

Europe's 2026 wildfire season

Climate, fuels and
hydroclimatic rebound

Francesca Di Giuseppe



SPARKY
THE ECMWF FIRE MODEL



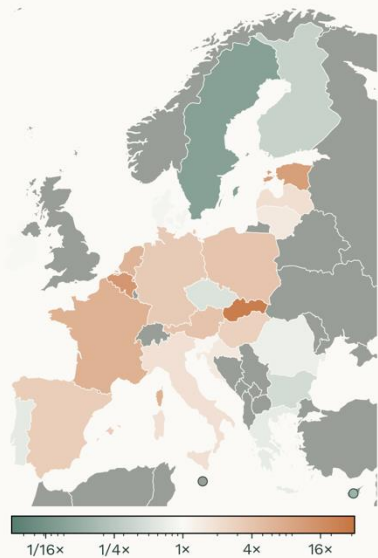
THE STATE OF
WILDFIRES PROJECT

The season's geography depends on the question

Burned area (ha, logarithmic scale)



Relative to supplied baseline



National area burned (%)



Difference from baseline (ha)



■ No supplied 2026 data / outside EU table

Europe's 2026 wildfire footprint

Four views of an uneven season

670,516 hectares reported

Spain, Italy and France account for 75.3% of the total BA.

Absolute and relative impacts differ

France reaches 6.6x its climatological mean (2006-2025).

Portugal has the largest national fraction burned, at 0.74%.

Snapshot across 25 reporting EU countries. Luxembourg and Malta have missing values. Reporting date and baseline timing are unspecified.

Europe's 2026 wildfire season: the scale of response

Interim picture • sources available on 17 September 2026

666,534 ha burned • 2,037 fires

EU, 1 January–15 September; EFFIS fires >30 ha.

10 EU Civil Protection Mechanism activations

Reported by 25 August; requests for international assistance.

22 planes + 5 helicopters • 777 firefighters

EU summer fleet and pre-positioning programme (2 June).

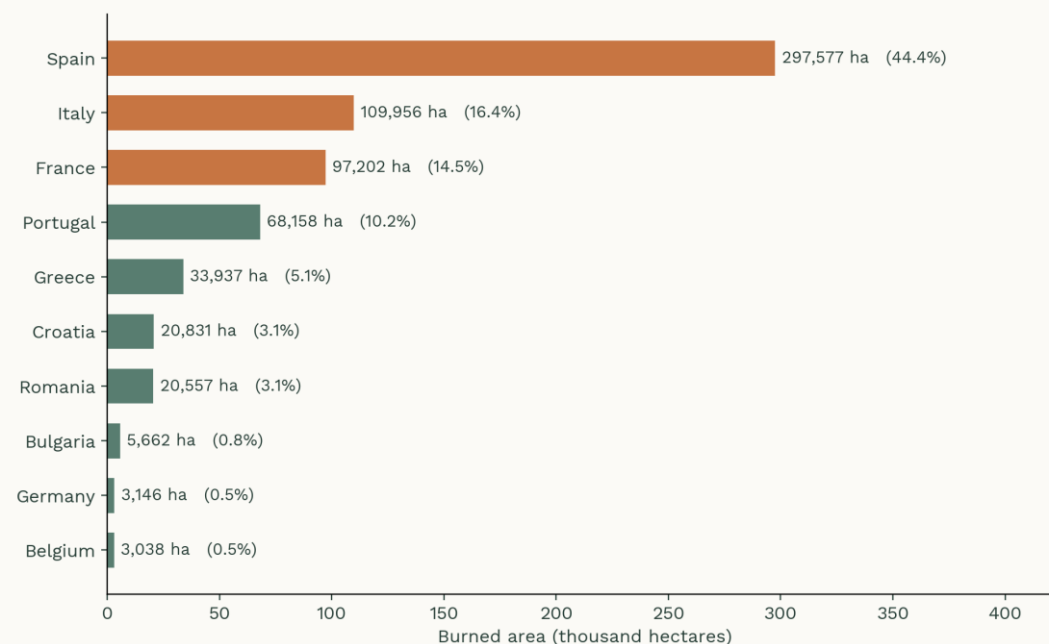
>700 firefighters • >200 vehicles • 38 aircraft

Coordinated deployments reported by 25 August.

€15.6–19.1 billion estimated economic costs

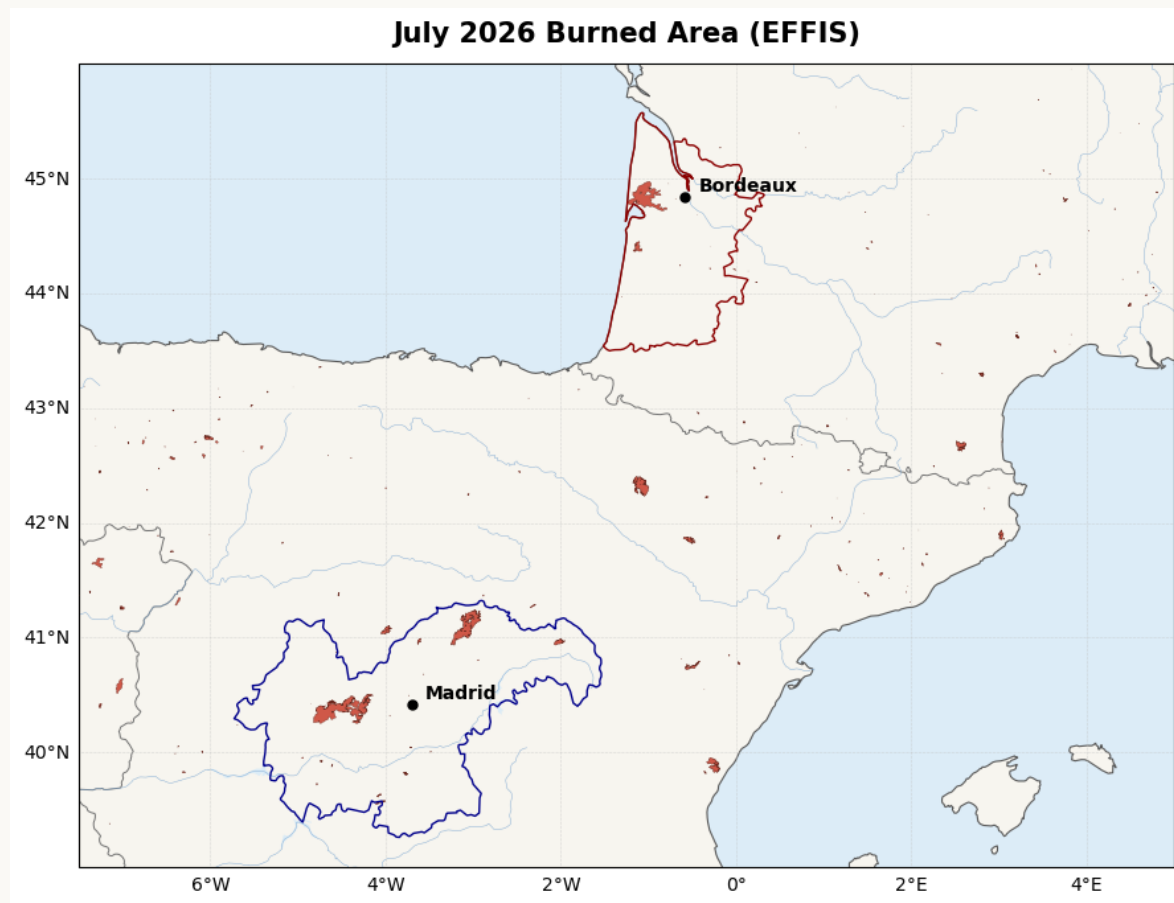
France, Spain and Greece only; AccuWeather, 6 August.

A few countries account for most of the reported burned area



2026 snapshot (date not supplied) | User-supplied EFFIS table | Percentages refer to the total reported in this table

Two countries, a shared July crisis



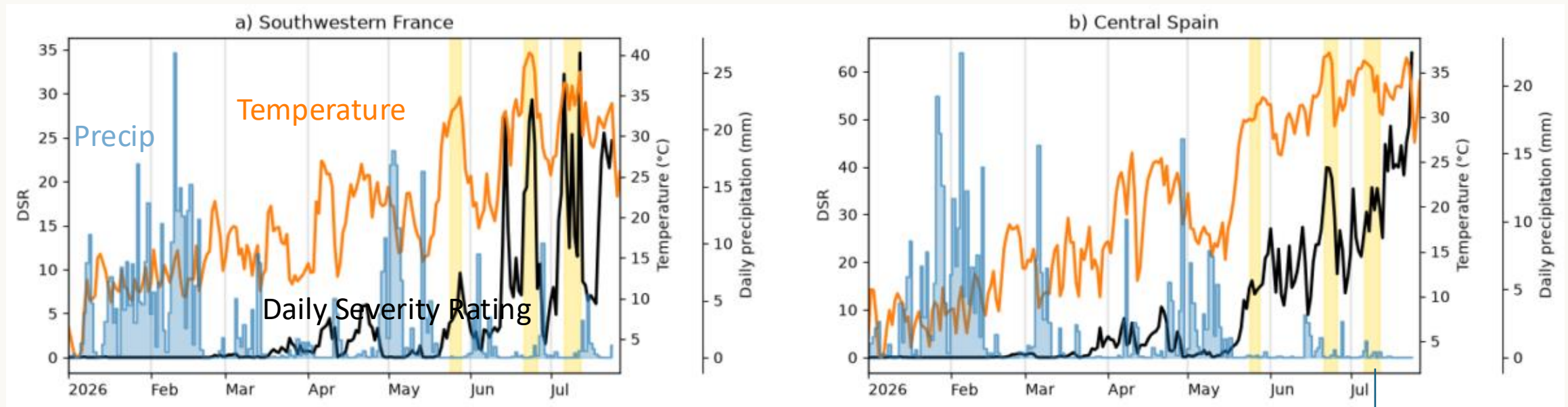
EFFIS through world weather attribution report, July 2026

>300,000

people evacuated across
France and Spain

EU assistance supports
both countries
simultaneously

Repeated heatwaves and progressive drying a shared hydroclimatic sequence



Southwestern France and central Spain, January–July 2026. WWA, 30 July 2026

Wet period

Vegetation growth
adds biomass

Drying period

Fuel moisture falls
while biomass remains

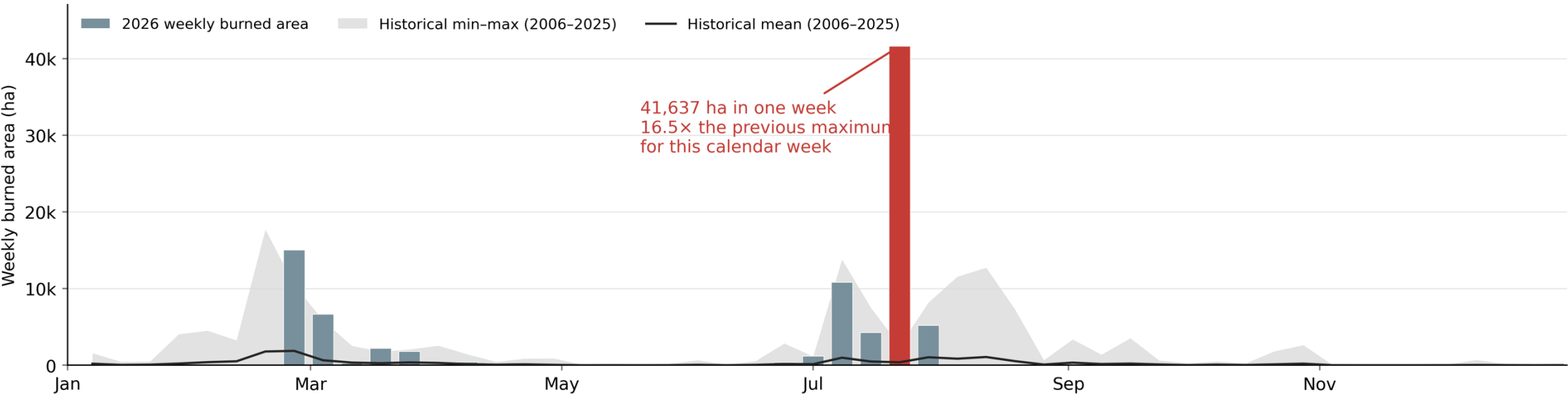
Fire weather

Heat and wind favour
spread after ignition

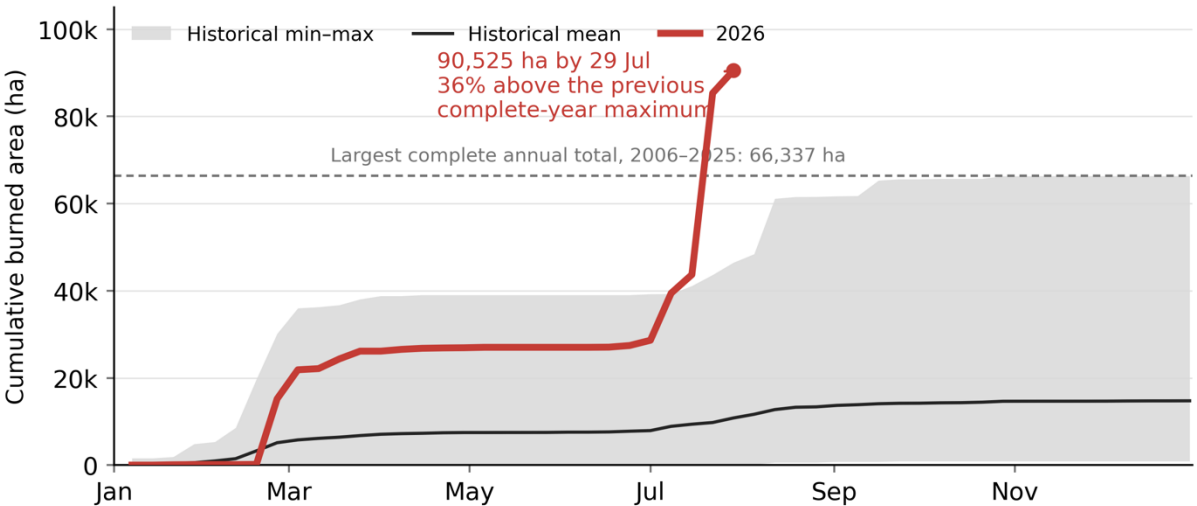
Heatwaves

France: an exceptional acceleration in burned area during July 2026

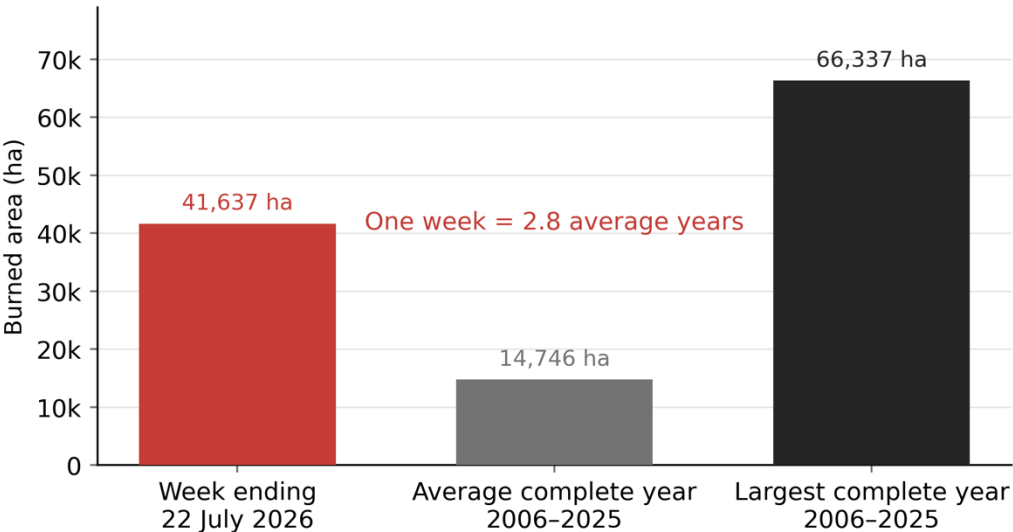
A A single week changed the trajectory of the 2026 fire season



B Cumulative burned area exceeded the historical annual range



C One exceptional week compared with entire fire seasons



Data source:EFFIS, Copernicus program
Historical reference: weekly min-max and mean across 2006-2025. The historical envelope may combine different years. Recent 2026 estimates may be provisional.

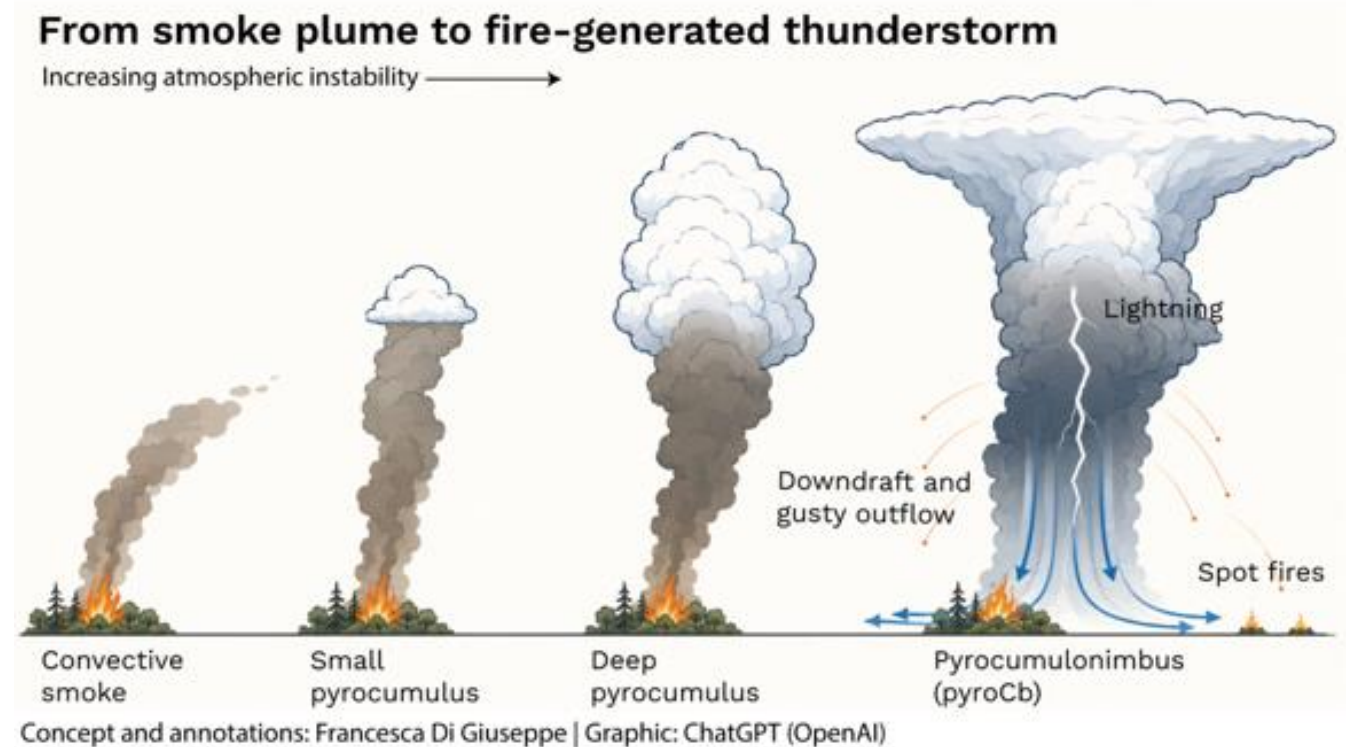
Gironde, July 2026: a wildfire builds a thunderstorm

Southwest France

Connected maritime pine fuels support rapid spread

A fire-generated thunderstorm adds hazardous winds

Exposure near settlements and tourist areas amplifies impacts

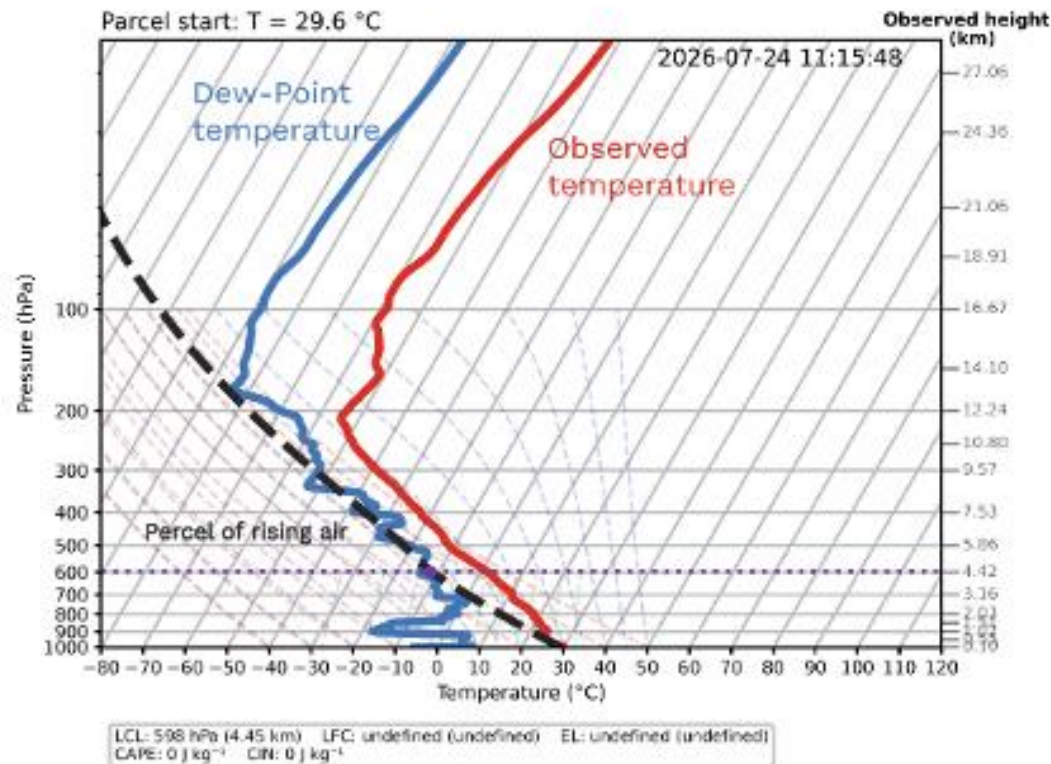


A pyroCb can produce lightning, gusty outflows and long-range spotting.

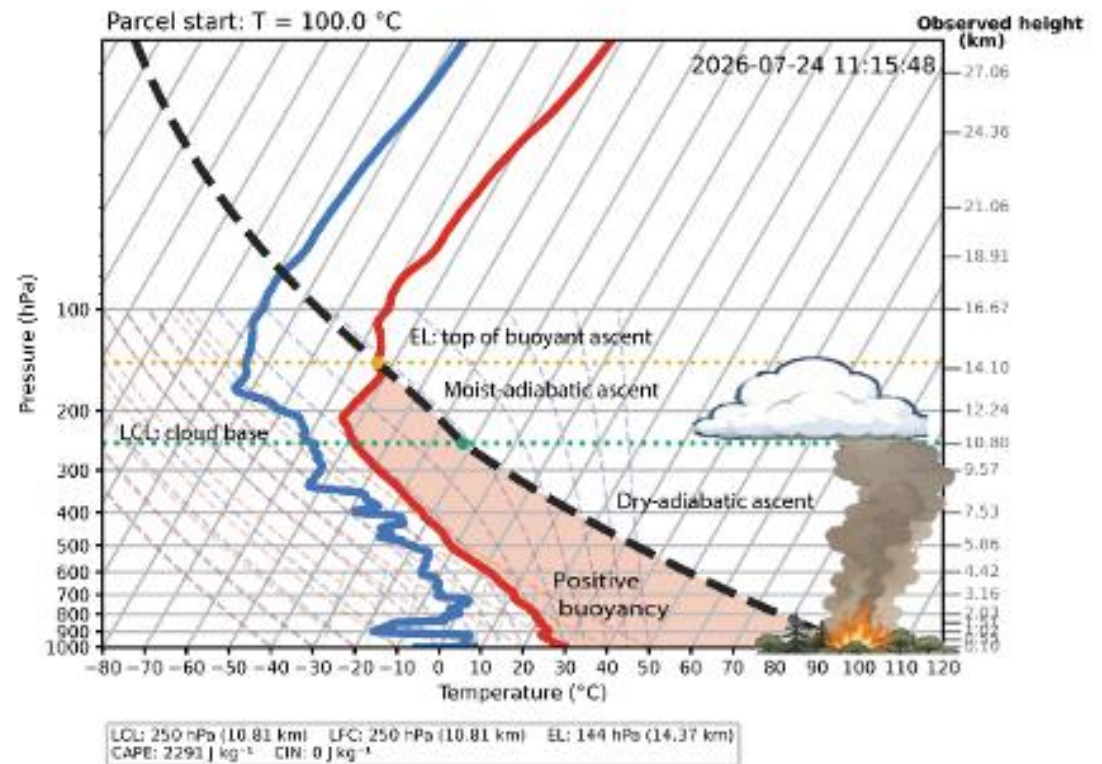
Fire heating changes the parcel's ascent

Bordeaux-Mérignac sounding, 24 July 2026, nominal 12 UTC

(a) Buoyant ascent in an conditionally-unstable atmosphere



(b) Fire-enhanced ascent and cloud development



Fire heating adds buoyancy. Condensation releases latent heat and can sustain deeper ascent.

The 100°C parcel is illustrative. Entrainment is omitted, so this is not a reconstruction of the fire.

Attribution: what changes with warming?

July 2026 fire weather	Central Spain	Southwestern France
Likelihood increase ¹	At least 20×	At least 2×
Present-climate recurrence	About 6 years	About 20 years

¹ Relative to pre-industrial climate. Observations-only analysis of DSR7x. WWA, 30 July 2026

These are fire-weather estimates, not burned-area multipliers

Warming raises the odds of extreme fire weather

El Garroussi et al. (2024) • ERA5 sensitivity experiments + CMIP6 SSP2-4.5

Up to 10× higher annual probability

From 5% to 50% in local hotspots;
Mediterranean regions face the largest increases.

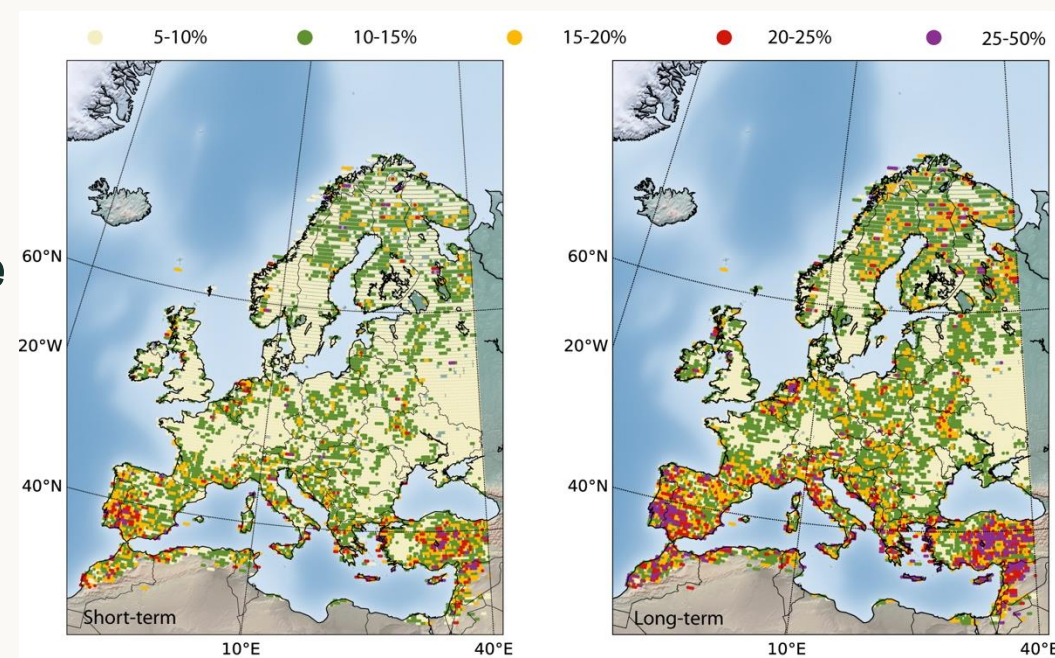
Risk expands into central and northern Europe

Drought strongly amplifies extreme fire weather;
warming beyond +2°C increases susceptibility.*

Longer fire seasons

Around one extra week across much of Europe;
up to 20 days in one-fifth of the Mediterranean
region by the end of the century.

*Relative to the 1981–2010 baseline. Results describe FWI-based hazard, not burned-area forecasts.



Extreme fire weather affects larger areas at once

Synchronicity: seasonal mean of the daily area with FWI > 50

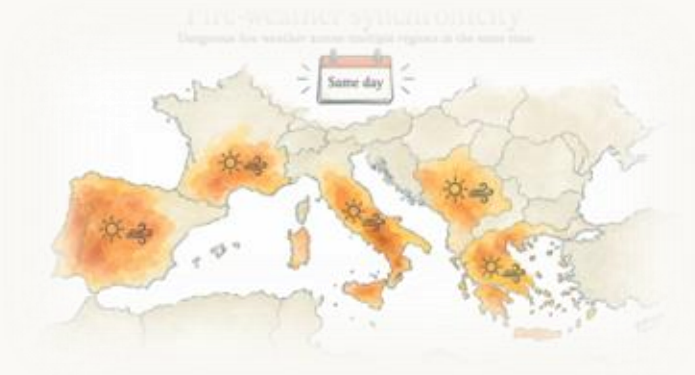
Historical change: 2002–2022 versus 1981–2001

Summer (JJA)	Relative increase	Additional area
Central Europe	+271%	+21,440 km ²
Mediterranean	+19%	+129,799 km ²

Central Europe also rises by 389% in autumn, from a small baseline.
Northern Europe shows no significant historical change.

Warmer, drier scenarios further increase synchronicity

Implication: simultaneous demand can strain shared firefighting resources.



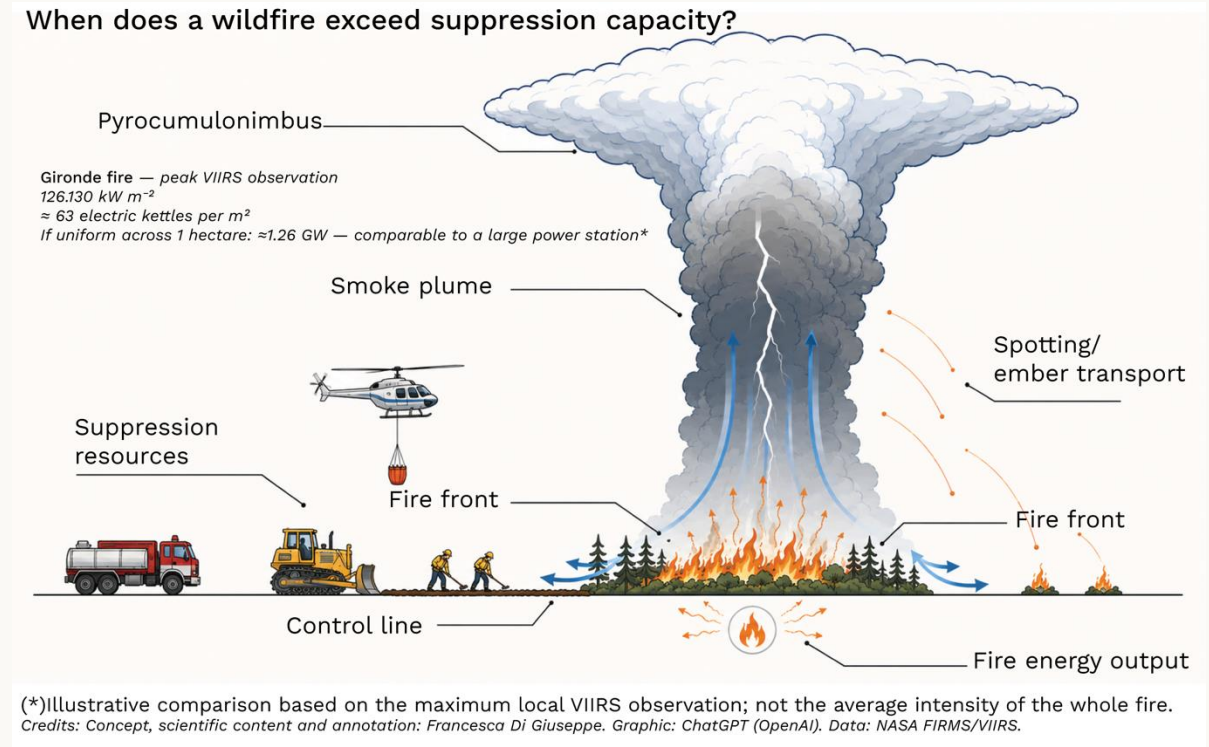
Simultaneous crises change resource planning

France

7 planes + 4 helicopters

Spain

6 planes + 134 personnel



Shared danger can constrain the pool of available assistance

EU assistance reported on 27 July 2026

Fire weather is a useful metric, but it is *not* fire activity

Fire Weather Index

Describes **atmospheric potential** only

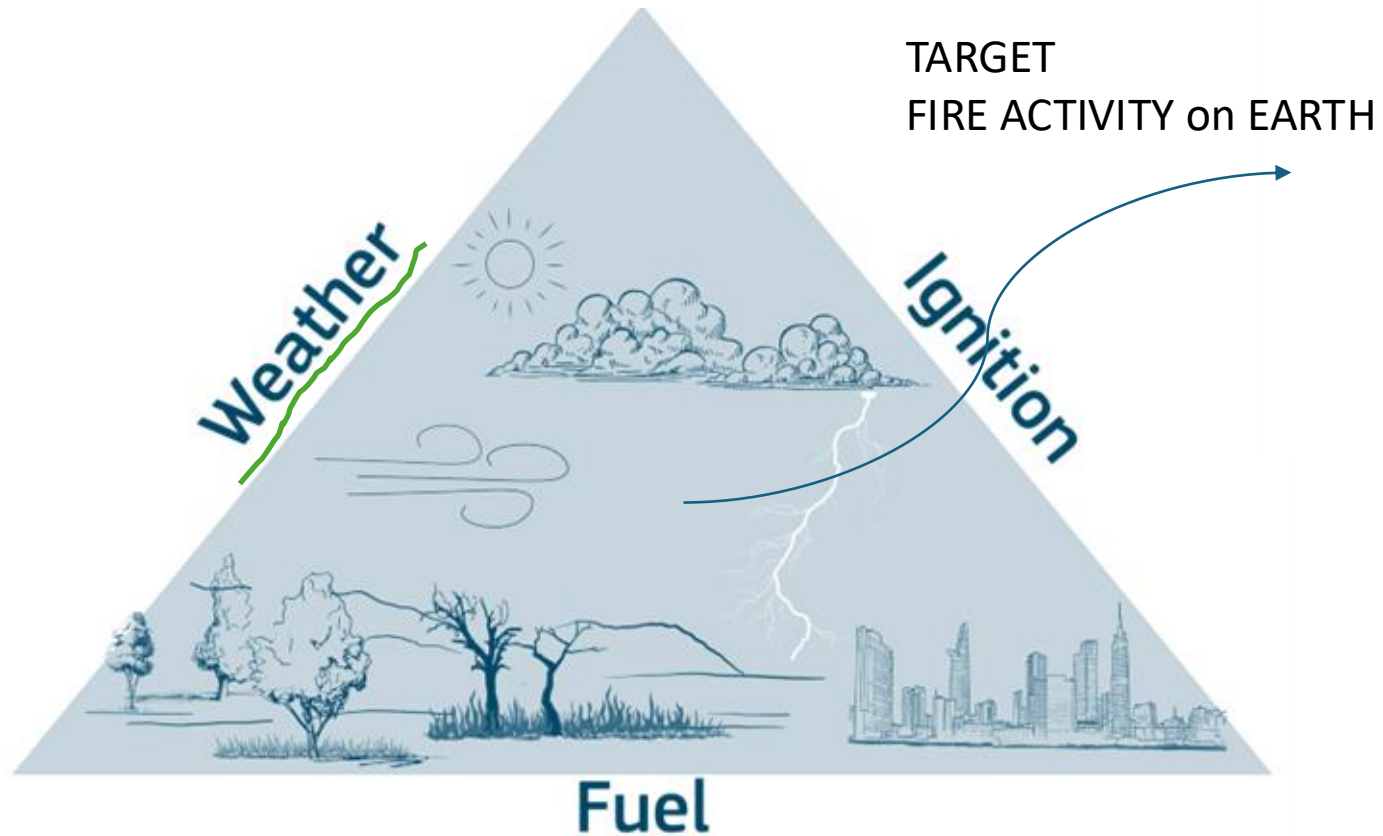
- No information on fuel availability or load
- No information on ignition presence
- Hot, dry, fuel-poor regions: high danger — few fires

Probability of Fire (PoF)

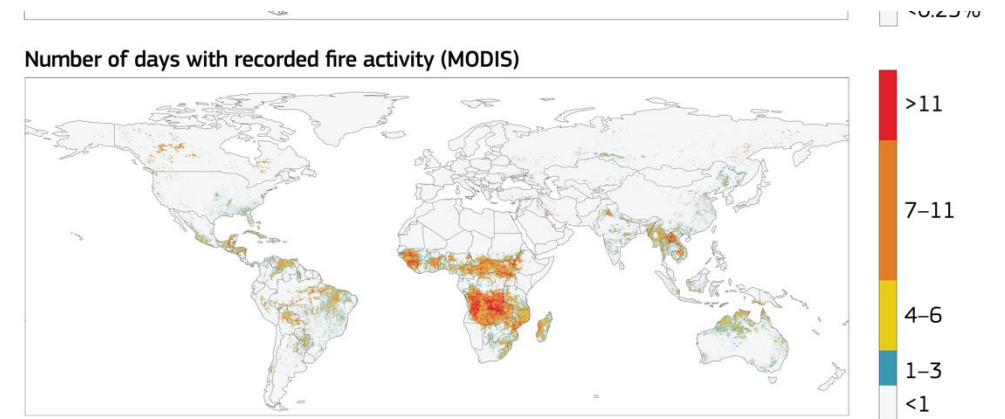
Describes **probability of fire to be detected**

- At least one MODIS/VIIRS/SEVIRY active-fire detection
- Daily $\sim 9 \times 9$ km land grid cell
- Shifts question from "conditions" to "realised occurrence"

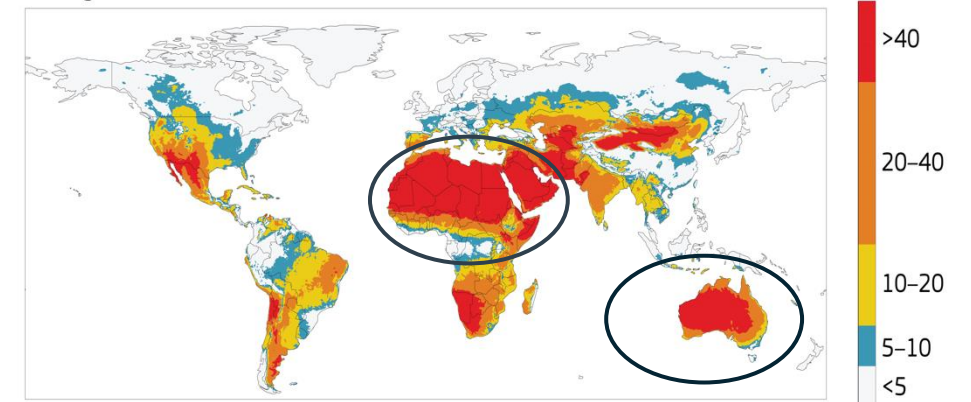
Drivers of fire activity



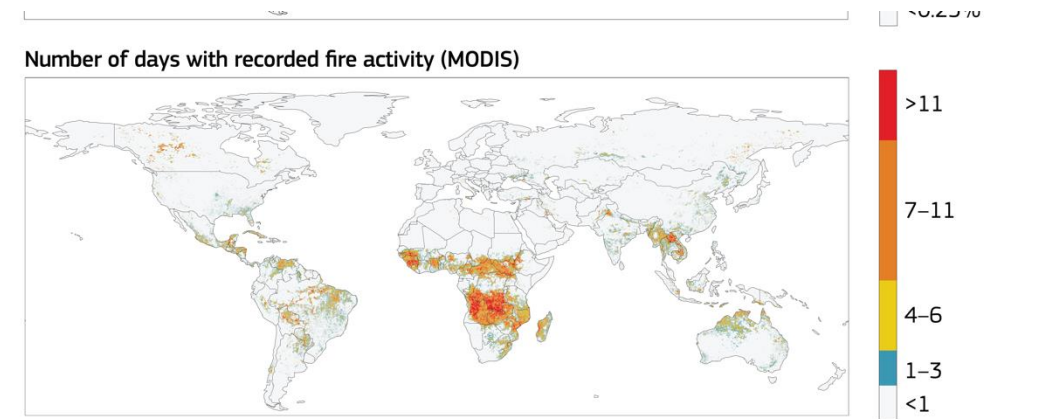
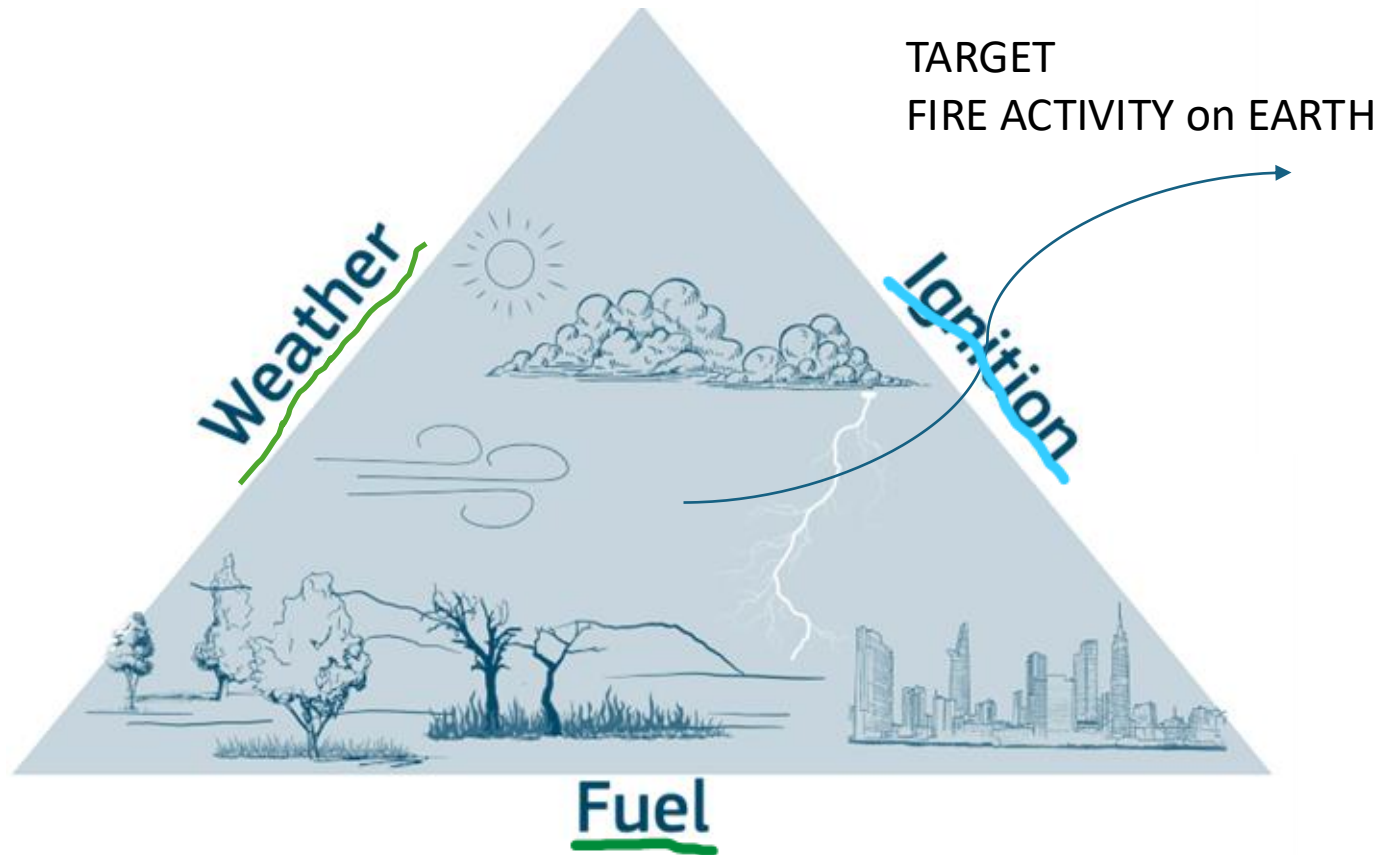
Di Giuseppe et al. Global data driven prediction of fire activity, Nature Communications, 2025



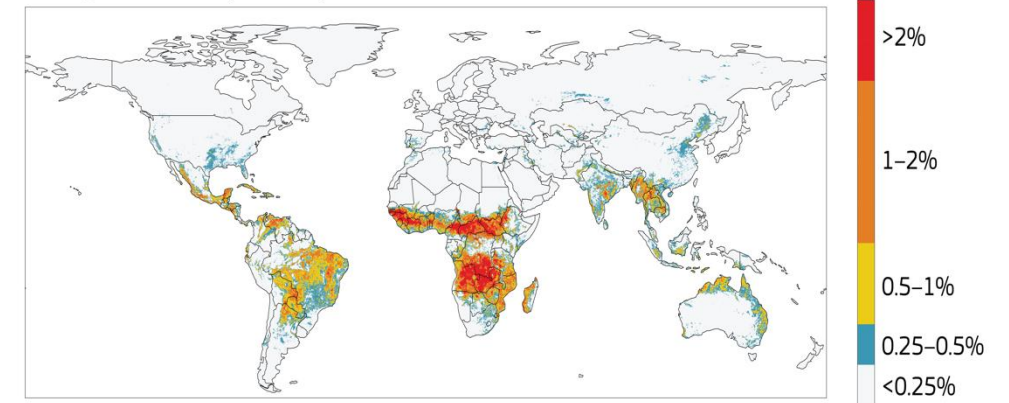
Average Fire Weather Index



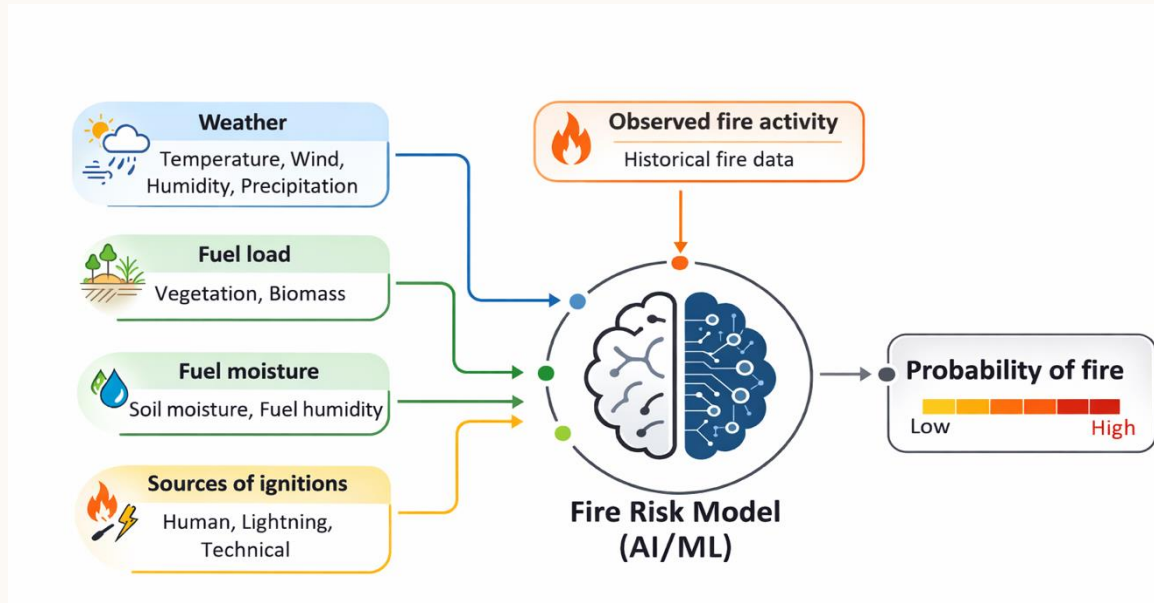
Drivers of fire activity



Average data-driven probability of fire (all)



PoF integrates the three controls on realised fire activity



17 predictors — operational framework

Weather · 4 variables

Temperature, dew point, precipitation, wind

Fuel · 9 variables

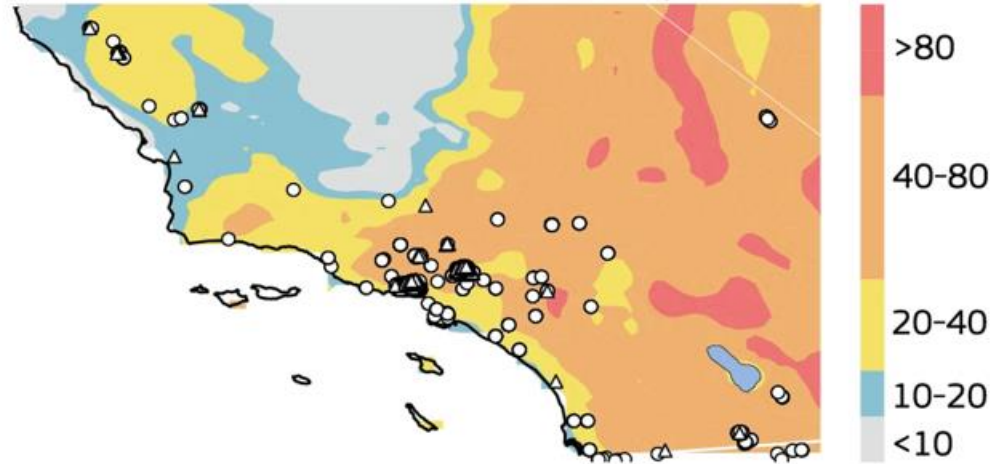
7 fuel characteristics + 2 LAI fields

Land surface · 4 static fields

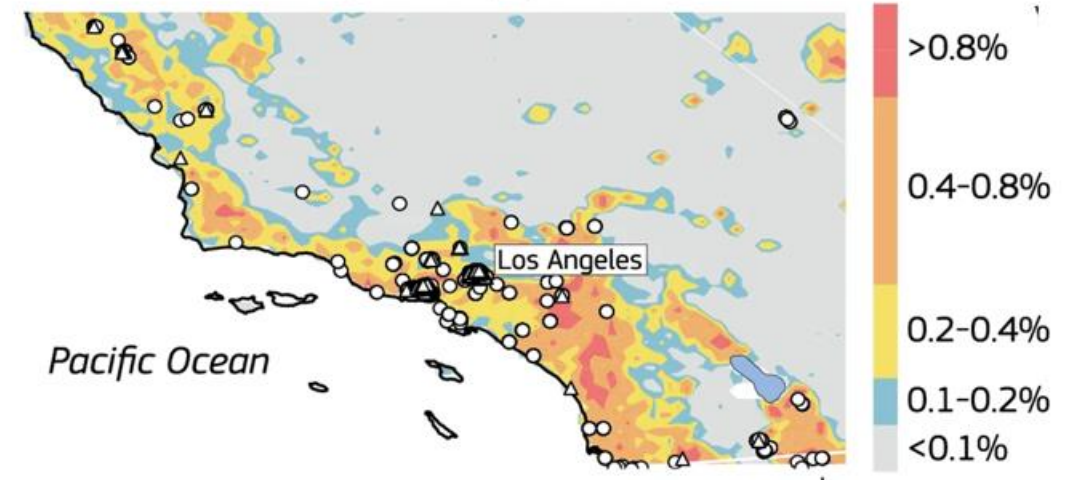
Ignition: lightning + human-activity proxies

Case study: Los Angeles fires 2025

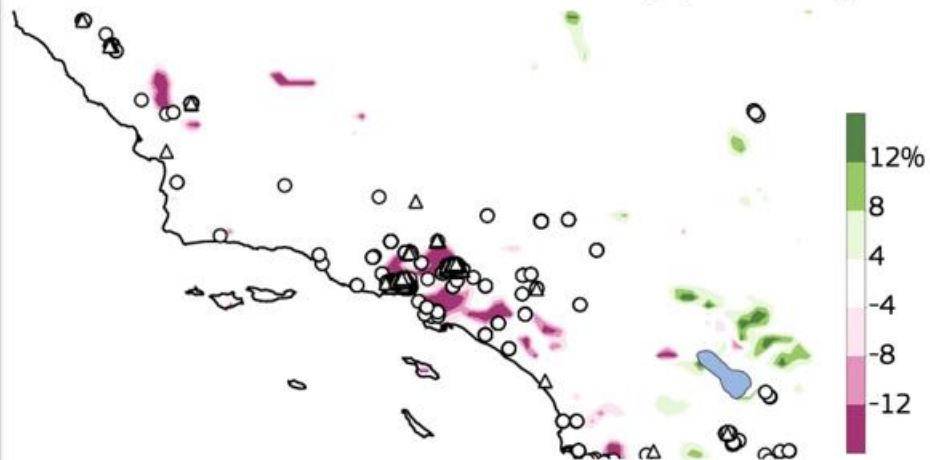
5-day FWI (ECMWF)



5-day PoF (ECMWF)



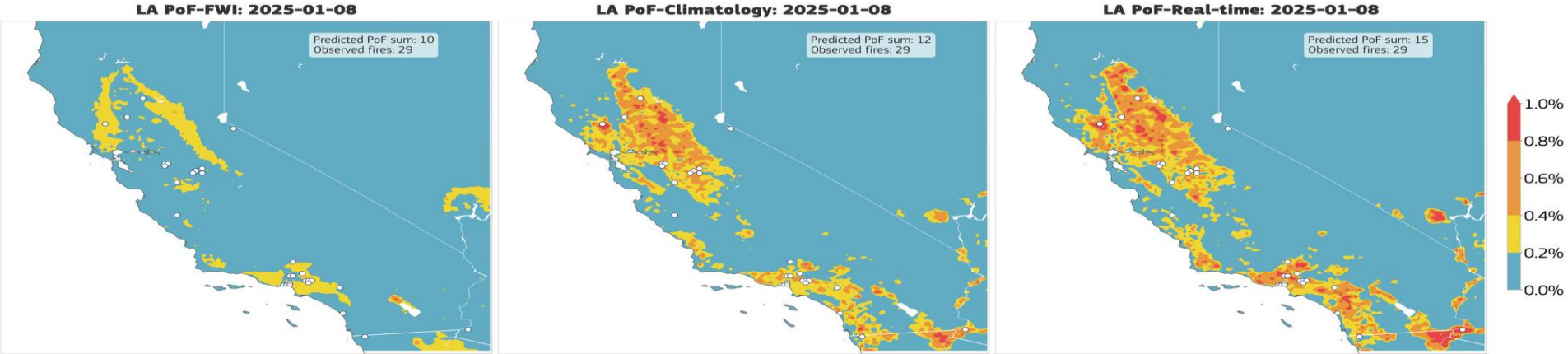
Dead fuel moisture content anomaly (7-1-2025)



Total Fuel Load [kg m²] (7-1-2025)



Year-specific fuels improve fire-occurrence prediction for the Los Angeles case



10

Weather only

Predicted active-fire grid cells

12

Climatological fuel

Predicted active-fire grid cells

15

Year-specific fuel

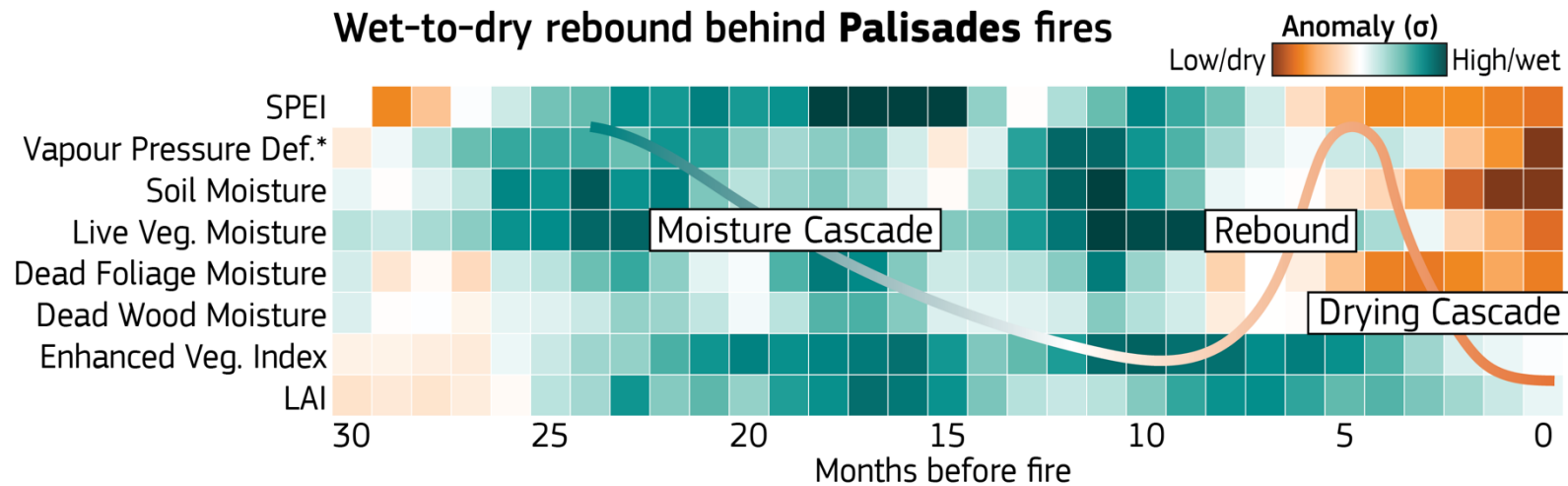
Predicted active-fire grid cells

29

Observed

Active-fire grid cells, 8 Jan 2025

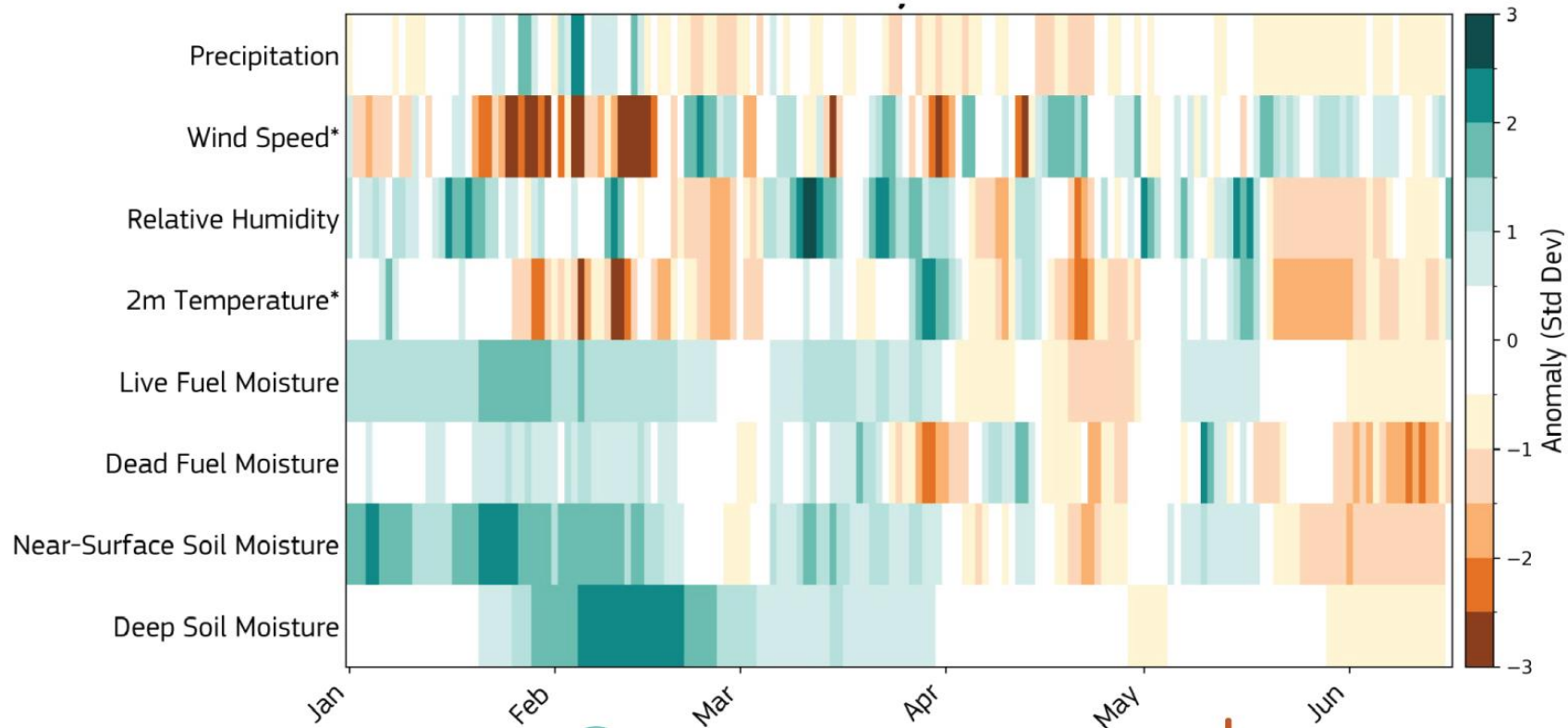
Wet antecedent conditions in Palisades and Eaton



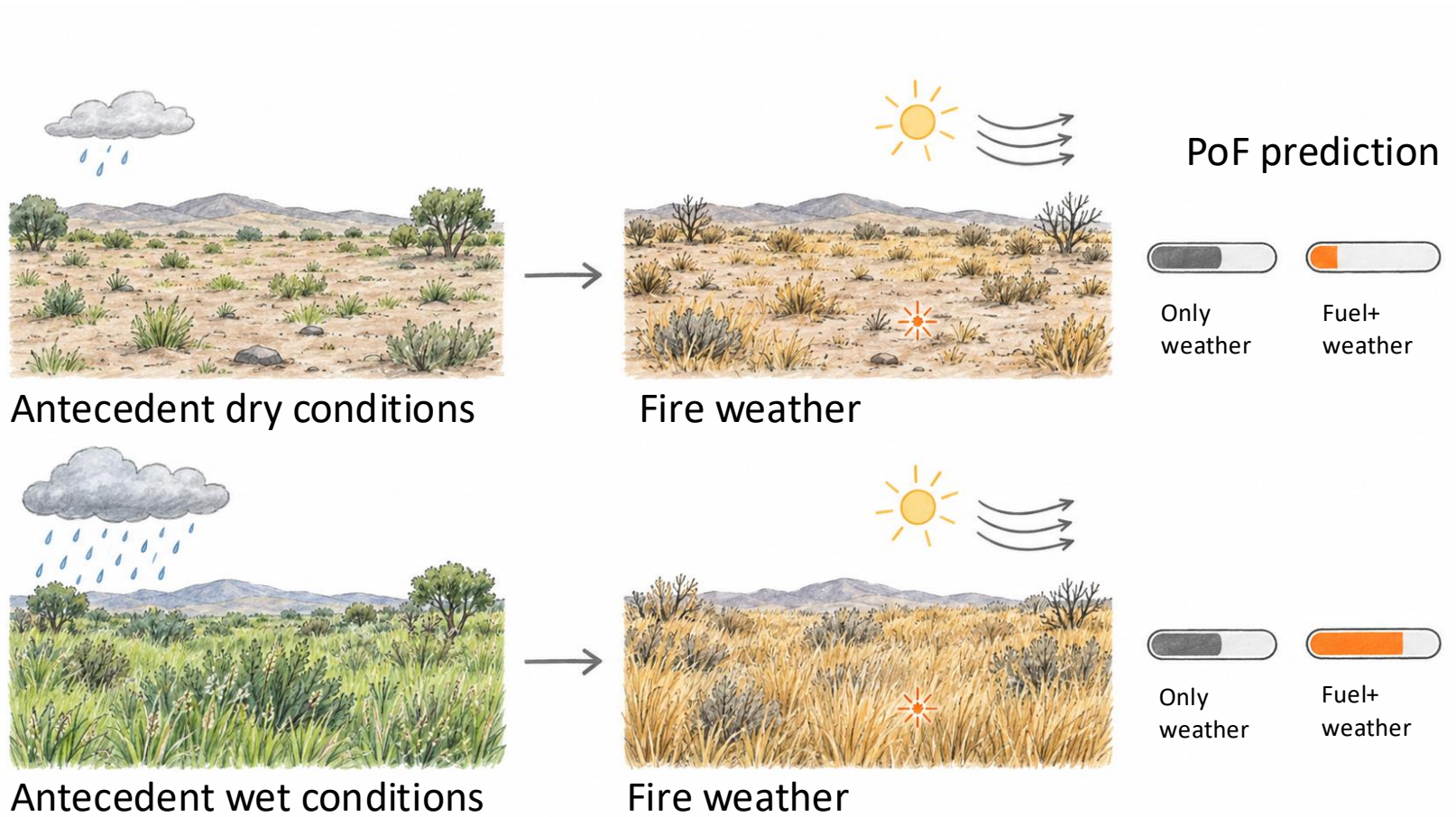
Wet anomalies detected **6–27 months** before ignition. Moist conditions supported vegetation growth and progressive fuel accumulation in non-forested ecosystems.

Mediterranean ecosystems: a rebound pattern in 2026

Hydroclimatic Conditions for the Western Mediterranean in 2026



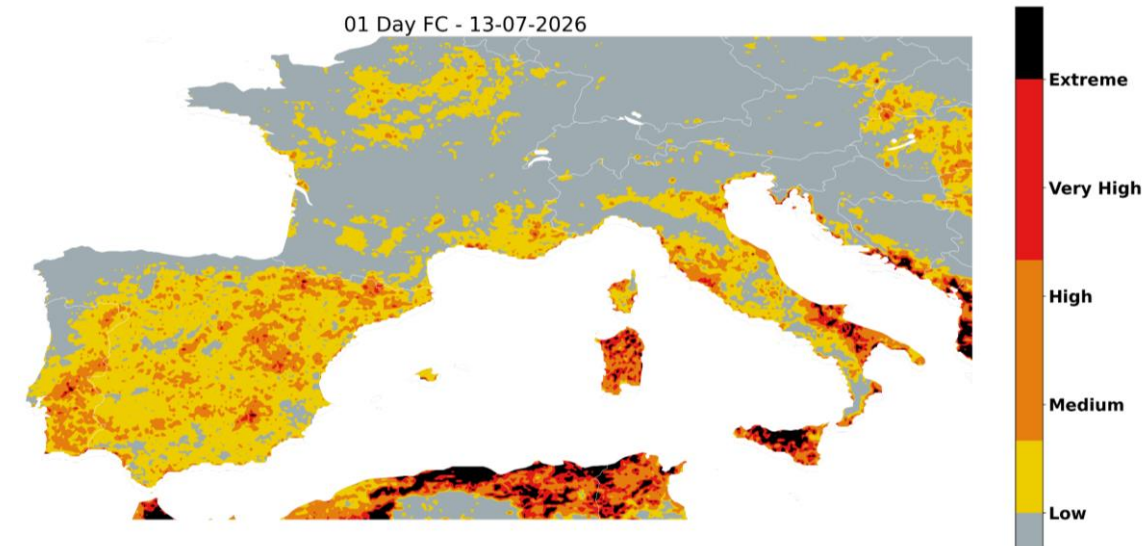
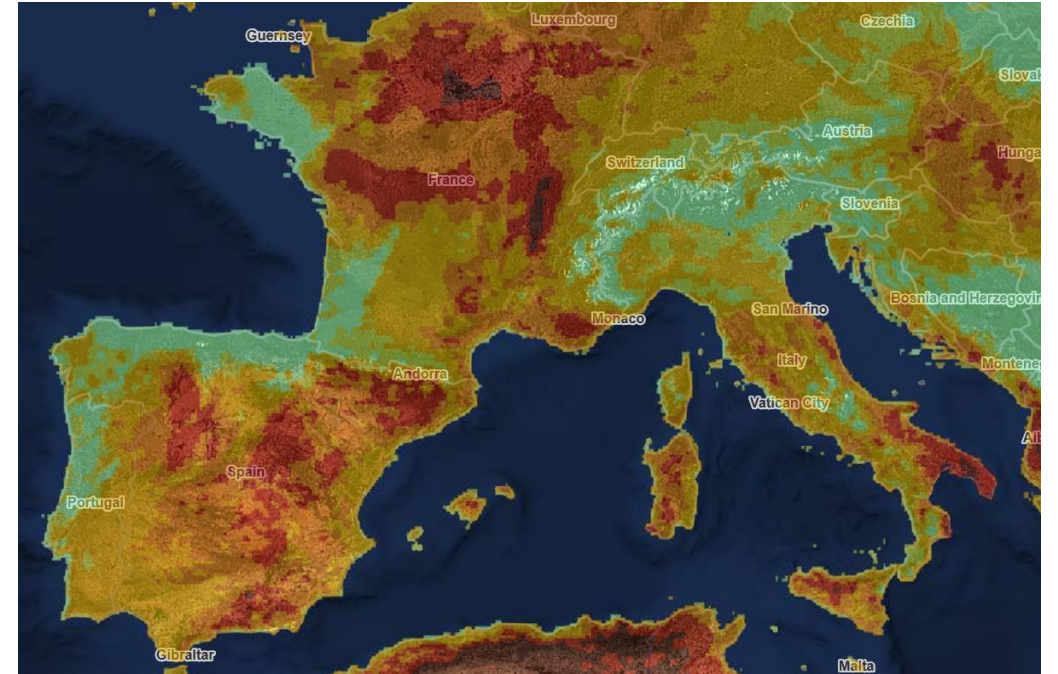
Implications for operational forecasting

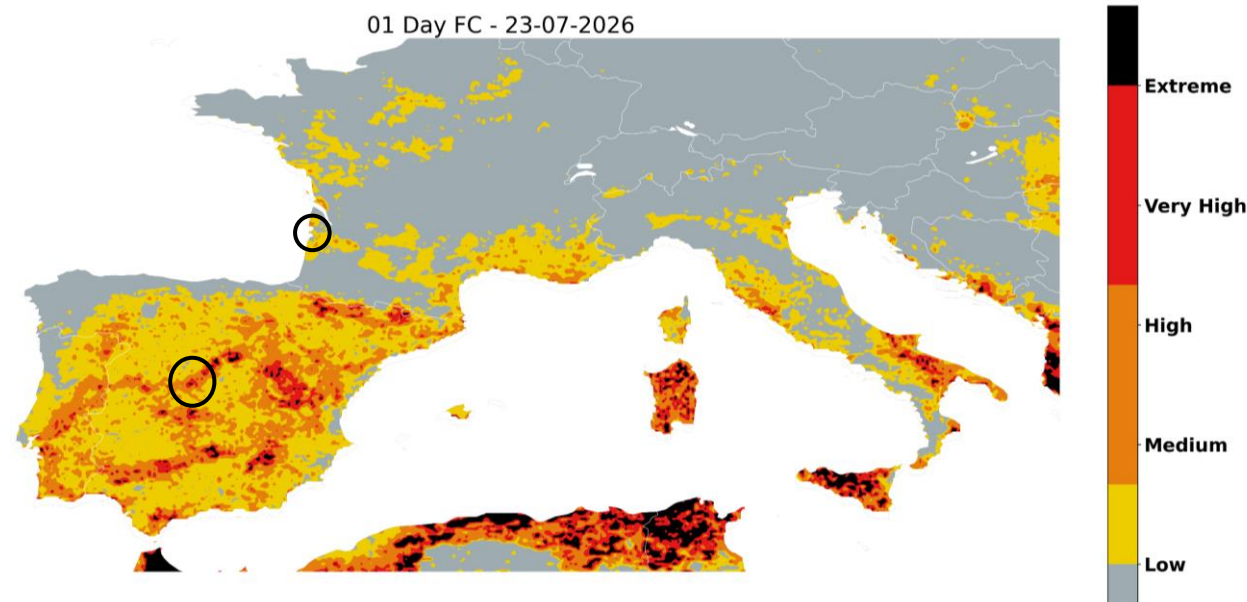
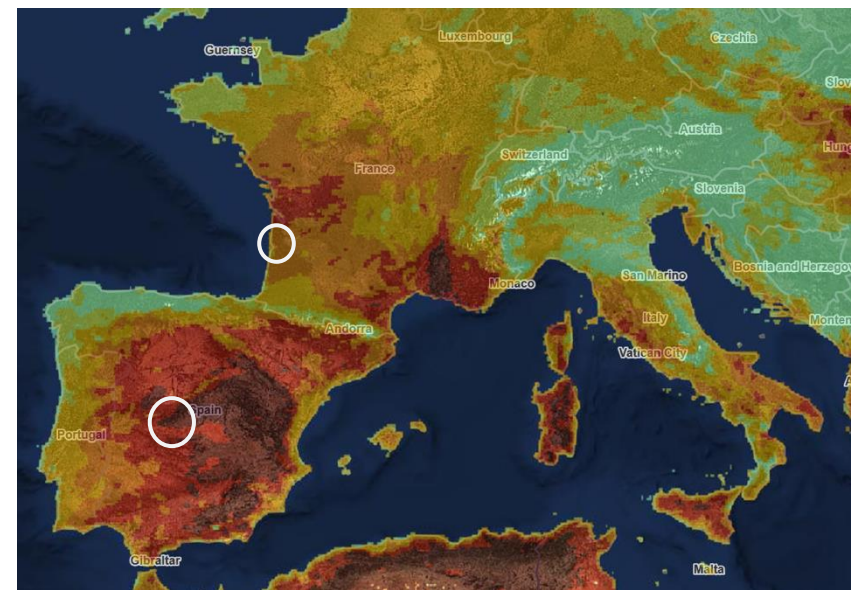


Timeline of European fires – July 2026

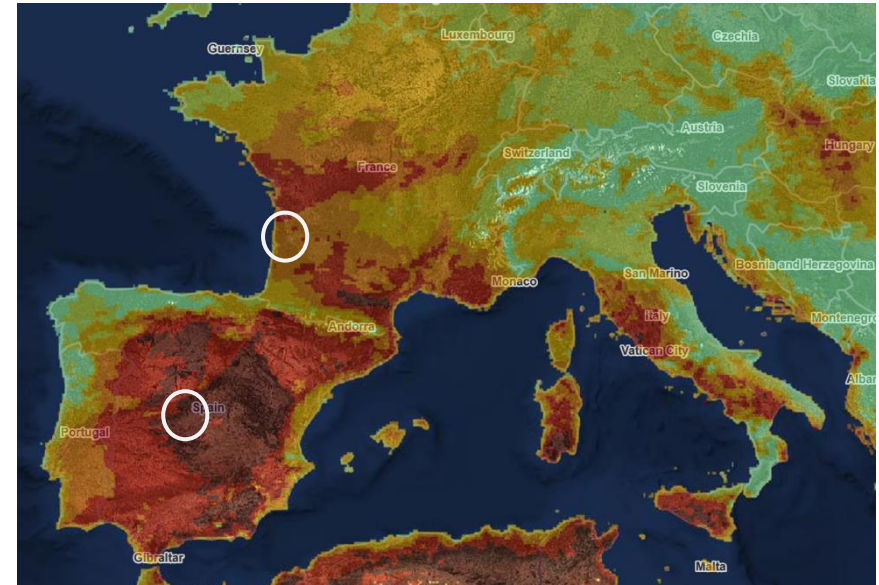


13th July – pre-fire

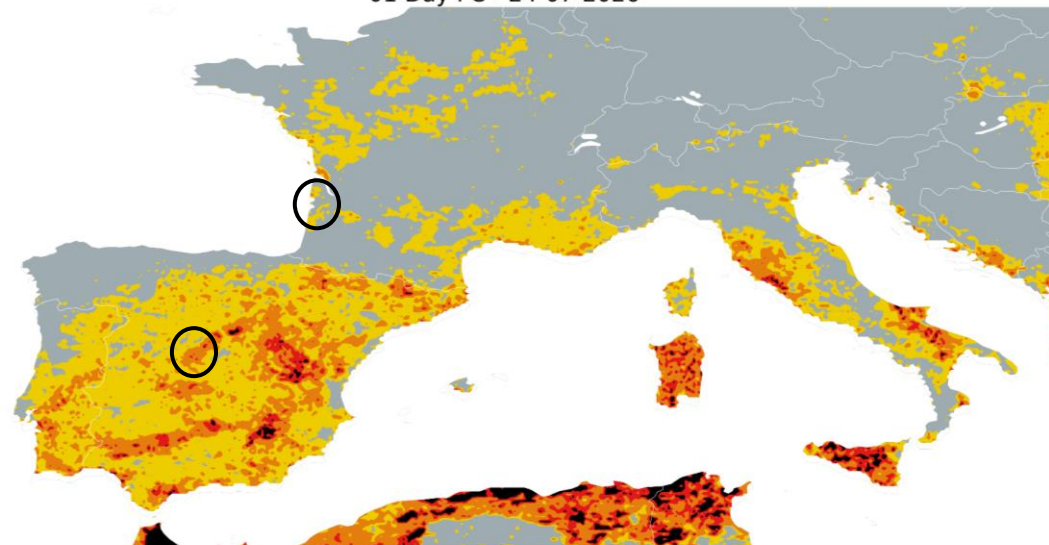




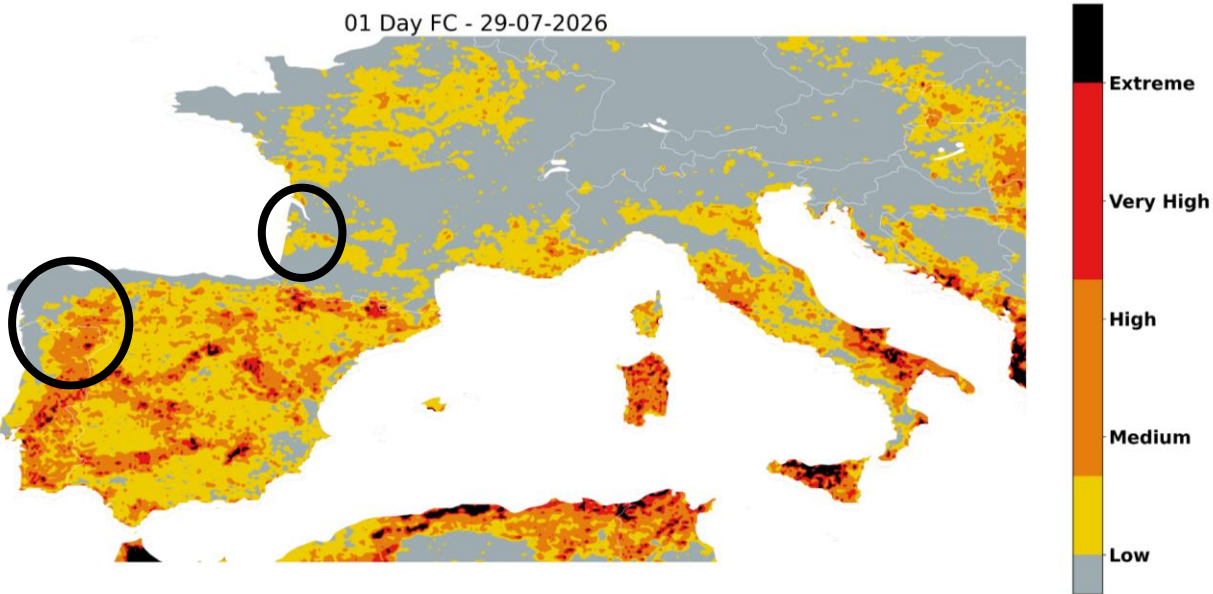
23rd July – continuation of Bordeaux
and New Madrid fires



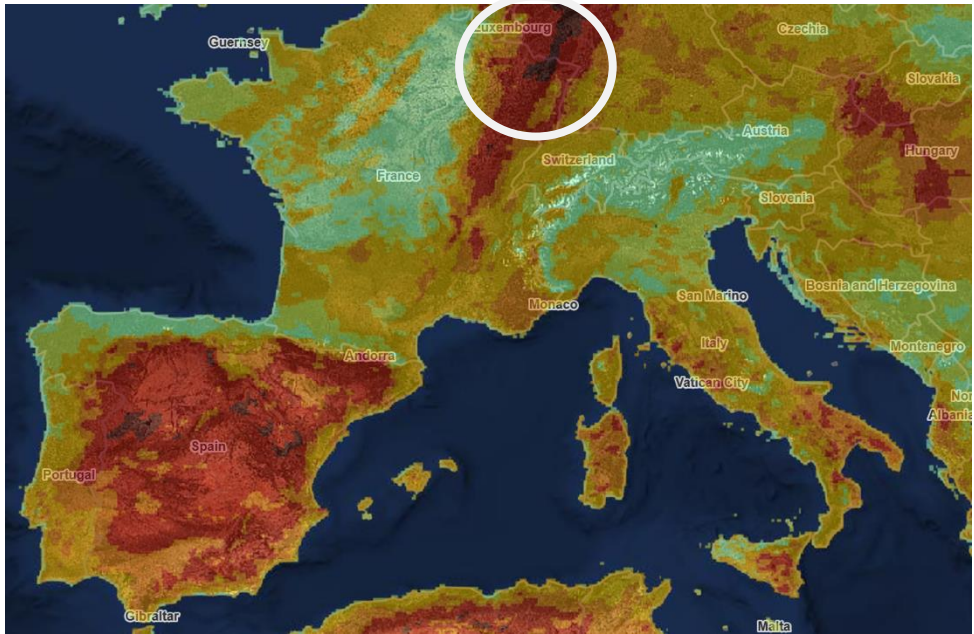
01 Day FC - 24-07-2026



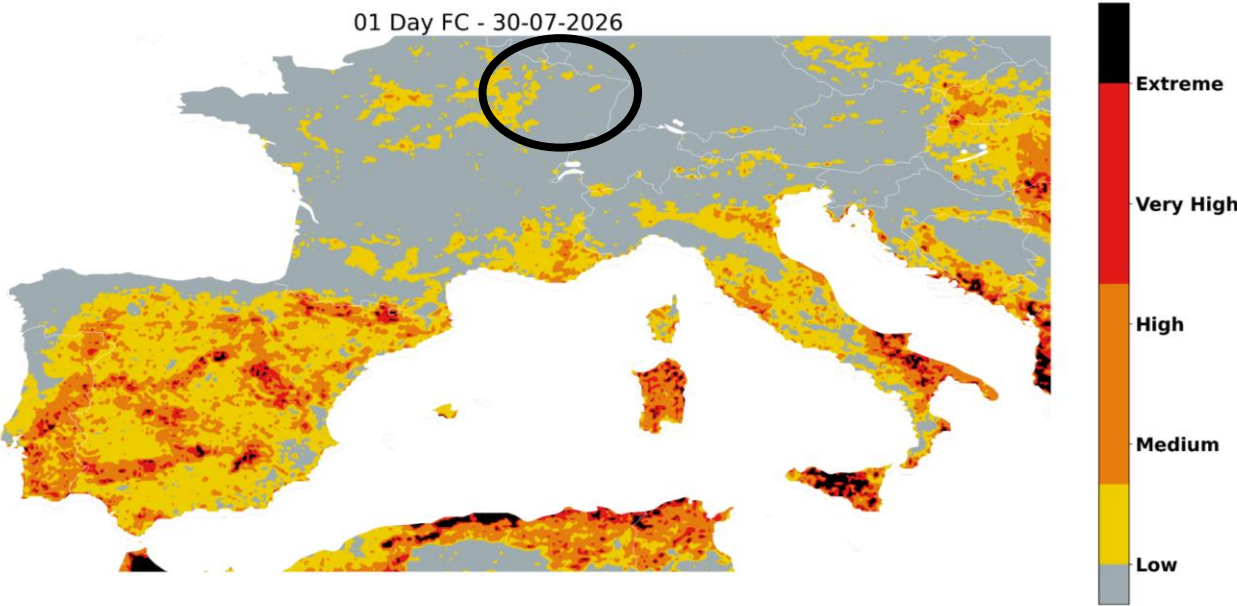
24th July – peak of extreme fires



29th July – re-emergence in Portugal & NW Spain



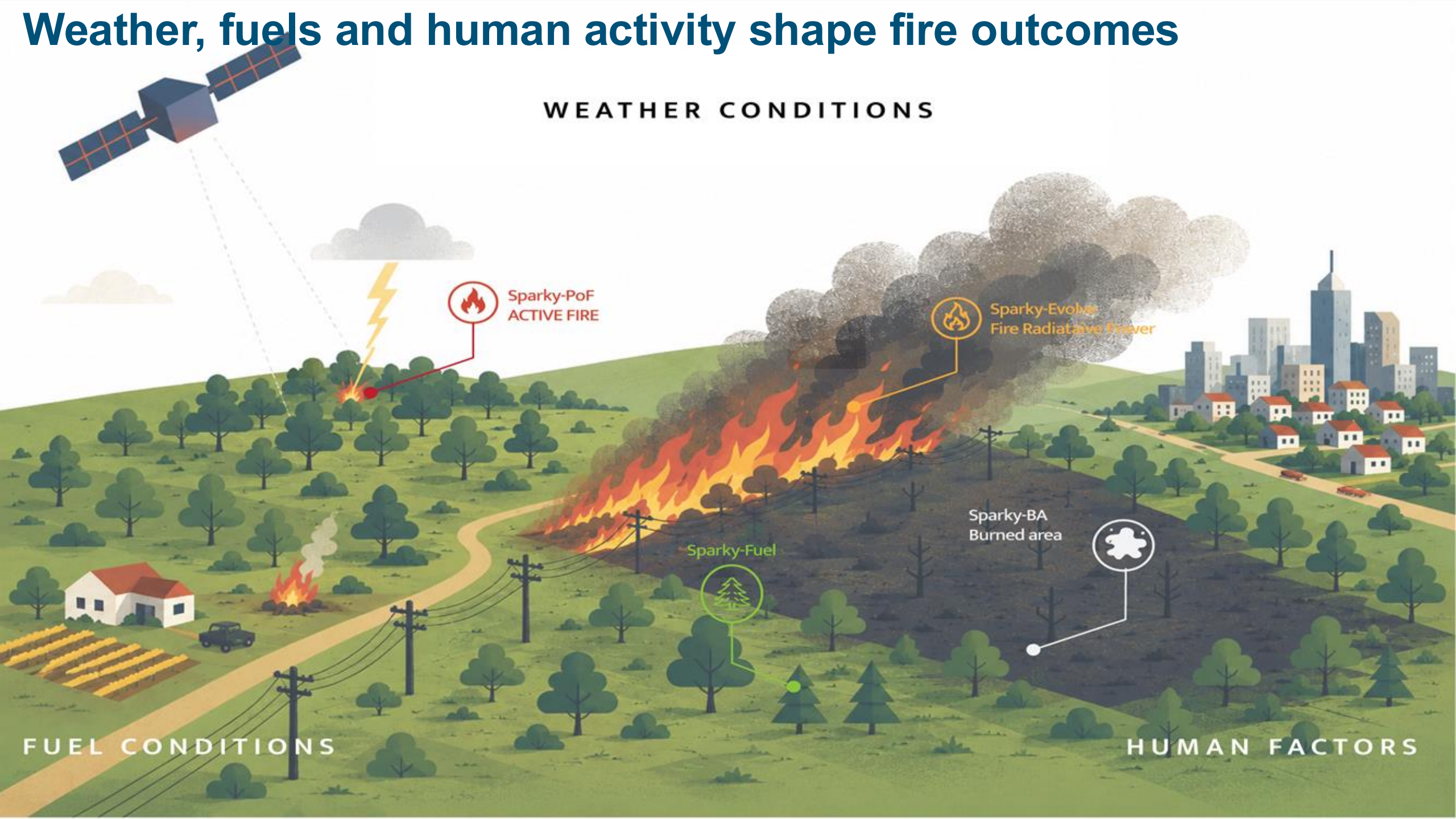
30th July – false alarms in FWI



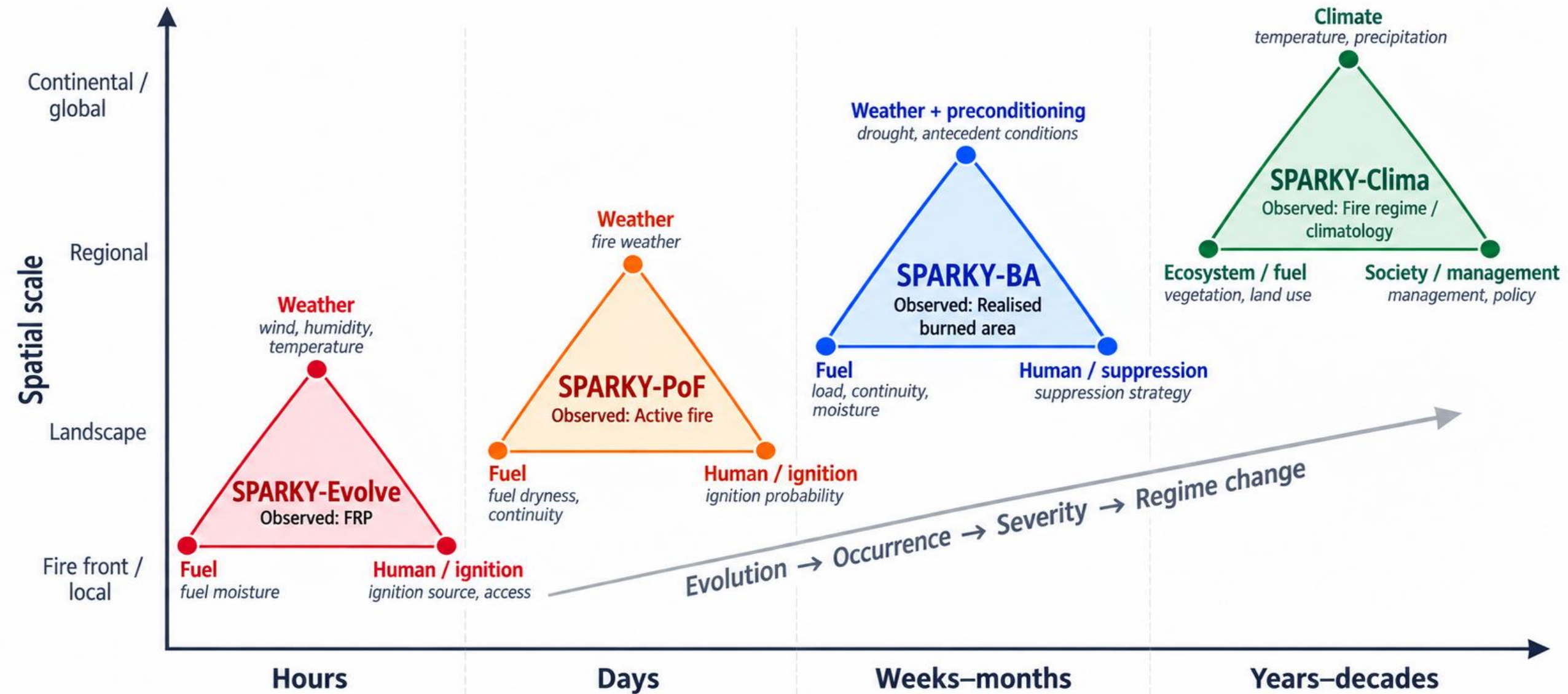
How can complementary predictions help us decide where to focus limited monitoring resources?

Second part of the talk

Weather, fuels and human activity shape fire outcomes

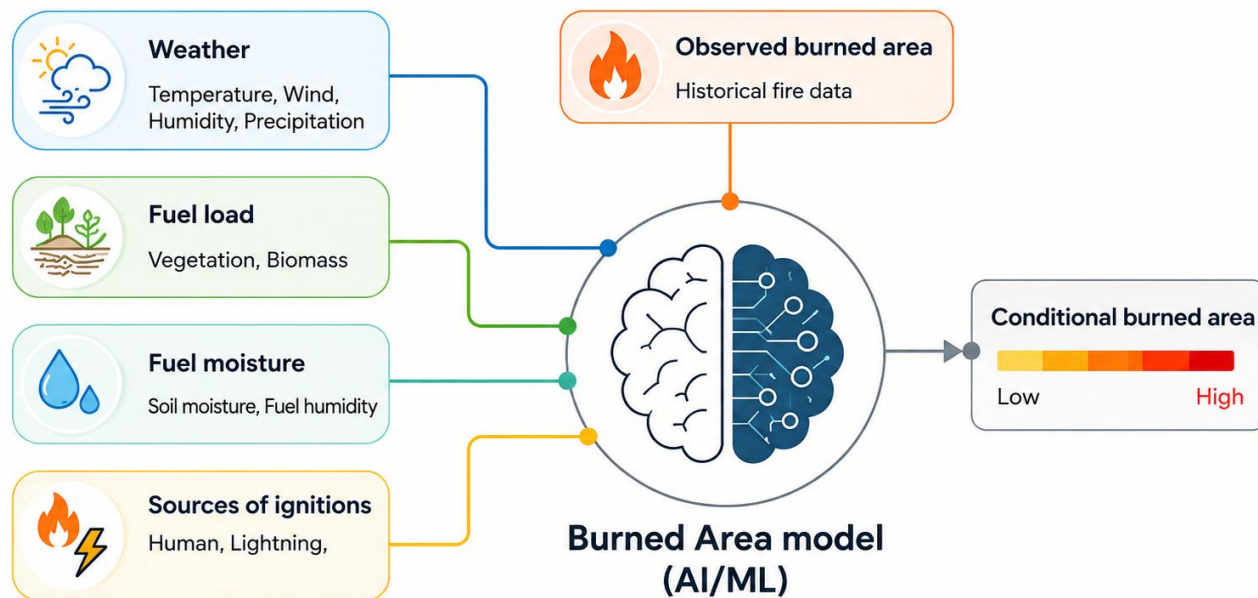


SPARKY across wildfire time and space scales



SPARKY-BA: potential burned area if fire occurs

Where is fire likely, and how much could burn if it occurs?



Combines weather predictions, land-surface information and satellite observations.

Uses XGBoost regression to estimate burned area conditional on fire occurrence.

Trains on MODIS burned-area observations for fire cases.

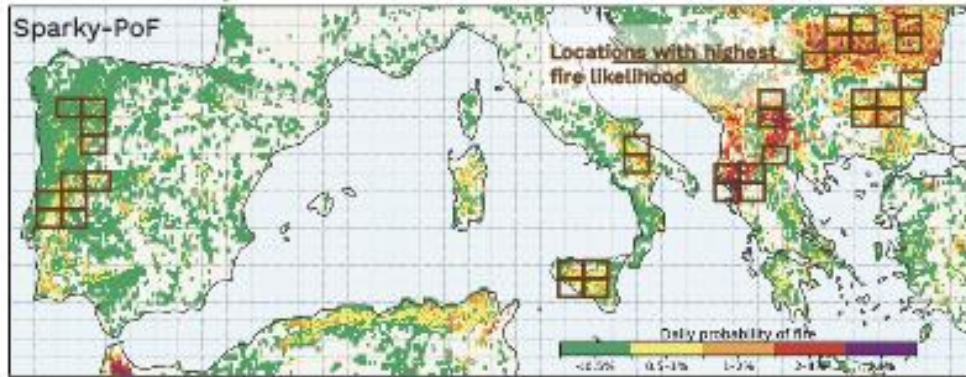
Produces daily estimates at 9 km resolution. Research model, not yet operational.

McNorton and Di Giuseppe, in preparation

Combining occurrence and potential burned area

PoF × conditional burned area provides a starting point for prioritisation.

Where is fire likely?



If fire occurs, how much could burn?



Fire likelihood and expected BA defines the top x% prioritised

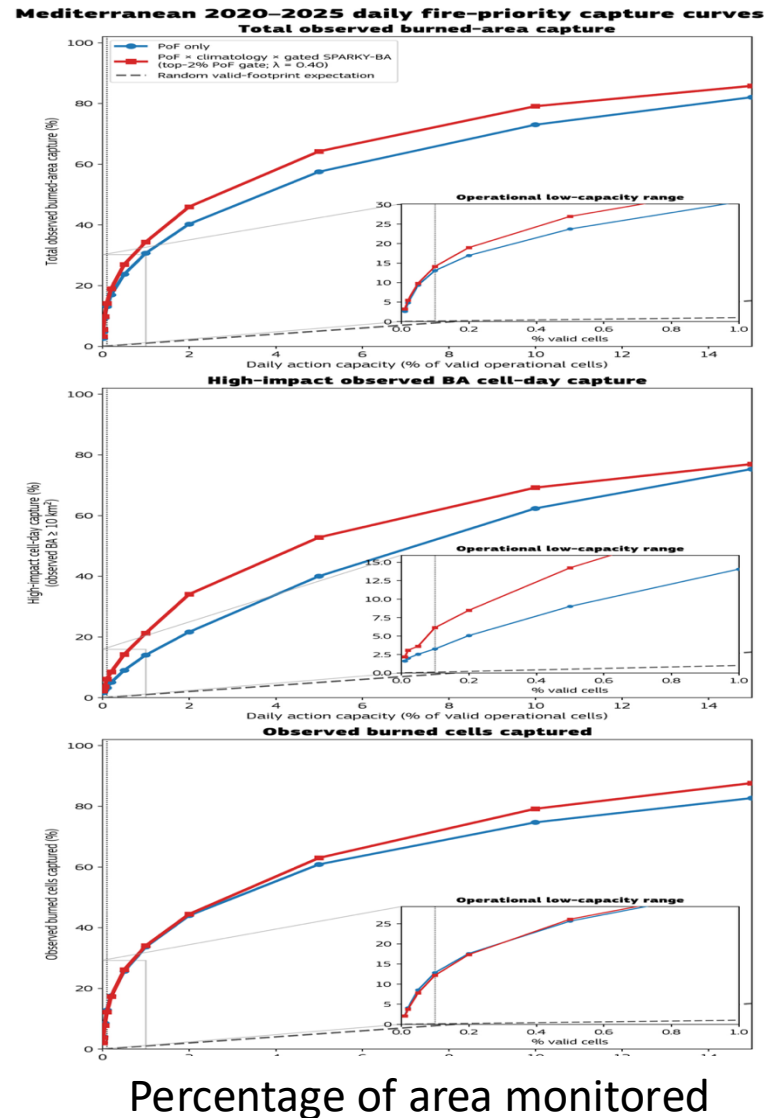


McNorton and Di Giuseppe, in preparation

Select the highest-priority areas within the available monitoring capacity.

How much burned area can limited monitoring capture?

Fraction of burned area captured



A fixed monitoring budget

If we can monitor only X% of the land, how much of the observed burned area falls within the selected locations?

Compare rankings based on PoF alone with the combined occurrence–burned-area priority score.

In this evaluation, the combined approach is particularly useful when monitoring covers only around 0.1–1% of the land.

Capture measures spatial coverage of observed burning, not prevented losses.

Conclusions

Extreme fire weather can affect several European regions at once, placing pressure on shared resources.

Climate change raises the **likelihood** of extreme fire weather and its **synchronisation** across countries.

Satellite observations and AI offer complementary information on fire evolution, occurrence and potential severity.

SPARKY connects these perspectives across space and time.

Combining predictions can help prioritise monitoring when resources are limited.

Outlook

Earlier warning

Track fuel growth and drying to capture the landscape's memory before ignition.

Understand predictive skill

Identify which observations add useful information, where they help and how they can inform future satellite missions.

Support adaptation

Connect fire prediction with fuel management and landscape planning alongside emergency response.