

# Floods in Rio Grande do Sul April-May 2024

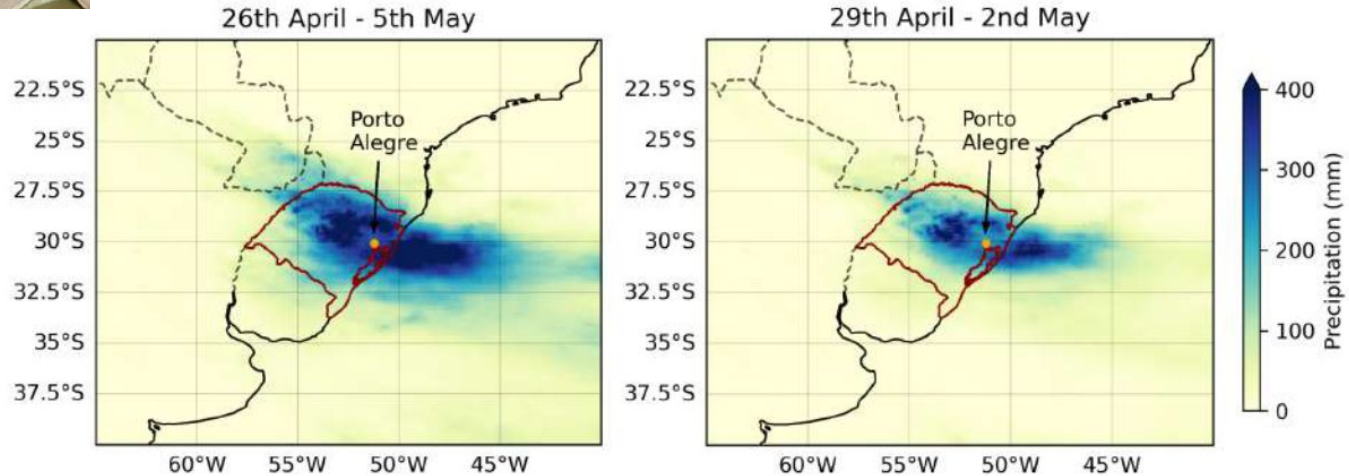


Ariane Frassoni, Fabio Rocha, Diogo Arsego - INPE

# Floods in Rio Grande do Sul



Accumulated precipitation over Rio Grande do Sul



Accumulated rainfall over Rio Grande do Sul, the southernmost state of Brazil, in late April and early May 2024. Data from MSWEP.

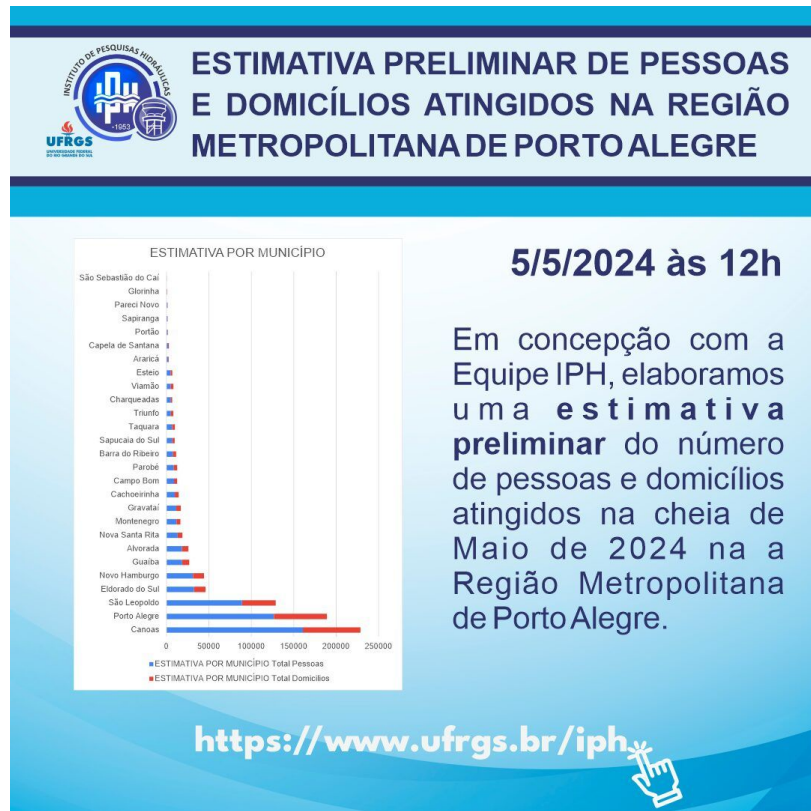
Source: Clarke et al., 2024

[https://mcusercontent.com/854a9a3e09405d4ab19a4a9d5/files/5fd7d7a2-9d1f-6ca5-407f-cd3b8003d286/Scientific\\_report\\_Brazil\\_RS\\_floods\\_compressed.pdf](https://mcusercontent.com/854a9a3e09405d4ab19a4a9d5/files/5fd7d7a2-9d1f-6ca5-407f-cd3b8003d286/Scientific_report_Brazil_RS_floods_compressed.pdf)



# Floods in Rio Grande do Sul in numbers

- One of the most significant environmental tragedies experienced in Brazil
- Affected 90% of the state's municipalities
- 2.3 million individuals affected
- 640,000 people losing their homes
- **175** confirmed deaths with a further **38** people unaccounted for as of early of June
- Average accumulation of 420 mm between April 24 and May 4

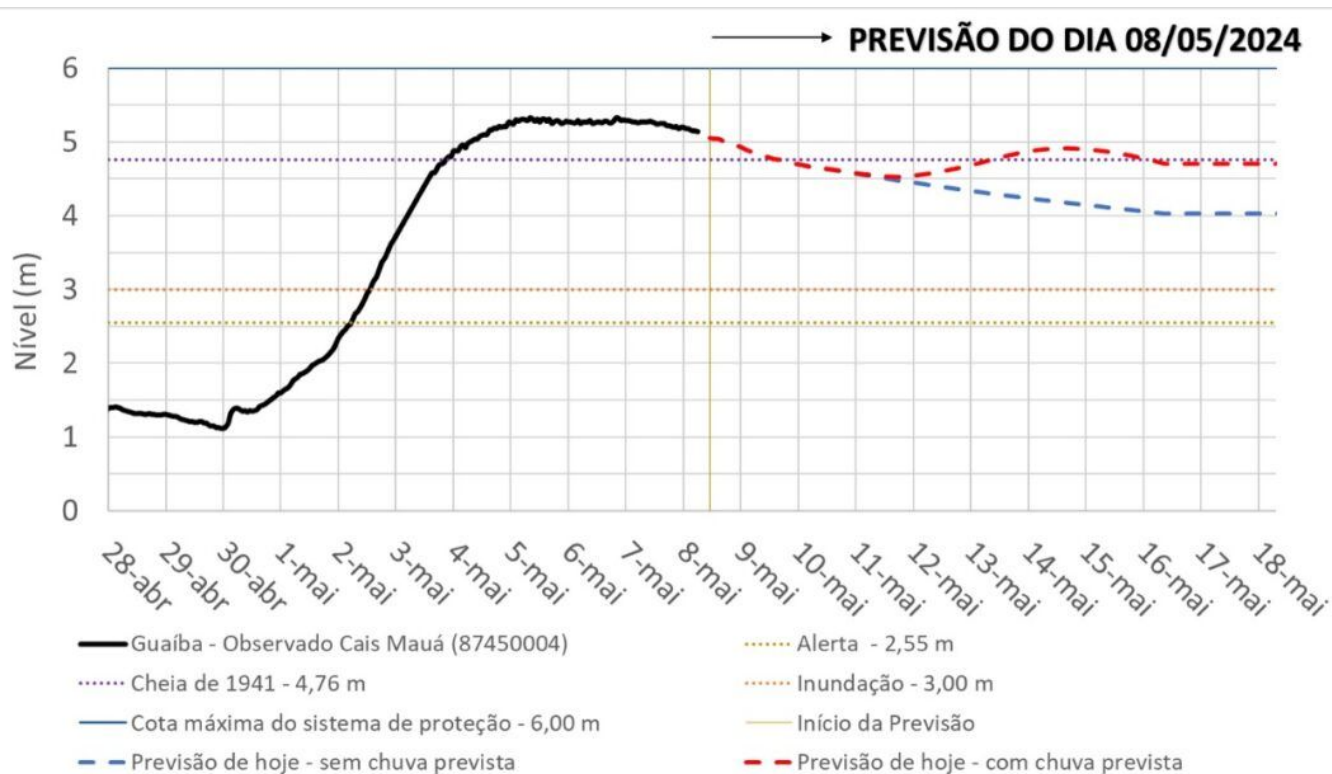


# Floods in Rio Grande do Sul

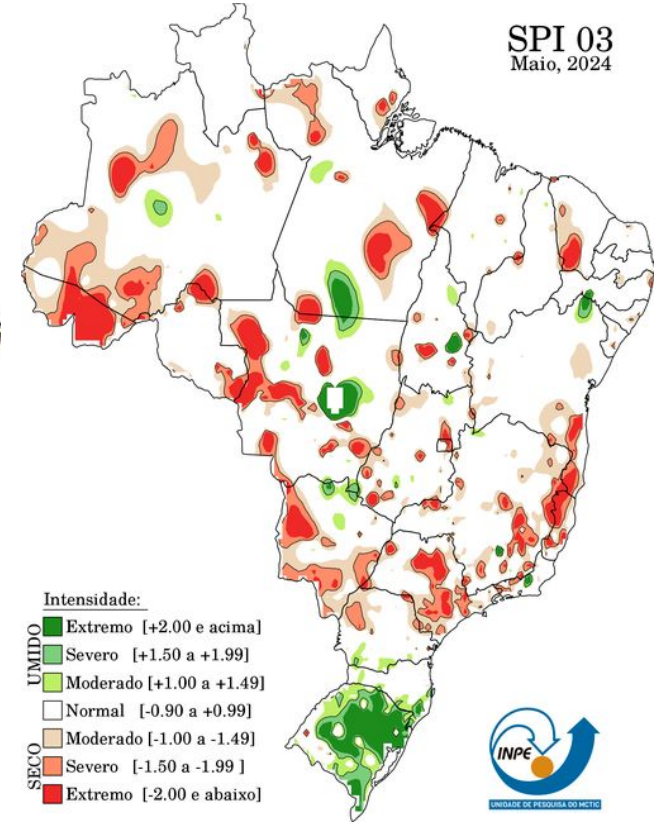
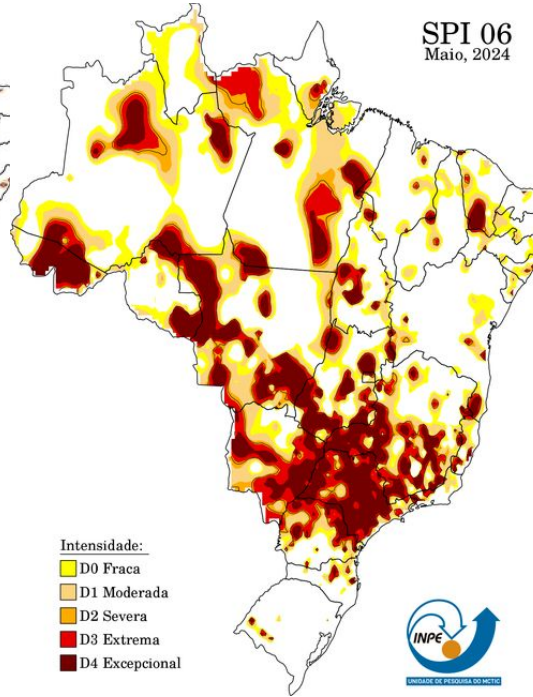
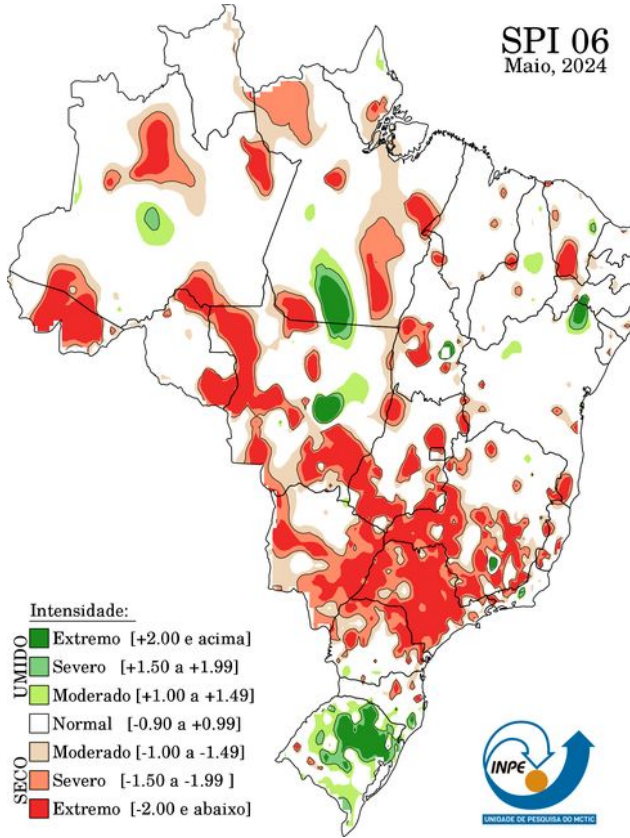
## Hydrological forecasts



MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO  
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

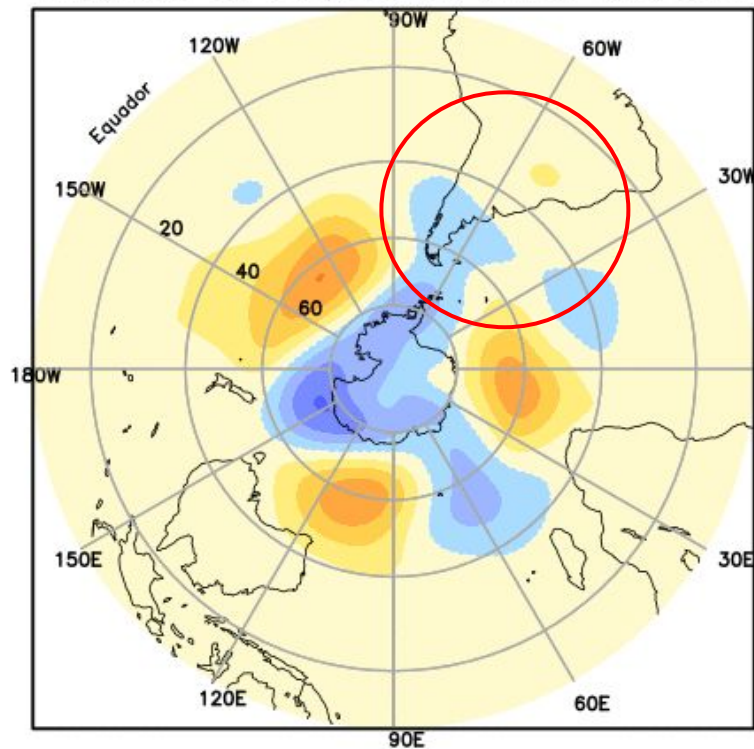


# Climate conditions

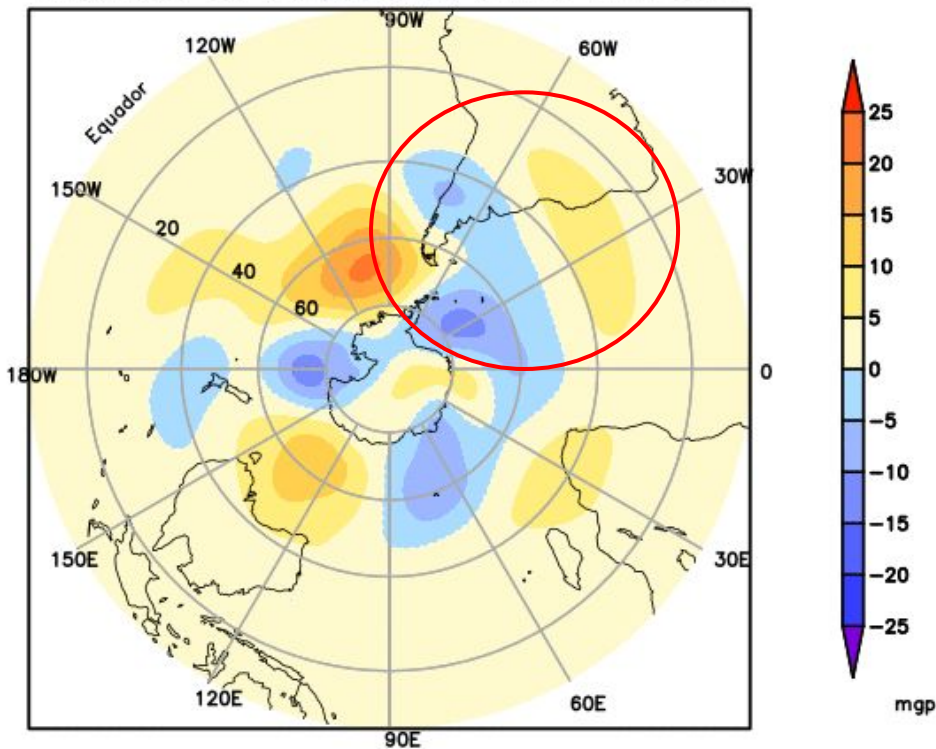


# Climate conditions

Anomalia de Geop. 500hPa H.S. APR2024



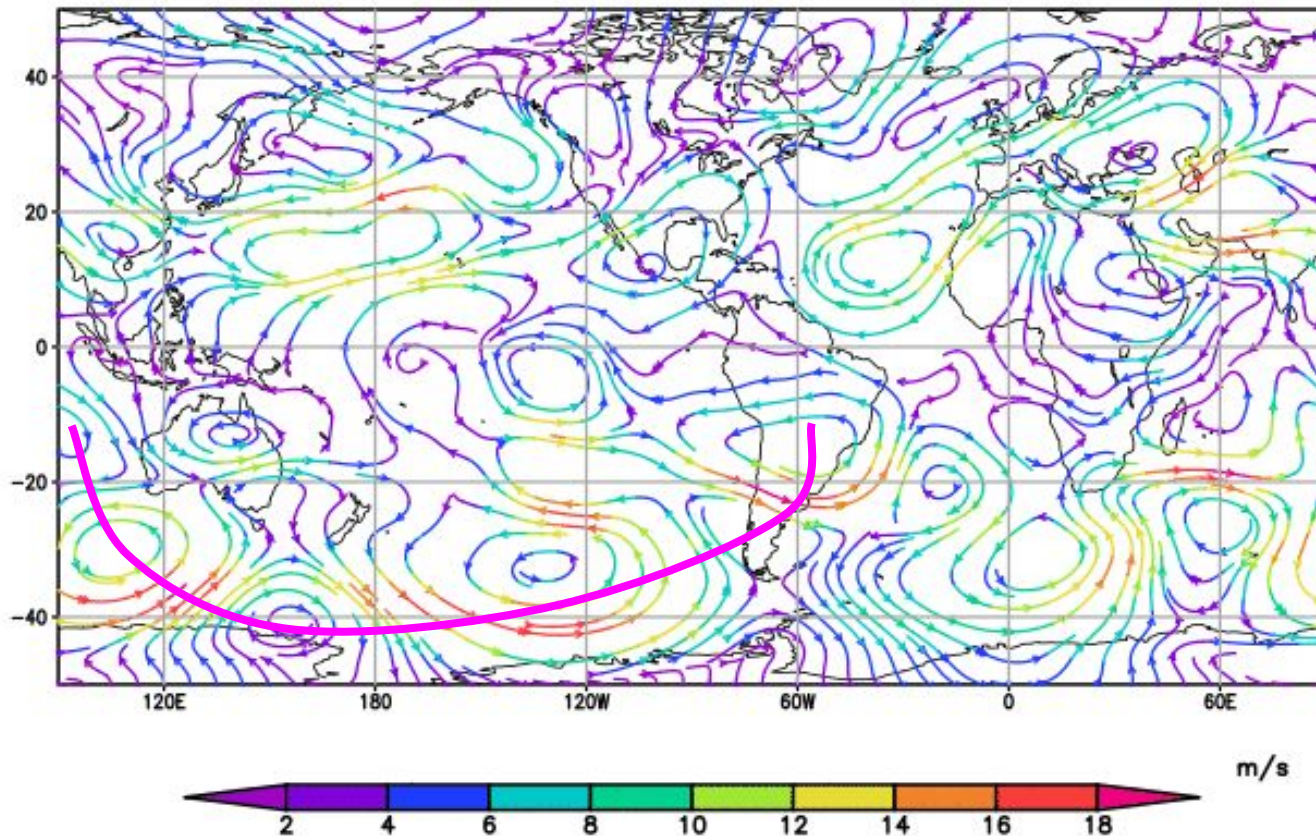
Anomalia de Geop. 500hPa H.S. MAY2024

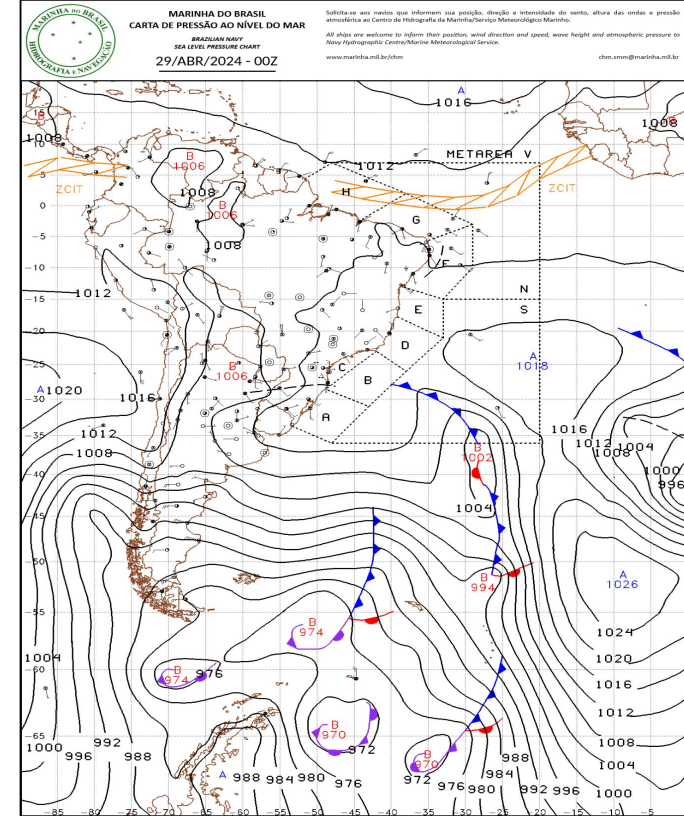
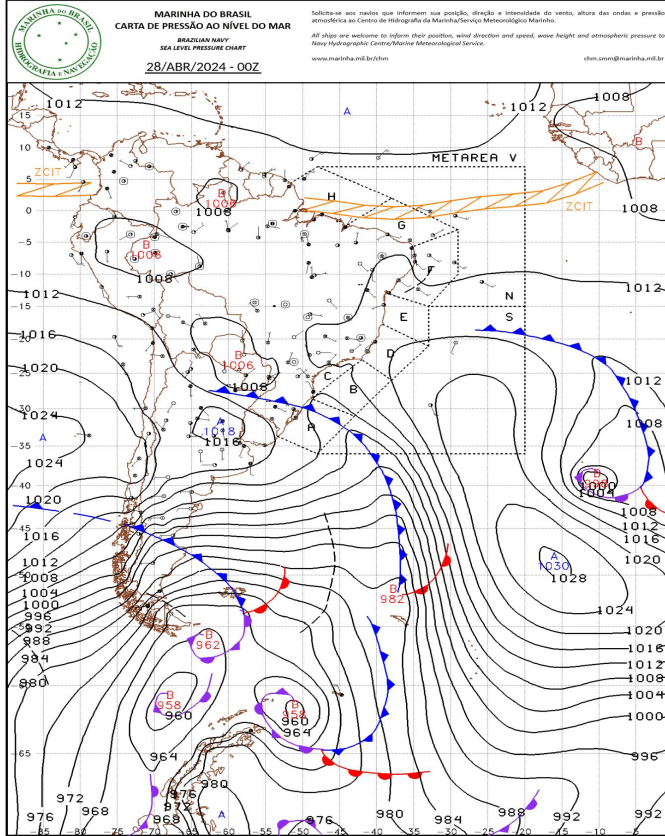




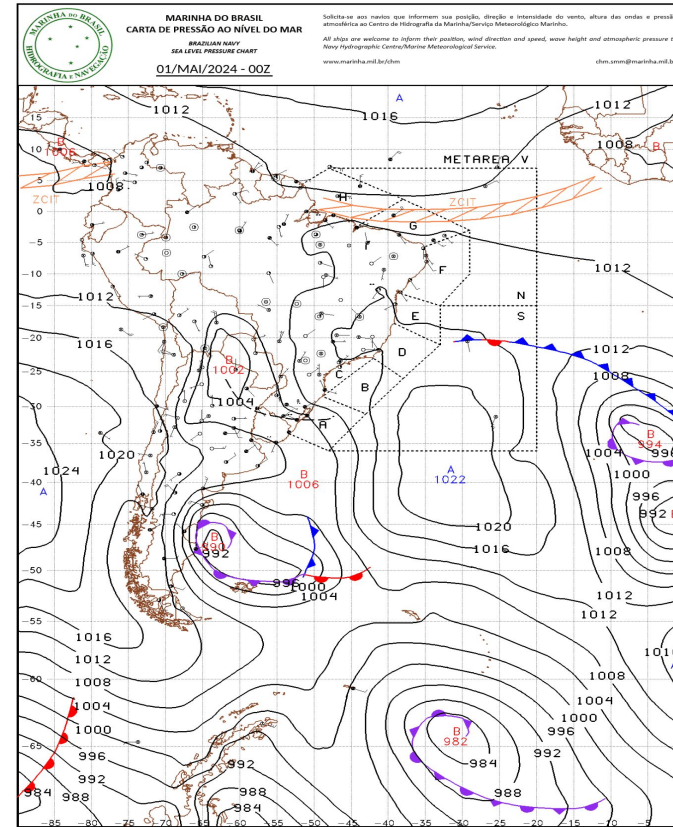
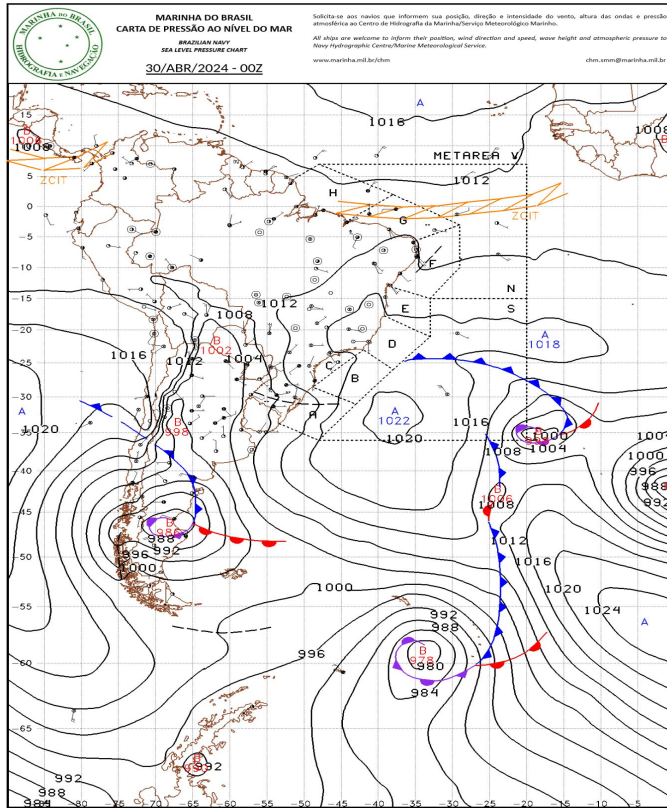
# Climate conditions

Anomalia de Linhas de Corrente em 200 hPa APR2024







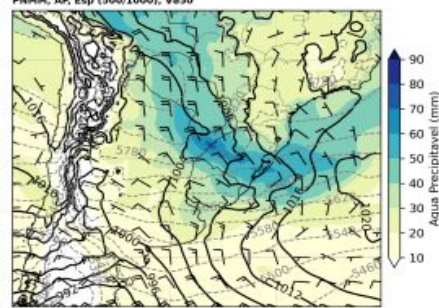
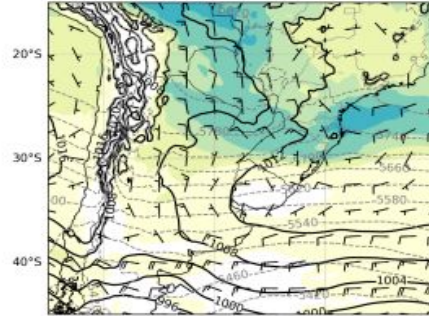


29/04 - 00UTC

30/04 - 00UTC

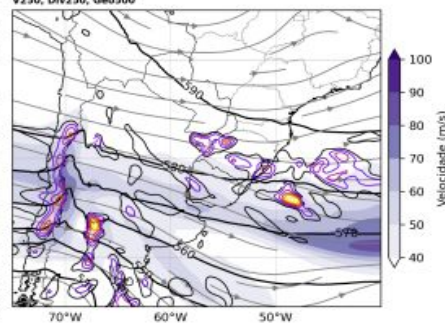
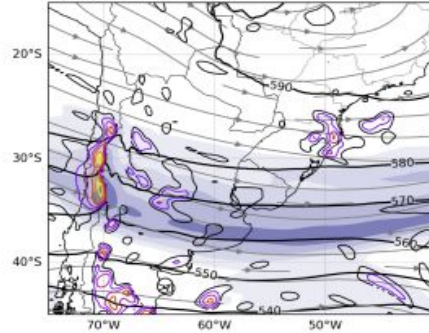
PNMM, AP, Esp (500/1000), V850

PNMM, AP, Esp (500/1000), V850



V250, Div250, Geo500

V250, Div250, Geo500

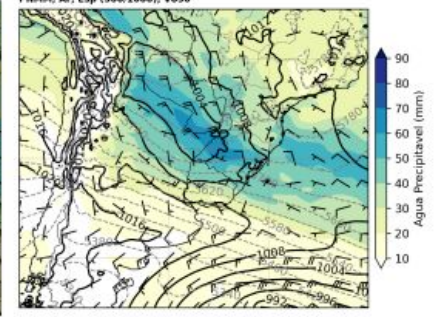
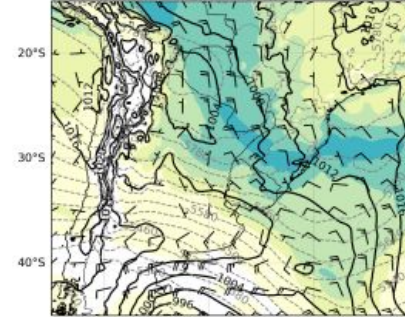


01/05 - 00UTC

02/05 - 00UTC

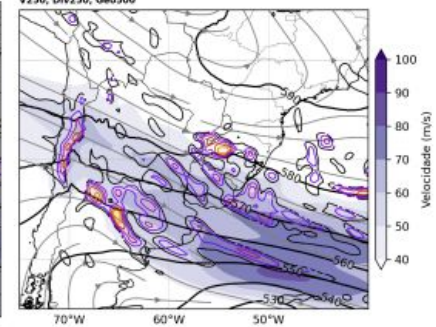
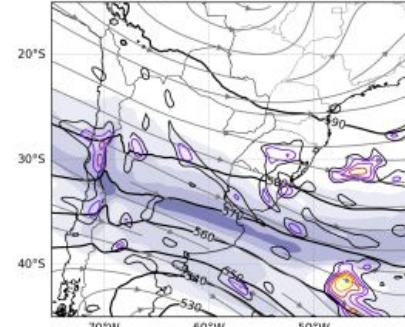
PNMM, AP, Esp (500/1000), V850

PNMM, AP, Esp (500/1000), V850



V250, Div250, Geo500

V250, Div250, Geo500

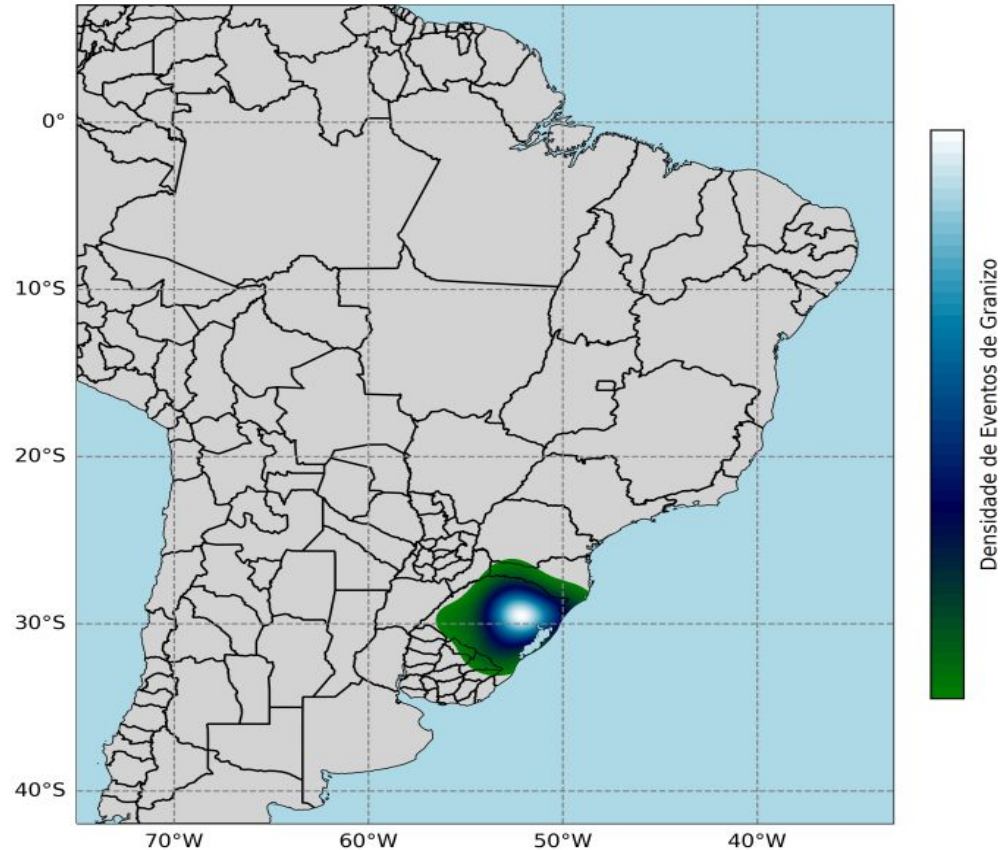




The main hail records were in RS and SC. In some cities, storms were accompanied by localized gusty winds exceeding 80 km/h, causing trees and power poles to fall, roof damage, and other impacts.

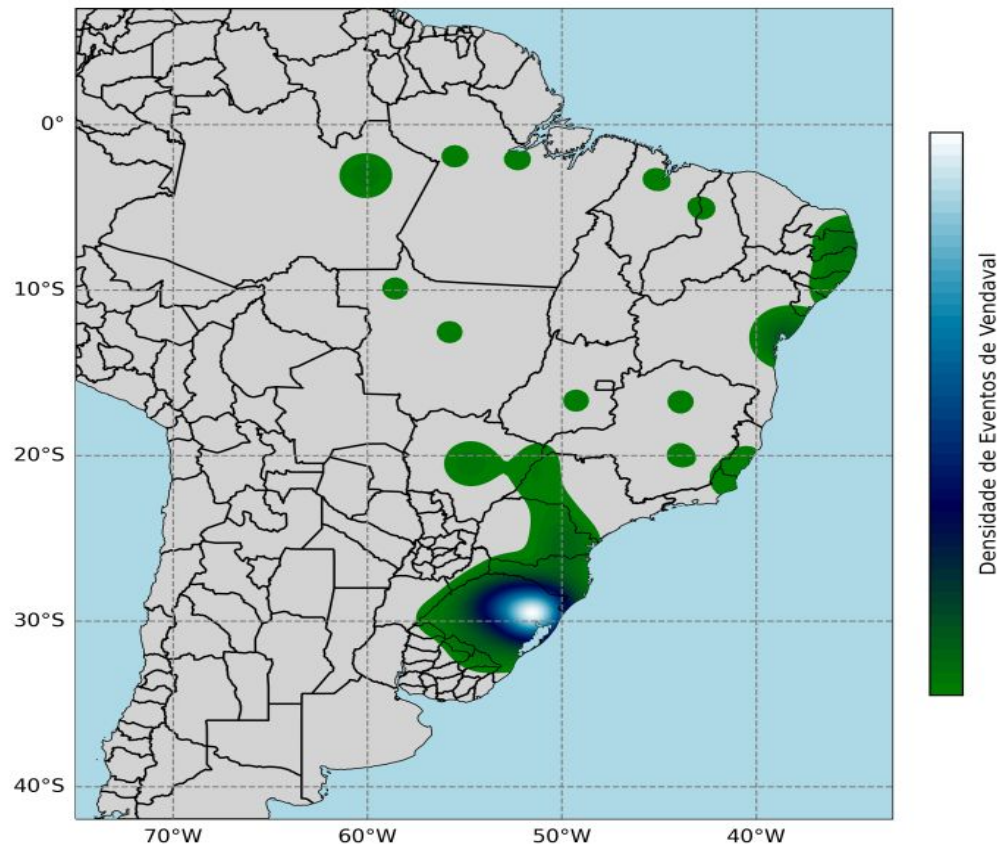


**Densidade de Eventos de Granizo no Brasil em Abril de 2024**



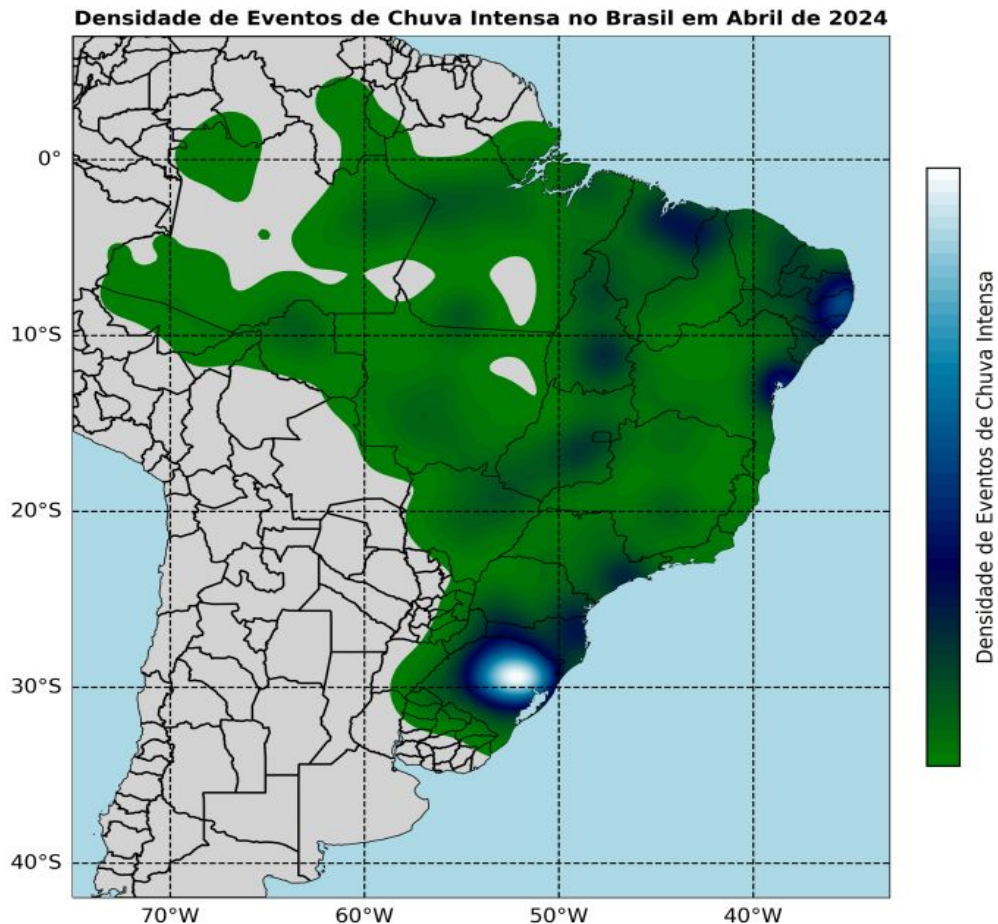


### Densidade de Eventos de Vendaval no Brasil em Abril de 2024

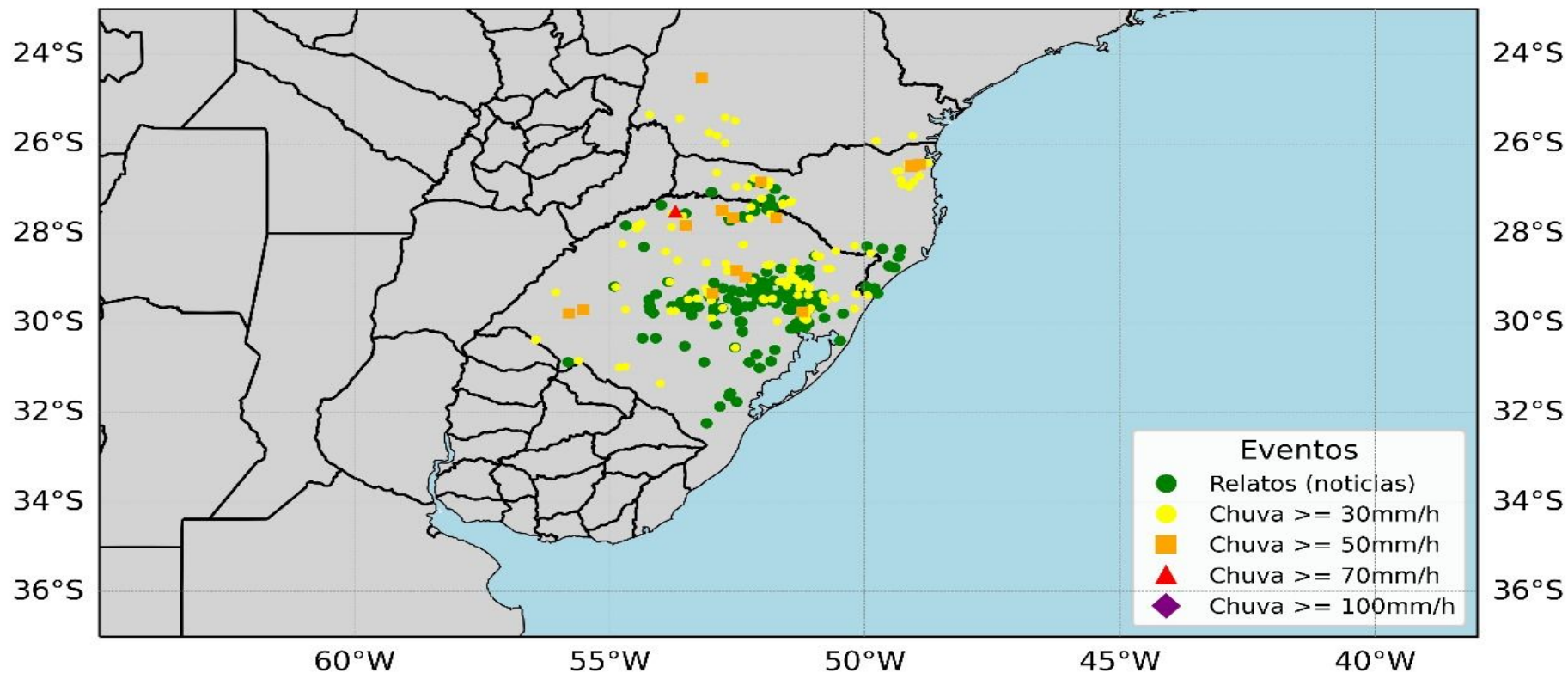


The density of gusty winds also became more evident in the Southern region of Brazil, especially in RS between April 27th and 30th.

Episodes of heavy rain (significant rainfall volumes within a one-hour period) documented in the INPE Database, this is illustrated in Figure 03. It is noted that the density of records was more pronounced over RS and SC, but also with significant records along the coast of PR, SP, GO, TO, in the eastern Northeast of Brazil, and between MA and PI.



## Eventos de Chuva intensa no Sul do Brasil

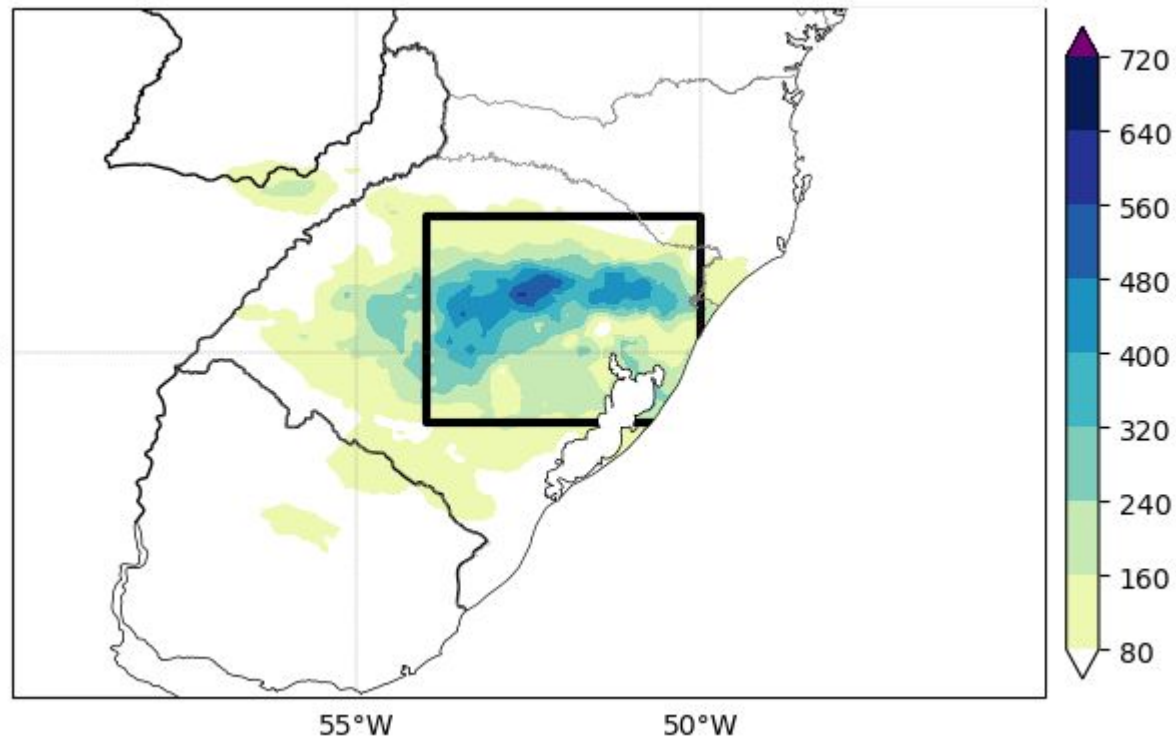




### Prec. Ac. - 12:00 UTC (29/04) - 12:UTC (02/05)

Most critical period of rain in Rio Grande do Sul - April 29 and May 2

Highest accumulations were concentrated in the central-northern and northeastern regions of the state, with values between 240mm and 480mm, according to MERGE, which compiles data from weather stations and satellite estimates.

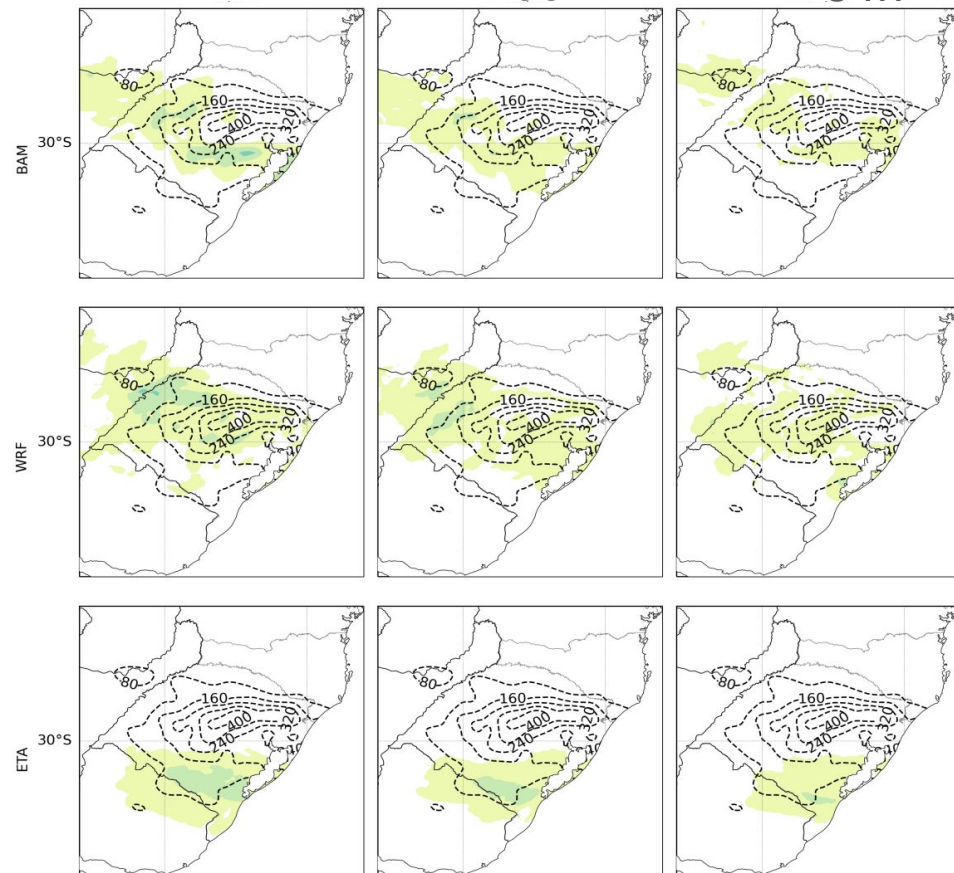


# Precipitation forecasts

36h

60h

84h

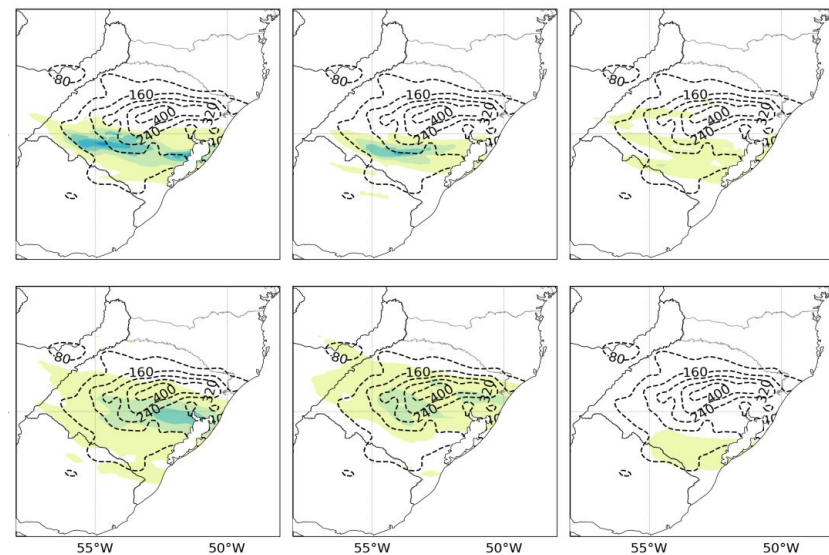


BRAMS

36h

60h

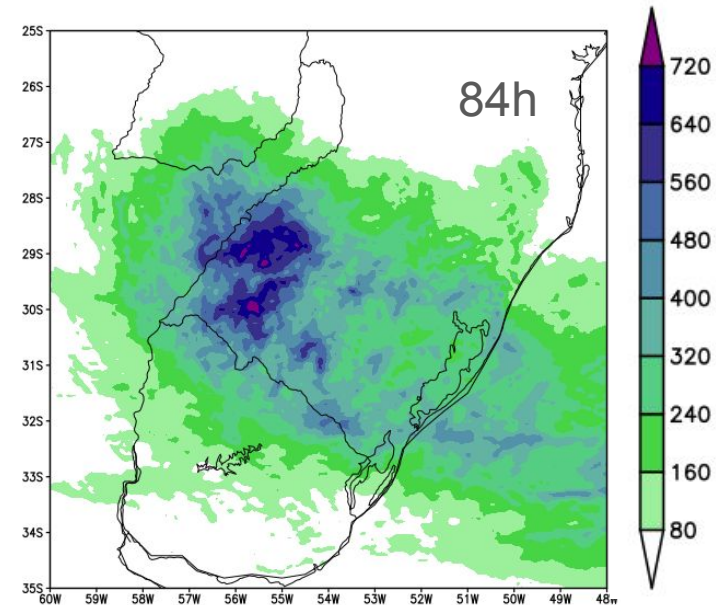
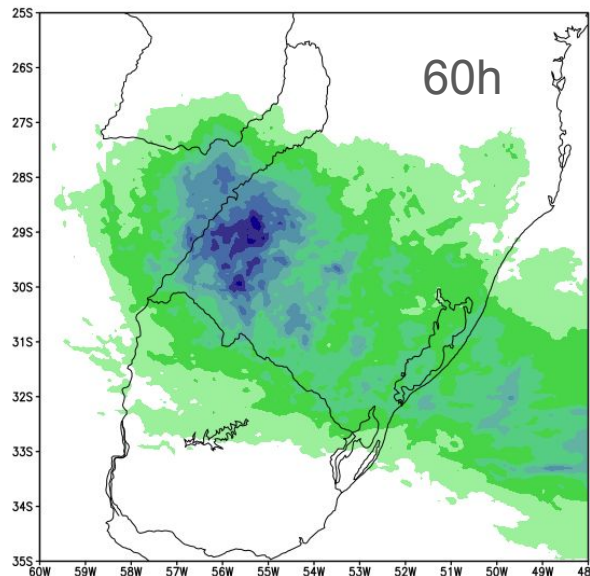
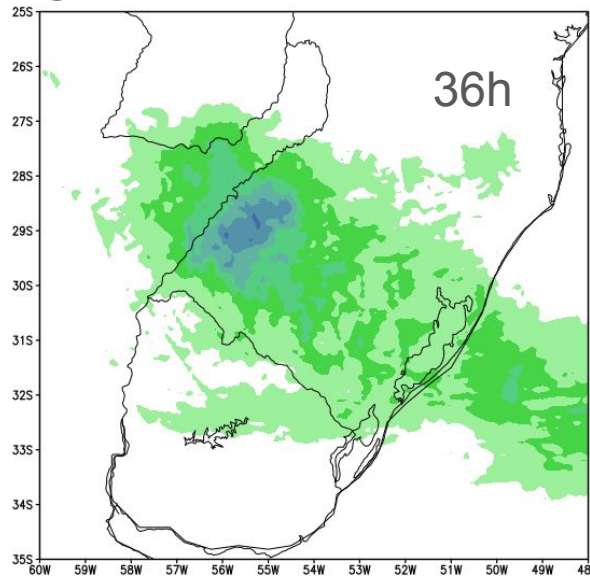
84h



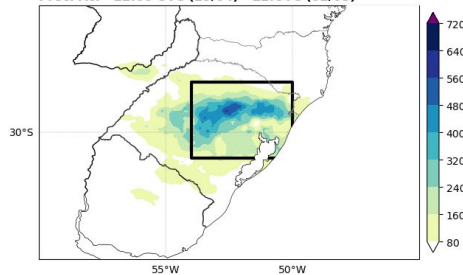
GFS

# Precipitation forecasts DestinE

ECMWF



Prec. Ac. - 12:00 UTC (29/04) - 12:UTC (02/05)

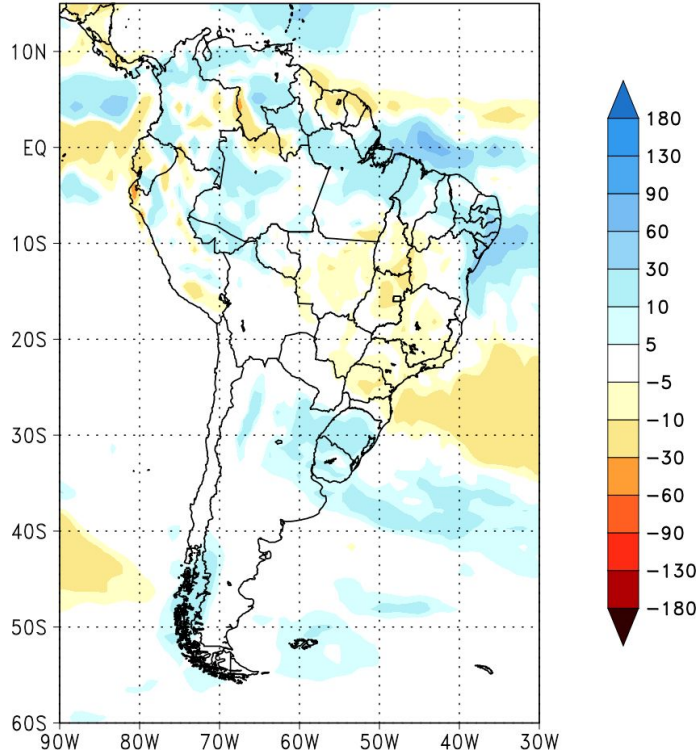


Thanks to Esti & Nils

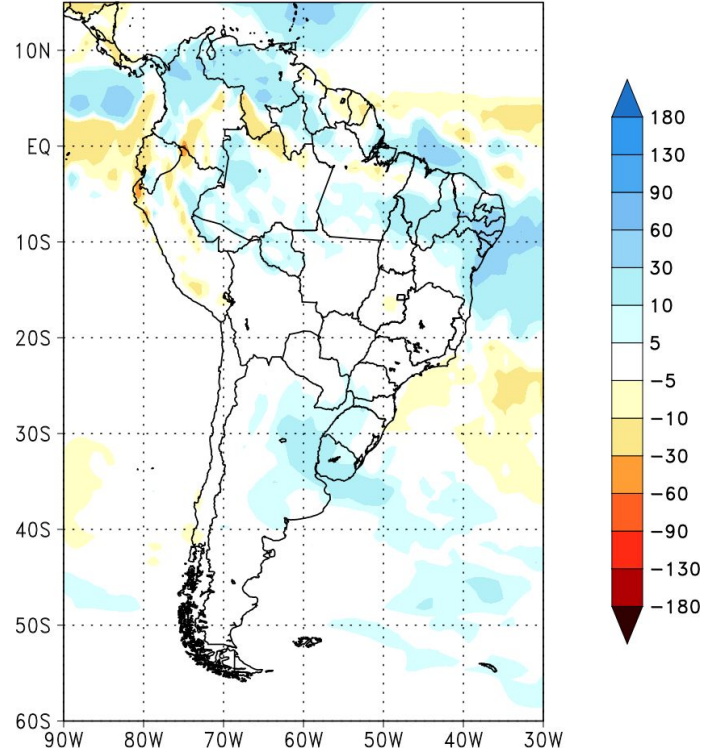


# Extended range forecast issued 10 Apr 2024

CPTEC/INPE (BAM1.2) PRECIPITATION ANOMALY (mm)  
FORECAST ISSUED: 10 APR 2024  
FOR WEEK 3: 24 APR 2024 TO 30 APR 2024 (7 DAYS)

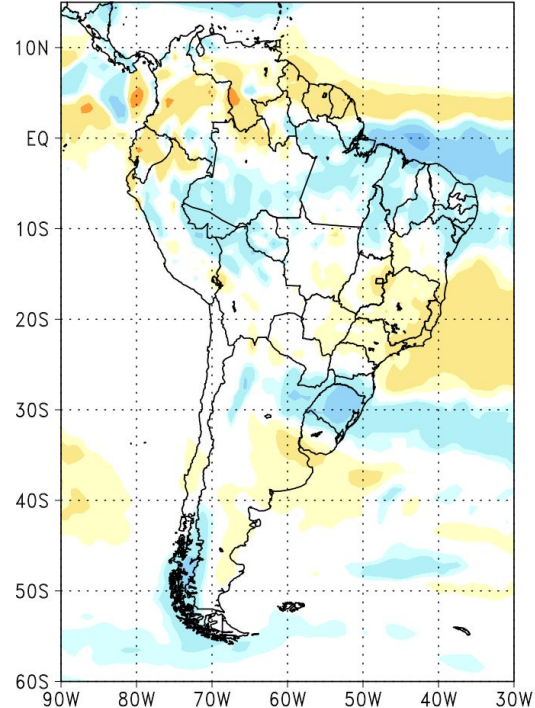


CPTEC/INPE (BAM1.2) PRECIPITATION ANOMALY (mm)  
FORECAST ISSUED: 10 APR 2024  
FOR WEEK 4: 01 MAY 2024 TO 07 MAY 2024 (7 DAYS)

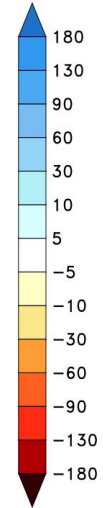
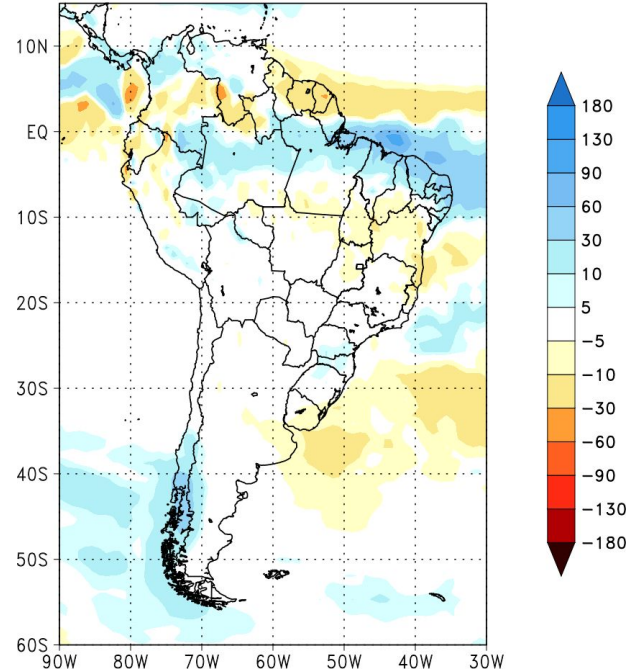


# Extended range forecast issued 17 Apr 2024

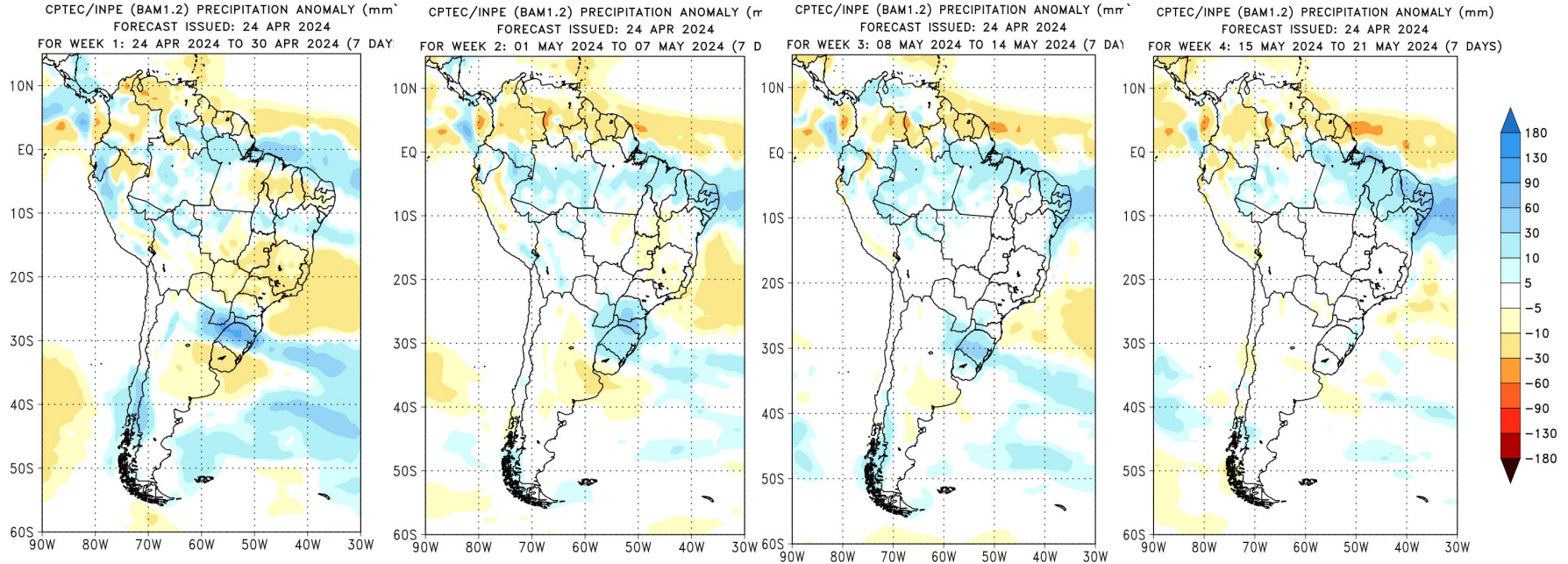
CPTEC/INPE (BAM1.2) PRECIPITATION ANOMALY (mm)  
FORECAST ISSUED: 17 APR 2024  
FOR WEEK 2: 24 APR 2024 TO 30 APR 2024 (7 DAYS)



CPTEC/INPE (BAM1.2) PRECIPITATION ANOMALY (mm)  
FORECAST ISSUED: 17 APR 2024  
FOR WEEK 3: 01 MAY 2024 TO 07 MAY 2024 (7 DAYS)



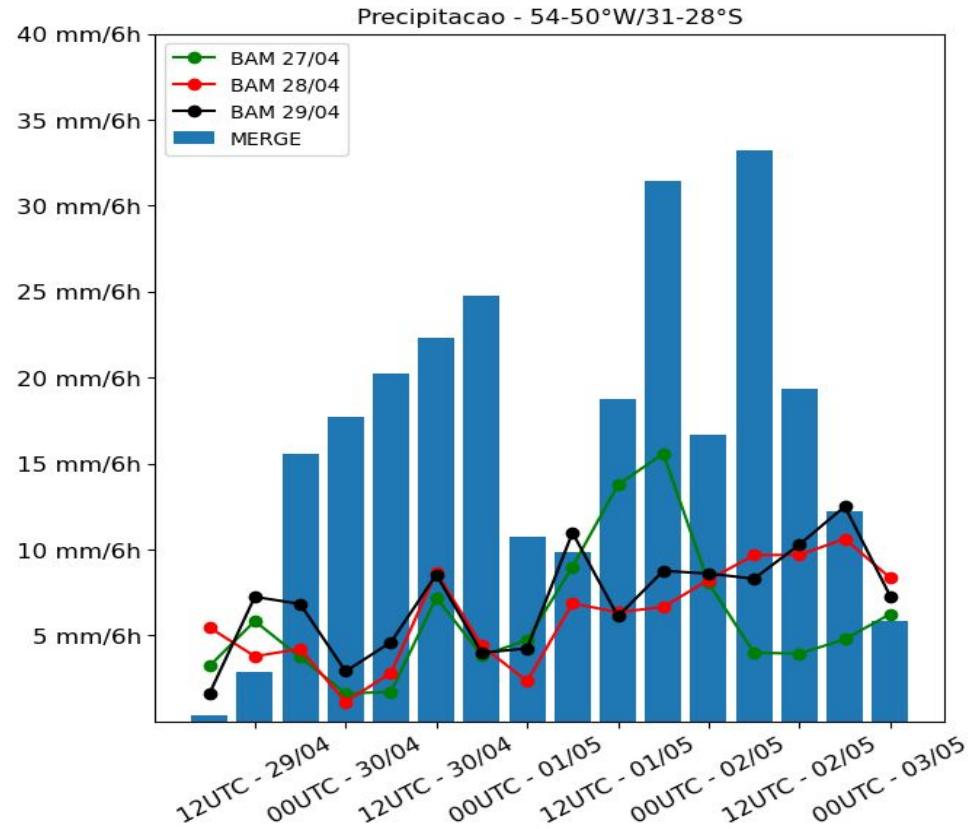
# Extended range forecast issued 24 Apr 2024





Comparison between the MERGE records in the blue polygons every 6 hours, and 24h, 48h and 72h of BAM forecasts

Overall, the BAM underestimated rainfall values throughout the period (between April 29th and May 2nd), even in the closest run to the 29th. For example, at 12 UTC on April 30th, MERGE indicates an accumulation of 23mm in the last 6 hours, while the model predicted rainfall of about 8mm in the same 6 hours.



THANK YOU!!!

[ariane.frassoni@inpe.br](mailto:ariane.frassoni@inpe.br)

[fabio.rocha@inpe.br](mailto:fabio.rocha@inpe.br)