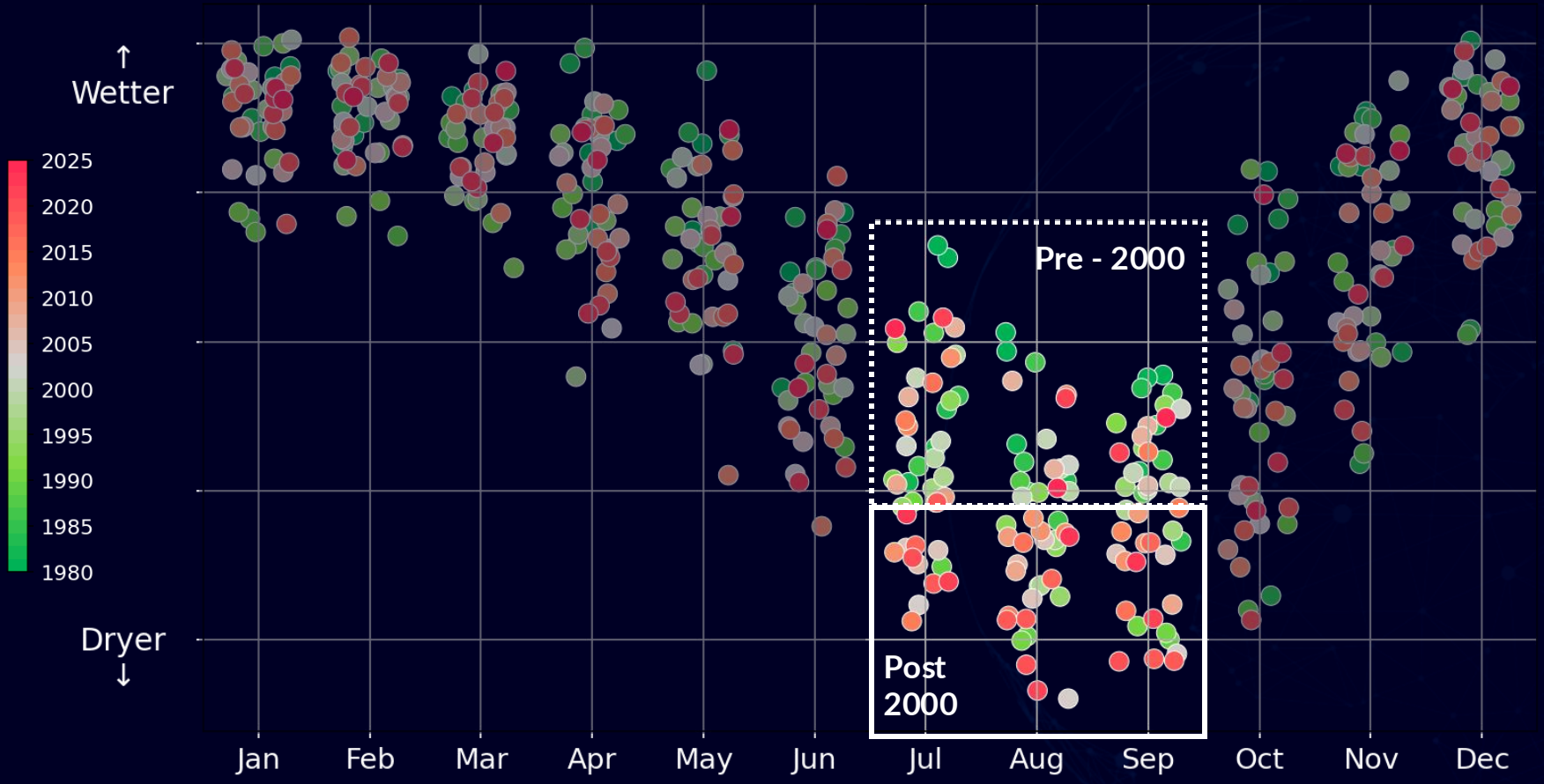
reask
earth system risk

# *Modelling European (Drought and) Wildfire Risk*

September 2025

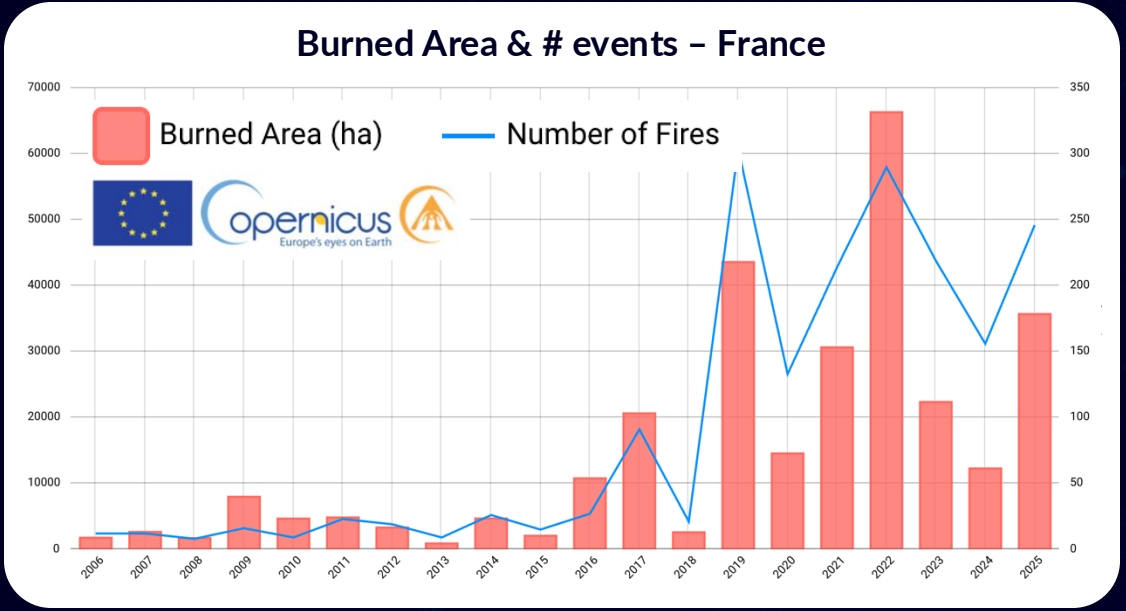
Oasis Conference – Paris

# Soil Wetness Index over France
(derived from ERA5-Land during the satellite-era)

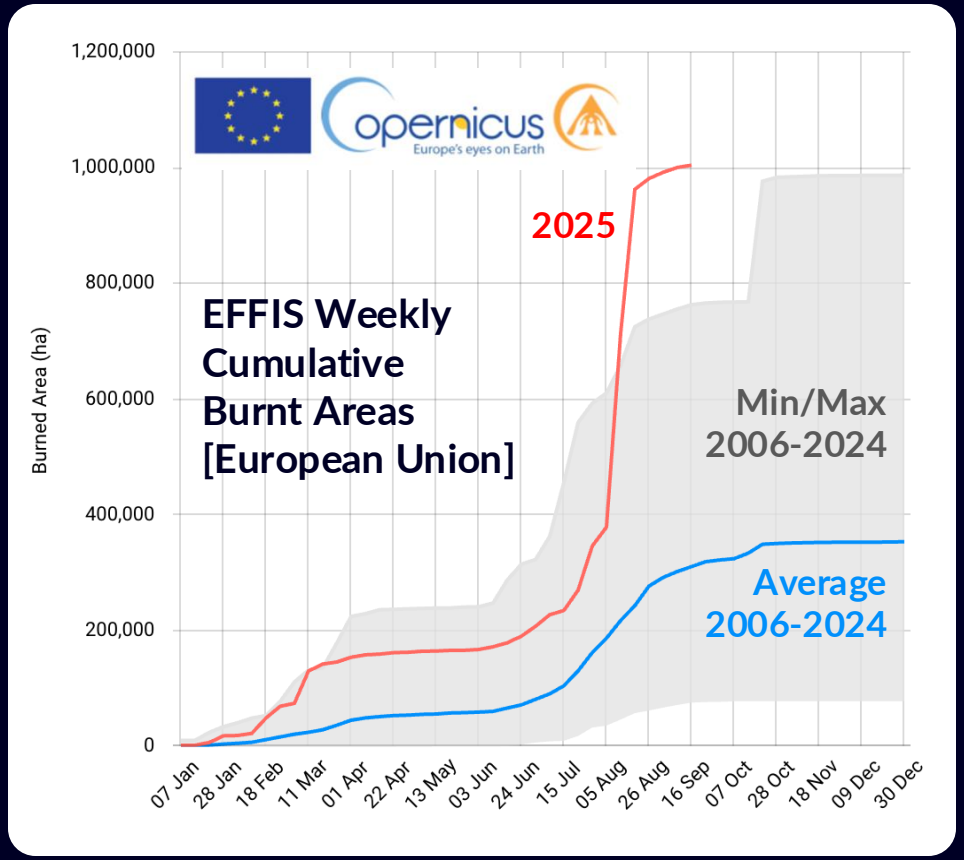


# Interest in European Drought & WF models is increasing

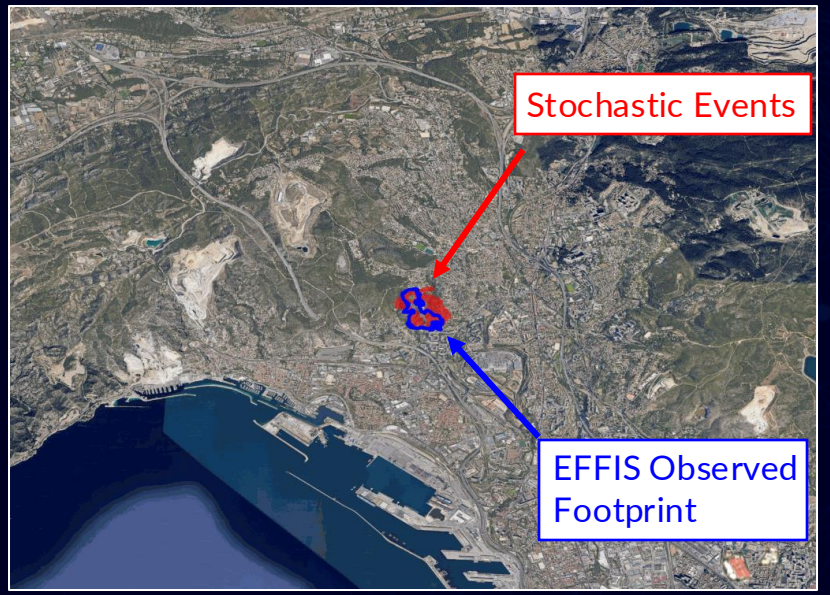
- Recent years have seen large numbers of losses driven by drought (for France 2018, 2022 for example)
- and by WF (Portugal 2017, Mediterranean region 2021)
- 2025… potential for the largest WF season ?



# What happened so far in 2025 ?




Example: Marseille, July 2025 ( France)

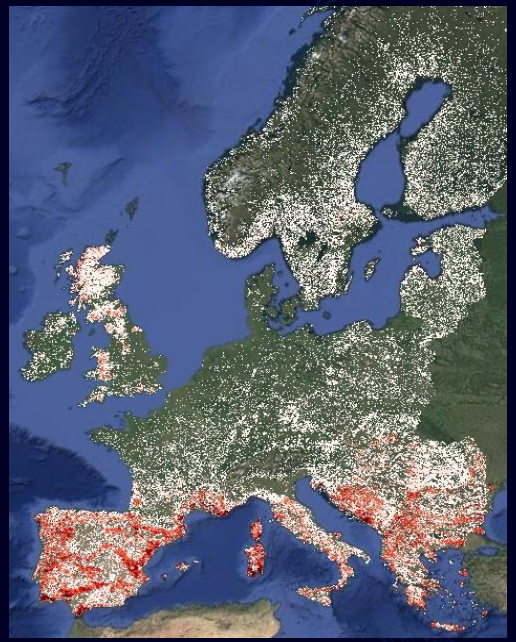



- Should these perils be considered as Cat event ?

# Climate connected risk models help expand limited historical records

- **Data scarcity context;** 20+ years of data with most significant seasons over Southern Europe.
- Clear divide between Northern and **Southern Europe in EUWF too.**
- **UK** also exposed, mostly over **natural grassland and moorland**
- At high RPs, regions not usually associated with wildfire are also exposed

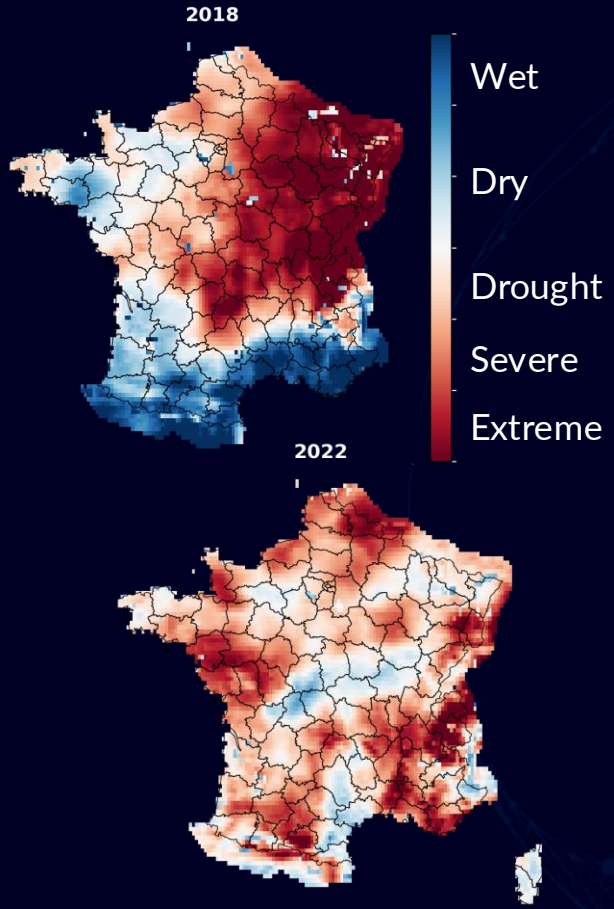
EUWF Return Period map, stochastic years



Globfire data, 20 years of

# Interconnecting Perils: Drought <> Wild Fire

- Subsidence risk: the special case of France

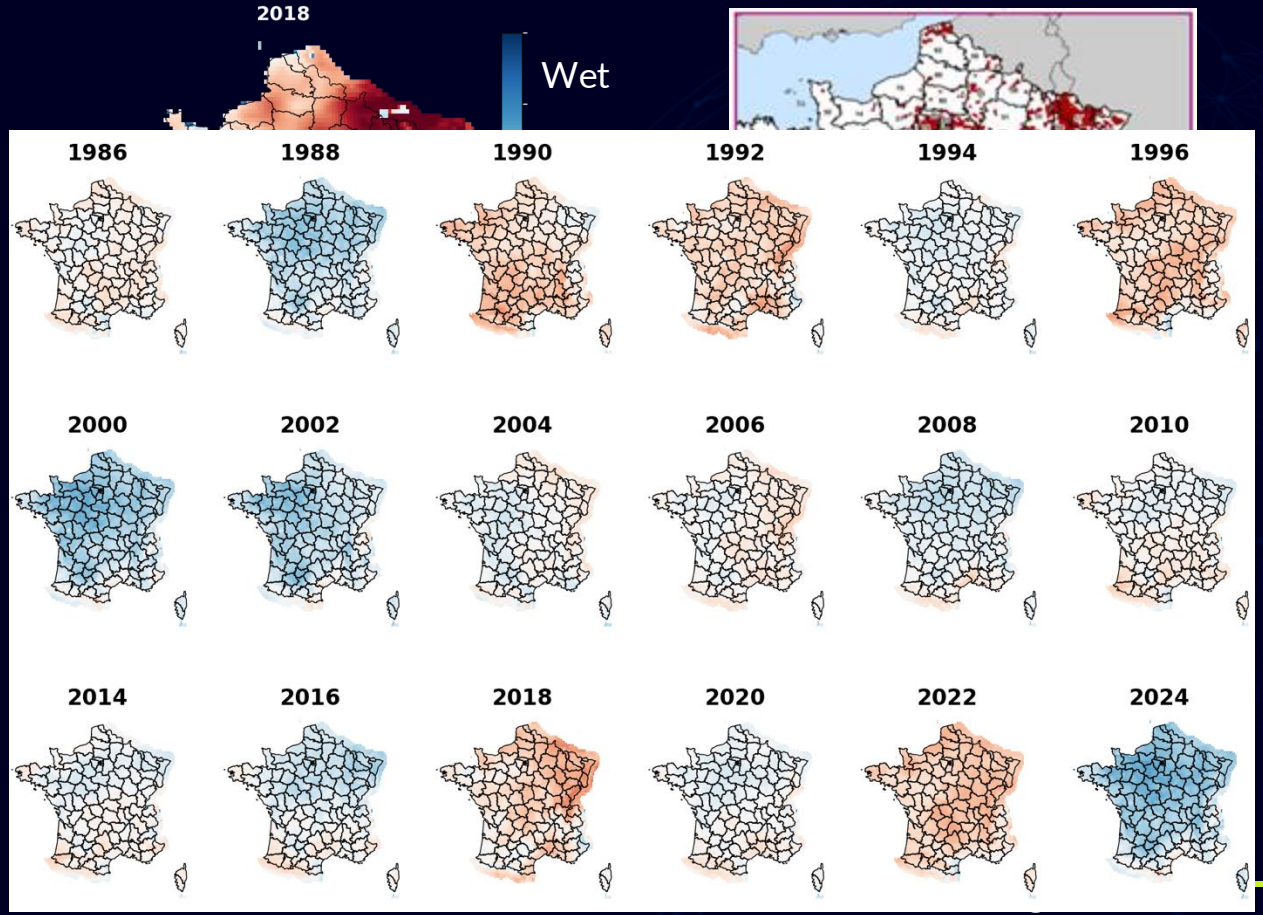



Nat Cat recognition

# Interconnecting Perils: Drought <> Wild Fire

- Subsidence risk: the special case of France

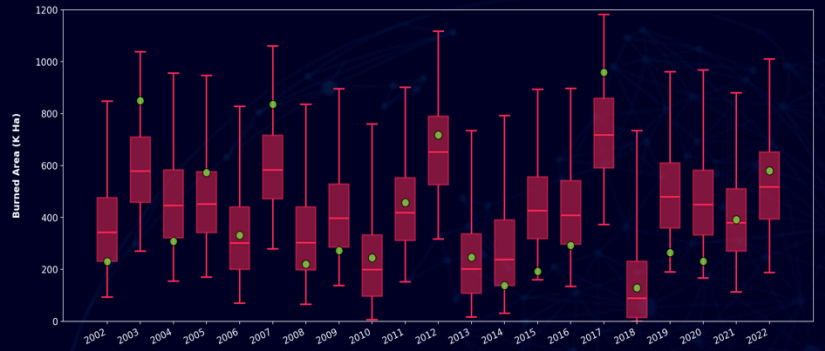
- Building an event-set based on SWI to follow the Nat Cat system
- Climate-connected
- Interconnected to WF risk



# Modelling Framework : Top-down approach

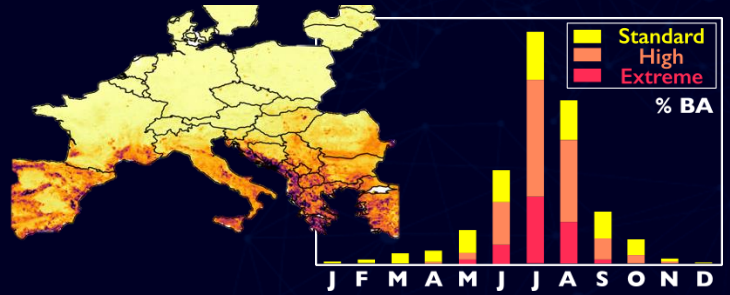
## Fire activity modelling (Burnt Area + Number of events)

→ Sample **targets of fire activity** from distributions conditioned to the climate



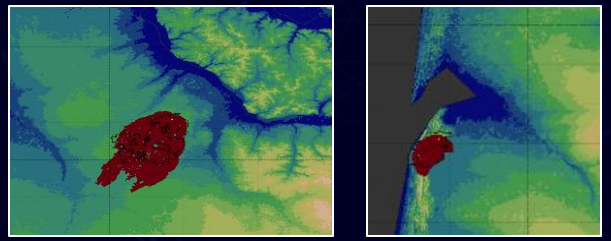

## Ignition modelling

→ Create **location level events** (coordinates and date) driven by **key human and natural risk factors**




## Fire propagation modelling

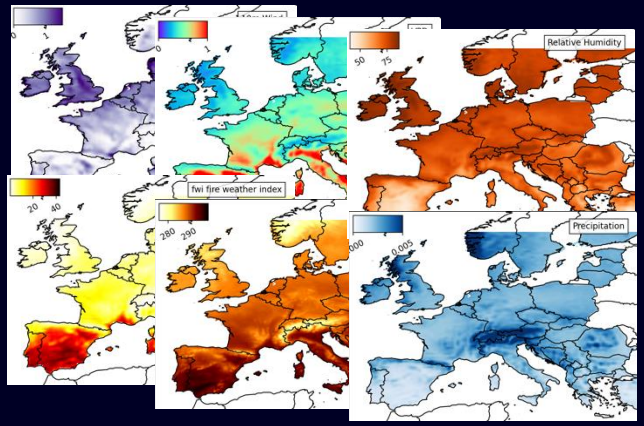
→ Create **event footprints** with burnt/not burnt information



# What drives BA, ignition and fire behaviour

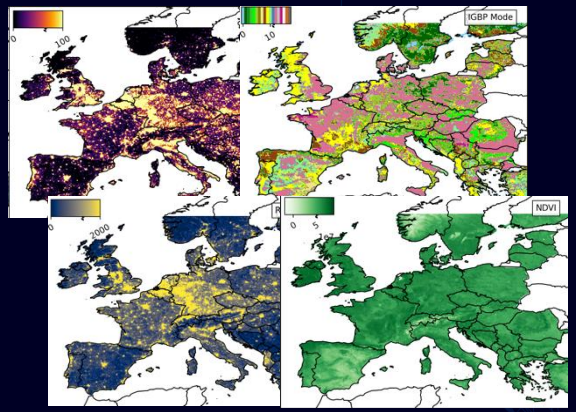
**Climate and Fire weather**

- Temperature
- Wind
- Relative Humidity
- VPD
- Precipitation
- Fire Weather Index
- Lightning



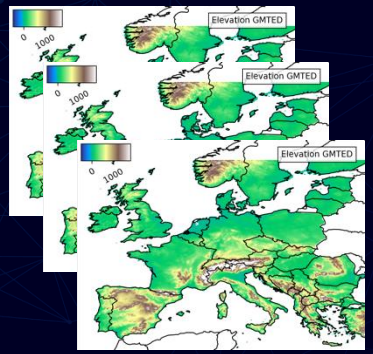

**Land cover**

- Fuel Model
- Tree Cover
- Roads
- Land Cover
- Wildland Urban Interface
- Population
- Grass Land
- NDVI




**Topography**

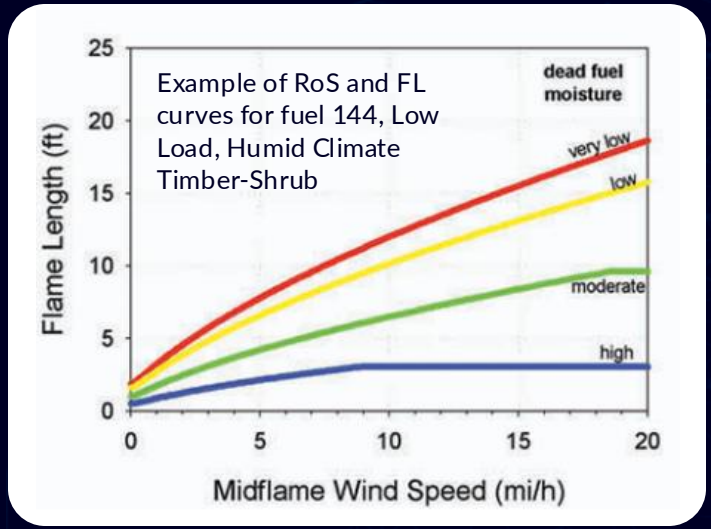
- Elevation
- Slope
- Aspect



# Propagation modelling – Fuel data and spread model

- The fuel model follows **Scott & Burgan fuel classification**
- Each fuel class has **4 flammability profiles**

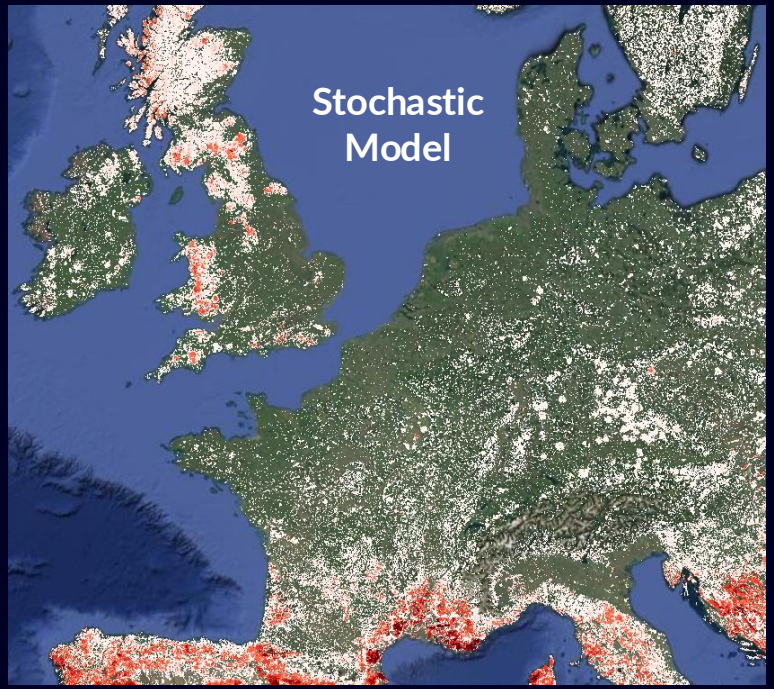
| | STANDARD | HIGH | EXTREME |
|---|---|---|---|
| Fuel flammability | LOW | Medium / High | HIGH |
| Propagation onto agricultural covers | ✗ | ✓ | ✓ |
| Propagation onto WUI | ✗ | ✗ | ✓ |
| Embers | ✗ | ✗ | Possible |
| Road crossing | ✗ | Possible | Possible |

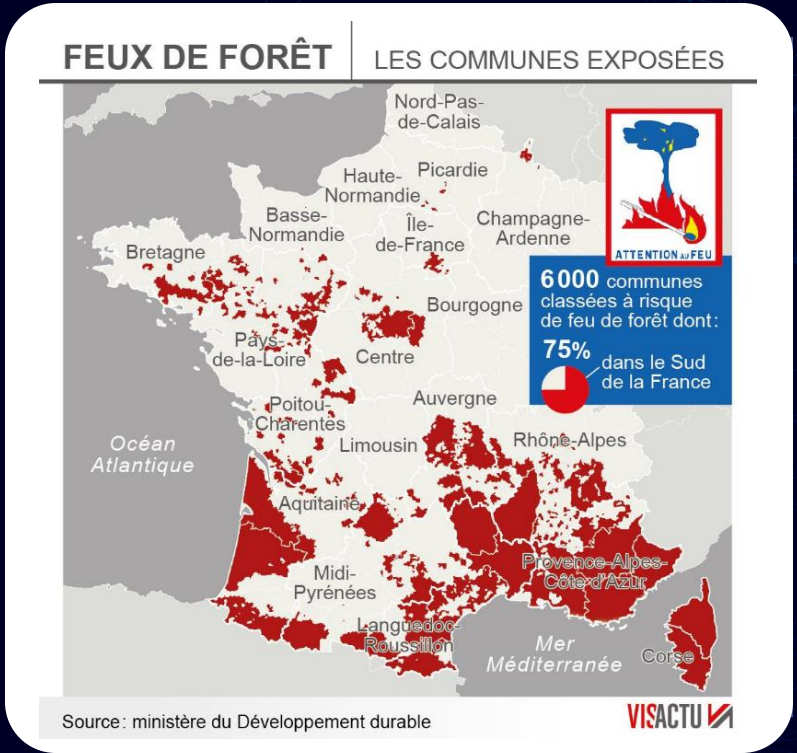



- Stochastic events are classified as Standard, High, Extreme and propagation profiles vary
- Based on Wind, RH, Temp and FWI

# Return period maps – Atlantic, Continental, British Islands

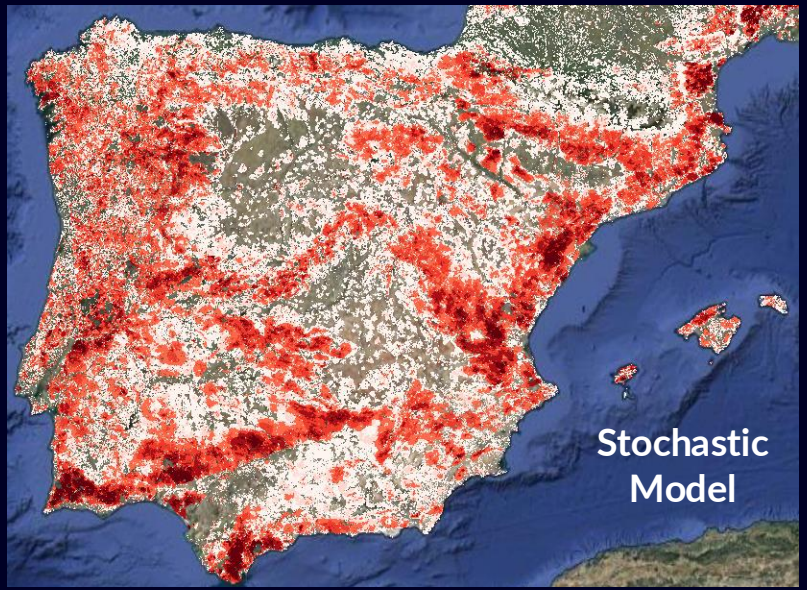
- Most of the risk concentrate in Southern France (Landes, Gironde, Ardèche, Drôme)
- At high RPs, regions not usually associated with wildfire are also exposed

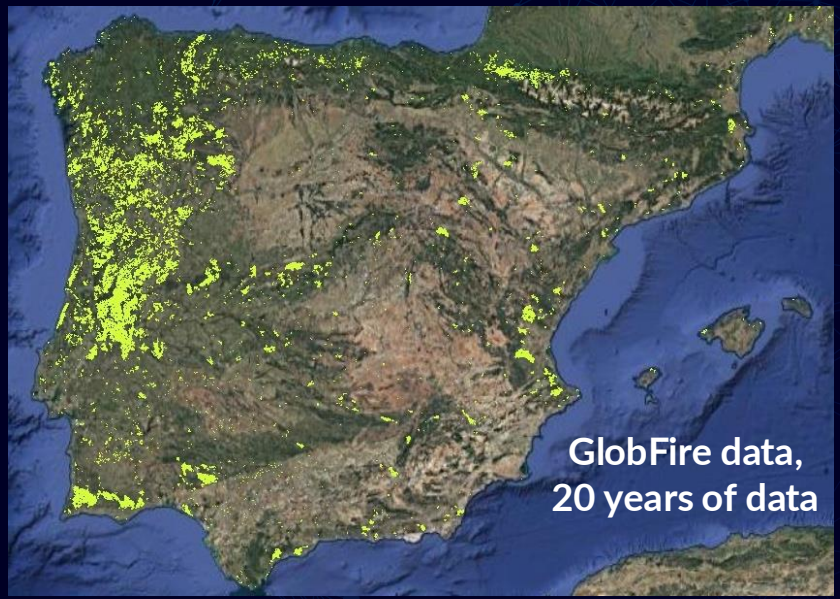


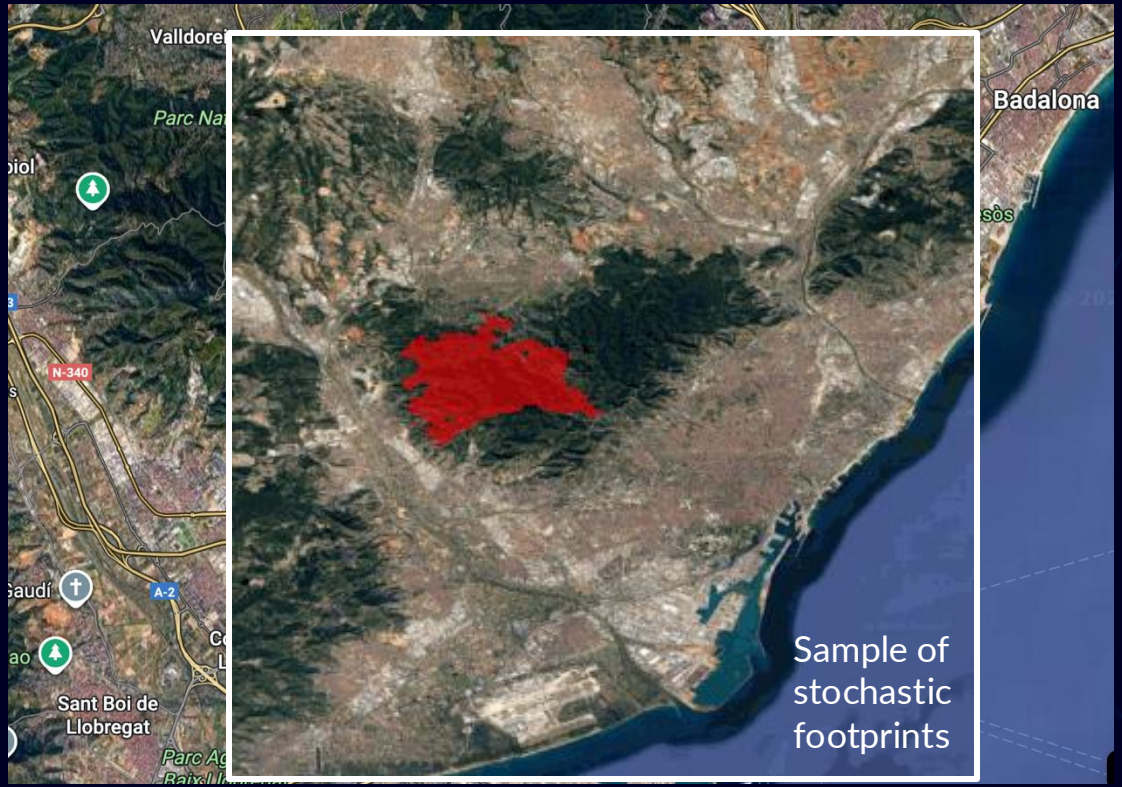
# Return period maps – Iberia region

- Iberia region shows a widespread high level of risk, with only intensive cropland regions left aside
- Portugal is the most exposed country



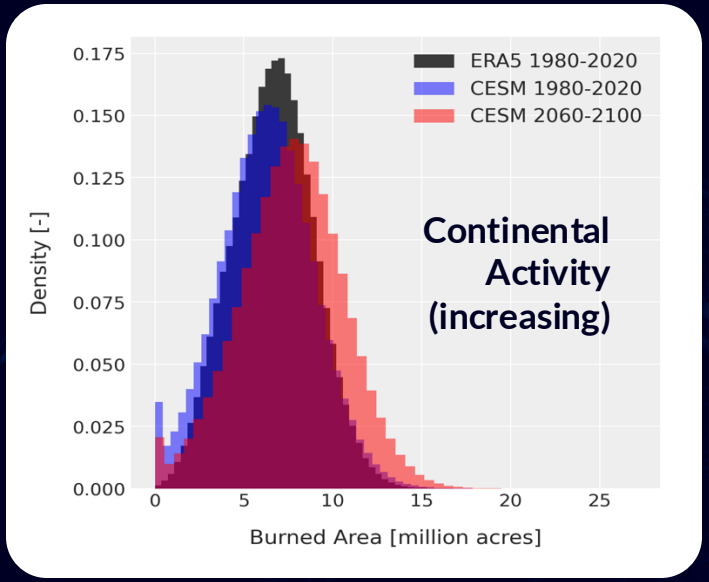
# What if a fire was happening in Barcelona…




- Potential areas at risk near populated and high exposure areas.
- Potential headache for evacuation
- High values properties being directly at risk
- Air quality and Health

**Collserola, Barcelona**

# Climate Change Potential Impacts




- Increasing trend in total BA in EU.
- Extreme weather conditions leads to more frequent extreme fire behaviour (overwhelming event response) + concomitant events
- Vegetation load/state and wet / dry phases (incl. long term drought)
- In a longer term,
  - Land use / cover changes will impact wildfire risk (e.g. Spain with land abandonment)
  - Longer seasons as the earth is warming and expansion to Northern latitudes
  - Vegetation changes, illness
- Prevention and suppression strategy + advances in technology to detect fires

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