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Catastrophic Flooding in Rio Grande do Sul: synoptic aspects

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INTRODUCTION

The catastrophic flooding and landslides over the Rio Grande do Sul (RS), from late April up to the beginning of May, specially from April 29 to May 2, impacted over 90% of the state's municipalities with 2.3 million individuals affected. Others impacts: 640,000 people losing their homes; 175 confirmed deaths with a further 38 people unaccounted for as of early of June and millions of dollars in damages. 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.

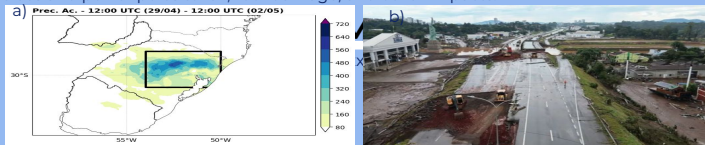


Figure 1 a) Accumulated rainfall over Rio Grande do Sul, the southernmost state of Brazil. Source: product MERGE/INPE; Figure b) Impacts over Lajeado/RS. Source: CNN Brasil

METHODOLOGY

- Diary precipitation date from MERGE/INPE and ERA5 Reanalysis.

Mains factors:

- Atmosphere blocking over the Pacific and Atlantic Oceans;
- Convective instability line;
- Influence of El Niño in the Pacific Ocean (even weak phase)
- Cold front over the RS

RESULTS

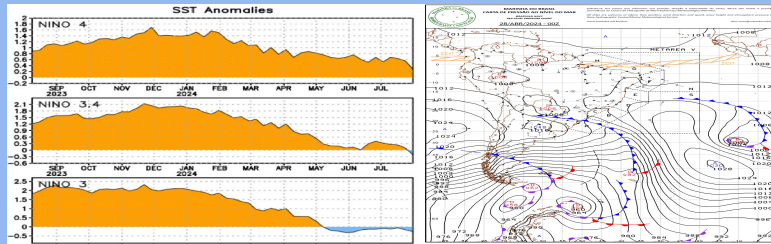


Figure 2: Time series of area-averaged sea surface temperature (SST) anomalies (°C) in the Niño regions. Source: https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensio_analysis/ensiodisc.shtml

Figure 3: Synoptic systems acting April 28 th UTC. Source: Brazilian Navy

- Continuous influx of warm and moisture air from Amazon Area at low levels;

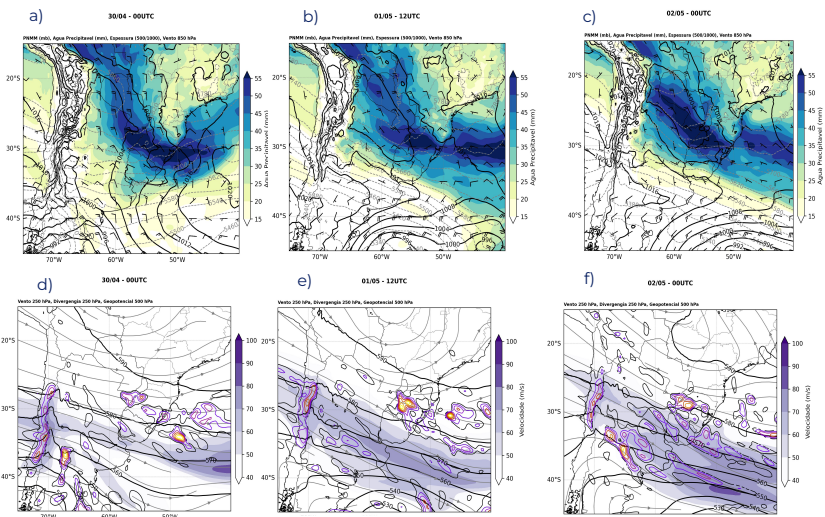


Figure 4 a, b, c) Pressure at sea level, Precipitable Water, Thickness(500/1000), Flow at 850 hPa; d, e, f) Flow at 250 hPa, Divergence at 250 hPa, Geopotential at 500 hPa. Validity to: a,d) april 30th; b,e) may 1st; c,f) may 2th. Source:INPE

CONCLUSION

- As mentioned above, this extreme events combine different synoptic aspects with different components, including global scale and was responsible for deaths and serious damage in the Rio Grande do Sul state between the end of April and the beginning of May, 2024.

REFERENCES

- <https://www.gov.br/inpe/pt-br/assuntos/ultimas-noticias/relatorio-do-inpe-explica-evento-meteorologico-gue-causou-a-tragedia-no-rs/chuvas-rio-grande-do-sul.pdf>
- <https://www.sbmec.org.br/noticia?id=30>