Audiencia publica - 05/03/2024

Comissão Especial destinada a estudar e analisar formas de prevenção e auxílio a desastres e calamidades naturais que vêm assolando o território nacional

“Ciência para Adiar o Fim do Mundo”

O que aprendemos sobre a Amazonia e os fatores que afetam o funcionamento da floresta

Luciana Vanni Gatti

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INPE - Coordenação Geral de Ciências da Terra (CGCT-DIIAV)

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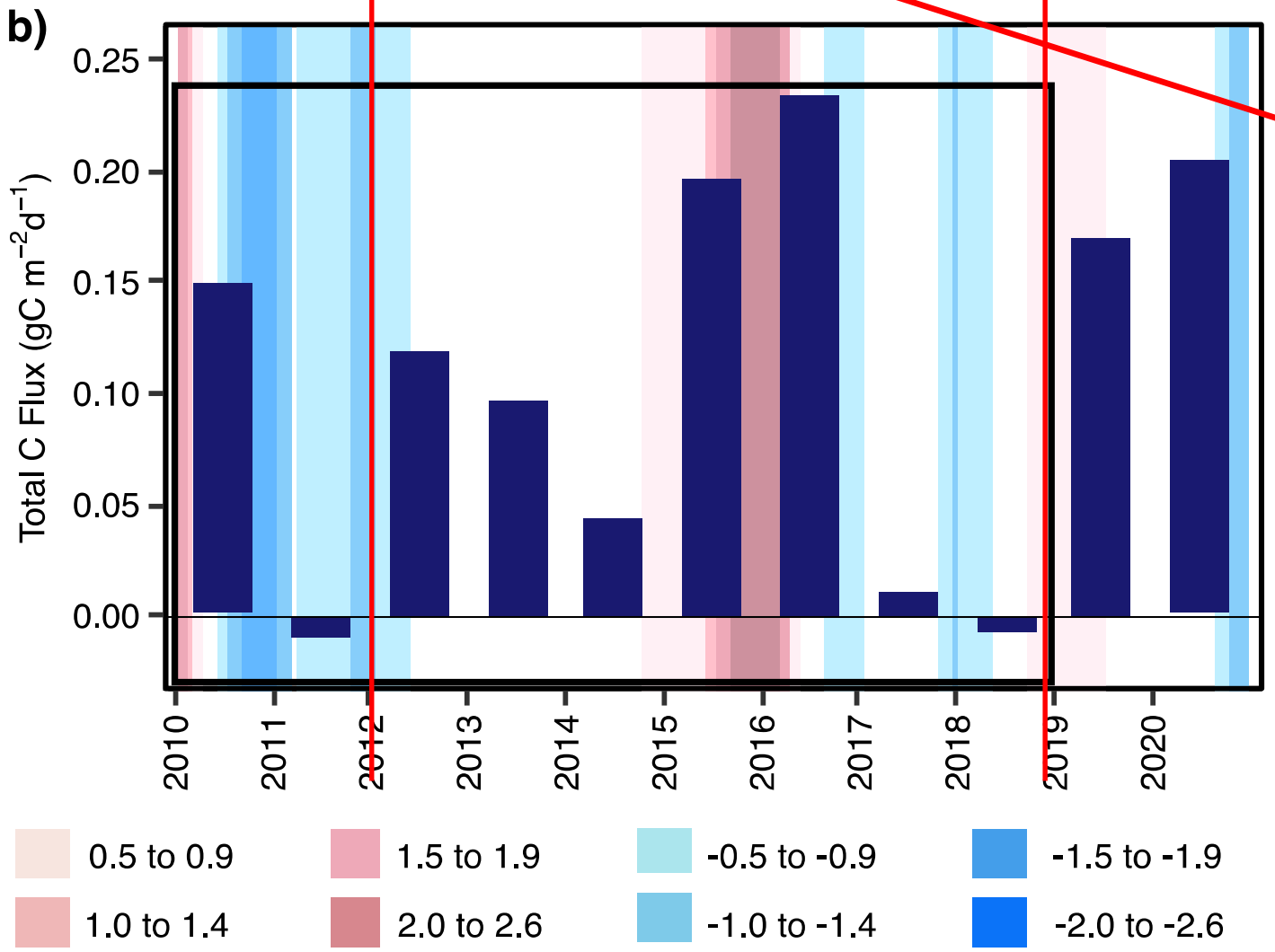
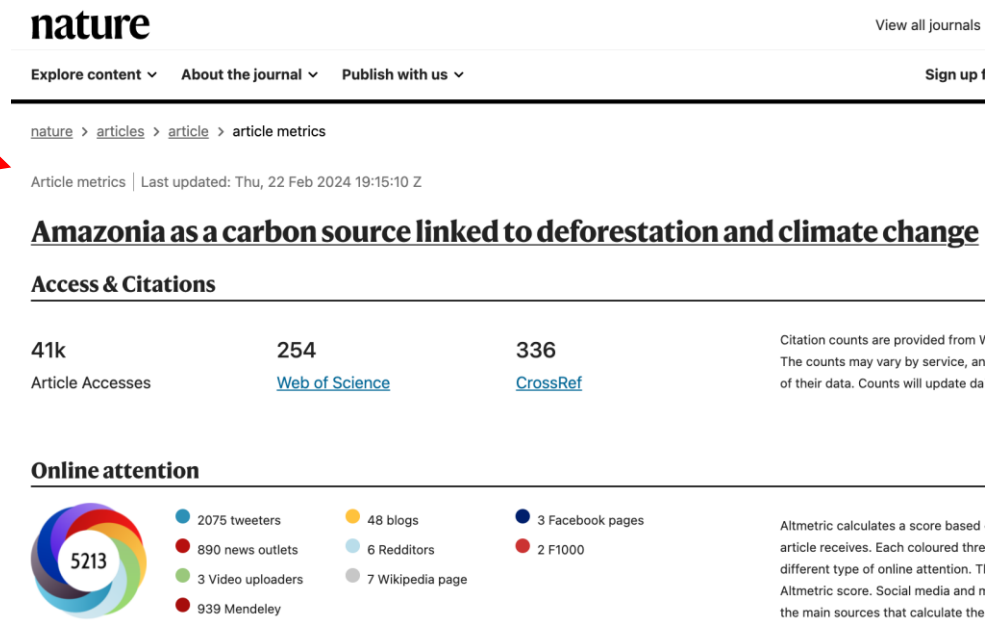
Nature_Gatti, 2014

Nature_Gatti, 2021

Nature_Gatti, 2023





This article is in the 99th percentile (ranked 52nd) of the 430,453 tracked articles of a similar age in all journals and the 99th percentile (ranked 7th) of the 927 tracked articles of a similar age in *Nature*

Figure 4 | Amazonia carbon flux 2010-2020. a) Seasonal Amazonia total carbon flux (FC_{Total}). Black line denotes the 2010-2018 mean, for which the grey bands denote the standard deviation of the monthly mean. Red line shows the seasonal FC_{Total} for 2019 and blue line for 2020. b) Annual mean Amazonia total carbon flux (blue bars) and the Oceanic Niño Index (ONI) classification in the background showing El Niño and La Niña[42] (see Extended Data Fig. 7a and Methods).

	NOAA	LaGEE - IPEN						LaGEE - INPE								19 Years
	2000/03	2004/09	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total LaGEE
SAN	22	86	19	23	24	23	16	6		17	21	18	17	20	17	307
ALF			20	19	24	22	19	5	20	24	23	23	21	21	22	263
RBA		1	20	18	22	19	15	12	21	24	20	23	17	18	22	252
TAB/TEF			20	14	9	15	16	4		14	13	17	9	9	1	141
CZS															18	18
FOR	11															0
PAN										11	8	8				27
MAN		35								9	2	15	10			71
Total	**33**	122	79	74	79	79	66	27	41	99	87	104	74	68	80	**1079**

CO_2, CH_4, N_2O, CO Vertical Profile

2000

2004/2015

Proposta da Criação do Laboratório Nacional de GEE e da rede Nac de GEE

2015/atual

NASA Grant
2000 - 2005
2013 - 2020

NERC Grant
2009 - 2015

GEOCARBON Grant
2011 - 2014

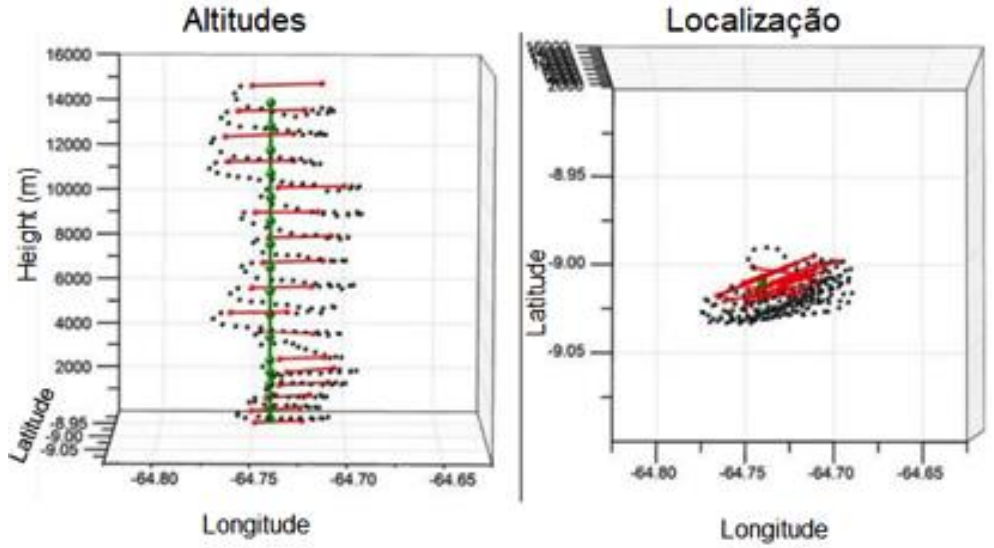
ERC Grant
2017 - 2021

Fapesp Grant

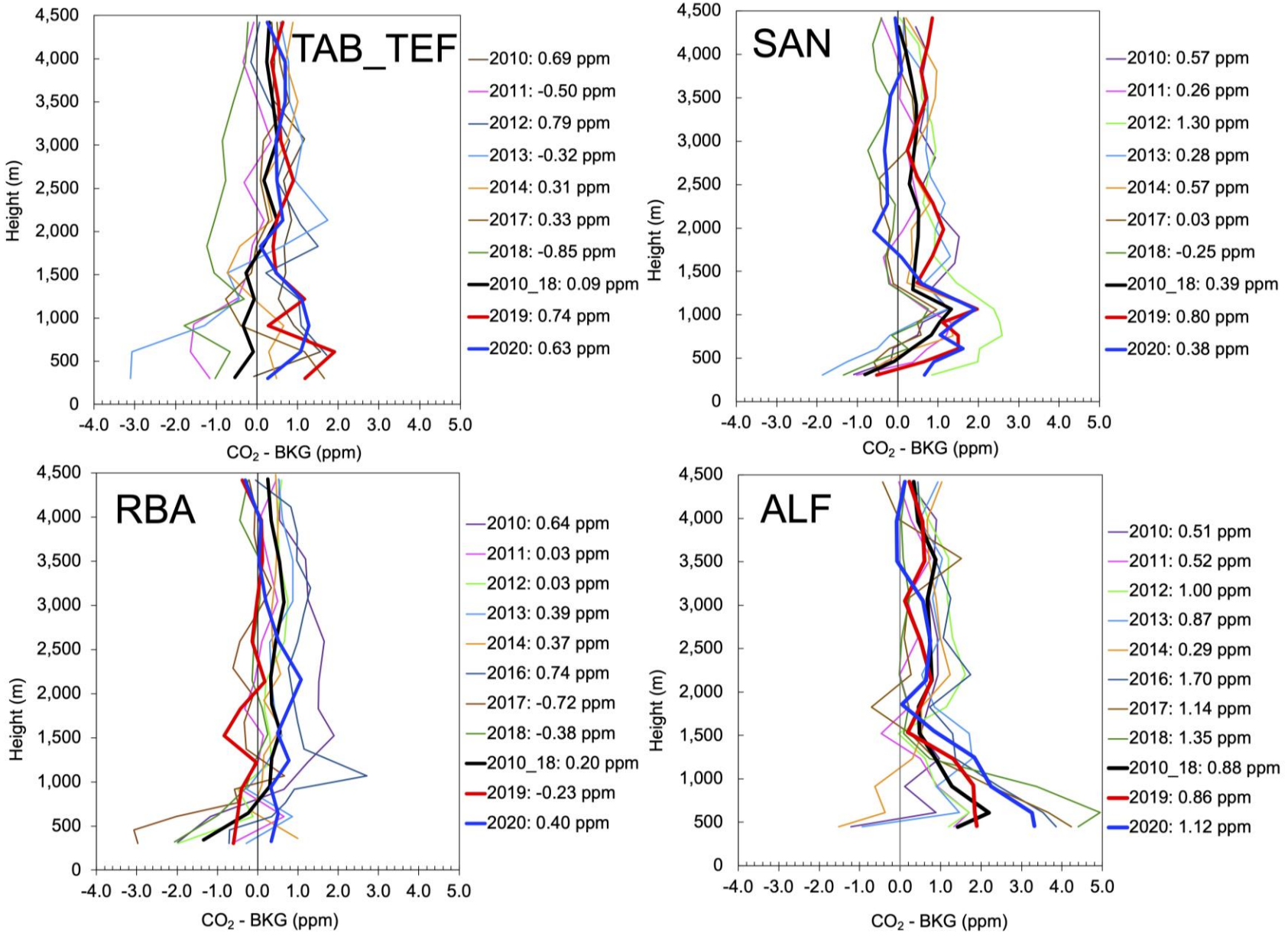
2009 – 2012 - Carbon Tracker
2013 – 2015 – ACO
2017 – 2023 – CARBAM (término Ago 23)

MCTIC/CNPq Grant
2012 - 2013

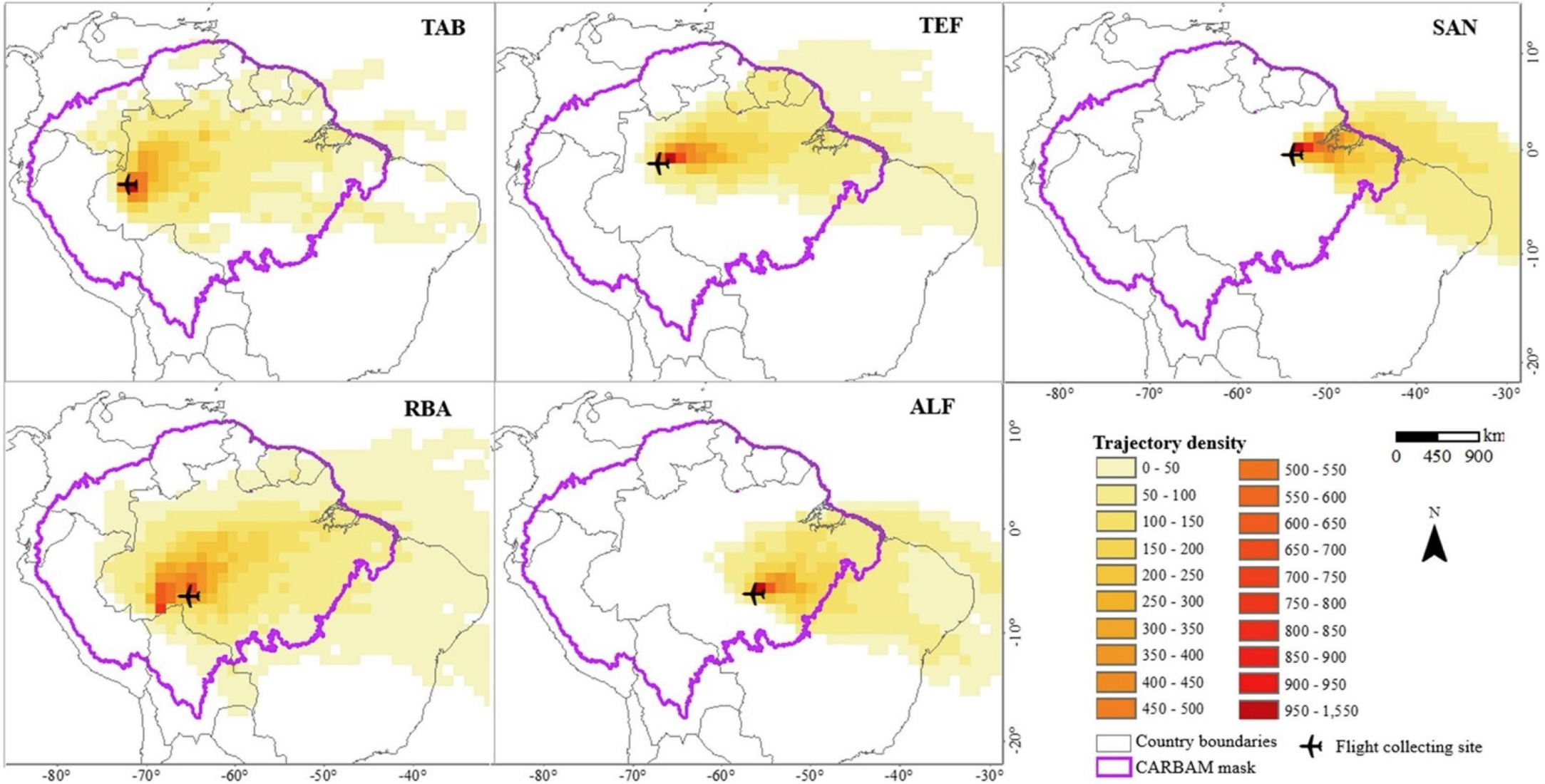
7.25×10^6 km^2



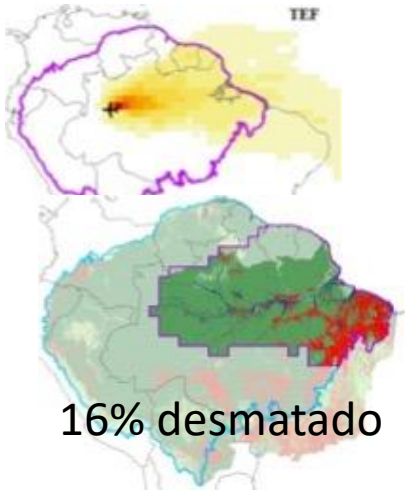
CO_2, CH_4, N_2O and CO



Extended Data Fig. 2 | Annual mean ΔVPs per site. Annual mean ΔVPs for each site TAB_TEF, SAN, RBA, and ALF for the time series (2010–2020), constructed from the annual mean VP, where the background was subtracted from each height, each flask (see methods). The black thick line represent the 2010-2018 Amazonia sites mean vertical profiles, the red thick line 2019 mean and blue thick line 2020 mean.

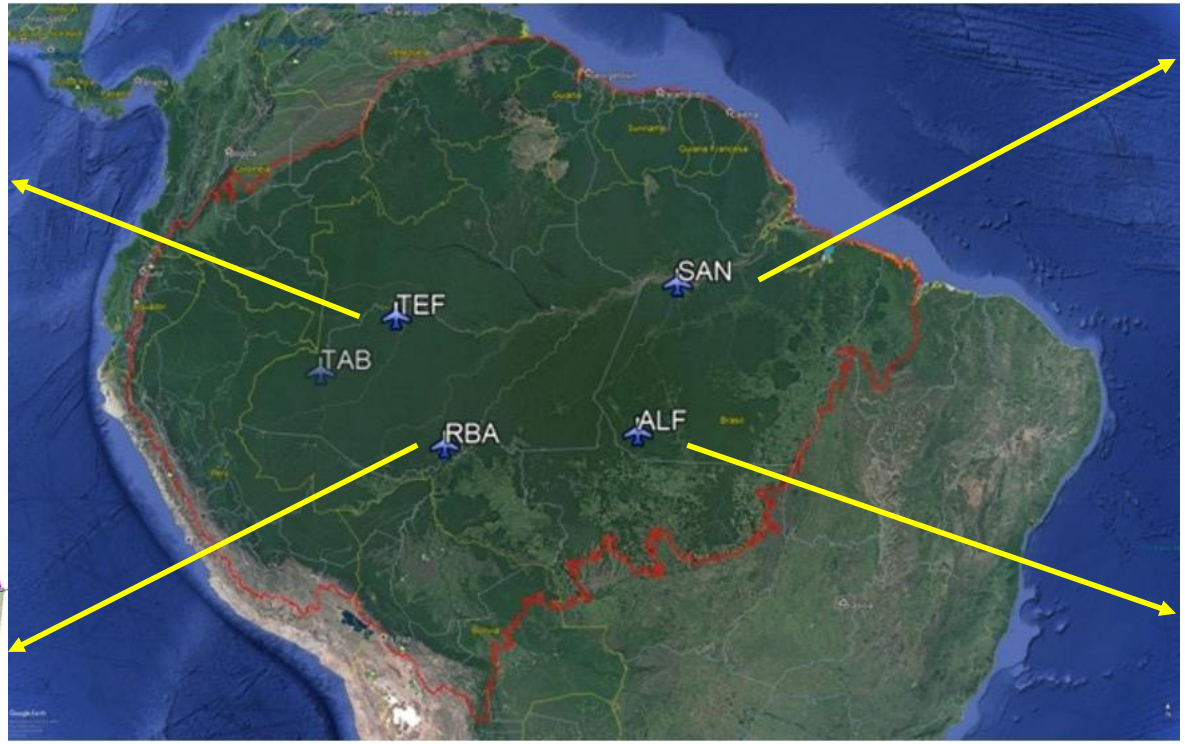


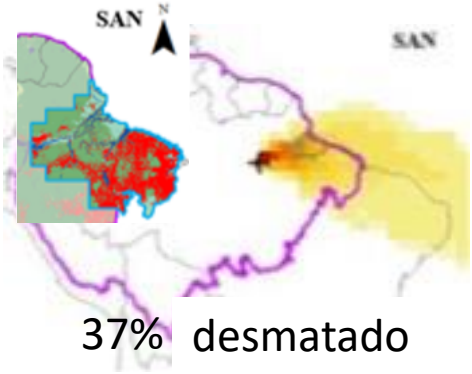
Extended Data Fig. 1 | Regions of Influence. Annual mean regions of influence based on back trajectories density, calculated by Hysplit trajectory model for each flask, on each vertical profile along all studied years (2010 to 2018) for the sites SAN (2.9° S 55.0° W), ALF (8.8° S 56.8° W), RBA (9.4° S 67.6° W); 2010-2012 for TAB (6.0° S 70.1° W); and from 2013 for TEF (3.4° S 65.6° W) (see Methods).



16% desmatado

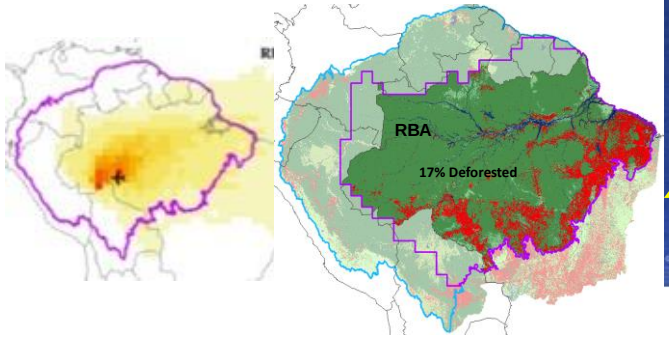
0.03 ± 0.02 gC $m^{-2}d^{-1}$





37% desmatado

0.41 ± 0.06 gC $m^{-2}d^{-1}$

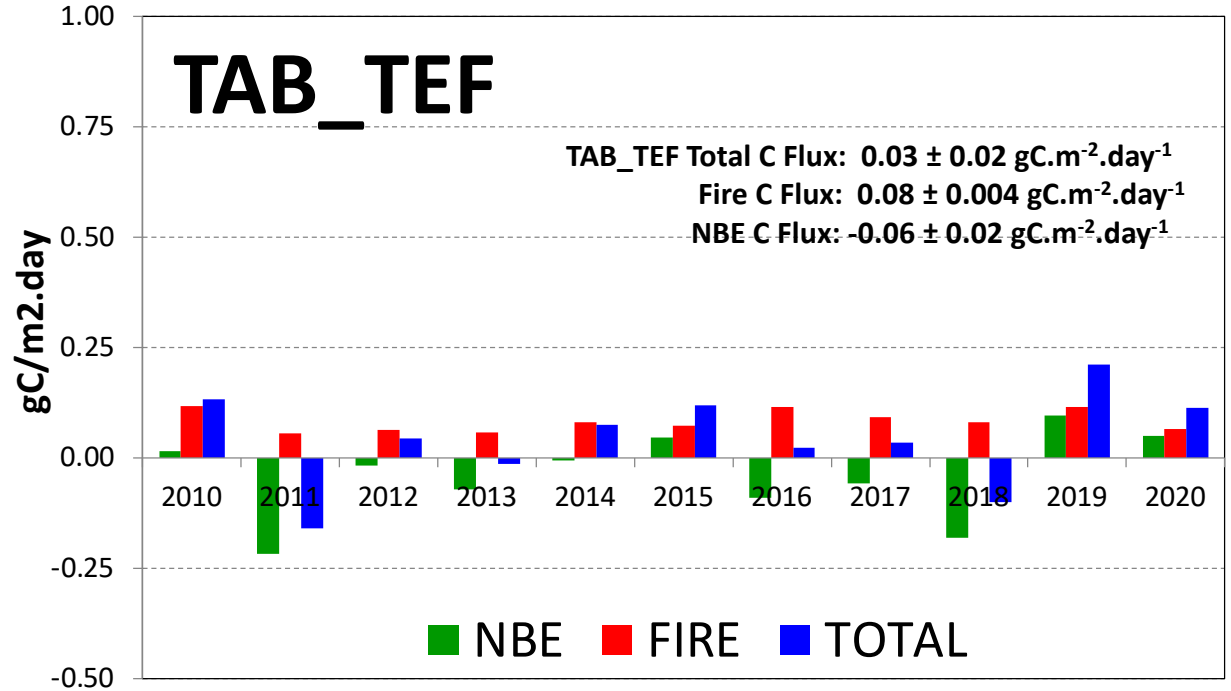


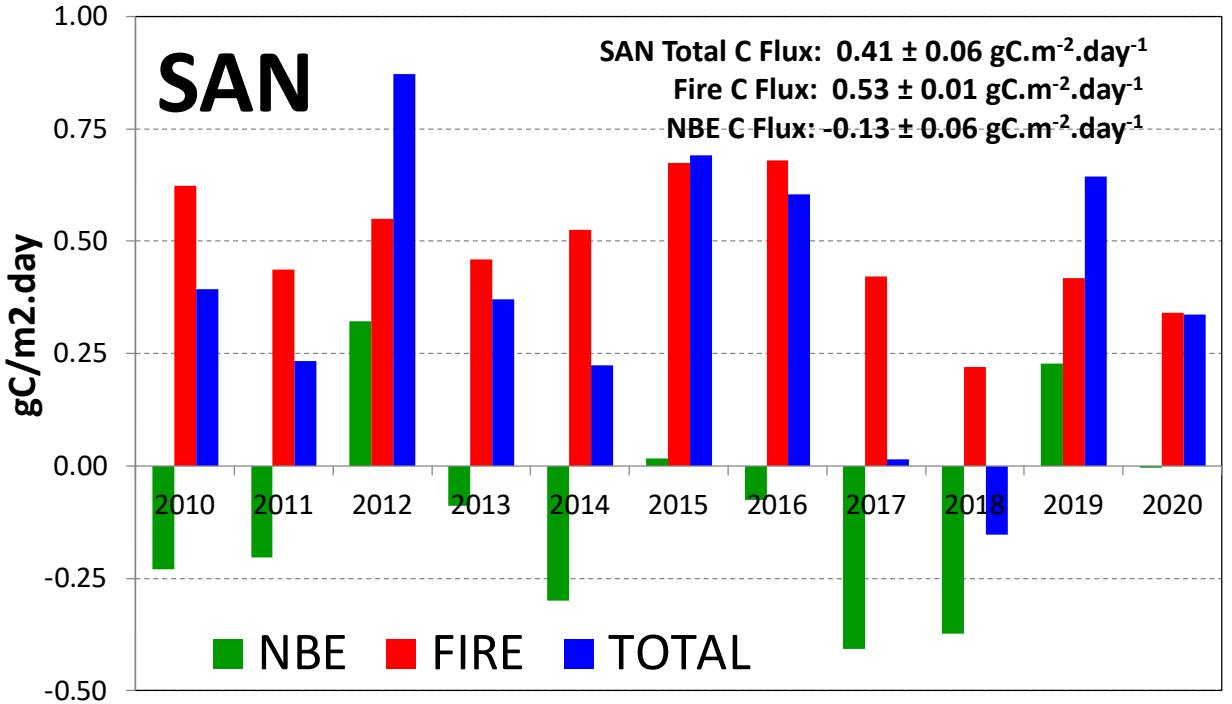
17% desmatado

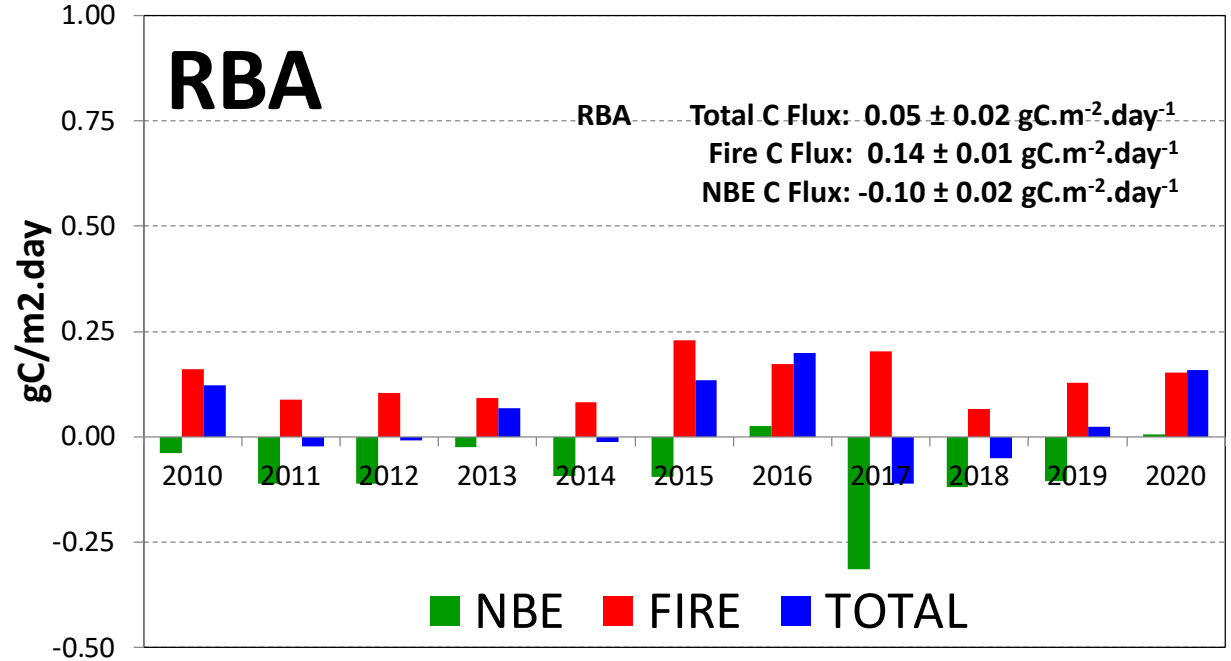
0.05 ± 0.02 gC $m^{-2}d^{-1}$

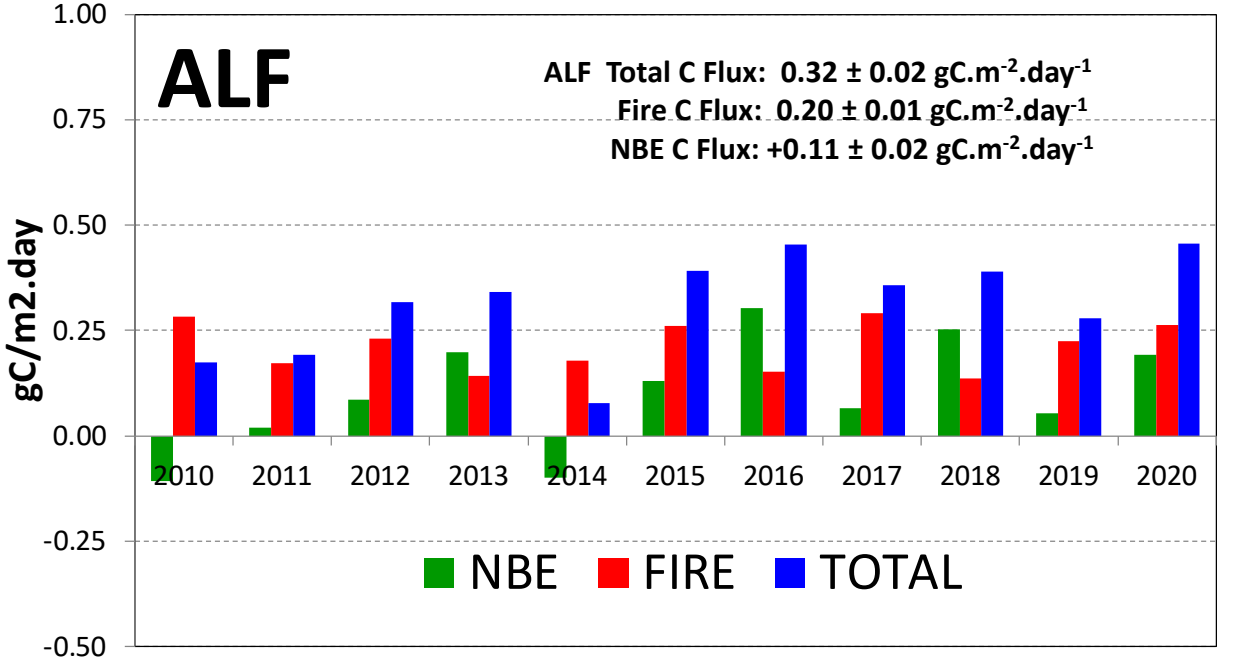
28% desmatado

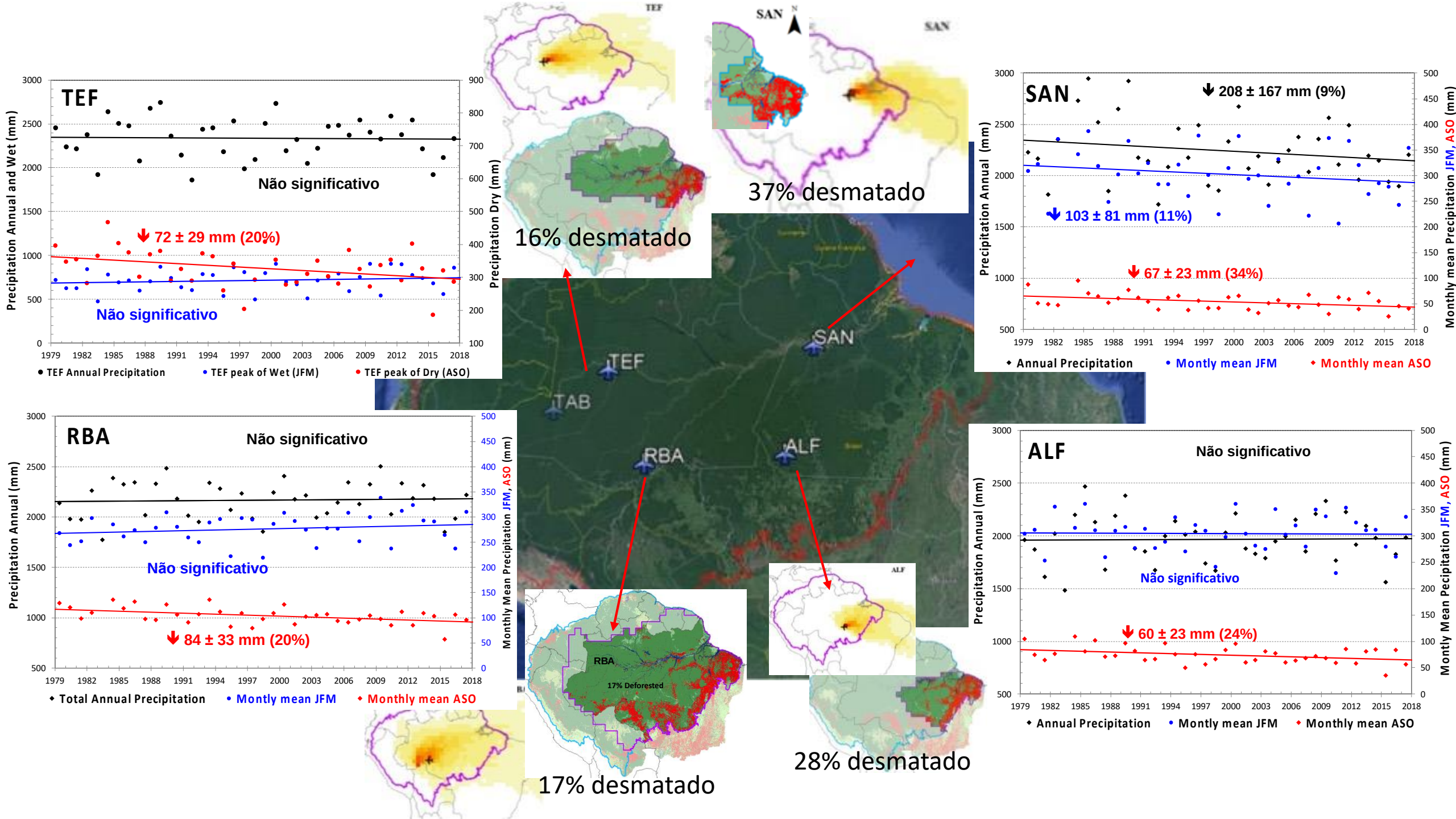
0.32 ± 0.02 gC $m^{-2}d^{-1}$


TAB_TEF
TAB_TEF Total C Flux: 0.03 ± 0.02 gC.m-2.day-1
Fire C Flux: 0.08 ± 0.004 gC.m-2.day-1
NBE C Flux: -0.06 ± 0.02 gC.m-2.day-1
gC/m2.day
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
NBE
FIRE
TOTAL

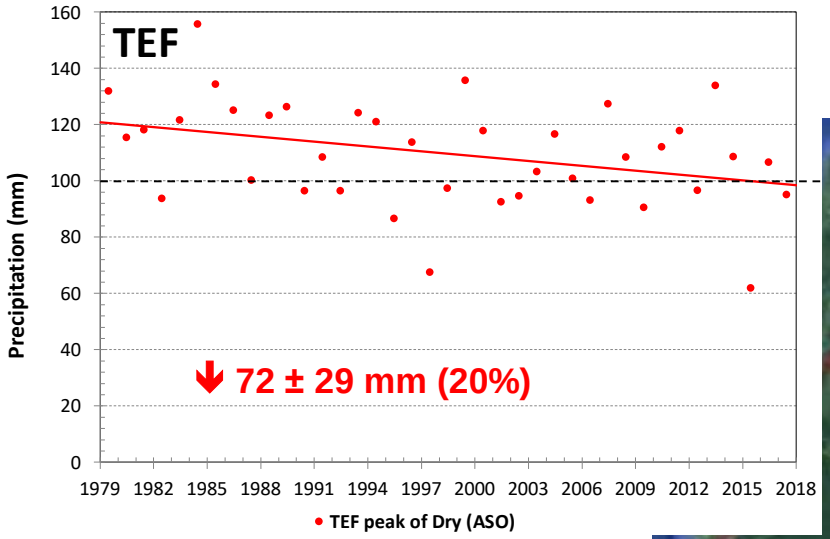

SAN
SAN Total C Flux: 0.41 ± 0.06 gC.m-2.day-1
Fire C Flux: 0.53 ± 0.01 gC.m-2.day-1
NBE C Flux: -0.13 ± 0.06 gC.m-2.day-1
gC/m2.day
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
NBE
FIRE
TOTAL

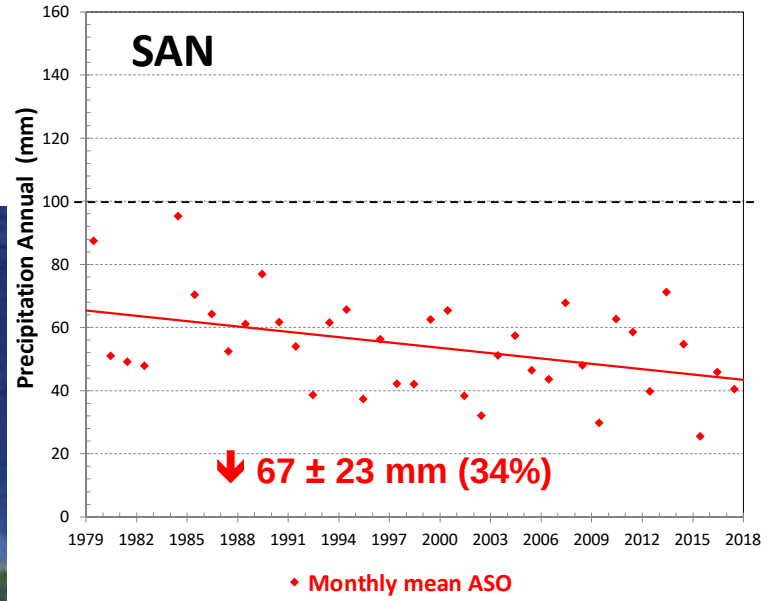

RBA
RBA Total C Flux: 0.05 ± 0.02 gC.m-2.day-1
Fire C Flux: 0.14 ± 0.01 gC.m-2.day-1
NBE C Flux: -0.10 ± 0.02 gC.m-2.day-1
gC/m2.day
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
NBE
FIRE
TOTAL

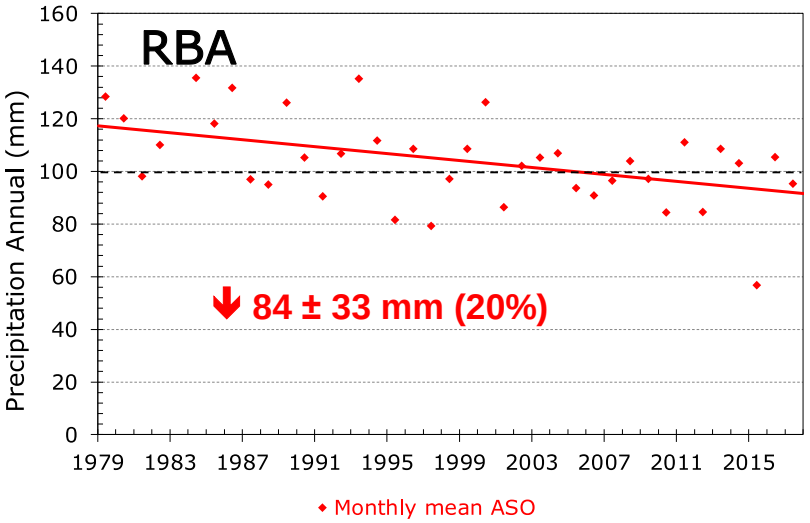

ALF
ALF Total C Flux: 0.32 ± 0.02 gC.m-2.day-1
Fire C Flux: 0.20 ± 0.01 gC.m-2.day-1
NBE C Flux: +0.11 ± 0.02 gC.m-2.day-1
gC/m2.day
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
NBE
FIRE
TOTAL

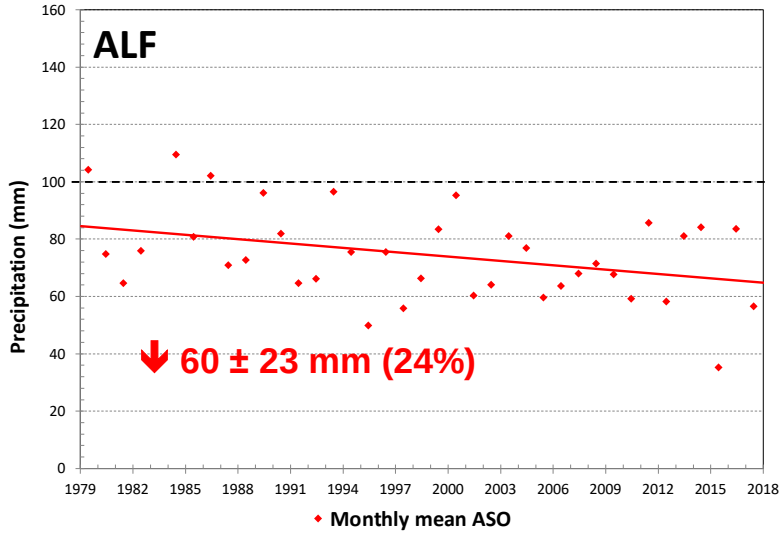

TEF
Não significativo
72 ± 29 mm (20%)
Não significativo
Precipitation Annual and Wet (mm)
Precipitation Dry (mm)
TEF Annual Precipitation
TEF peak of Wet (JFM)
TEF peak of Dry (ASO)
16% desmatado
SAN
37% desmatado
SAN
208 ± 167 mm (9%)
103 ± 81 mm (11%)
67 ± 23 mm (34%)
Precipitation Annual (mm)
Monthly mean Precipitation JFM, ASO (mm)
Annual Precipitation
Montly mean JFM
Monthly mean ASO
TEF
TAB
RBA
ALF
SAN
RBA
Não significativo
Não significativo
84 ± 33 mm (20%)
Precipitation Annual (mm)
Monthly Mean Precipitation JFM, ASO (mm)
Total Annual Precipitation
Montly mean JFM
Monthly mean ASO
RBA
17% Deforested
17% desmatado
ALF
28% desmatado
ALF
Não significativo
Não significativo
60 ± 23 mm (24%)
Precipitation Annual (mm)
Monthly Mean Pecipitation JFM, ASO (mm)
Annual Precipitation
Montly mean JFM
Monthly mean ASO

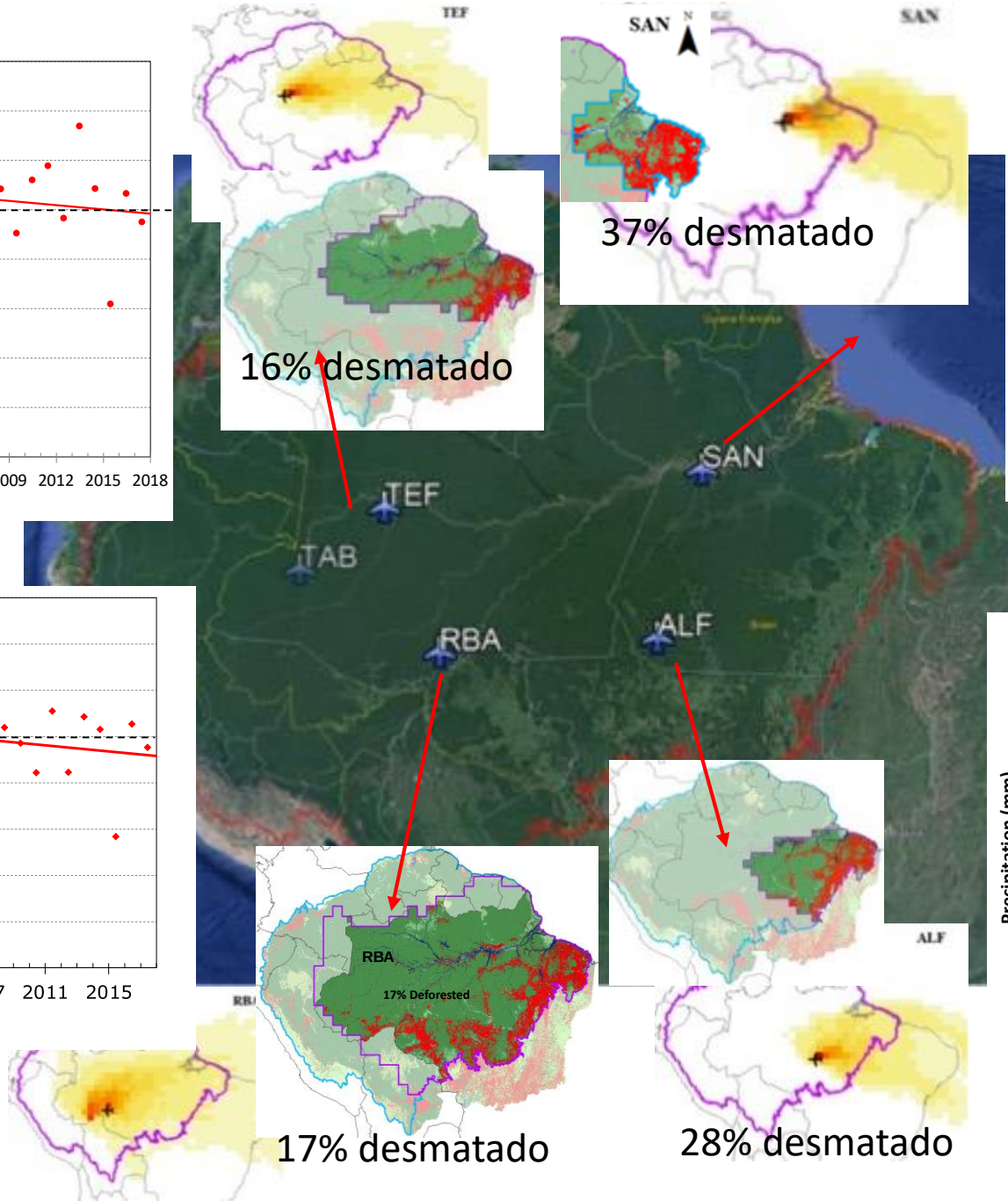
↓ Precipitação Agosto, Setembro, Outubro (pico da estaçao seca)

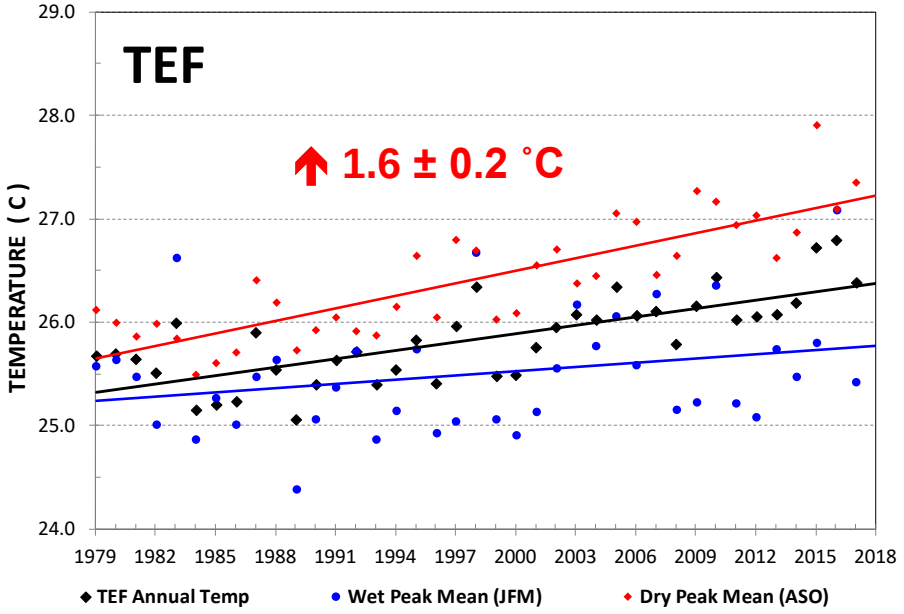


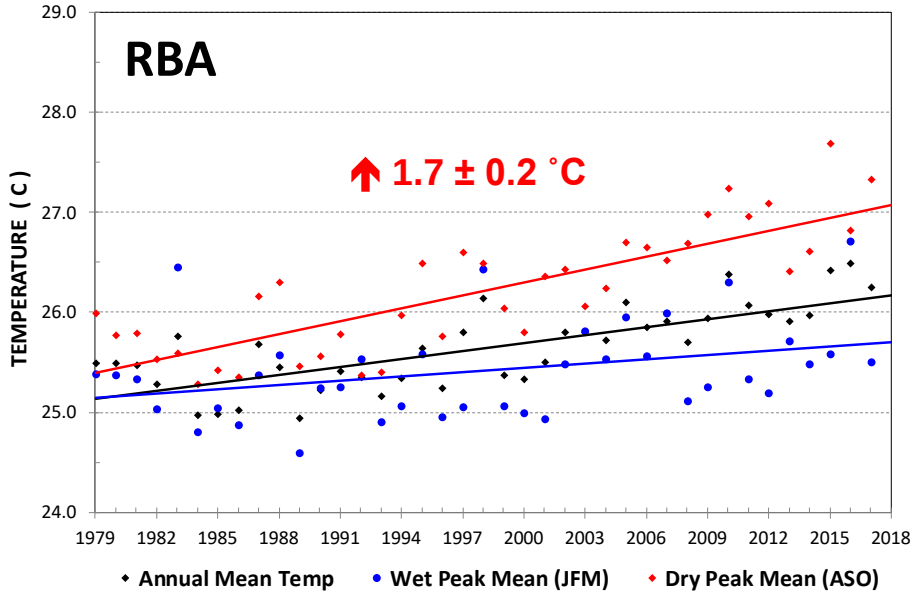




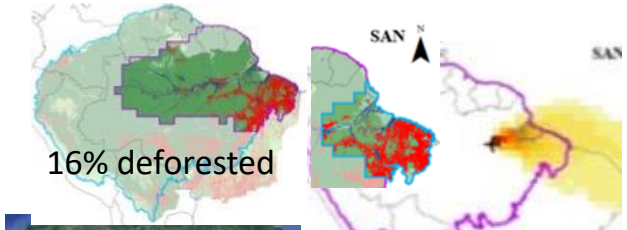


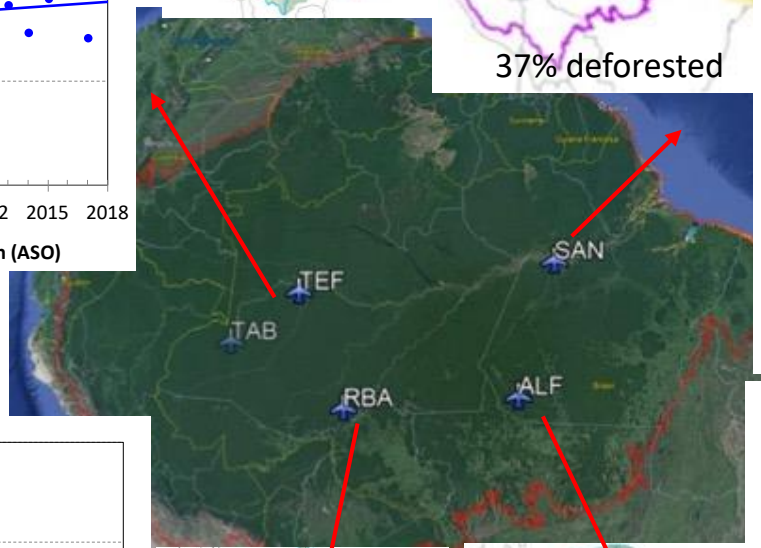


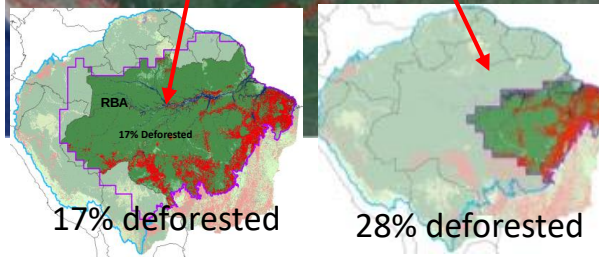


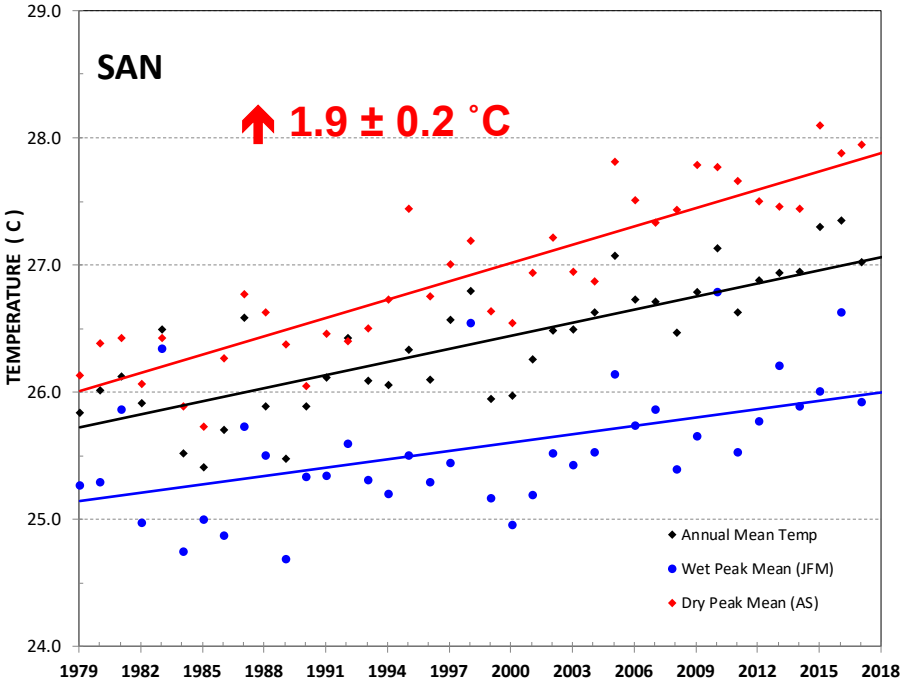


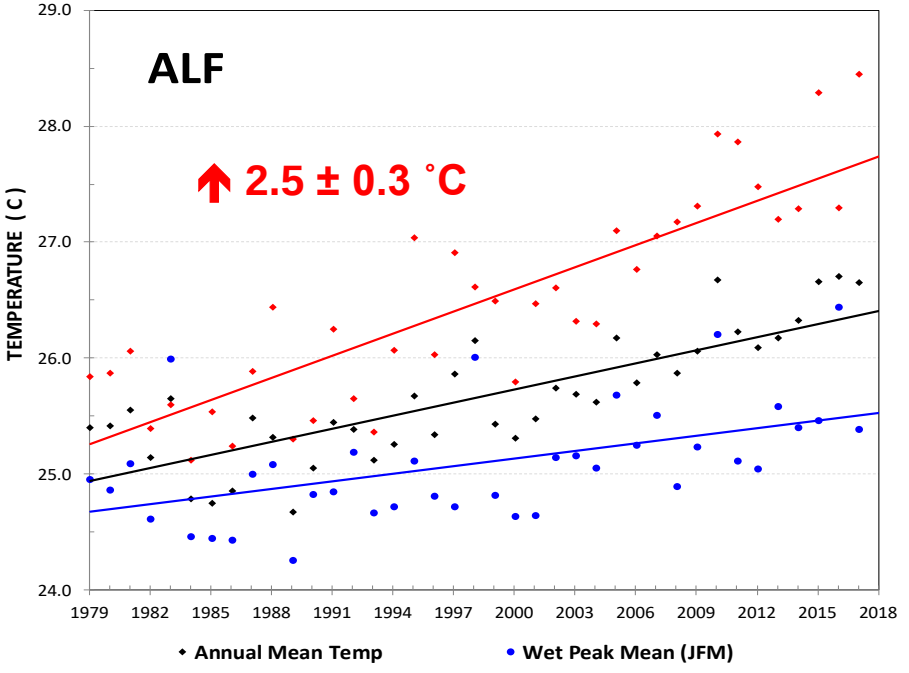
Temperature ASO



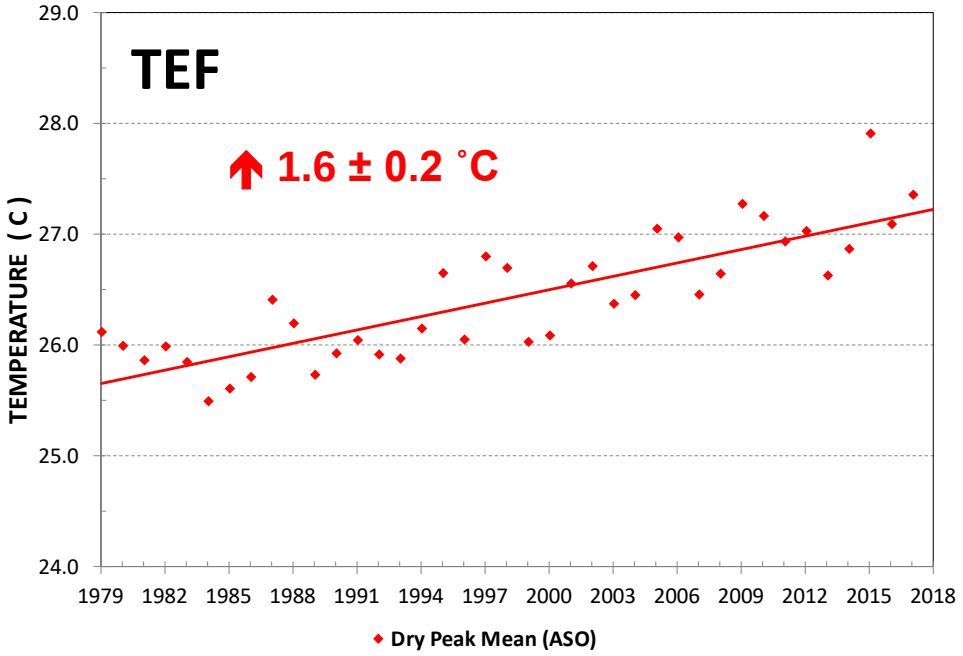


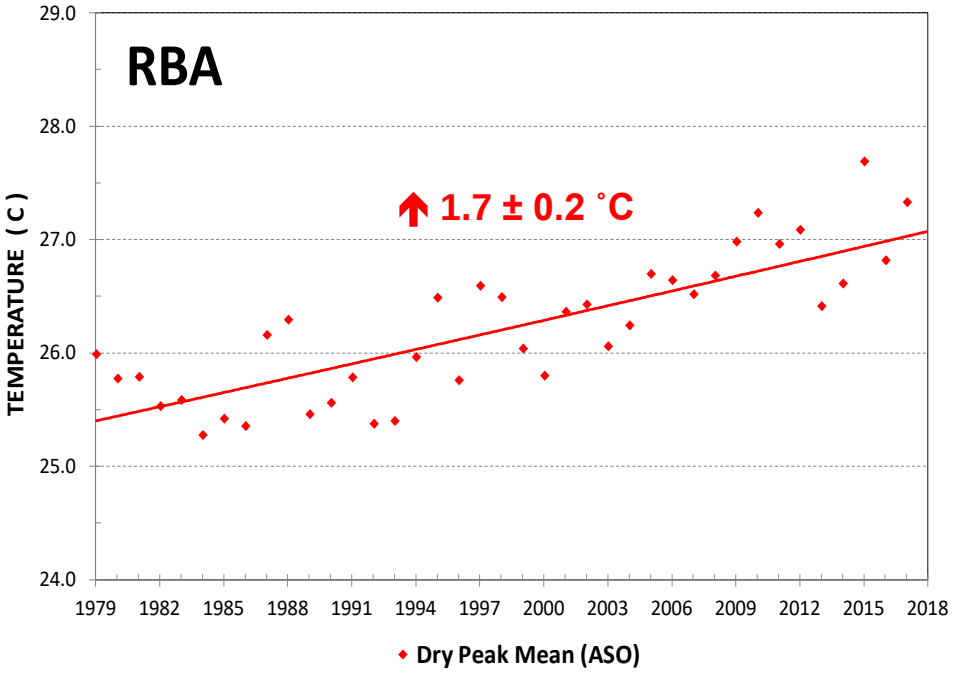


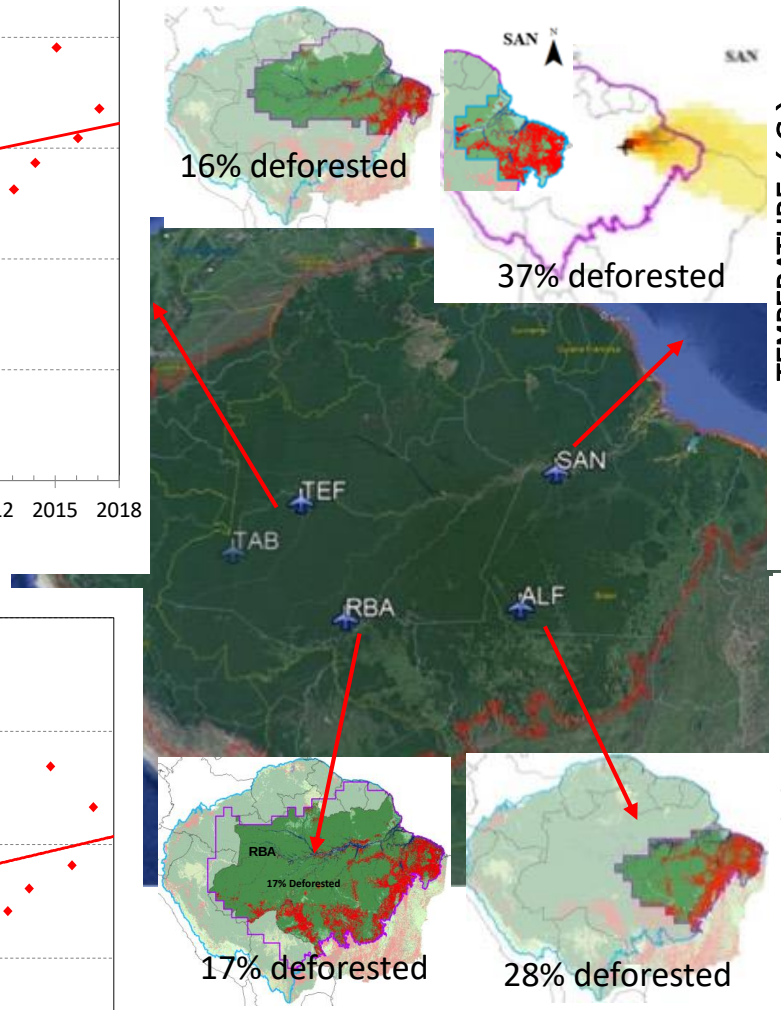


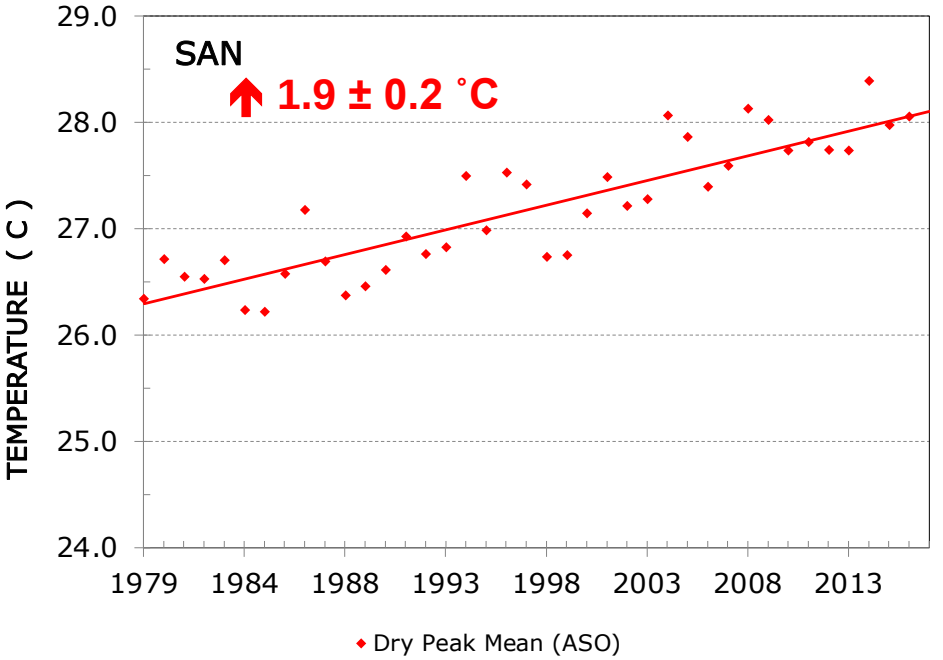


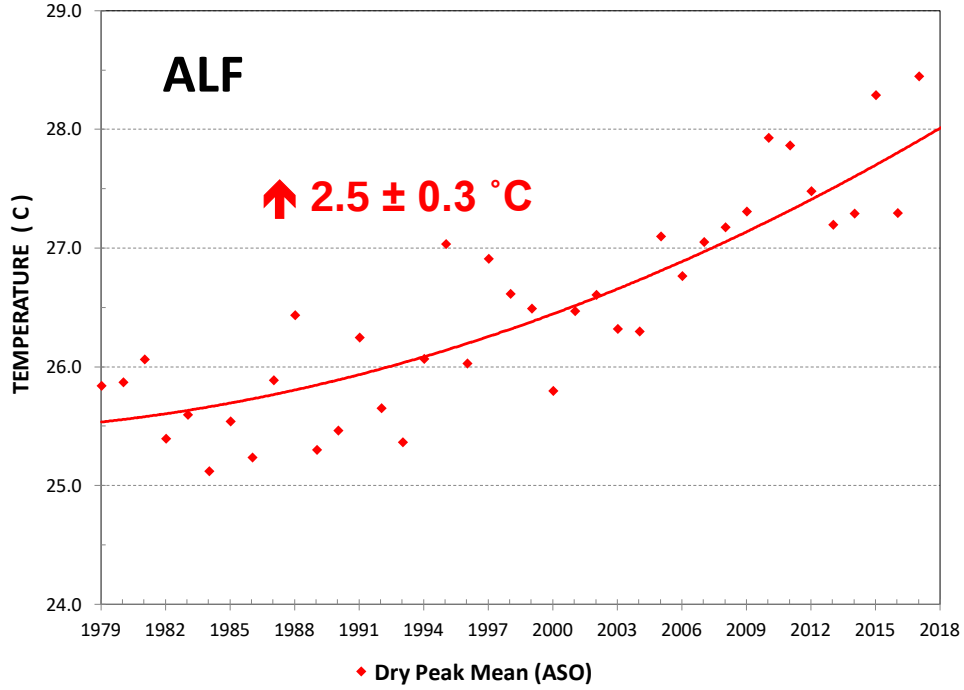
↑ Temperature August, September, October (Dry season peak)

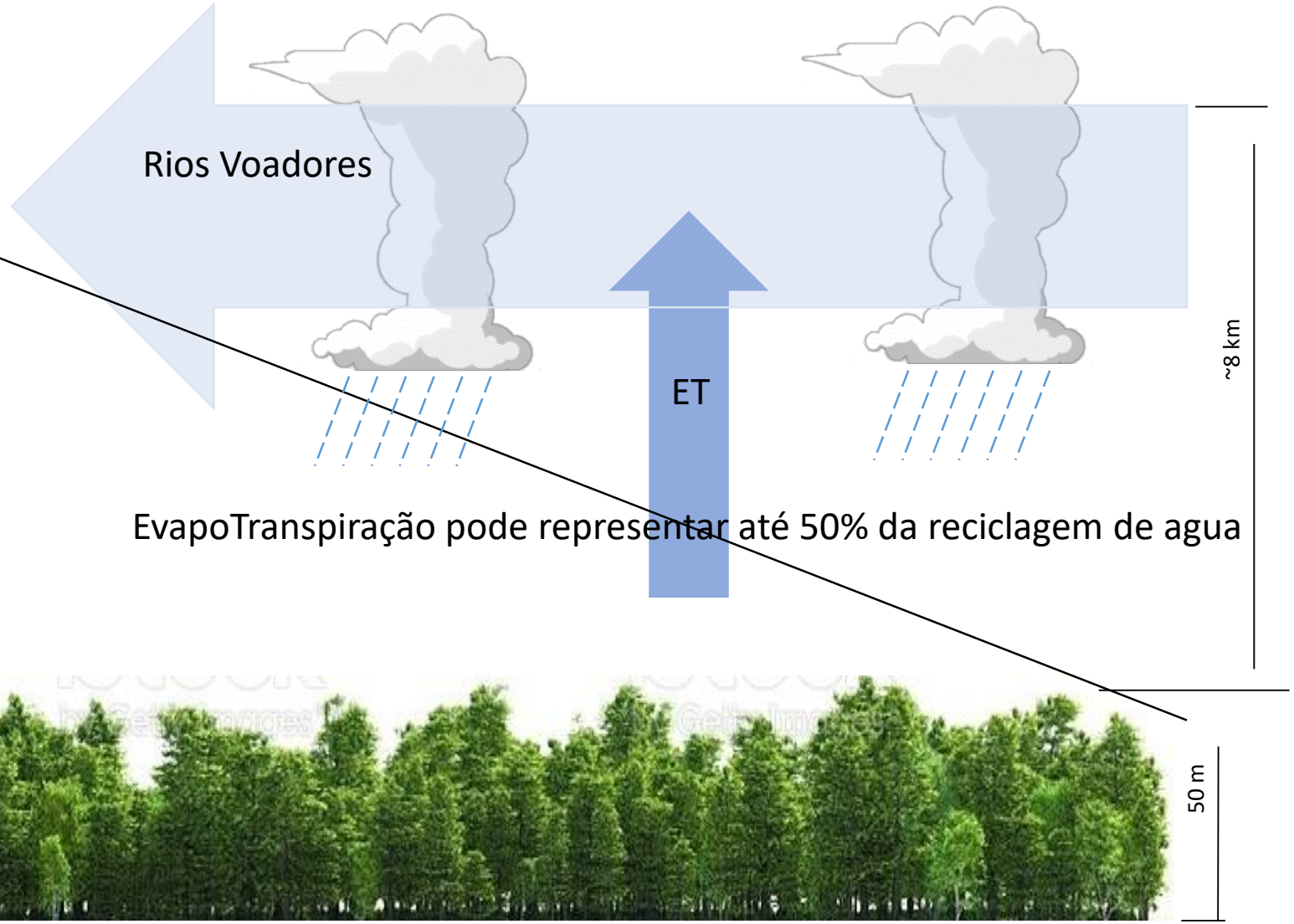












Science Panel for the Amazon (SPA) WG3 / CHAPTER 7 - Biosphere-Atmosphere Interactions

Lead Authors: Marcos H. Costa & Luciana V. Gatti

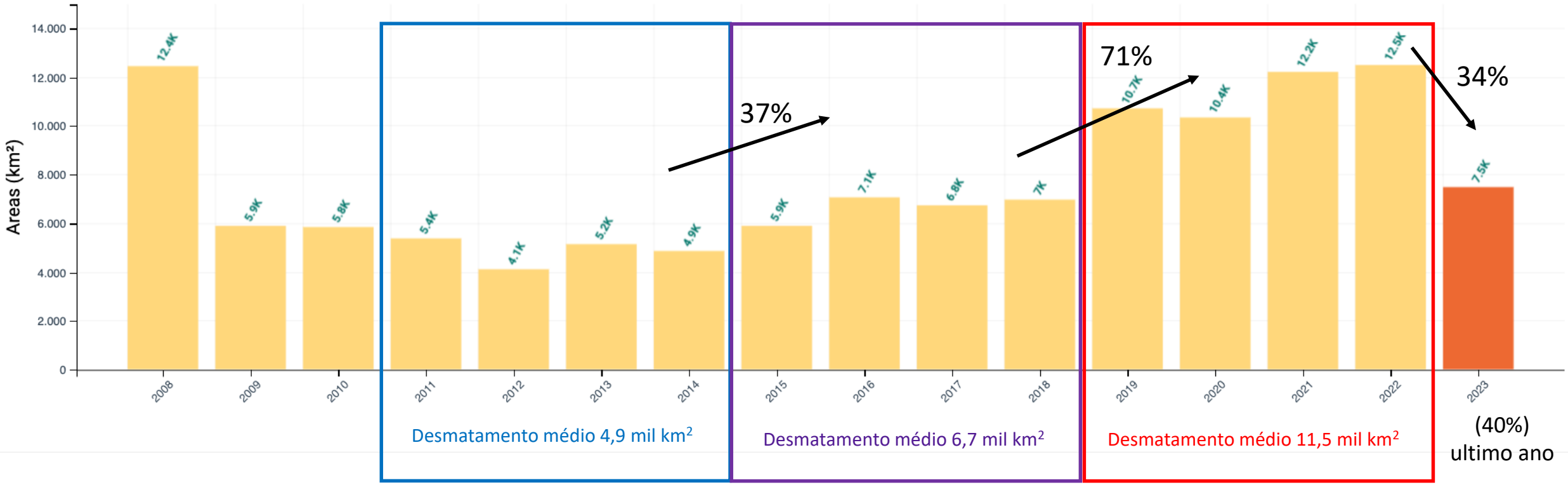
TerraBrasilis

PRODES (Desmatamento)

INPE

UNIDADE DE PESQUISA DO MCTI

Incrementos de desmatamento - Amazônia - Estados



TerraBrasilis

PRODES (Desmatamento)

INPE

UNIDADE DE PESQUISA DO MCTI

Impactos de chuvas torrenciais

Brasil

2013 – 2022

(até VI/2022)

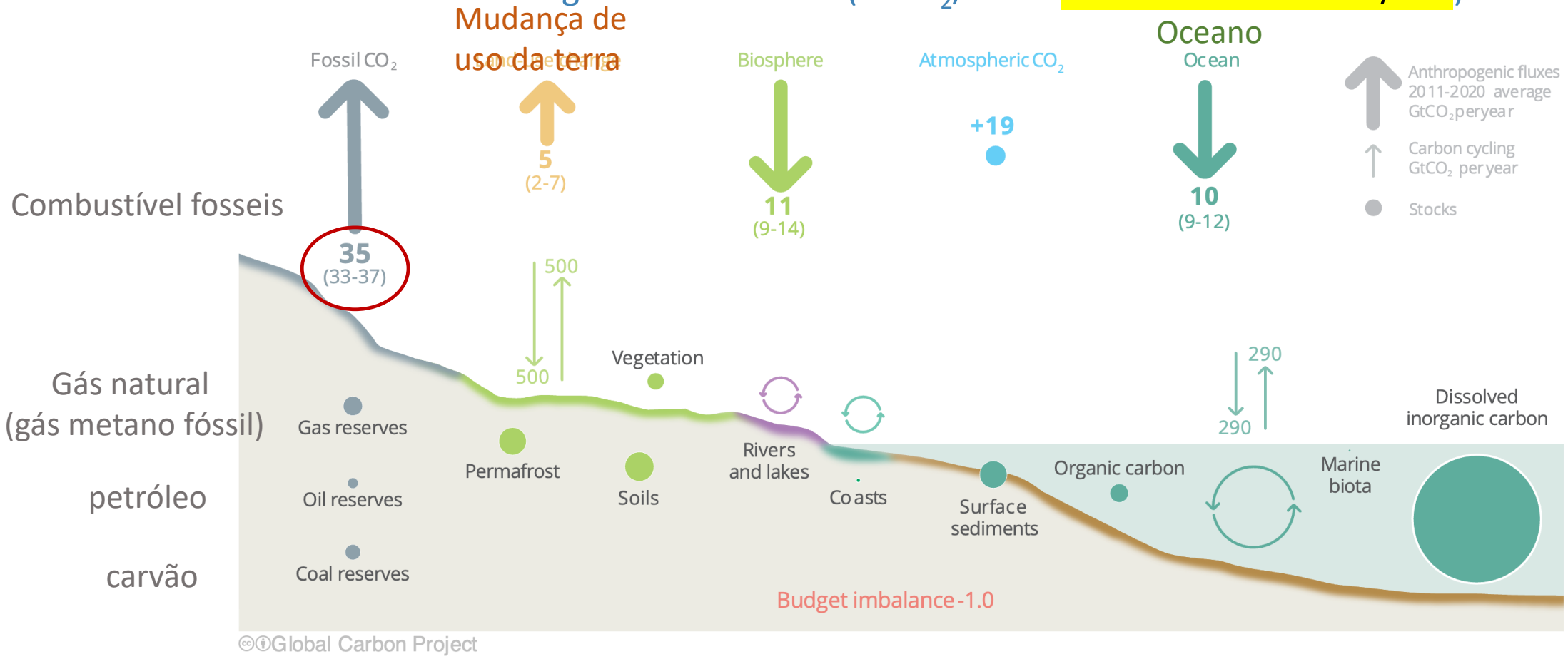
Salto no período 2019 – 2022:

1.281 mortes ou 72% do período 2013-2022

Incrementos de desmatame

Pertubação antropogenicado ciclo do carbono global

Perturbação global causada pelas atifvidades humanas,
media annual global 2012–2021 ($GtCO_2$/ano = bilhões de toneladas/ano)



The budget imbalance is the difference between the estimated emissions and sinks.
Source: NOAA-ESRL; Friedlingstein et al 2022; Canadell et al 2021 (IPCC AR6 WG1 Chapter 5); Global Carbon Project 2022

Fate of anthropogenic CO_2 emissions (2013–2022)

Sources

35.3 $GtCO_2$/yr

88%

12%

4.7 $GtCO_2$/yr

= Sinks

18.9 $GtCO_2$/yr

47%

31%

12.3 $GtCO_2$/yr

26%

10.4 $GtCO_2$/yr

Budget Imbalance:

(the difference between estimated sources & sinks)

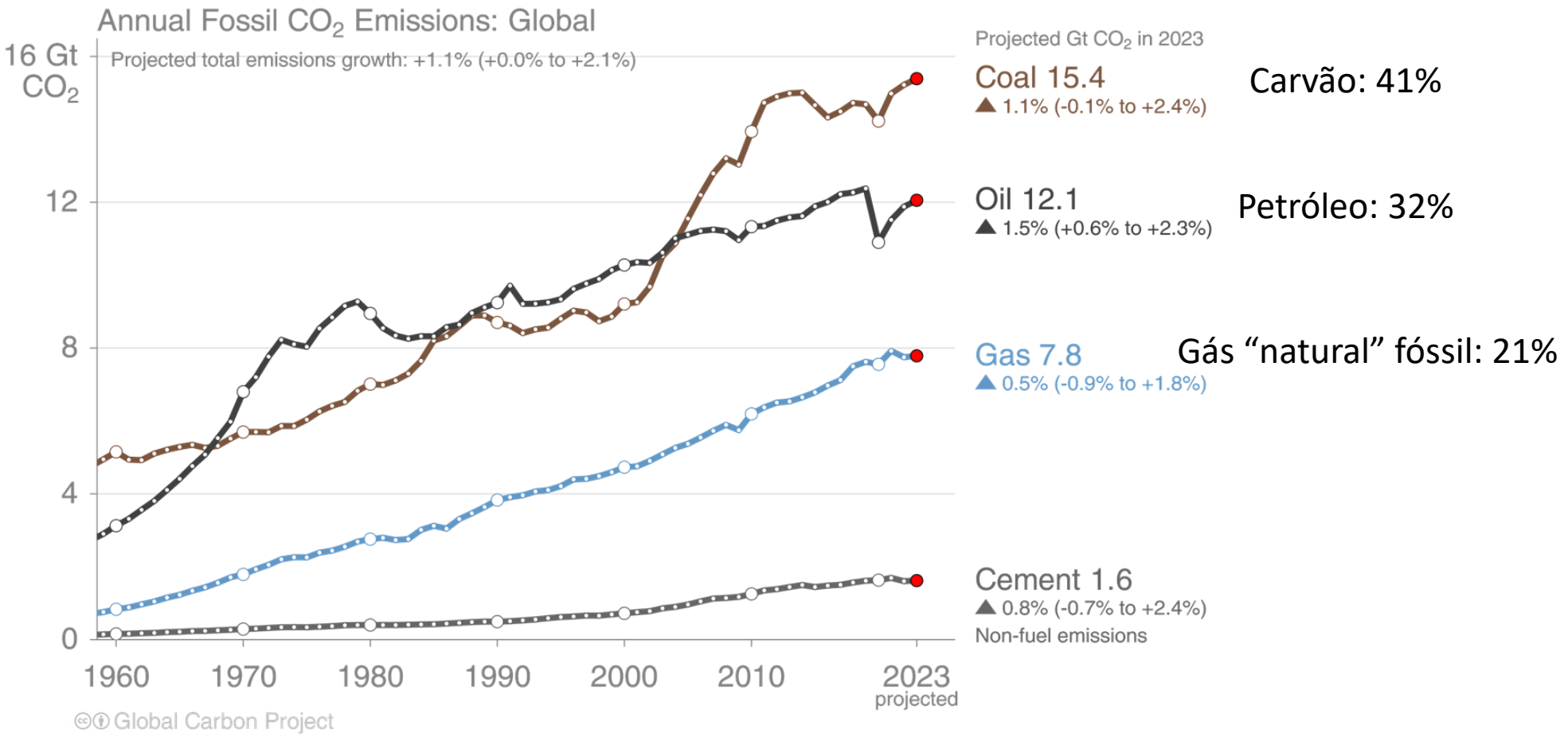
4%

-1.6 $GtCO_2$/yr

Source: Friedlingstein et al 2023; Global Carbon Project 2023

Fossil CO_2 emissions by source

Share of global fossil CO_2 emissions in 2023: coal (41%), oil (32%), gas (21%), cement (4%), flaring and others (2%, not shown)

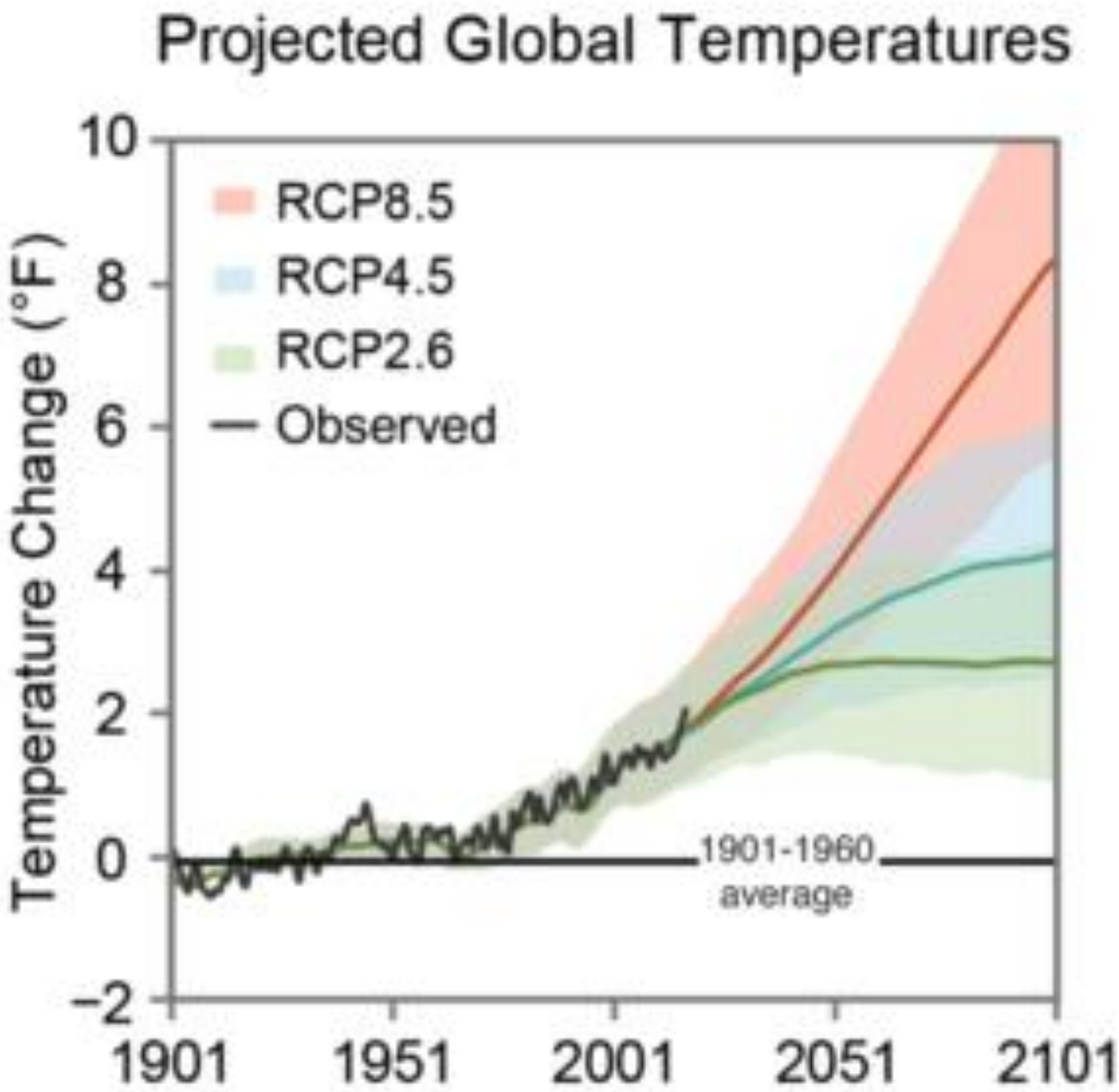


Carvão: 41%

Petróleo: 32%

Gás “natural” fóssil: 21%

The 2023 projection is based on preliminary data and modelling.
Source: Friedlingstein et al 2023; Global Carbon Project 2023

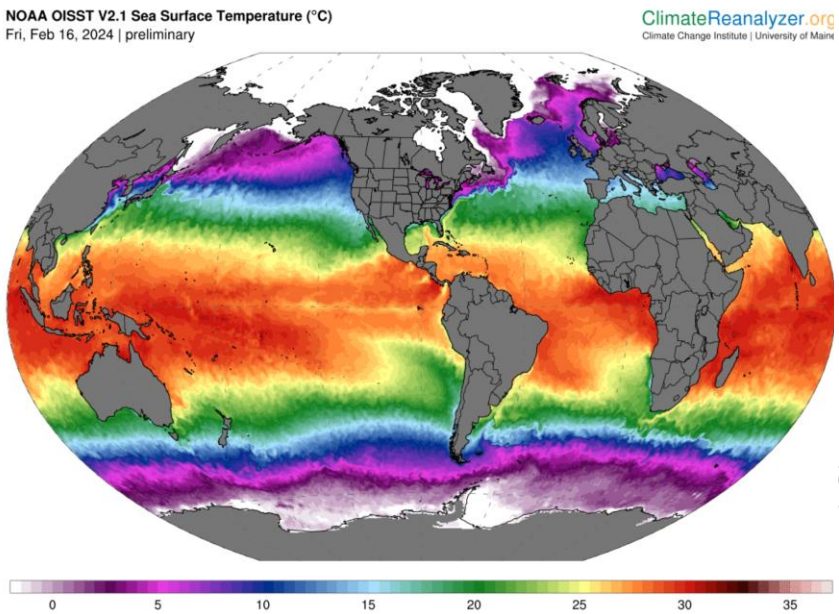


2017 Climate Science Special Report, Figure ES-3

Climate Reanalyzer
Climate Change Institute | University of Maine

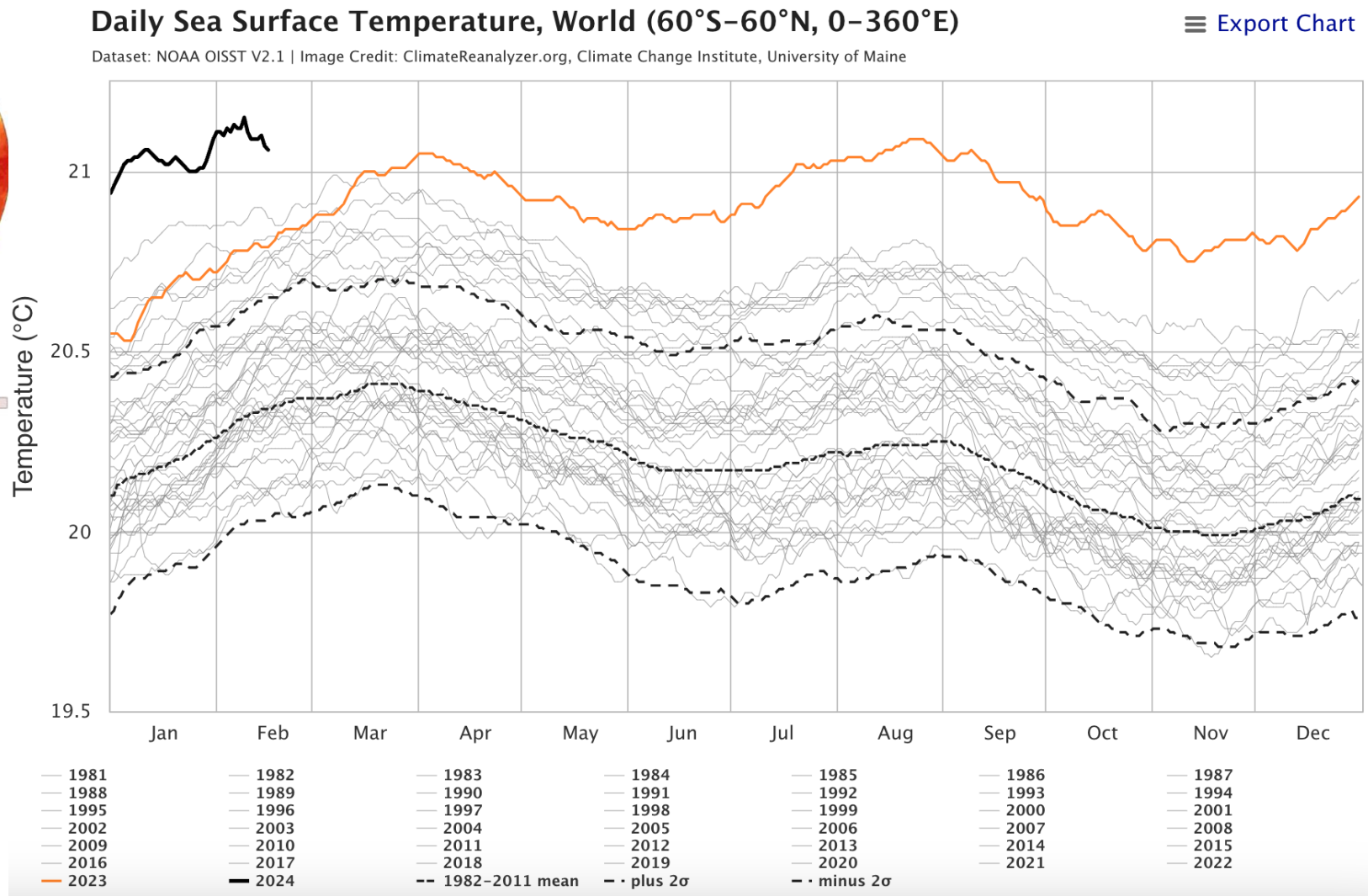
Weather Forecasts | Climate Data | Research Tools | About

Daily Sea Surface Temperature



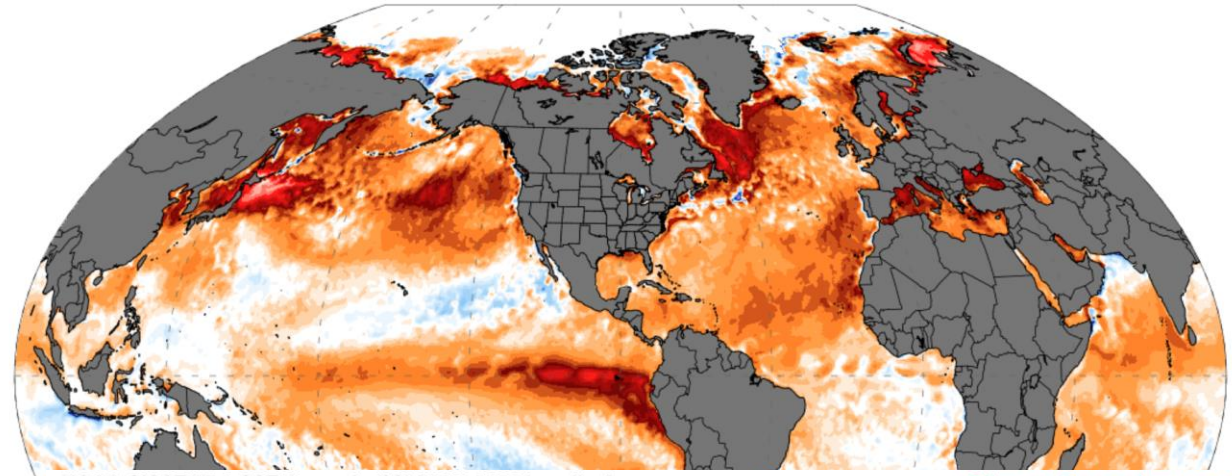
Area Selection: World (60°S-60°N)

This page shows daily sea surface temperature estimates from NOAA OISST v2.1 – View details.



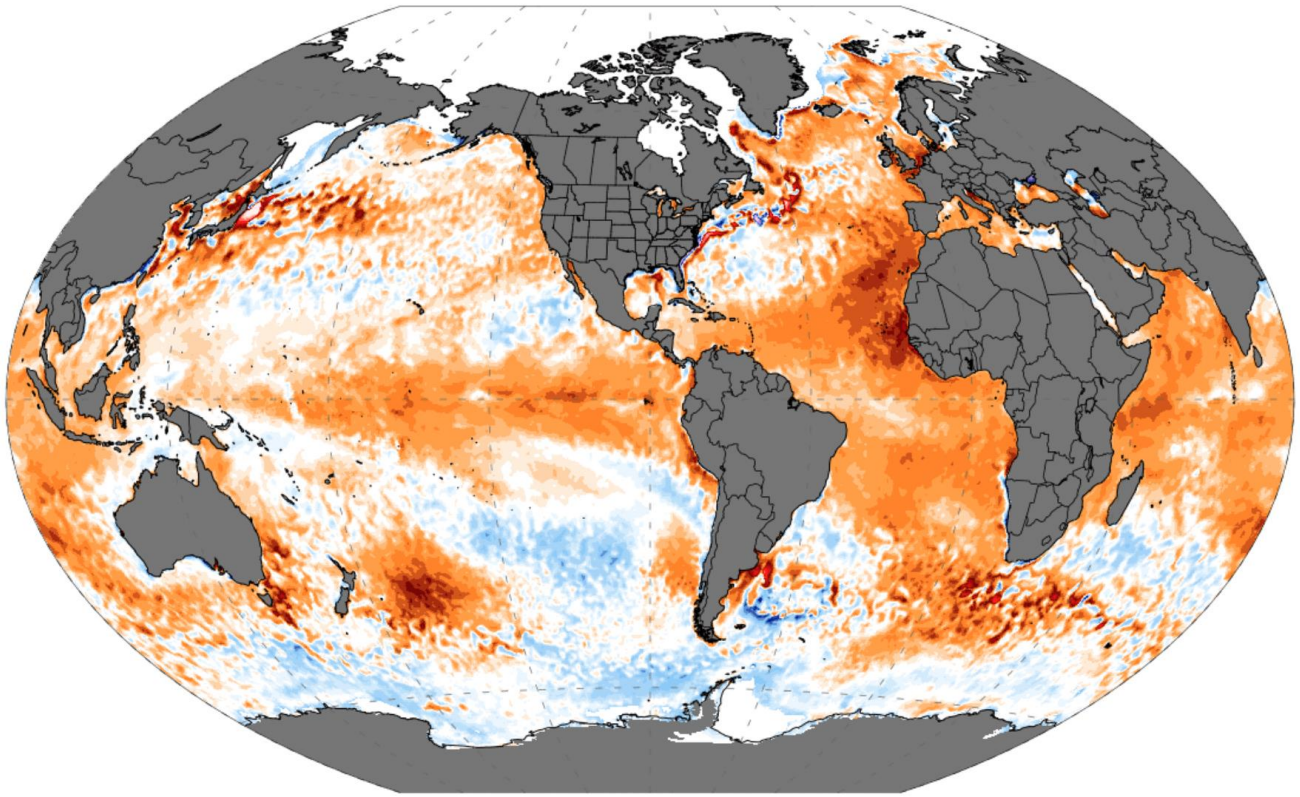
NOAA OISST V2.1 SST Anomaly (°C) [1971-2000 baseline]
Sun, Aug 27, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine



NOAA OISST V2.1 SST Anomaly (°C) [1971-2000 baseline]
Fri, Feb 16, 2024 | preliminary

ClimateReanalyzer.org
Climate Change Institute | University of Maine



-9 -7 -5 -4 -3 -2 -1 -0.5 0 0.5 1 2 3 4 5 7 9

NOAA OISST V2.1 SST Anomaly (°C) [1971-2000 baseline]
Sun, Nov 26, 2023

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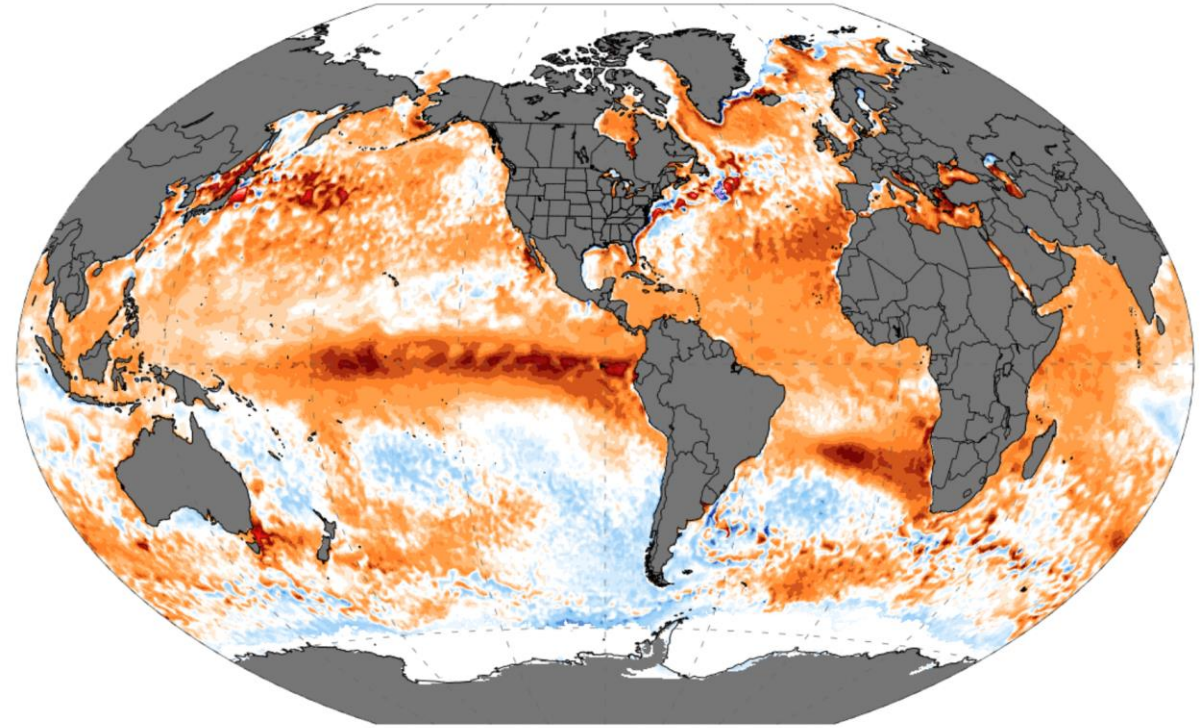


-9 -7 -5 -4 -3 -2 -1 -0.5 0 0.5 1 2 3 4 5 7 9

Daily Surface Air Temperature

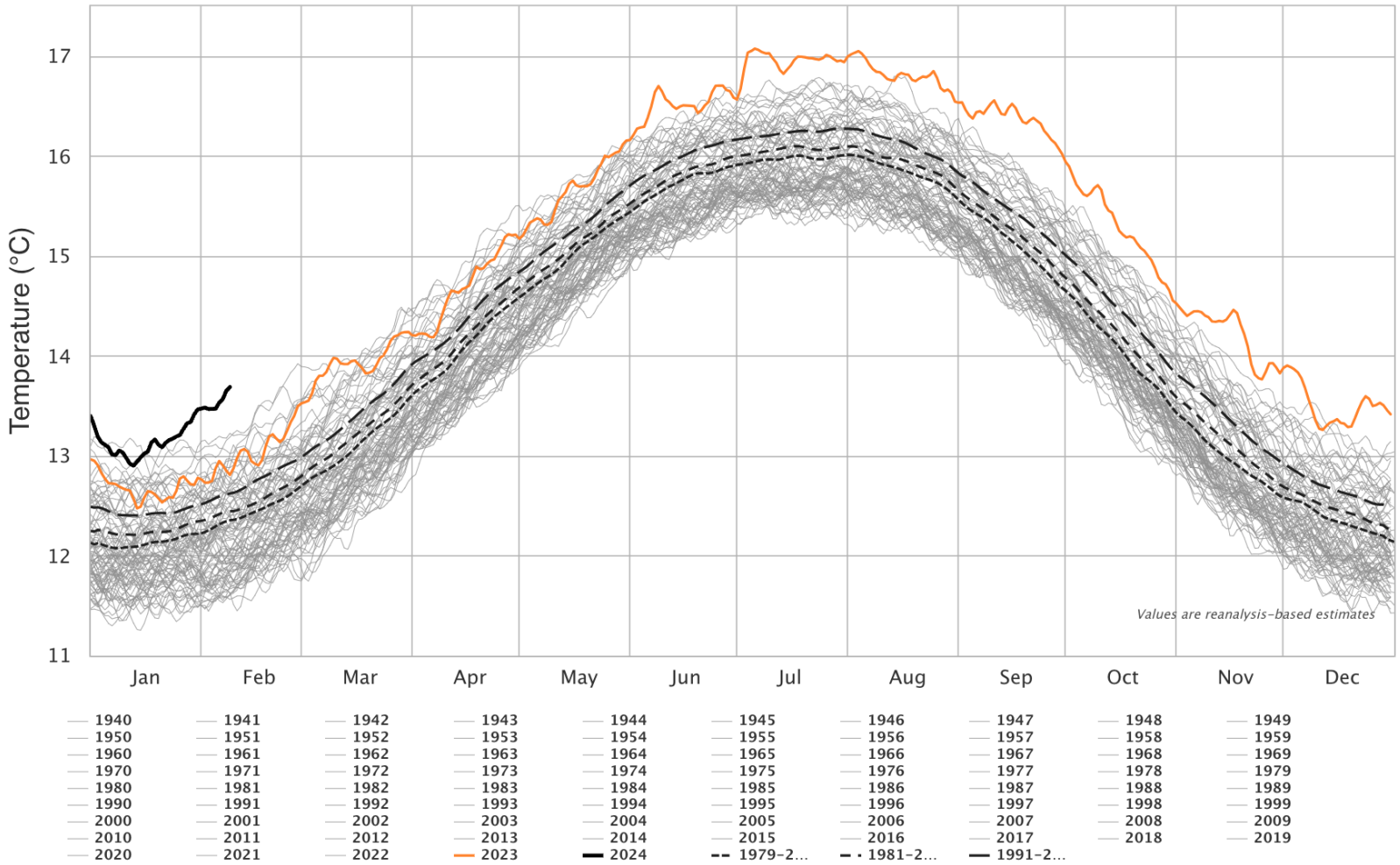
Area Selection: World

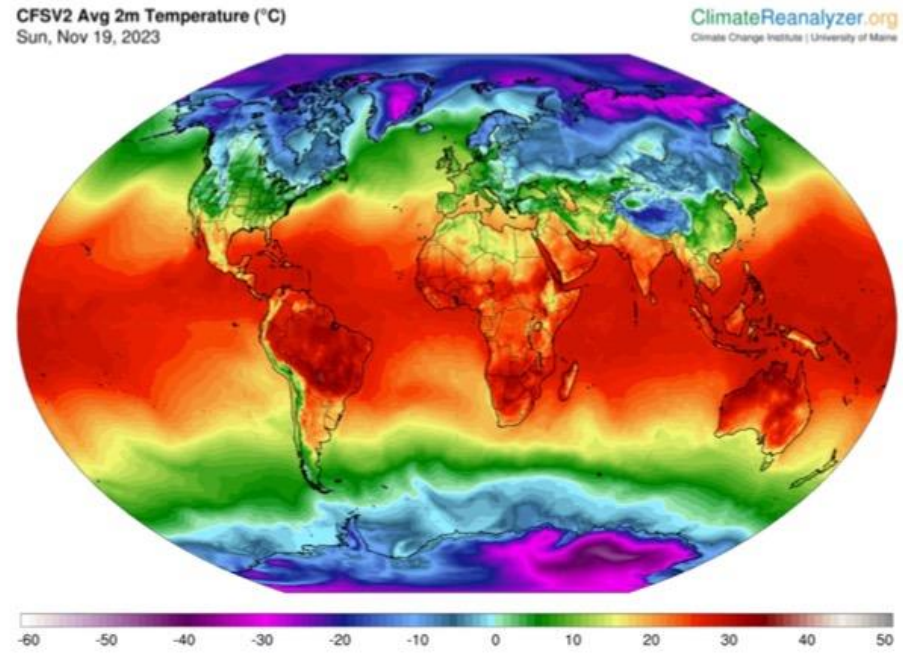
This page shows daily temperature estimates from ECMWF Reanalysis v5 (ERA5) – View details.

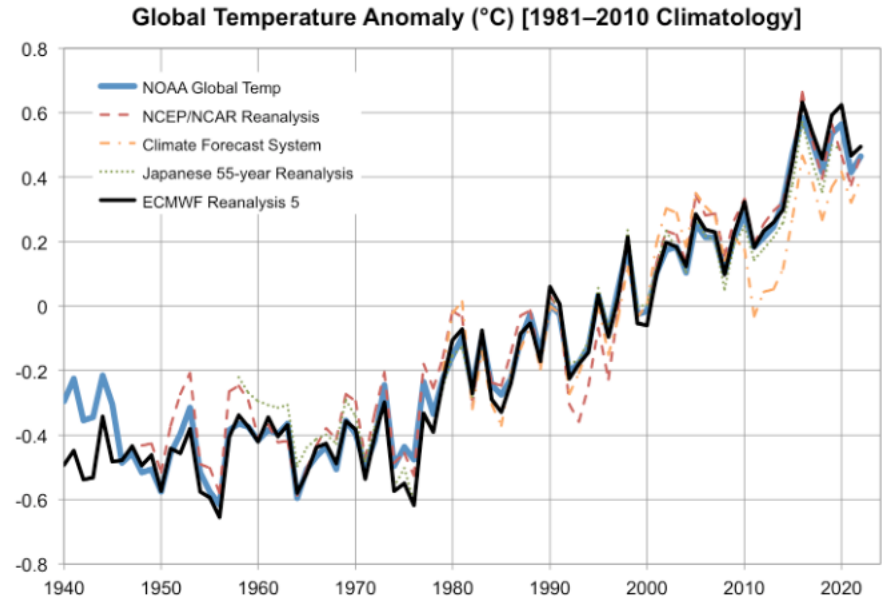
Daily Surface Air Temperature, World (90°S-90°N, 0-360°E)

Export Chart

Dataset: ECMWF Reanalysis v5 (ERA5) downloaded from C3S | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine



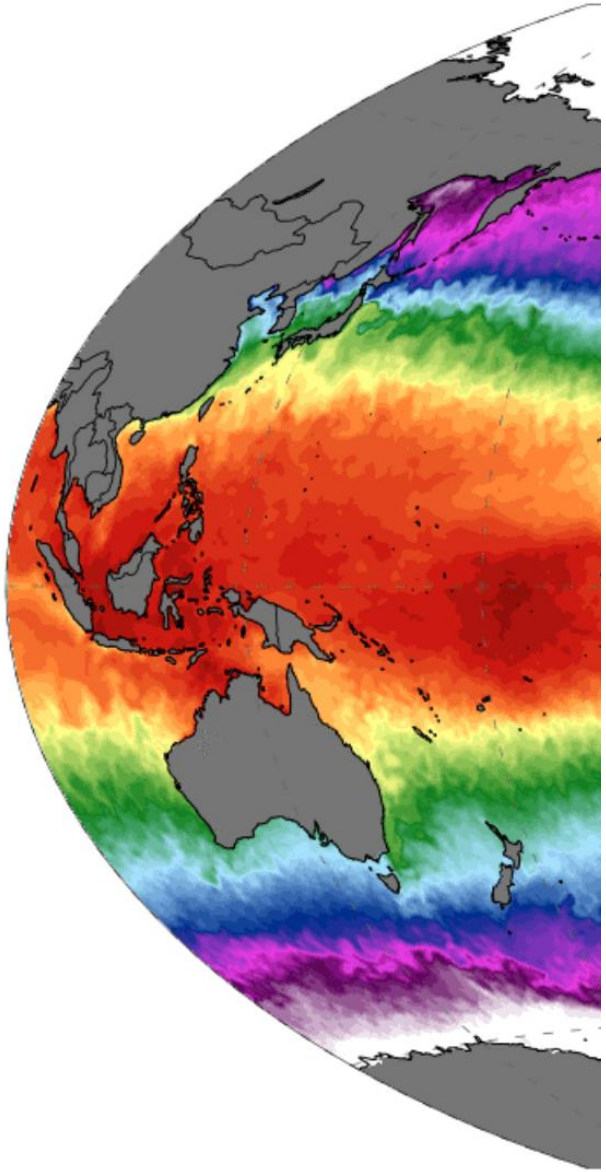




Porque os eventos extremos estão aumentando?

NOAA OISST V2.1 Sea Surface Temper

Sun, Nov 19, 2023



0 5 10

CFSV2 Avg 2m T Anomaly (°C) | CFSR 1979-2000 base

Sun, Nov 19, 2023

ClimateReanalyzer.org

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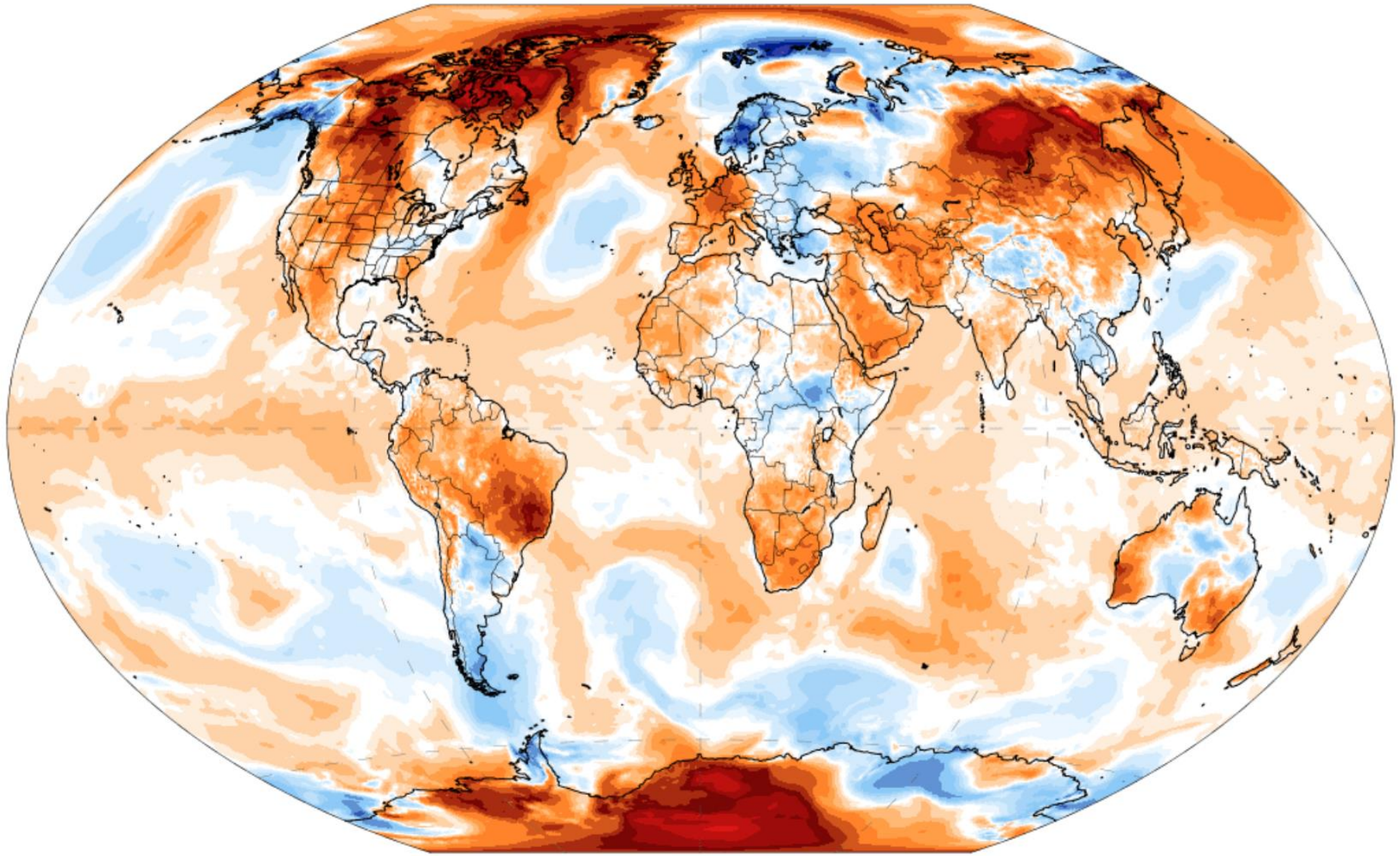

-32 -24 -18 -14 -10 -6 -3 -1 0 1 3 6 10 14 18 24 32

15 20 25 30 35

Sugestões de medidas necessárias a serem realizadas e/ou planejadas para realização futura:

1- Reduzir as emissões de Gases de Efeito Estufa

2- Resfriar a superfície terrestre de áreas rurais e urbanas

3- Continuar o Monitoramento e estudo da Amazônia e outros ecossistemas importantes como o Cerrado.

1- Reduzir as emissões de Gases de Efeito Estufa

Brasil: reduzir: - o desmatamento e não apenas na Amazônia, mas em todo o pais
- a produção de petróleo,
- Termoelétricas

2 - Resfriar a superfície terrestre de áreas rurais e urbanas

2.1 – Reflorestar com espécies da região. Eucalipto, pinos só pioram o problema
Arvores abaixam a temperatura, recarregam rios e fontes e participam do controle do Clima
Retiram da atmosfera o CO2 (o maior GEE) - (esta vale por inúmeras)

2.2 – Clarear a superfície: pintar tetos de branco, paredes, chão reduzem ate 5 ˚C a temperatura

3- Continuar o Monitoramento e estudo da Amazônia, além de iniciar de outros ecossistemas importantes como o Cerrado (Emenda Parlamentar).

3.1 – Financiar uma Rede de Monitoramento de GEE na Amazonia (garantir a continuidade das medidas do LaGEE, temos recurso ate Nov de 2024)

3.2 – Expandir a Rede para os demais ecossistemas brasileiros com perfis de avião e torres