EGU General Assembly 2020

NH7.2 **Spatial and temporal patterns of wildfires: models, theory, and reality**

Identification of favorable local-scale weather forcing conditions to Iberia's largest fires

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INTRODUCTION

The Mediterranean region is characterised by frequent large summer wildfires

Wildfires affect both ecosystems and human communities, with potential major negative environmental and socioeconomic consequences.

Meteorological Conditions

INTERNATIONAL JOURNAL OF CLIMATOLOGY
Int. J. Climatol. **37**: 524–533 (2017)
Published online 19 February 2016 in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/joc.4680

RMetS
Royal Meteorological Society

Short Communication

Daily synoptic conditions associated with large fire occurrence in Mediterranean France: evidence for a wind-driven fire regime

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Multiplicity of another factors

Vegetation Conditions

Nat. Hazards Earth Syst. Sci., 18, 847–856, 2018
https://doi.org/10.5194/nhess-18-847-2018

Natural Hazards and Earth System Sciences — Open Access — EGU

Extreme wildfire events are linked to global-change-type droughts in the northern Mediterranean

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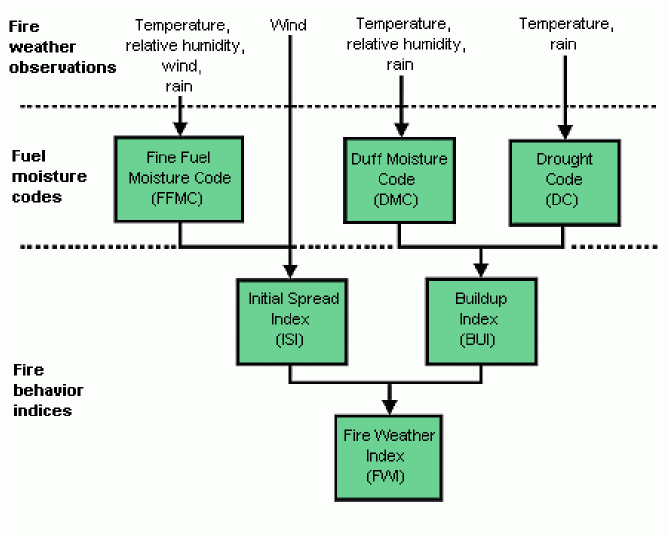
Received: 21 November 2017 – Discussion started: 6 December 2017
Revised: 10 February 2018 – Accepted: 21 February 2018 – Published: 16 March 2018

INTRODUCTION

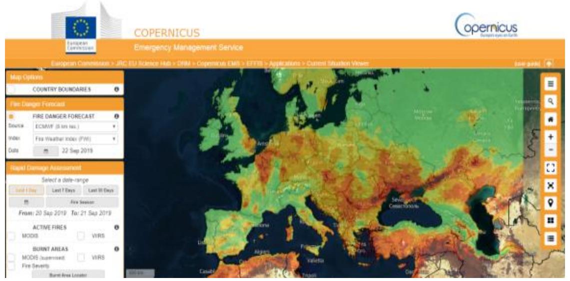
Fire danger rating systems try to anticipate periods of heightened fire risk



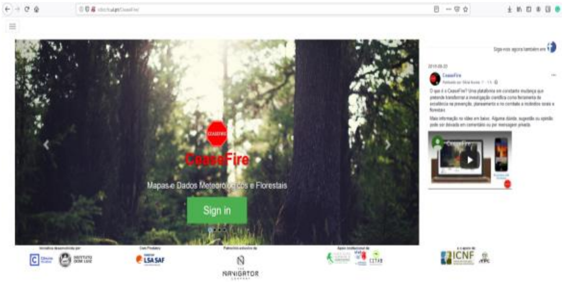
FWI

(Fire Weather Index System)

EFFIS (Europe)



CeaseFire (Portugal)



GOAL

Analysis of historical meteorological data and fire records with the aiming of **classifying large summer fires for four regions of Iberia**:

- local-scale weather conditions (Temperature, RH, Wind, Precipitation)
- fire danger weather indices (Duff Moisture Code and Drought Code)

The composite analysis was used to investigate the **impact of local and regional climate drivers at different time scales**, and to **identify distinct climatologies** associated with the occurrence of LF in Iberia.

DATA SETS

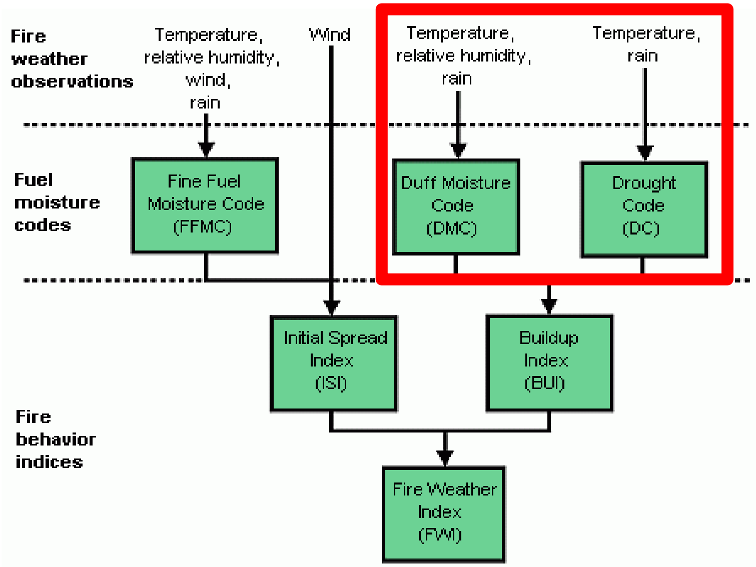
1. Fire Events

- ICNF (Portugal)
- MARM (Spain)
- 1980 – 2015
- June – September
- Burned Areas > 1 ha

2. Meteorological Variables

- Temperature at 2m
- Relative Humidity
- U, V Components of Wind at 10 m
- Precipitation of the last 24 hours

3. Fuel Moisture Codes



METHODOLOGY

1. Preliminary pre-processing sequence

- Calculation of daily, weekly and monthly climatologies.
- Calculation of daily, weekly and monthly anomalies.
- Standardization of anomalies to allow comparison between variables.

1. Algarve
2. Alentejo
3. Ribatejo Oeste
4. Beira Interior
5. Beira Litoral
6. Trás Montes
7. Entre Douro Minho
8. Alava
9. Albacete
10. Alicante
11. Almeria
12. Ávila
13. Badajoz
14. Barcelona
15. Burgos
16. Cáceres
17. Cádiz
18. Castellon
19. Ciudad Real
20. Córdoba
21. La Coruña
22. Cuenca
23. Gerona
24. Granada
25. Guadalajara
26. Gúipúzcoa
27. Huelva
28. Huesca
29. Jaén
30. León
31. Lérida
32. La Rioja
33. Lugo
34. Madrid
35. Malaga
36. Múrcia
37. Navarra
38. Ourense
39. Astúrias
40. Palencia
41. Pontevedra
42. Salamanca
43. Cantabria
44. Segovia
45. Sevilla
46. Soria
47. Tarragona
48. Teruel
49. Toledo
50. Valencia
51. Valladolid
52. Viscaya
53. Zamora
54. Zaragoza

Geographical boundaries of the fifty-four regions of IP.

METHODOLOGY

2. Large fires (LFs) classification

LFs > Percentile 95

3. Provincies elimination

Absolute number of LF < Percentile 25

Iberian Peninsula (IP) level

4. Cluster Analysis (K-Means)

- FWTs identification
- Association of each event to a FWT

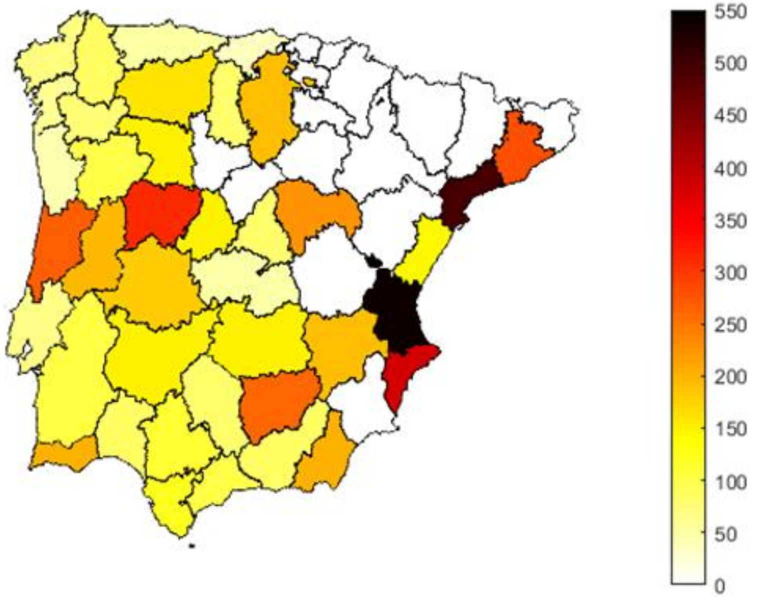
5. Composite analysis for climatic variables

Two timescales analyzed to capture variability:

- Interannual
- Synoptic

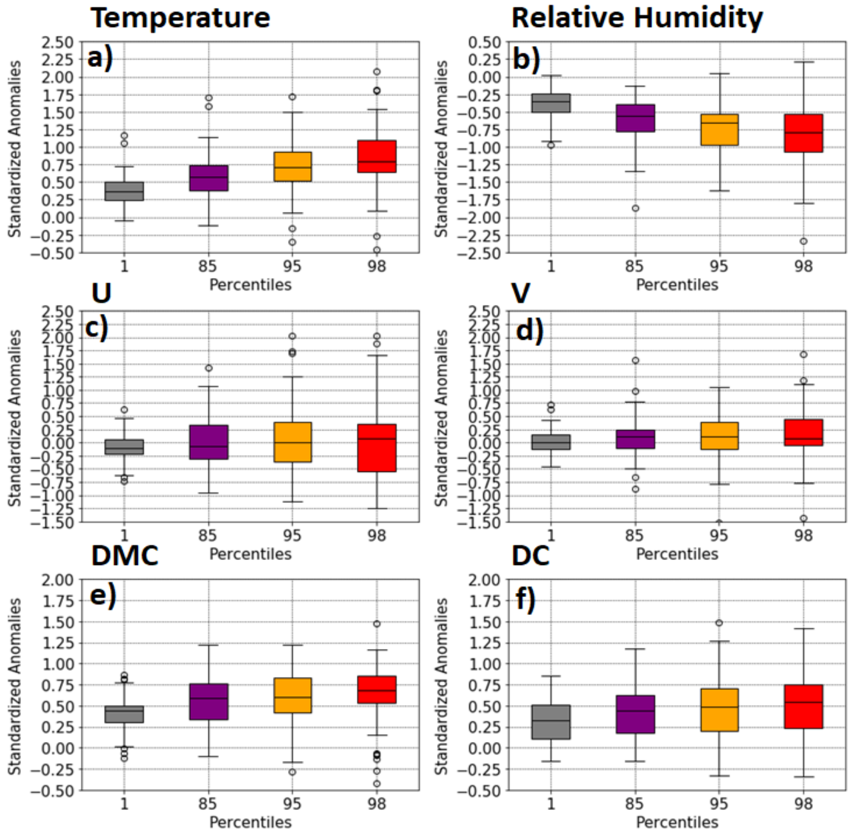
Results and Discussion

1. Large Fires Classification



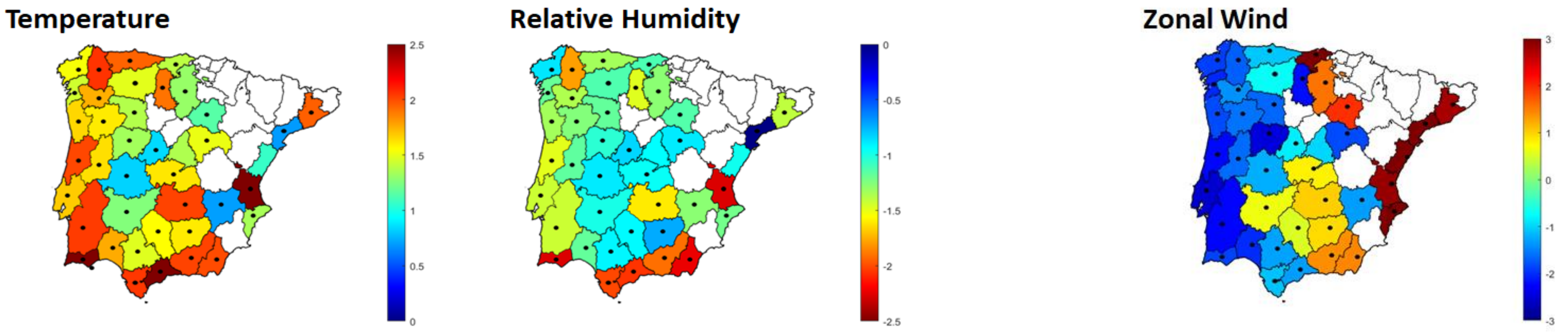
Representation of 95th percentile of BA (ha) for each of the provinces of the IP.

2. Large fires in the Iberian Peninsula: Day of Fire



Standardized anomalies for the ignition days of temperature, relative humidity, zonal (U) and meridional (V) velocity of the wind, DMC and DC in IP according to the final BA percentiles 1 (gray), 85 (purple), 95 (orange), 98 (red).

3. K – Means Analysis: Fire Weather Types identification



FWT1

High-temperature anomalies and strong **negative relative humidity** anomalies.

FWT2

Negative (positive) standardized anomalies of the **zonal wind velocity**.

Standardized anomalies of the meteorological variables of the fire day associated with the Fire Weather Types identified by K-means. The point indicates whether the FWT represented is statistically significant at province level (Kruskal-Wallis non-parametric test with 95% significance).

4. Predominant FWT in each province

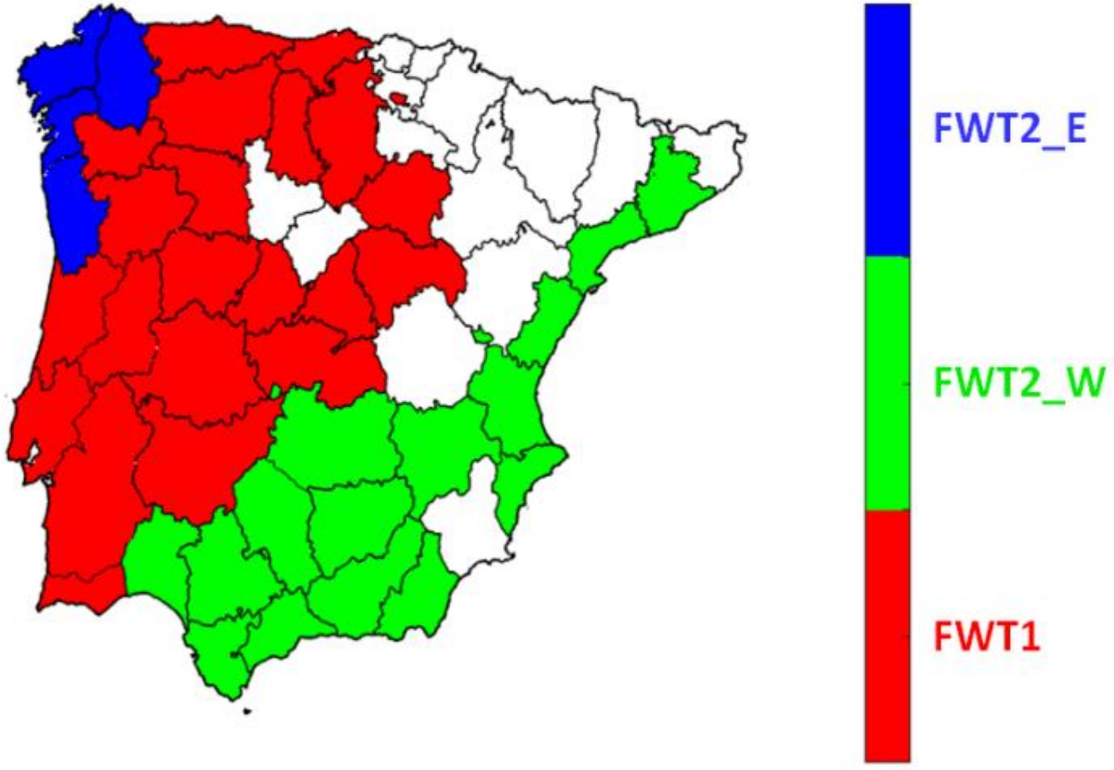
FWT1 is responsible for the largest amount of BA in most provinces;

FWT2

FWT2_E the provinces where the east winds are predominant, which are concentrated in the northwest regions of the IP.

FWT2_W predominates in the easternmost provinces of the IP and is controlled by westerly winds.

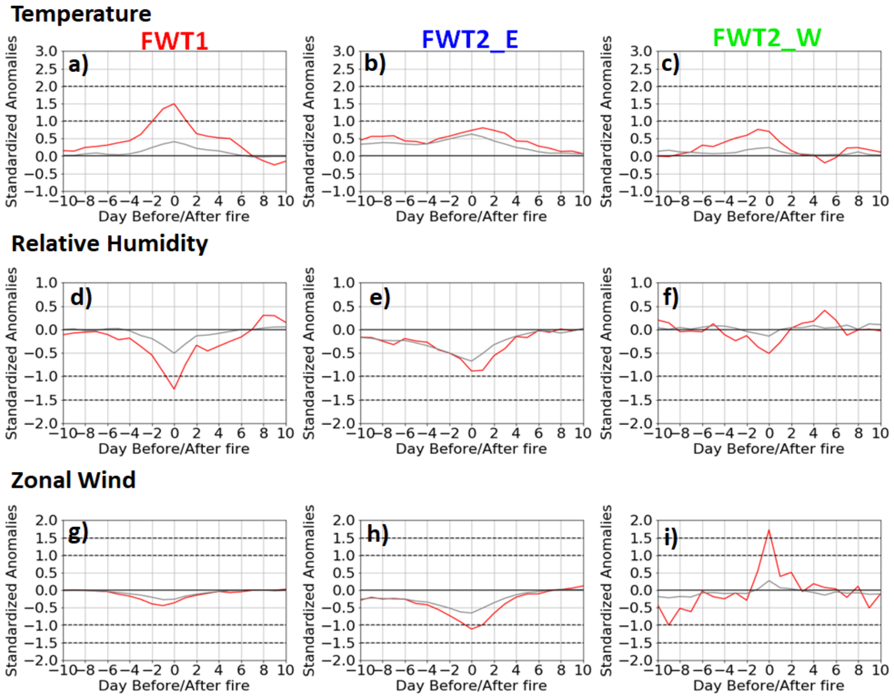
Three distinct large regions in the IP



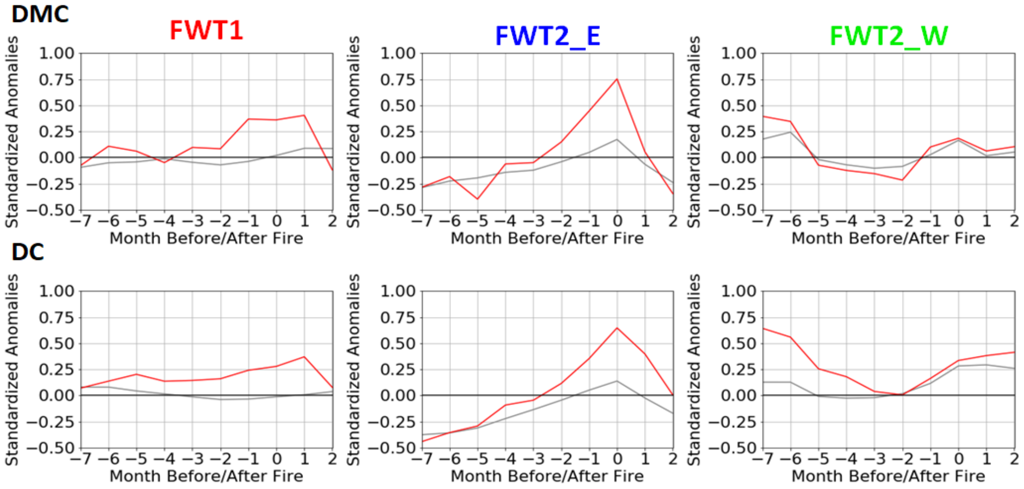
5. Fire Weather Types characterization

All Fires — Large Fires

5.1 Shorter timescales



5.2 Montly timescales



Composites of the standardized anomalies of the variables (temperature, relative humidity, zonal wind, DMC and DC) for all fires (gray) and for large fires (red) associated with the three large regions identified with the same predominant FWT (FWT1 (temperature e relative humidity), FWT2_E (east wind) and FWT2_W (west wind)).

Conclusions

- **Each region** is characterized by a **specific fire regime** which causes that LF to be triggered by **different conditions**.
- At a **20-day scale**, the **meteorological variables** are those that represent greater importance in distinguishing the activity associated with LF.
- For **nine months** the **indices** that translate the **dryness of the fuels** to different layers of the soil are those with a significant difference between the activity associated to all fires and LF.
- **Two major FWT** were identified based on the **synoptic conditions** associated with LF days.

FWT1

- High temperature and low relative humidity.
- One that most contributes to the occurrence of LF.

FWT2

- Significant zonal wind speed anomalies.
- Two distinguish behaviours in IP.
- FWT2_E with the highest anomalies of DMC and DC.

THANK YOU!

Acknowledgments

This work was partially supported by national funds through FCT (Fundação para a Ciência e a Tecnologia, Portugal) under project IMPECAF (PTDC/CTA-CLI/28902/2017).

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IMPECAF WEATHER EXTREMES · Ciências ULisboa · Universitas Olisiponensis ad Lucem · República Portuguesa · FCT Fundação para a Ciência e a Tecnologia