

# Present and future fire regime in Iberia

Tomás Calheiros

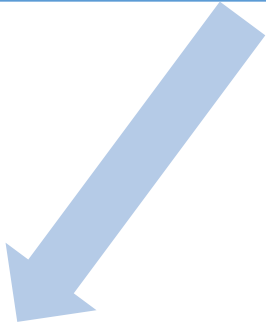
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# Research Questions (RQ)

**RQ1.** Are there recent changes in the fire regime or in the Pyro-Regions of Iberia?

**Article 1 (published in June 2020)**



**RQ2.** How is the relationship between extreme fire weather and Burnt Area in Portugal?

**Article 3 (pre-print published in June 2021)**



**RQ3.** Will future climate modify the Iberian's fire regime or Pyro-Regions?

**Article 2 (published in February 2021)**

# 1. Are there recent changes in the fire regime or in the Pyro-Regions of Iberia?



## Recent evolution of spatial and temporal patterns of burnt areas and fire weather risk in the Iberian Peninsula

**Author:** T. Calheiros, J.P. Nunes, M.G. Pereira

**Publication:** Agricultural and Forest Meteorology

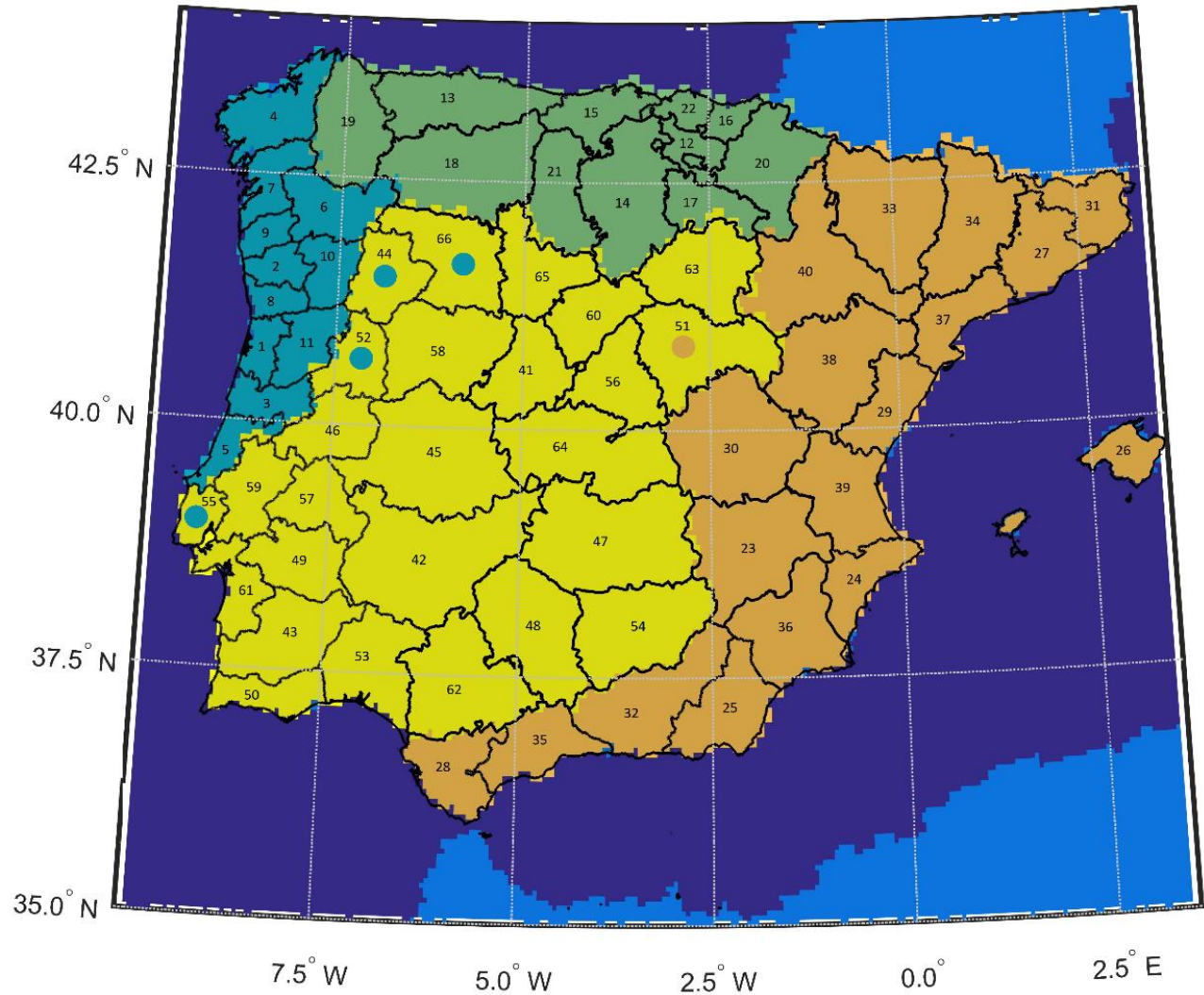
**Publisher:** Elsevier

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# Recent Changes in Pyro-Regions

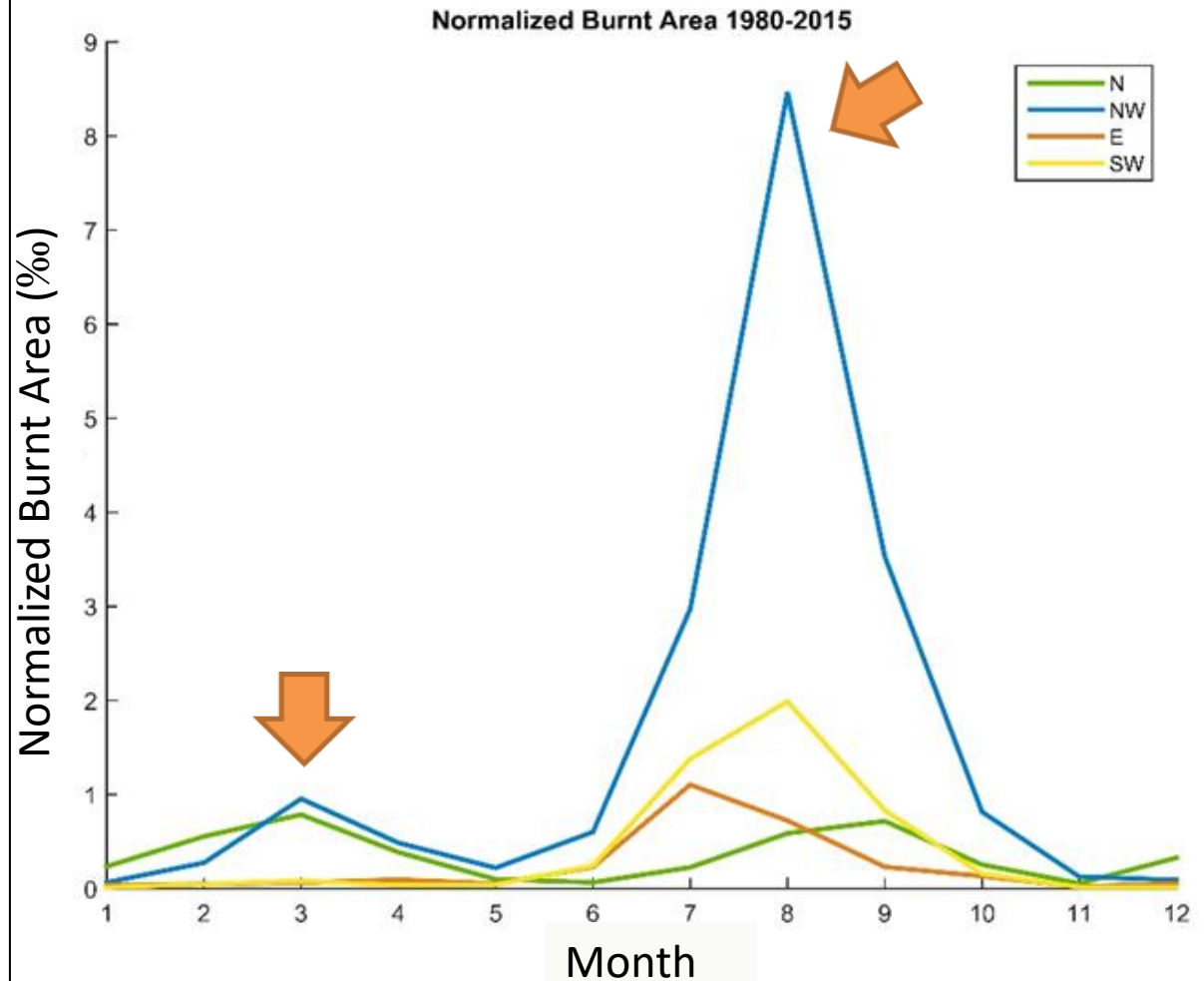
- Portugal and Spain fire data (1980-2015)
- Cluster analysis
- Different intra annual burnt area
- FWI Indices using ERA-Interim data



# Recent Changes in Pyro-Regions

## Fire clusters (1980-2015)

- NW (2 peaks: August and March)
- N (2 peaks: March and September)
- E (1 peak in July)
- SW (1 peak in August)
- Ratio [NBA (August)/ NBA March] is higher in **SW** than in **NW**
- Fire seasonality is changing in some provinces



NBA = monthly burnt area divided by the area of the district/province, presented in permillage (‰)

# Extreme Days

- High correlation with NBA seasonal variability:

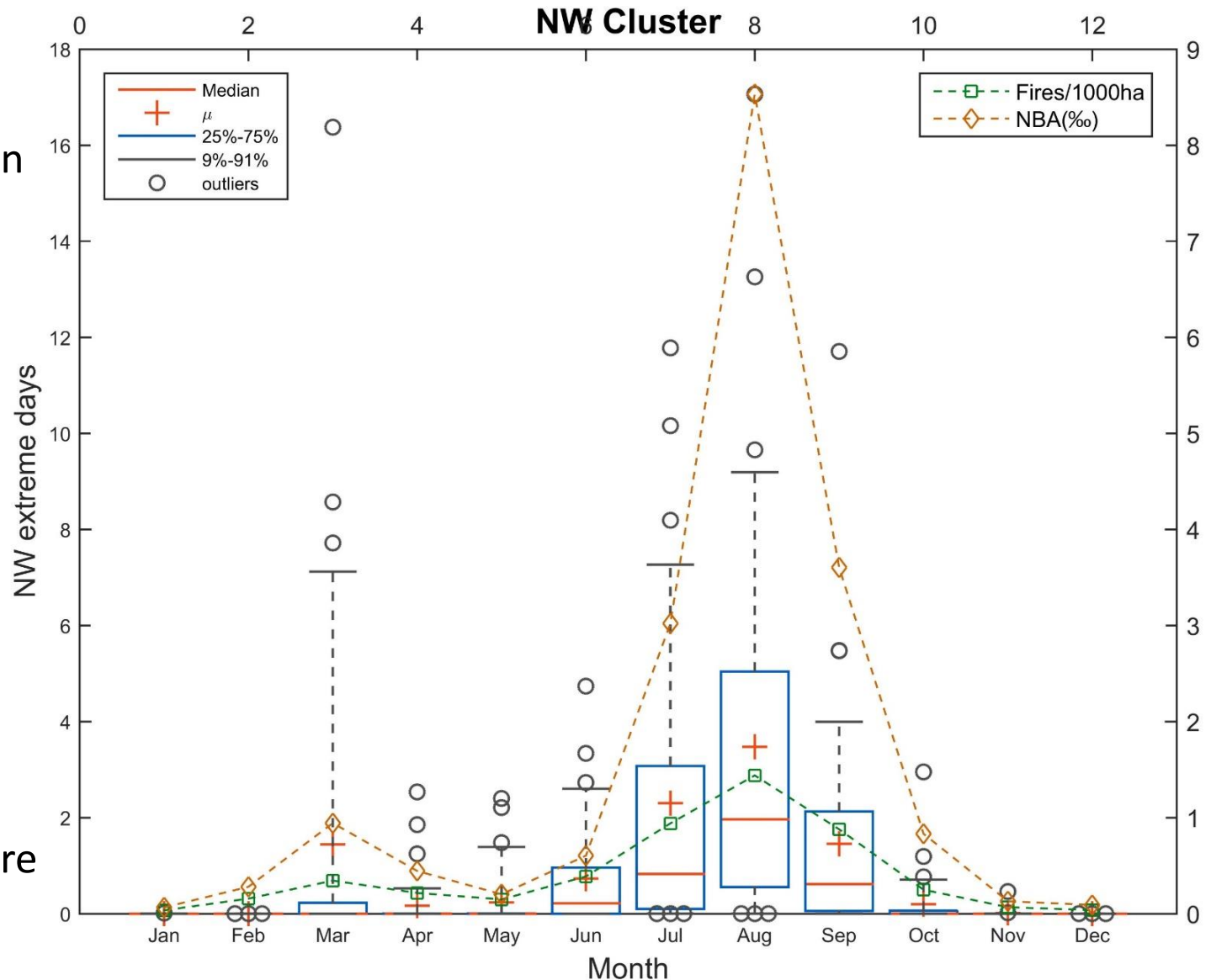
**SW = 0.94**

**E = 0.92**

**NW = 0.92**

**N = 0.46**

- Explains the differences between seasonal wildfire characteristics





## 2. How is the relationship between extreme fire weather and Burnt Area in Portugal?

Review status: this preprint is currently under review for the journal NHESS.

# Spatial variability in the relation between fire weather and burned area: patterns and drivers in Portugal

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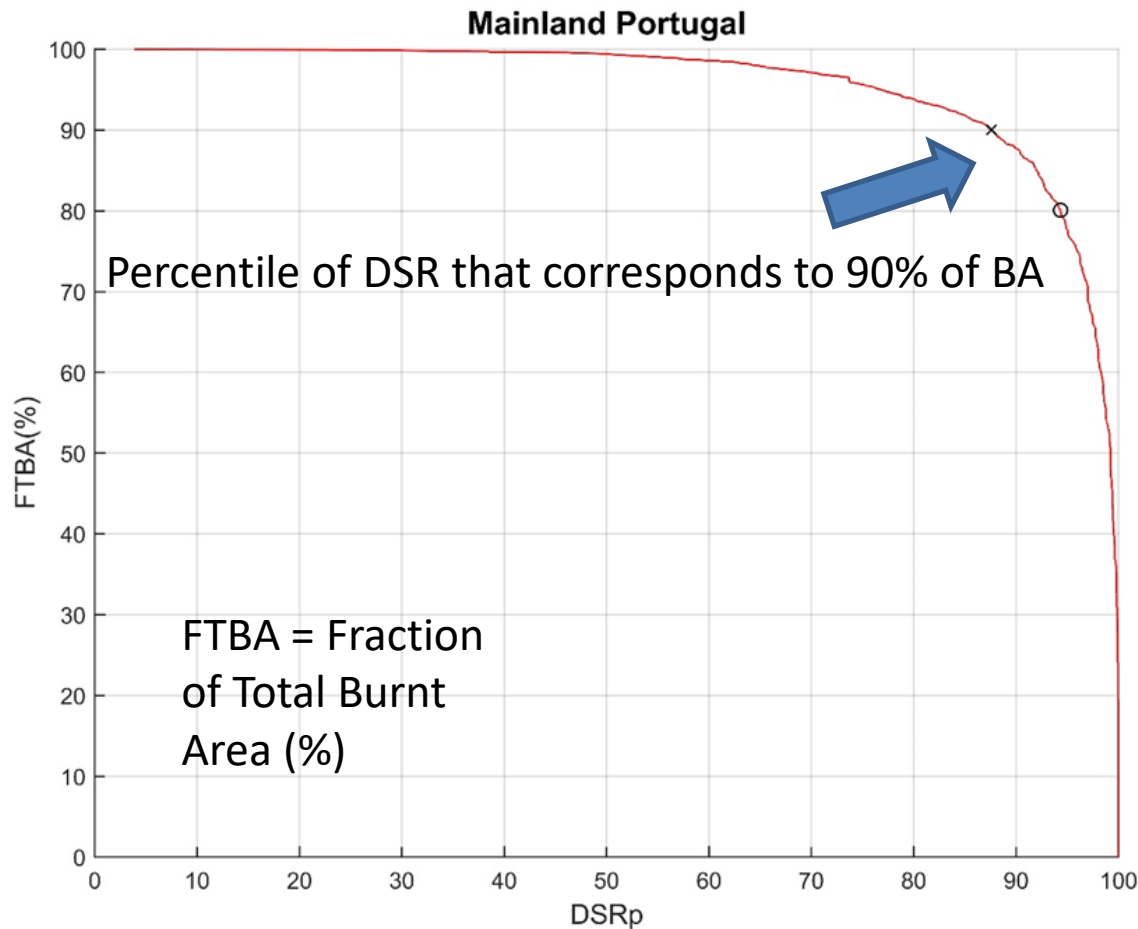
<sup>3</sup>Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas (CITAB), Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

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# Fire Weather and Burned Area in Portugal

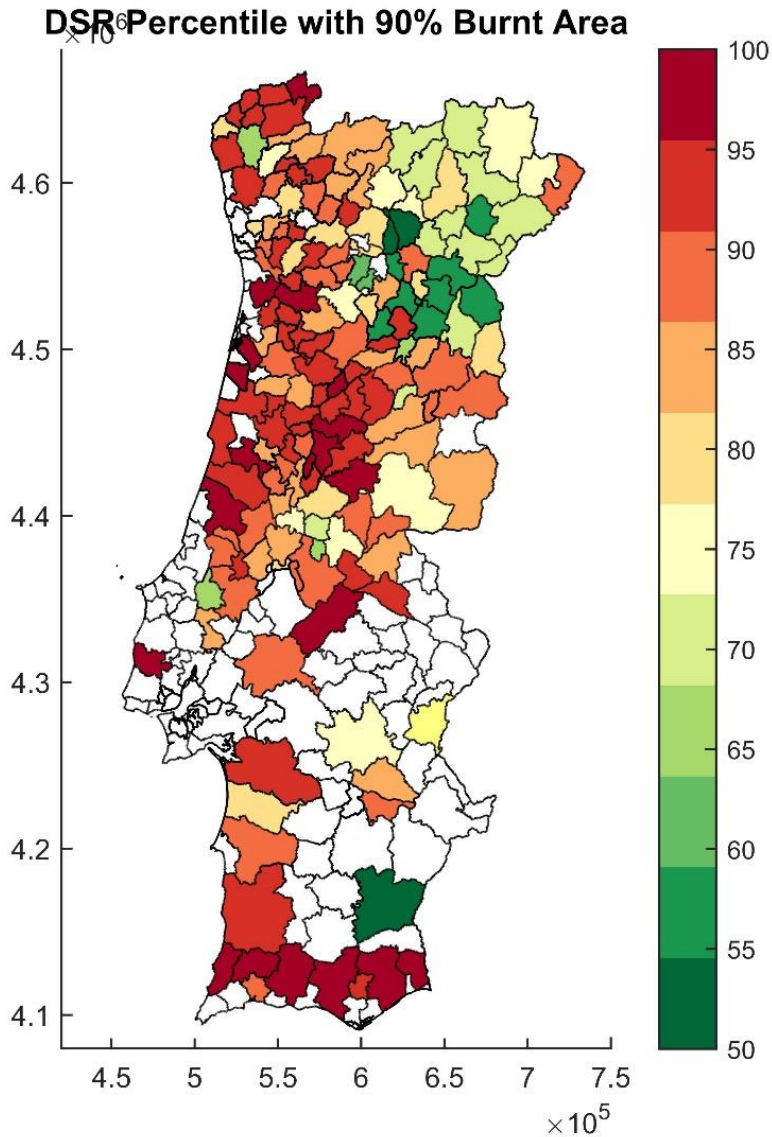


- Satellite data (shapefiles) with **initial and final fire dates**, for 2001-2019;
- **ERA5-Land** reanalysis data, for 2001-2019, for the meteorological variables needed to compute FWI Indices (**DSR**)
- **COS2018** (Land Use) data

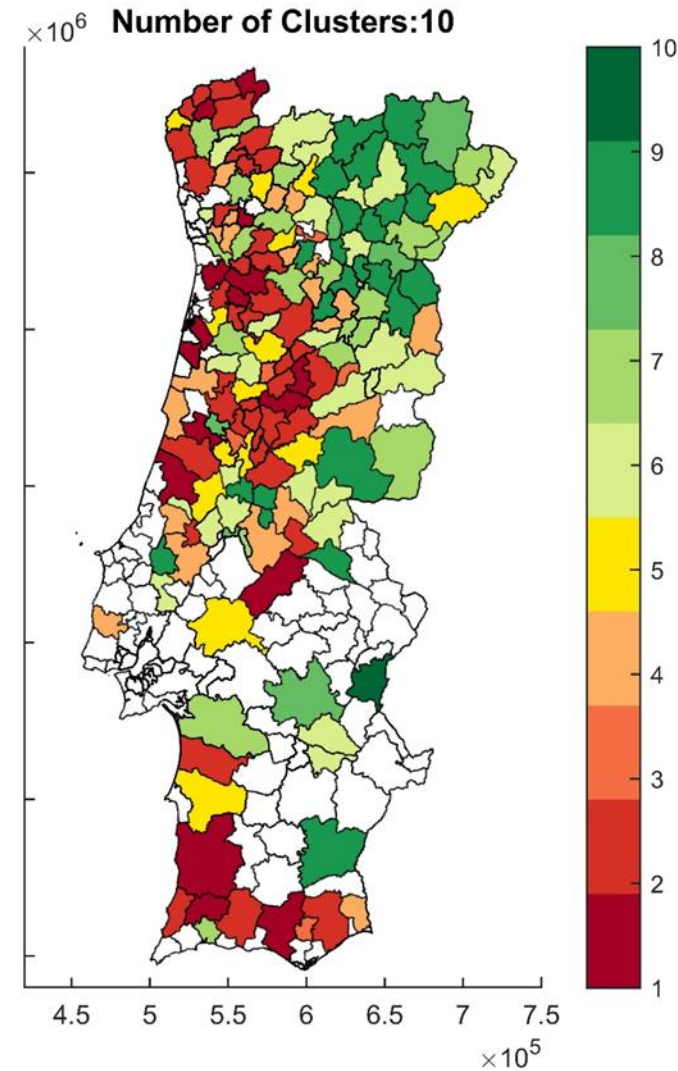
- **Most of Burnt Area (90%) occurs with DSRp>87**
- **90th Percentile of DSR is suitable for Portugal**



# Fire Weather and Burned Area in Portugal

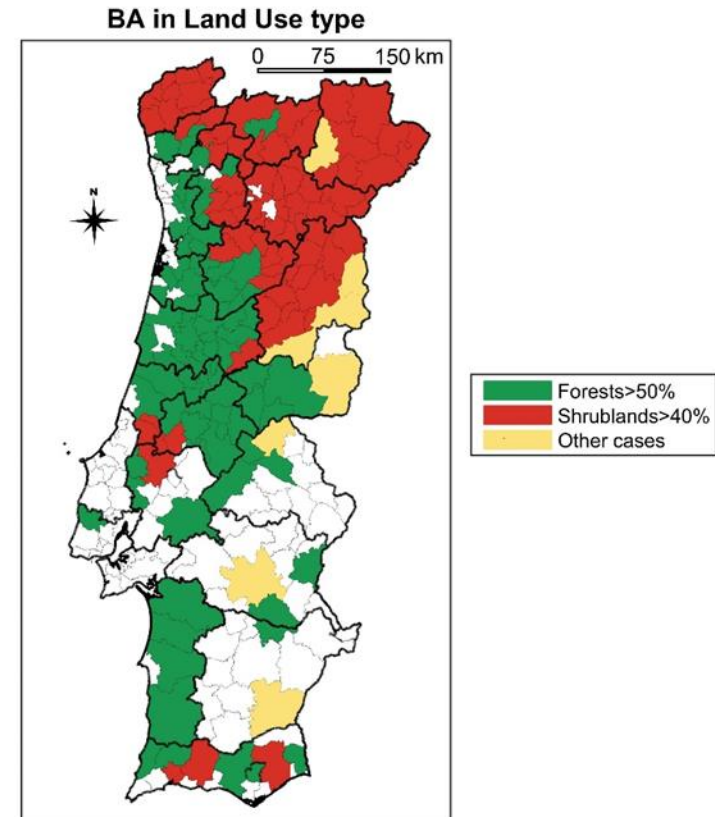
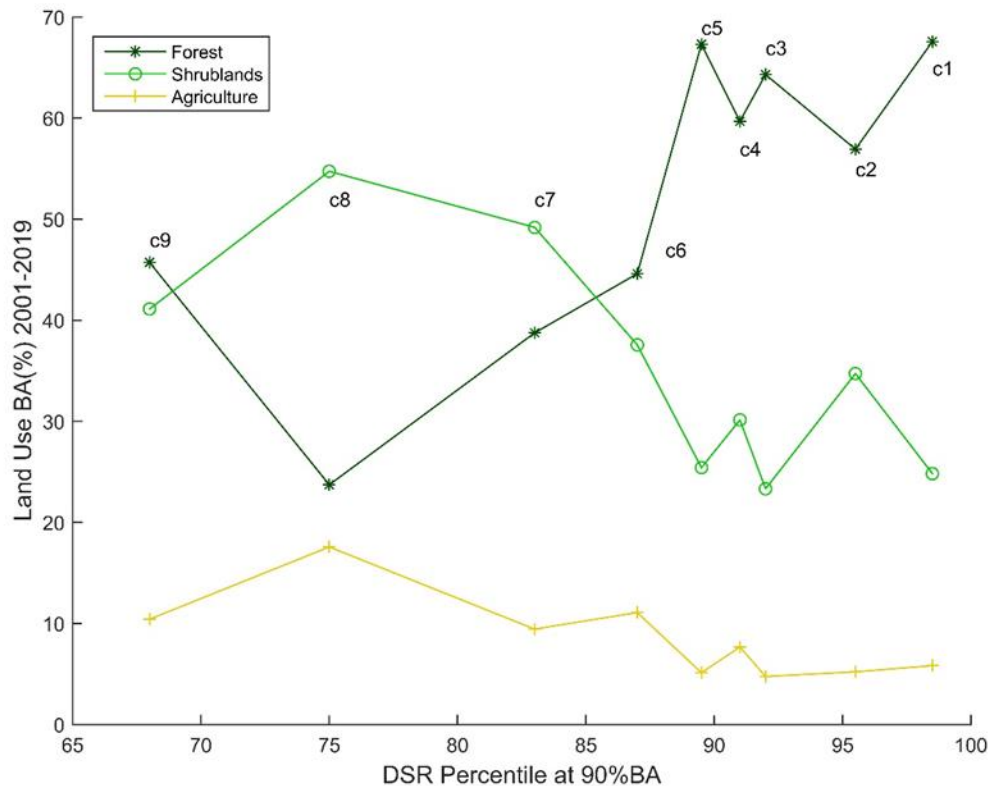


Differences between coastal and inland municipalities



Cluster's spatial distribution is similar

# Fire Weather and Burned Area in Portugal



- **Extreme DSR** ➡ Higher burnt area in **forests** ➡ **Coastal** areas
- **Lower DSR** ➡ Greater burnt area in **shrublands** ➡ **Eastern** regions
- Statistical tests reveal that this relationship is **dependable**

### 3. Will future climate modify the Iberian's fire regime or Pyro-Regions?



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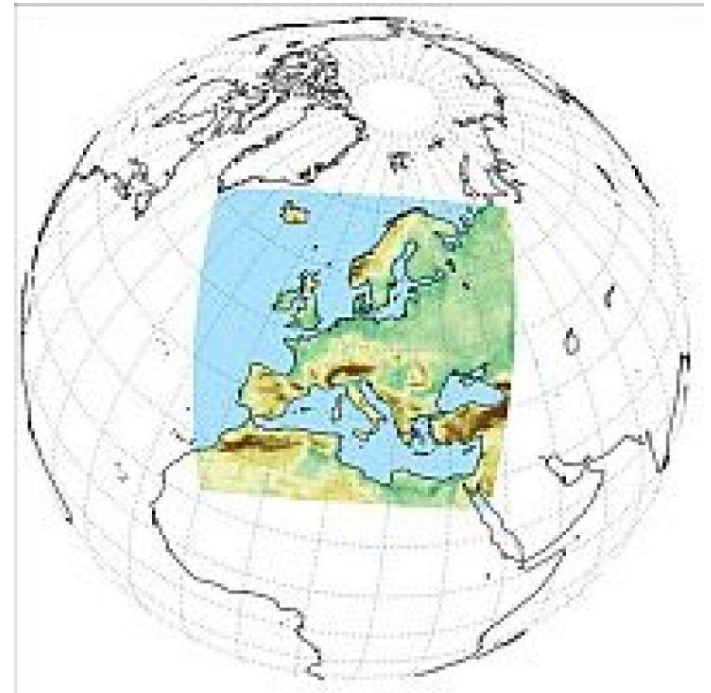


## Assessing impacts of future climate change on extreme fire weather and pyro-regions in Iberian Peninsula

T. Calheiros <sup>a</sup>  , M.G. Pereira <sup>b, c</sup>  , J.P. Nunes <sup>a</sup> 

# Fire Regime in the Future Climate

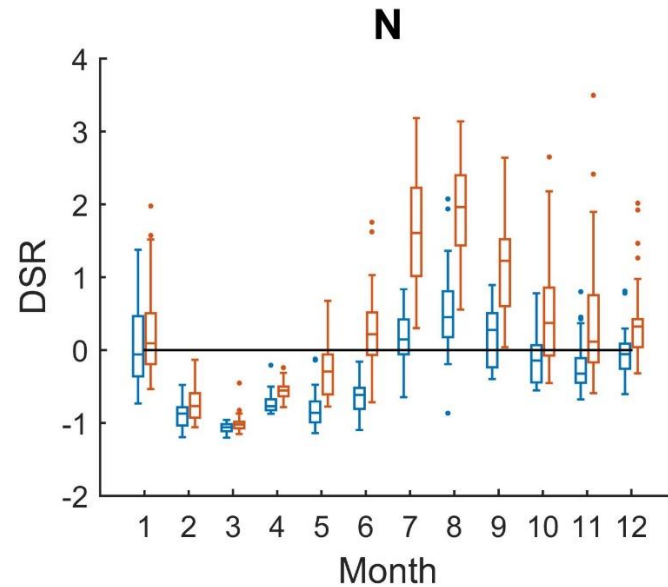
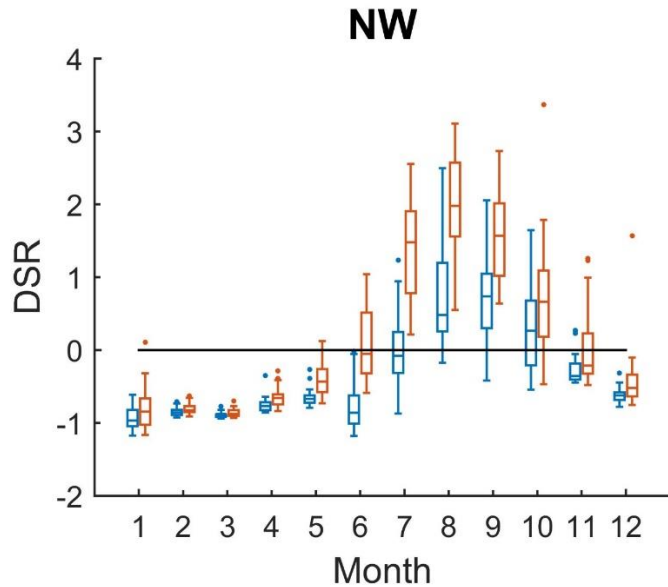
- 11 models ensemble
- 2 future scenarios
- 3 climatic periods



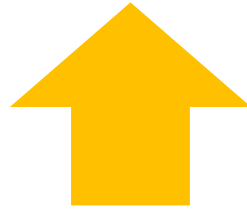
<http://www.euro-cordex.net/index.php.en>

# Fire Regime in the Future Climate

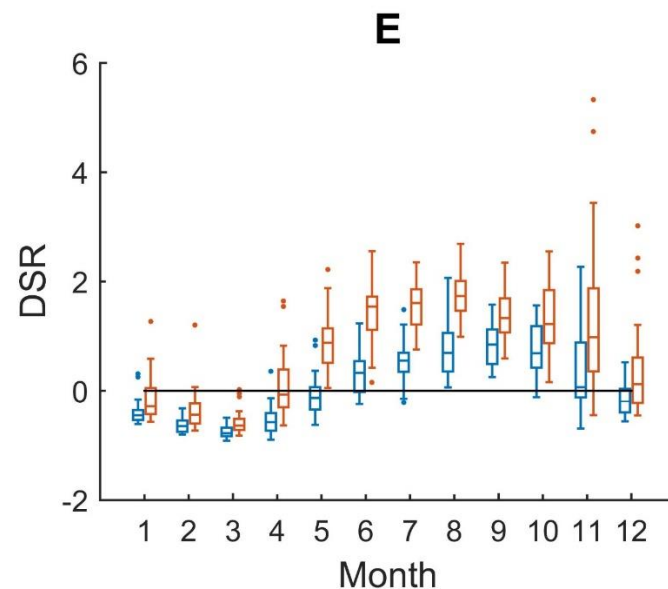
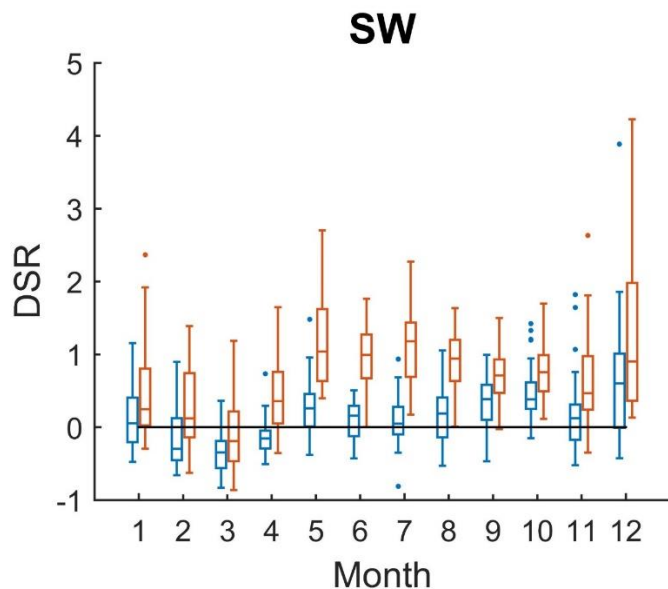
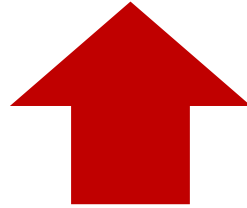
- Anomaly for **RCP4.5 (blue)** and **RCP8.5 (red)**, 2071-2100
- Divided by the standard deviation of the observed period



BUI



DC



ISI



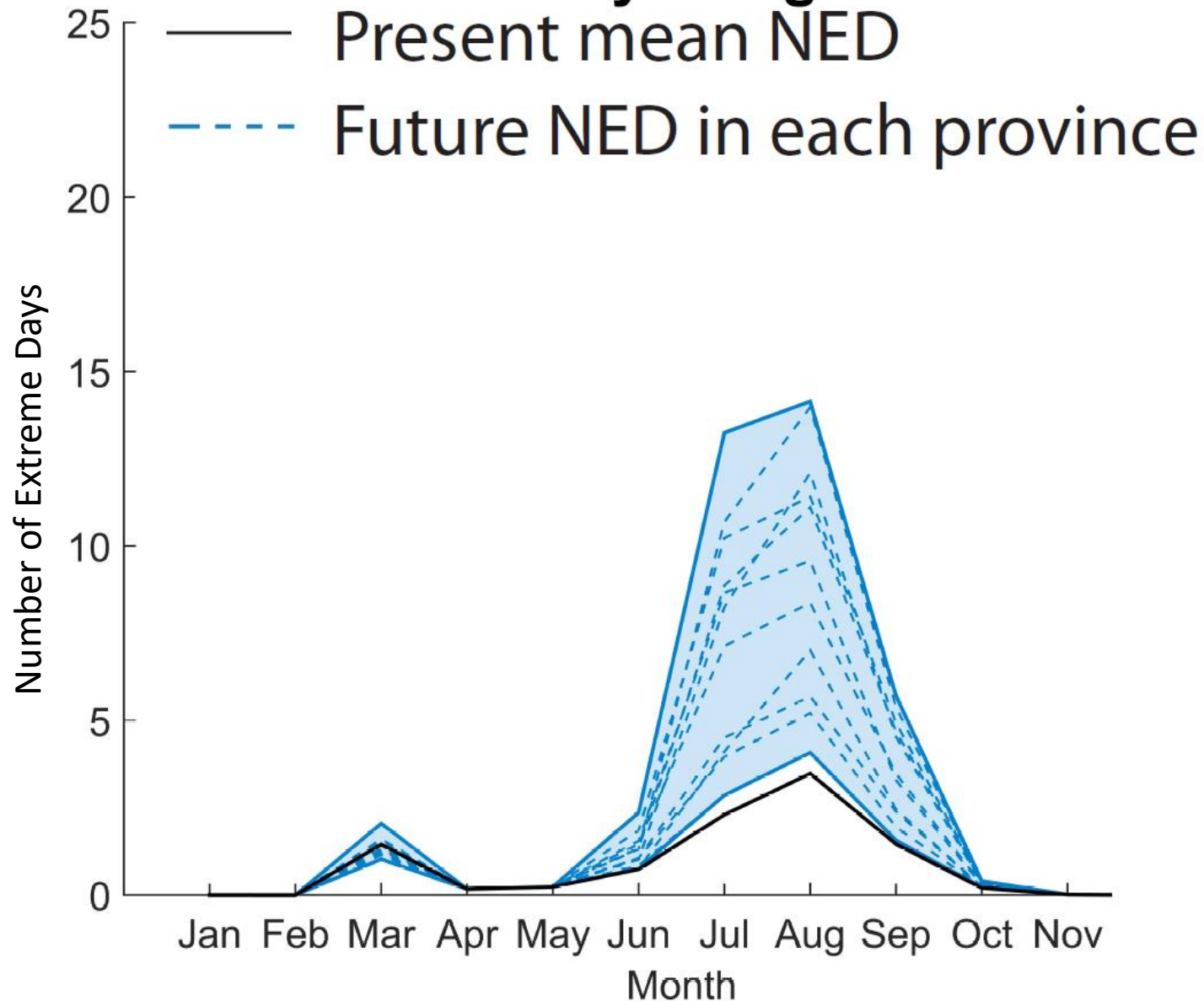
DSR



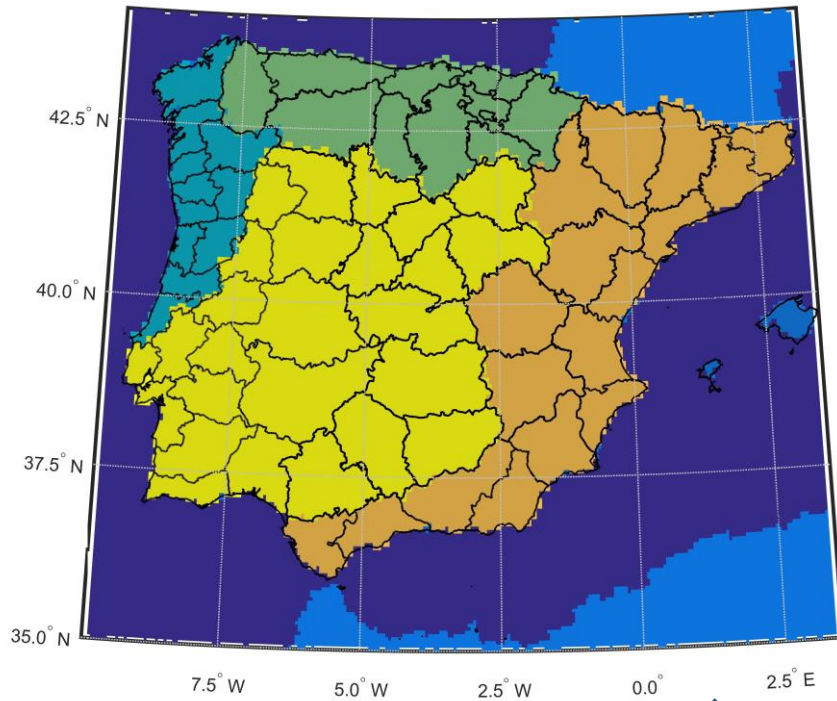


# Fire Regime in the Future Climate

## NW Pyro-region

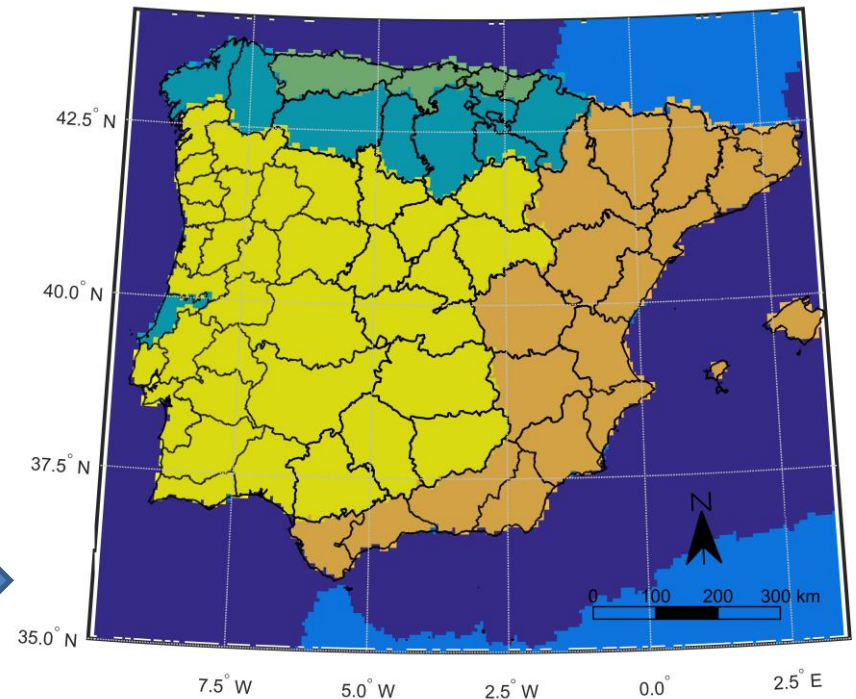


# Fire Regime in the Future Climate



- SW and NW pyro-regions move to the **north**
- N almost **disappear**
- Uncertainty in the E, due to possible vegetation changes

Future RCP8.5 (2071-2100)





# Conclusions

- Ongoing **climate change** has already modified fire regimes in Iberia in recent years.
- **DSR extreme values** are important for **wildfires in summer**.
- **Drought is more important** than other meteorological factors for the occurrence of **wildfires in winter**.
- **Vegetation type (forest and shrublands)** affect the influence of climate on large wildfires.
- Future climate change will **increase fire risk and modify fire regimes** in Iberia.
- This results can be used to support the **management of landscape and fire management** in Iberia.