

Present and future tropical fire risks associated with compound events

Andreia Ribeiro, Paulo Brando, Lucas Rodrigues, Ludmila Rattis, Mathias Hauser, Martin Hirschi, Sonia I. Seneviratne and Jakob Zscheischler

EGU 23-27 May 2022

Background and motivation

How may climate change alter the likelihood of fire risks associated with compound events?

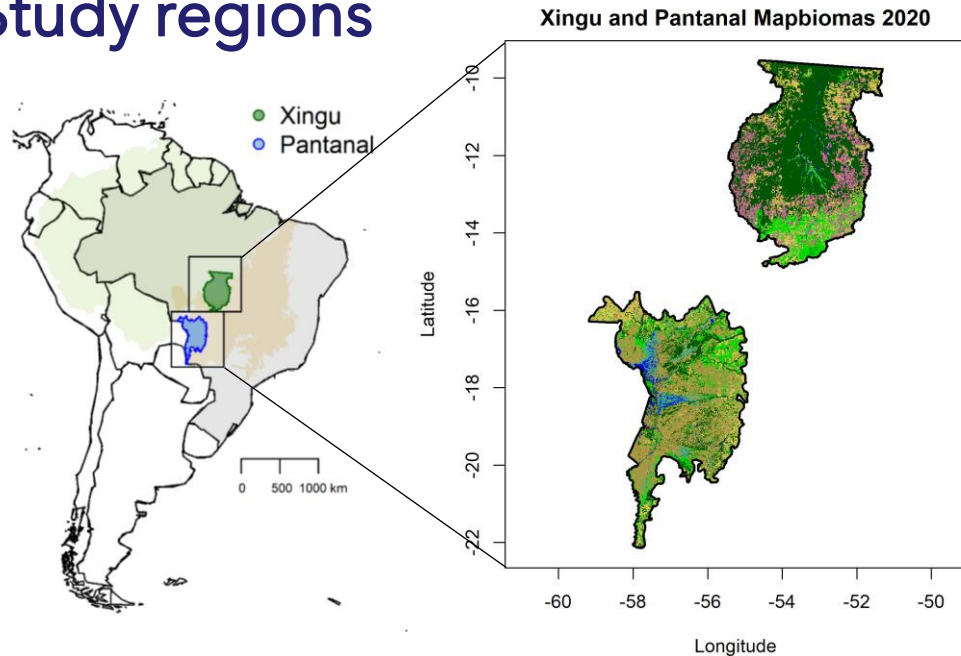


Source: Courtesy of Paulo Brando

- Brazilian biomes are being affected by concurrent warm and dry conditions, agricultural expansion and intensification, deforestation, and forest fires
- The combination of these factors are expected to increase the flammability of these landscapes in a future drier and warmer climate

Burned area and land-use data

Study regions



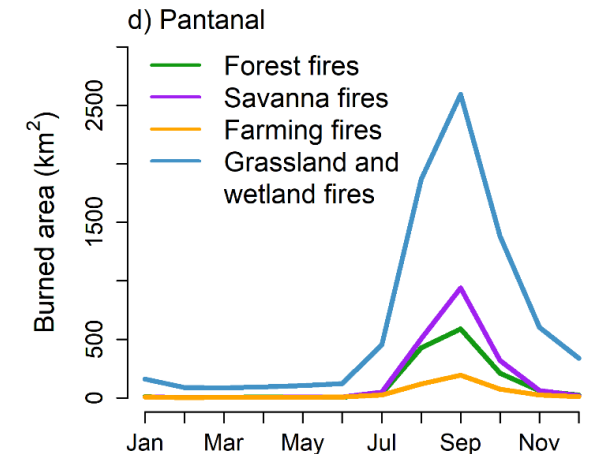
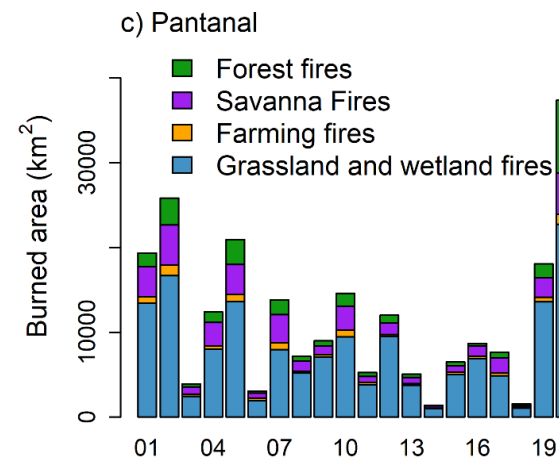
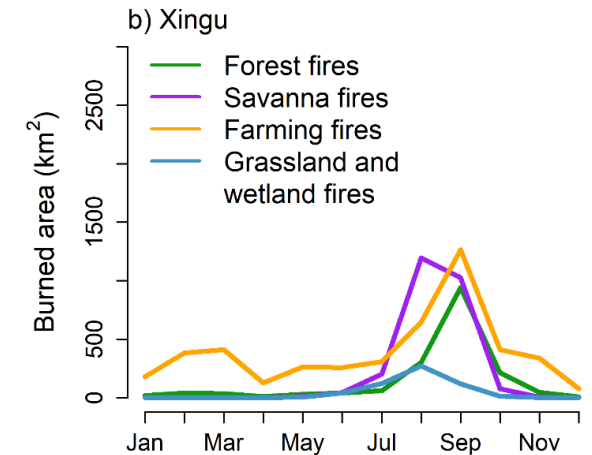
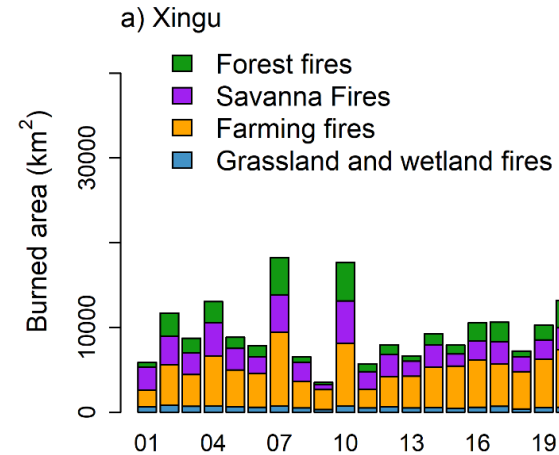
Fire and land-use data

MODIS burned area (2001-2020)

Mapbiomas Land Cover (2001-2020)



Google Earth
Engine (GEE)



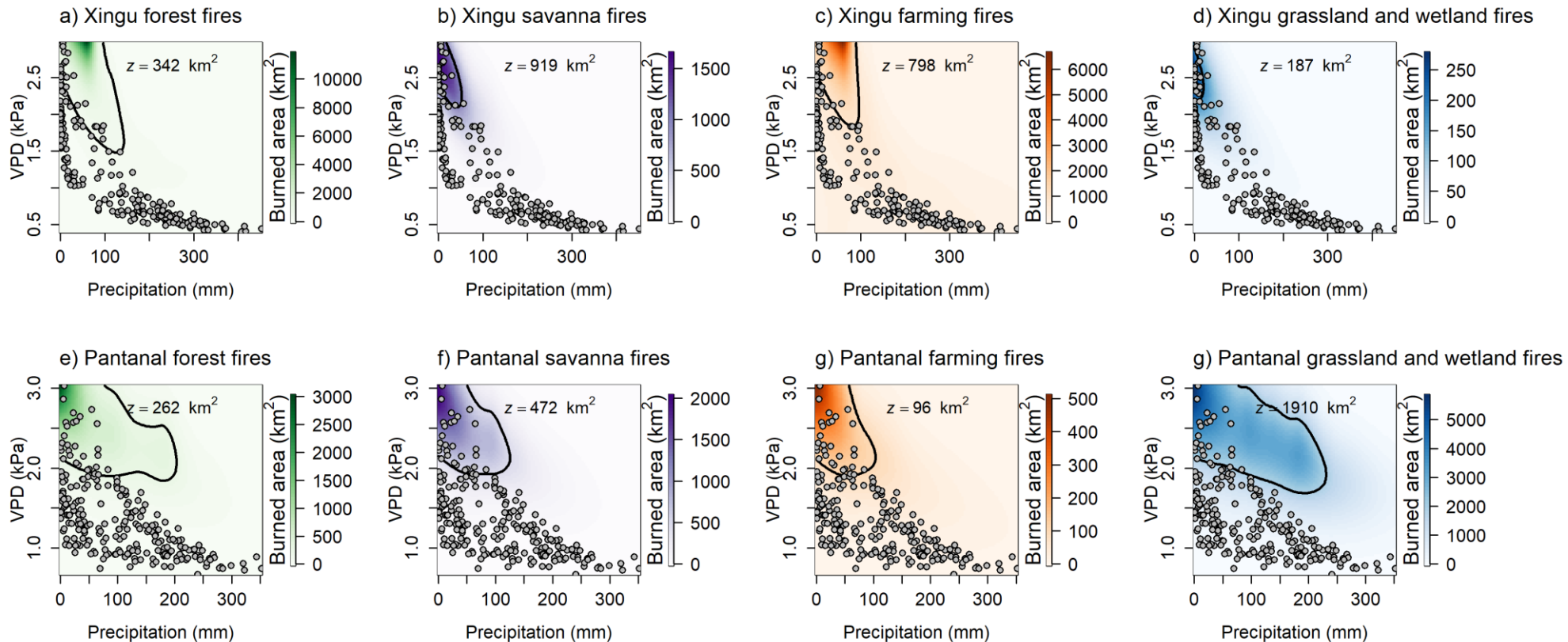
Burned area response to compound events

Local Poisson regression models

$$Y_t \sim \text{Poisson}$$

$$\log(Y_t) = f(\text{Pre}_t, \text{VPD}_t)$$

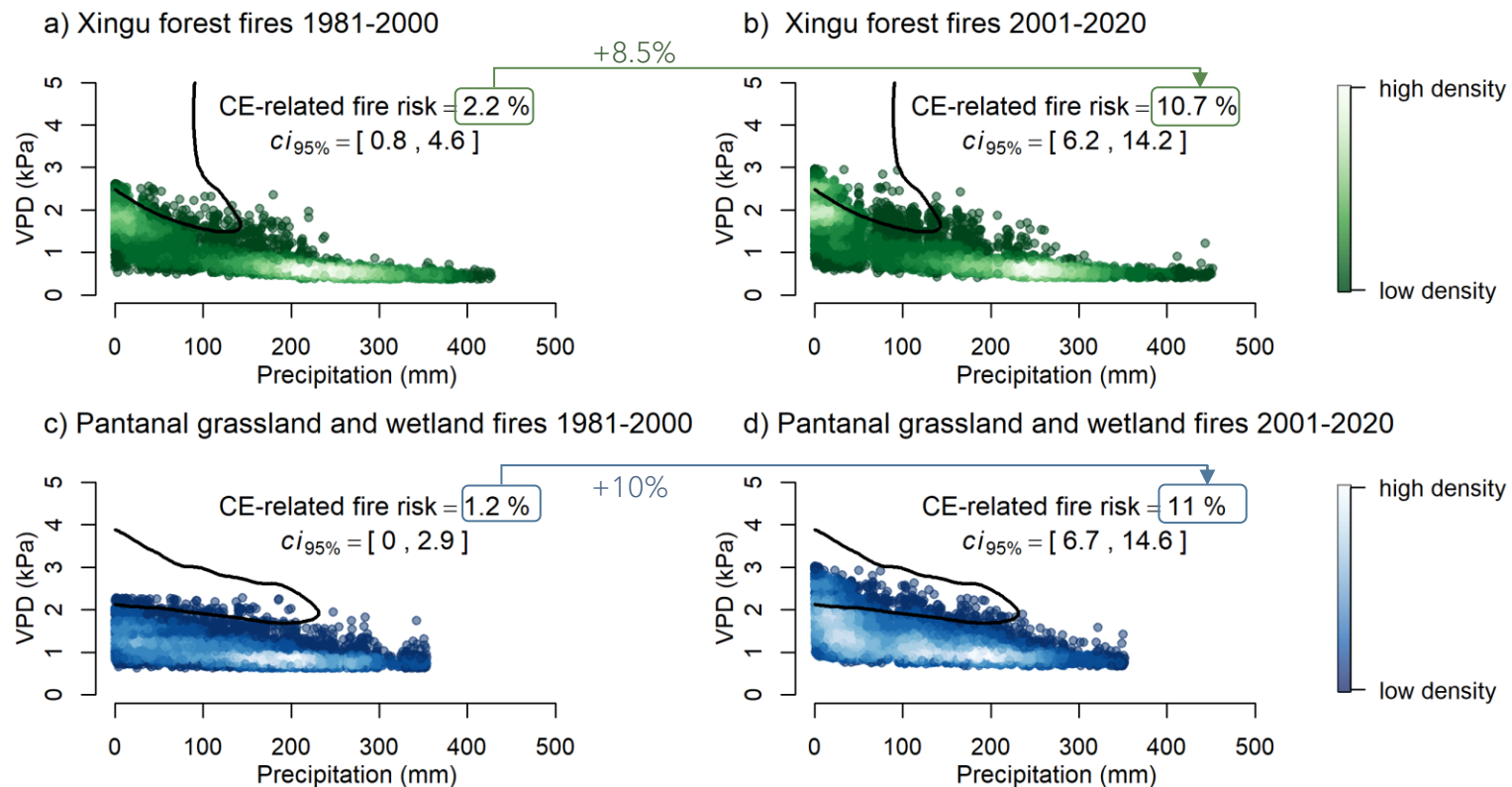
- The non-linear relationship is well explained by compound events
- Air dryness (high VPD) and low precipitation are key drivers of fire



Compound event-related fire risks

Percentage of realizations (VPD,P) for which burned area exceeds the 90th percentile

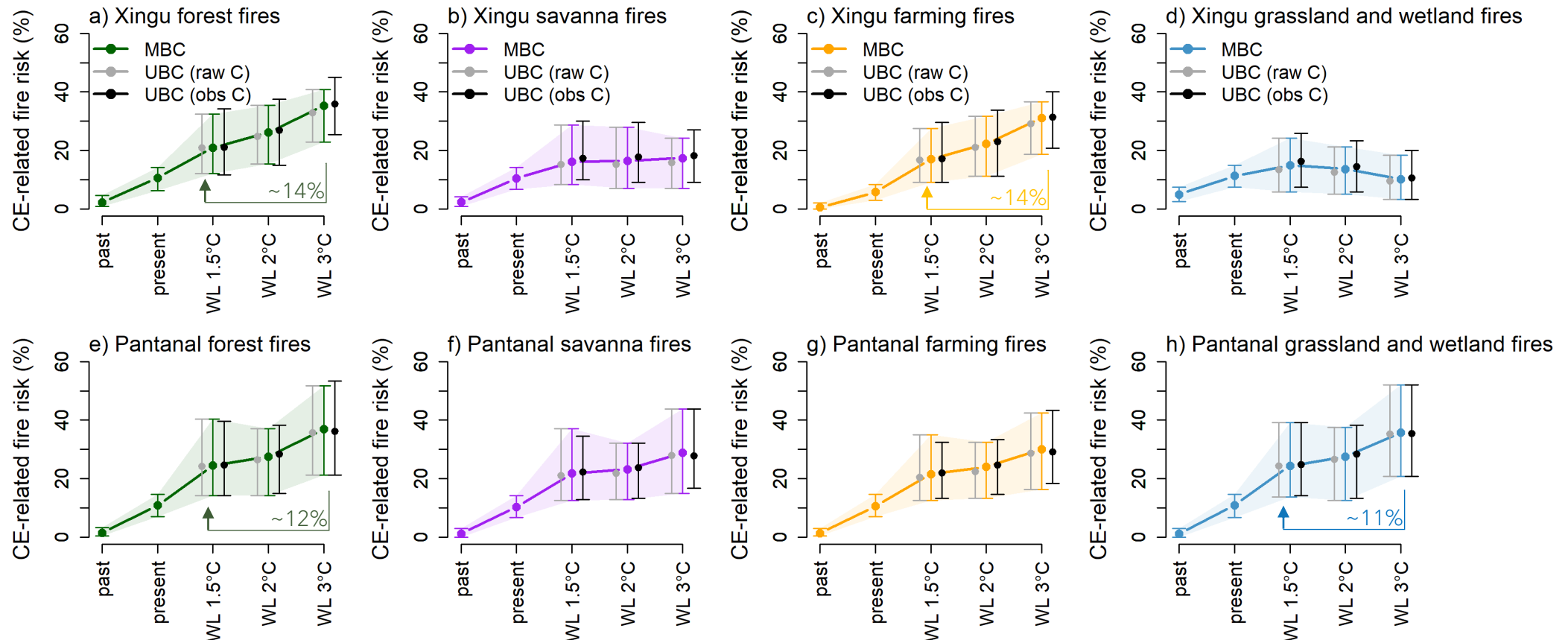
- Present-day climate change has already led to more fire prone conditions
- CE-related fire risk as increased 5-10% in present days



Future compound event-related fire risk

Projections of the CE-related fire risks under +1.5°C, +2°C and +3°C warming levels (WL)

- Increased risk is projected to be experienced in both regions, but to a larger extent in the Pantanal
- The likelihood of CE-related fire risk can be reduced by up to ~14% if global warming is constrained to +1.5°C instead of +3°C



Present and future tropical fire risks associated with compound events

Take-aways

- Present-day climate change has already led to more fire prone conditions
- Constraining future global mean warming is key to decrease compound event-related fire risk
- If we do not achieve the “full potential” for climate change projected fire risks might be reduced

Andreia Ribeiro
andreia.ribeiro@env.ethz.ch

 @afsribeiro

ETH Zurich
Land-Climate Dynamics
Institute for Atmospheric and Climate Science

Available soon in *Environmental Research Letters*:
'A compound event-oriented framework to tropical fire risk assessment in a changing climate' by Ribeiro et al.

Thank you!