

POST-FIRE RECOVERY ESTIMATION OF RECURRENTLY BURNED VEGETATION ACROSS MEDITERRANEAN REGIONS WORLDWIDE

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1. OBJECTIVES AND MAIN RESEARCH QUESTIONS

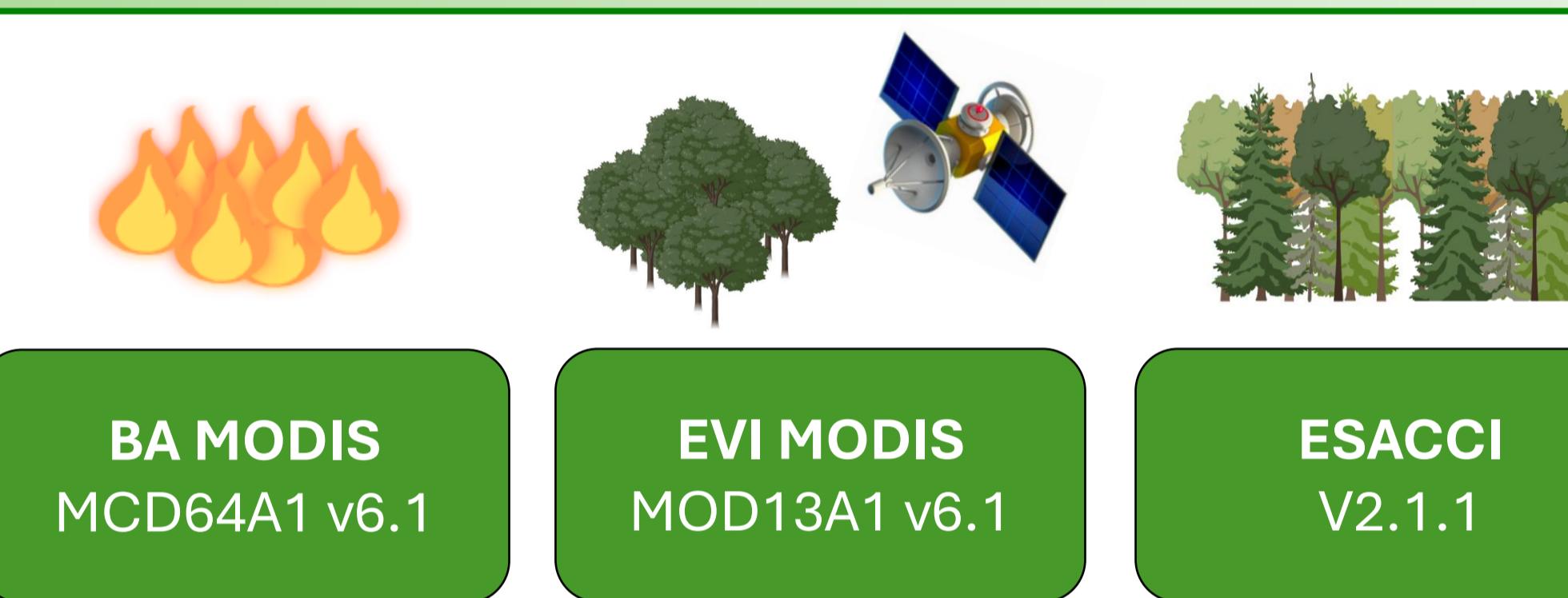
Provide a framework of how post-fire recovery dynamics of vegetation following recurrent fires over Mediterranean ecosystems worldwide based on **remotely-sensed data**. Based on a statistical model, we aim to address the following three research questions:

- Can remotely-sensed products of vegetation and burned areas suitable to monitor the post-fire vegetation recovery across Mediterranean ecosystems?
- Are the recovery processes of fire-prone Mediterranean ecosystems being impacted by recurrent fires in recent years?
- How does pre-fire conditions of these ecosystems influence fire severity, and in turn, how does fire severity modulate the recovery rate of burned vegetation?

2. DATA AND METHODS

- Burned Areas (BA) from MODIS
- Enhanced Vegetation Index (EVI) from MODIS
- Land Cover from ESACCI

PERIOD 2001-2022

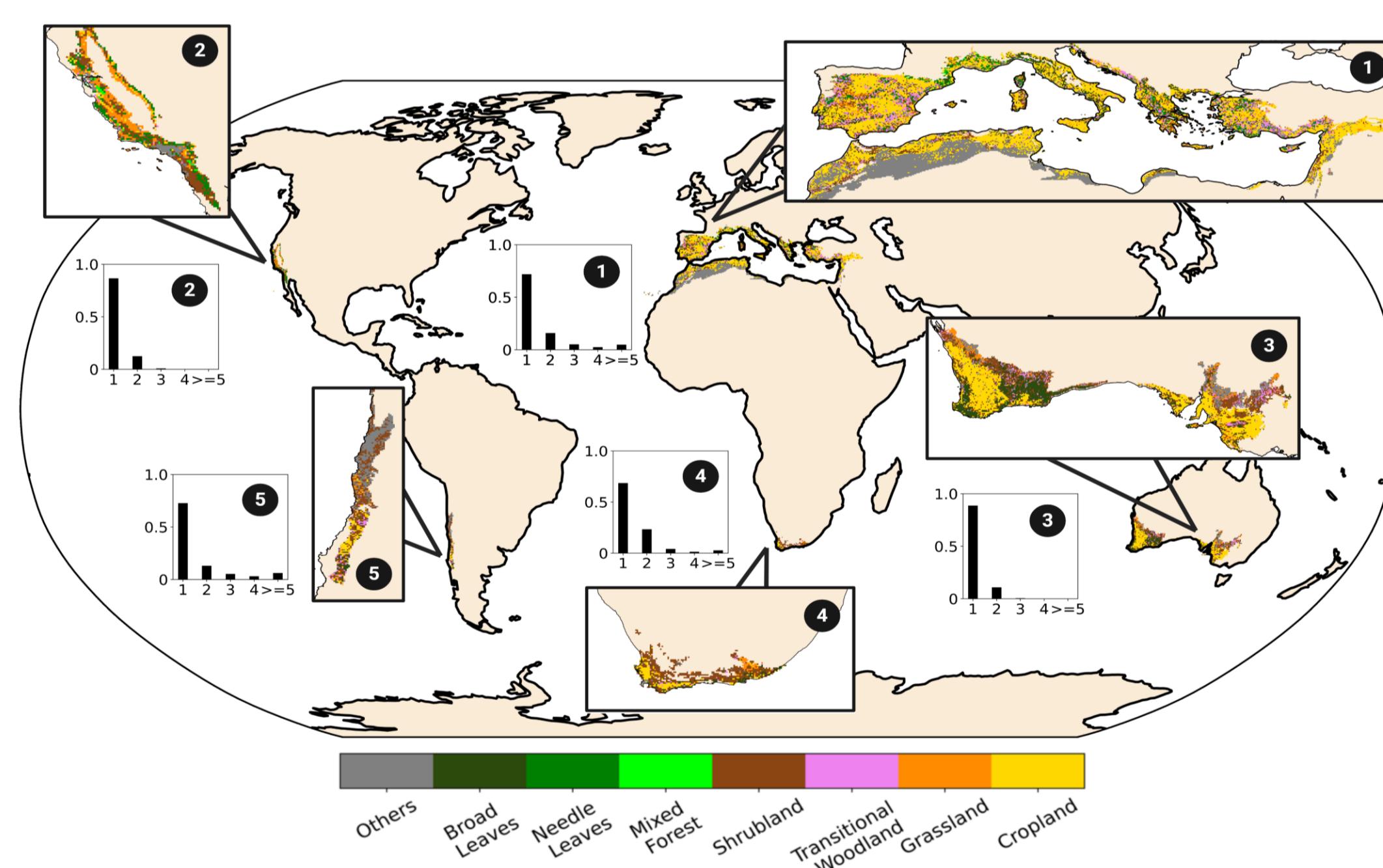


BA MODIS
MCD64A1 v6.1

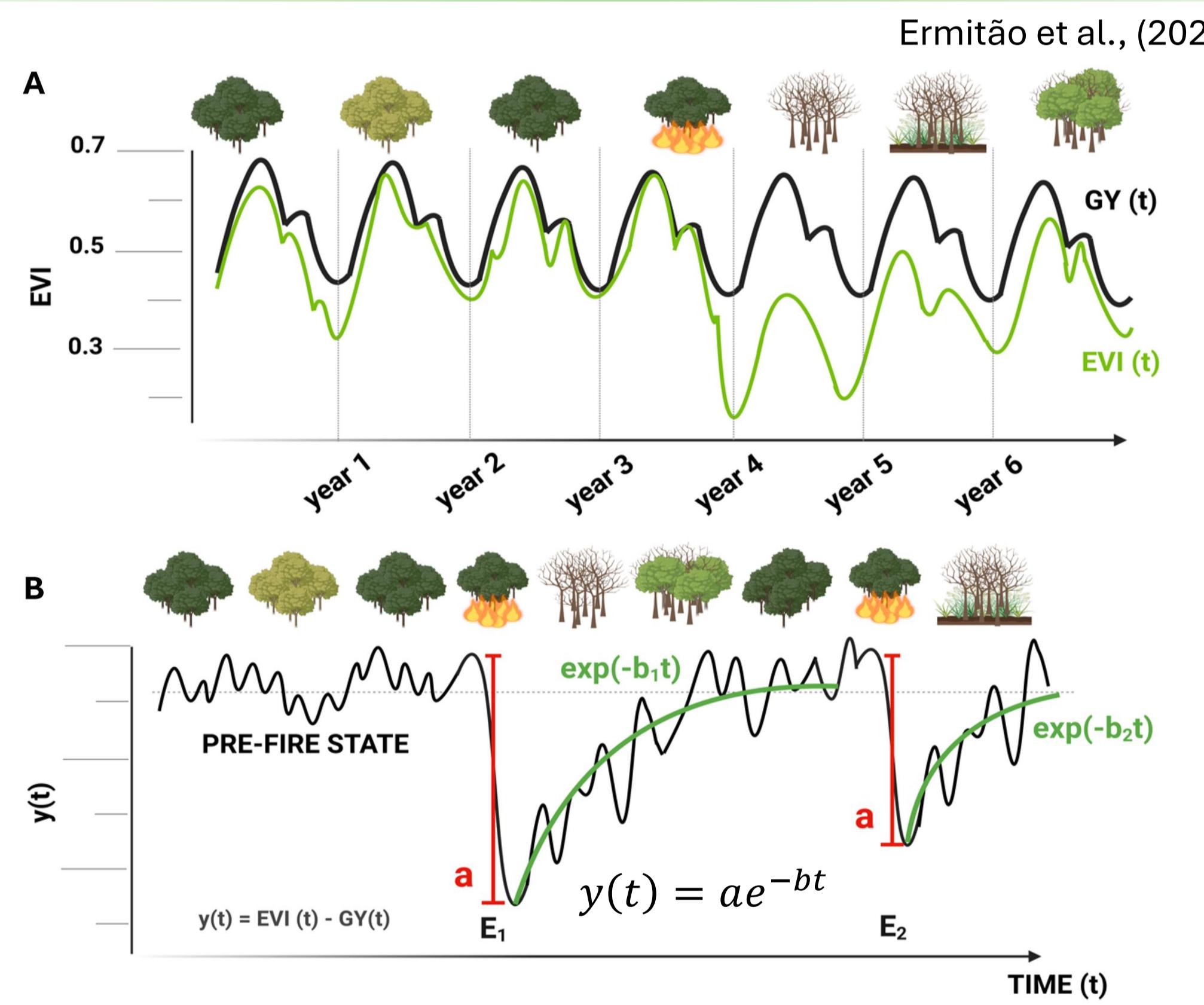
EVI MODIS
MOD13A1 v6.1

ESACCI
V2.1.1

STUDY AREA



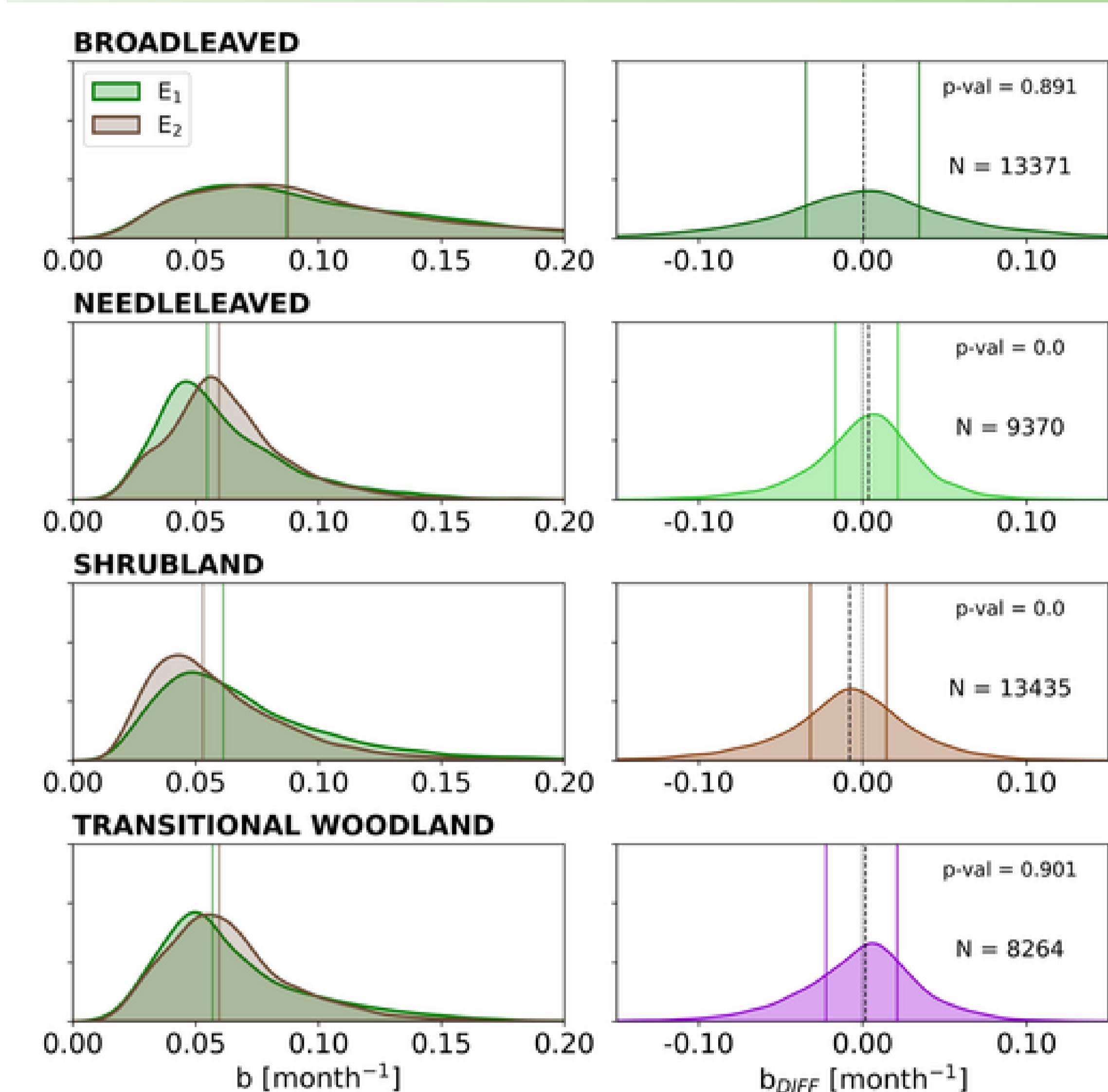
STATISTICAL MODEL



- We apply a mono-parametric statistical model to a time-series of EVI (panel A) that evaluates the **recovery rate** of vegetation greenness over regions that burned **twice** (panel B).
- We analyse the recovery rate, and the impact of pre-fire vegetation state and fire severity, separately for the following land covers: Broad-leaved forests (BL), Needle-leaved forests (NL), Shrublands (Shb) and Transitional Woodlands (TW).

3. RESULTS

RECOVERY RATE



BL tend to show **faster** mean recovery times (0.08 month^{-1}) as well as larger variability in recovery rates than the other vegetation types.

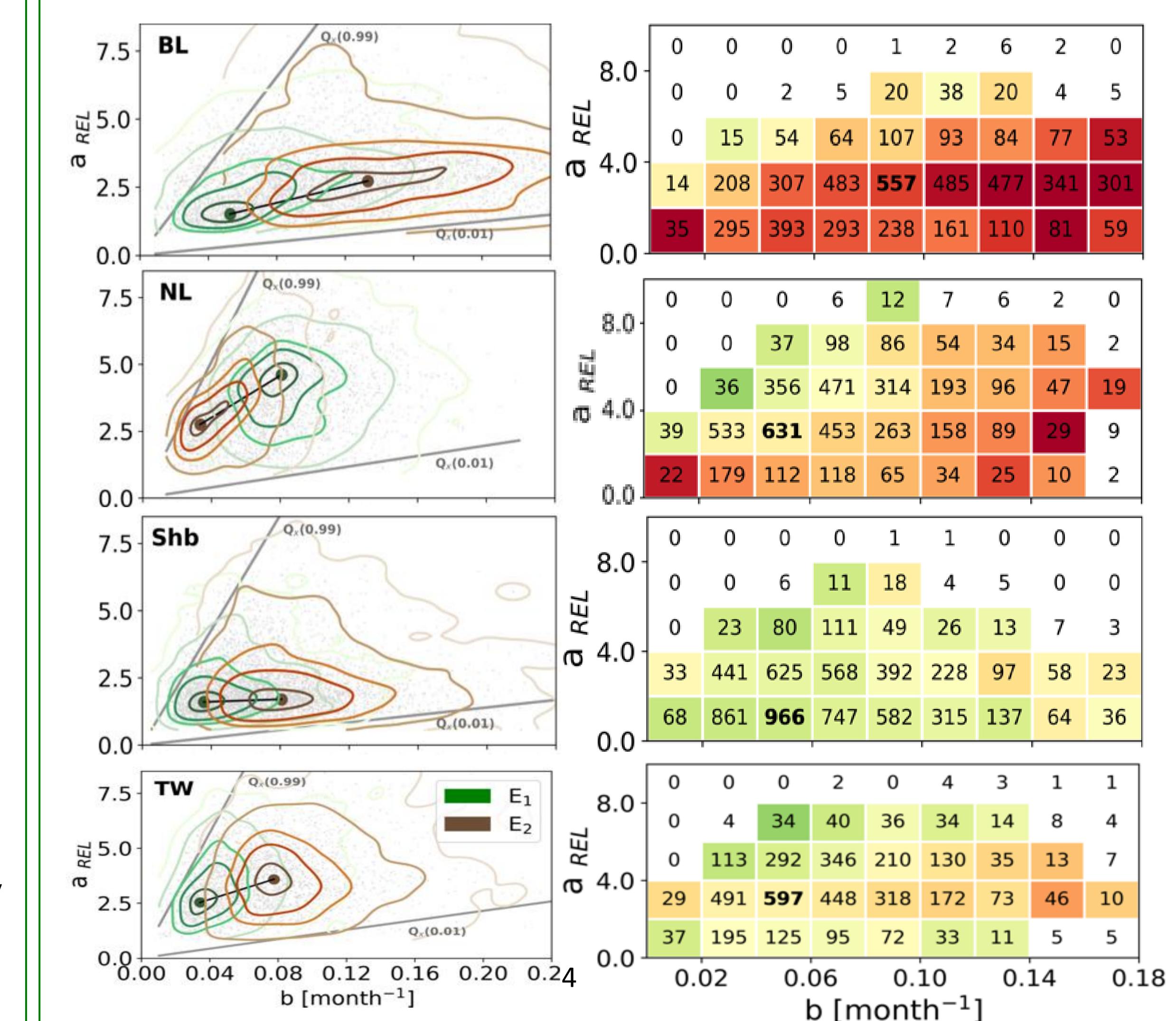
On average, NL generally show **faster** recovery following E₂ than E₁ by 0.005 month^{-1} , as given by the mean value of the pairwise differences.

Shb pixels recover **faster** after E₁ than E₂ by 0.008 month^{-1} .

For BL and TW, the median differences are not statistically significant, indicating that E₁ and E₂ distributions are very similar.

Broad spread of b_{DIFF} distributions can indicate that **marked differences** in recovery rates between the two events have occurred.

FIRE SEVERITY AND PRE-FIRE STATE



Distribution of the points suggests a **marked dependence** of recovery rate on the relative fire severity.

Strong sensitivity of recovery rates to relative severity in the most severe fires (99th quantile of a_{REL}) for all vegetation types (*higher slopes*). For the least severe fires (1st quantile of a_{REL}), the recovery rates show **low sensitivity** to relative fire severity (*lower slopes*).

Strongly **negative values** of $y(t)_{\text{PRE-FIRE}}$ tend to be associated with **faster** recovery rates. Closer to ideal seasonal cycle values of $y(t)_{\text{PRE-FIRE}}$ tend to be associated with **more severe** fires and **slower** recovery rates.

FINAL REMARKS

- Good** performance of the proposed methodology, enhancing the value of **remote sensing**, with a **time-series approach**, to assess fire recovery.
- Mean recovery rate tends to be **faster** after the **first event** than the second event, although we detect large variability between recovery rates.
- Fire severity modulates the recovery of vegetation, as recovery rates are enhanced with **increasing** severity.
- More severe** fires are followed by very **slow** recovery, and these events are strongly associated with **high** values of pre-fire greenness.

REFERENCES

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