# LSA SAF Products for Fire Forecast and Monitoring

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25th May 2021

**Existing and next-generation earth observation products for wildfire monitoring and forecast**

**25 -27 May 2021**

# LSA-SAF Objective

**Satellite Products related to Land Surfaces & Land-Atmosphere interactions**

- Focusing primarily EUMETSAT satellites

- Maintain (& improve!) the service for current missions

- Ensure transition to Next Generation of EUM satellites: MTG & EPS-SG

- NRT & Off-line production of Land surface variables (EUMETCast, ftp & Website)

- Helpdesk User Support Service (helpdesk.landsaf@ipma.pt)



IPMA-Lead
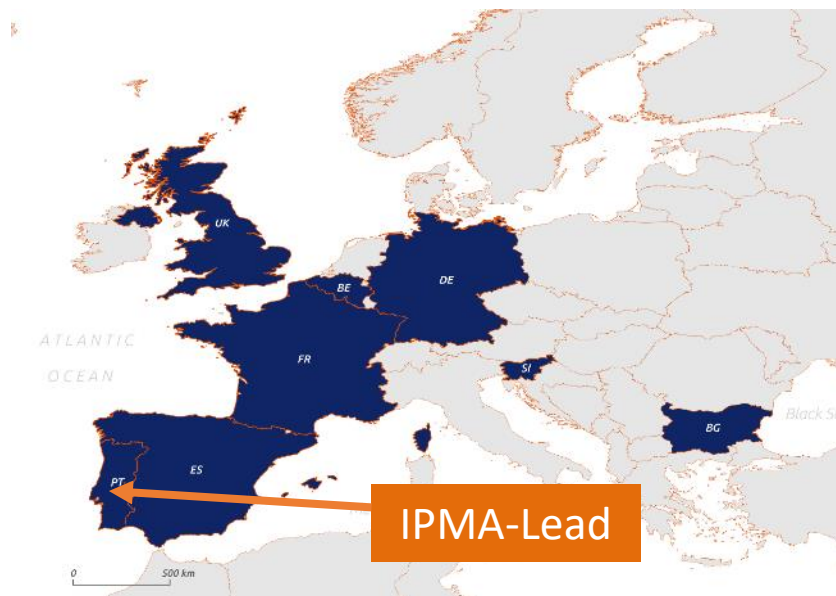
| IPMA | (Portugal) – Leading Institution |
| MF | (France) |
| RMI | (Belgium) |
| IDL | (Univ Lisbon) |
| KCL | (King's College London) |
| KIT | (Karlsruhe Inst Technology) |
| UV | (Univ Valencia) |
| VITO | (Flemish Inst Technological Res) |
| ARSO | (Slovenian Env Agency) |
| NIMH | (Bulgarian Inst Met and Hyd) |

(image credit: EUMETSAT, Bonekamp, 2010)

**Main focus of LSA SAF until present**
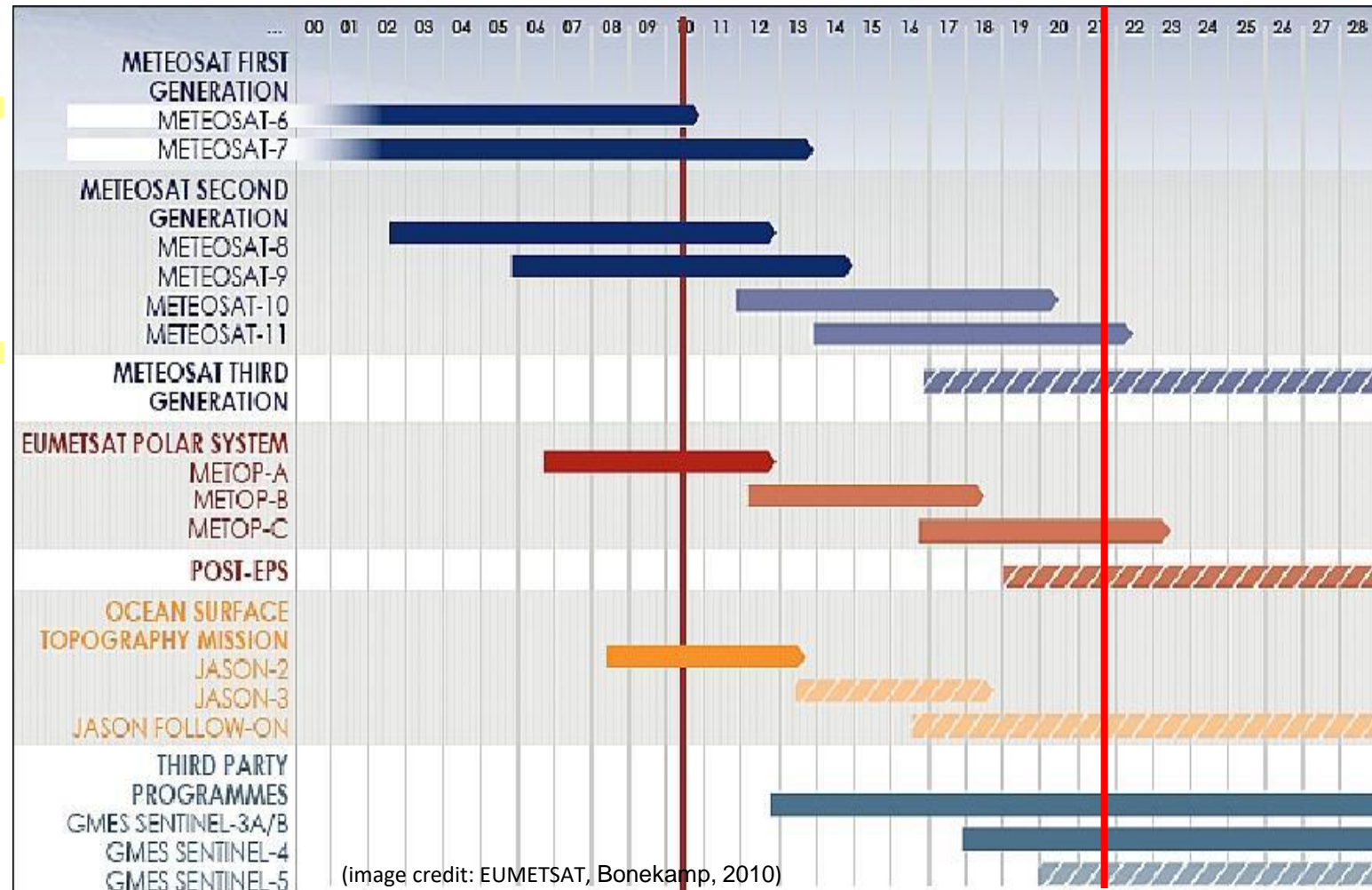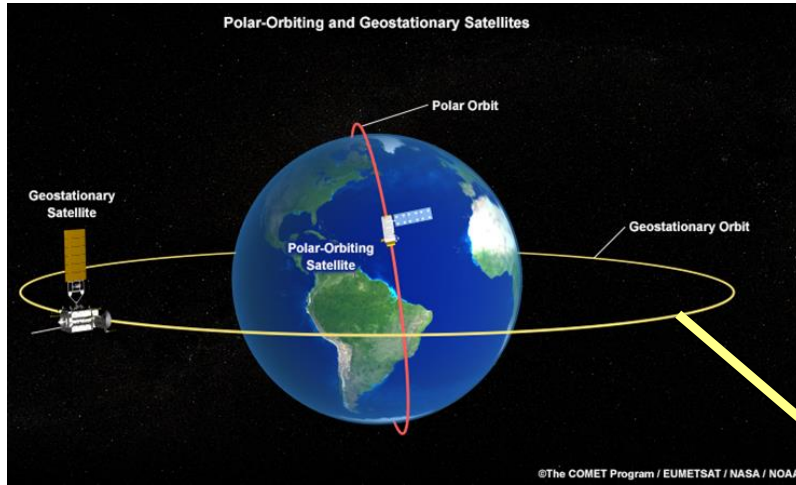
**Meteosat Second Generation**

- Geostationary orbit
- Nominal sub-satellite point at 0º long
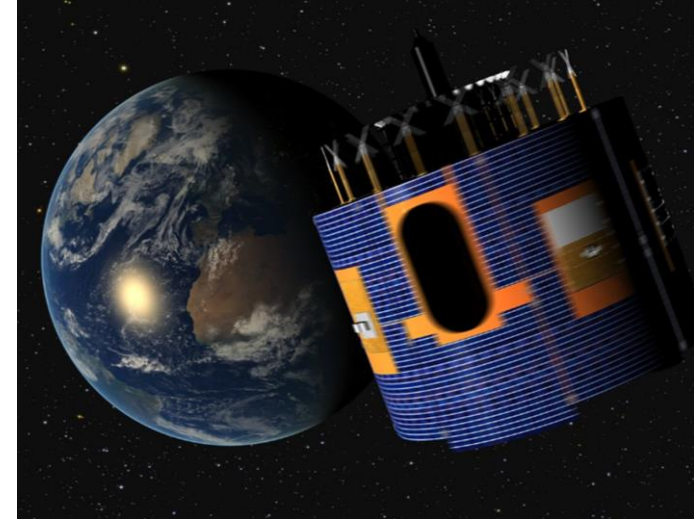




**Spinning Enhanced Visible and Infrared Imager (SEVIRI)**

- explore 96 observations /day  (every 15 min) …
- 12 channels …
- at 3 km at nadir

## SURFACE RADIATION BUDGET

DSSF: ↓Surface Short-wave Flux
DSLF: ↓Surface Long-wave Flux
LST: Land Surface Temperature
AL: Albedo

## WILDFIRES

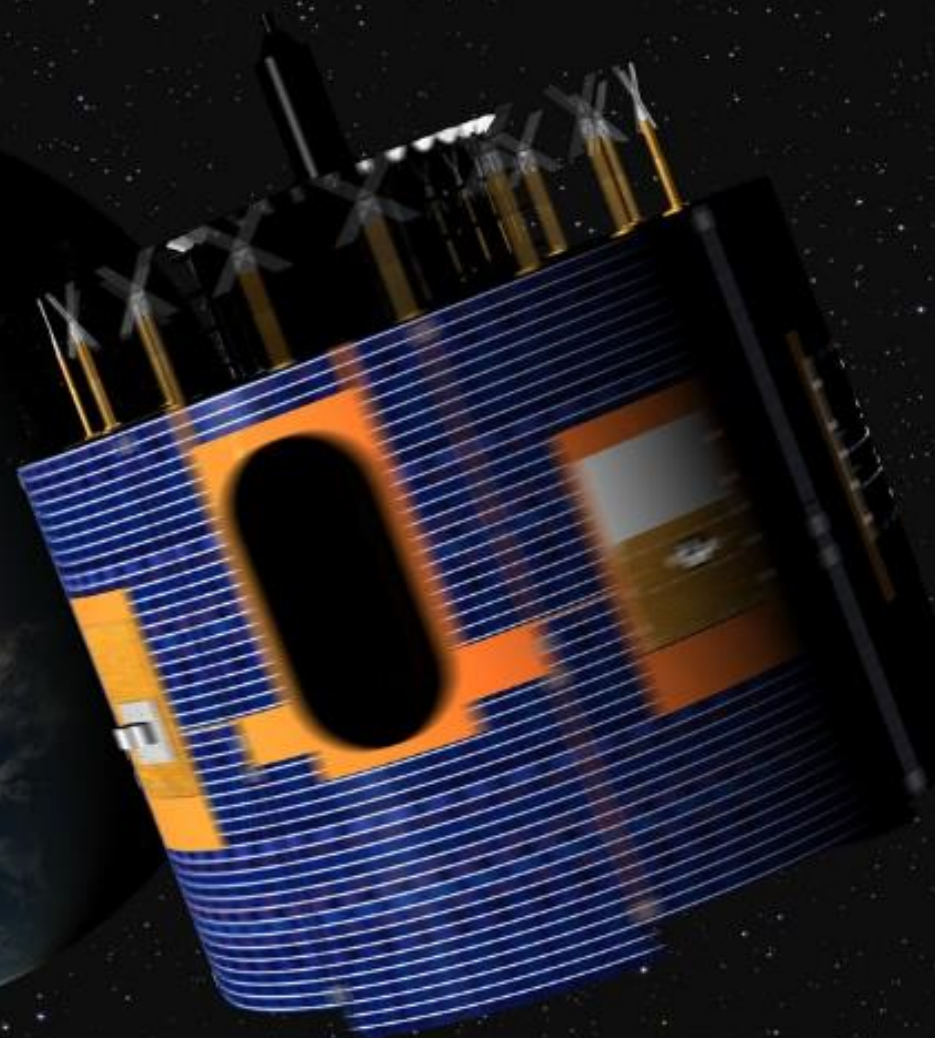FRP: Fire Radiative Power
FRM: Fire Risk Map

## VEGETTAION STATE

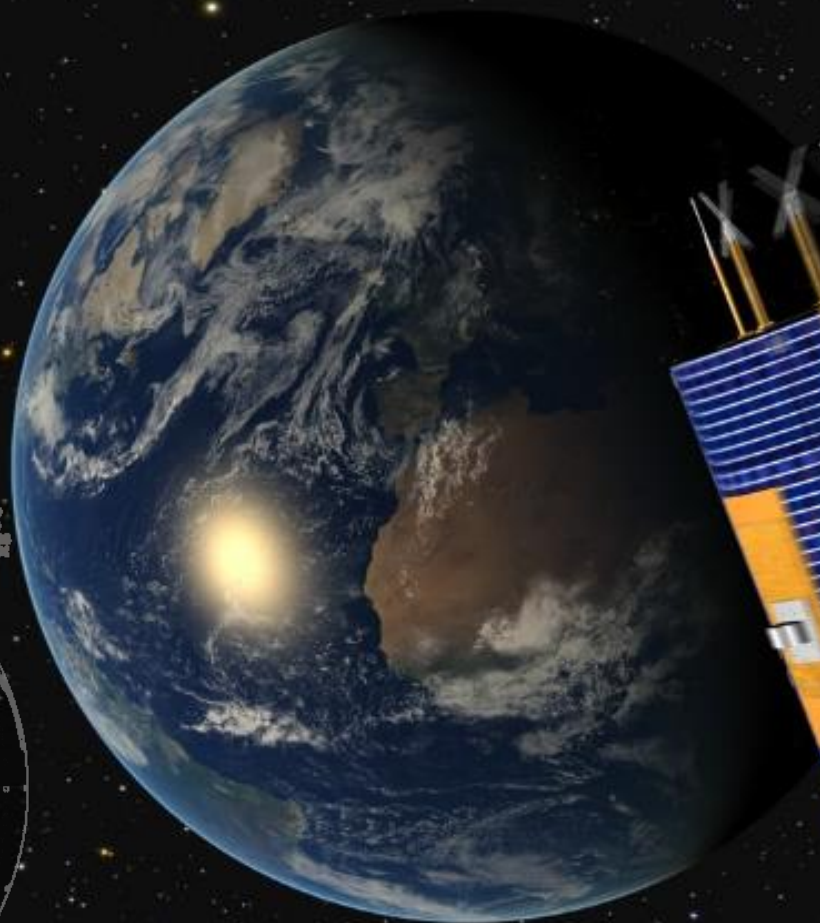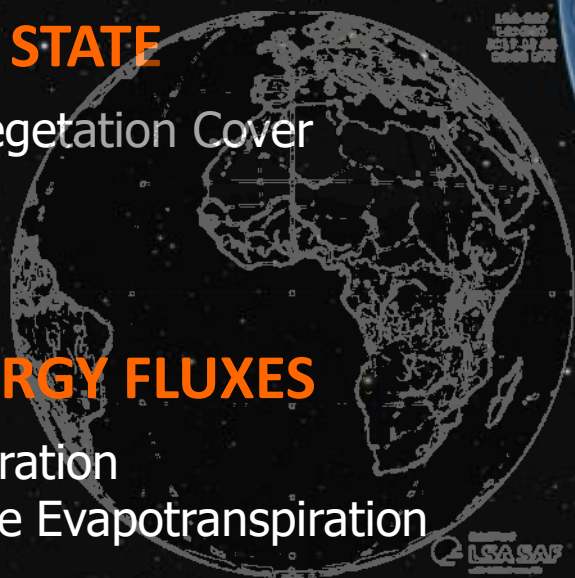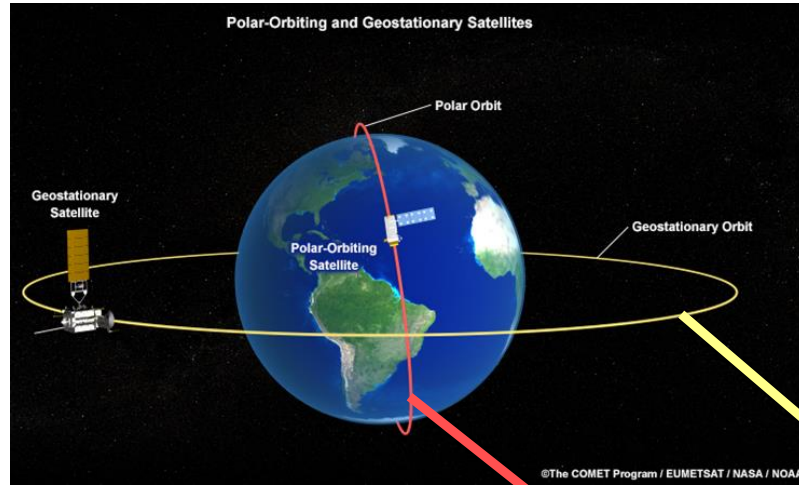FVC: Fraction Vegetation Cover
fAPAR
LAI

## SURFACE ENERGY FLUXES

ET: Evapotranspiration
ETREF: Reference Evapotranspiration

**EUMETSAT space segment**
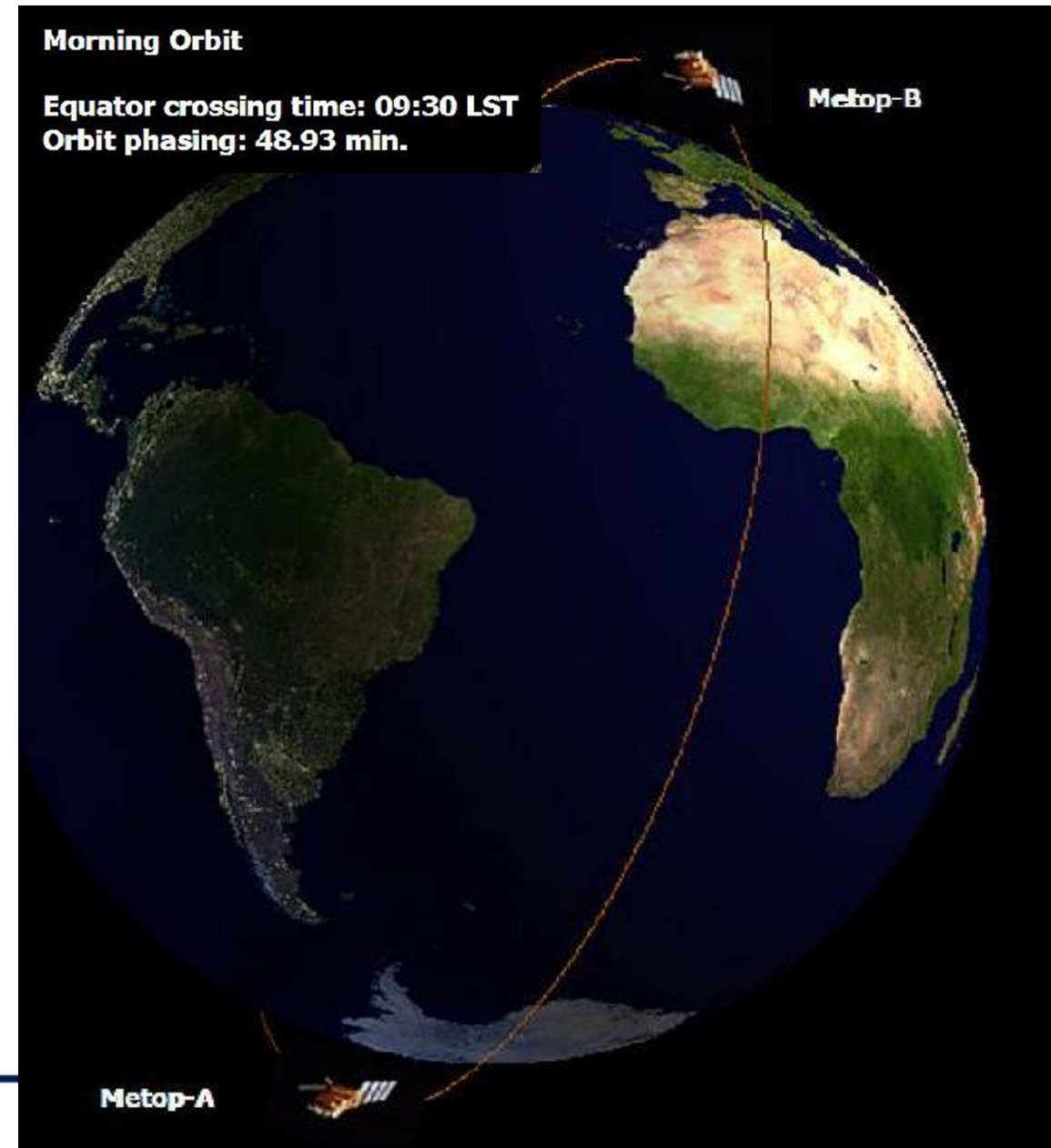
(image credit: EUMETSAT, Bonekamp, 2010)
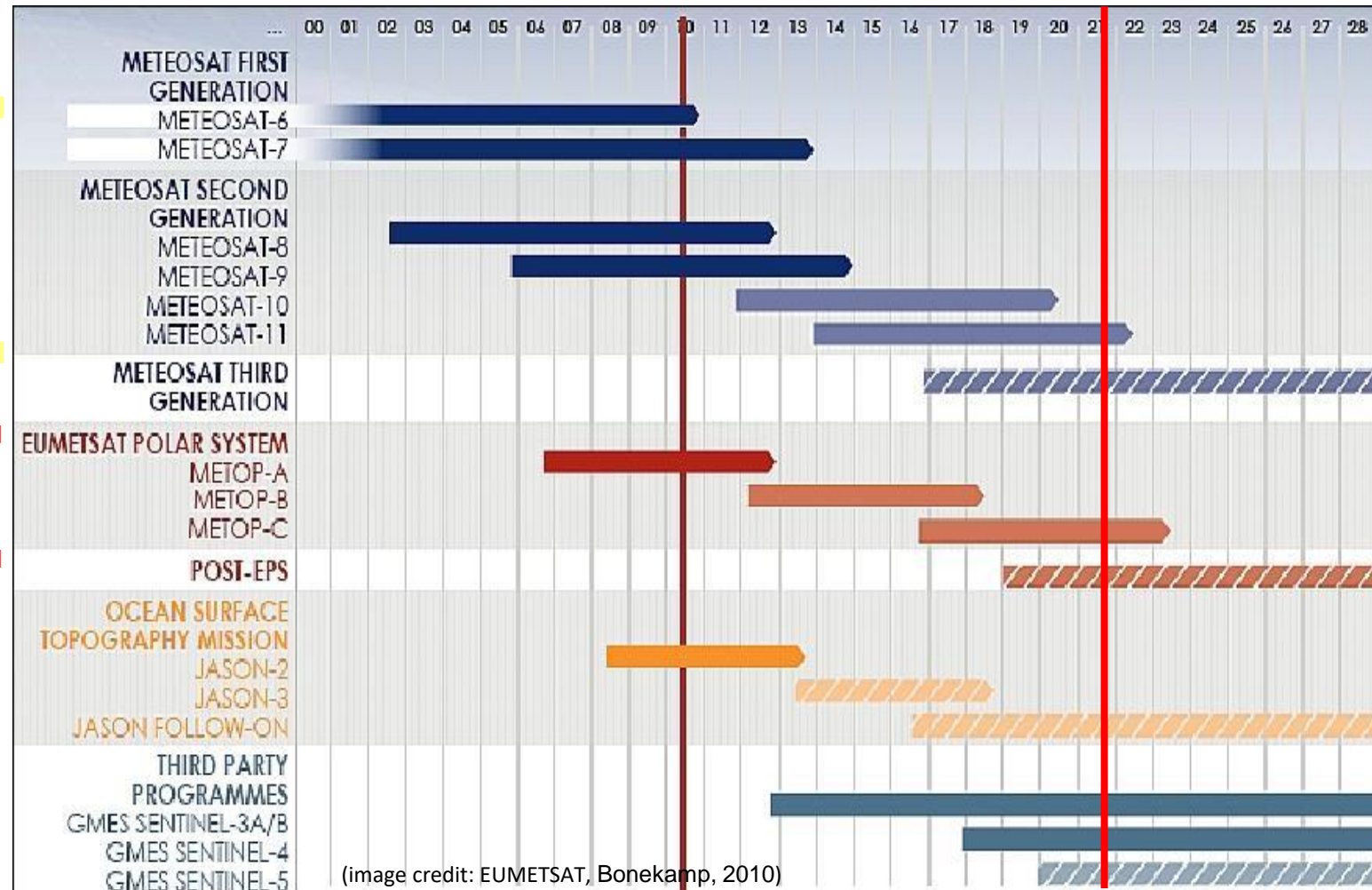
**Metop (EUM Polar-Orbiter)**

**Advanced Very High-Resolution Radiometer (AVHRR)**

- 5 channels

- 2 observations/day GLOBAL

- c.a. 1 km at sub-satellite point

**Metop (Polar-Orbit) – Playload:**

- AVHRR

- HIRS

- AMSU-A



Morning Orbit

Equator crossing time: 09:30 LST
Orbit phasing: 48.93 min.

Metop-B

Metop-A

**SURFACE RADIATION BUDGET**

EPS LST: Land Surface Temperature
EPS AL: Albedo

**VEGETTAION STATE**

FVC: Fraction Vegetation Cover
fAPAR
LAI
NDVI

# Climate Data Records

## MSG/SEVIRI-based

### Reprocessed from 2004 onwards using

- the latest product algorithms – in line with "Near Real Time" products

- recalibrated level 1.5 SEVIRI data

## EPS/AVHRR-based

### Reprocessed from 2007 onwards using

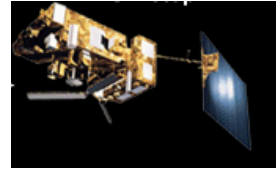- the latest product algorithms – in line with "Near Real Time" products

- level 1b AVHRR data

Atmospheric Fields: ERA-5

# Product Generation, Archiving & Distribution for Indian Ocean Data Coverage (IODC)

- To be continued under a best effort basis, i.e., distributed as "Demo Products" …
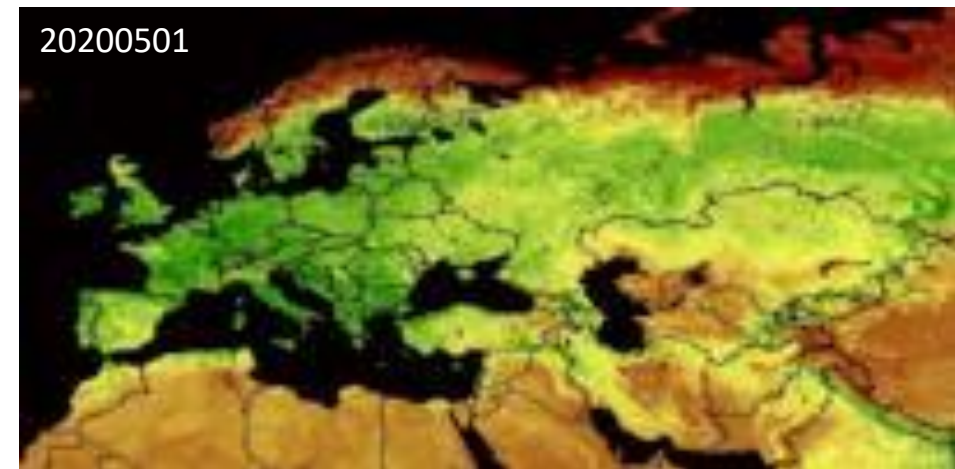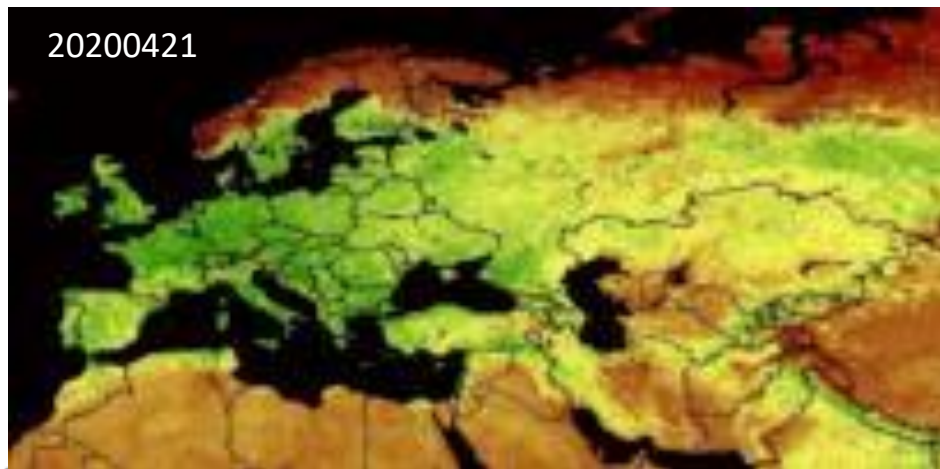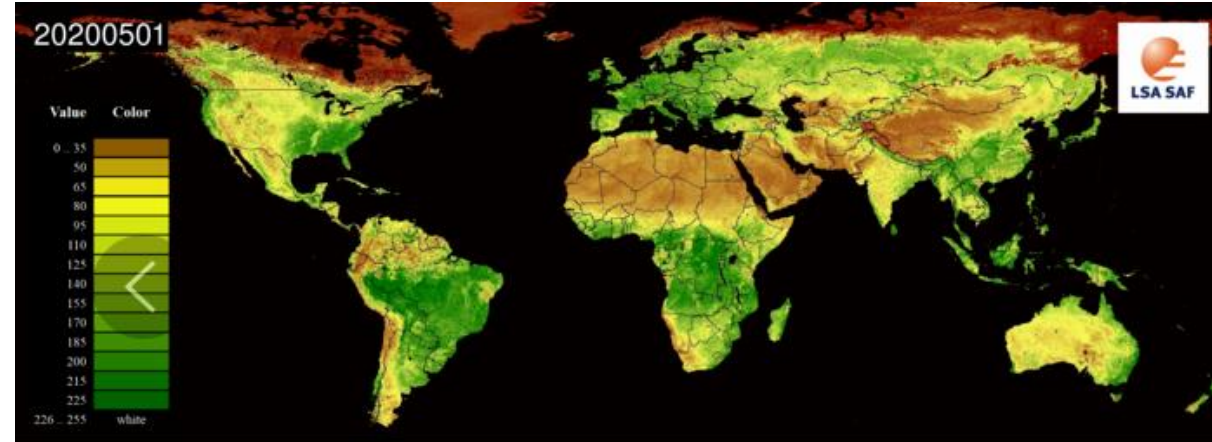
- … to limit the number reviews.
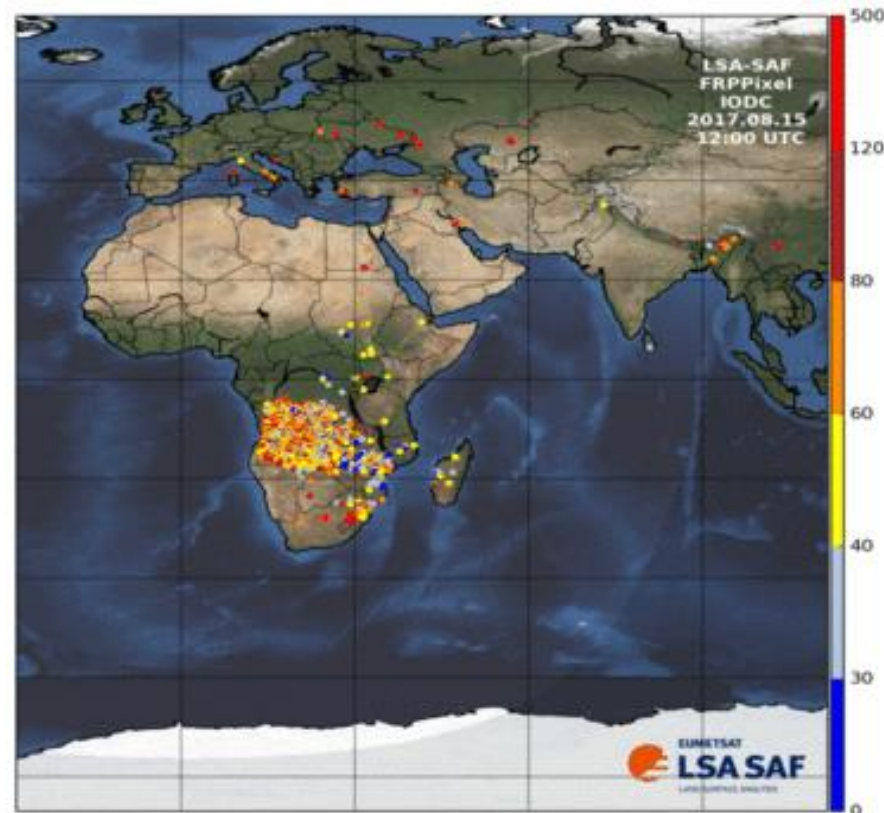
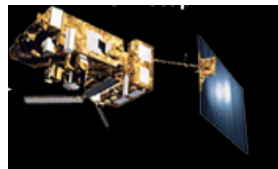# LSA-SAF (EPS Products)



**NDVI**

10 days

2007 - Present

# LSA-SAF (EPS Products)

**Fraction of Photosynthetically Active Radiation (fAPAR)**

Daily/10 days since 2007

Fraction of radiation in the PAR region (0.4 μm - 0.7 μm) absorbed by the green parts of the canopy for the photosynthesis – indicator of the presence and productivity of alive elements of the canopy.

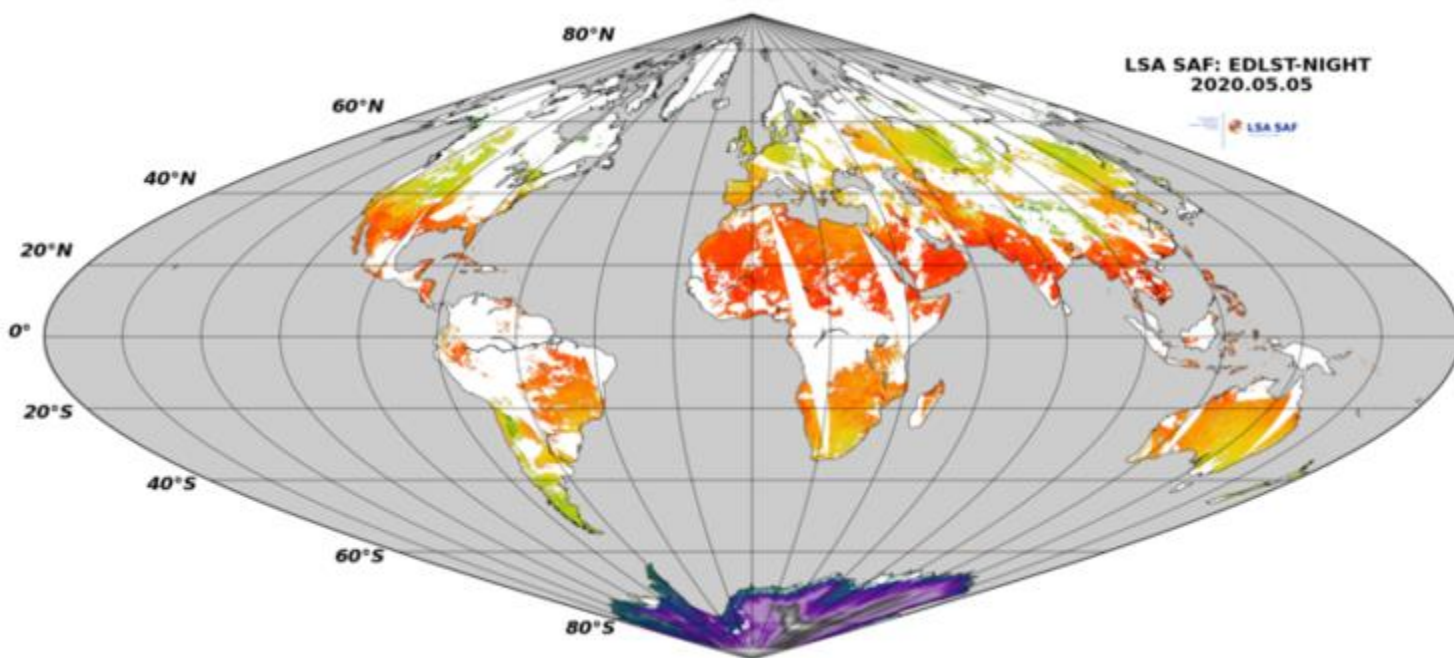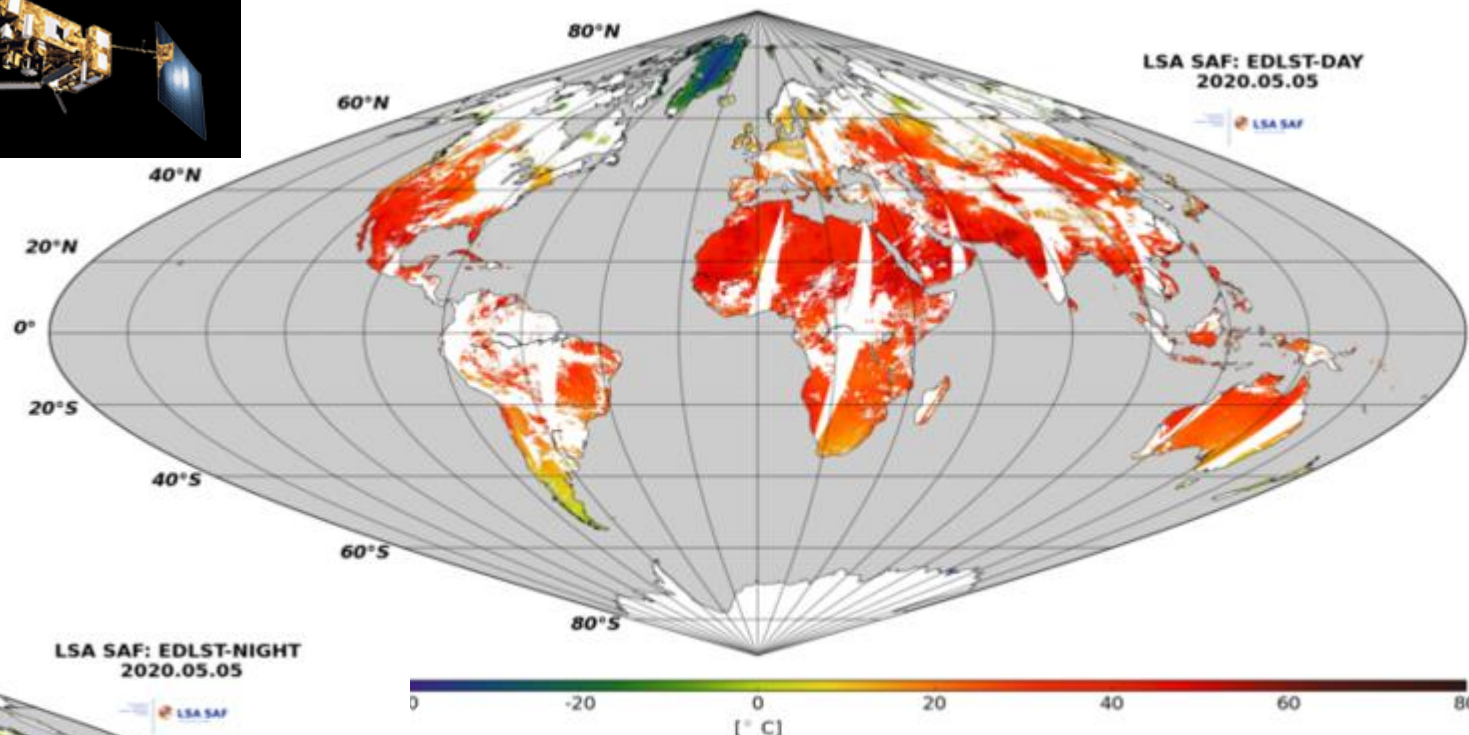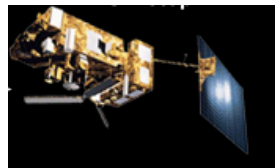Depends canopy structure, Leaf and soil optical properties, Irradiance conditions



LSA SAF: ETFAPAR
2020.05.05

20200501

[dimensionless]
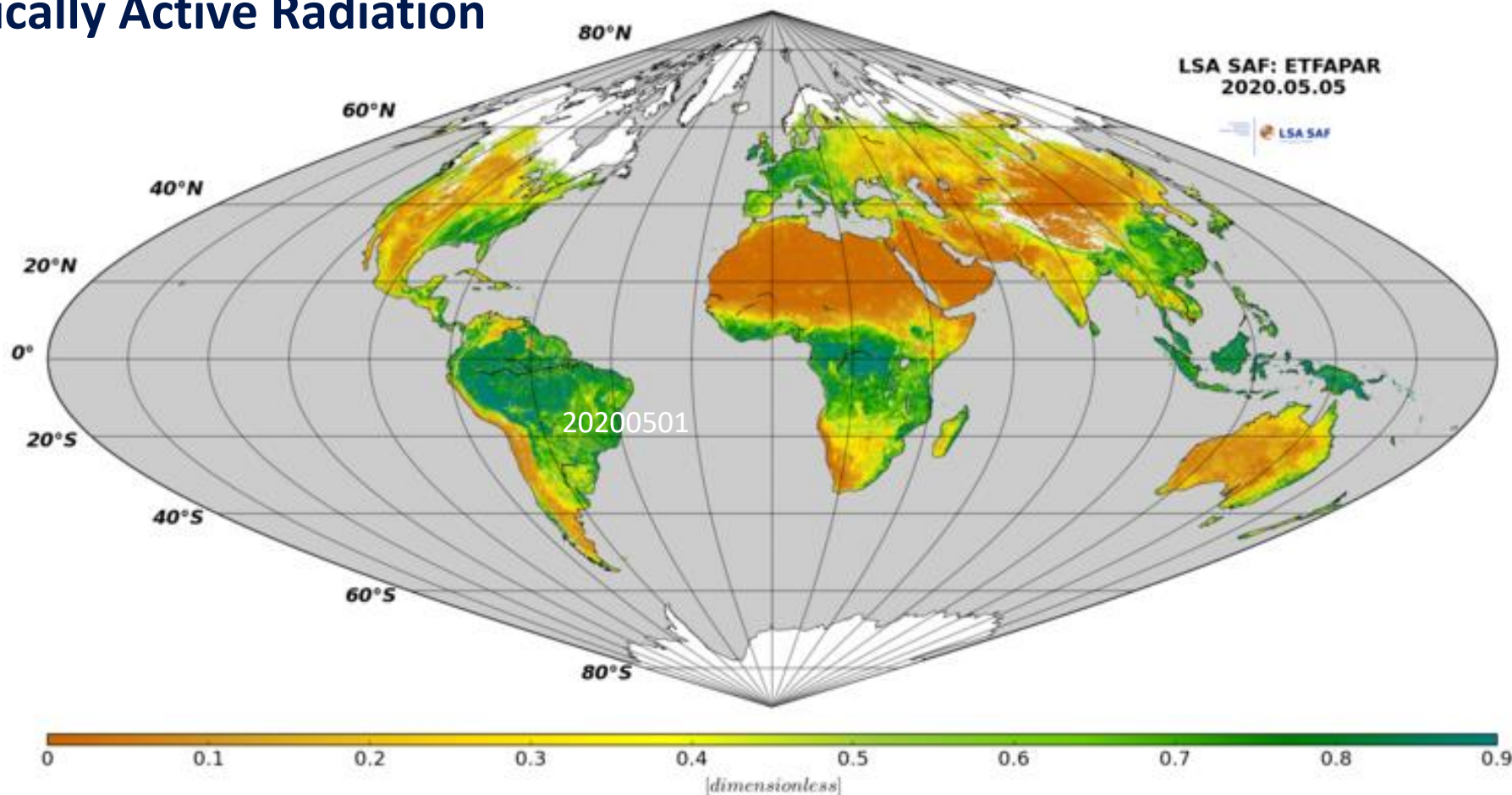
# LSA-SAF (EPS Products)

**LST**

Daily: Day and Night

2007-2020 (will be available begin 2021)

LSA SAF: EDLST-DAY
2020.05.05

LSA SAF: EDLST-NIGHT
2020.05.05

The **EDLST (EPS Daily Land Surface Temperature)** provides a day-time and nigh-time retrievals of LST based on clear-sky measurements from the Advanced Very High Resolution Radiometer (AVHRR) on-board EUMETSAT polar system satellites, the METOP series.

The EDLST (EPS Daily Land Surface Temperature) provides a day-time and nigh-time retrievals of LST based on clear-sky measurements from the Advanced Very High Resolution Radiometer (AVHRR) on-board EUMETSAT polar system satellites, the Metop series.



LSA SAF: EDLST-DAY
2020.05.05

LSA SAF: EDLST-NIGHT
2020.05.05
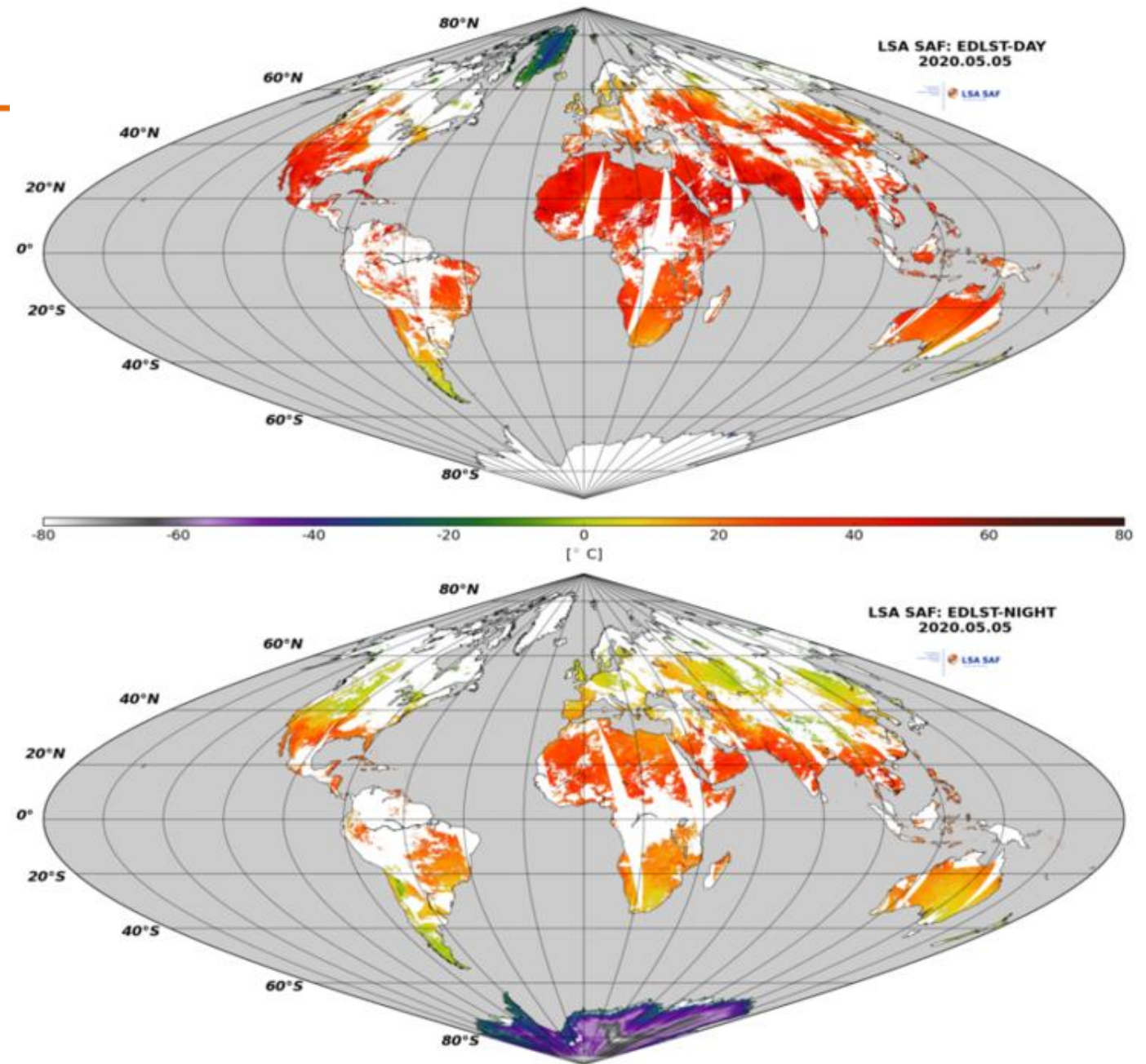
# LSA-SAF (MSG Products)



## Fire Radiative Power (FRP)

The product records information on the location, timing and fire radiative power (**FRP**, in **MWatt**) of landscape fires detected every **15 minutes** across the full **Meteosat Disk** at the native spatial resolution of the SEVIRI sensor.



Integrating FRP over the lifetime of a fire provides an estimate of the total **Fire Radiative Energy (FRE)** released (proportional to the total amount of biomass burned).

**Wildfires in Iberia:** Portugal in June 2017. Several very intense hot-spots (64 casualties).
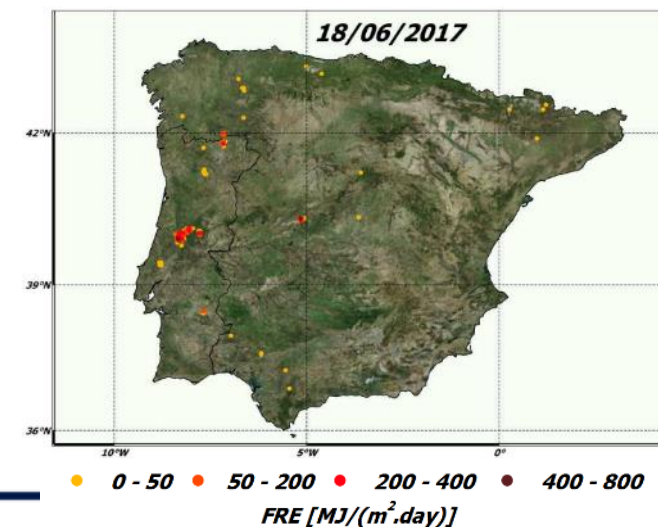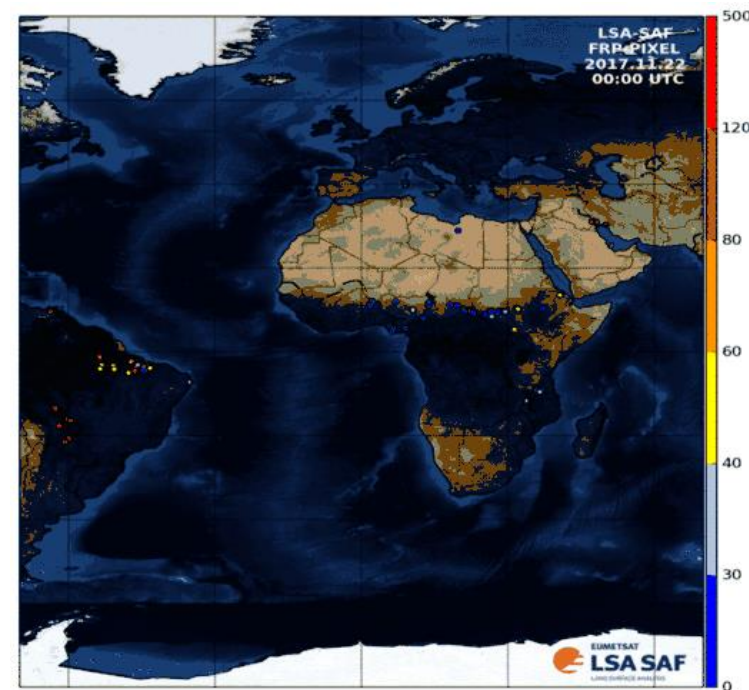
# LSA-SAF (MSG Products)
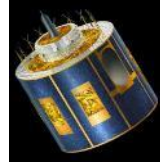
## Fire Radiative Power (FRP)
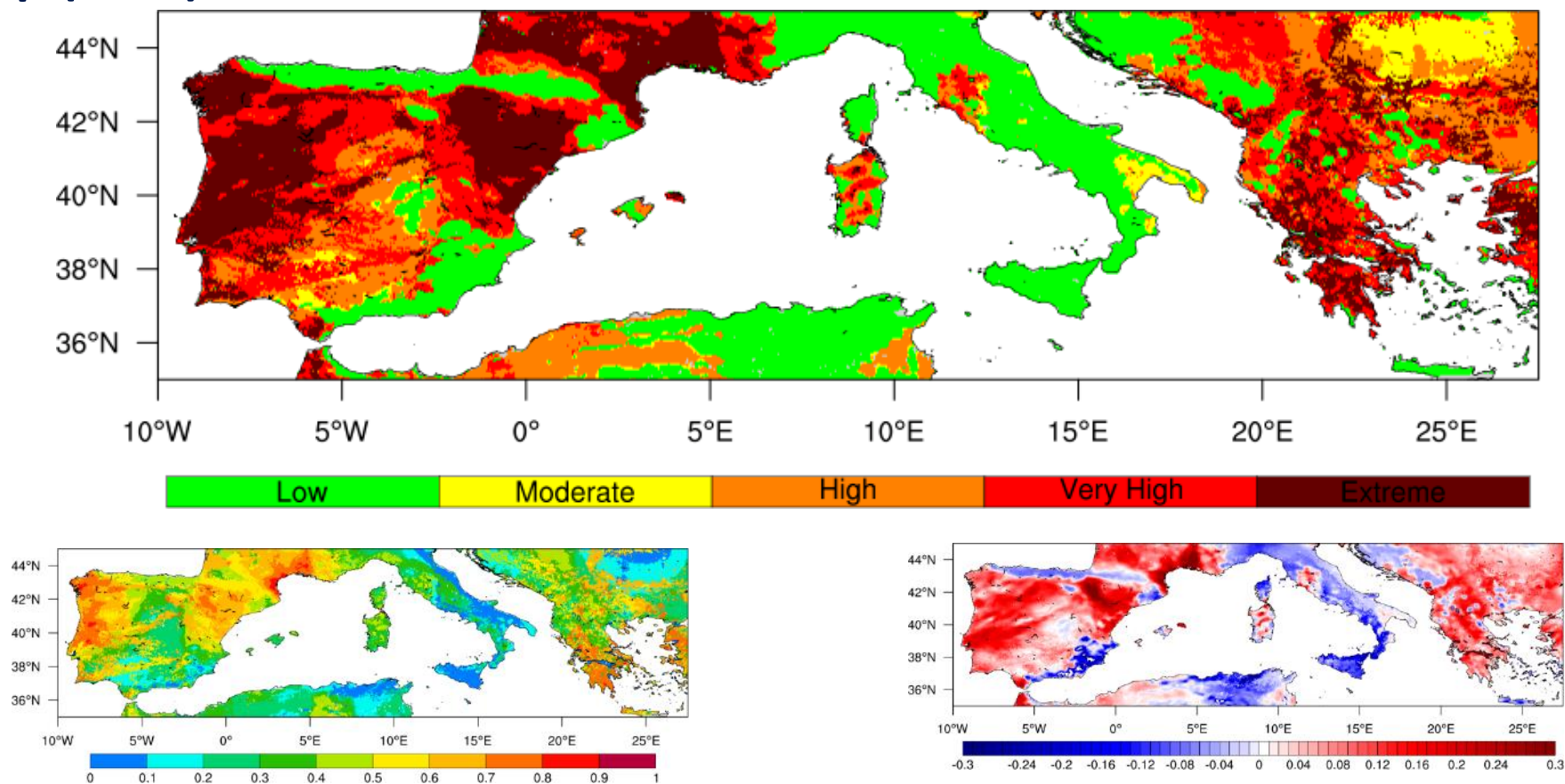
**Wildfires in Sweden :** 16th July 2018.
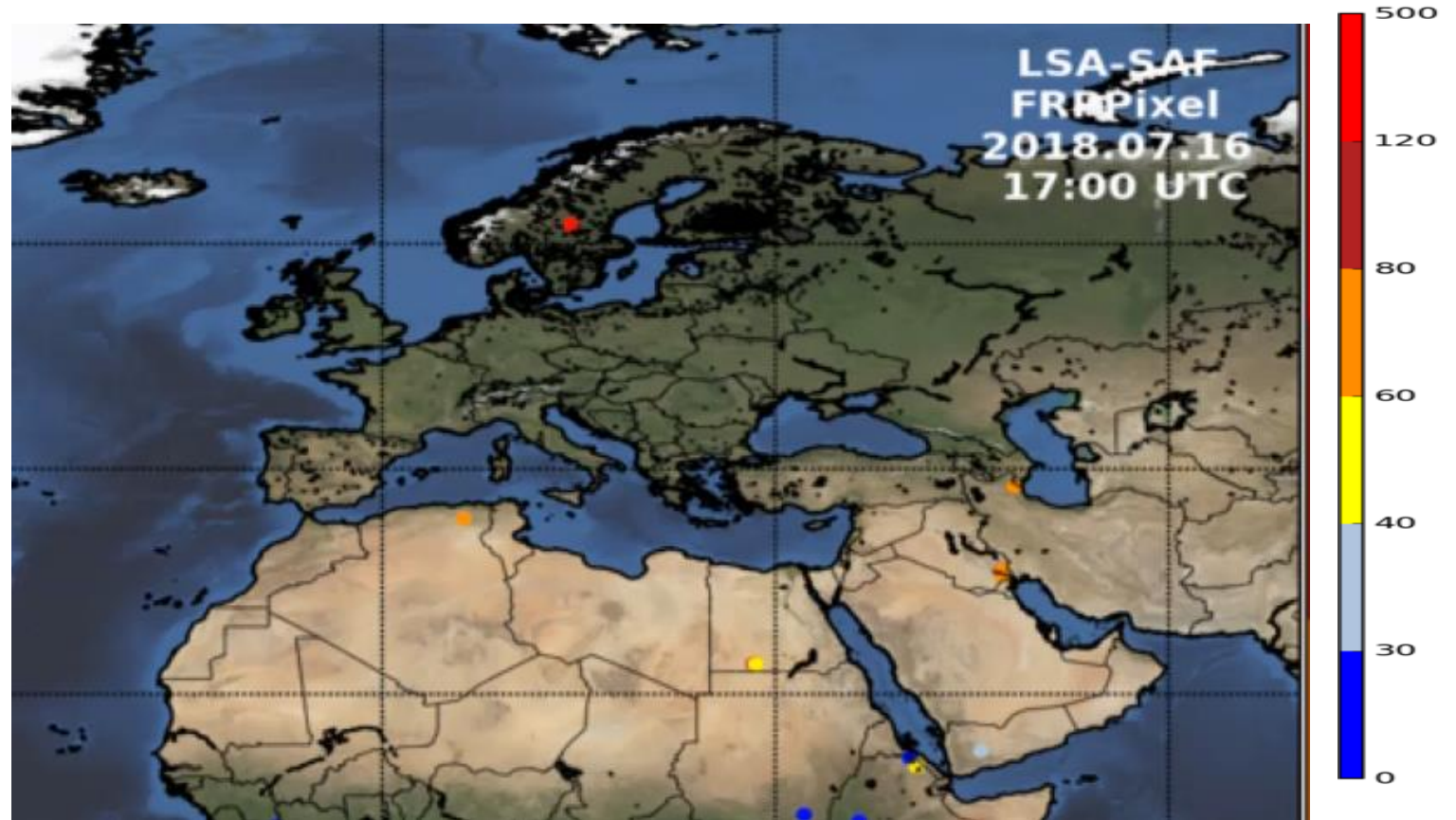
# LSA-SAF (MSG Products)

5 days of forecast risk (new!)

**Fire Risk Map (FRM)**



Low | Moderate | High | Very High | Extreme



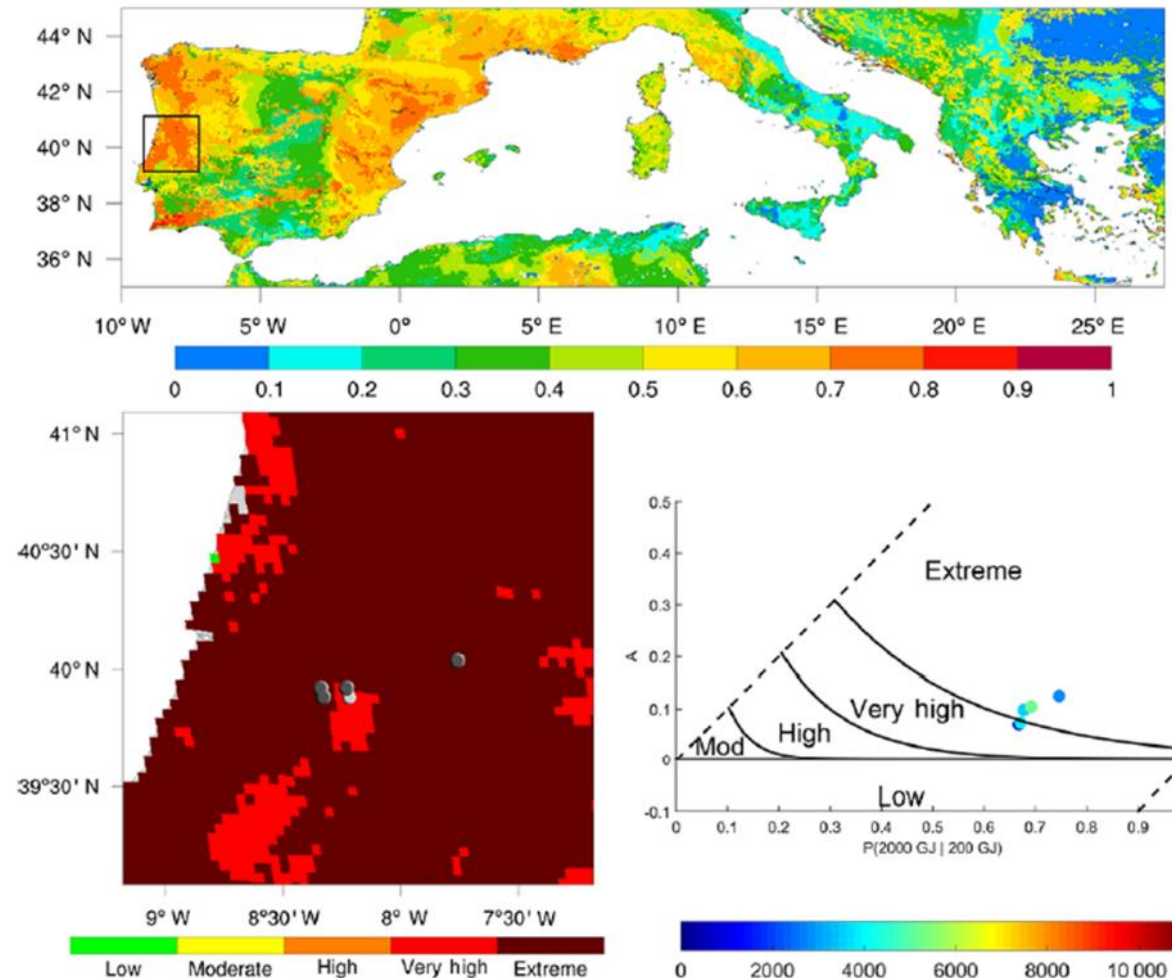Probability of exceedance 2000 GJ/day



Anomalies of Probability

# LSA-SAF (MSG Products)

**Fire Risk Map (FRM)**

Applications: Pedrogão Fire (Portugal)
18th June 2017
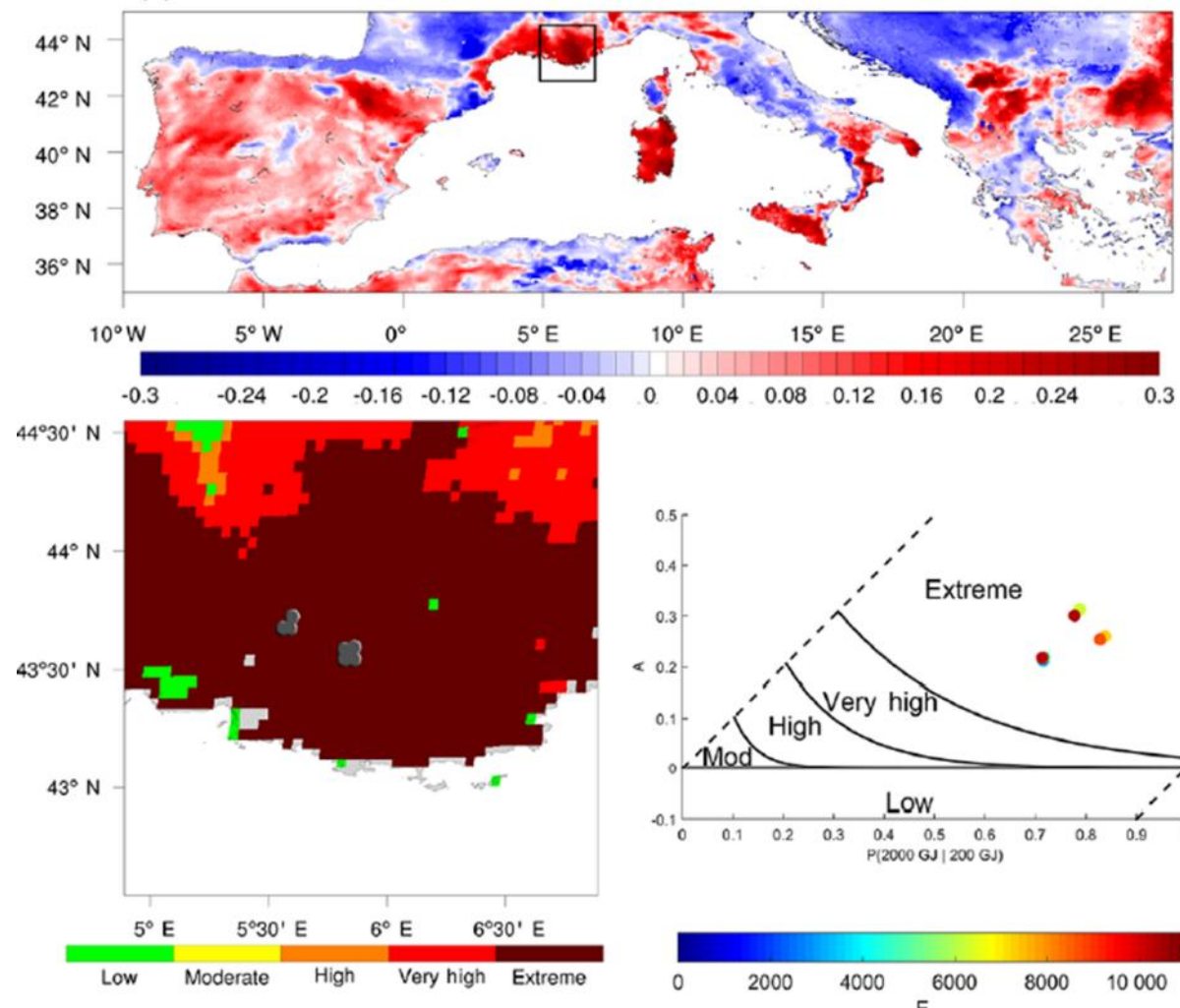
High Probability of exceedance and low anomalies of probability

# LSA-SAF (MSG Products)



**Fire Risk Map (FRM)**

Applications: Marselha Fire (France)
25th June 2017

High anomalies of probability and high
probability of exceedance

# August 2020 Wild Fires in Huelva, Spain

Using LSA SAF Fire products to forecast and monitoring
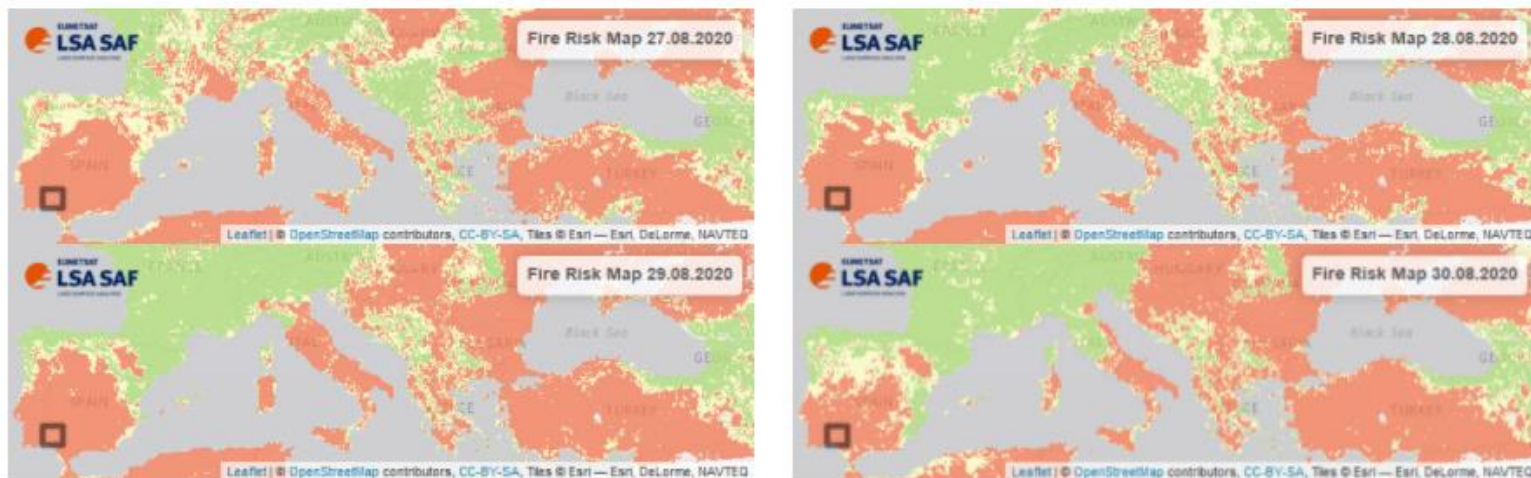


Figure 1 - Daily fire risk classes for Mediterranean Europe at the end of August 2020, using the FRM product. Green, yellow and orange correspond to low, moderate and high risk of fire for the next 24 hours. Black square corresponds to 24 hours fire risk in province of Huelva.

## News

https://landsaf.ipma.pt/en/news/news/august-2020-wild-fires-in-huelva-spain/



Figure 2 - Animation of daily maximum fire radiative power from 27th until 30th of August 2020, expressed in Watts per square meter, using FRPPIXEL product. Maximum FRP for each pixel is selected as maximum value of FPR within a day. Area inside black square corresponds to province of Huelva.

# Autumn 2019 Fire Activity in Southeast Europe

## Detecting fire occurrence and radiative power from satellite

Year 2019 was above average in terms of number of wildfires in Europe. In Southeast Europe, many fires ignited at the end of October after a longer period of dry and warm weather. Several bigger forest fires started to burn in the mountainous and hilly regions of south Serbia along the border with Bulgaria and North Macedonia. Numerous fires were also burning in the agriculturally very important region of Vojvodina in north Serbia due to mostly crop residuals burning. Daily mapping of fire risk over Southern Europe as based on the LSA SAF Fire Risk Map product (FRM, LSA-504) is depicted in Fig. 1. FRM combines meteorological information with vegetation characteristics and satellite observations of active fires to produce fire risk maps for Southern Europe. It displays high fire risk over many parts of Southeast Europe for the end of October.
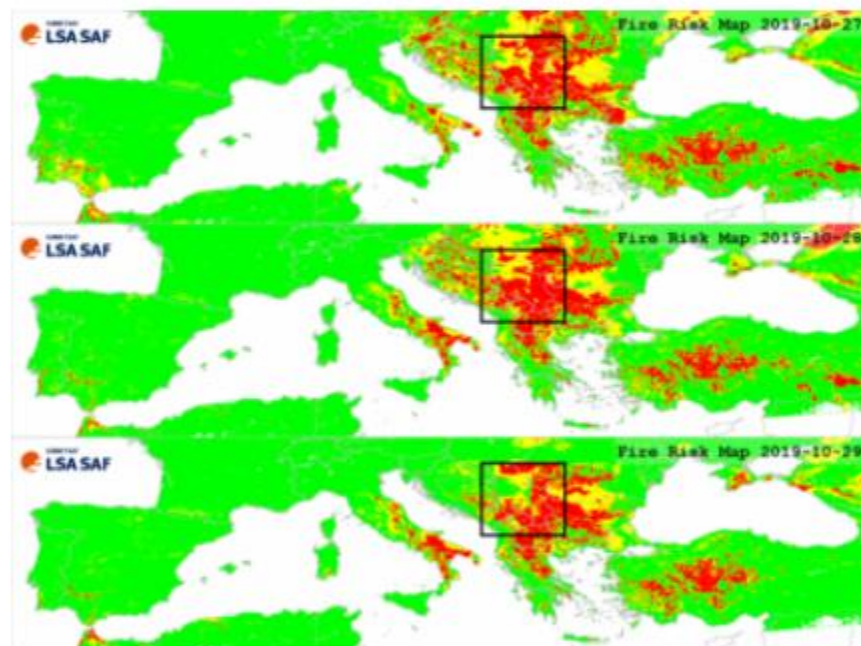


Figure 1 - Daily fire risk classes for Mediterranean Europe at the end of October from the FRM product. Green, yellow and red correspond to low, moderate and high risk of fire. Parts of Southeast Europe with high fire risk are framed by the black square.
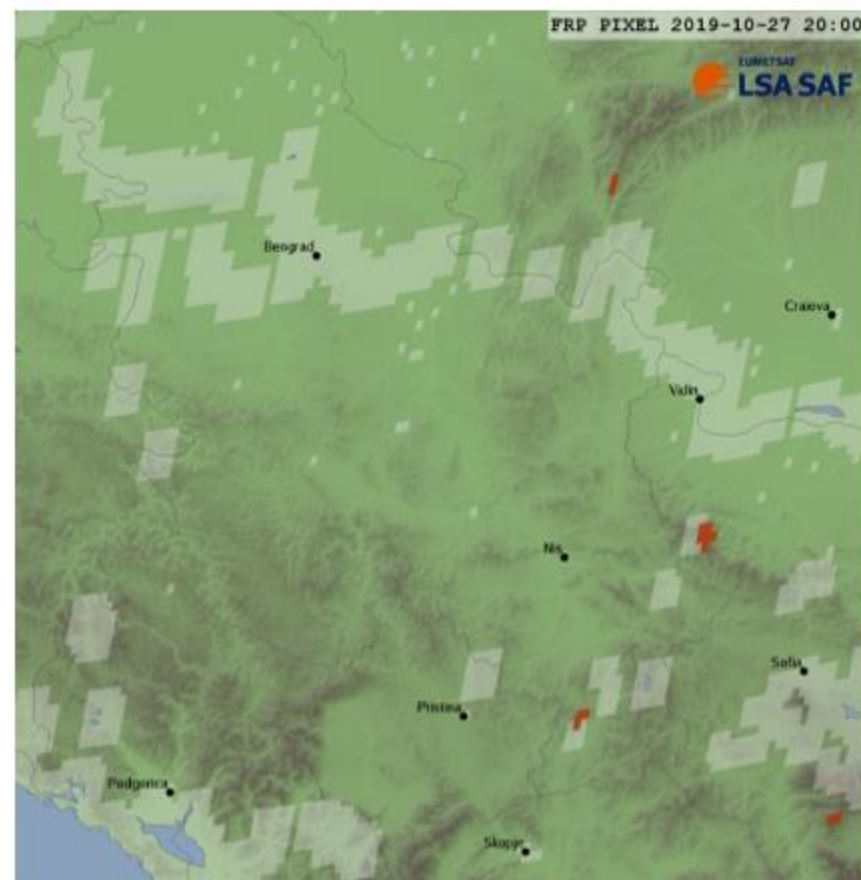


Figure 2 - Fire pixels (FRP Pixel product) in Serbia for the end of October are displayed. Fires are shown in red; cloudy and unclassified satellite pixels are indicated in the shades of light grey.

## News

https://landsaf.ipma.pt/en/news/news/autumn-2019-fire-activity-in-southeast-europe/

**Wildfires Greece 2021**

# 'Ecological disaster' feared as Greece battles forest fire

Marina Rafenberg

AFP Staff
Contact

Published Saturday, May 22, 2021 8:56AM EDT

The blaze started late on Wednesday near the village of S

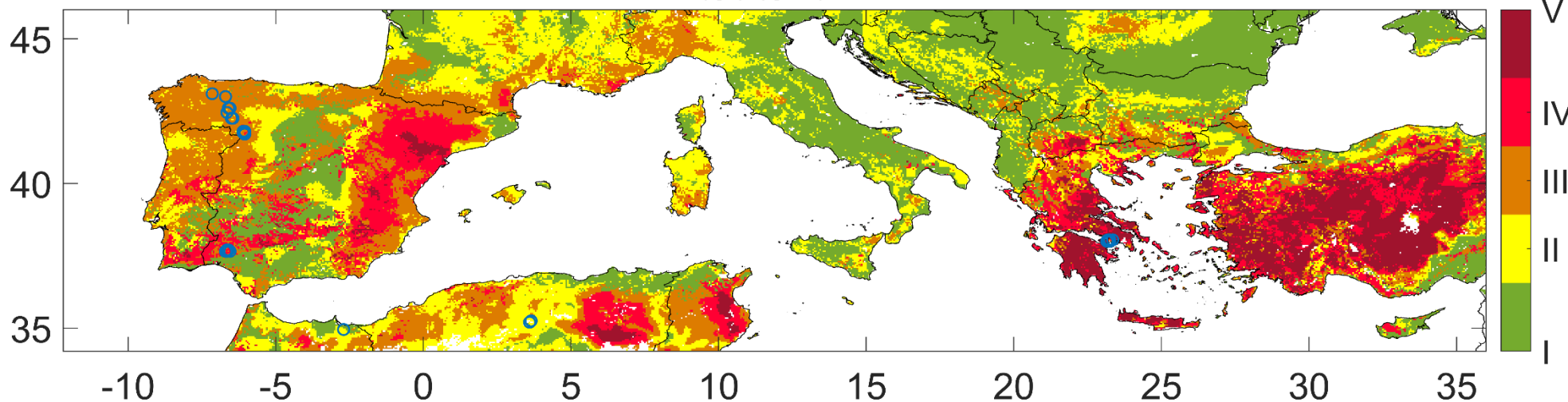SHARE: 🔲 Share  1  🐦 Tweet  📮 Reddit  f Share

ATHENS -- Hundreds of firefighters b
on Saturday, as experts warned of a
area near Athens.

The fire, which broke out late Wedne
(55 miles) west of the capital, is "one
come early in the season," fire chief S
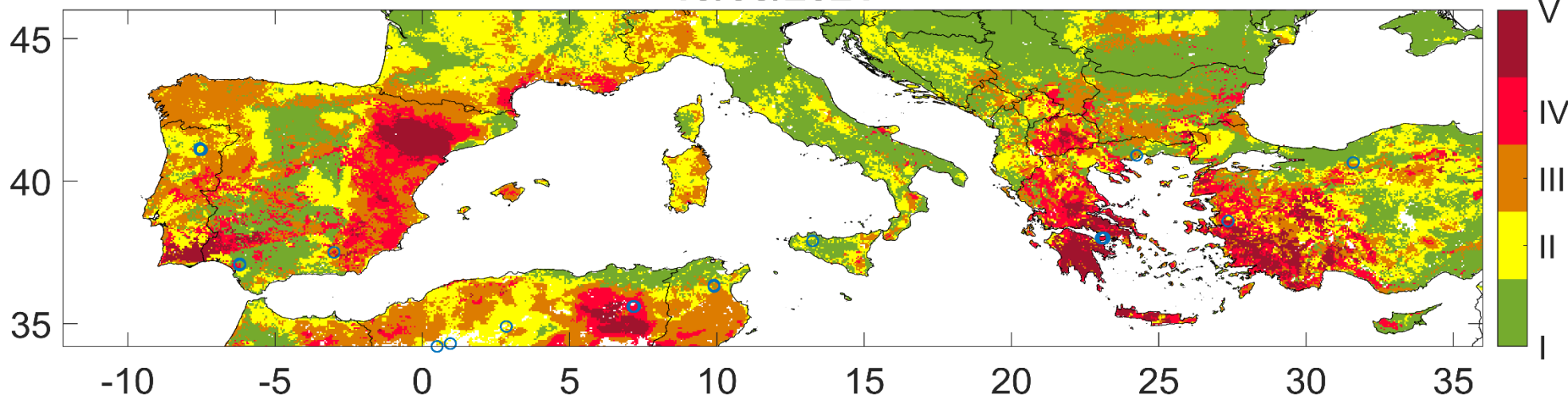
## 19/05/2021



## 20/05/2021

## EPS – Second Generation

- Metop-SG A1 to be launched in 2024
  - ✓ **Visible Infrared Imager (20 channels; 500m)**
  - ✓ **3MI – Multi-spectral, Multi-angle, Multi-polarization**
  - ✓ Sentinel-5 (UVNS)
  - ✓ IASI-SG, ....

## EPS – Second Generation

- Metop-SG B1 to be launched in 2024/2025
  - ✓ Microwave Imager Radiometer (MWI)
  - ✓ Ice Cloude Imager (ICI)
  - ✓ Scatterometer (SCA)
  - ✓ ...

## Meteosat Third Generation

- MTG-I1 to be launched in **2023**
  - ✓ **Imager (16 channels; 1-2 km; 10-minute)**
  - ✓ Lightning Imager
- MTG-S1 to be launched in 2023/2024
  - ✓ Infrared Sounder (0.754/0.625 cm$^{-1}$; 30-60 minute)
  - ✓ Sentinel-4 (UV-VIS-NIR)

**EUMETSAT space segment**



(image credit: EUMETSAT, Bonekamp, 2010)
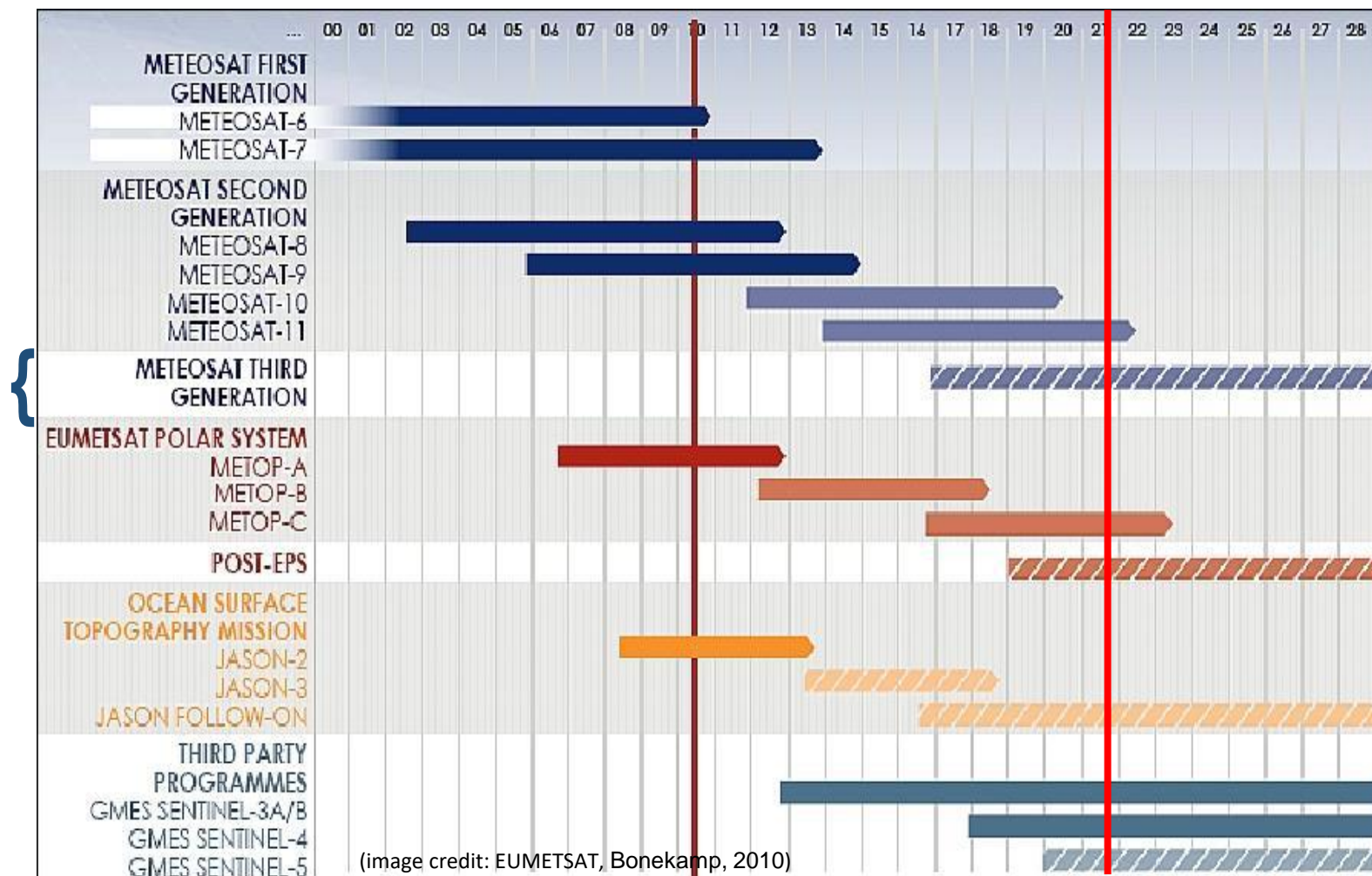
# EUMETSAT space segment

**New Products (High resolution)**

Burnt Area
FRP



(image credit: EUMETSAT, Bonekamp, 2010)
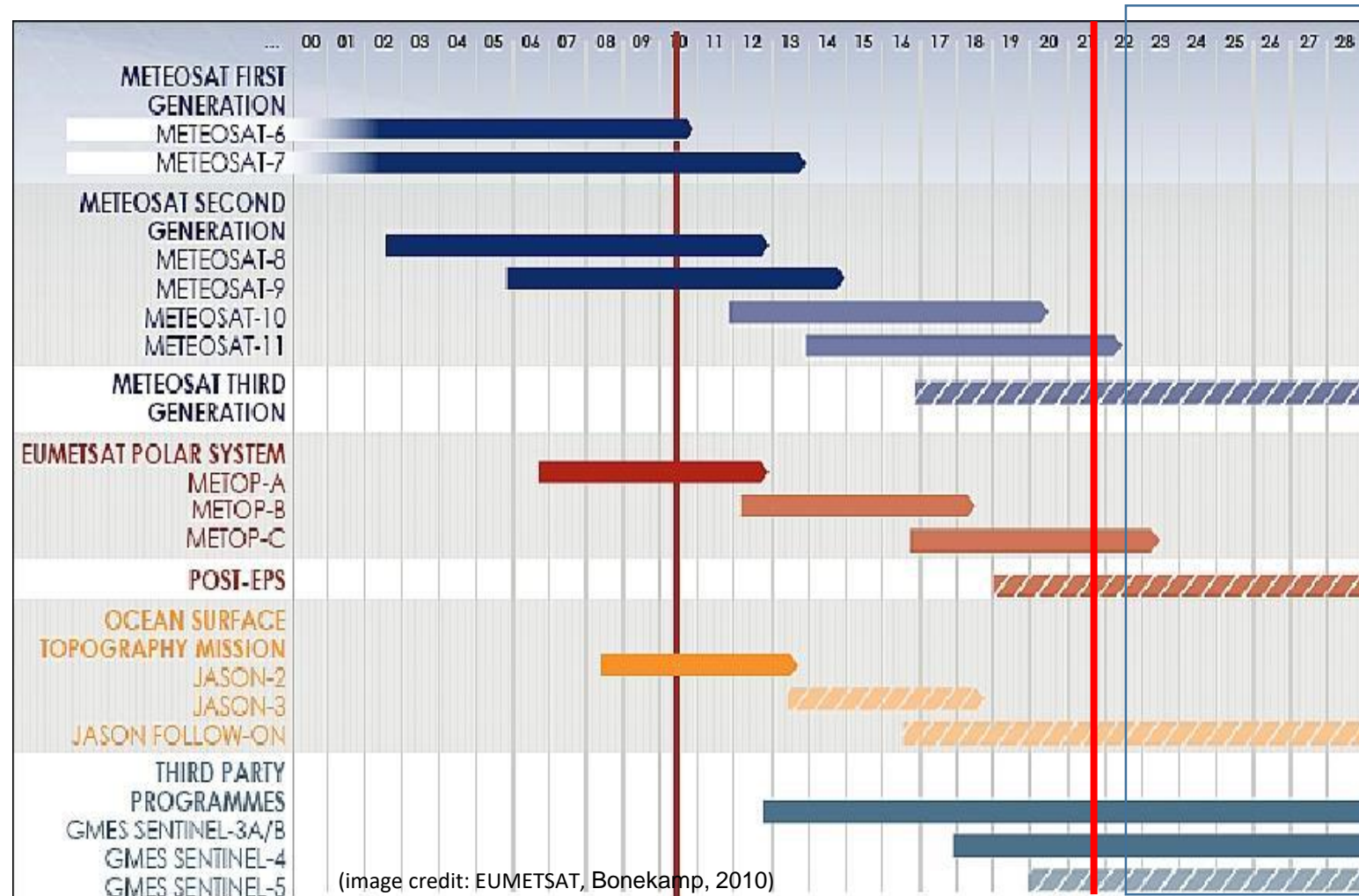
# How to access LSA-SAF data
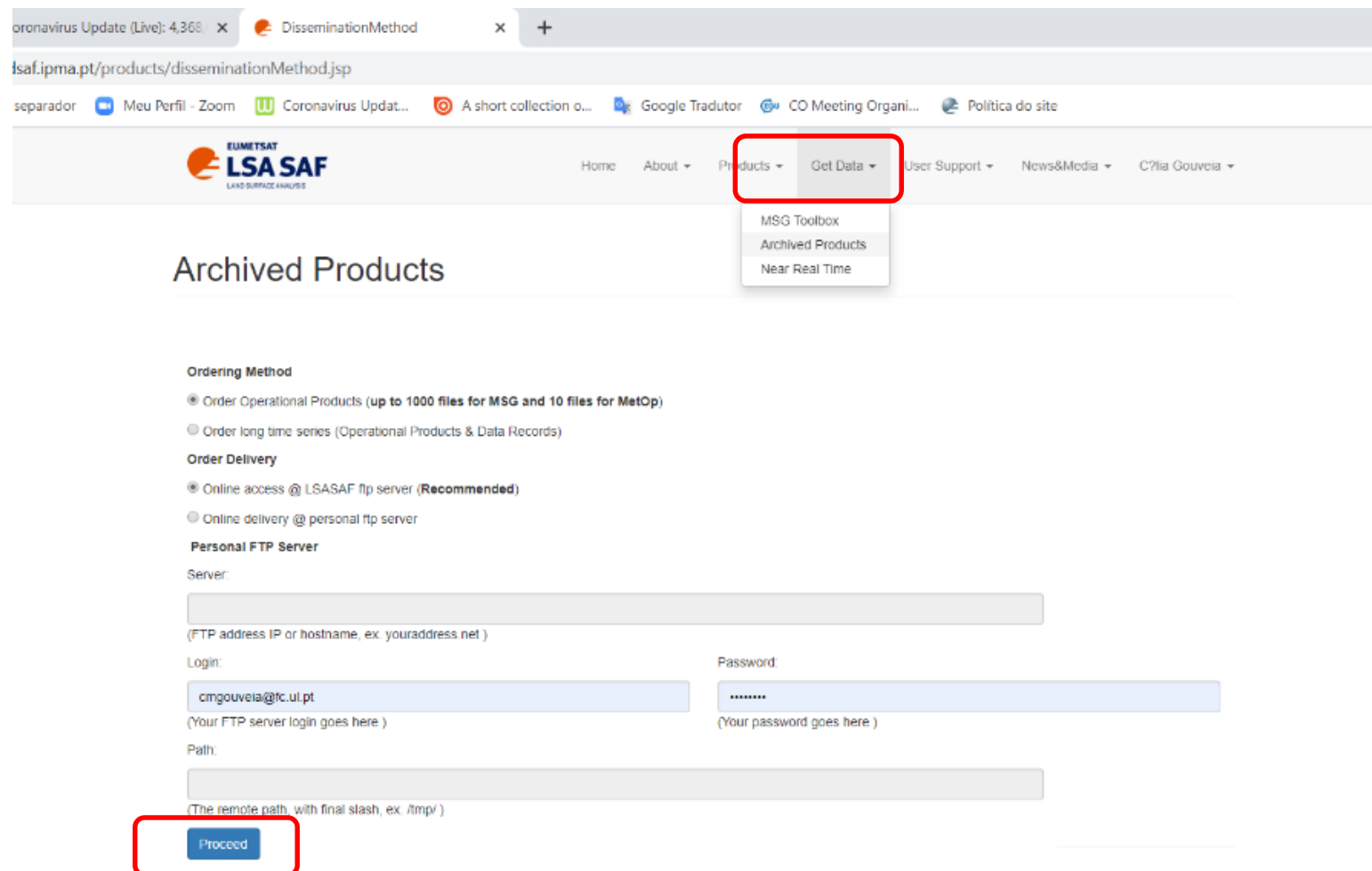
- Users must be registered and need to be logged in before an actual order can be set

- Login with provided credentials
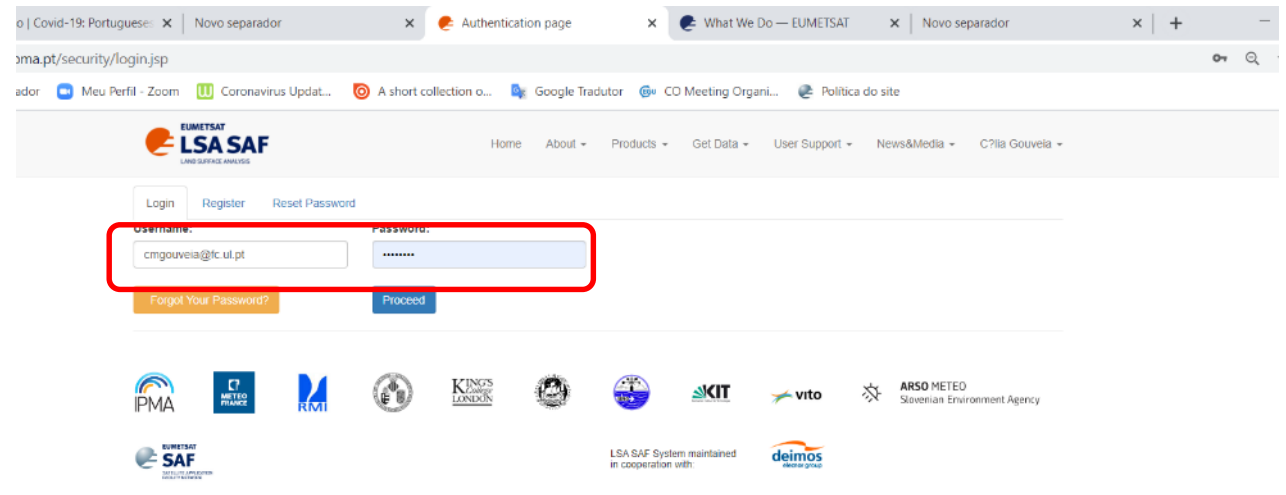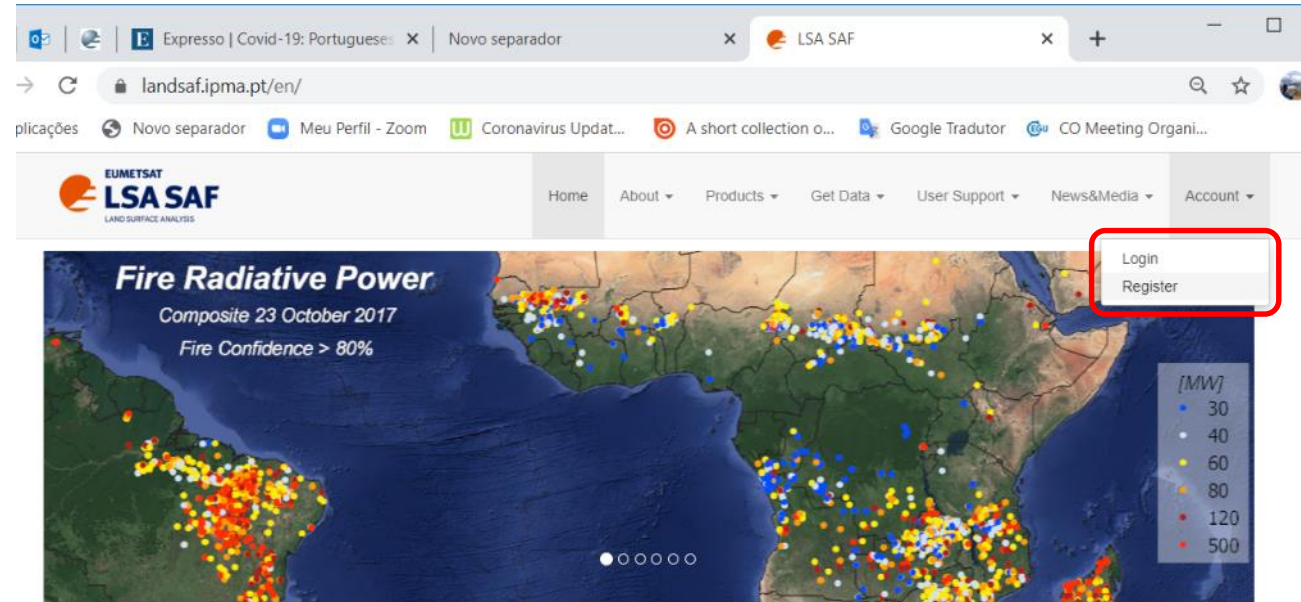
# How to access LSA-SAF data
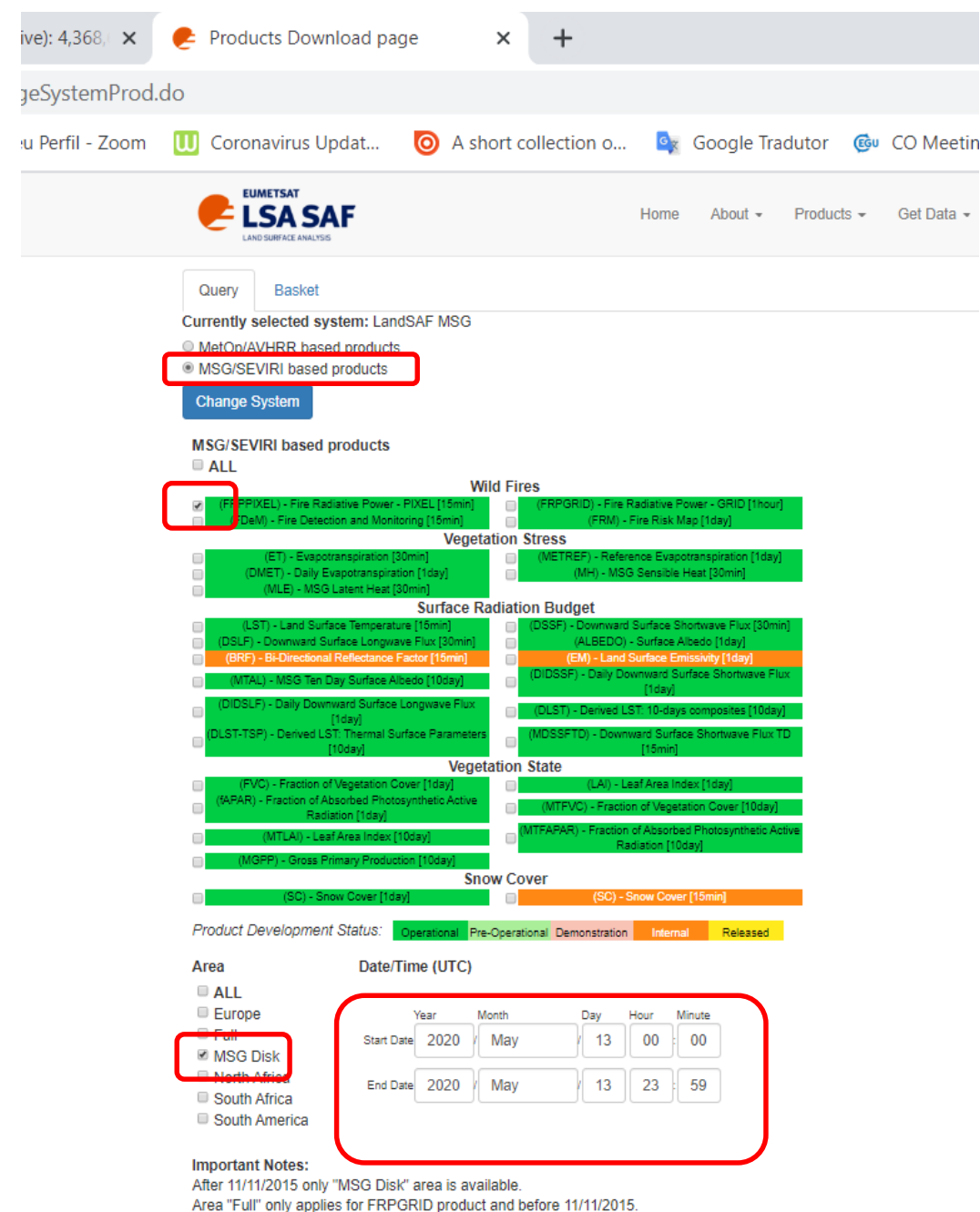
Get Data → Archived Products →
Proceed

# How to access LSA-SAF data

MSG/SEVIRI based Products → FRP
Pixel→ MSG Disk→ Data time →
Proceed

# How to access LSA-SAF data

METOP AVHRR based Products   →
EDLST/ETfAPAR   →  Area Of Interest  →
Area Of Interest→ Data time   →  Proceed

**Thank you for your attention!**

**QUESTIONS?**
celia.gouveia@ipma.pt