

ARISTOTLE-eENHSP Forest Fires Hazard Group

Mathieu Regimbeau

EO products for Wildfires 2021

26 May 2021

ARISTOTLE-eENHSP Forest Fires HG

- **ARISTOTLE-eENHSP project**
- Aristotle Forest Fire Hazard Group
 - Who we are
 - What we provide
 - How we do
- Aristotle FF products
 - Routine Mode reports
 - Emergency reports

ARISTOTLE-eENHSP

- All Risk Integrated System TOwards Trans-boundary hoListic Early-warning
- enhanced European Natural Hazards Scientific Partnership
- To deliver Multi-hazard scientific assessments to European Commission Emergency Response Coordination Center (ERCC)
- eENHSP : 2020-2024
 - Consolidate and expand operational services
 - Multi-Hazard Board / extended global 24/7 monitoring and analysis

ARISTOTLE-eENHSP

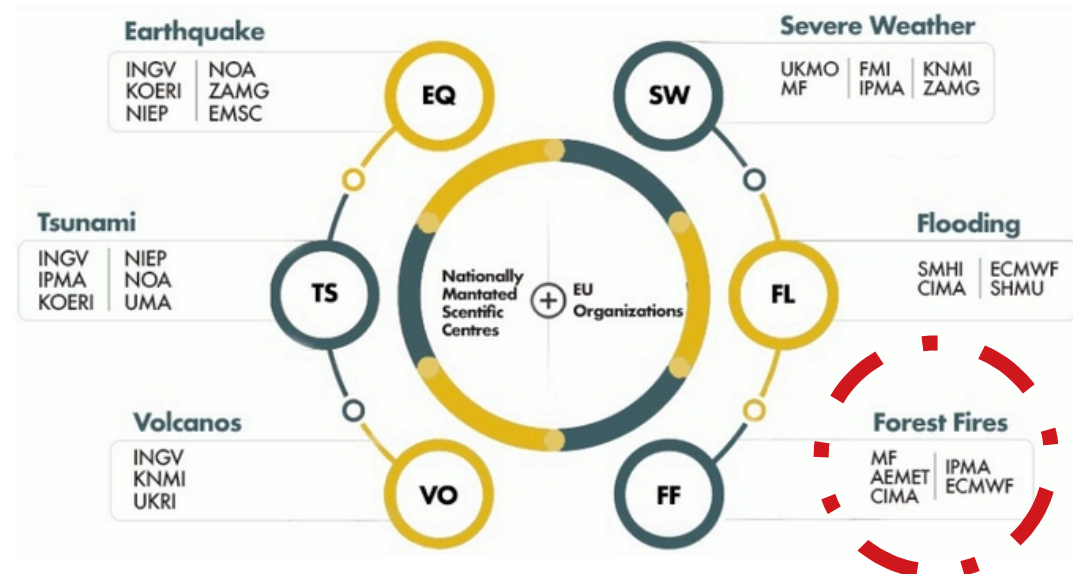
- All Risk Integrated System TOwards Trans-boundary hoListic Early-warning
- enhanced European Natural Hazards Scientific Partnership
- To deliver Multi-hazard scientific assessments to European Commission Emergency Response Coordination Center (ERCC)
- eENHSP : 2020-2024
 - Consolidate and expand operational services
 - Multi-Hazard Board / extended global 24/7 monitoring and analysis
- 2 modes : Emergency and Routine modes
 - Emergency : 24/7 operational response to major events w/ dedicated scientific reports
 - Routine mode : 3/weekly Multi-Hazard reports
 - (both monitoring + forecasts)
 - VTC/Briefings to ERCC

ARISTOTLE-eENHSP

- 6 Hazards

Non-forecastable hazards	Forecastable hazards
Earthquakes	Severe Weather events
Tsunamis	Floodings events
Volcanic eruptions	Wildfires/Forest Fires events

- 16 European institutions
+ 2 international organisations



ARISTOTLE-eENHSP Forest Fires HG

- ARISTOTLE-eENHSP project
- **Aristotle Forest Fire Hazard Group**
 - Who we are
 - What we provide
 - How we do
- Aristotle FF products
 - Routine Mode reports
 - Emergency reports

Aristotle Forest Fire Hazard Group

- Who we are
 - Météo-France (FR) *leader*, IPMA (PT), CIMA (IT), AEMET (SP) :
FF danger expertise, assessment for national CPAs
 - operative on-duty FF forecasters
 - weekly rotation to deliver FF assessments to ERCC & Aristotle
 - ECMWF : FF danger expertise, data provider (Copernicus Fire computation operator)

Aristotle Forest Fire Hazard Group

- Who we are
 - Météo-France (FR) *leader*, IPMA (PT), CIMA (IT), AEMET (SP) :
FF danger expertise, assessment for national CPAs
→ operative on-duty FF forecasters
→ weekly rotation to deliver FF assessments to ERCC & Aristotle
 - ECMWF : FF danger expertise, data provider (Copernicus Fire computation operator)
 - Forest Fires services in Aristotle
 - 2018 expert group, 2019 demos, 2020 pre-operational
→ ERCC's satisfaction
 - 2021 operational phase, w/ global coverage

Aristotle Forest Fire Hazard Group

- What we provide
 - 2020+ : ROM activities : 3/weekly FF contributions in MHOB reports
 - **Fire Weather Danger Forecasts for 2/3 days** (until next MH report)
 - Pan-European Domain*
 - Monitoring Major on-going fire events *Global Coverage*
 - 2020+ : Emergency Activations *Global Coverage*

Aristotle Forest Fire Hazard Group

- What we provide
 - 2020+ : ROM activities : 3/weekly FF contributions in MHOB reports
→ **Fire Weather Danger Forecasts for 2/3 days** (until next MH report)
Pan-European Domain
→ Monitoring Major on-going fire events *Global Coverage*
 - 2020+ : Emergency Activations *Global Coverage*
 - Added value for ERCC
 - Human assessments, complementary to EFFIS/GWIS
 - **focusing main Fire Weather Danger Areas**
 - + Specific requested areas (by ERCC) to assess
 - + FF contributions for MH impacted areas
 - → **Tailored** and synthetic information to be delivered to ERCC
 - Common Aristotle scale to present MH events

Aristotle Events	Green events	Yellow Ev.	Amber Ev.	Red Events
------------------	--------------	------------	-----------	------------

Aristotle Forest Fire Hazard Group

- How we do
 - Overlapping of fire indices and weather parameters
 - ECMWF weather forecasts (and specific diagnoses) [[EC-Charts](#)]
 - Copernicus Forest Fire Indices [[EFFIS - GWIS](#)]
 - FF info (active fires, rapid damage products, MODIS, VIIRS NRT, ...)
 - FF assessments

Aristotle Forest Fire Hazard Group

- How we do
 - Overlapping of fire indices and weather parameters
 - ECMWF weather forecasts (and specific diagnoses) [\[\[EC-Charts \]\]](#)
 - Copernicus Forest Fire Indices [\[\[EFFIS - GWIS \]\]](#)
 - FF info (active fires, rapid damage products, MODIS, VIIRS NRT, ...)
 - FF assessments
 - institutional resources and expertise,
 - how to combine indices/parameters,
 - thresholds/methods (*Forecasts = Always learning-by-doing → adaptations/modulations*)
- Fire Weather danger (danger scale, levels)

Aristotle Forest Fire Hazard Group

- How we do
 - Overlapping of fire indices and weather parameters
 - ECMWF weather forecasts (and specific diagnoses) [\[\[EC-Charts \]\]](#)
 - Copernicus Forest Fire Indices [\[\[EFFIS - GWIS \]\]](#)
 - FF info (active fires, rapid damage products, MODIS, VIIRS NRT, ...)
 - FF assessments
 - institutional resources and expertise,
 - how to combine indices/parameters,
 - thresholds/methods (*Forecasts = Always learning-by-doing → adaptations/modulations*)
 - Fire Weather danger (danger scale, levels)
 - Mitigation w/ Hazard + Exposure + Vulnerability + Ignitions (on-going)
 - processing data over **main Fire Weather Danger Areas**
 - **Tailored** and synthetic information to be delivered to ERCC

ARISTOTLE-eENHSP Forest Fires HG

- ARISTOTLE-eENHSP project
- Aristotle Forest Fire Hazard Group
 - Who we are
 - What we provide
 - How we do
- **Aristotle Forest Fire products**
 - Routine Mode reports
 - Emergency reports

FF ROutline Mode assessment

- Integrated in MH Report
- Headlines / World map
- Specified when forecasted FF

HEADLINES

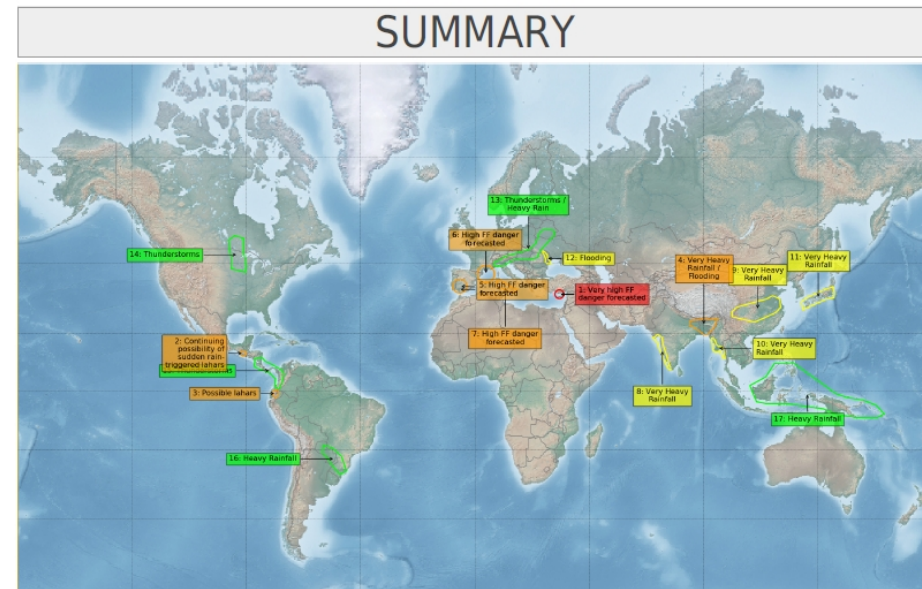
- **Very high forest danger forecasted over Central Turkey and central Cyprus**
- Possible lahars
- Possible lahars continue to affect the areas surrounding Sangay volcano, Ecuador
- Flooding in Bangladesh continues
- **High forest fire danger forecasted over Southern Iberian Peninsula**
- **High forest fire forecasted over Southern France and northeastern Spain**
- **High forest fire danger over Southern Sardinia and Sicilia**

SUMMARY



FF ROutline Mode assessment

- Integrated in MH Report
- Headlines / World map
- Specified when forecasted FF
- For each noticeable FF event (orange/red)
description and highlighting days/
forecasts conditions over period +
Image
- For each noticeable FF event (green/yellow)
descriptive text (no image)



FF ROM assessment

- **Description of FF events**
- Weather conditions illustrating fire danger assessment (indices, hours)

5: High Fire Danger - Southern France

Description

High Fire Danger expected for today over Southern France, expected to decrease tomorrow and increasing for Friday. Fire Weather Index (FWI) values around 50, reaching tomorrow locally FWI values <40.

High fire danger patterns expected over the next 2 days are in agreement high fire spread conditions (high ISI levels, ISI>15) and potential ignitions due to low fuels moisture patterns (high FPMC levels, FPMC>95).

8th-10th July

Maximum daily temperatures varying between 30°C-32°C today, increasing locally up to 34°C tomorrow over all this region. Low daily relative humidity values below 40%-30% over next 2 days, with no significant night recovery humidity levels. Southerly wind gusts, blowing between 30-40 km/h, during these two afternoons. Expected lightning occurrence (Moderate-High Lightning) and atmospheric instability over this region on the 10th July.

Impacts

Extreme wildfires are not expected since the values of Drought Code are still moderate to high.

Occurred fires on the last days were mainly in agricultural and crop areas.

FF ROM assessment

- **Description of FF events**
- Weather conditions illustrating fire danger assessment (indices, hours)
- Use of classic FWI map to present the level of assessment ==> fire danger ellipsoids

5: High Fire Danger - Southern France

Description

High Fire Danger expected for today over Southern France, expected to decrease tomorrow and increasing for Friday. Fire Weather Index (FWI) values around 50, reaching tomorrow locally FWI values <40.

High fire danger patterns expected over the next 2 days are in agreement high fire spread conditions (high ISI levels, ISI>15) and potential ignitions due to low fuels moisture patterns (high FPMC levels, FPMC>95).

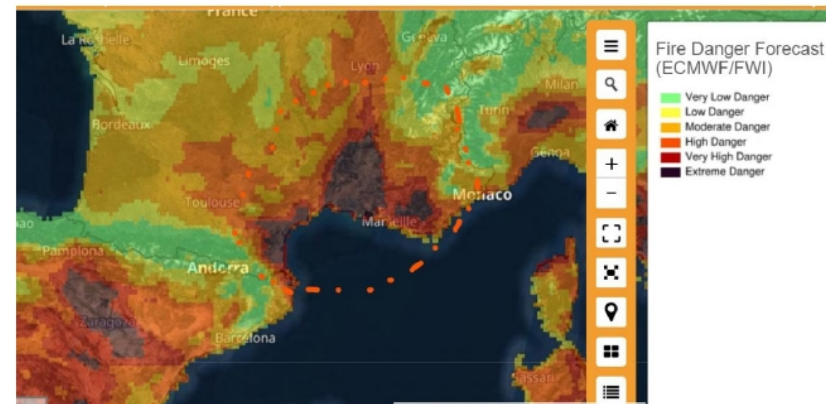
8th-10th July

Maximum daily temperatures varying between 30°C-32°C today, increasing locally up to 34°C tomorrow over all this region. Low daily relative humidity values below 40%-30% over next 2 days, with no significant night recovery humidity levels. Southerly wind gusts, blowing between 30-40 km/h, during these two afternoons. Expected lightning occurrence (Moderate-High Lightning) and atmospheric instability over this region on the 10th July.

Impacts

Extreme wildfires are not expected since the values of Drought Code are still moderate to high.

Occurred fires on the last days were mainly in agricultural and crop areas.



Legend : FWI map with ellipsoid highlighting the assessed danger area. FWI values using the EFFIS color thresholds are only a geographic support for the Aristotle assessments.

Dashed Orange ellipsoid corresponds to a forecasted High Level of Fire Weather Danger.



FF ROM assessment example.

- MHOB report : 21/08/20
 - **Headlines** : High Fire Danger over Mediterranean France and Italian Islands

5: High Fire Danger - Mediterranean France and Italian Islands

Description

High Fire Danger over these regions for the next 2 days, with $50 < FWI < 60$ values, expected to increase on Sunday (locally up to 70). Fire danger patterns linked to high fire spread conditions ($ISI > 20$), being locally higher; and high conditions for potential ignitions due to low fuels moisture patterns ($FFMC > 95$).

FWI high anomaly values are expected due to persistent hot and dry weather conditions and to strong wind gusts periods.

21st – 23rd August

Mediterranean France: Maximum daily temperatures varying between 30°C-34°C, locally up to 34°C-36°C for the next days. Low daily relative humidity values varying between 20-40% in the afternoon, with no significant night recovery on Saturday, along with minimum temperature varying between 20°C -24°C. Moderate southerly winds, becoming strong northerly winds from Saturday (30-50km/h), with gusts up to 60-70km/h. Expected lightning occurrence (Low-Moderate Lightning) on Saturday.

Italian Islands (Sardinia and Sicilia): Maximum daily temperatures varying between 30°C-34°C, locally up to 34°C-36°C especially for today and tomorrow. Low daily relative humidity values varying between 20-40% in the afternoon, with no significant night recovery (40-60%) especially over mountain areas, along with minimum temperature varying between 20-24°C, locally up to 26°C. Moderate southerly winds, becoming northerly winds late Saturday (up to 30km/h), with gusts up to 50-60km/h over Sardinia.

Impacts

Severe wildfires are not expected, however high vegetation sensitivity and very low soil moisture values ($700 < DC < 850$, locally 850/1000) are persistent.



Likelihood vs Impact

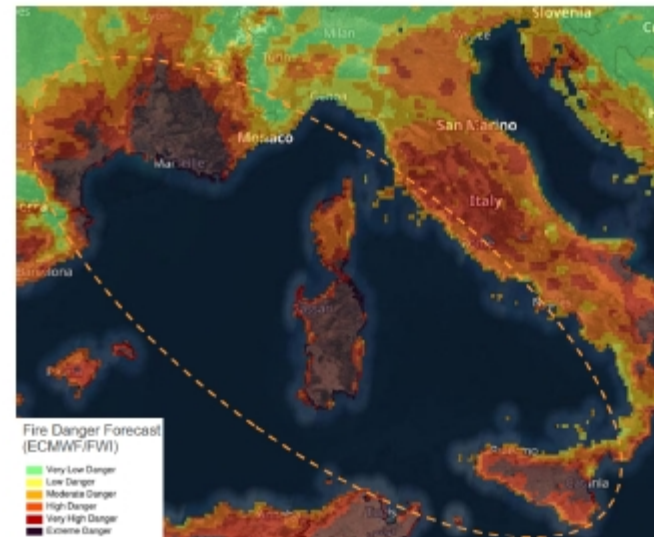


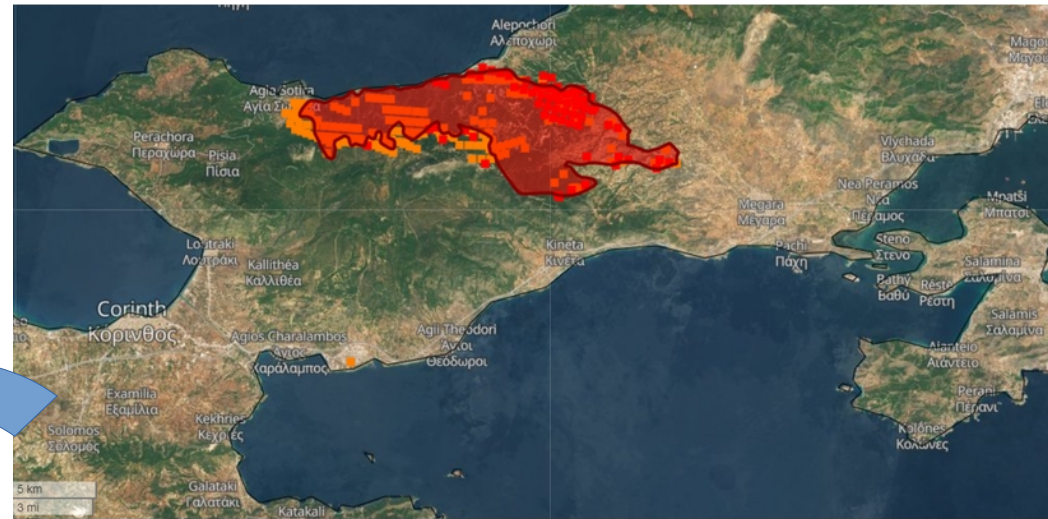
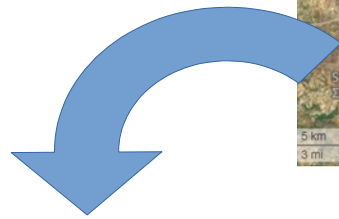
Image 1

France_Italy_FWIOr
angeAreas_230820
20(EFFIS)

FF ROM assessment example.

- MHOB report : 21/05/20
 - Ongoing forest fires – Greece

EO data among processed info



2: Ongoing forest fire - Peloponnese And Attika Regions, Greece

Description

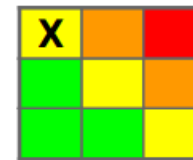
An out-of-control wildfire is alive in the area of Schinos, in Corinthia prefecture, 70 km west of Athens. The fire, which broke out late Wednesday, was fanned by gale-force winds.

The fire danger in the region is very high today since wind gusts are expected to reach up to 70 km/h, with relative humidity values under 30%.

By the end of the day, winds are expected to decelerate, with a little increase in relative humidity. These favourable conditions are forecast to remain during the weekend. No more strong wind gusts are expected in the short-term.

Impacts

More than 4,000 hectares of mostly forest in mountainous terrain has been burned. Dozens of houses were also destroyed, mostly holiday homes or small dwellings outside of villages and more than 10 villages and two monasteries have already been evacuated. Athens was blanketed with acrid smoke yesterday.



Likelihood vs Impact

FF ROM assessment example.

- MHOB report : 02/11/20
 - *Headlines* : Ongoing forest fires - USA - California

12: Ongoing forest fires - USA - California

Description

The 2020 fire season with 5 out of the 6 largest forest fires ever observed, is an exceptional period in California in terms of forest fires.

Firefighters continue to battle 22 ongoing wildfires in California. Yesterday, firefighters responded to 37 new wildfires, all of which were quickly contained. As favourable weather remains, firefighters are gaining the upper hand on these fires with containment numbers increasing.

Nevertheless, California will be under the influence of a strong high pressure system, with continued warm and very dry conditions. Locally breezy today through Thursday. Maximum temperatures will be 5 to 15 degrees above normal away from the coastal areas, with maximum temperature around 30 Celsius (decreasing significantly next Friday) and low humidity, below 20% with no significant recovery during the night. Winds will generally be light with gusts up 50/60 kph in some mountain areas. Warm and dry weather will keep fire danger heightened over the next few days.

Impacts

Although most fires remain away from densely populated areas, the situation must be monitored over the next few days.



Likelihood vs Impact

FF Emergency report

- Single/MultiHazard activation
- → embedded in MH report
- Executive Summary
- Forest Fire Hazard Section
 - Description / Impacts
- Situation
- Weather parameters
- Trends for next hours
- EcCharts, FF indices maps/graphi

FOREST FIRE HAZARD

Title

A severe fire is ongoing since 25th July in Oleiros, central Portugal (39.88, -7.94).

Description

In the last 24hours large amount of energy has been released (more than 100 000 MJ). The fire loses intensity during the night linked with temperature and humidity recovery, but is expected to increase in the afternoon.

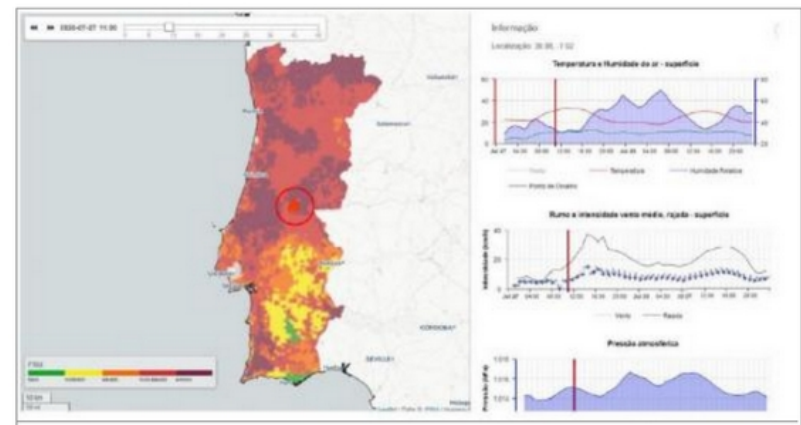
Extreme Fire Danger expected in central Portugal for the next 2 days due to very hot and dry weather.

Expected Very High FWI values ($FWI > 50$) directly linked with very high danger spread conditions ($ISI > 15$) and very high potential ignitions ($FFMC > 95$). Expected fire danger patterns in agreement with forecasted wind gust patterns and fuel's moisture conditions. The extreme character of Fire Danger patterns is depicted by the persistent anomaly values of FWI that remain very close to the historical maximum.

27th-28th July: Maximum daily temperature 36°C up to 39 °C during the afternoons. Low daily relative humidity values are expected (below 30%), with significant recovery of humidity levels during the night (~60%-70%). Northeast wind gusts varying between 20-40 km/h, with some intensification at the end of the afternoons.

Impacts

Fire is spreading over an area of dense coniferous forest and shrub land over complex terrains which make difficult the access to the local and thus the combat measures. The area was previously affected by severe wildfires in the 2003 fire season and since then a high amount of biomass was accumulated. Suppression measures are very difficult since fuels dryness is very high and soil moisture is very low, with very high drought values ($DC > 500$).



National Fire Risk Map for the next days for Portugal on the left +

Weather parameters time-series for Oleiros on the right (top to bottom : temperature, wind (and gusts), and humidity)

FF Emergency report

FOREST FIRE HAZARD

Title

A severe fire is ongoing since 25th July in Oleiros, central Portugal (39.88, -7.94).

Description

In the last 24hours large amount of energy has been released (more than 100 000 MJ). The fire loses intensity during the night linked with temperature and humidity recovery, but is expected to increase in the afternoon.

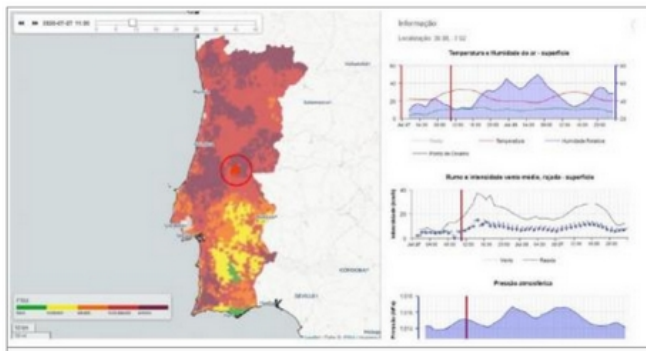
Extreme Fire Danger expected in central Portugal for the next 2 days due to very hot and dry weather.

Expected Very High FWI values ($FWI > 50$) directly linked with very high danger spread conditions ($ISI > 15$) and very high potential ignitions ($FFMC > 95$). Expected fire danger patterns in agreement with forecasted wind gust patterns and fuel's moisture conditions. The extreme character of Fire Danger patterns is depicted by the persistent anomaly values of FWI that remain very close to the historical maximum.

27th-28th July: Maximum daily temperature 36°C up to 39 °C during the afternoons. Low daily relative humidity values are expected (below 30%), with significant recovery of humidity levels during the night (~60%-70%). Northeast wind gusts varying between 20-40 km/h, with some intensification at the end of the afternoons.

Impacts

Fire is spreading over an area of dense coniferous forest and shrub land over complex terrains which make difficult the access to the local and thus the combat measures. The area was previously affected by severe wildfires in the 2003 fire season and since then a high amount of biomass was accumulated. Suppression measures are very difficult since fuels dryness is very high and soil moisture is very low, with very high drought values ($DC > 500$).



National Fire Risk Map for the next days for Portugal on the left +

Weather parameters time-series for Oleiros on the right (top to bottom : temperature, wind (and gusts), and humidity)



EFFIS Fire Weather Index map for 27th July (left) + FWI+ranking evolutions (right) concerning the blaze

Acronyms

- **AF.** Active Fires.
- **BUI.** Buildup Index.
- **CFFWIS.** Canadian Forest Fire Weather Index System.
- **DC.** Drought Code.
- **DMC.** Duff Moisture Code.
- **DSR.** Daily Severity Rating.
- **FFMC.** Fine Fuel Moisture Code.
- **FIRMS.** NASA's Fire Information for Resource Management System.
- **FWI.** Fire Weather Index.
- **ISI.** Initial Spread Index.
- **MODIS.** NASA's Moderate Resolution Imaging Spectroradiometer.
- **NDVI.** Normalized Difference Vegetation Index.
- **NRT.** Near Real-Time.
- **SMI.** Soil Moisture Index.
- **VIIRS.** NASA's Visible Infrared Imaging Radiometer Suite.

Thanks for your attention



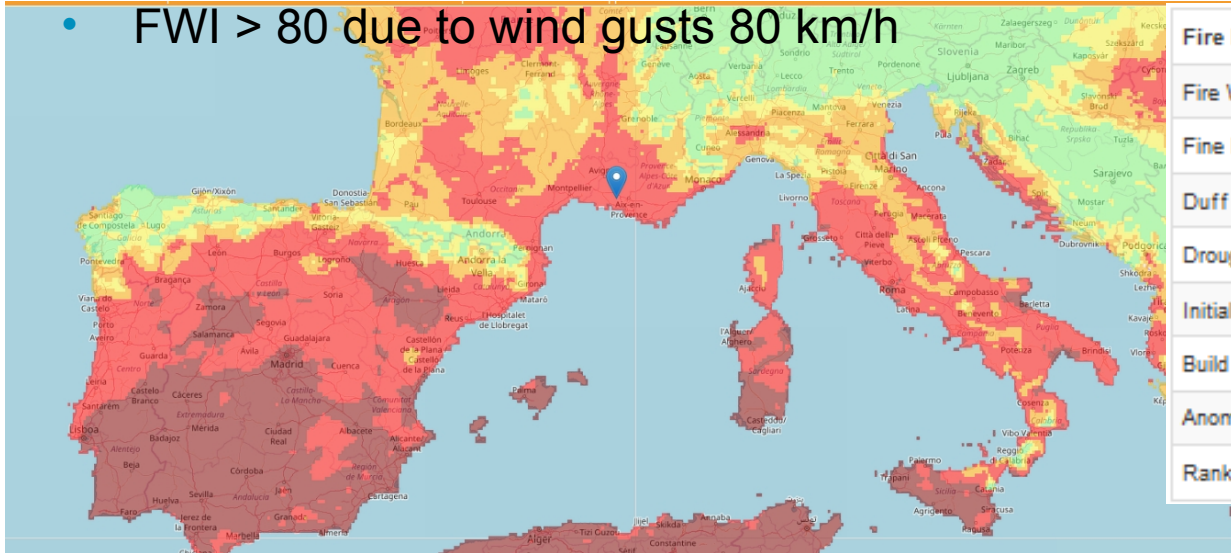
Any questions ?

mathieu.regimbeau@meteo.fr

slido #wildfires2021

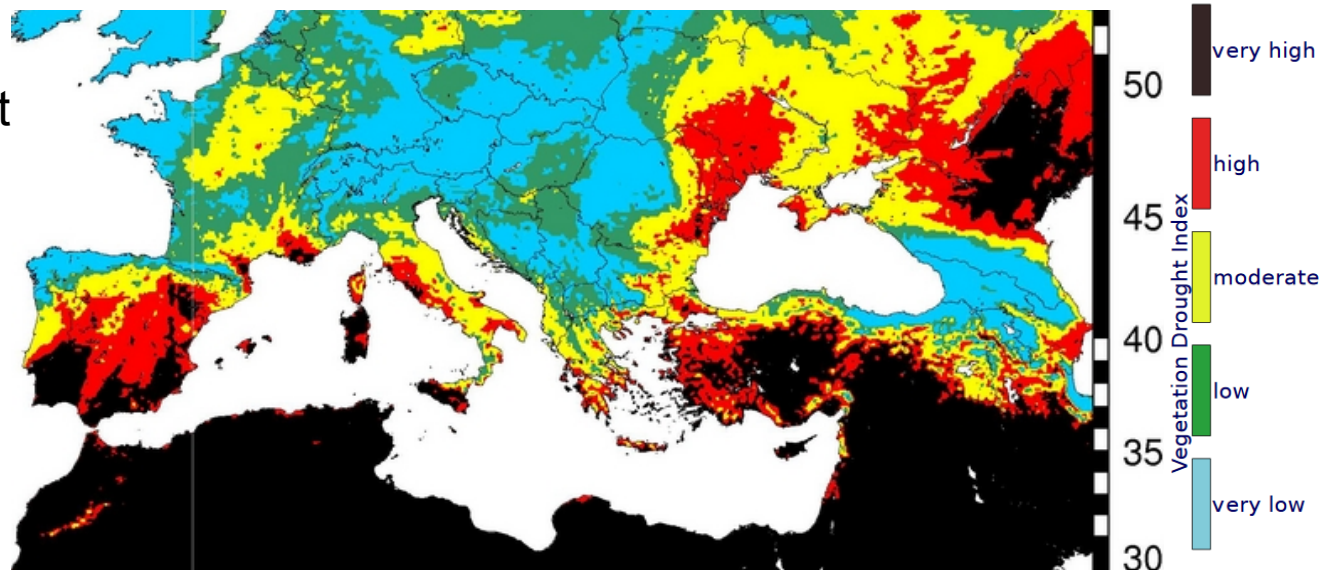
FF assessment - process example

- Vegetation Drought is Very High – DC 700 DMC 130
- FWI > 80 due to wind gusts 80 km/h



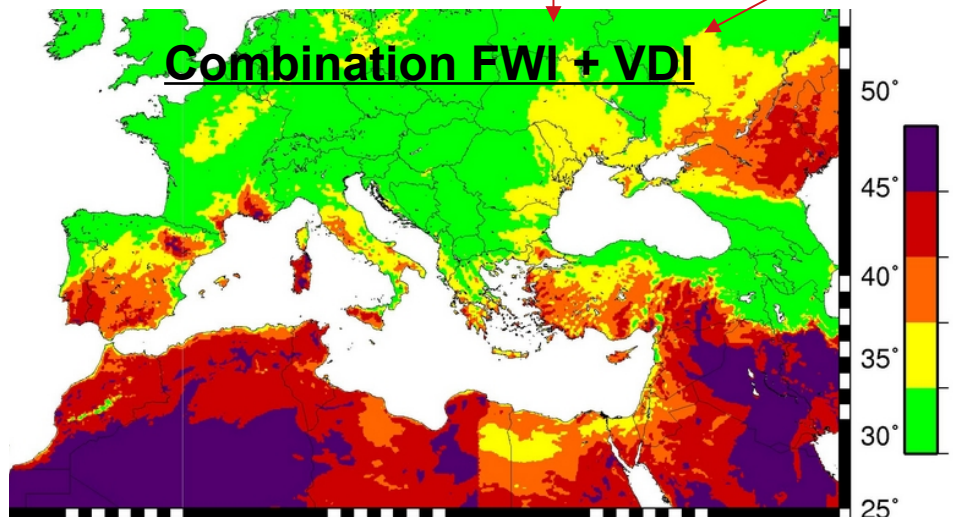
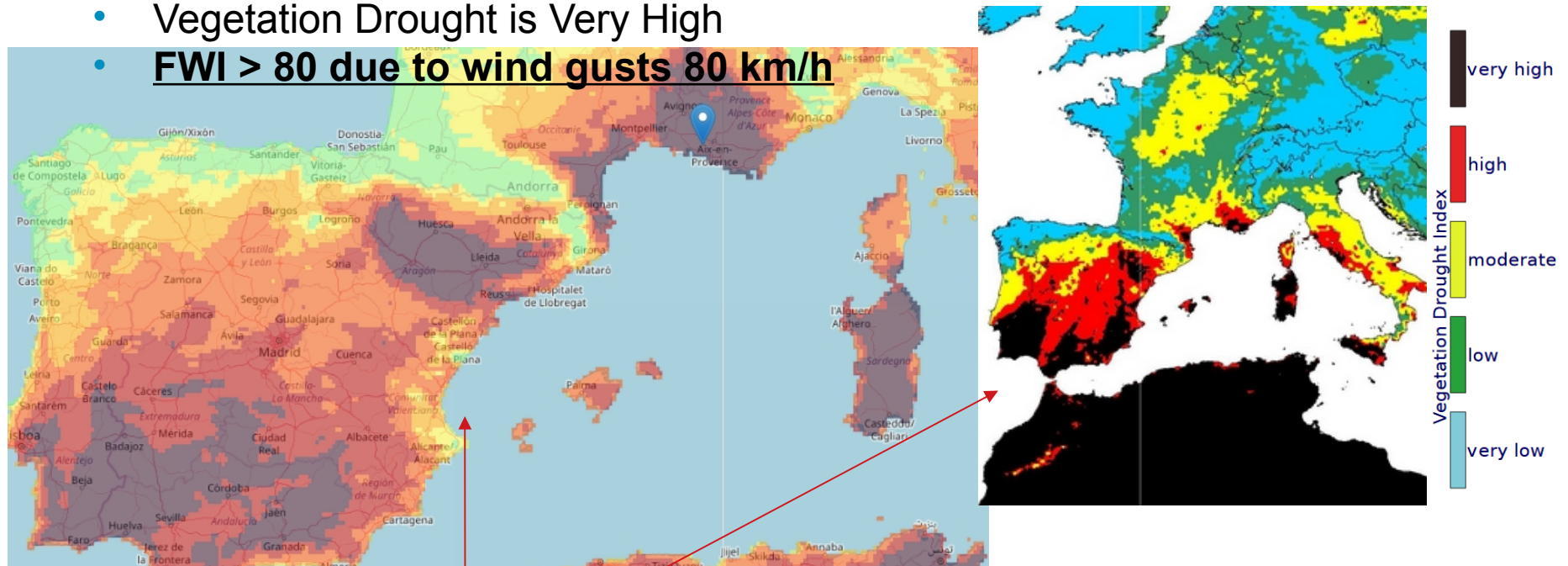
Fire Danger		✕
Fire Weather Index (FWI)	80.4	
Fine Fuel Moisture Code (FFMC)	91.5	
Duff Moisture Code (DMC)	122.1	
Drought Code (DC)	689.0	
Initial Spread Index (ISI)	33.9	
Build Up Index (BUI)	167.7	
Anomaly	2.9	
Ranking	99.0	

Vegetation Drought
DC and DMC



FF assessment - process example

- Vegetation Drought is Very High
- **FWI > 80 due to wind gusts 80 km/h**



Expertised danger is Very High

- wind and thus FWI is lower than for Martigues but after 3 weeks without rain , vegetation drought is deeper
- several fires
- 2 main fires 100/300 ha

