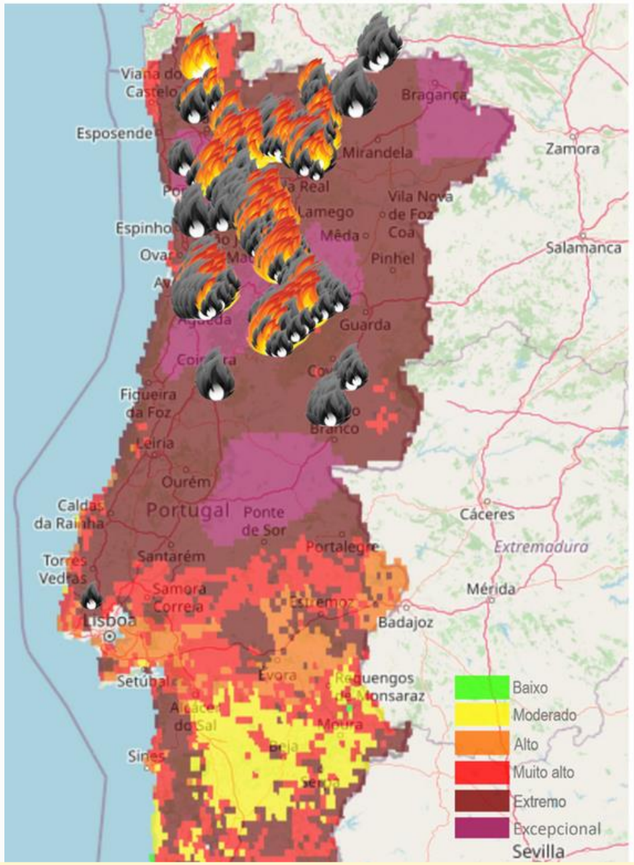
Assessing the impact of drought conditions and heat waves interannual variability of burned area in Continental Portugal

Mariana Ponte Oliveira

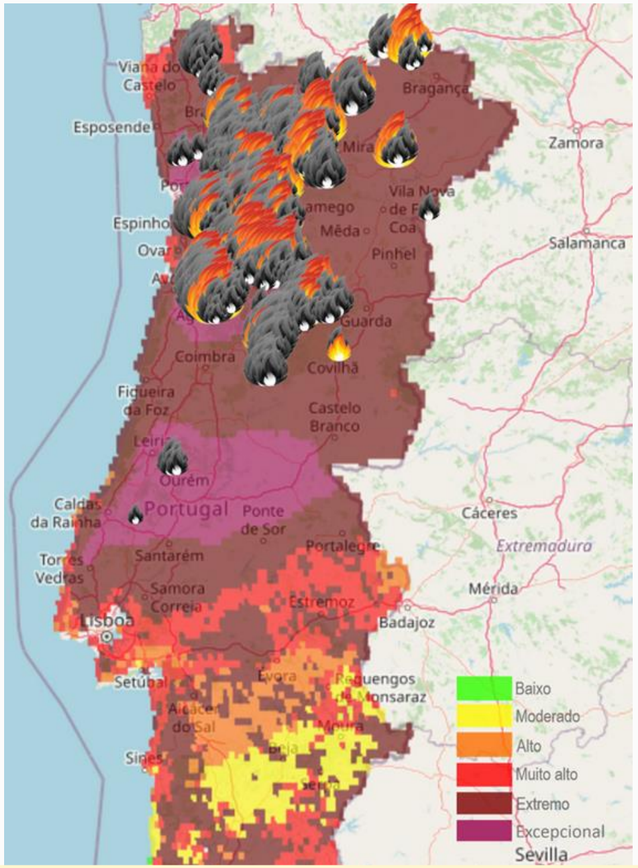
With contribution:

Carlos C. DaCamara

Motivation



16 SEP 2024



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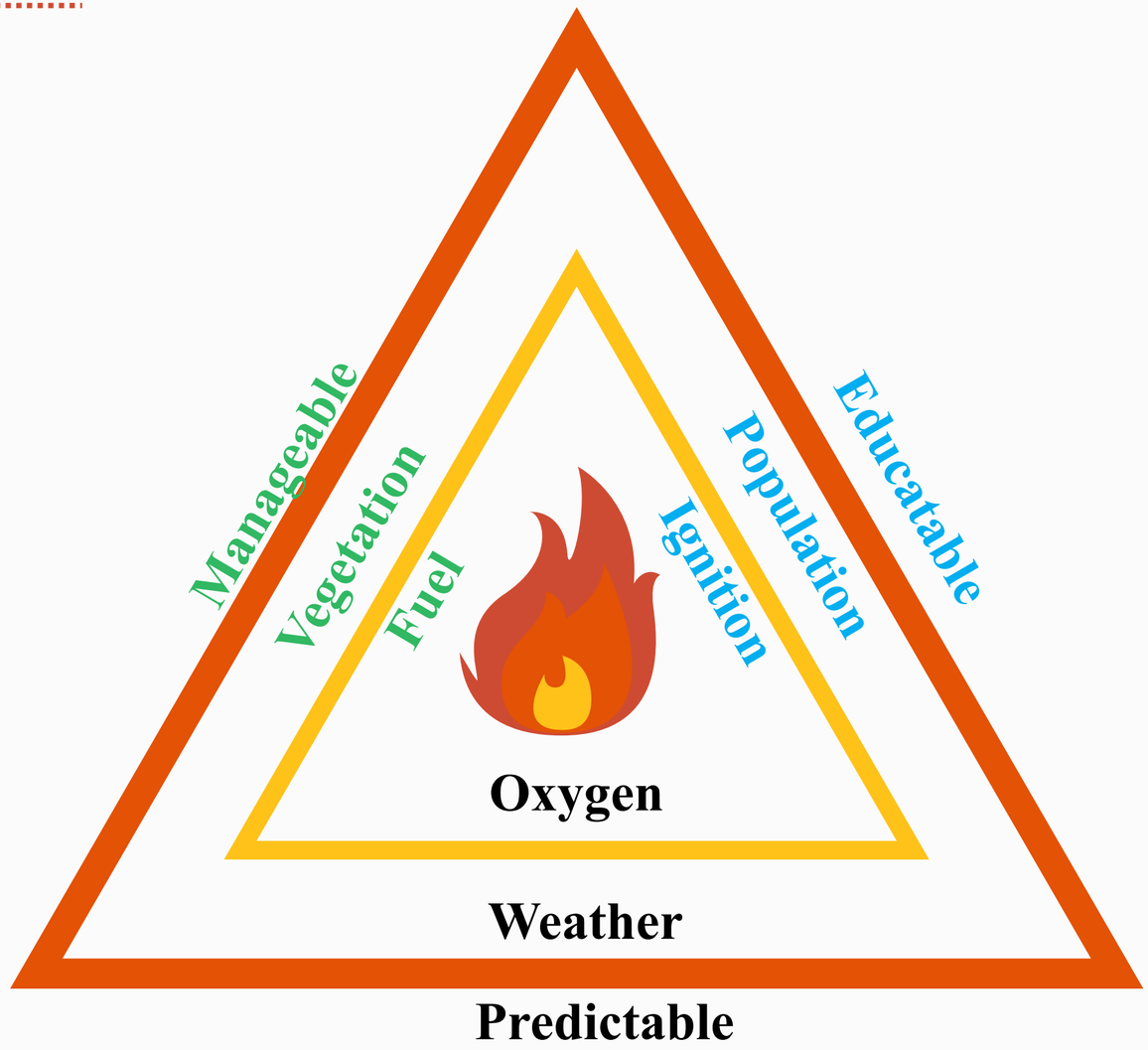
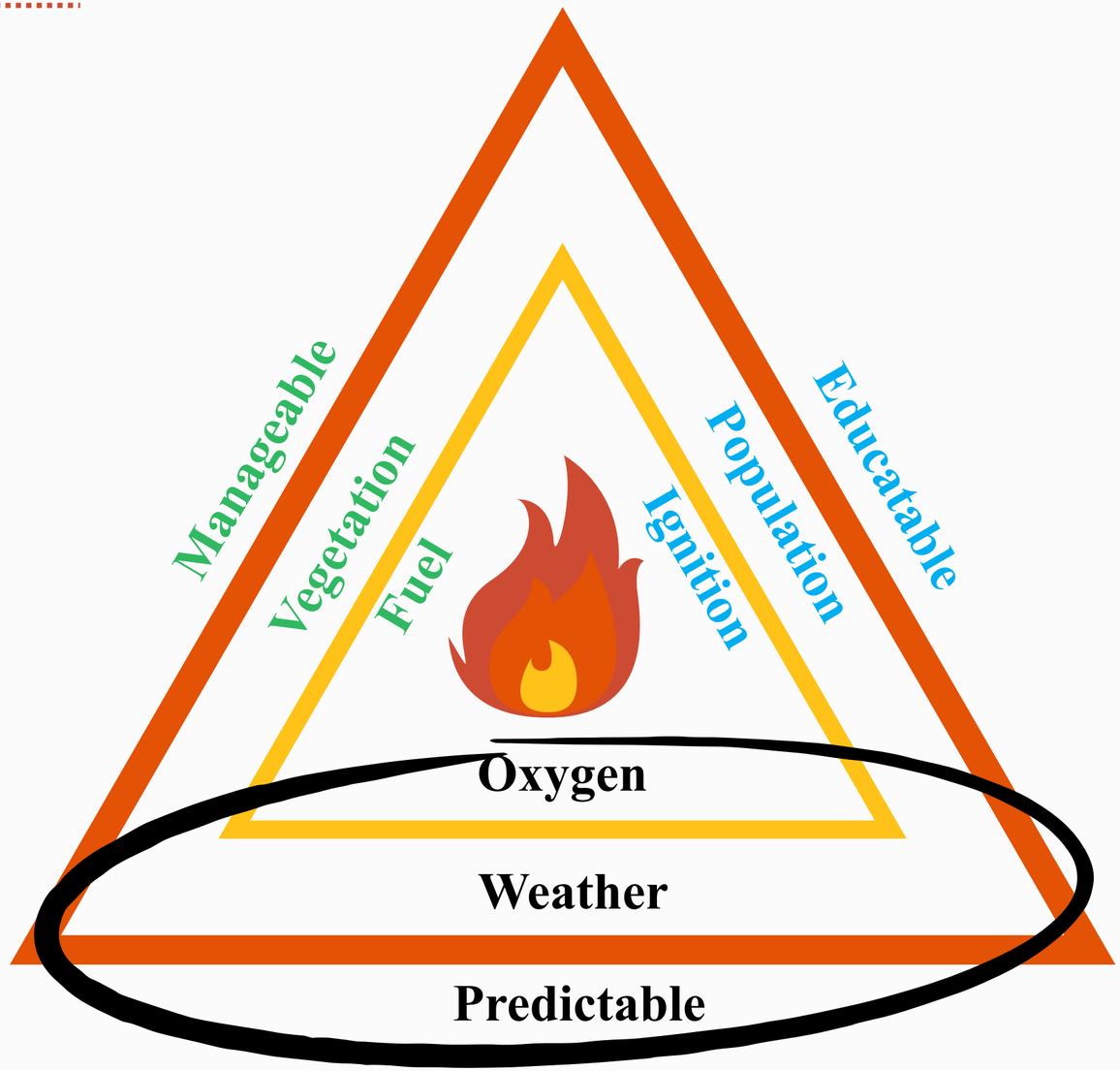

Manageable
Vegetation
Fuel
Educatable
Population
Ignition
Oxygen
Weather
Predictable

Motivation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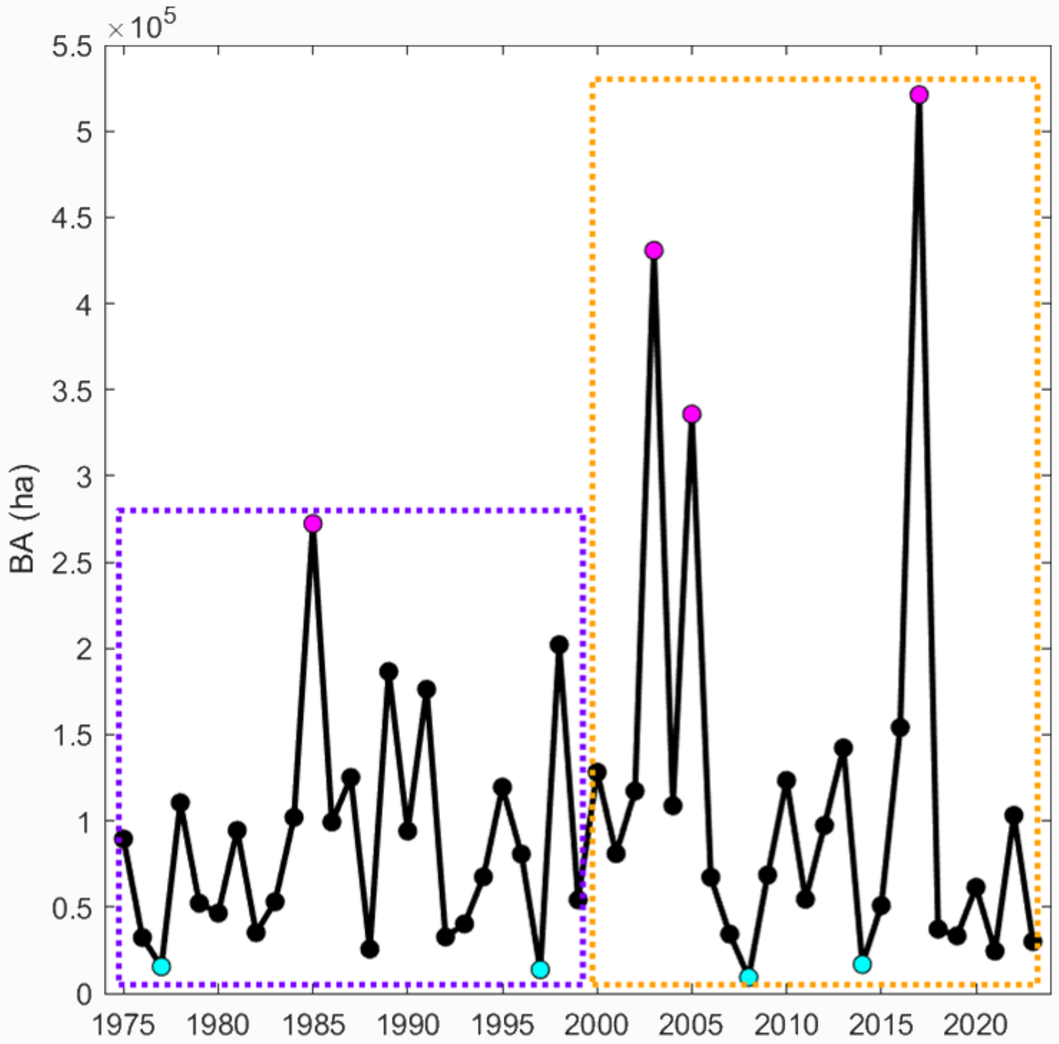
Burned area



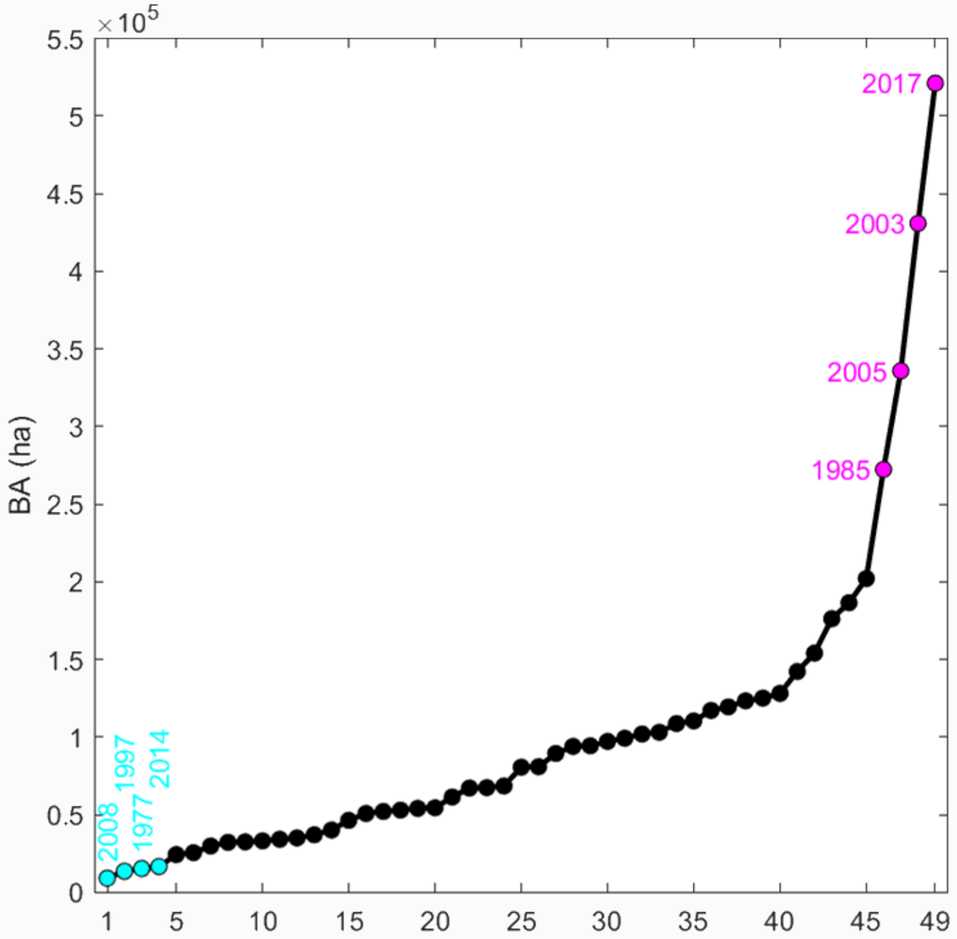
Data

Period: 1975-2023 (49-year period) derived from end of fire season

Dataset: Landsat imagery (as well as Sentinel in the recent years)

For the sake of **spatial homogeneity** we restricted to **burned patches** with **area greater than 35**

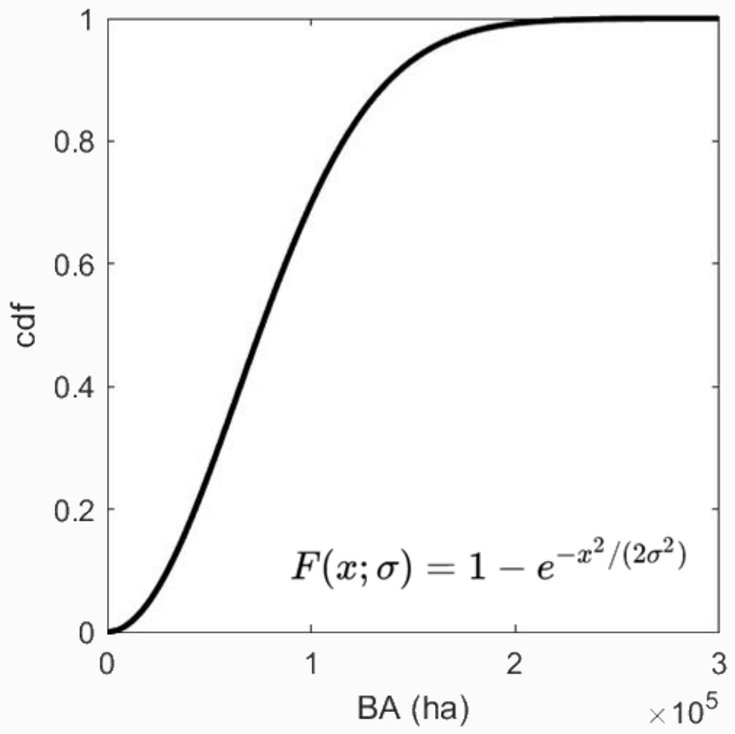
Burned area

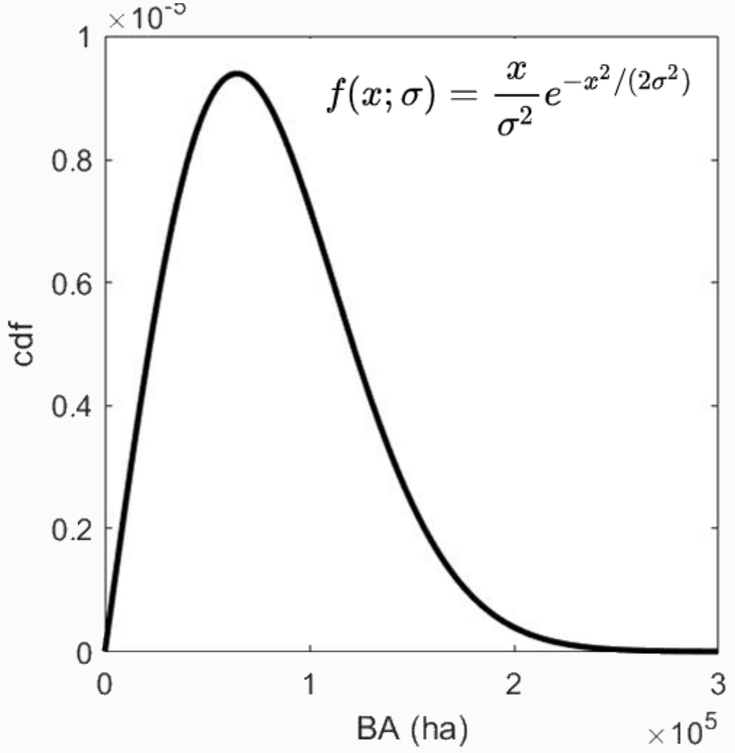


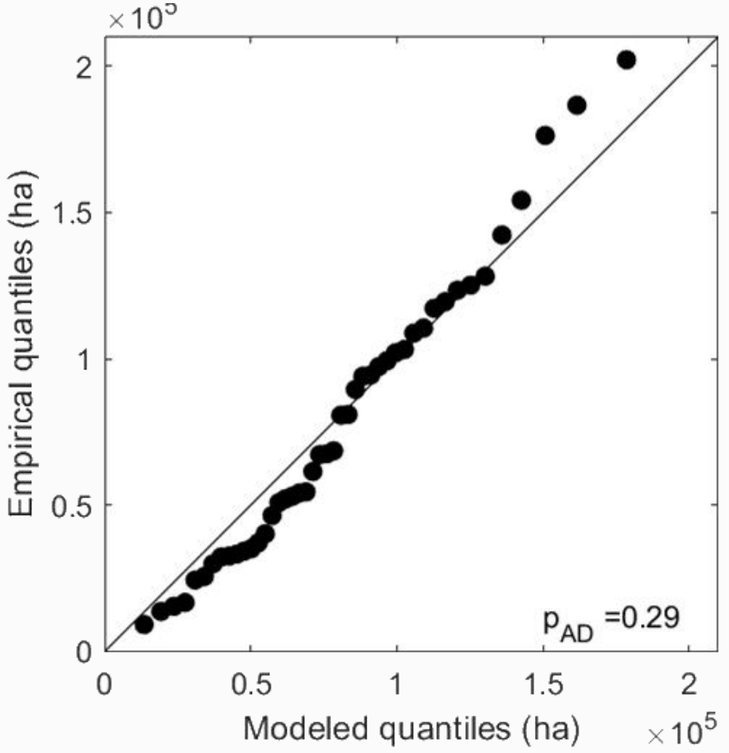
•The **four largest values of BA** (in **2017, 2003, 2005, and 1985**) are **outstandingly larger** than the remaining values.

•**Three** out of the **four largest values** occurred in the **second half (1975–2023)** of the period of study (2000–2023).

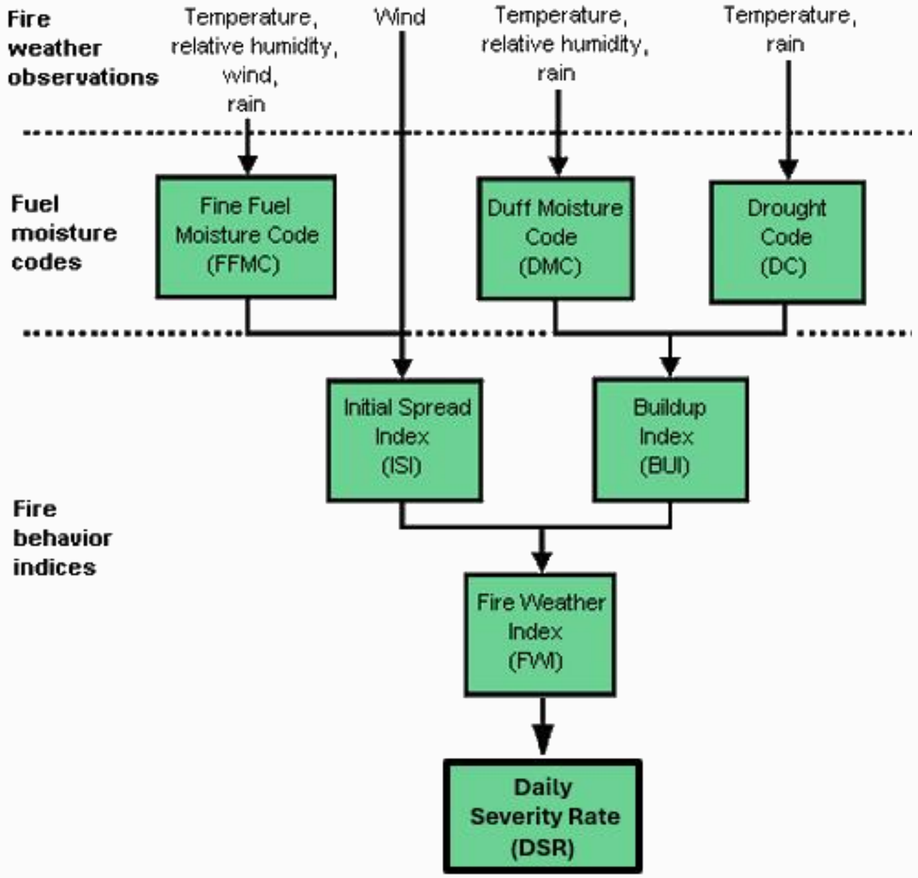
Statistical model of burned area (without 2017, 2003, 2005, and 1985)



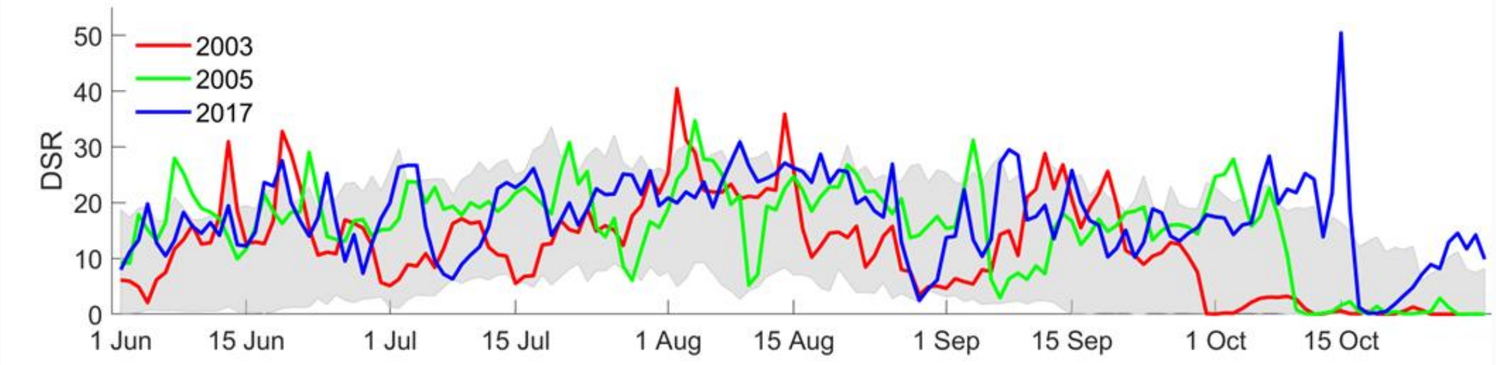




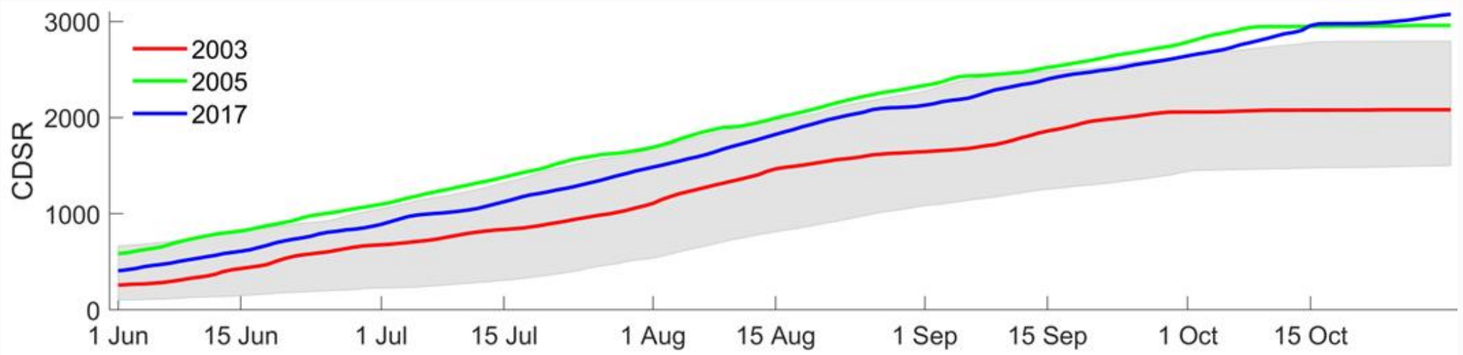
The double role of weather



"Heat" wave effect



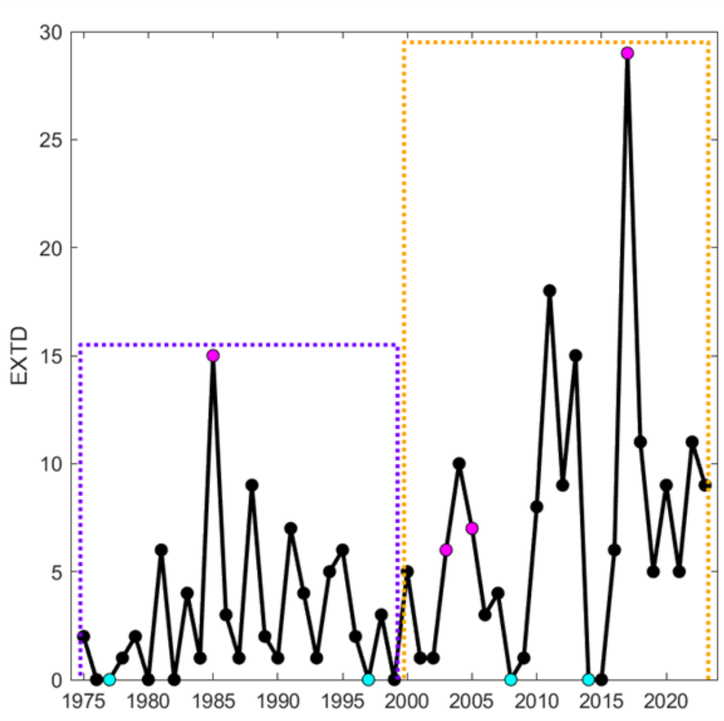
"Drought" effect

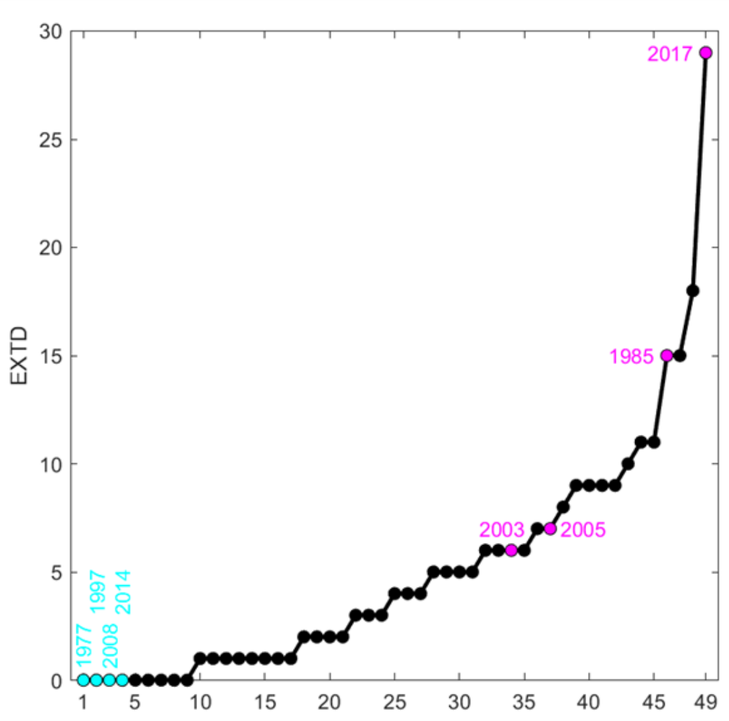


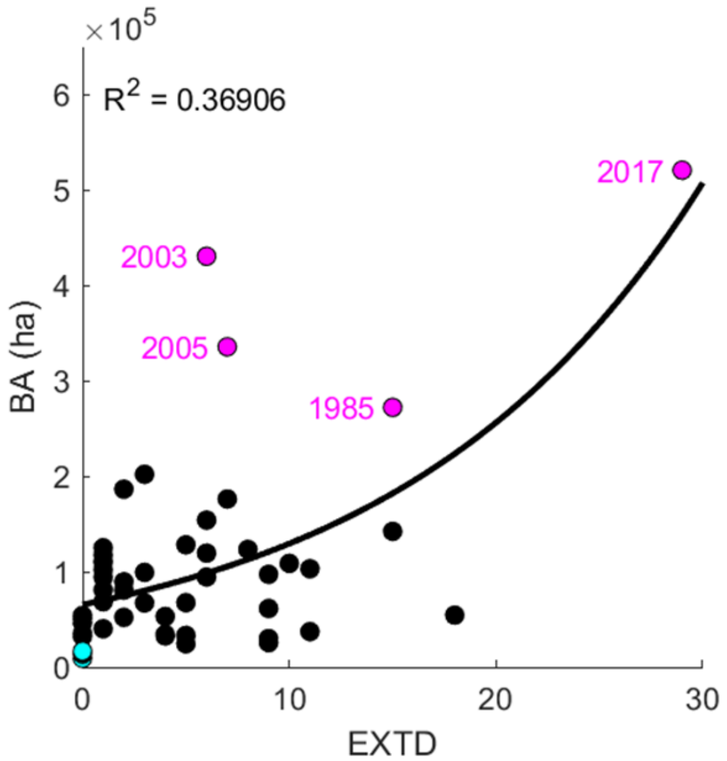
Daily values of DSR were extracted from the Copernicus Climate Change Service and are available online

The heat wave effect

BA=a exp(b×EXTD)

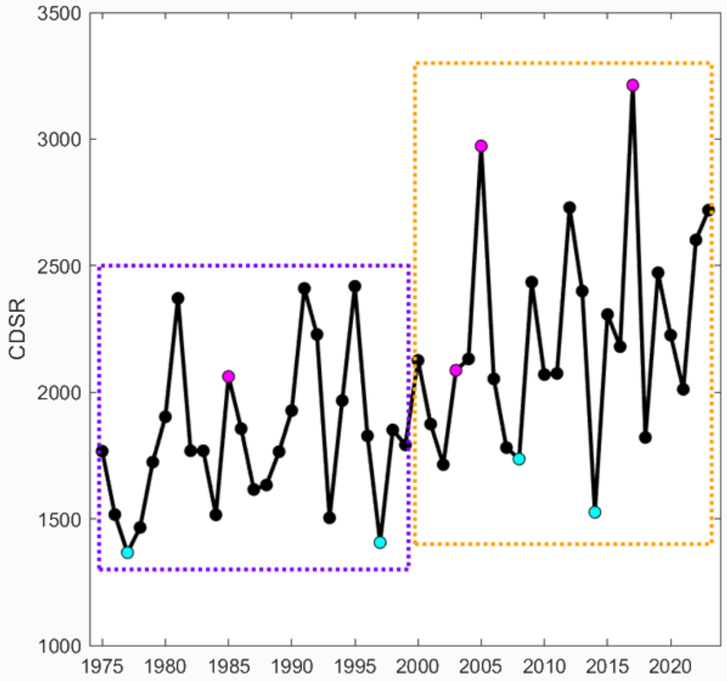


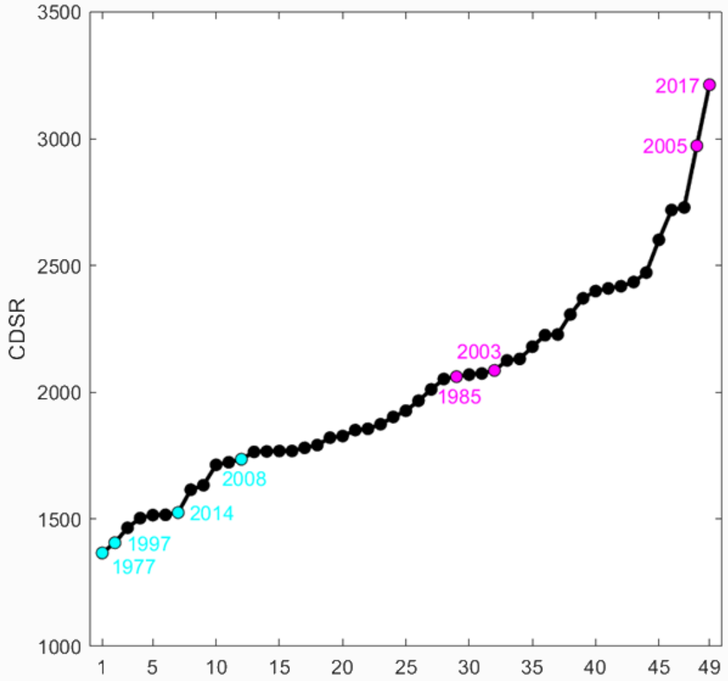


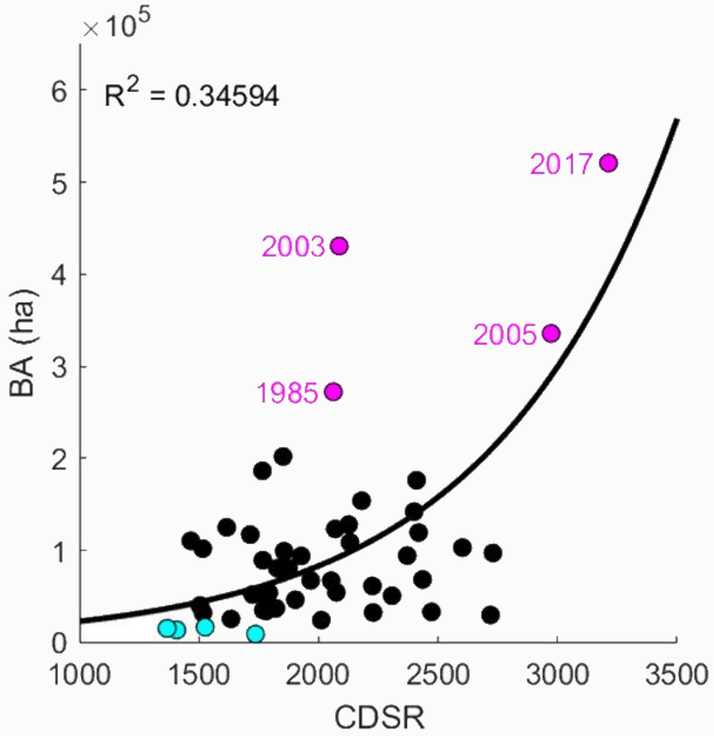


EXTD → Annual number of extreme days, i.e. those with DSR exceeding percentile 90

The drought effect







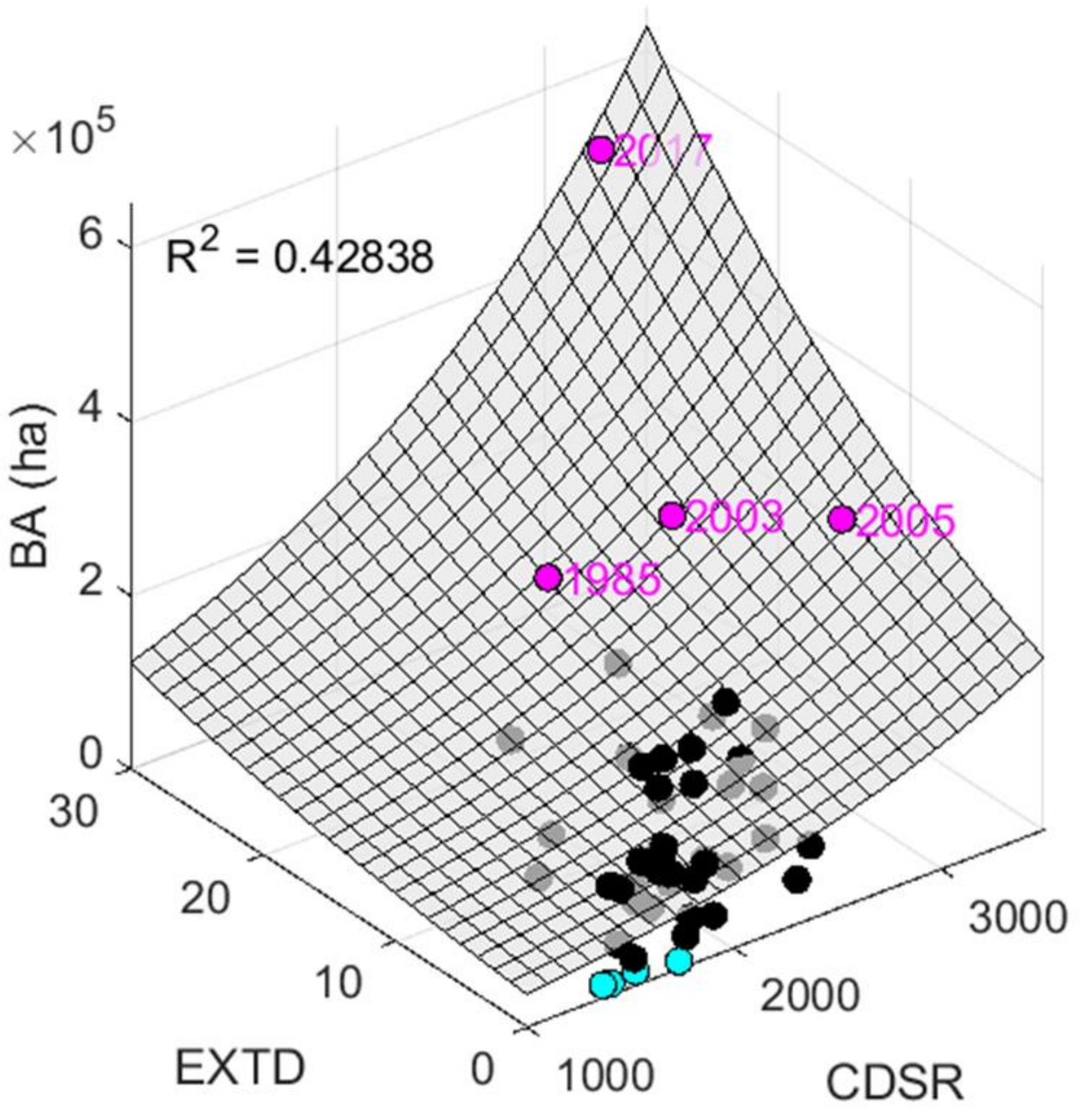
BA=c exp(d×CDSR)

The combined effect

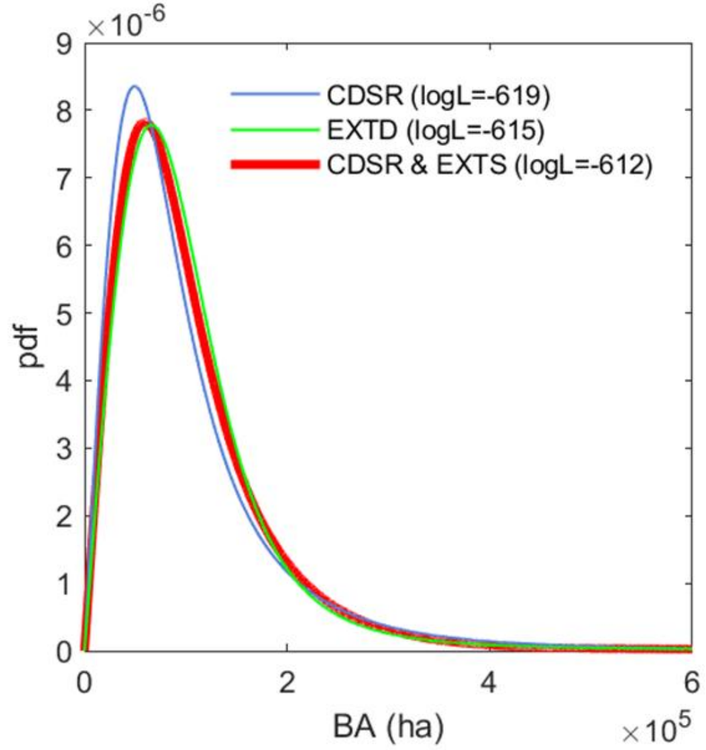
BA =u exp(v×EXTD+w×CDSR)

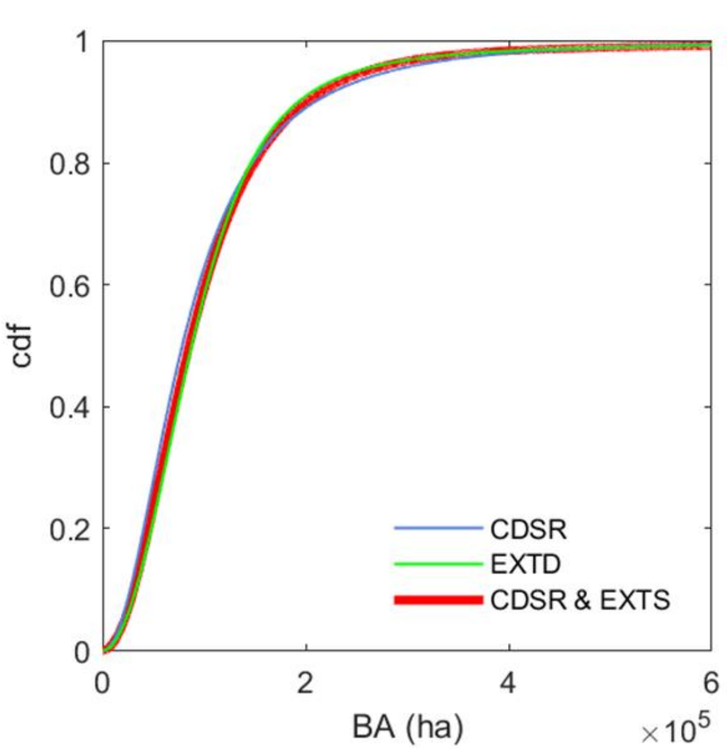
EXTD ⟶ Heat wave effect

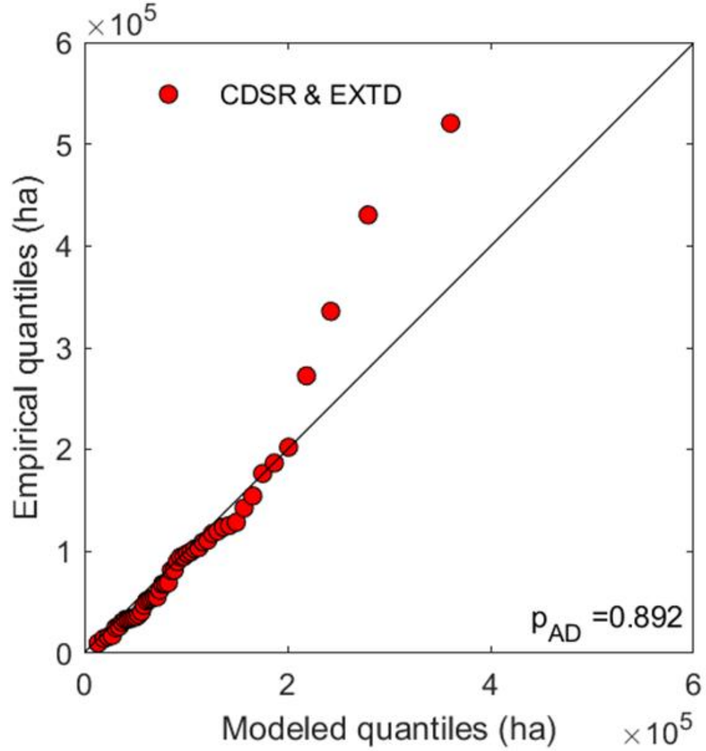
CDSR ⟶ Drought effect



Statistical models of burned area (with EXTD, CDSR and both as covariates)





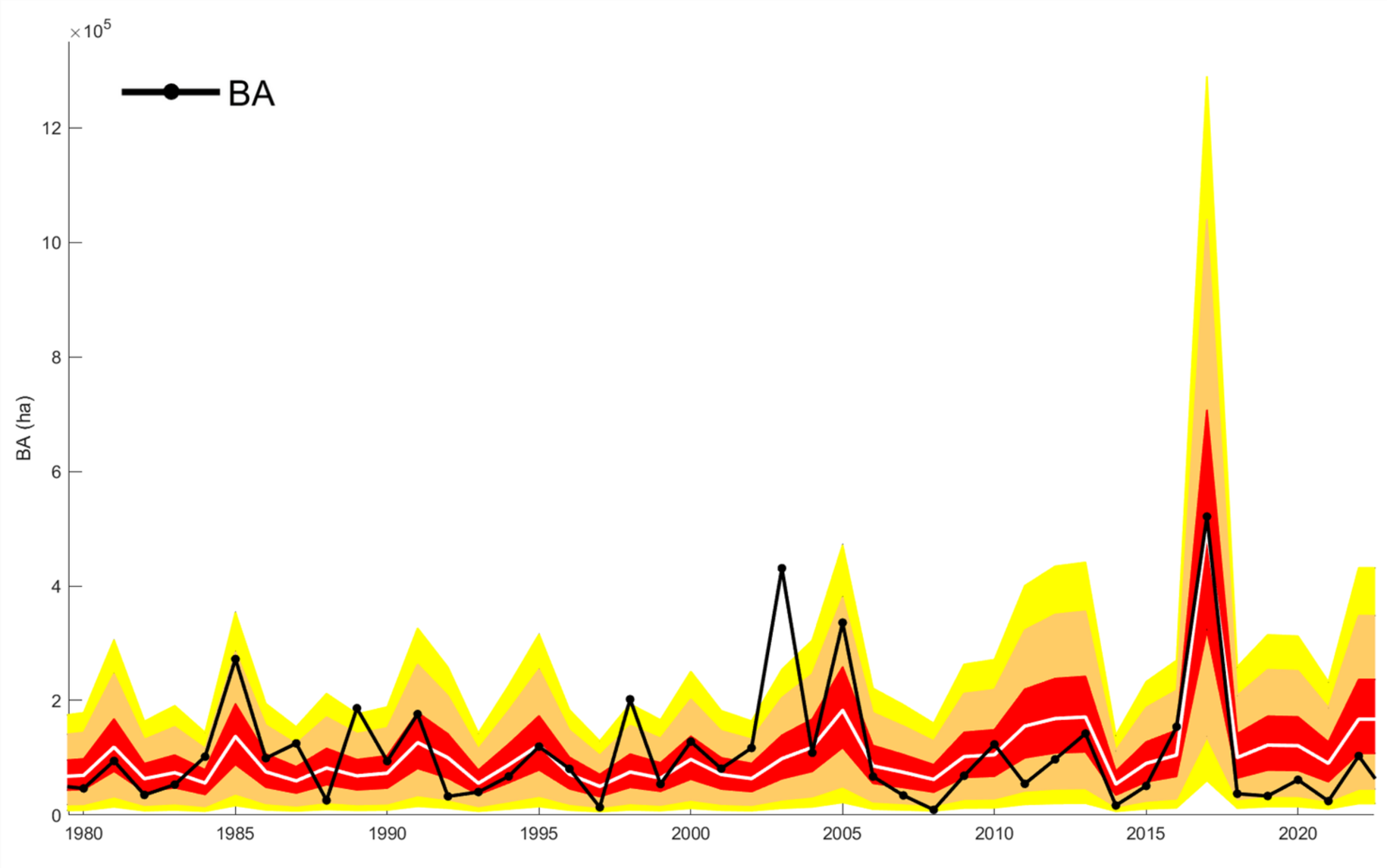


$\sigma = A \exp(B \times EXTD)$

$\sigma = C \exp(D \times CDSR)$

$\sigma = U \exp(V \times EXTD + W \times CDSR)$

The role of climate variability



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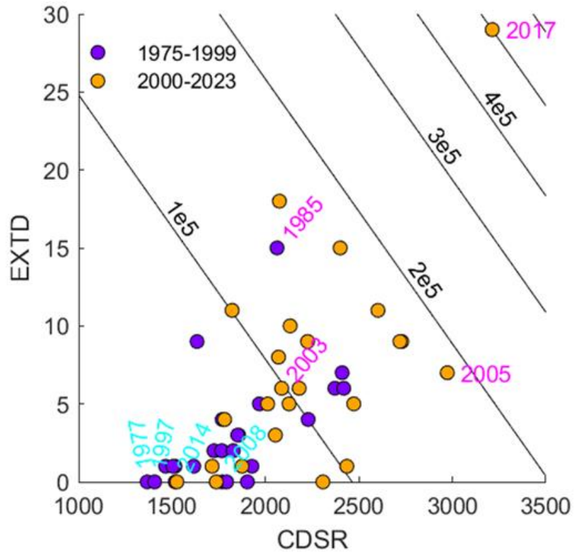

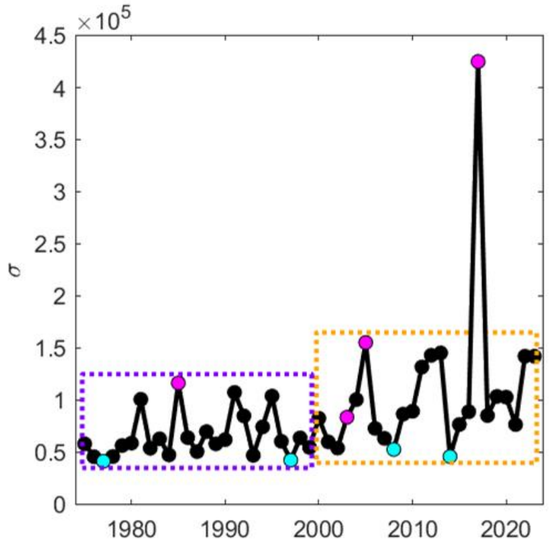

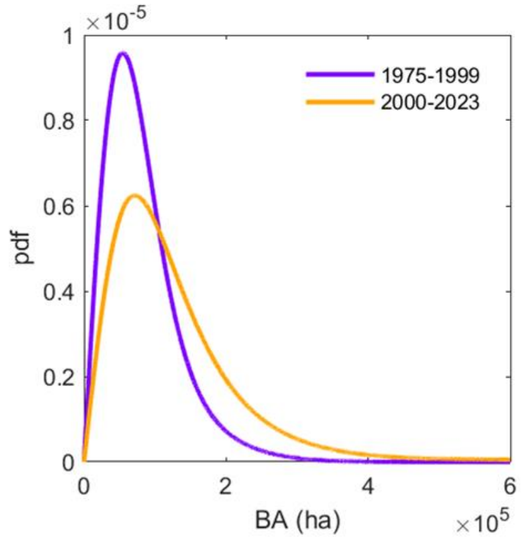

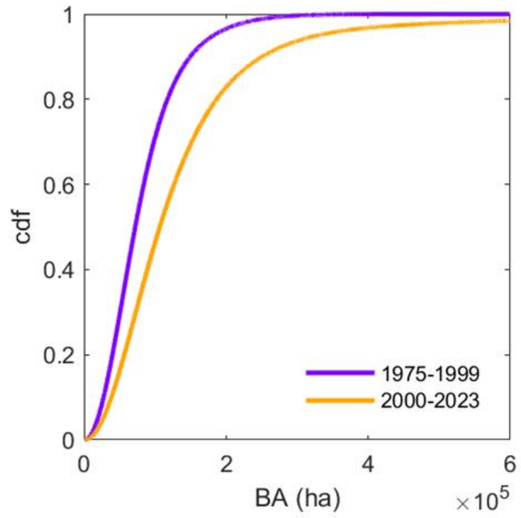

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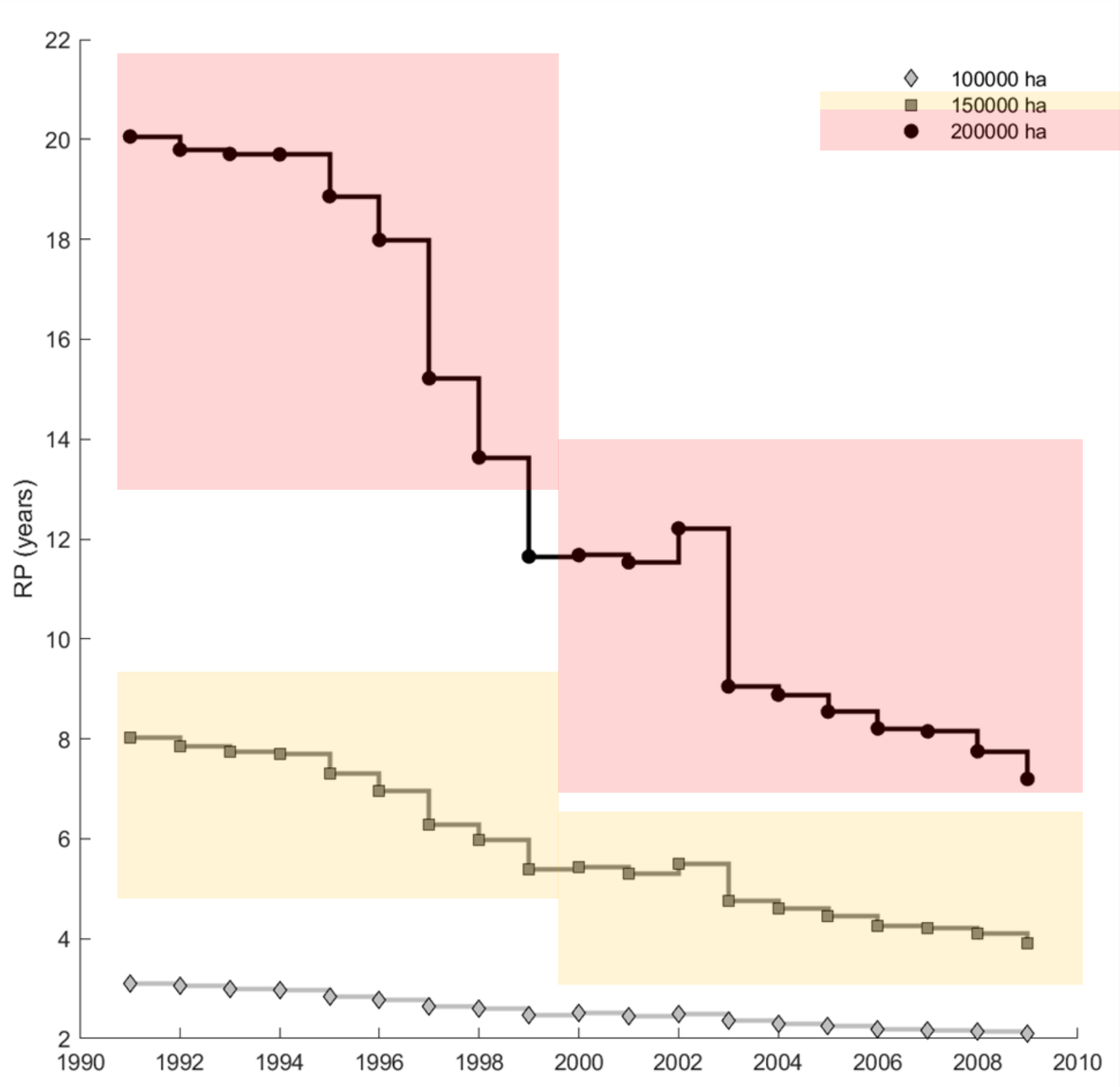

Conclusions

1. Although a **Rayleigh distribution** with **constant scale parameter σ** is **adequate** to model **the distribution of BA without the extreme years of 2017, 2003, 2005, and 1985** extending the model to the **entire period of 1975–2023** requires incorporating the **double role of meteorology** incorporating **EXTD (heat wave factor)** and **CDSR (drough factor)** as **covariates of σ**.

2. **Statistical models of BA** similar to the one proposed can be **operationally** applied to **produce outlooks of annual burned area in Portugal**

3. **Statistical model of BA** can also be used to **generate synthetic time series of BA** in **future scenarios of climate** based on information provided by **climate models**.

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Acknowledgements

This work was supported by EUMETSAT Satellite application Facility on Land Surface Analysis (LSA SAF) and by Instituto Dom Luiz (IDL), a research unit funded by the Portuguese Fundação para a Ciência e a Tecnologia (FCT) I.P./MCTES through national funds (PIDDAC) – UIDB/50019/2020 (https://doi.org/10.54499/UIDB/50019/2020), UIDP/50019/2020 (https://doi.org/10.54499/UIDP/50019/ 2020) and LA/P/0068/2020 (https://doi.org/10.54499/LA/P/0068/2020)