Towards the prediction of large wildfire occurrence from synoptic circulation patterns?

Ruffault J., Curt T., Moron V. and Trigo R.M.
A growing “large wildfire” problem

Human exposure and sensitivity to globally extreme wildfire events

David M. J. S. Bowman, Grant J. Williamson, John T. Abatzoglou, Crystal A. Kolden, Mark A. Cochrane and Alistair M. S. Smith

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Human exposure and sensitivity to globally extreme wildfire events

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Today’s focus: Large Fire Forecasting and Projection

Large fire occurrence Probability

Wind speed
Temperature
Air Humidity

Weather variables predictions
Main issues

• Relies on local predictions of surface climatic variables

• Limited understanding of the fire-climate relationship
Today’s focus: Large Fire Forecasting and Projection

A classification of synoptic scale variables might be used to predict large fires.
Today’s focus: Large Fire Forecasting and Projection

Objectives

1. Can we relate synoptic patterns to fire weather?
2. Can synoptic patterns be used to predict large fire probability?
1. Are synoptic patterns related to fire weather
A parsimonious discretization of summer synoptic-scale conditions

Classification method
(PCA+Kmeans)

1973-2013 period

Summer daily sea level pressure and winds at 925 hpa
NCEP/NCAR (2.5 x 2.5 °)

2460 maps

4 Weather Types
Four Weather Types with contrasted patterns

(a) Atl.Low (27.2%)
(b) NAO- (20.1%)
(c) Blocking (27.6%)
(d) Atl.Ridge (25.1%)
Atlantic Low: Warm and humid

(a) Atl.Low (27.2%)

(b) NAO- (20.1%)

(c) Blocking (27.6%)

(d) Atl.Ridge (25.1%)

Sea level pressure anomaly (mb)

Temp anomaly

Wind anomaly

humidity anomaly
Atlantic Ridge: windy, dry and cold

(a) Atl.Low (27.2%)
(b) NAO- (20.1%)
(c) Blocking (27.6%)
(d) Atl.Ridge (25.1%)

Sea level pressure anomaly (mb)

Temp anomaly
Wind anomaly
humidity anomaly
2. Are Weather Types related to large fire probability?
Large fires preferentially occur under some specific Weather Types

![Diagram showing relative fire risk ratio for different weather types.](image-url)
Combining Weather types drought estimations to forecast daily fire danger in Mediterranean France

**Daily fire danger**

- Wet
- Dry

Fuel Aridity

Large Fire probability

- high
- low

AUC=0.79
**Conclusions and perspectives**

**Weather types** are related to fire weather and can be used to **predict large fire** occurrence

**Should we use WTs for large fire impact studies?**

- Evaluate the predictive capacity of WTs
- Drought estimations?