

CLIMA E RECURSOS HÍDRICOS NO BRASIL

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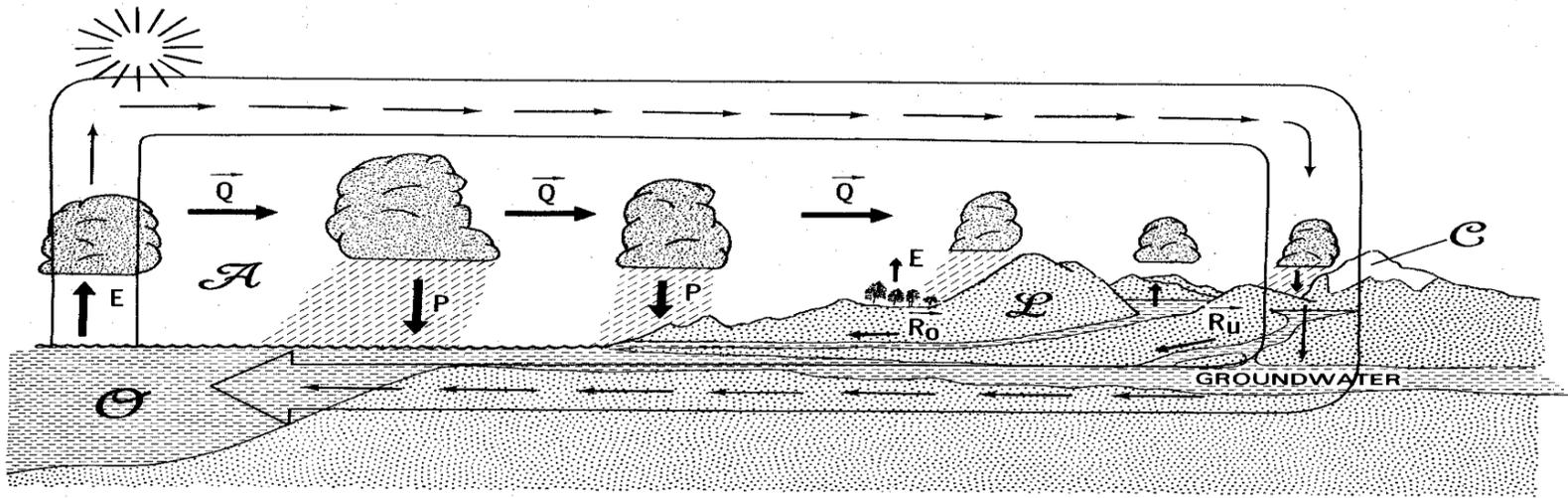


FIGURE 12.1. Schematic diagram of the atmospheric and terrestrial branches of the hydrological cycle showing the importance of evaporation E , advection of water vapor in the atmosphere Q , precipitation P , river runoff R_0 , and underground runoff R_u .

(Peixot & Oort, 1992)

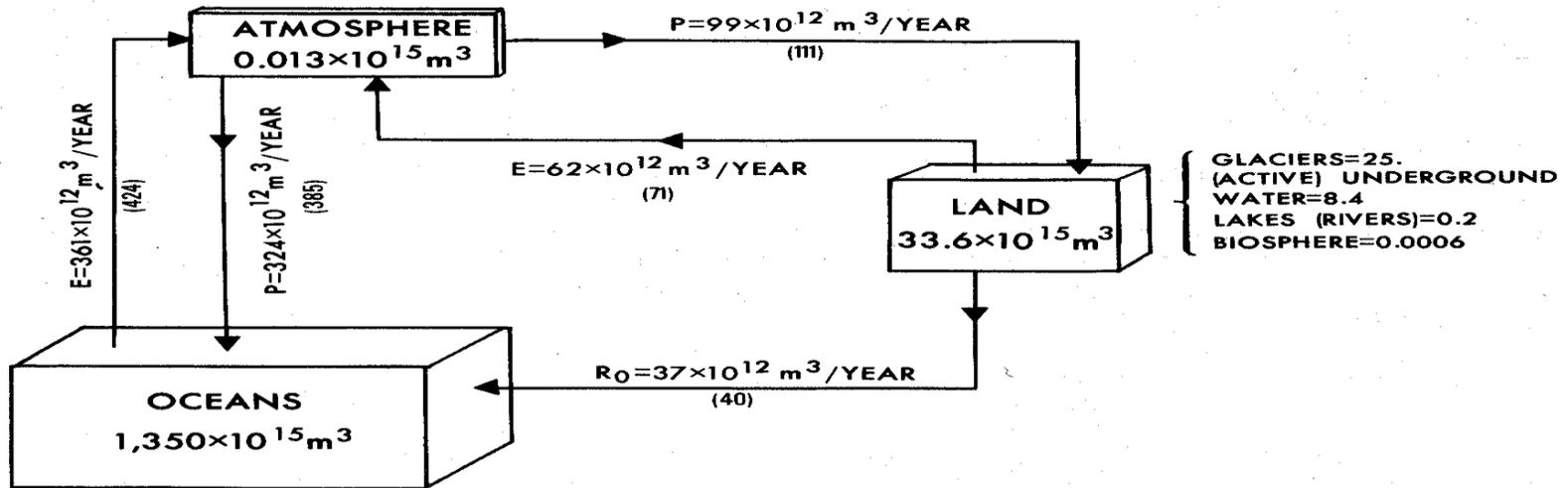


FIGURE 12.2. The amounts of water stored in the oceans, land, and atmosphere, and the amounts exchanged annually between the different reservoirs through evaporation, precipitation, and runoff (estimates are from Peixoto and Kettani, 1973, and, in parentheses, from Baumgartner and Reichel, 1975).

Divergência do vapor d'água – média zonal 0,01 m ano⁻¹

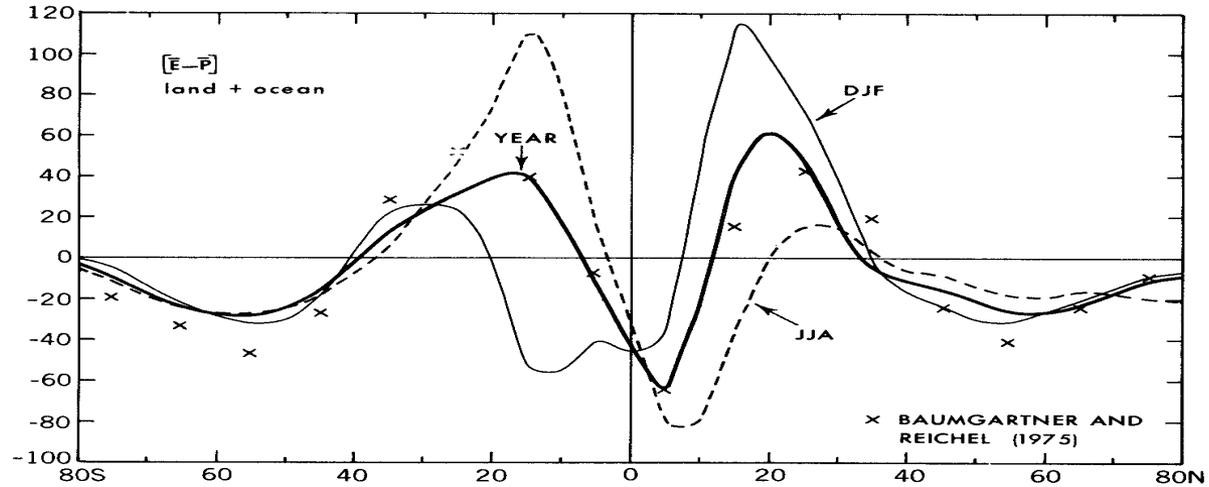


FIGURE 12.16. Meridional profiles of the zonal-mean divergence of the total water vapor transport $[\text{div } \mathbf{Q}] \approx [E - P]$ in 0.01 m yr^{-1} for annual, DJF, and JJA mean conditions. Some annual-mean estimates of $E - P$ by Baumgartner and Reichel (1975) are added for comparison (see also Table 7.1).

(Peixot & Oort, 1992)

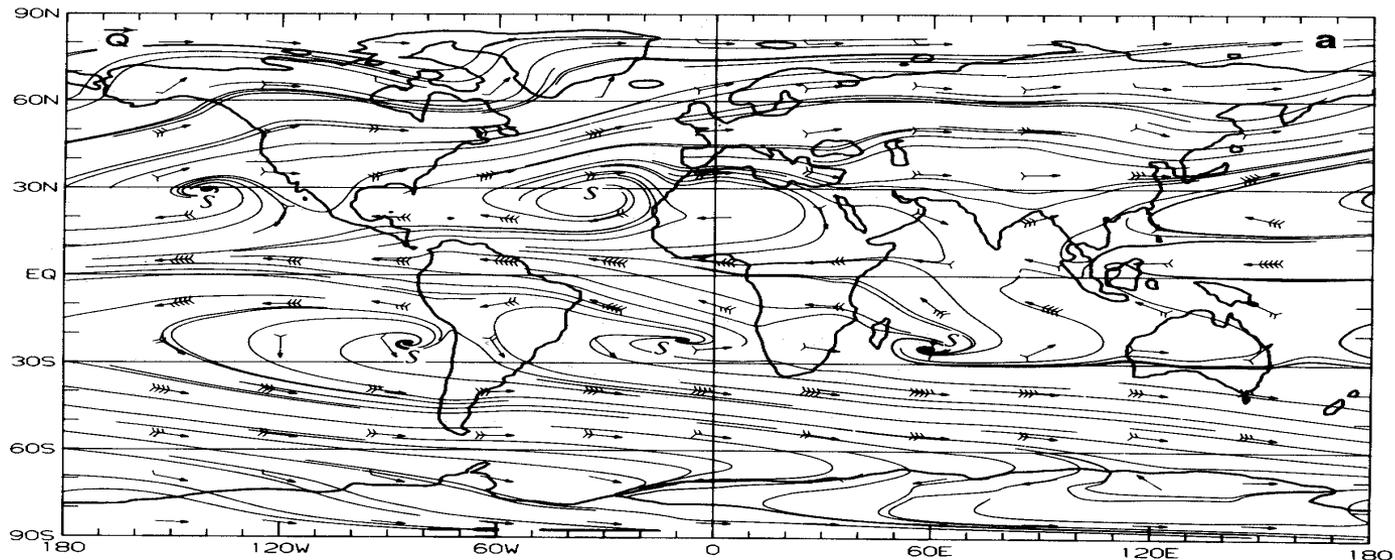


FIGURE 12.17a

Resultados NCEP 2010

(Saha et al. 2010)

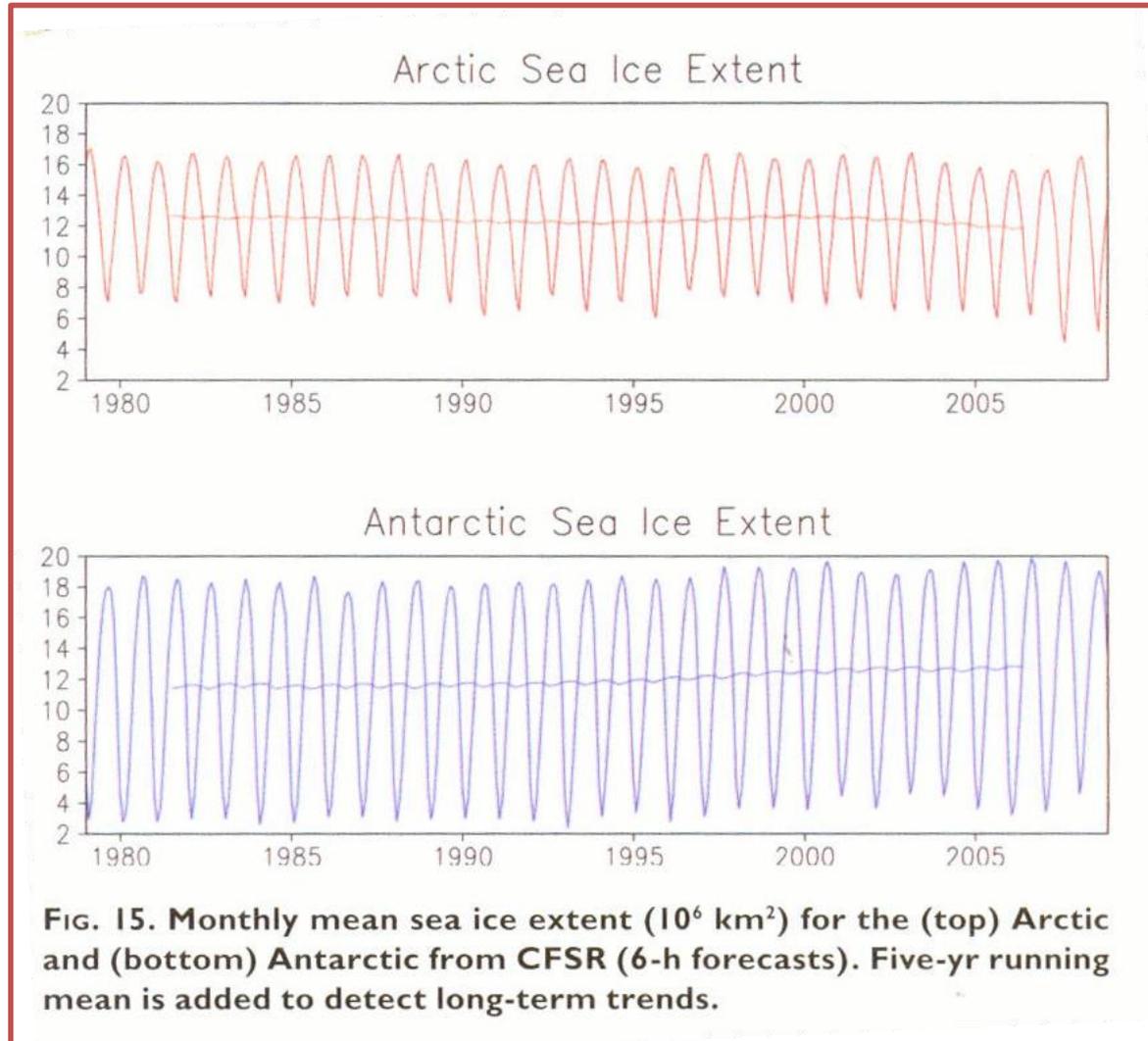
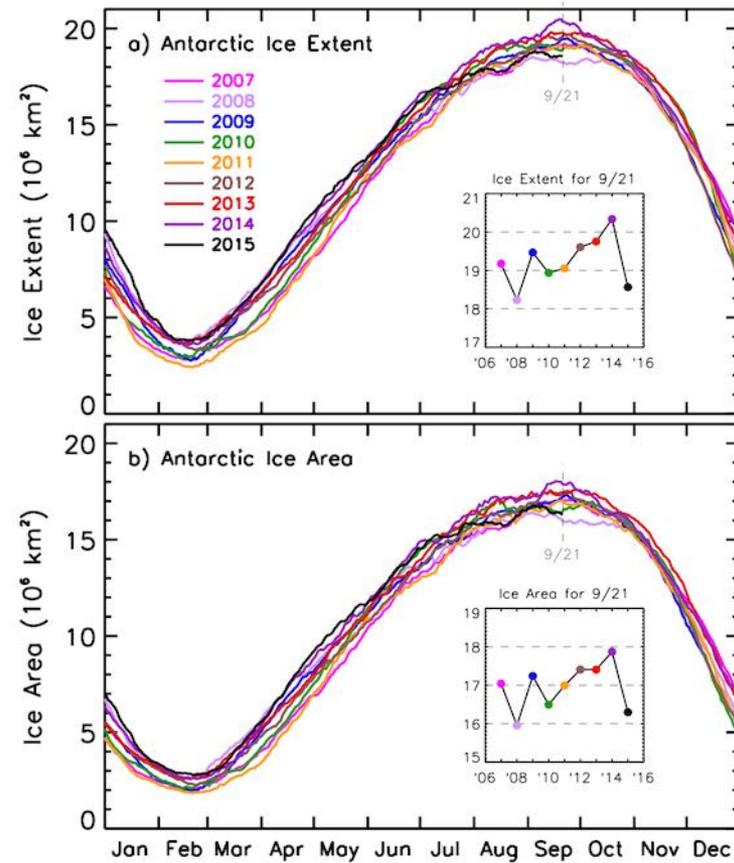
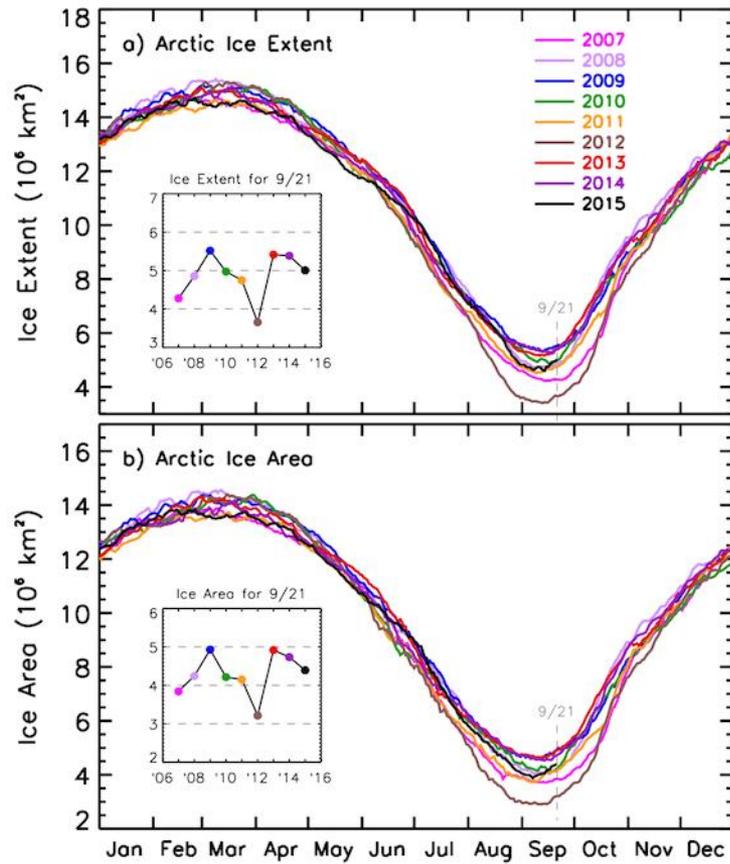
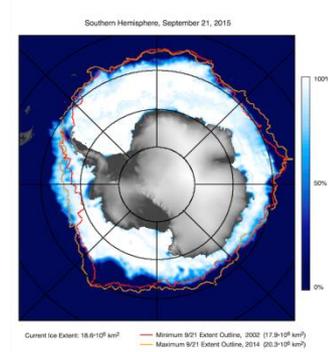
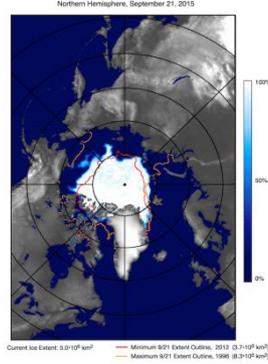


FIG. 15. Monthly mean sea ice extent (10^6 km^2) for the (top) Arctic and (bottom) Antarctic from CFSR (6-h forecasts). Five-yr running mean is added to detect long-term trends.



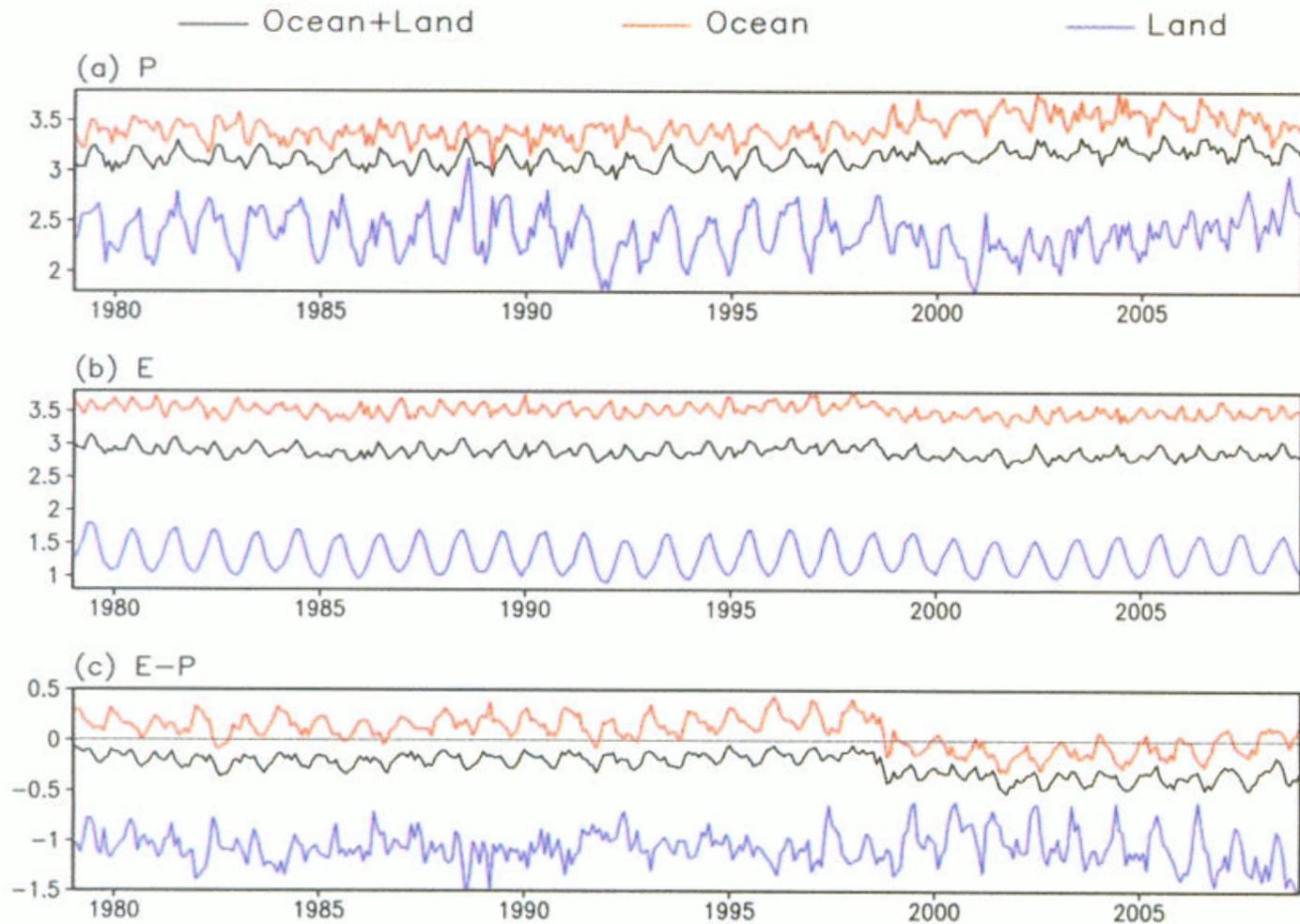


FIG. 21. Global average of monthly mean (a) precipitation, (b) evaporation, and (c) evaporation minus precipitation. Averages over ocean (red), land (blue), and ocean plus land (black) are plotted. (Units: mm day⁻¹)

(Saha et al. 2010)

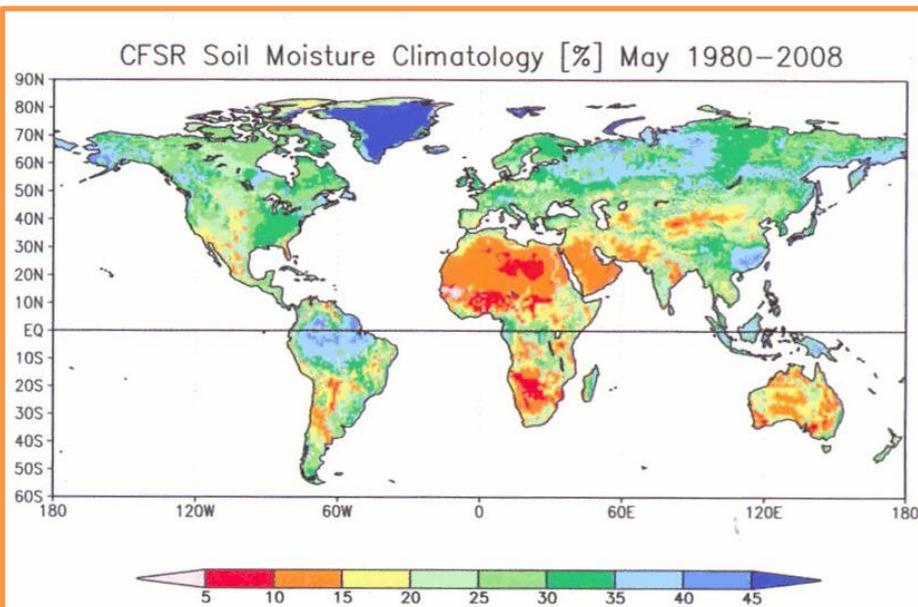


FIG. 17. The 2-m volumetric soil moisture climatology of CFSR for May averaged over 1980–2008.

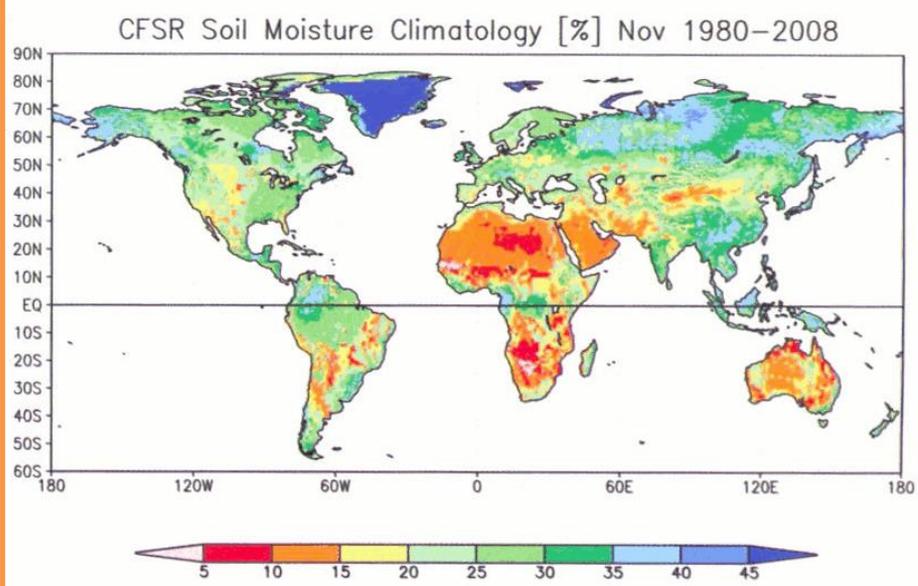
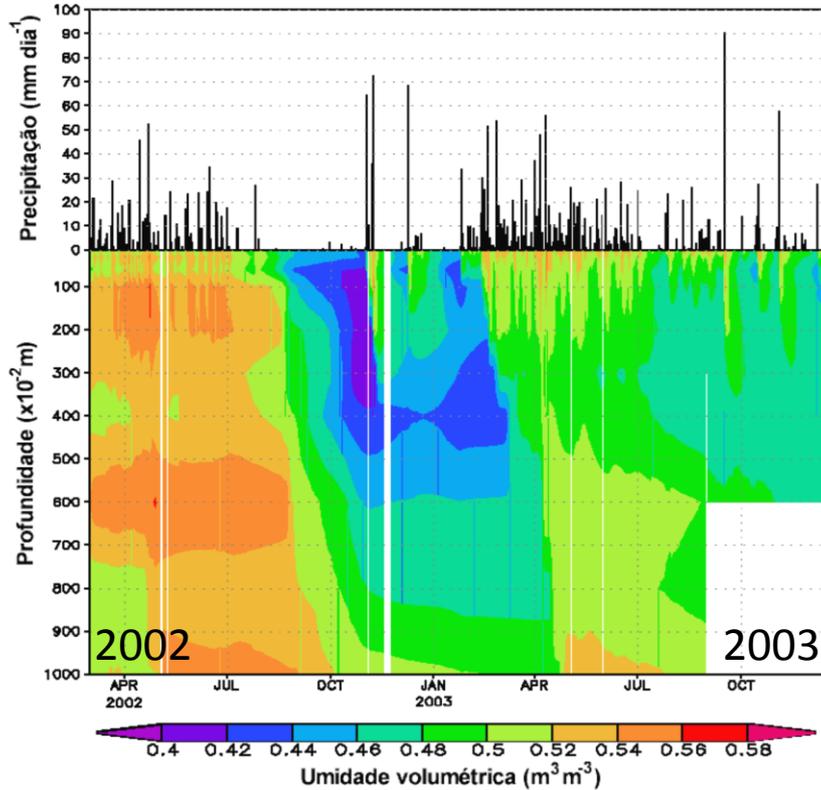


FIG. 18. As in Fig. 17, but for Nov.

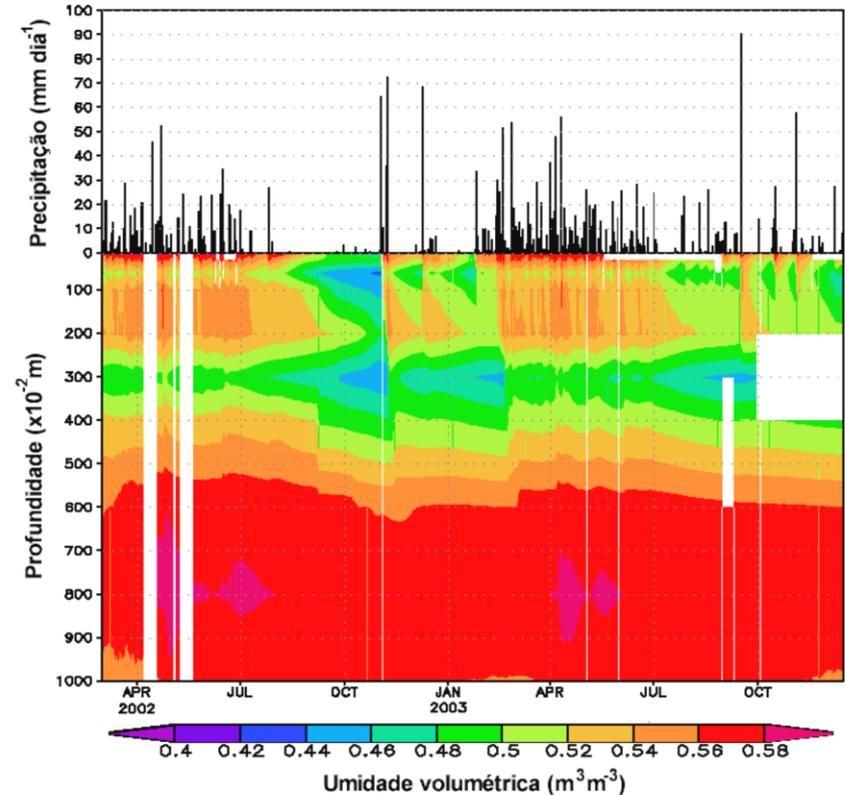
(Saha et al. 2010)

Floresta Amazônica

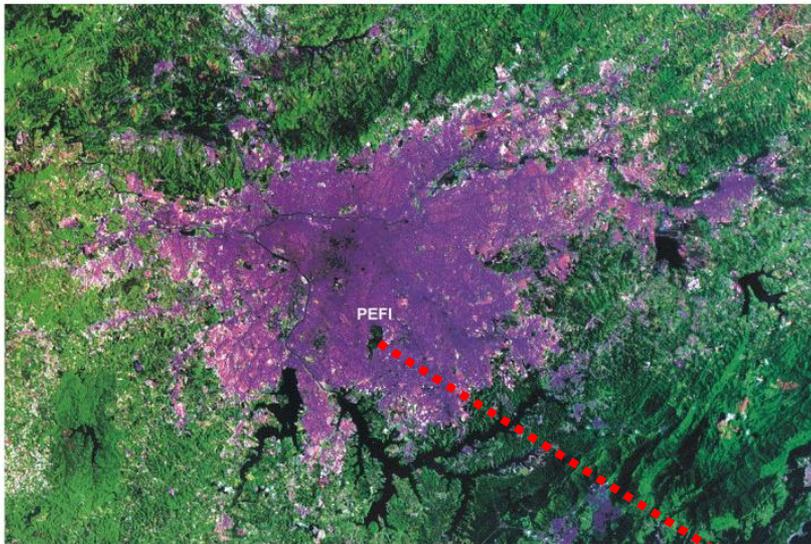
Floresta Tropical Úmida (não perturbada)
FLONA Tapajós, Santarém/PA



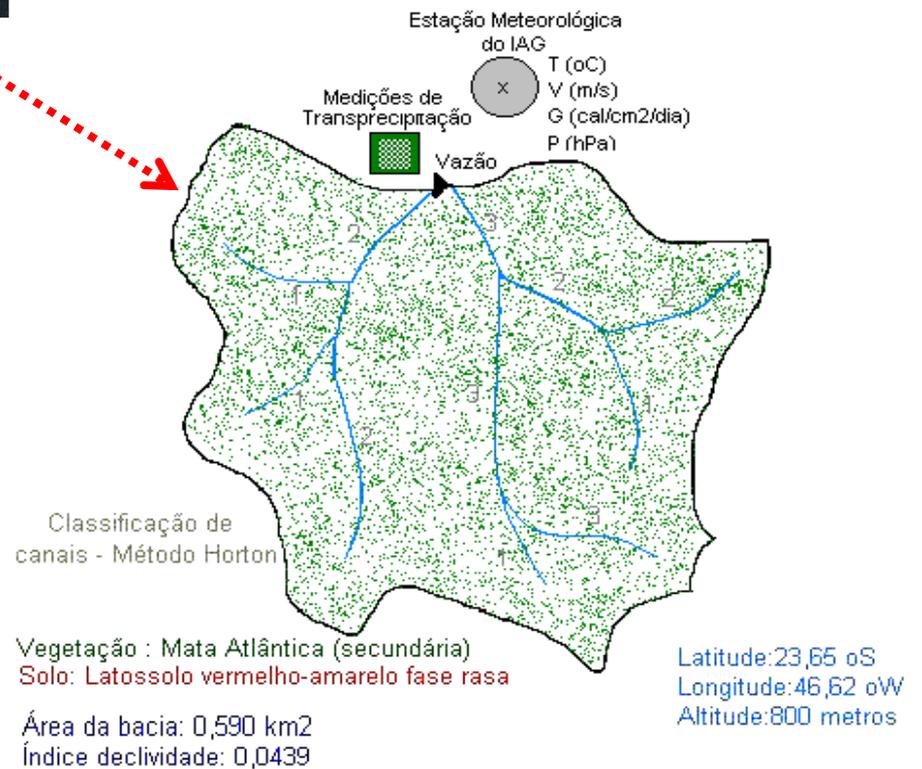
Floresta Tropical Úmida (clareira)
FLONA Tapajós, Santarém/PA



Bruno e Rocha (2004)

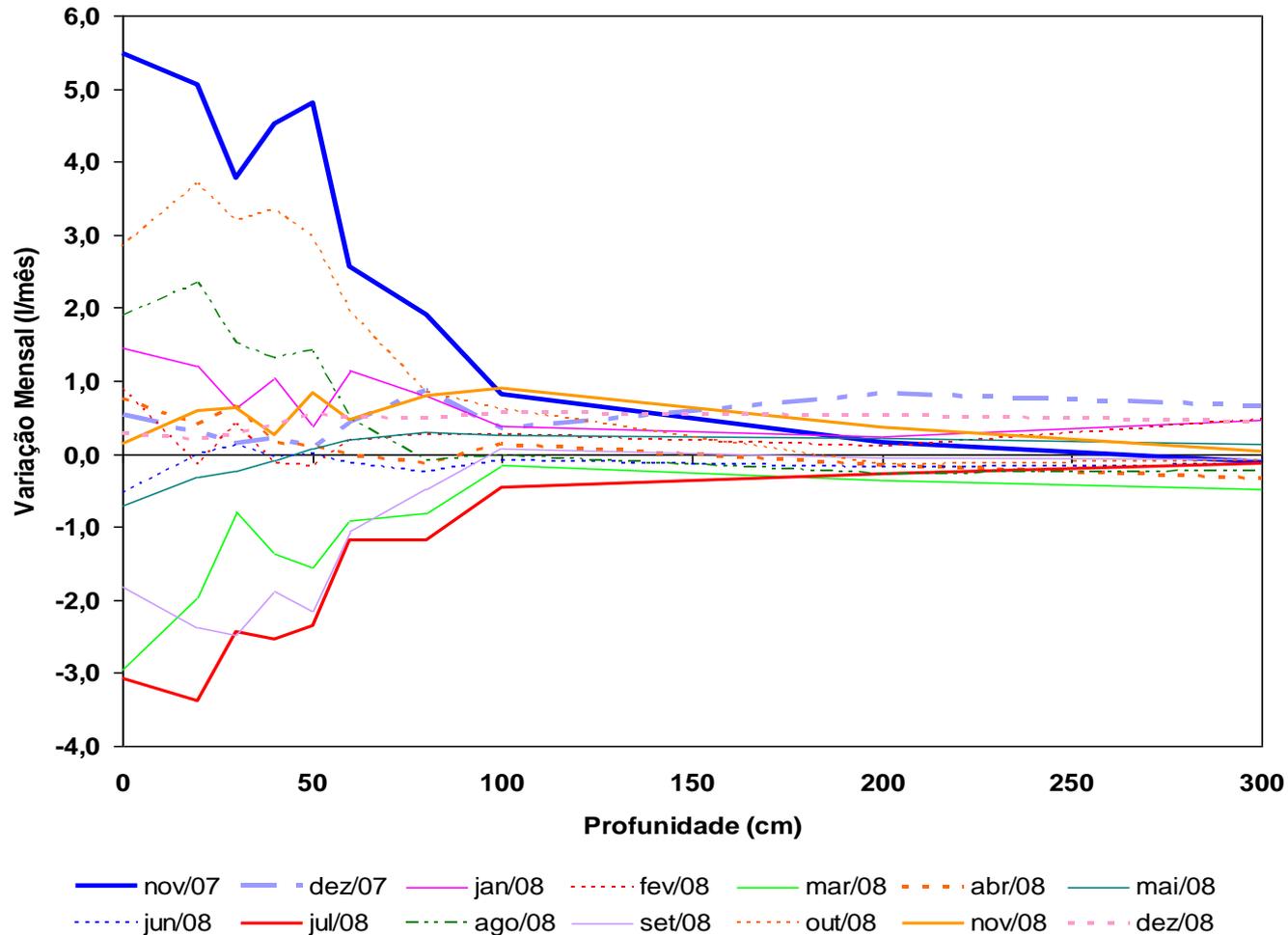


Bacia do IAG



(Pereira Filho et al., 2002)

Variação da Umidade do solo - PEFI



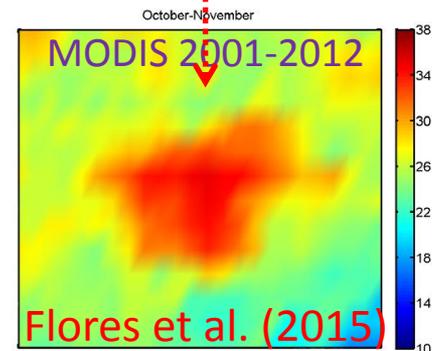
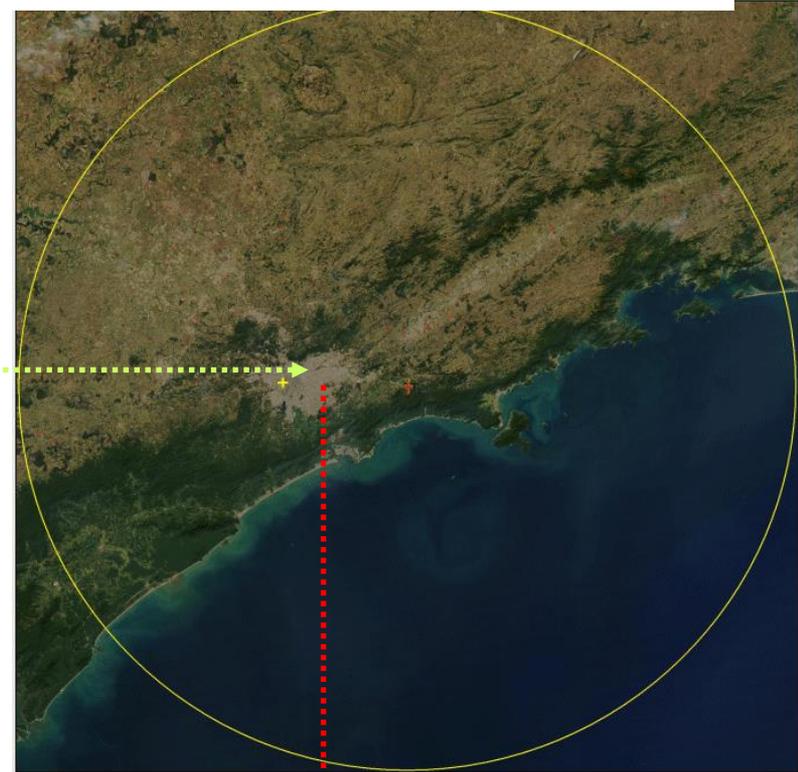
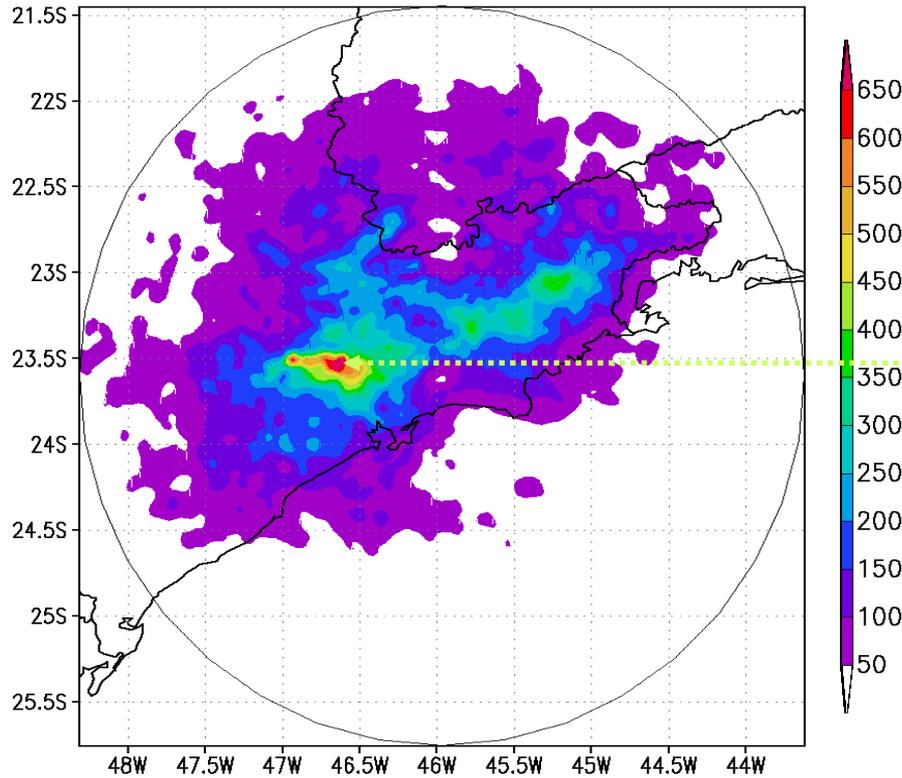
(Pereira Filho, 2010)

Balanço Hídrico - PEFI (mm)

Precipitação (P)	1290,5
Transprecipitação (T)	1002,1
Interceptação (I)	288,4
Vazão (Q)	285,6
Evapotranspiração (ETo)	1004,9

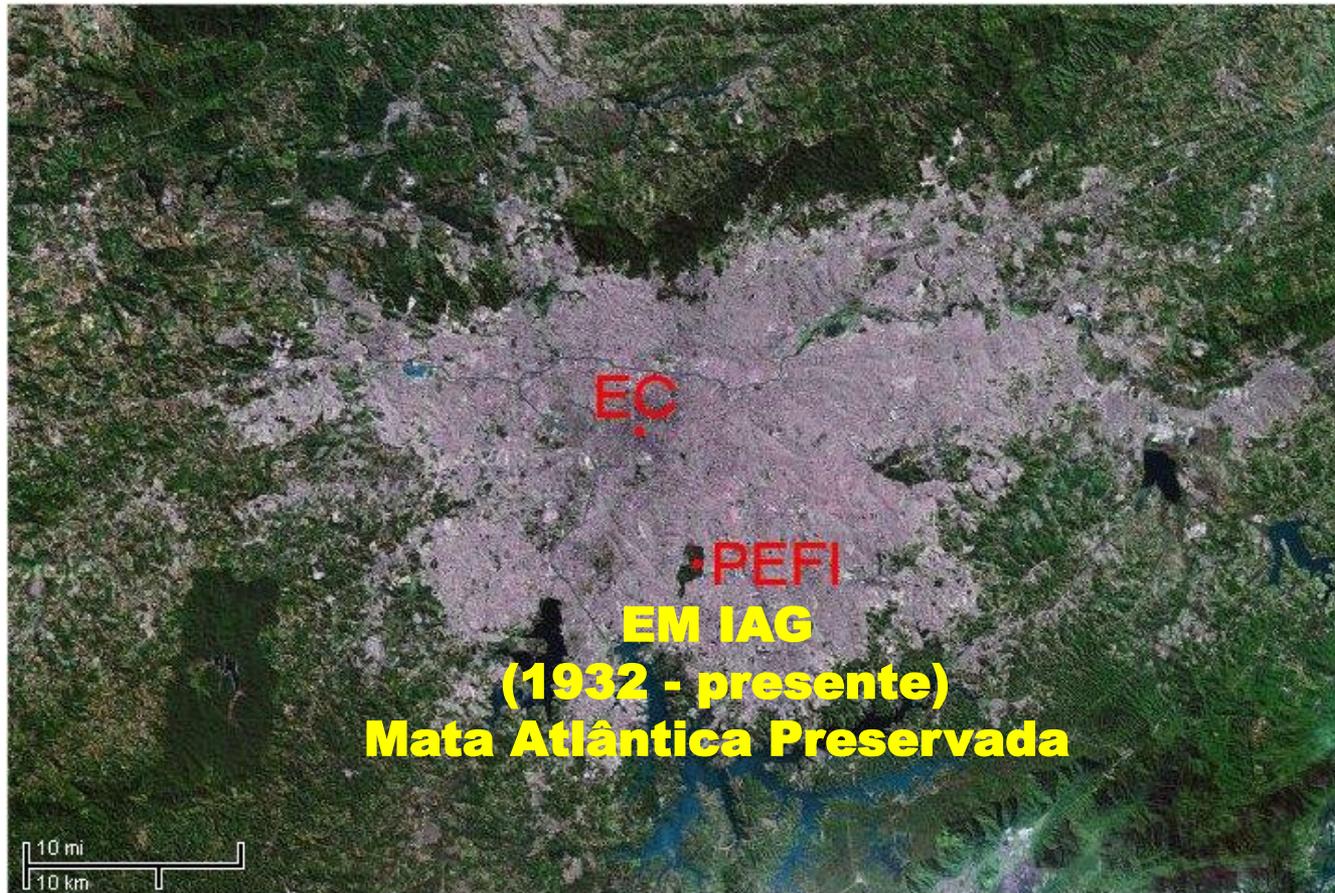
(Pereira Filho et al., 2002)

Efeitos Ilha de Calor e Brisa na Distribuição de chuva (mm) (2002 – 2004)

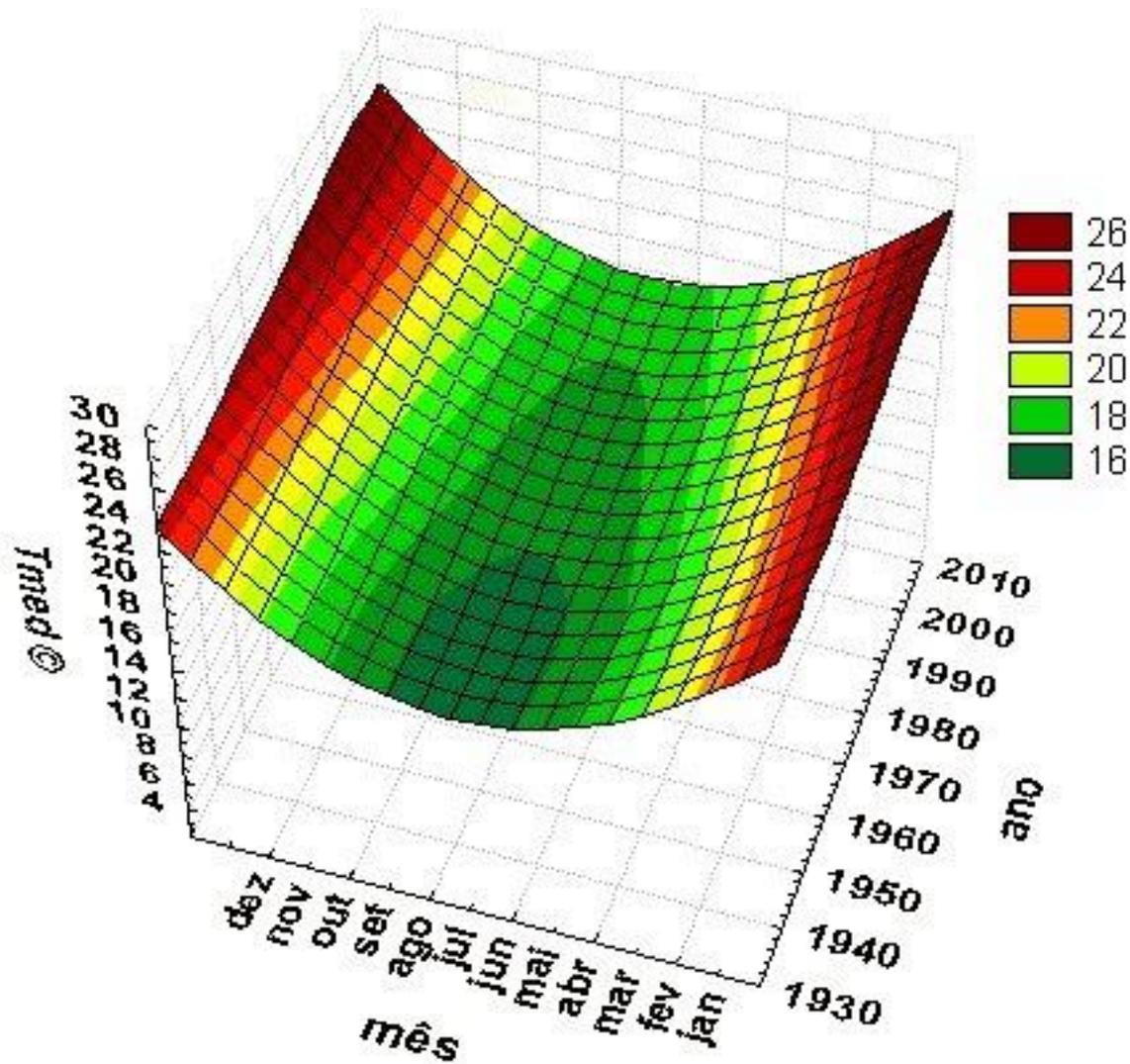


CLIMATOLOGIA DA RSMP

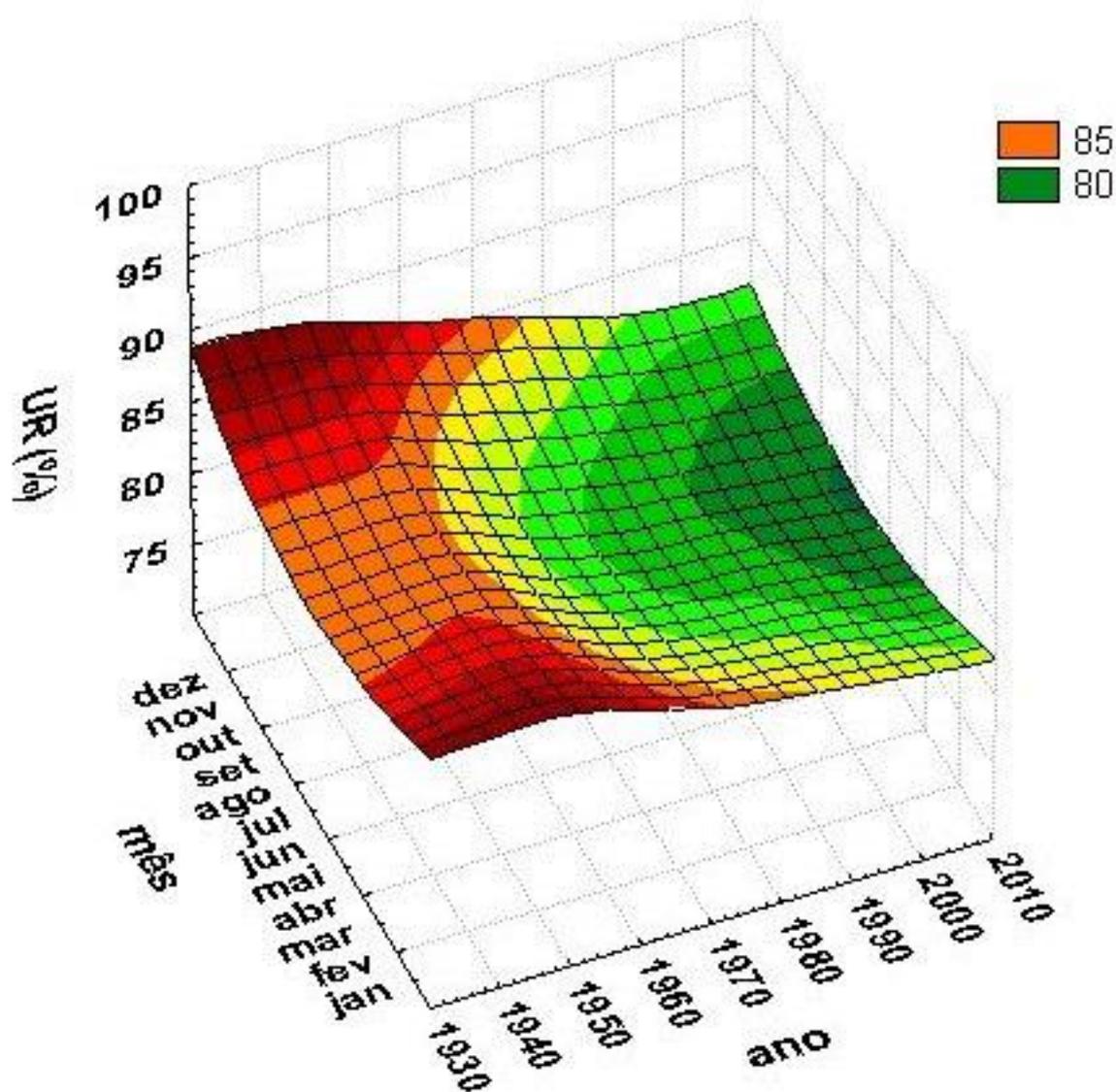
1936 - 2005



TEMPERATURA DO AR DIÁRIA 1936 - 2005



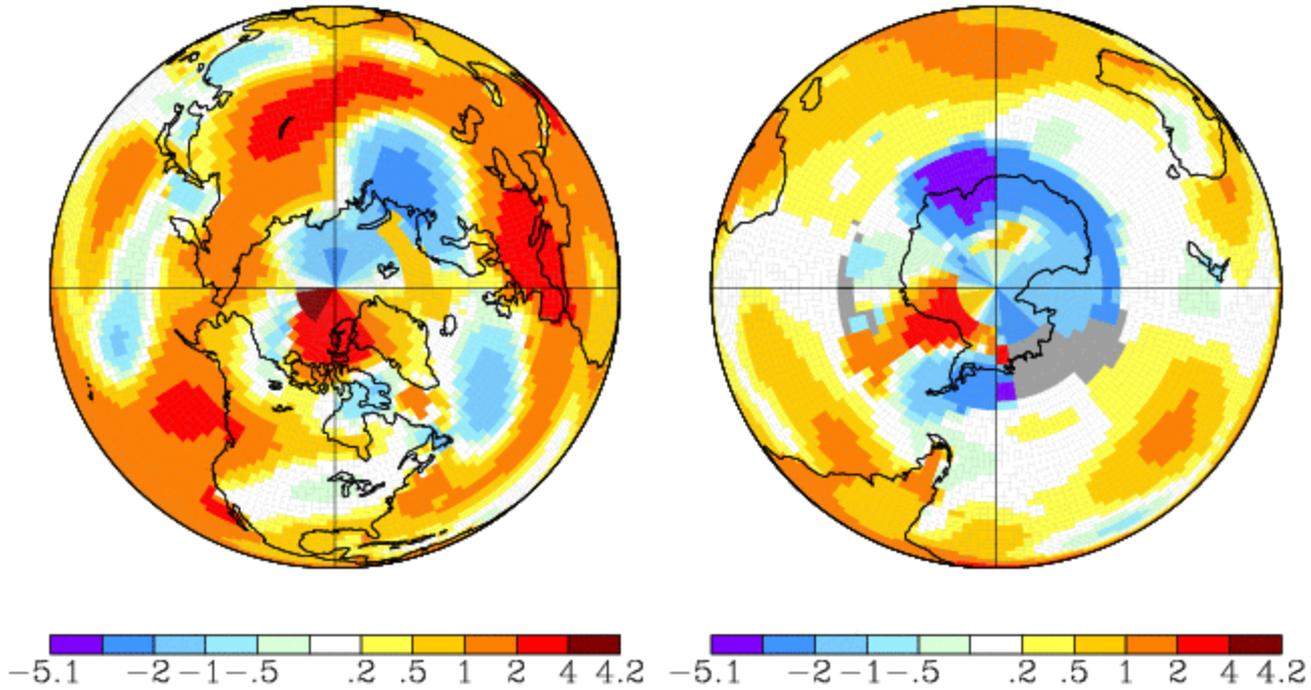
UMIDADE RELATIVA DIÁRIA 1936 -2005



July 2015

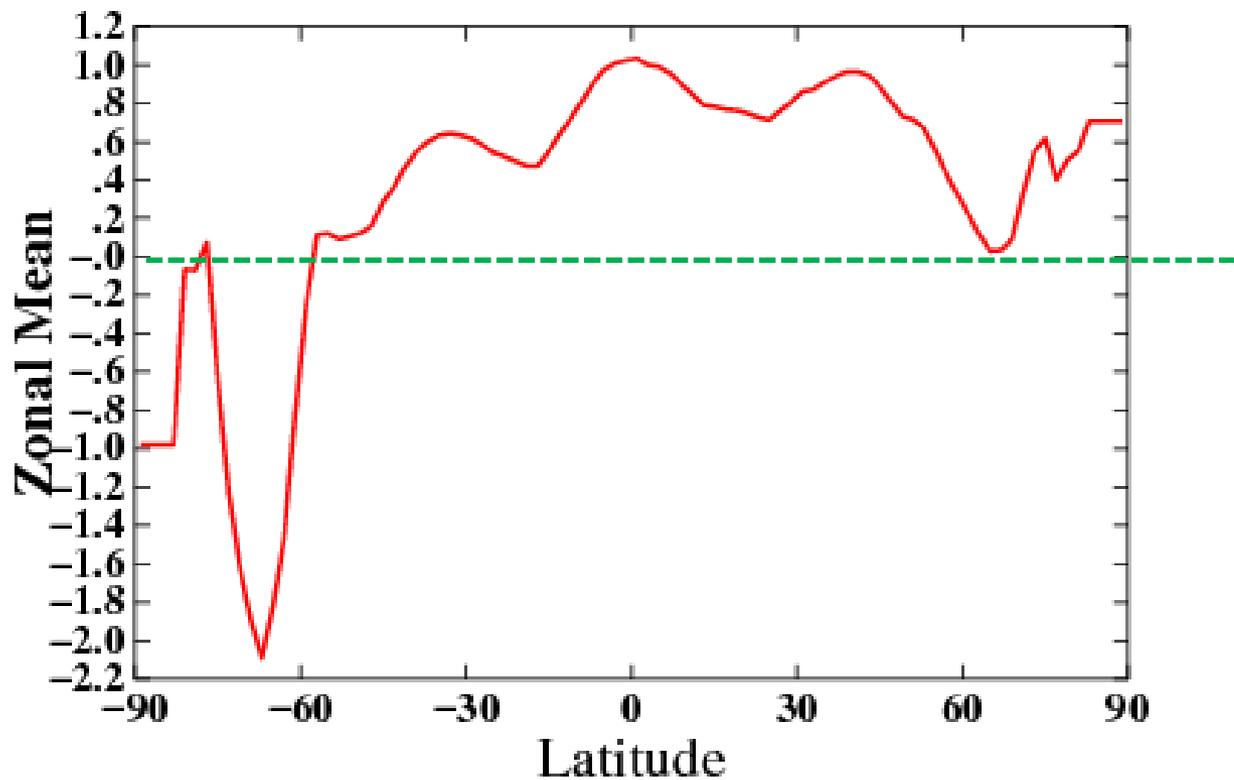
L-OTI(°C) Anomaly vs 1961-2000

0.54



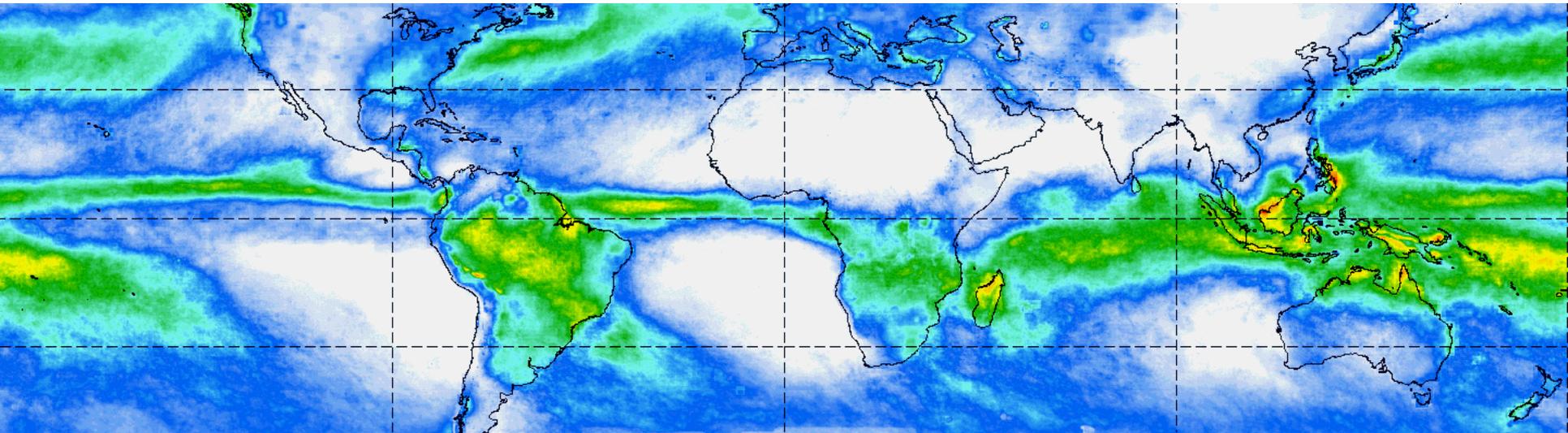
Fonte: <http://data.giss.nasa.gov/gistemp/maps/>

ANOMMALIA (1960-2000) JULHO 2015

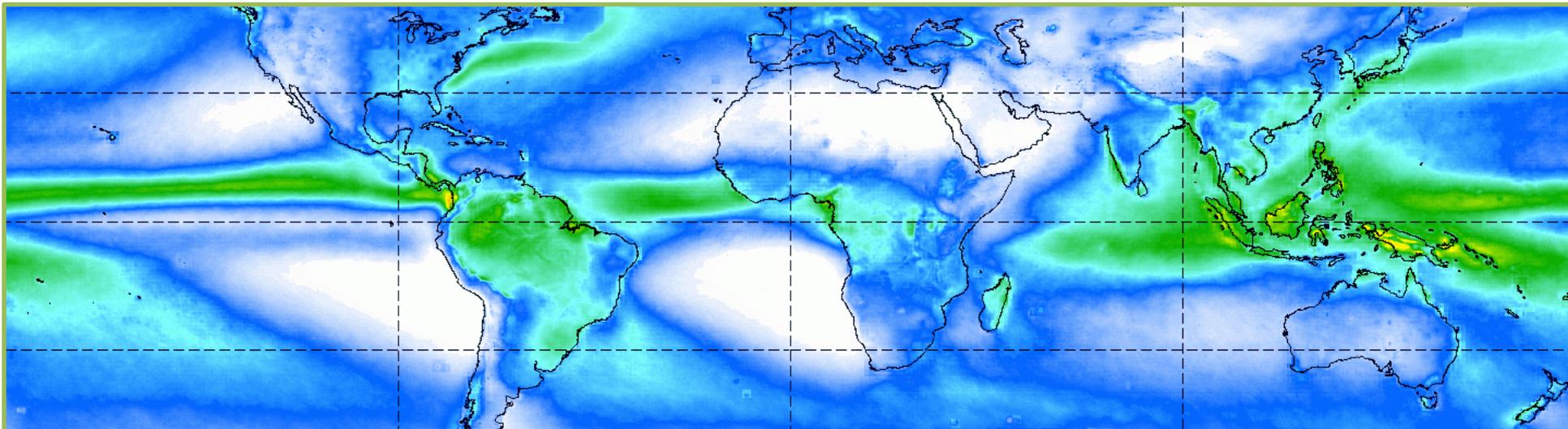
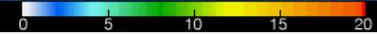


Fonte: <http://data.giss.nasa.gov/gistemp/maps/>

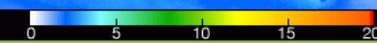
CLIMATOLOGIA TRMM



JANUARY Average Rainfall mm/dd (3B43) 1998 to 2011

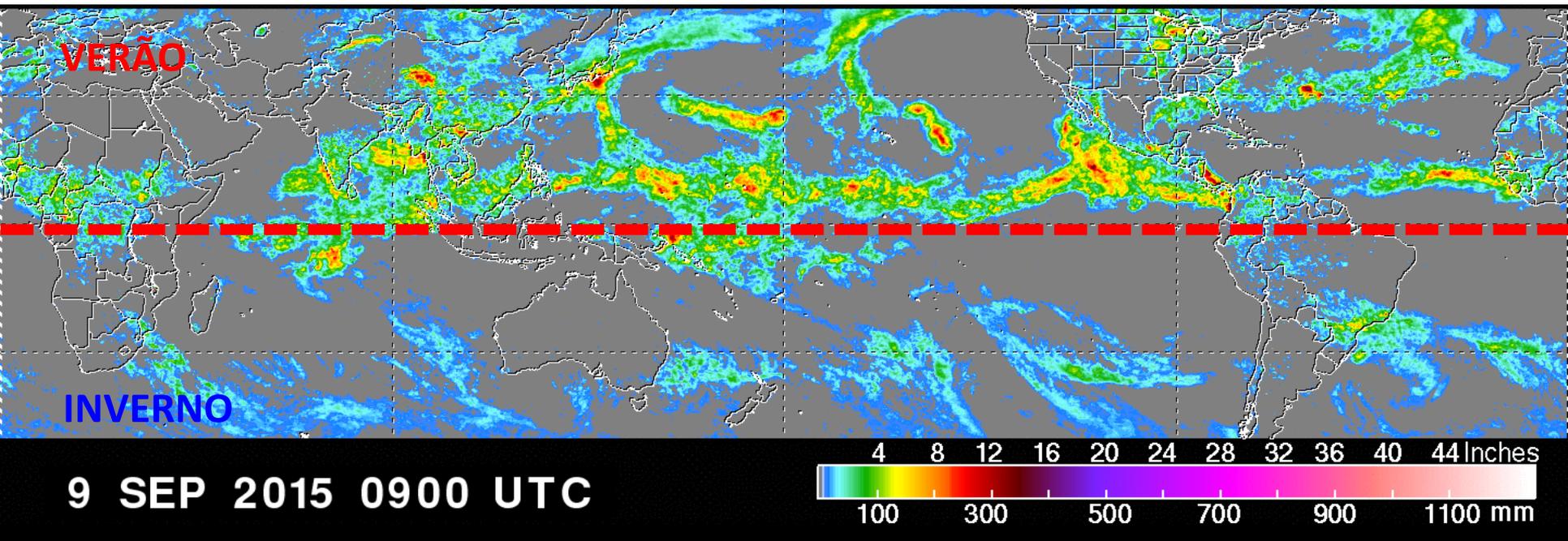


Average of ALL AVAILABLE Rainfall mm/dd (3B43) 1998 to 2011



PRECIPITAÇÃO GLOBAL

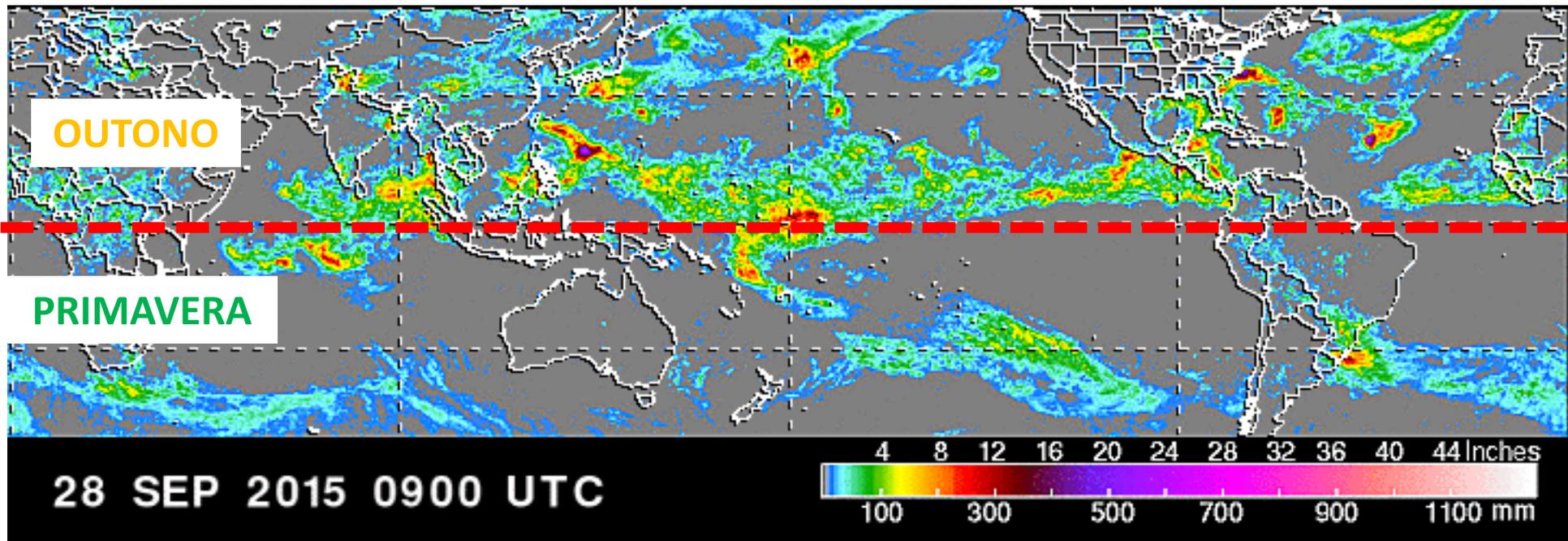
02-09 SET 2015



Fonte: http://trmm.gsfc.nasa.gov/trmm_rain/Events/big_global_accumlation.gif

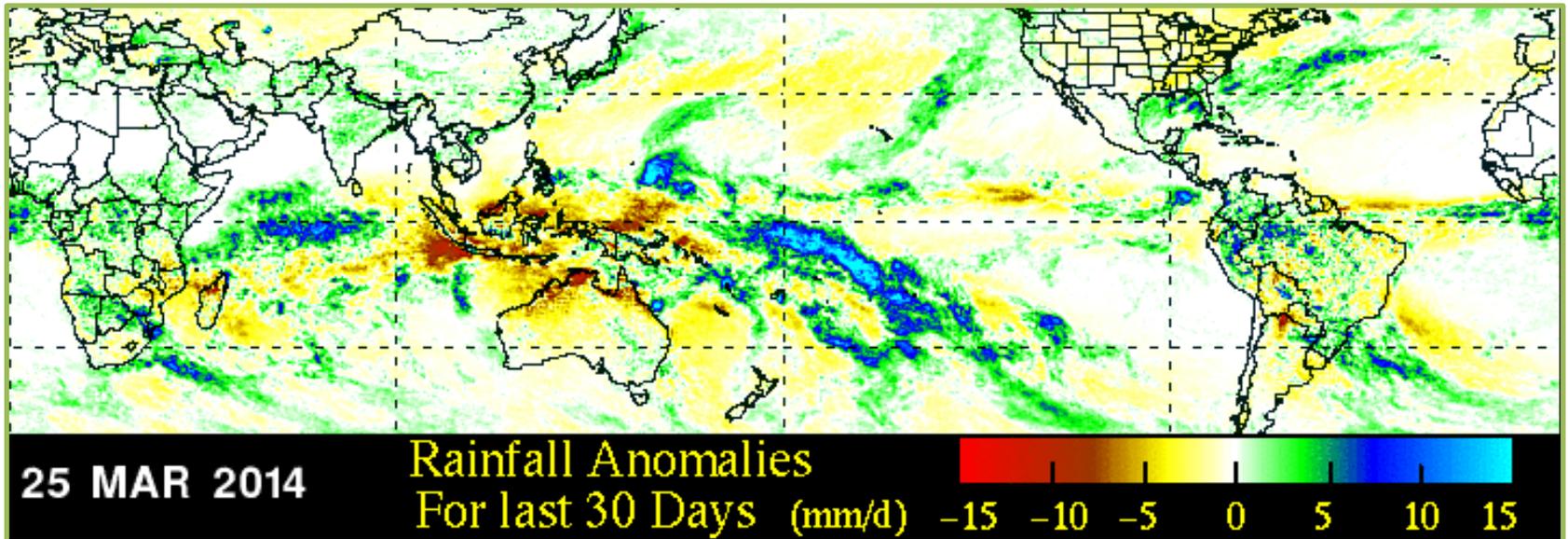
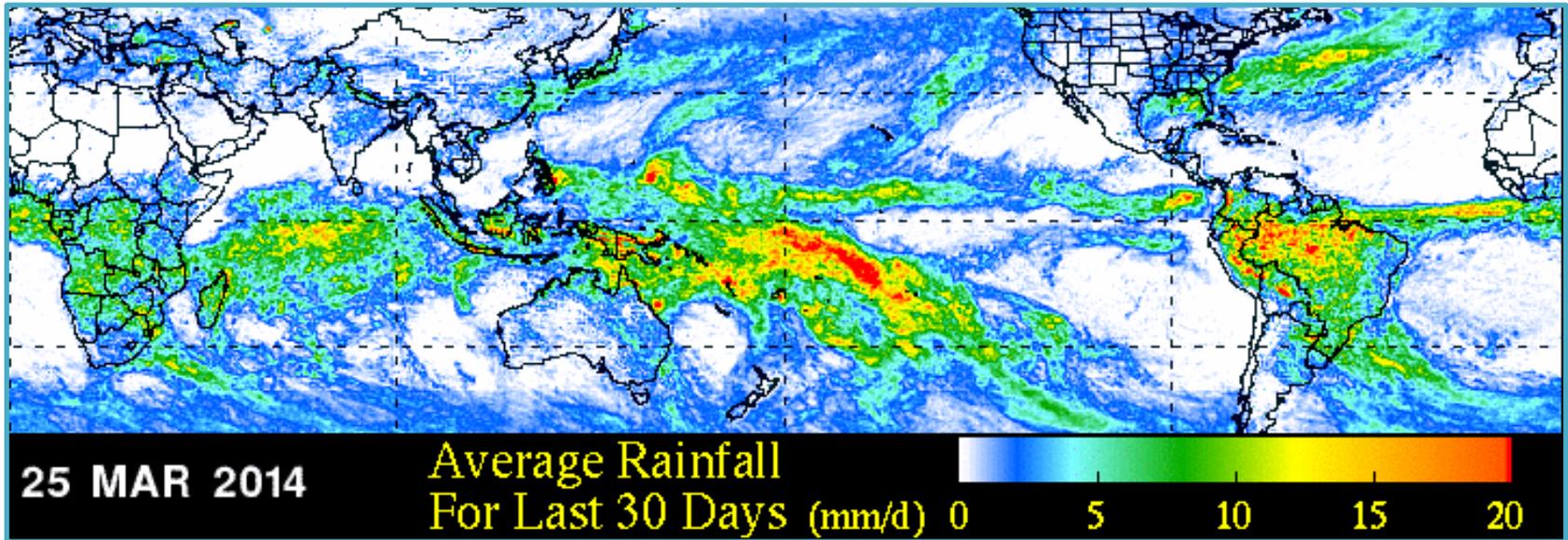
PRECIPITAÇÃO GLOBAL

21-28 SET 2015



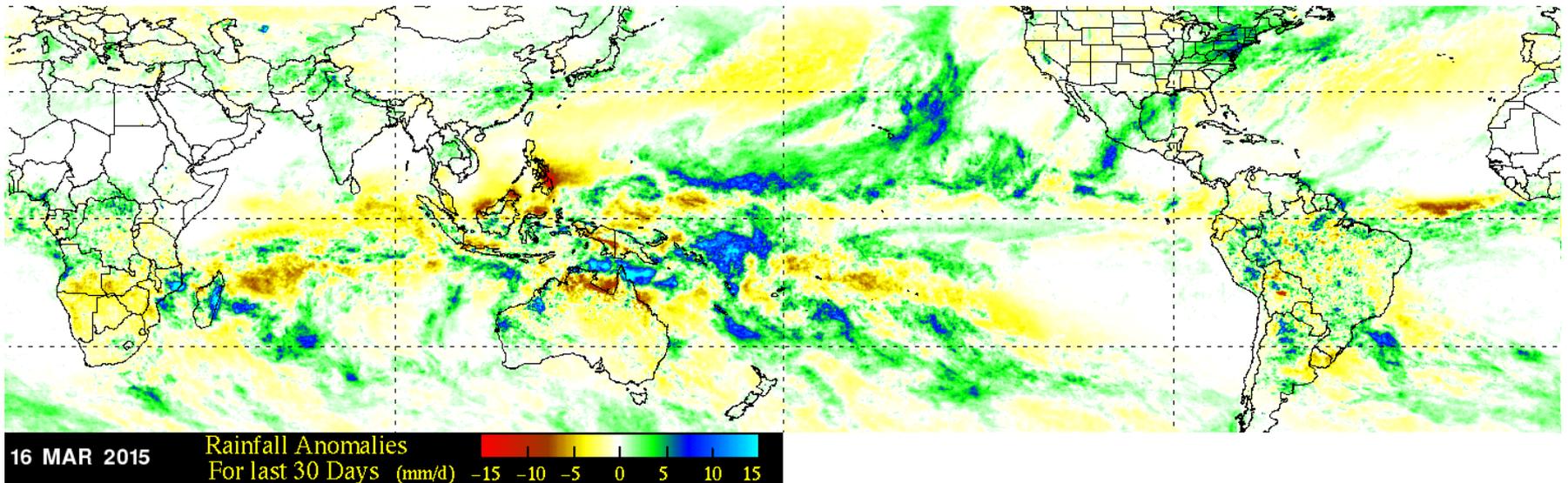
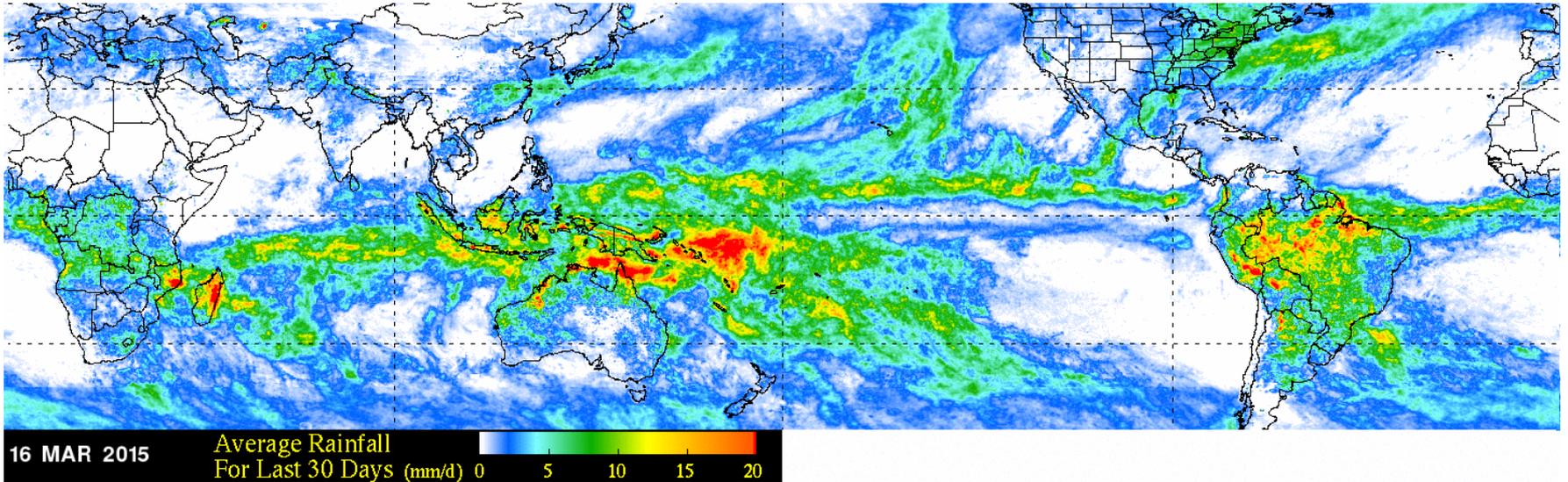
Fonte: http://trmm.gsfc.nasa.gov/trmm_rain/Events/big_global_accumlation.gif

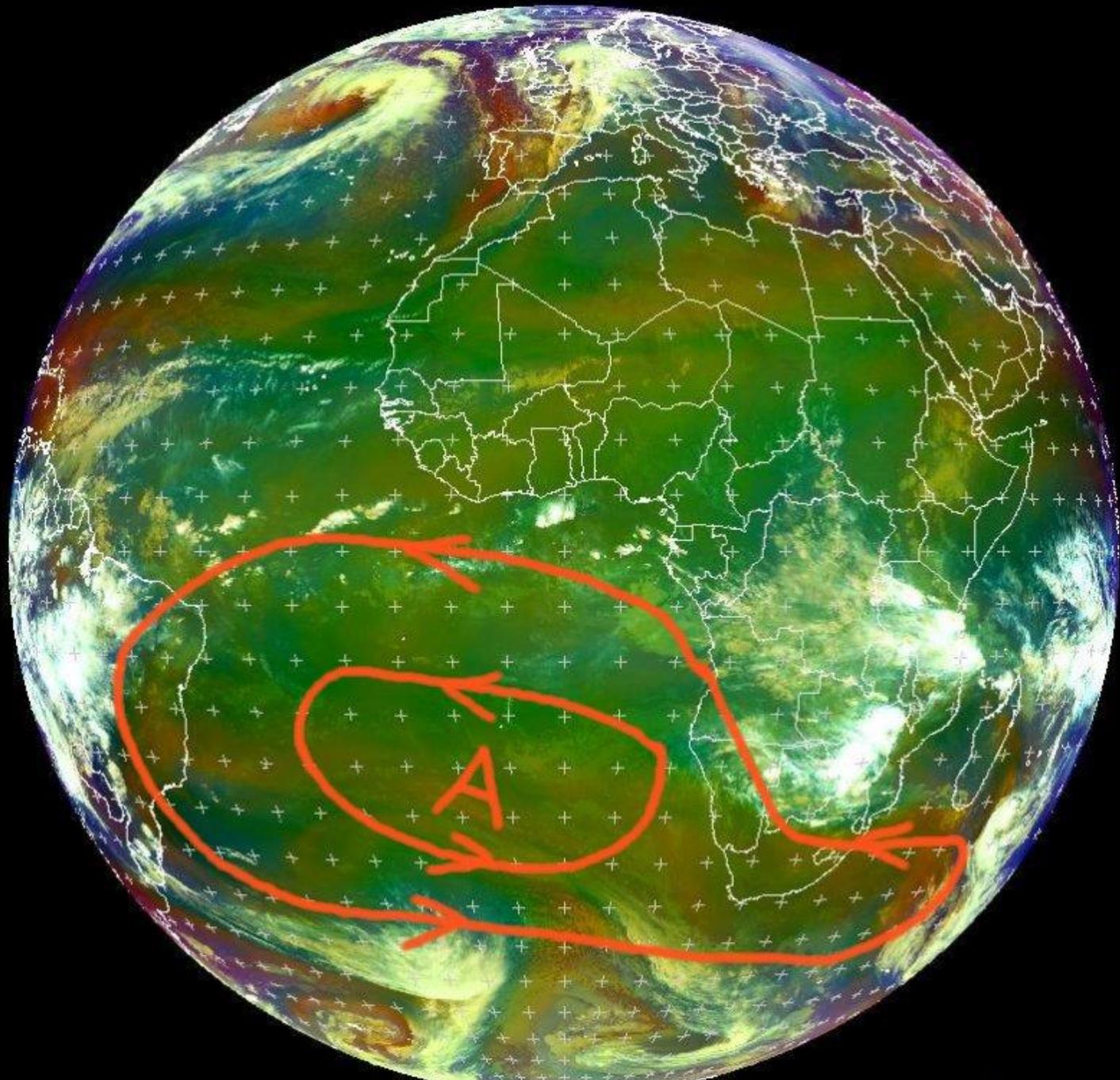
PRECIPITAÇÃO 30 DIAS -03/2014



PRECIPITAÇÃO 30 DIAS - 03/2015

http://trmm.gsfc.nasa.gov/trmm_rain/Events/thirty_day.html

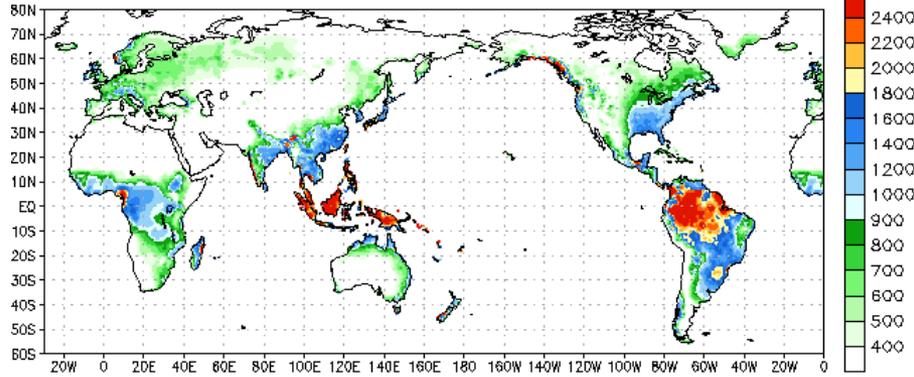




MET10 RGB-Airmass 2014-02-07 01:00 UTC

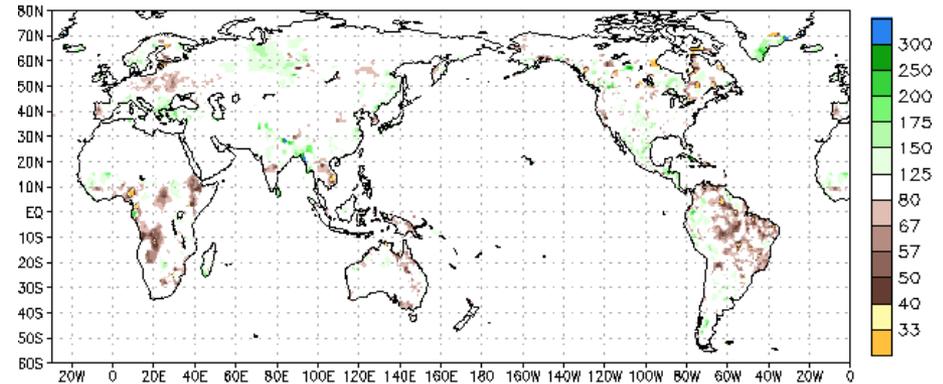
PRECIPITAÇÃO 365 DIAS

Climatological 365-day Accumulated Prep (mm) 28SEP2014-27SEP2015



Data Source: CPC Unified (gauge-based) Precipitation
Climatology (1981-2010)

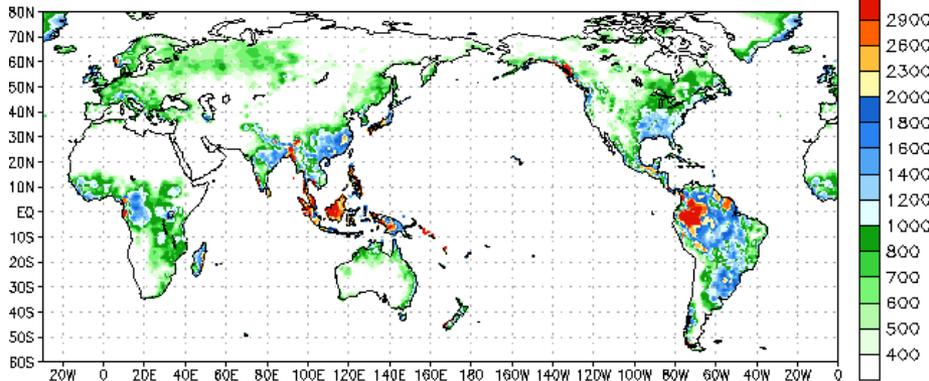
365-day Accumulated Prep % of Normal 28 SEP 2014 - 27 SEP 2015



Data Source: CPC Unified (gauge-based) Precipitation
Climatology (1981-2010)

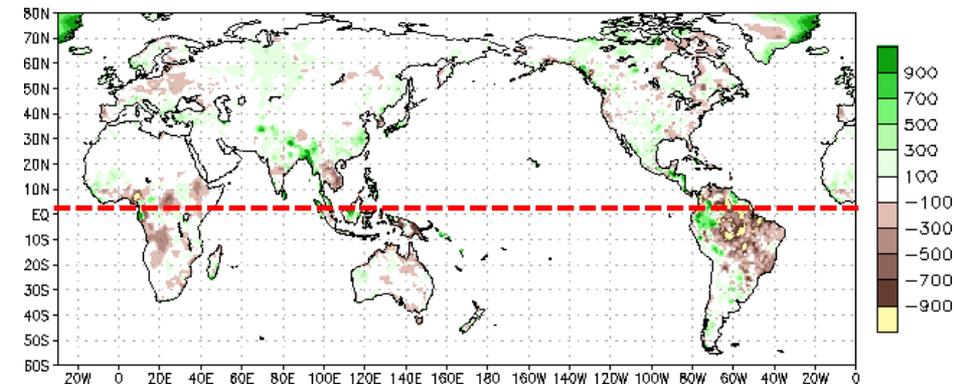
Note: Areas which receive on average 1mm/day are masked out.

Accumulated Prep (mm) 28 SEP 2014 - 27 SEP 2015



Data Source: CPC Unified (gauge-based) Precipitation

Prep Anomalies (mm) 28 SEP 2014 - 27 SEP 2015



Data Source: CPC Unified (gauge-based) Precipitation
Climatology (1981-2010)

Período chuvoso Outubro/ano a Março/ano seguinte

Dados EM-IAG/USP 1933-2014

+ SECOS (mm)

670,5	1941
697,7	1934
730,7	1964
740,9	1943
760,5	1955
798	1954
800,7	1937
803,6	1936
814,6	1969
824	1953
837,5	1939
850,2	1938
887,2	2014
900,5	1946
901,6	1945
913,2	1957
914,7	1935
915,71	1975
916,7	1994
920,1	1985

+ CHUVOSOS (mm)

1259,9	2013
1260,4	2012
1296,8	1970
1339,6	1989
1363,8	1995
1380,2	1983
1385,8	1991
1401,7	2011
1443,1	1996
1775,8	2010

Evolução do Consumo na RMSP e Projeção para 20 anos

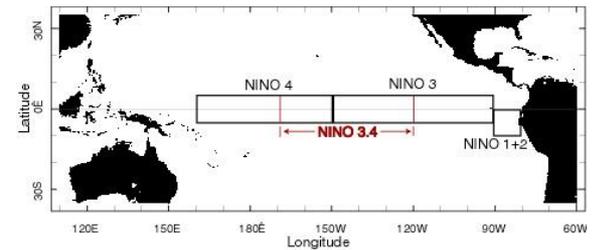
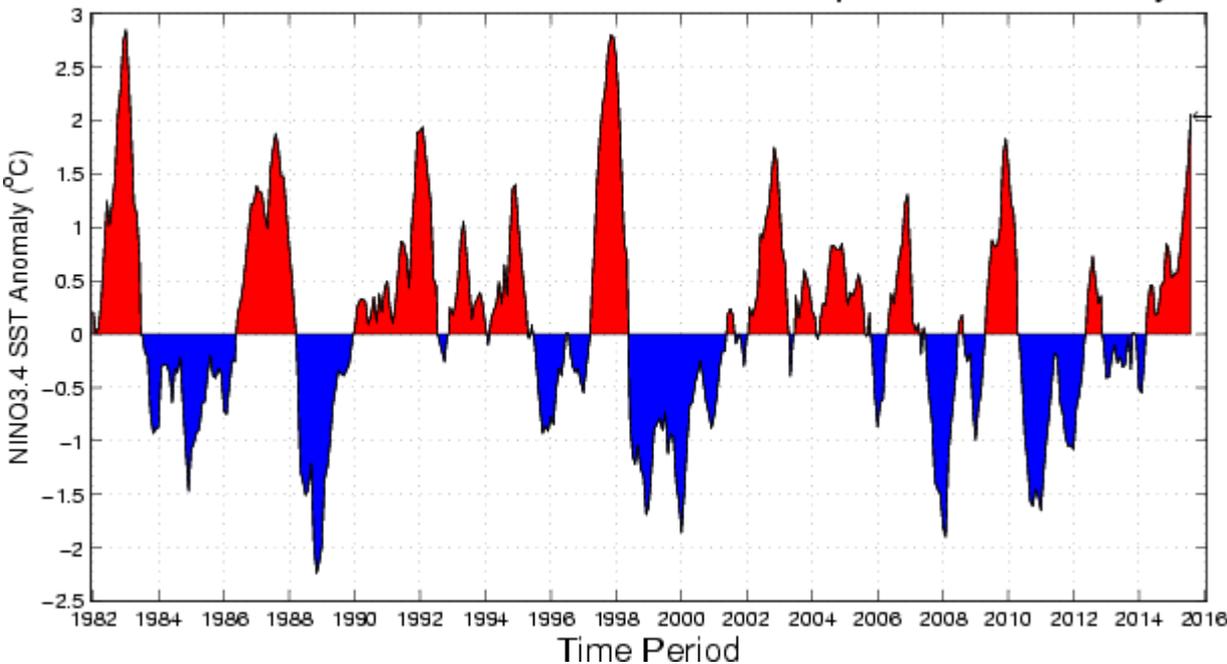
Ano	CHA (m ³ /ano)	PROD (10 ⁹ m ³ /ano)	CT (10 ⁹ m ³ /ano)	CT/PROD	HAB (mi)
2003	52,3	1.96	0.93	0.46	18.5
2013	59,9	2.18	1.21	0.55	20.1
2033	78,0	3.27	1.80	0.55 (1)	22.3
2033	78,0	2,33	1.80	0.73 (2)	22.3

Soluções :

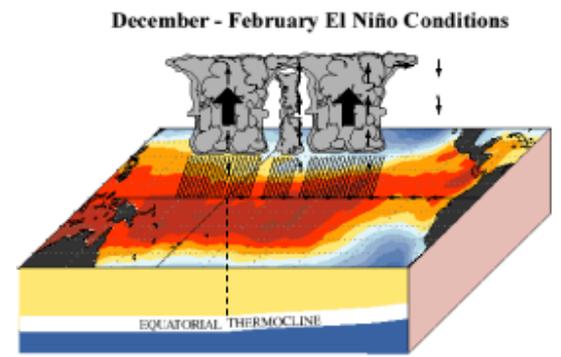
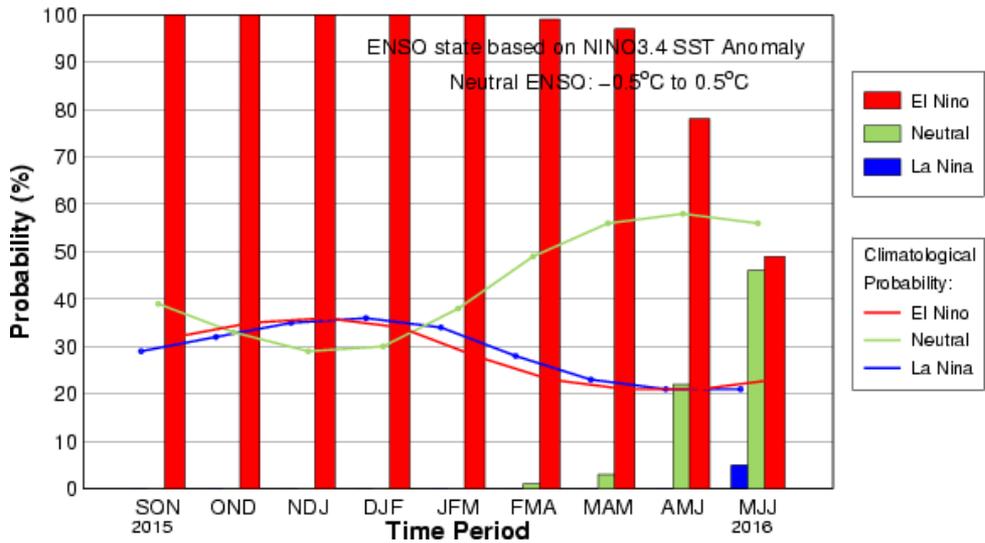
- Novas fontes para suprir demanda de + um Cantareira (cenário 1)
- Aumentar a razão consumo/produção (cenário 2)

PROGNÓSTICO CLIMÁTICO PRIMAVERA 2015

Historical NINO3.4 Sea Surface Temperature Anomaly

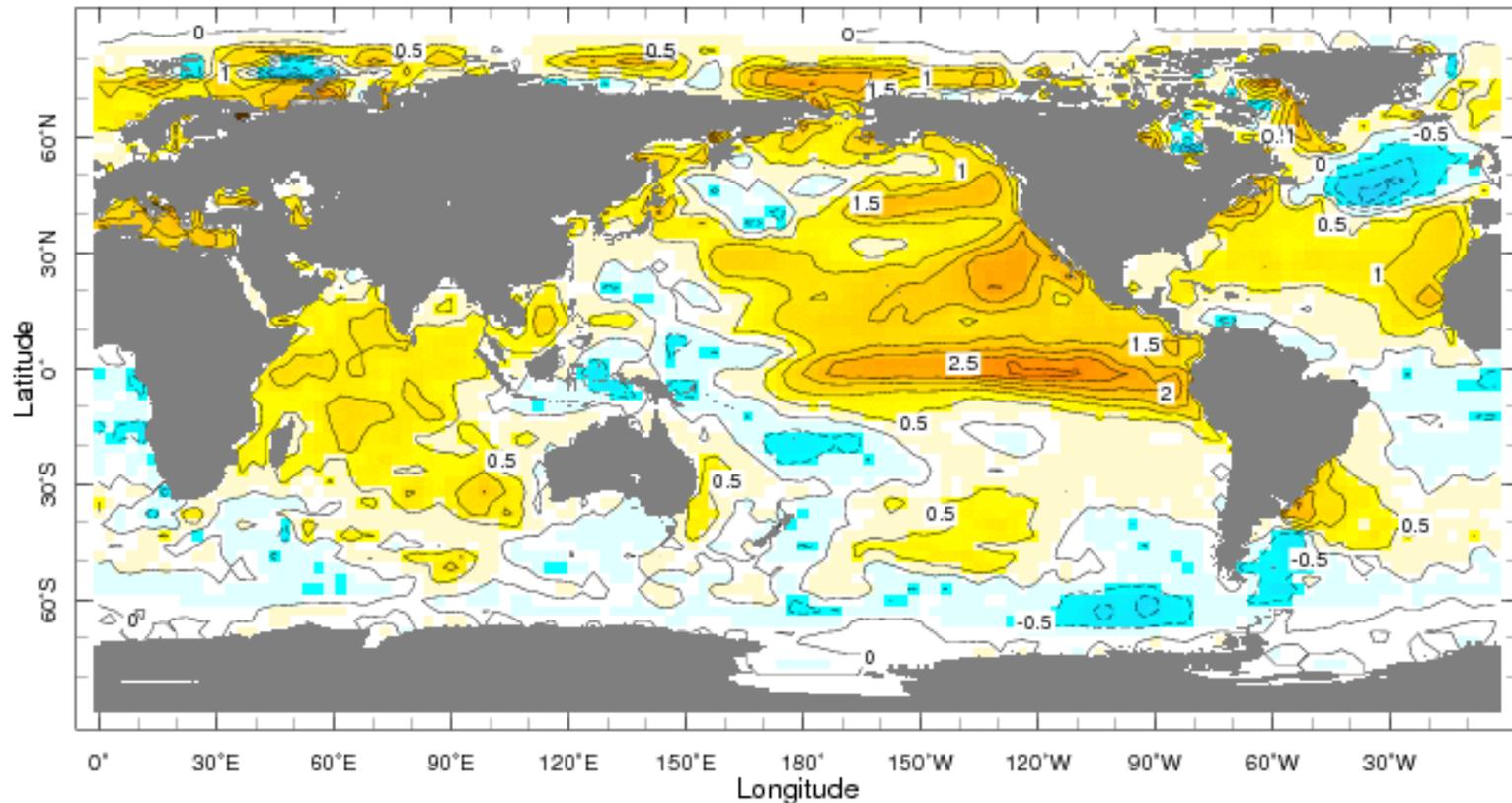


Mid-Sep IRI/CPC Plume-Based Probabilistic ENSO Forecast



TSM PREVISTA

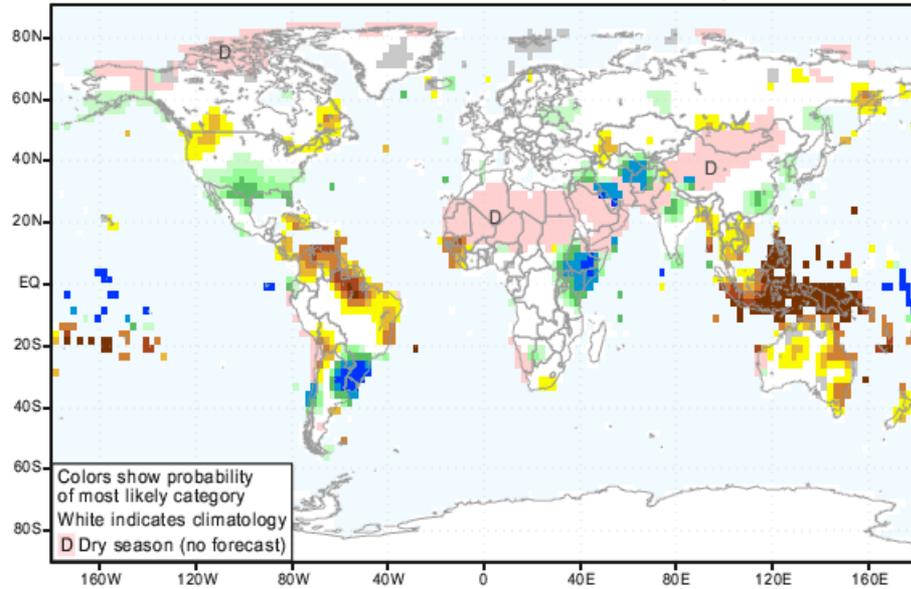
Sep-Nov 2015 IRI seasonal Forecast SSTA issued 0000 1 Sep 2015



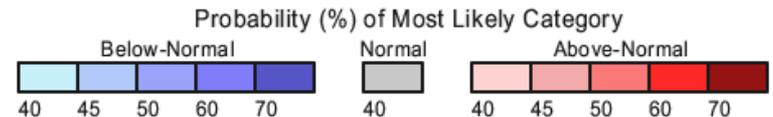
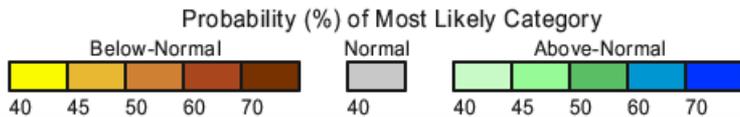
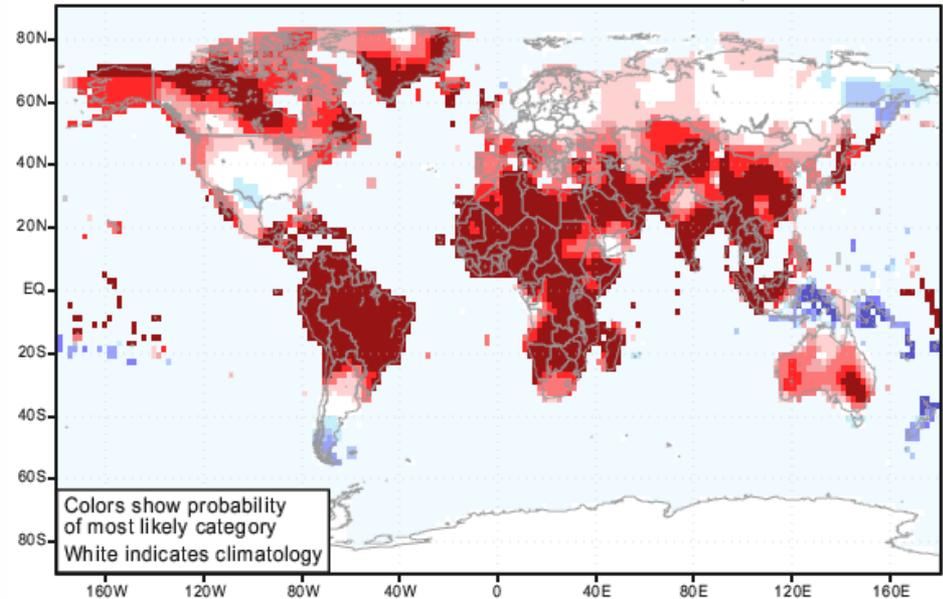
<http://iridl.ldeo.columbia.edu/maproom/Global/Forecasts/SST.html>

PROGNÓSTICO IRI

IRI Multi-Model Probability Forecast for Precipitation
for October-November-December 2015, Issued September 2015



IRI Multi-Model Probability Forecast for Temperature
for October-November-December 2015, Issued September 2015

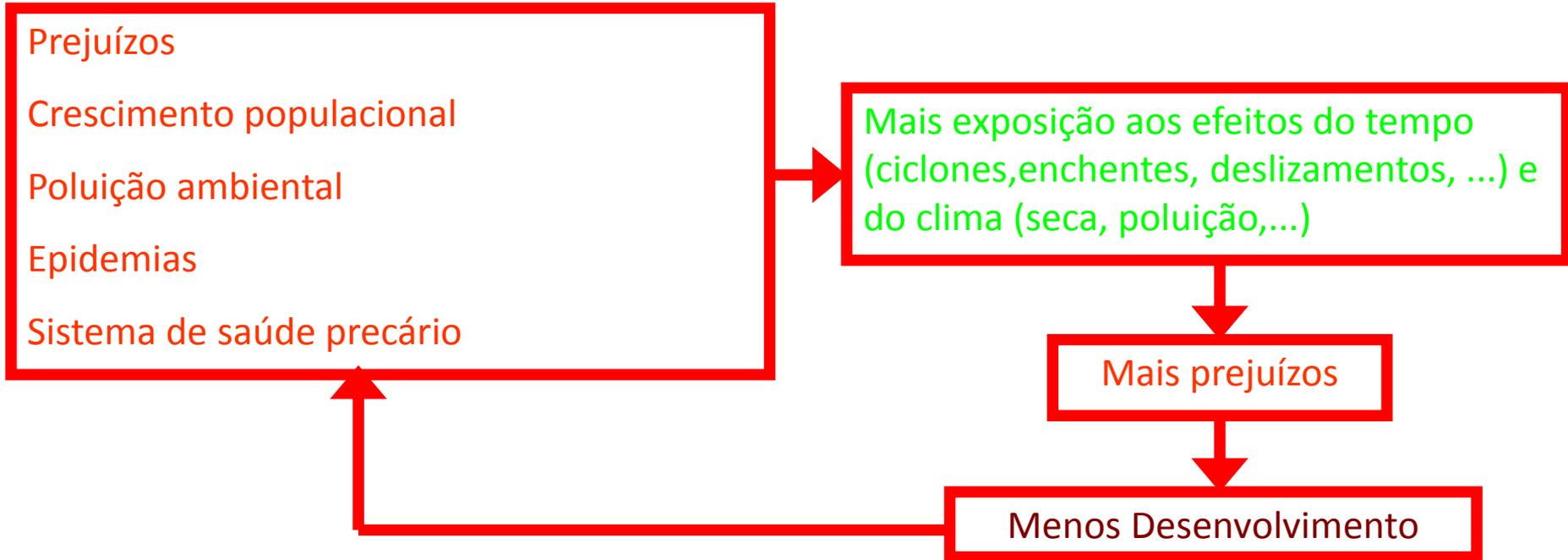


<http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/>

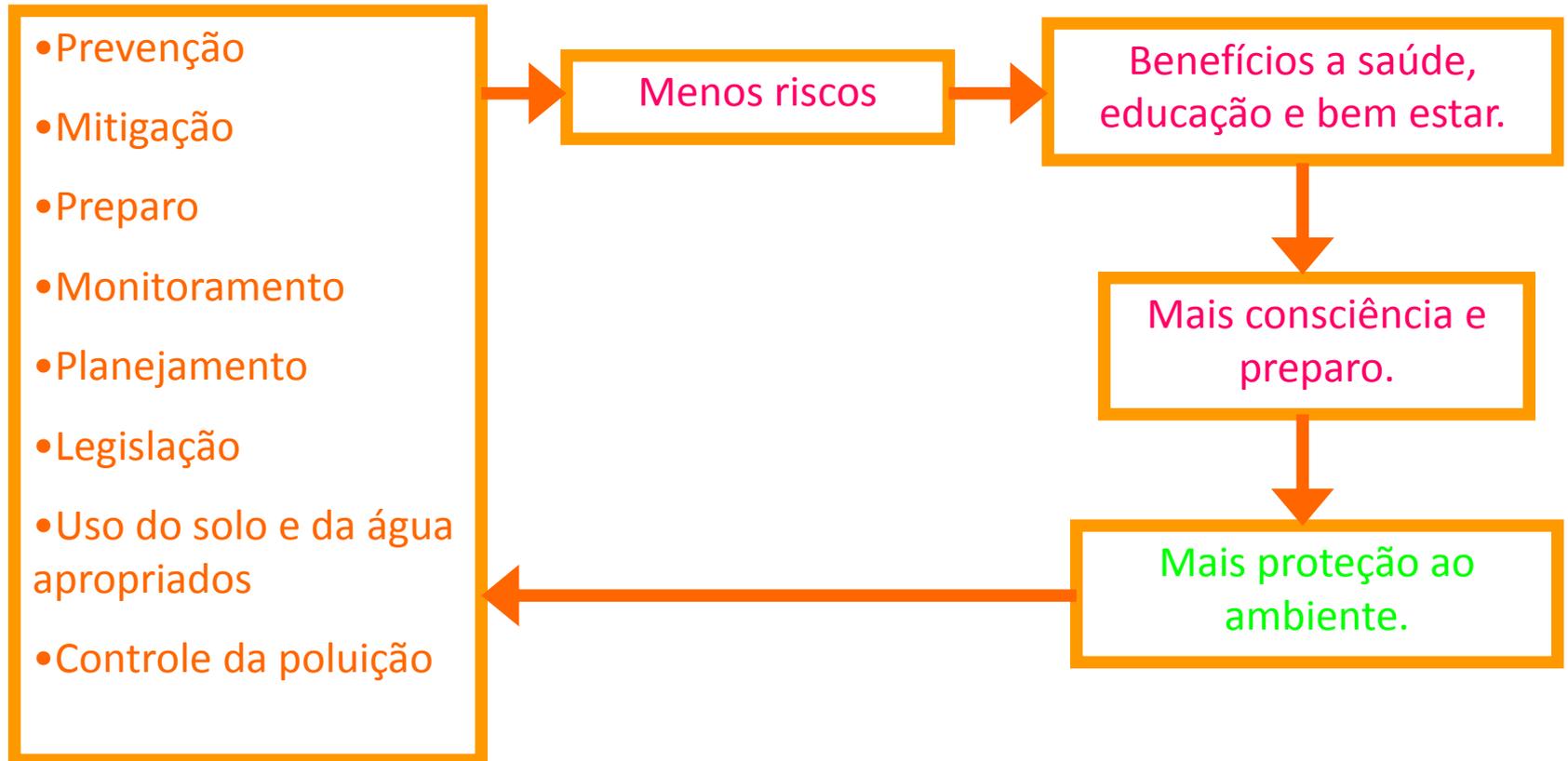
**METEOROLOGIA E
DESASTRES NATURAIS
CENÁRIO GLOBAL**

“As mudanças climáticas devem causar desastres naturais mais frequentes e mais graves”

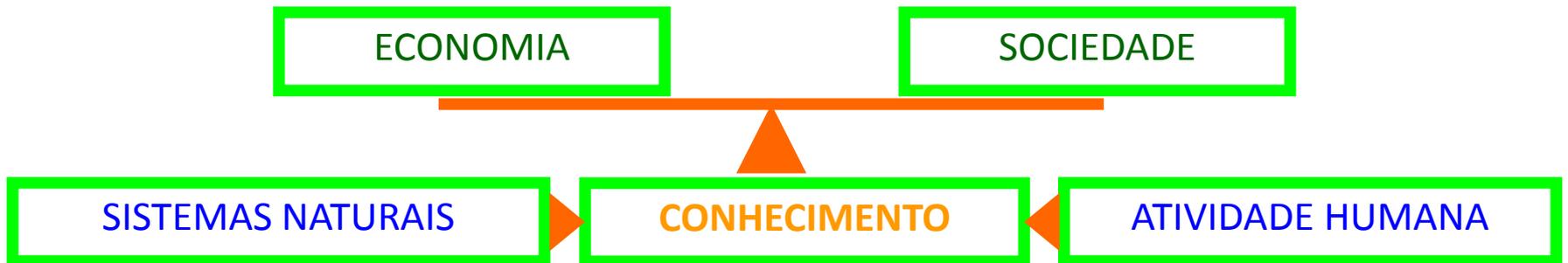
RETRO-ALIMENTAÇÃO POSITIVA DOS PROBLEMAS



GESTÃO AMBIENTAL – FATOR PARA O DESENVOLVIMENTO SUSTENTÁVEL



CIÊNCIA DA SUSTENTABILIDADE



OBSERVAÇÃO DA TERRA E DA ATMOSFERA

(Essenciais para a sustentabilidade)



FERRAMENTAS DE PREVISÃO

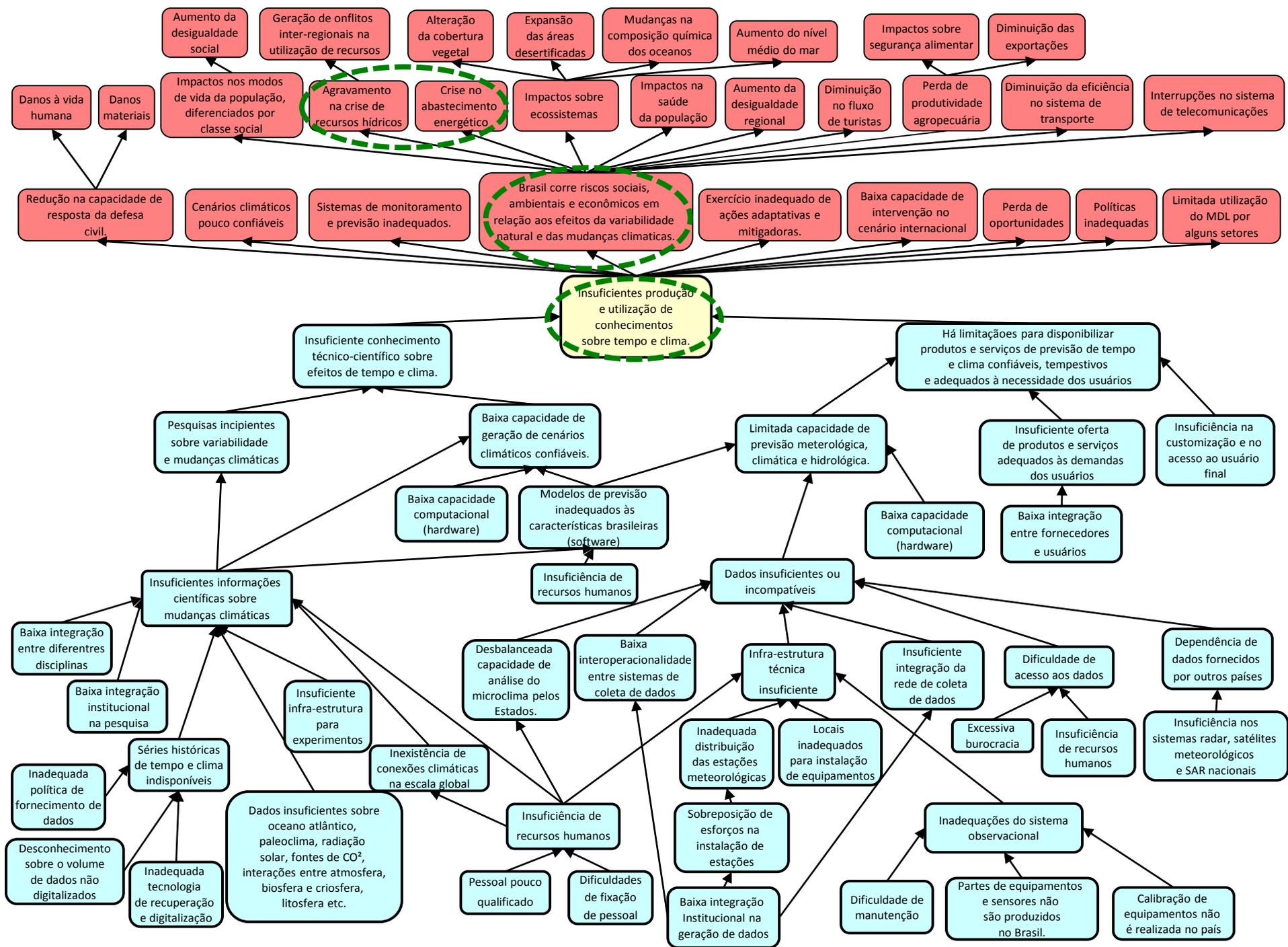
SISTEMAS DE ALERTA

ENTENDIMENTO DO TEMPO E DO CLIMA

INFORMAÇÃO



REDUÇÃO DE RISCOS



MUITO OBRIGADO!

apereira@model.iag.usp.br