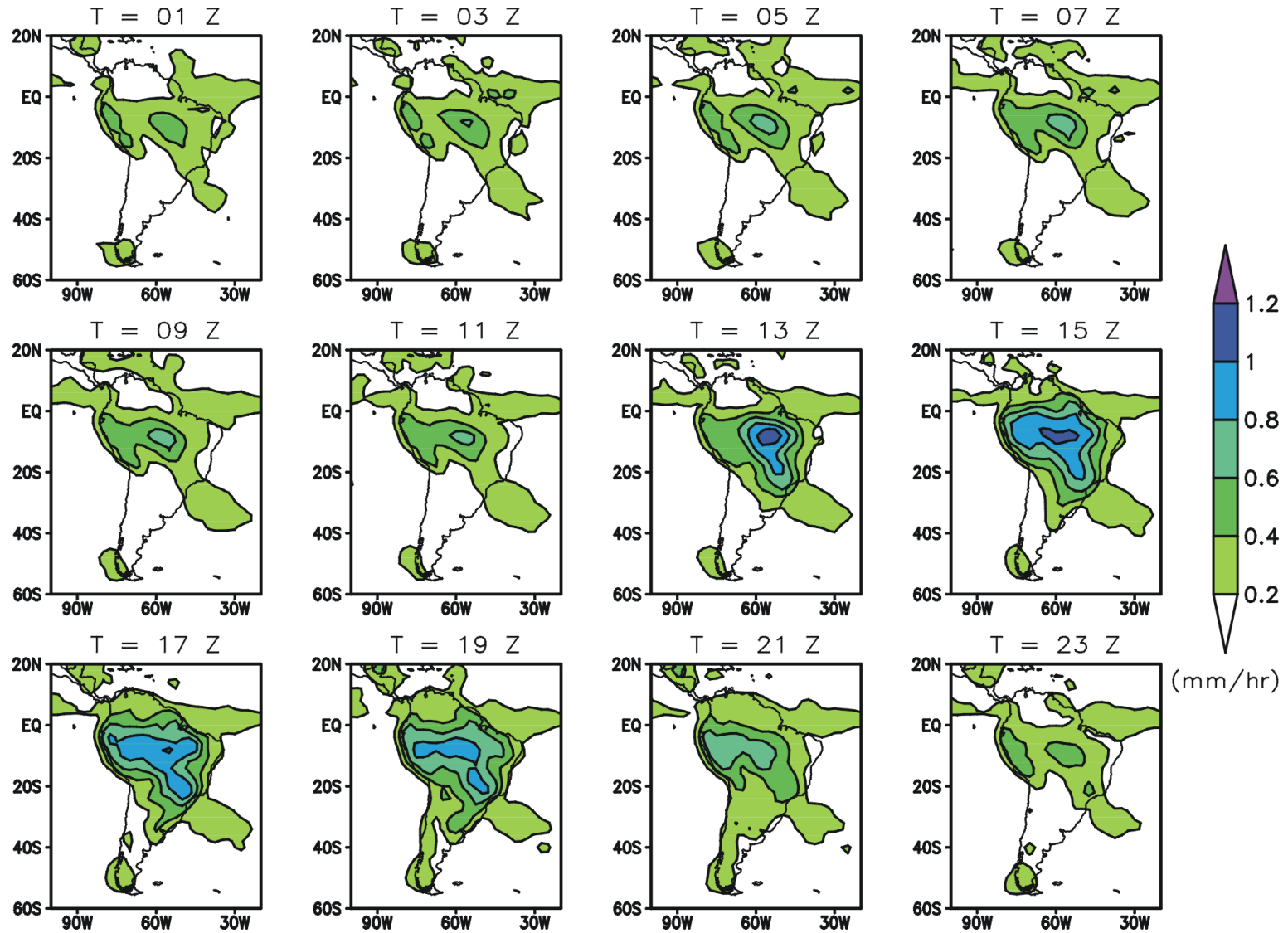
## Brasilia



# UCLA AGCM Description

- Version 7.1
- Resolution: high  $2.5^\circ\text{lon} \times 2^\circ\text{lat} \times 29$  levels  
low  $5^\circ\text{lon} \times 4^\circ\text{lat} \times 15$  levels
- Harshvardhan (1987) radiation scheme
- Prognostic version (Pan and Randall 1998) of the Arakawa-Schubert (1974) cumulus parameterization
- The PBL top is a coordinate surface; a cloudy sublayer develops if this top is above condensation level (Deardorff

# Simulated Diurnal Cycle of Precipitation - January



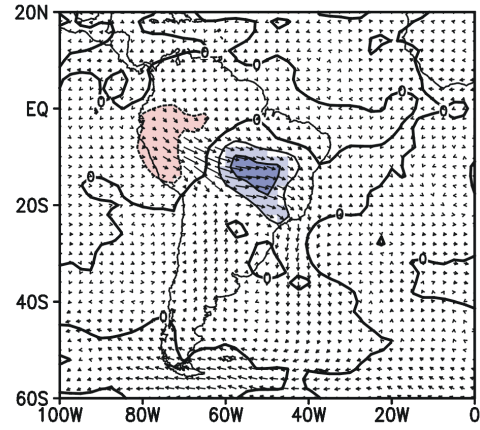
(UCLA AGCM v7.1H; 2.5x2x29)

**Table 2. List of the days of Easterly and Westerly Regime in the UCLA AGCM simulations**

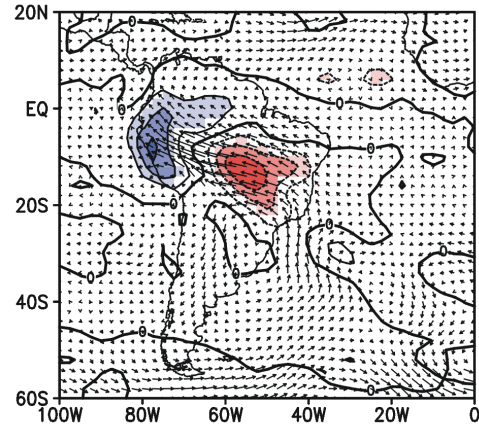
exp	days of westerly	days of easterly
1	52	17
2	44	10
3	31	19
4	45	24
5	42	30
6	43	21
total	257	121

850mb Velocity and Precipitation Anomaly (UCLA AGCM v7.1H)

Westerly Regime

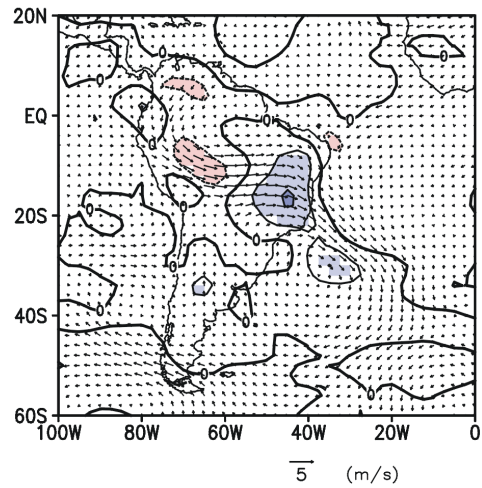


Easterly Regime

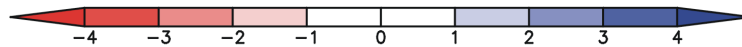
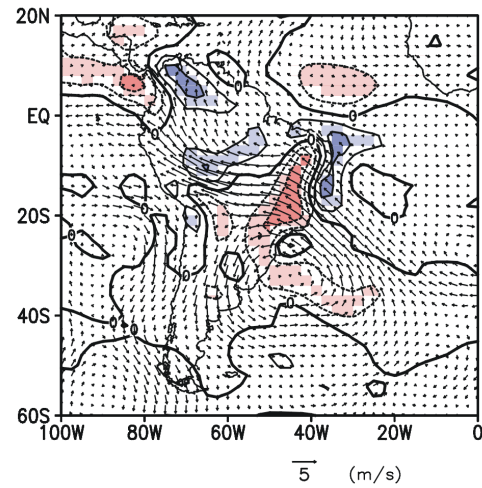


850mb Velocity and Precipitation Anomaly (NCEP Reanalysis)

Westerly Regime



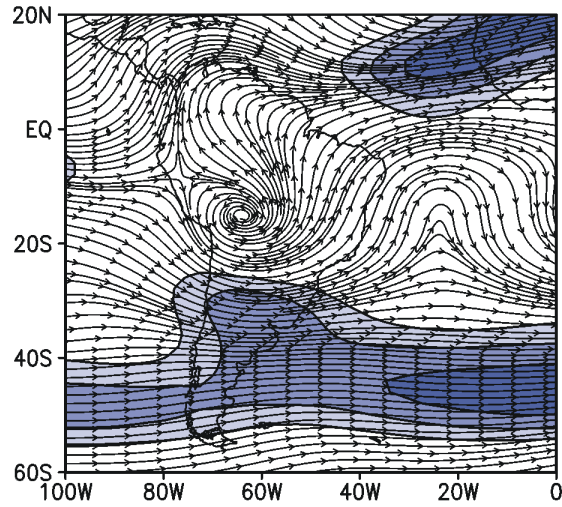
Easterly Regime



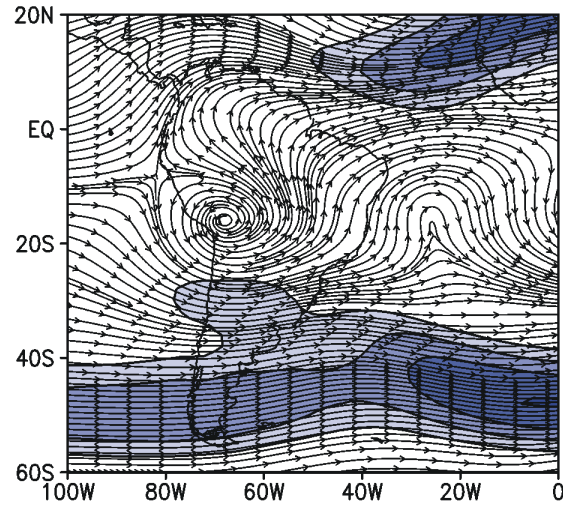
(mm/day)

200mb Streamline and Windspeed (UCLA AGCM v7.1H)

Westerly Regime

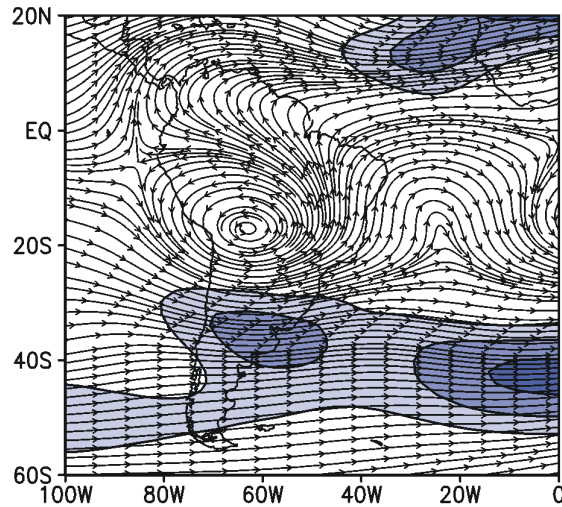


Easterly Regime

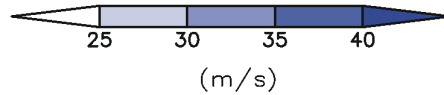
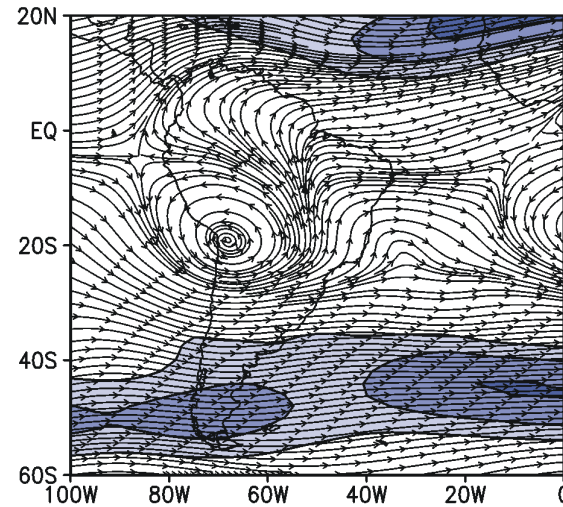


200mb Streamline and Windspeed (NCEP Reanalysis)

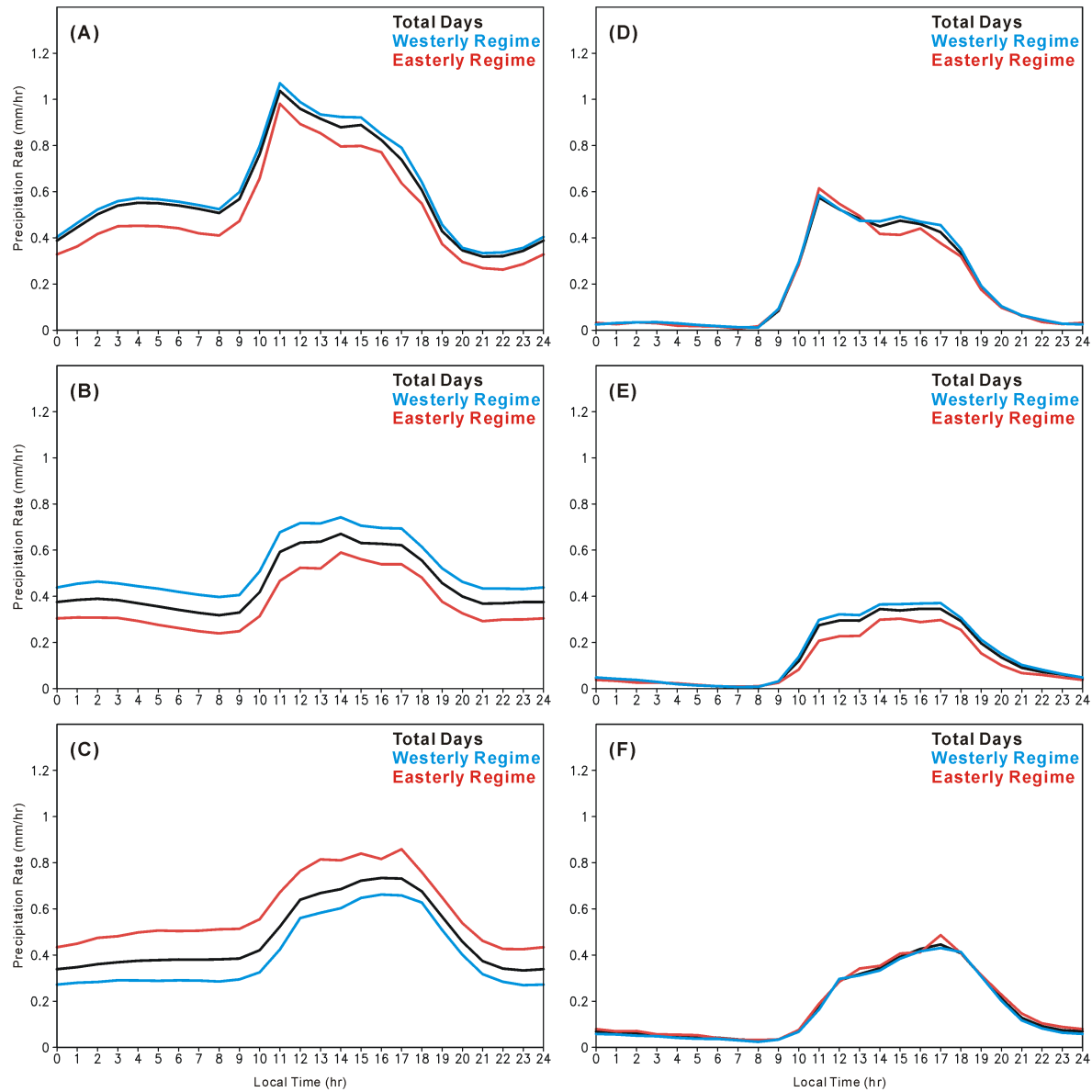
Westerly Regime



Easterly Regime



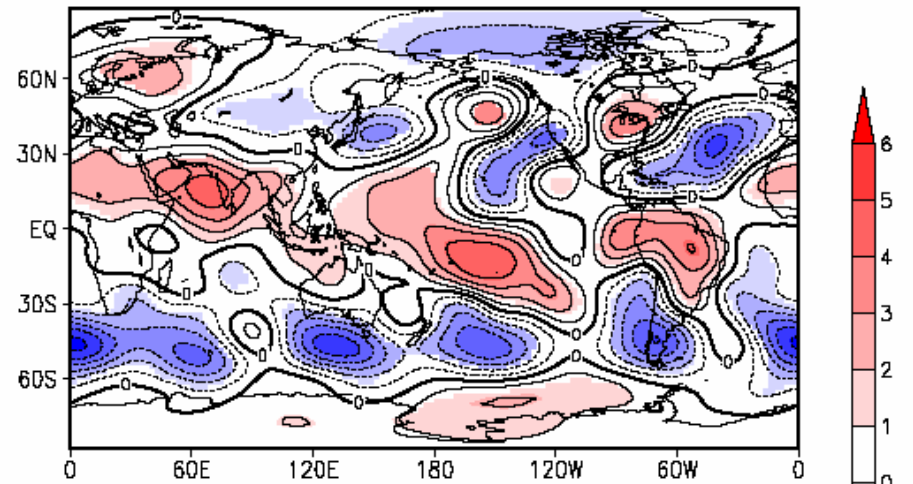
# Diurnal cycle of precipitation (AGCM)



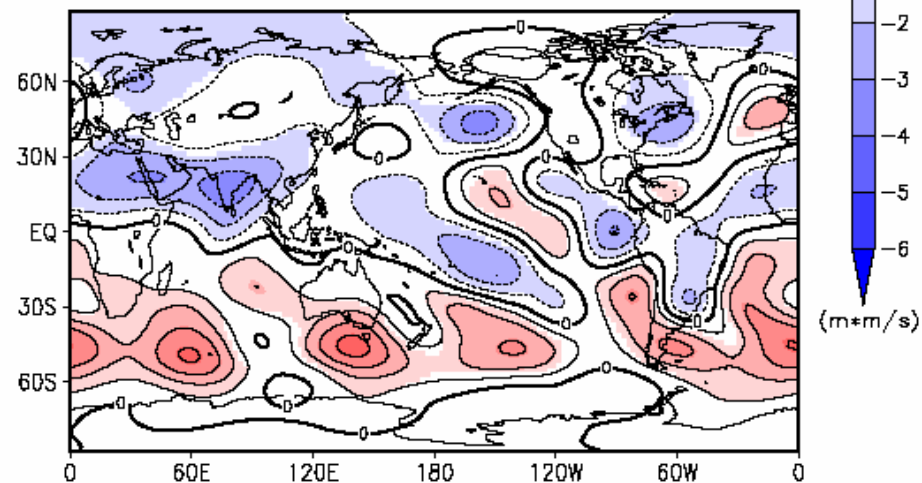
# A global connection?

200mb Stream Function Anomaly (UCLA AGCM v7.1H)

Easterly Regime



Westerly Regime



(m\*s/s)



# Summary

- In Central Amazonia, westerly and easterly wind regimes were defined by the persistence of low-level winds. WWR have a strong interannual variability, EWR are much less common
- WWR and EWR show a dipole pattern in precipitation, with poles in northwestern and southwestern Amazonia.
- SAMS upper-level high is weaker during EWR than WWR.
- EWR days have a strong precipitation maximum in the early morning, and more rainfall than WWR days. There are MELTS from different centers, particularly in Brasilia
- The AGCM captures the dipole pattern in rainfall, but the diurnal cycles in the WWR and EWR are very similar. The simulated intraseasonal variability is, therefore, weaker than in the observation