

# PROJECTED CHANGES IN THE FREQUENCY OF COMPOUND EVENTS OVER TROPICAL BRAZIL IN CORDEX-CORE SIMULATIONS

Lincoln Alves<sup>1</sup>, Mari Firppo, Maria Laura Bettoli, Alex Avilés, Oscar Chimborazo, Shabeh ul Hasson

<sup>1</sup>National Institute for Space Research (INPE), SP, Brazil

[lincoln.alves@inpe.br](mailto:lincoln.alves@inpe.br)

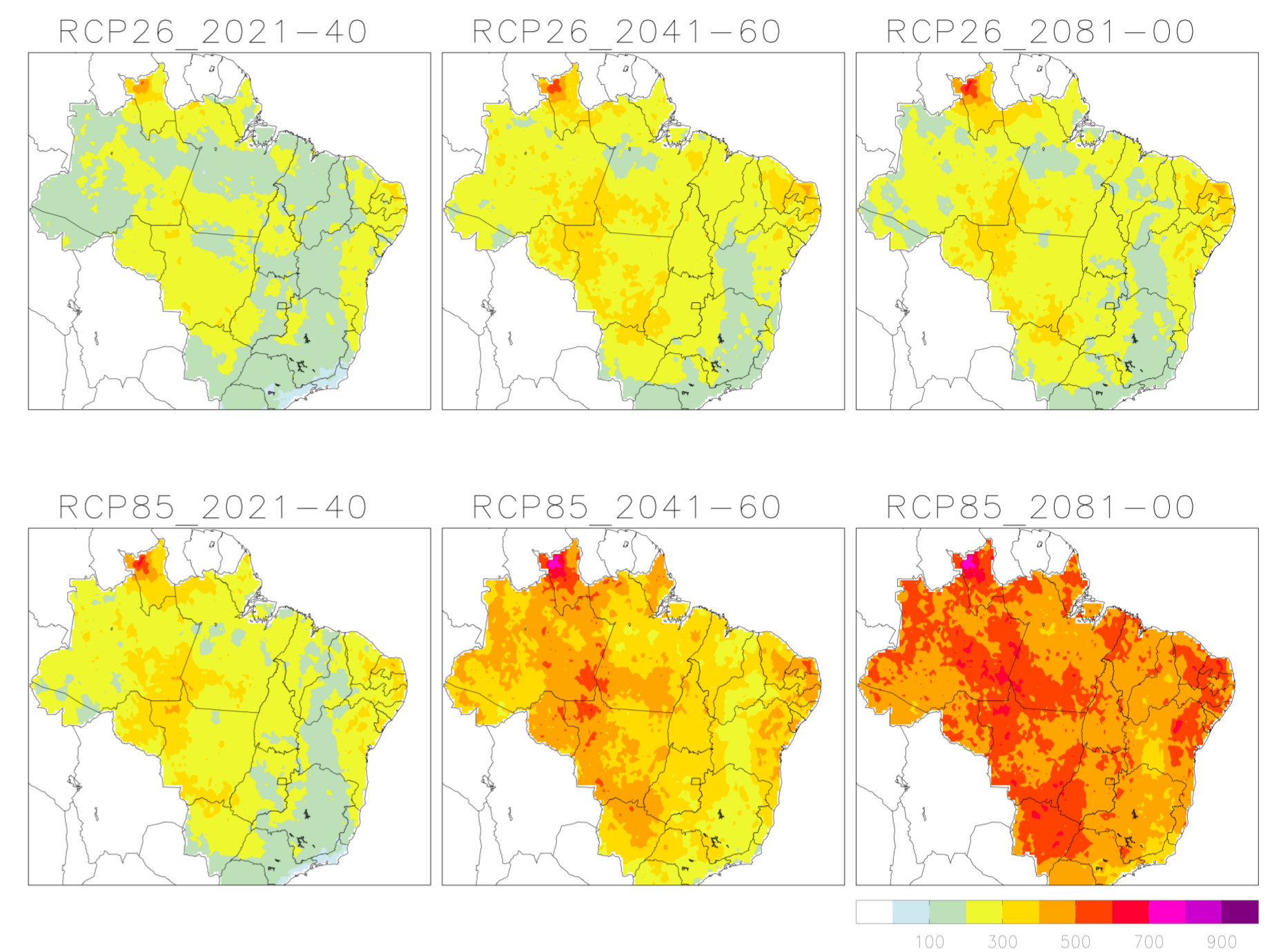
## ABSTRACT

In the past decade, extreme weather events have become increasingly frequent due to global warming, and their frequency is expected to rise with every increment in temperature. In particular, the potential increase in compound drought and heat events could profoundly impact societies, ecosystems, and economies, leading to crop failures, wildfires, and water scarcity, especially in Brazil, which is vulnerable to recent extreme climate events.

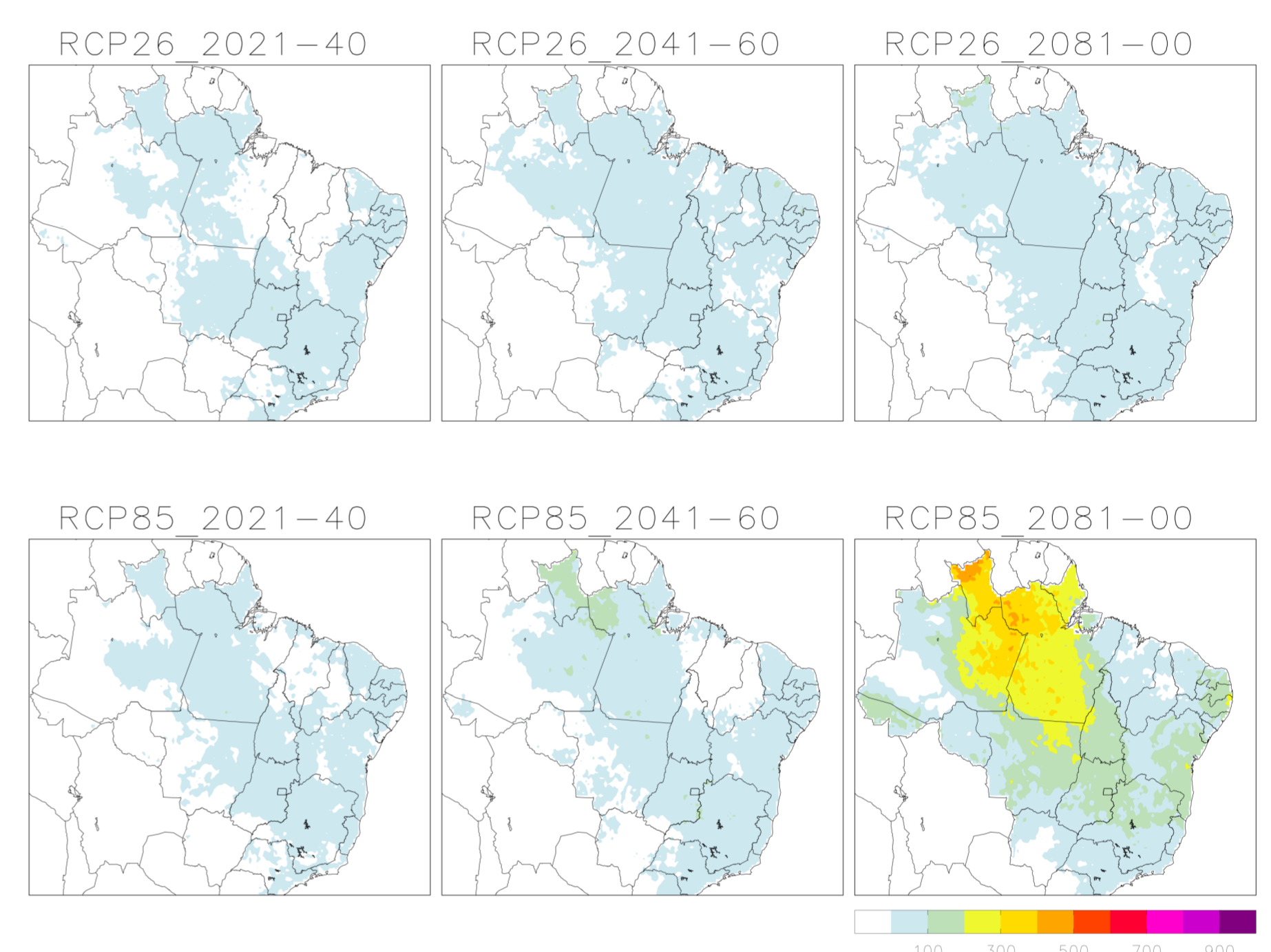
To investigate changes in compound events in response to changes in radiative forcing and their impact on extreme climate events such as drought and extreme heat, we assessed an ensemble of CORDEX-CORE simulations over Tropical Brazil. The simulations were conducted at a 25 km horizontal grid spacing using lateral and lower boundary forcing from three Coupled Model Intercomparison Project Phase 5 (CMIP5) climate models, each covering the period from 1980 to 2100 under two Radiative Concentration Pathways (RCP2.6 and RCP8.5) in the 21st century projections period. We evaluated the simulations using observed data from the Brazilian Daily Weather Gridded Data (BR-DWGD). In addition, we performed a quantitative assessment of the areas affected by these compound events during the present day.

## CLIMATE PROJECTIONS (Dec-Jan-Feb)

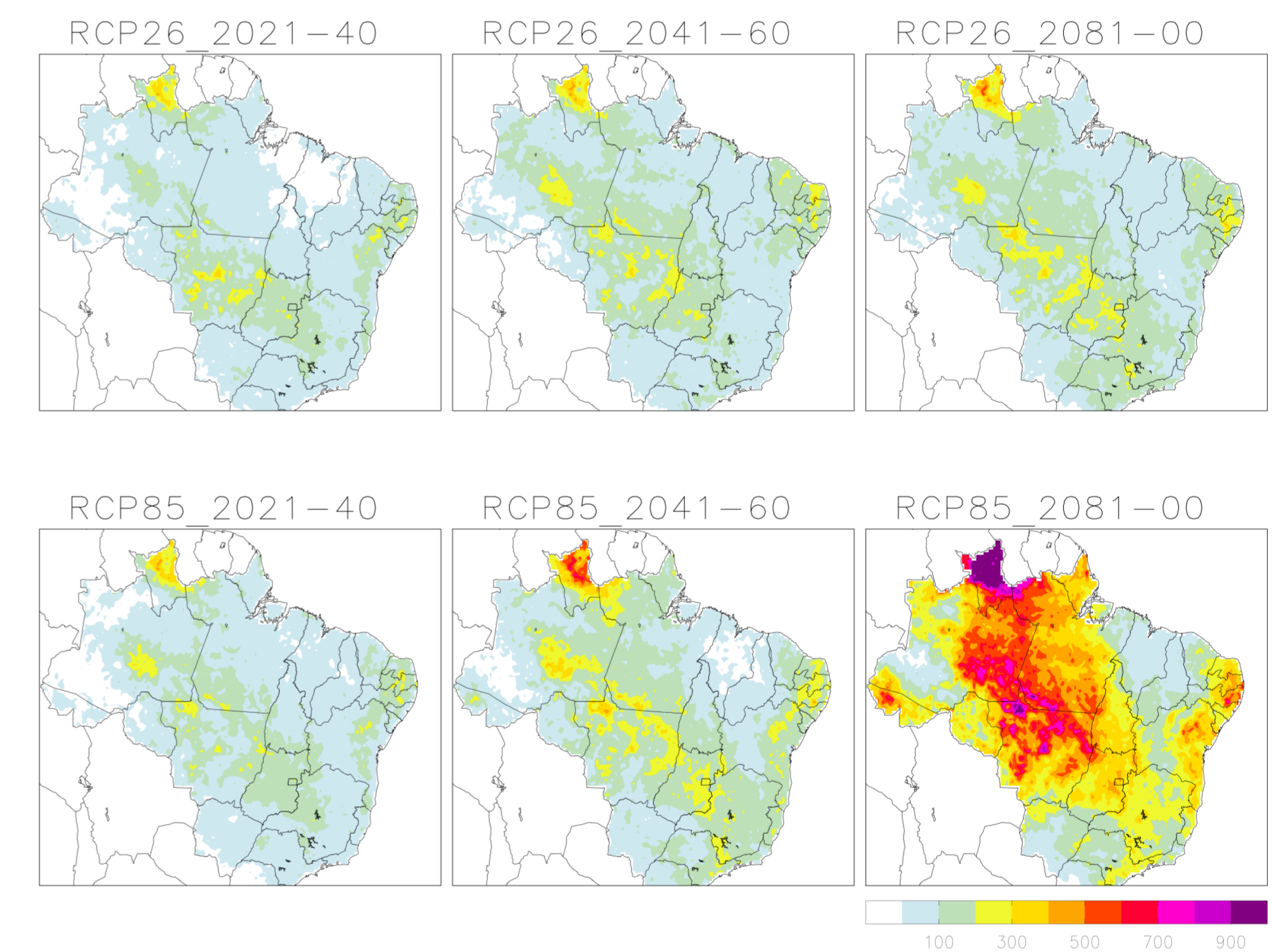
### Change in the % of the number of heatwaves



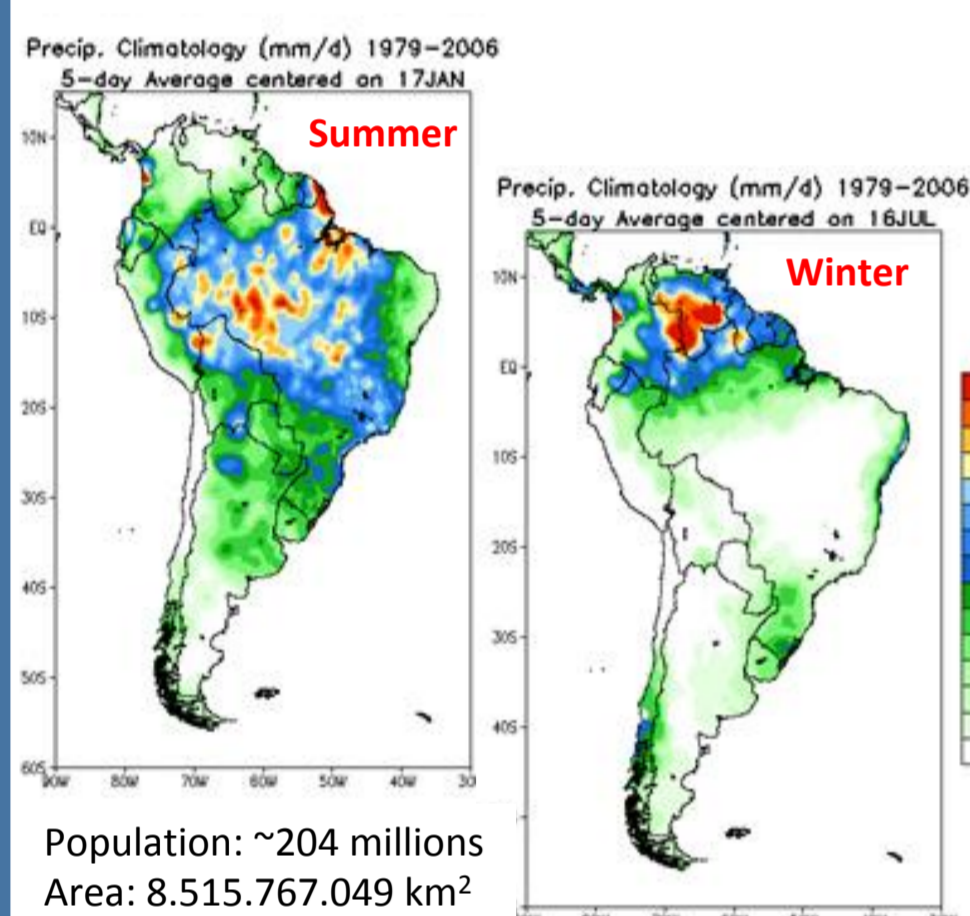
### Changes in the % of the number of drought



### Change in the % of Compound dry-hot extremes



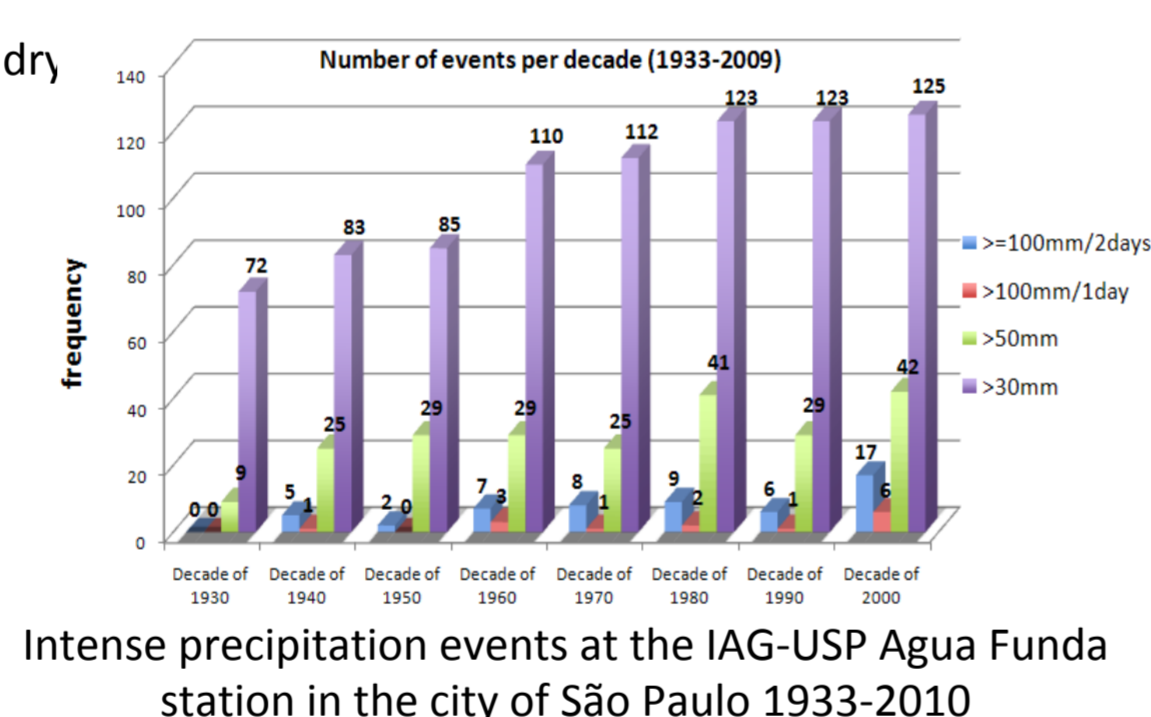
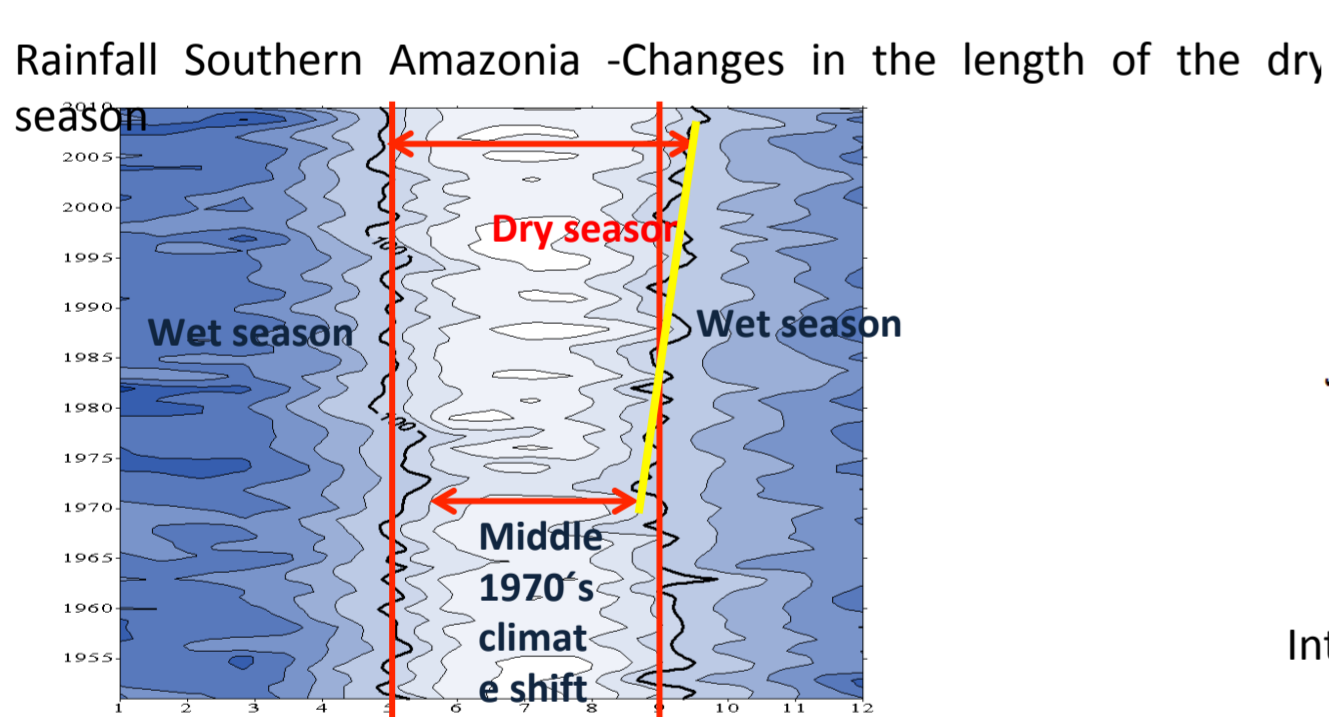
## Brazil & Climate Change: a country profile



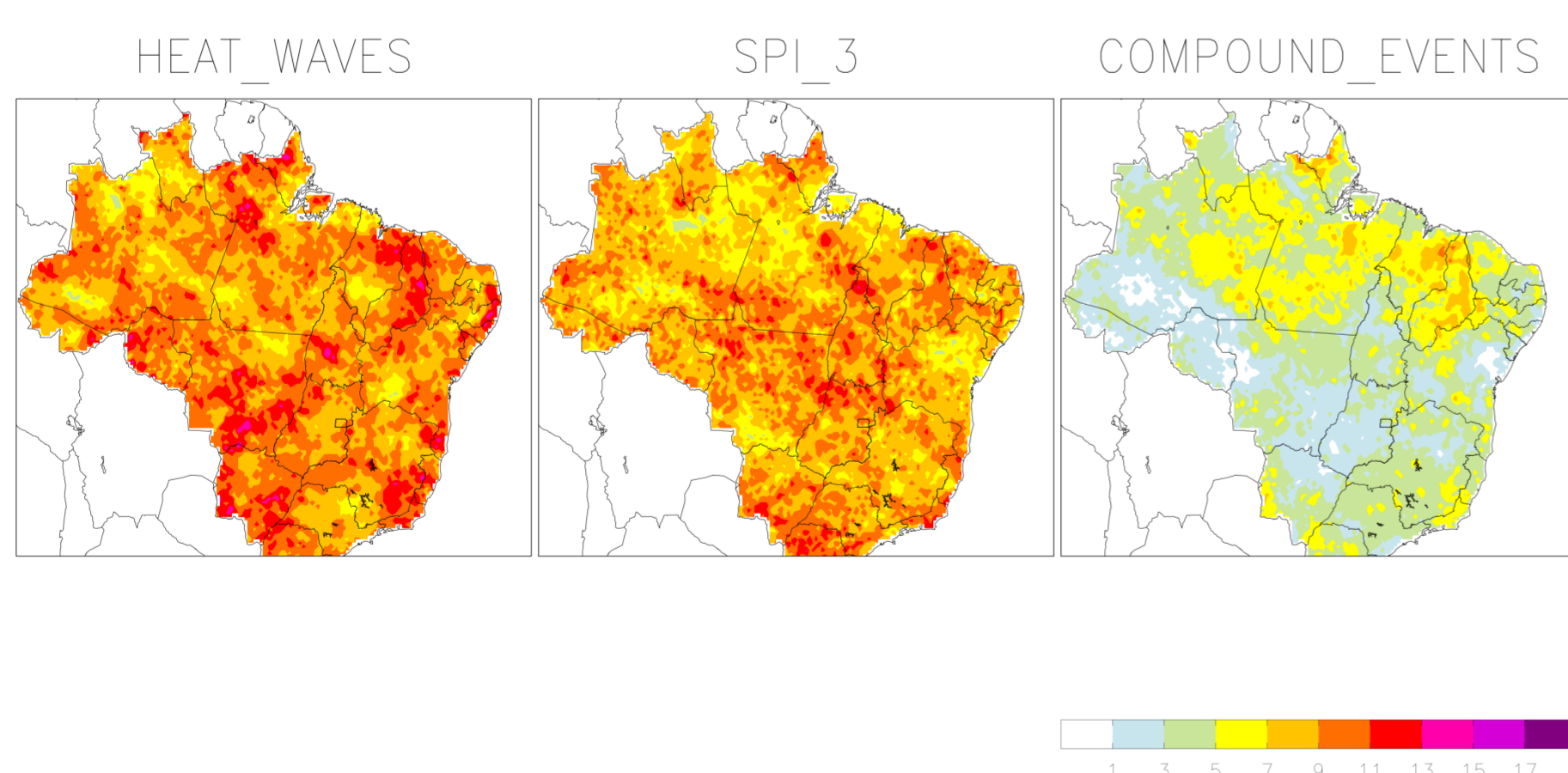
- Brazil is susceptible to various hazards depending on its geography and climate conditions (e.g. El Niño)
- Extreme events are frequent
- Economic & Social losses for each of these has been enormous
- The primary source of greenhouse gas emissions in Brazil is deforestation and land use change.



## Has the climate in Brazil been changing for the past 40 – 60 years?



## Current Climate Conditions



Number of heat waves, droughts and compound events calculated from the observational dataset BR-DWGD (Xavier et al. 2022) to 1986-2005 period, during DJF trimester

## Comments and Final Remarks

- Brazil has undergone some significant climate changes in recent years
- It is essential to accept that Brazil is vulnerable to global warming
- Climate models project changes in compound events
- Severity and increasing the frequency of extreme events;
- Brazil has been utilizing RCMs to provide the environment-related information to all the stakeholders and society

## Acknowledgements

Thank you the ICRC-CORDEX organizers and co-sponsors for providing financial support to attend the Conference.



MINISTÉRIO DA  
CIÊNCIA, TECNOLOGIA  
E INOVAÇÃO



UNIÃO E RECONSTRUÇÃO