A Brazilian perspective of the IPY-5:

linking the two polar regions to the tropics

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Pole-Tropical Connections

– What is the role of polar regions in the climate variability patterns of the tropics?

Focus on

- Reducing the **uncertainty of the role of the polar process on the tropics and subtropics**
- Requires a **network of polar and tropical scientists** to capture global-scale data and to draw on regional knowledge
- Essential to advance **understanding of connections/teleconnections** between polar climate and Earth's climate variability modes (e.g., ENSO, SAM)
- It will improve **tropical weather forecasts and climate scenarios** by including polar processes.
- Essential to **model impacts of polar regions changes on monsoons in** South Asia, in the **drought regime in Northeast Brazil**, and in **rainfall patterns in Sub-Saharan Africa**.
- And to learn how it affects food security in the Global South (> 85% of the human population), particularly in the South Atlantic and Indian Oceans.
- Investigate how changes in the tropics affect the polar regions (example, atmospheric river changes).

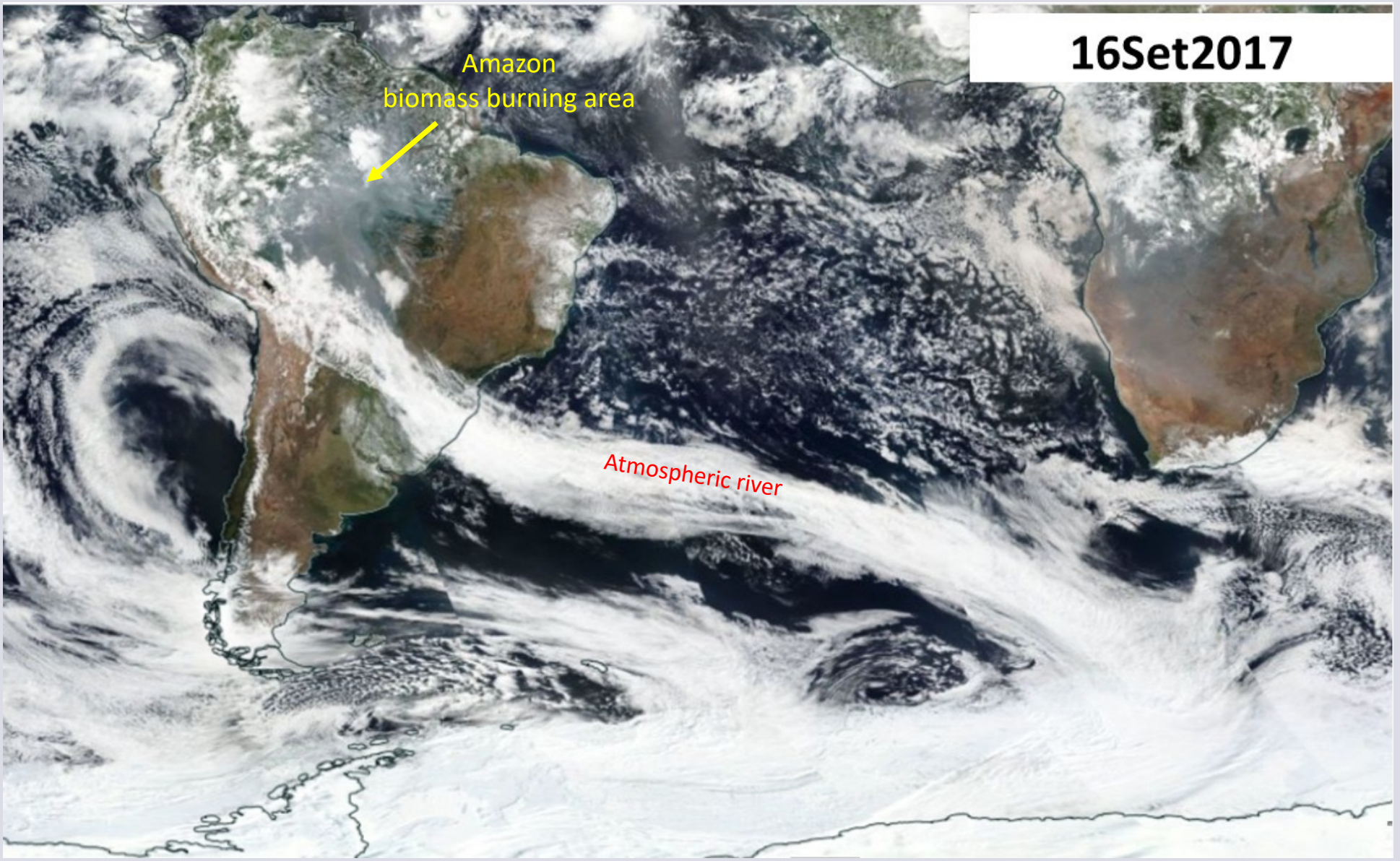
Antarctic – Tropics connections

- What's the role of atmospheric rivers in the transport of humidity and pollutants to Antarctica, and how its affected by the different modes of climatic variability and their connection to the tropical climatic variability?

- How do byproducts of southern hemisphere tropical forests' biomass burning, such as black carbon, affect climate trends and mass balance of Antarctic coastal glaciers?

- How do changes in the Amazon's and Africa's rainforest hydrological cycle affect the atmospheric rivers that reach Antarctica?

We still lack knowledge of how tropical teleconnections to the Southern Hemisphere extratropics arise and are associated with the El Niño–Southern Oscillation, Interdecadal Pacific Oscillation, and Atlantic Multidecadal Oscillation.


16Set2017
Amazon
biomass burning area
Atmospheric river

Southern Ocean - South Atlantic Connections

- How are changes in Antarctica being transmitted to the South Atlantic via water mass export?
- What is the role of this connection in the variability of global circulation (e.g., AMOC)?
- Could this pathway amplify or dampen climate change on a global scale?

We need high-resolution coupled ice-ocean-atmosphere models to advance our understanding of the formation of Antarctic Bottom Water (AABW) and its role in the AMOC.

Atmosphere

Arctic-Antarctic teleconnections

- How does the atmosphere respond to Arctic-Tropics-Antarctic connections, or could the fast Arctic climate change ripple to the Southern Hemisphere?

- Teleconnections between the Arctic Oscillation and other modes of climatic variability (ENSO, SAM, PDO)

Arctic atmospheric changes could affect mid- and low-latitude weather (through shifts in storm tracks, jet streams, and planetary waves), resulting in a southward shift of tropical rain belts.

Shallow cores (200 m deep) in the WAIS and EAIS, covering about the same timescale, could provide a basis for this discussion.

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Criosfera 1 (84° S, 79.5° W)
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- Complete Automatic Weather Station (AWS)
- Snow accumulation sensor
- Global Solar Radiation Sensor
- Atmospheric CO_2 meter
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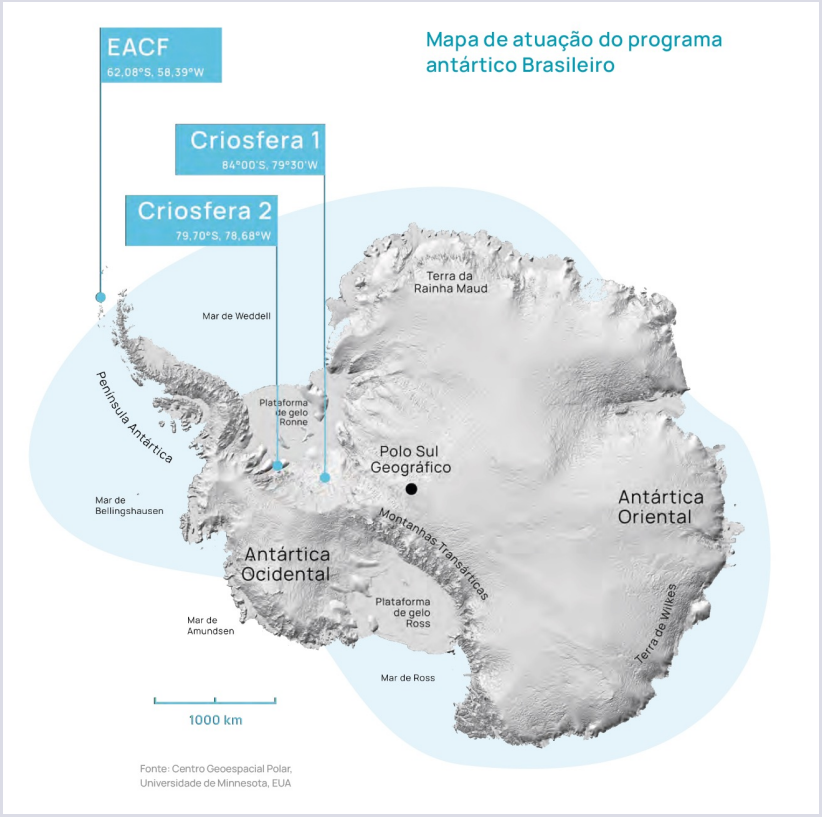


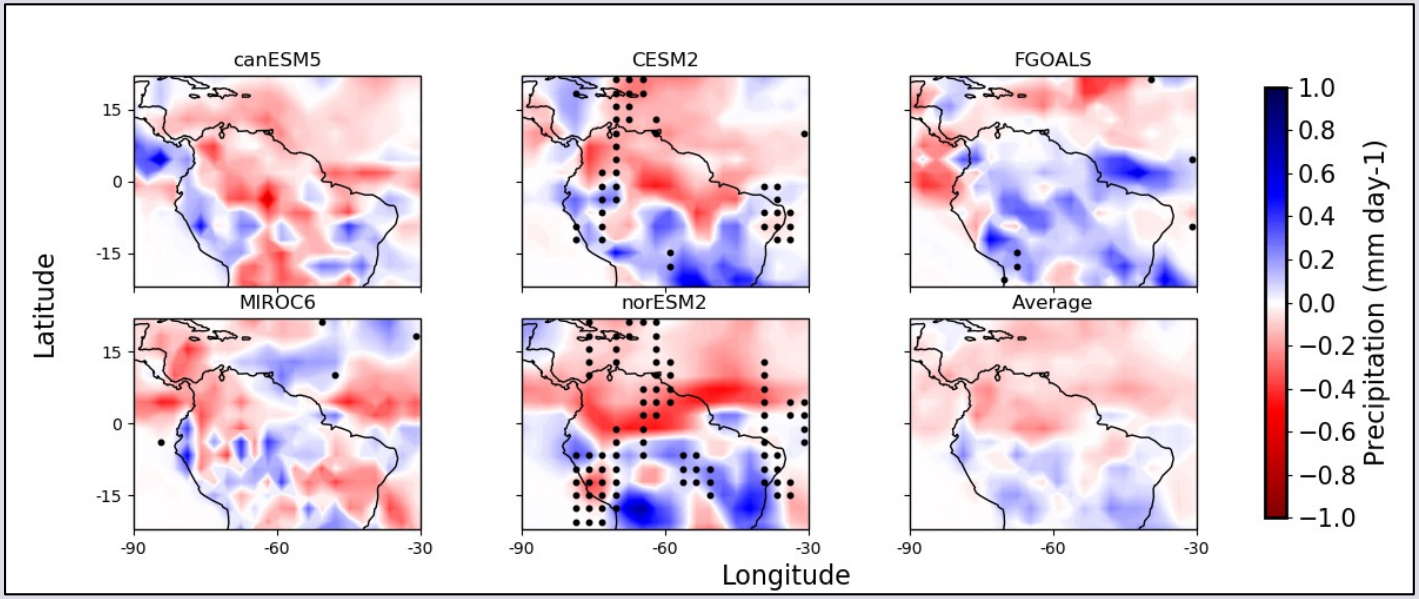
Atmospheric and Oceanic Polar Regions - Tropics connections
or
Could Arctic climate change ripple to the tropics?

- Arctic atmospheric changes could affect **mid- and low-latitude weather (through changes in storm tracks, jet streams, and planetary waves**), resulting in a southward shift of tropical rain belts.
- Caused particularly by a more meridional atmospheric circulation due to a warmer Arctic
- The natural variability of the Atlantic Meridional Overturning Cell (AMOC) affects the climatic variability of the continents in the Atlantic basin.
- Connections Arctic Oscillation - El Niño-Southern Oscillation (ENSO)
- Arctic amplification could serve as an early indicator of abrupt climatic change.

Arctic sea ice reduction on precipitation in northern South America

Future changes in the Arctic sea ice extent may affect low-latitude precipitation.

Model considering a decrease of sea ice extent under a 2 °C mean temperature increase scenario.



DJF: Northern Amazon becomes drier than present conditions, while the southern region becomes wetter.

- Weaken trade winds
- Reduction in the transport of moisture from the Atlantic to South America.

Brazilian interest in the Arctic Region

- Climate change
- Arctic contribution to sea level rise
- Biodiversity
- Natural resources
- Geopolitical scenario
- Education
- Comparative anthropology of indigenous populations

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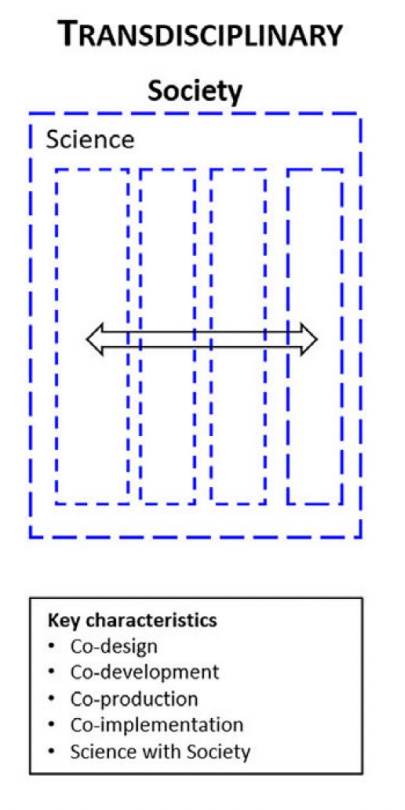
5° IPY

- **Use of the role of the diplomacy of science**
- **Transdisciplinary research projects**



Berkman (2025)

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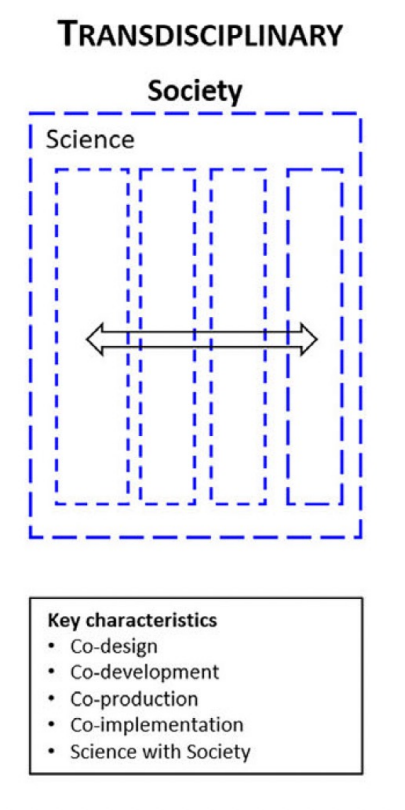

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International Expedition of Coastal Antarctic Circumnavigation ICCE 2024–2025

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Thank you
for your attention!

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