# Mapping Land-Use Conversion Pathways in Regions of Significant Rainfall Intensity and Frequency Trends: A Multi-Biome Assessment in Brazil

Jaqueline Vígolo Coutinho · No. 12.3 · 10.07.2026, 11:30:00 AM

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SESSION 12 LAND SURFACE

# Introduction

## Land-atmosphere interaction

Land use and land cover (LULC) influence on extreme precipitation

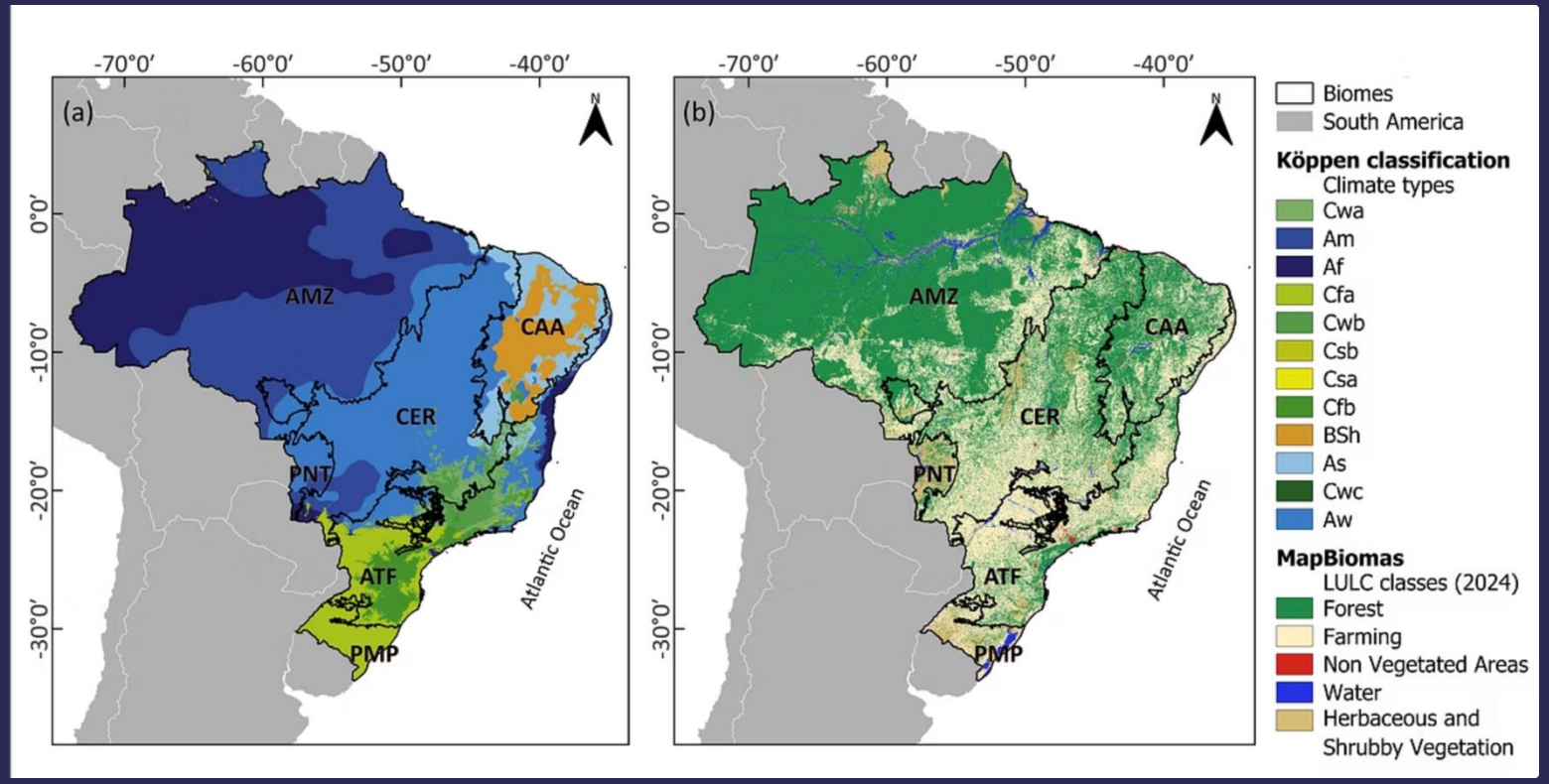
## Uncertain hydroclimatic effects

May we identify deforestation as the main regulator of extreme precipitation?

## Decadal observational data

What can they tell us?

# Study area: Brazil

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**Main climate regions**

A (tropical), B (semiarid), and C (temperate)

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**Biomes**

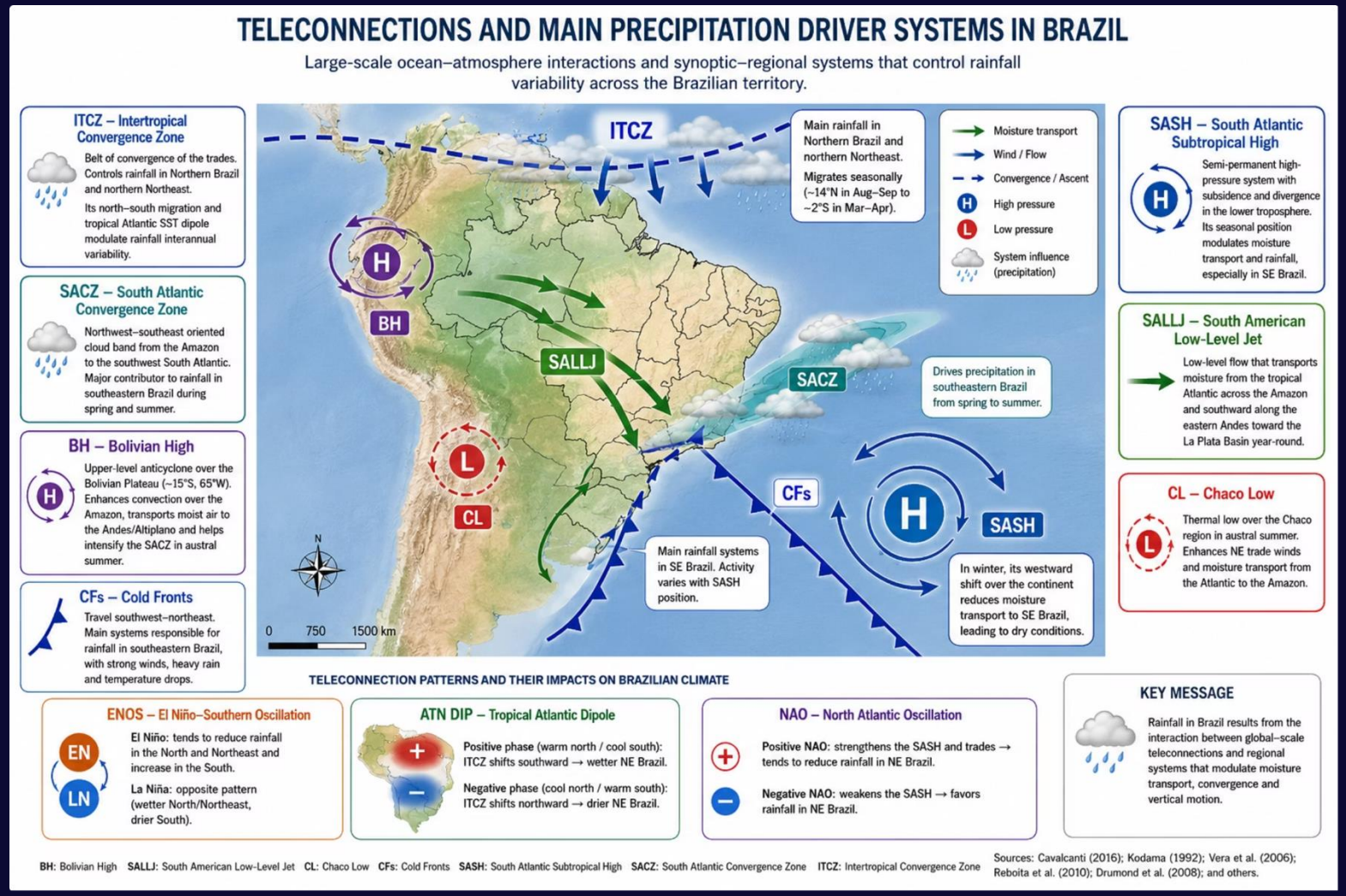
AMZ—Amazon, CAA—Caatinga, CER—Cerrado, ATF—Atlantic Forest, PMP—Pampa, PNT—Pantanale

**60%**

**Forest Formation**

in 2024, following by 32% of farming

# Study area: Brazil



# Methodology

- **Rainfall**

  CHIRPS Precipitation Daily: Climate Hazards Center InfraRed Precipitation With Station Data (Version 2.0 Final)

  Time period: 1985 - 2024

- **Rainfall indices**

  Rx5day: Maximum 5-day accumulated precipitation

  R99pTOT: Annual total precipitation from days > 99th percentile

  R20: Annual count when precipitation ≥ 20 mm

- **Teleconnection indices**

  El-Niño 1+2 anomaly

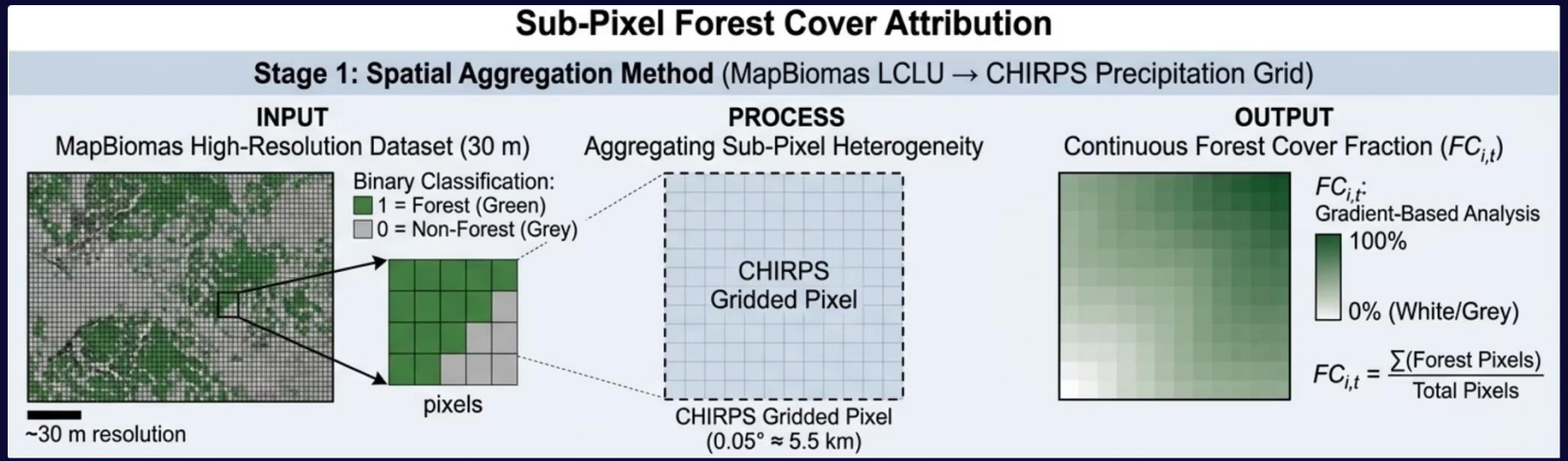
  AMO: Atlantic Multi-decadal Oscillation

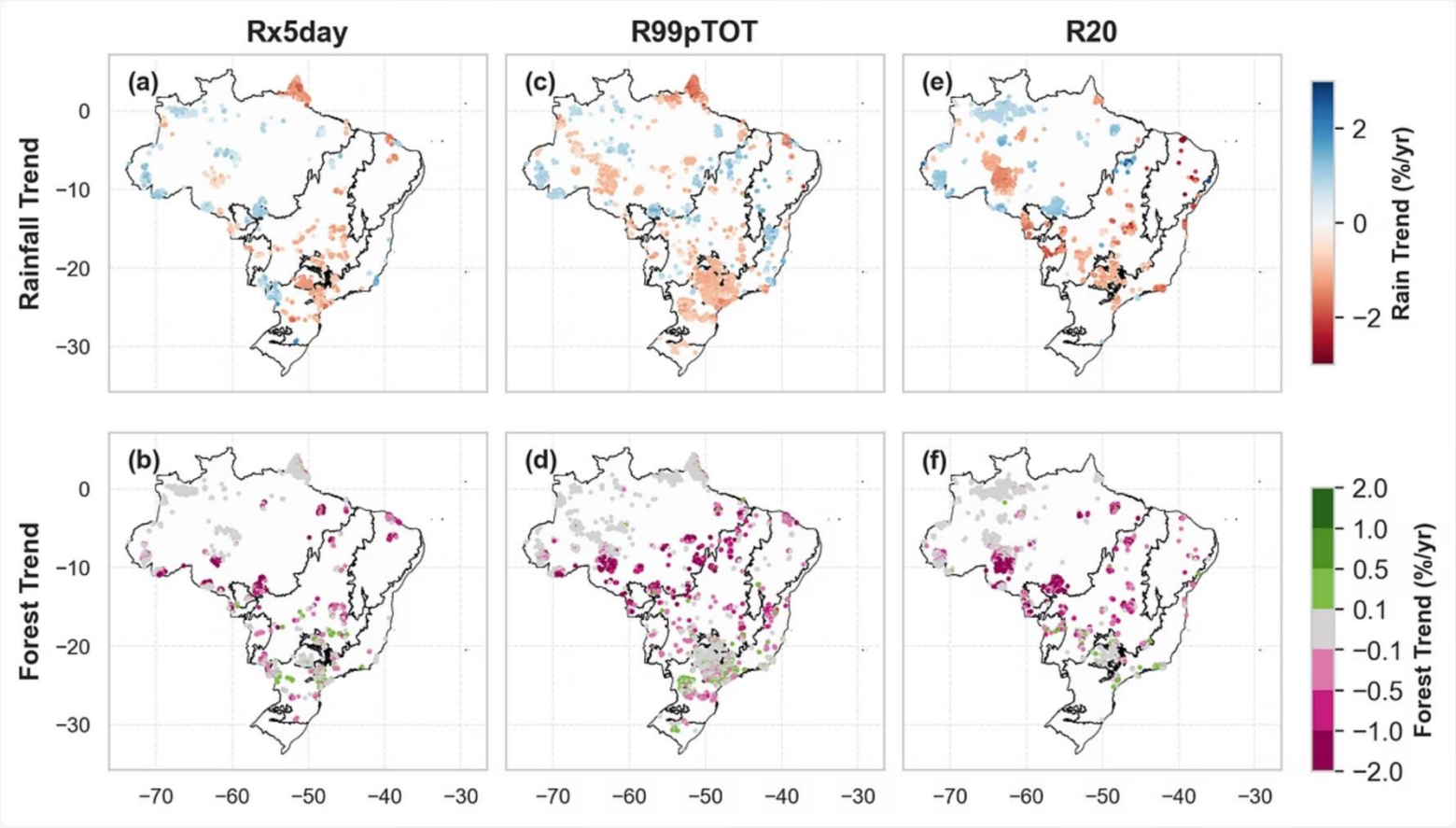
- **Land use map**

  MapBiomas Collection 10

  Based on Landsat imagery

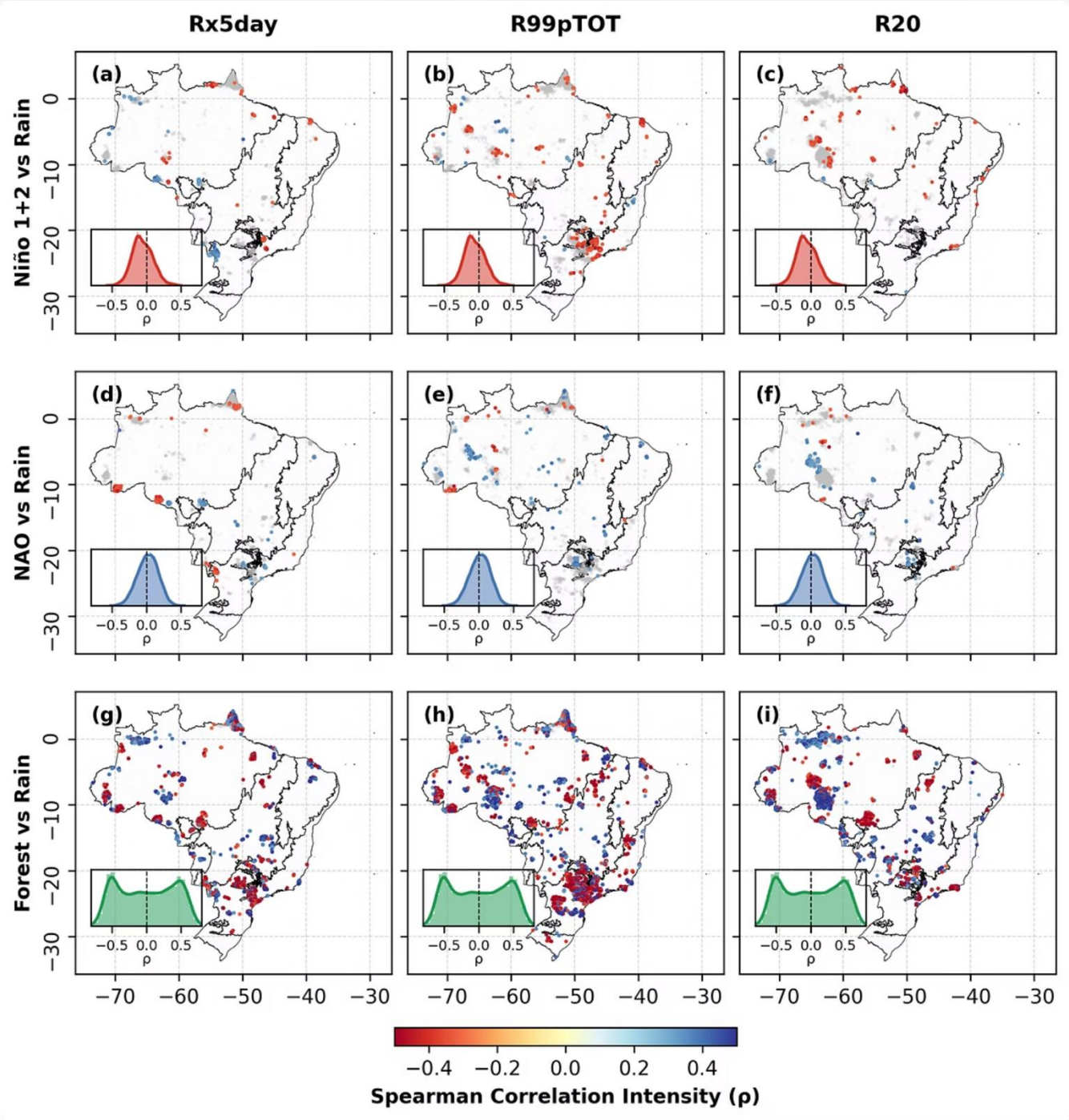
  Spatial resolution: 30 meters





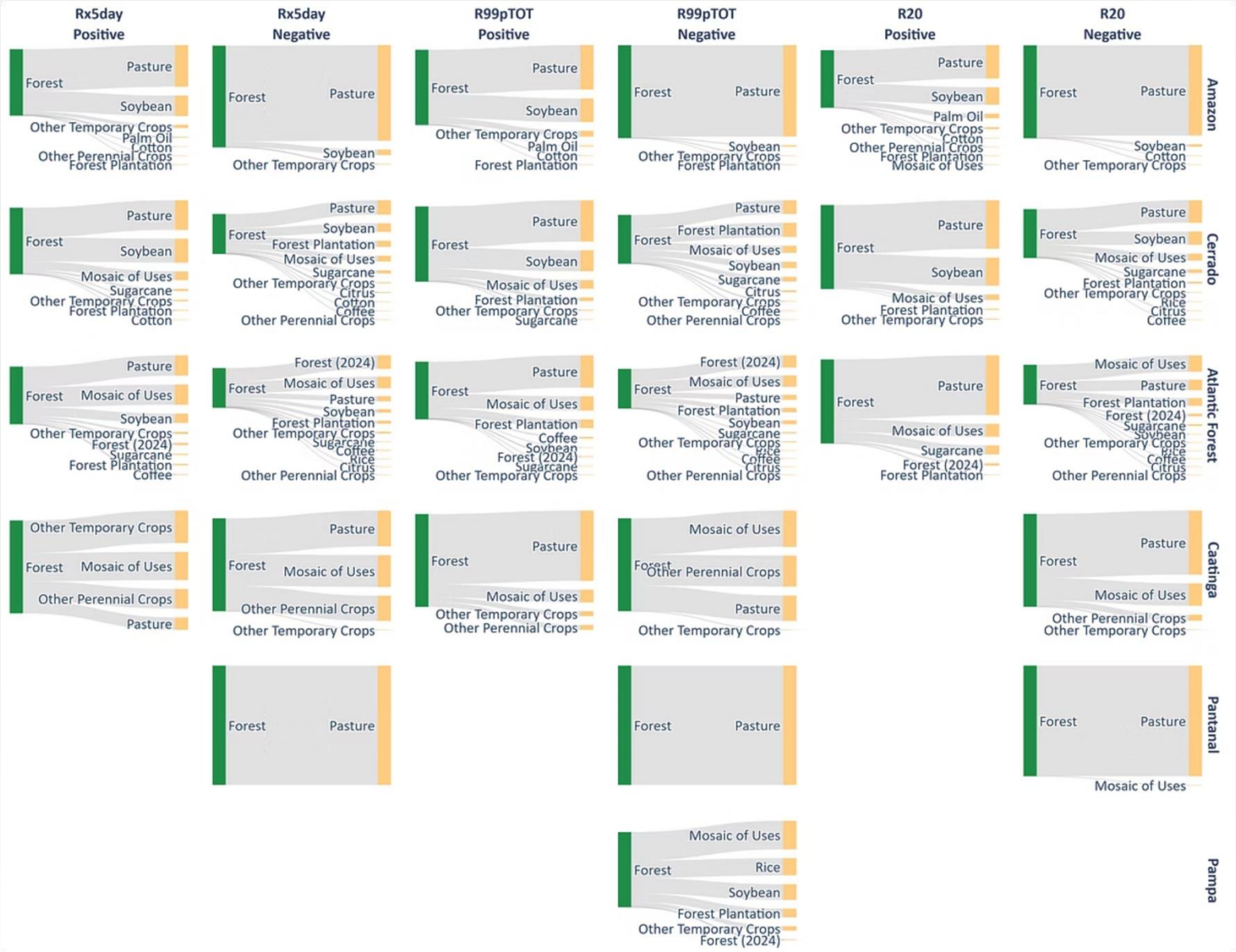

# Results

- Subtle vegetation changes (±0.1% per year) often coincide with regions experiencing significant hydroclimatic shifts, particularly in the northern Amazon and the central Atlantic Forest;
- High forest-cover trends were associated with both positive and negative rainfall trajectories.




# Results

- Direction and magnitude of relationships vary regionally, with Pacific- and Atlantic-related modes exerting contrasting influences across biomes and geographic locations;
- Forest vs Rain: Bimodal distribution of correlation




# Results

- Pasture expansion was the dominant net pathway for forest conversion for both positive and negative rainfall trend areas;
- The recurrence of similar transition pathways under opposite rainfall directions indicates that land-use change does not directly control the spatial sign of extreme rainfall trends.

# Conclusions and recommendations

Spatial mosaic of wetting and drying signals

LULC might disrupt evapotranspiration and surface roughness

Effects may be modulated by large-scale atmospheric circulation.

Land-use change as a modulator factor rather than a deterministic driver for regional extreme rainfall.

For future research:

### Annual Land-Use Change Experiments

Design sensitivity simulations with time-varying land-use maps to isolate the effect of deforestation and urbanization on rainfall extremes across Brazilian biomes.

# Thank you.

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