GLOBAL FIRE REGIMES, THEIR NON-FIRE CHARACTERISTICS, AND CHANGES IN TIME

Eleanor Butler [1, 2] ✳, Sebastian Sippel [3], Ana Bastos [2] ✳Email: eleanor.butler@uni-leipzig.de

1. Institute for Earth System Science and Remote Sensing, Leipzig University, Leipzig, Germany. 2. Max-Planck Institute for Biogeochemistry, Jena, Germany. 3. Institute for Meteorology, Leipzig University, Leipzig, Germany

Here we analyse the spatial distribution and characteristics of fire regimes between 1982 and 2018, including their changes. Fire regimes (pyromes) are separated by their fire characteristics: size, frequency, burned area, and fire season length. We then analyse how pyromes depend on non-fire characteristics such as climate, vegetation cover, and human population. We find that all factors are relevant to explain pyrome distribution, but population and land cover type have contrasting effects across different pyromes.

BACKGROUND

Previous studies (e.g. Archibald (2013), and Pais (2023)) have categorised fire regimes into pyromes, but have not considered longer-term changes at a global scale.

Pyromes are categorised purely based on their fire properties, independent of geographic location, local climate, fuel availability, or fuel type.

METHODS

- Remote sensing data (AVHRR-LTDR) monthly 1982-2018. Divided into 3 study periods of 12 years each.
- Each 0.25° gridcell is sorted into a pyrome by its fire characteristics using an expectation-maximisation clustering algorithm (Gaussian Mixture Model) with no priors. (Archibald 2013)
- Further study of non-fire characteristics of the pyromes, and their changes in time, using remote sensing data (population density, land cover, and climate).

GLOBAL DISTRIBUTION OF PYROMES

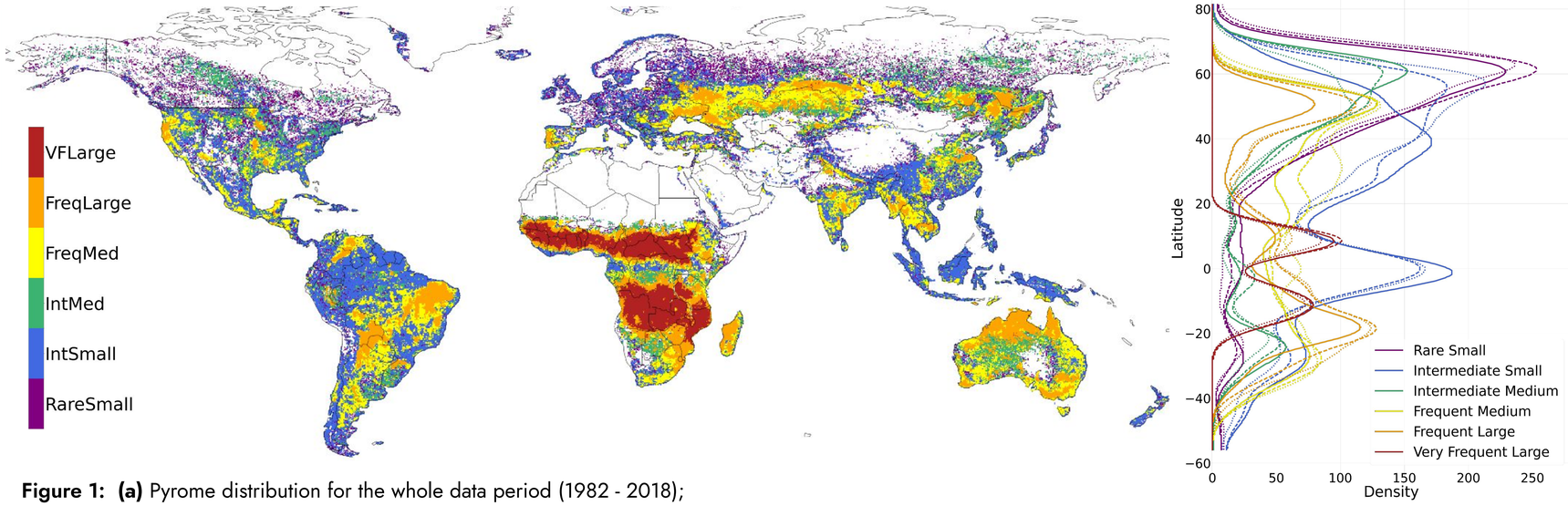

Figure 1: **(a)** Pyrome distribution for the whole data period (1982 - 2018); **(b)** Changes in the latitudinal distribution of pyromes across Period 1 (. . .), Period 2 (- - -), Period 3 (——).

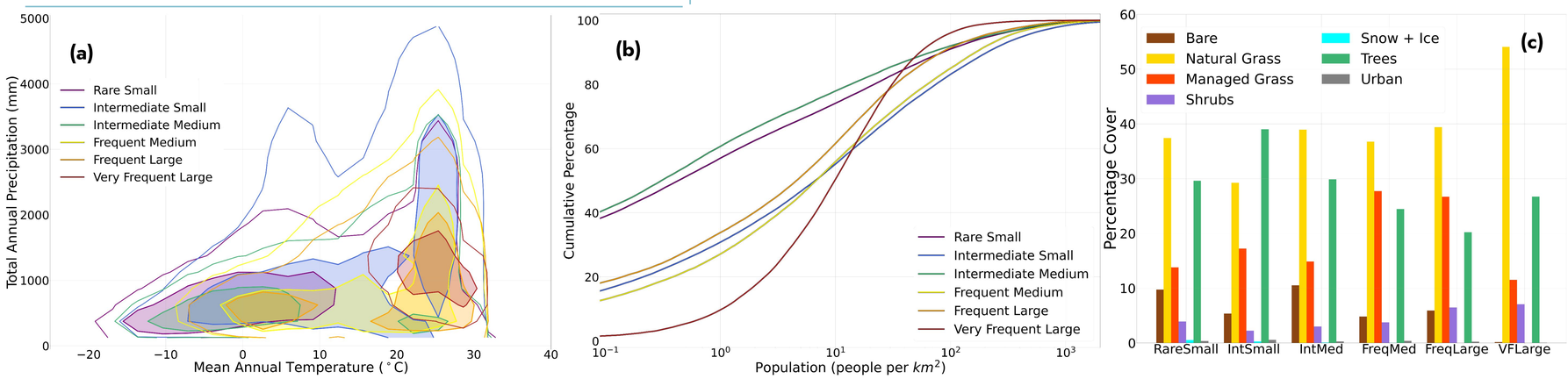

Figure 2: Non-Fire characteristics of each pyrome: **(a)** temperature and precipitation, **(b)** population density, and **(c)** land cover type, by pyrome.

RESULTS

- Pyrome distribution maps for each study period, and the whole period (Fig. 1a) show global extent of each pyrome.
- Non-fire features of each pyrome (Fig. 2) across all periods.
- Changes in the distribution of pyromes across the observation period (Fig. 1b), most commonly:
  - Frequent Large to Frequent Medium (Eurasia and South America).
  - Frequent Medium to Intermediate Small (North America, China).
- There are fewest burned pixels in the final study period.

References:

Mack et. al, 'Carbon loss from boreal wildfires offset by increased dominance of deciduous trees' (2021)

Archibald et al. 'Defining pyromes and global syndromes of fire regimes' (2013)

Pais et al. 'Global scale coupling of pyromes and fire regimes' (2023)

Sharing not permitted

This presentation participates in OSPP

EGU Outstanding Student & PhD candidate Presentation contest

This project is funded by the European Union (ERC StG, ForExD, grant agreement No. 101039567). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Council. Neither the European Union nor the granting authority can be held responsible for them.

ForExD Forest vulnerability to compound extremes and disturbances in a changing climate

erc European Research Council Established by the European Commission

UNIVERSITÄT LEIPZIG