

# **LSA SAF Products for Fire Forecast and Monitoring**

Célia Gouveia & Carla Barroso

25<sup>th</sup> May 2021

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

**25 -27 May 2021**

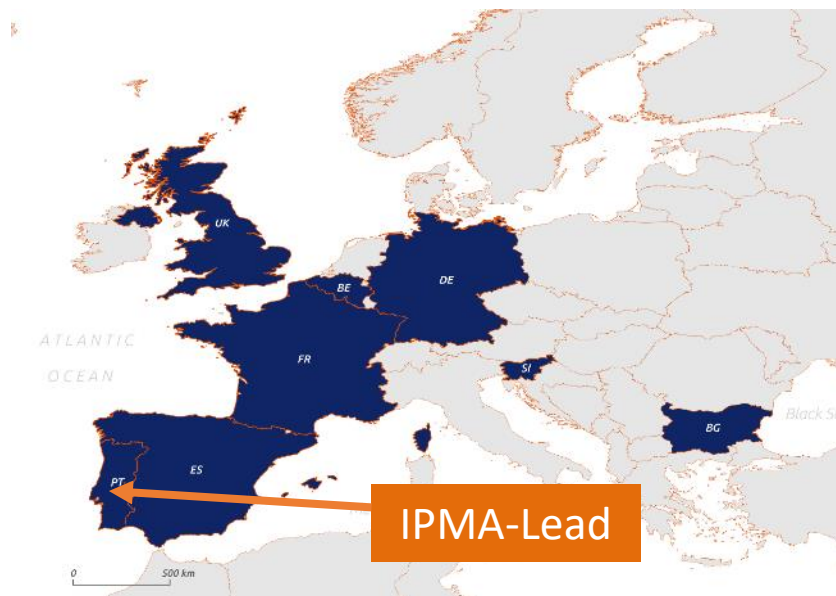
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# LSA-SAF Objective

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

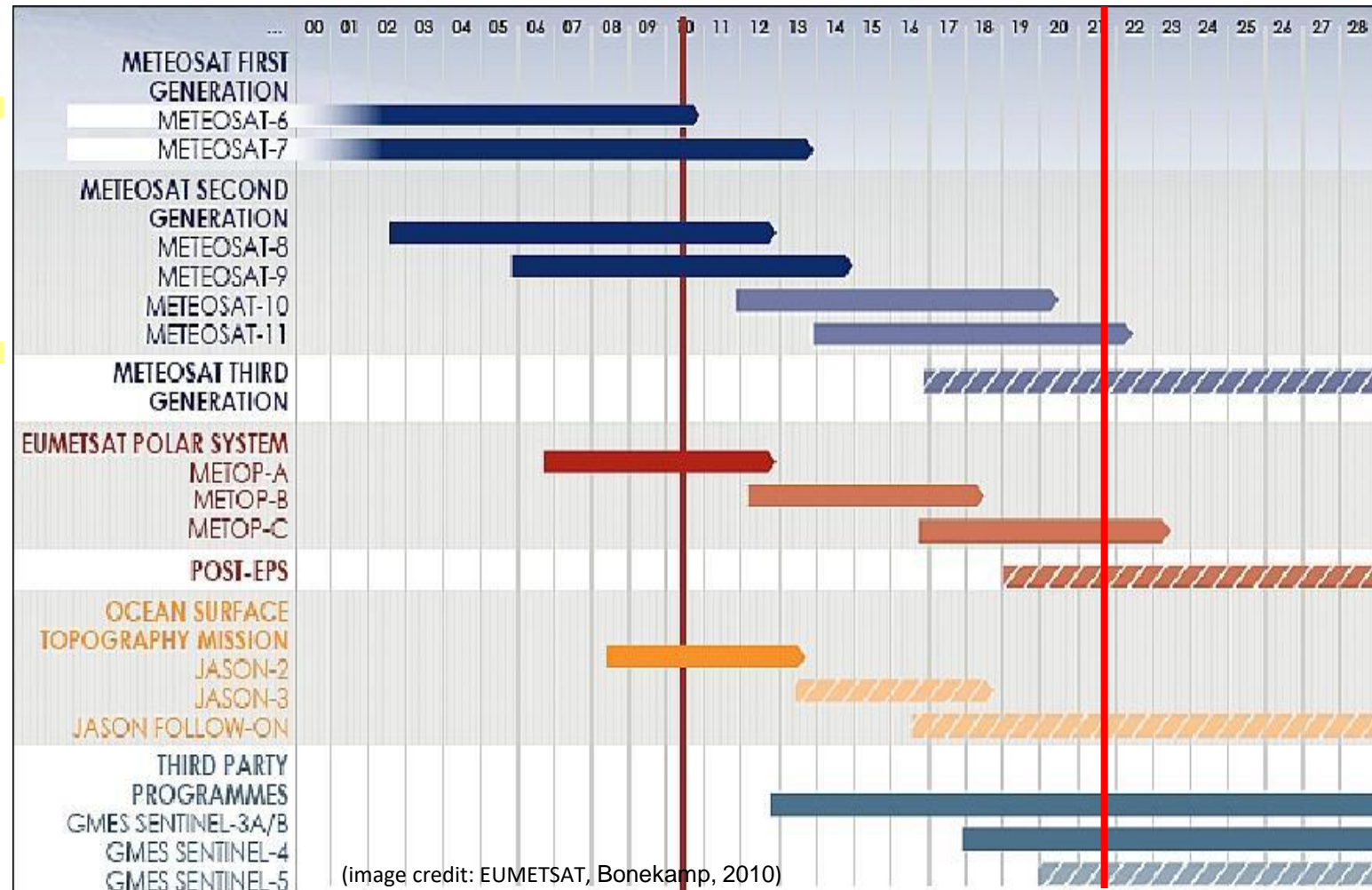
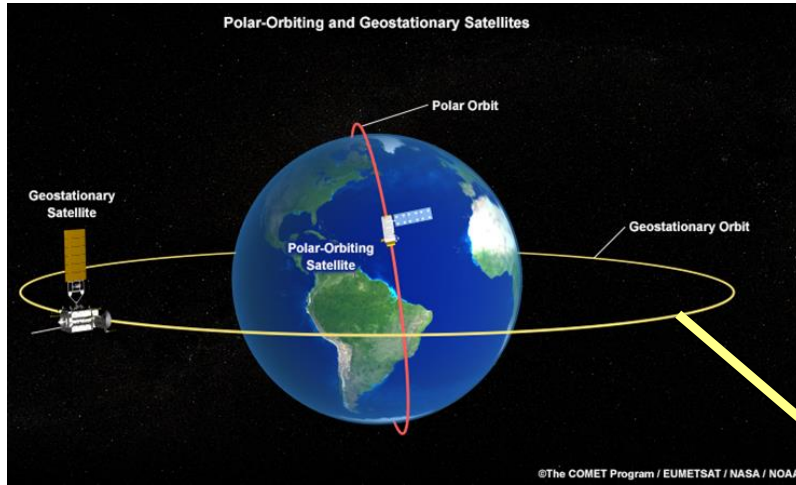
- Focusing primarily EUMETSAT satellites
- Maintain (& improve!) the service for current missions
- Ensure transition to Next Generation of EUM satellites: MTG & EPS-SG
- NRT & Off-line production of Land surface variables (EUMETCast, ftp & Website)
- Helpdesk User Support Service ([helpdesk.landsaf@ipma.pt](mailto:helpdesk.landsaf@ipma.pt))

## LSA SAF Consortium



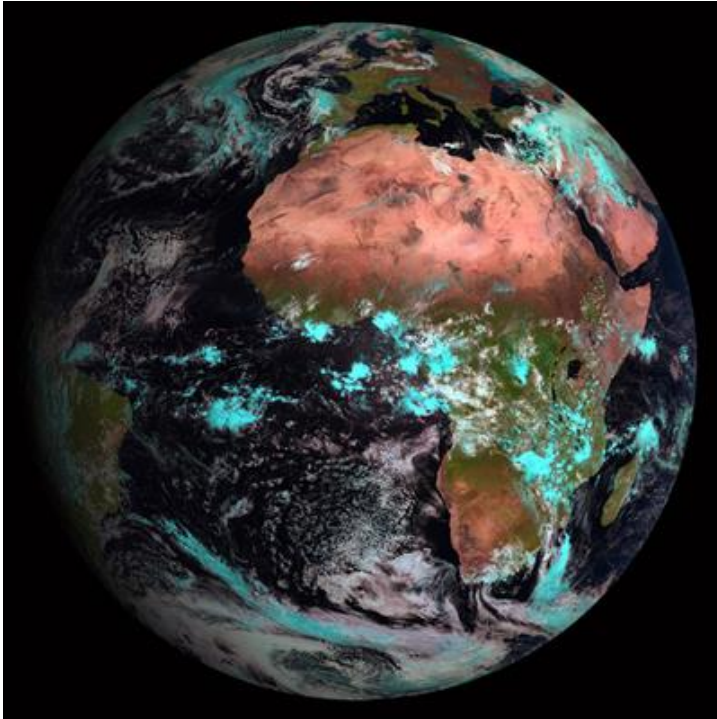
IPMA	(Portugal) – Leading Institution
MF	(France)
RMI	(Belgium)
IDL	(Univ Lisbon)
KCL	(King's College London)
KIT	(Karlsruhe Inst Technology)
UV	(Univ Valencia)
VITO	(Flemish Inst Technological Res)
ARSO	(Slovenian Env Agency)
NIMH	(Bulgarian Inst Met and Hyd)

## EUMETSAT space segment

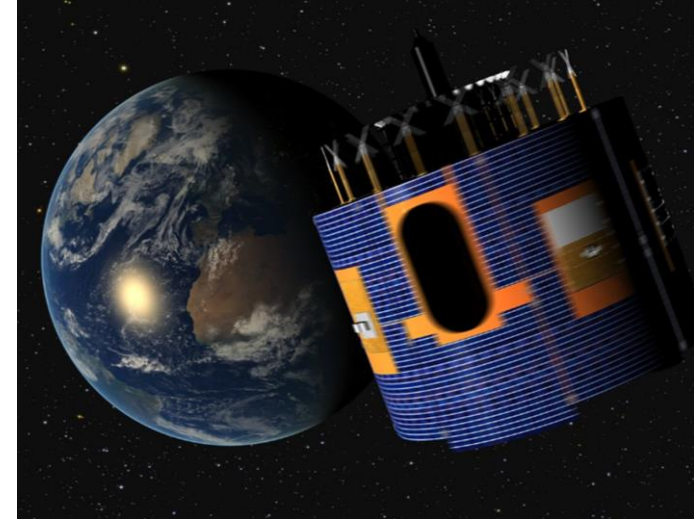


## Meteosat Second Generation

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



## Main focus of LSA SAF until present



## 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

DSLW: ↓Surface Long-wave Flux

LST: Land Surface Temperature

AL: Albedo

## WILDFIRES

FRP: Fire Radiative Power

FRM: Fire Risk Map

## VEGETATION STATE

FVC: Fraction Vegetation Cover

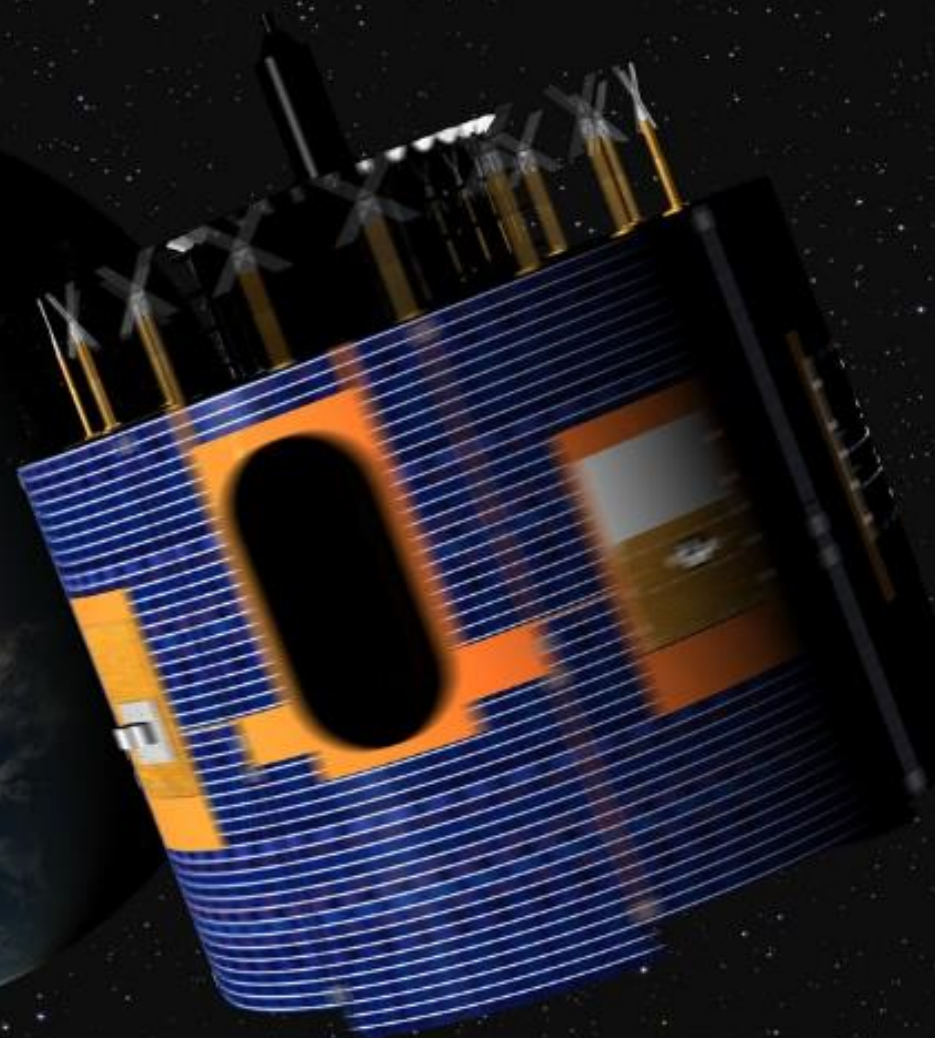
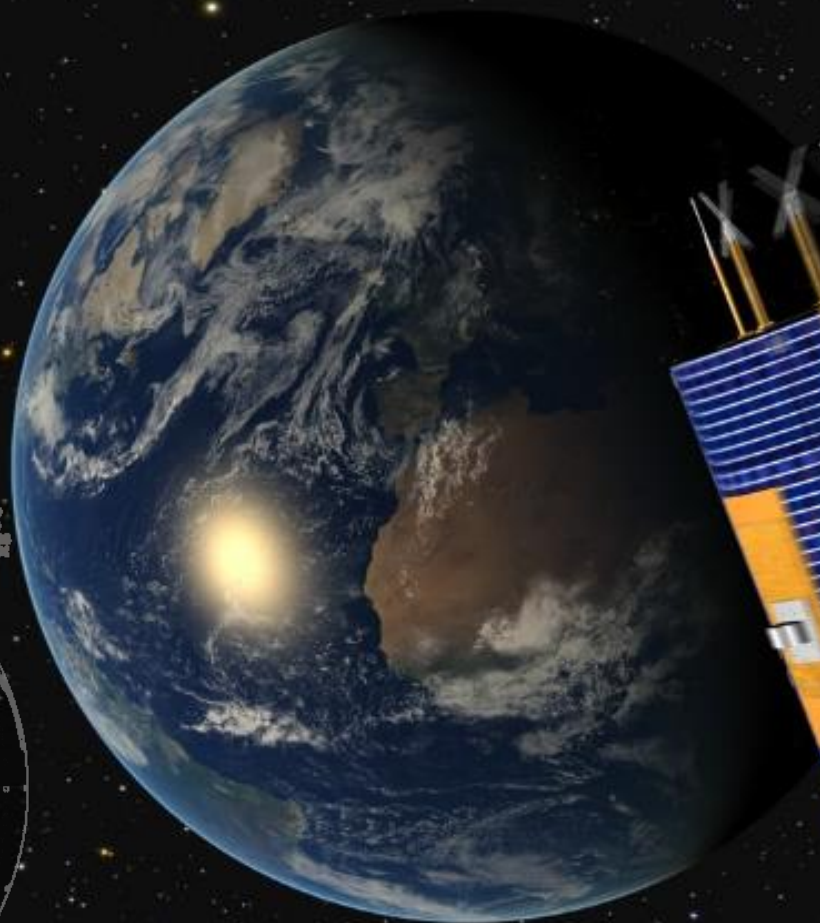
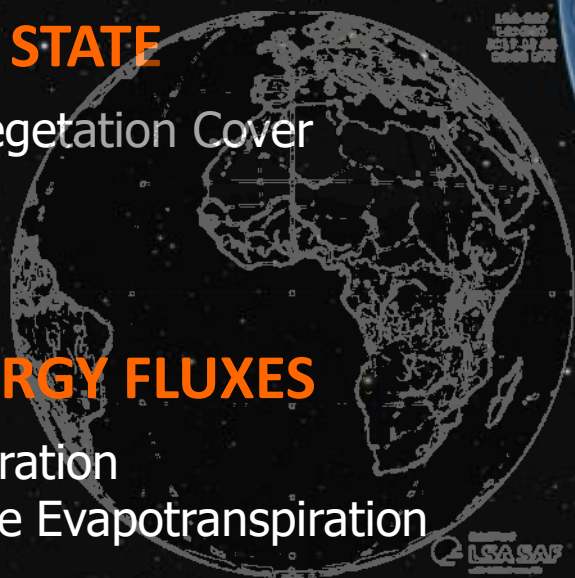
fAPAR

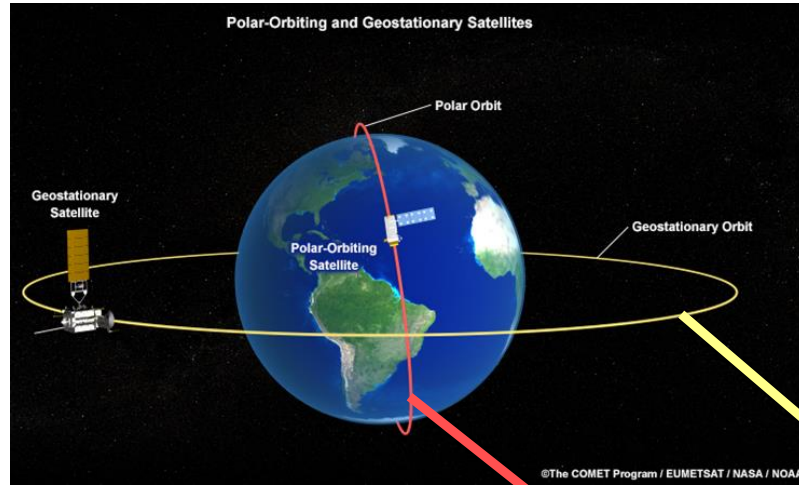
LAI

## SURFACE ENERGY FLUXES

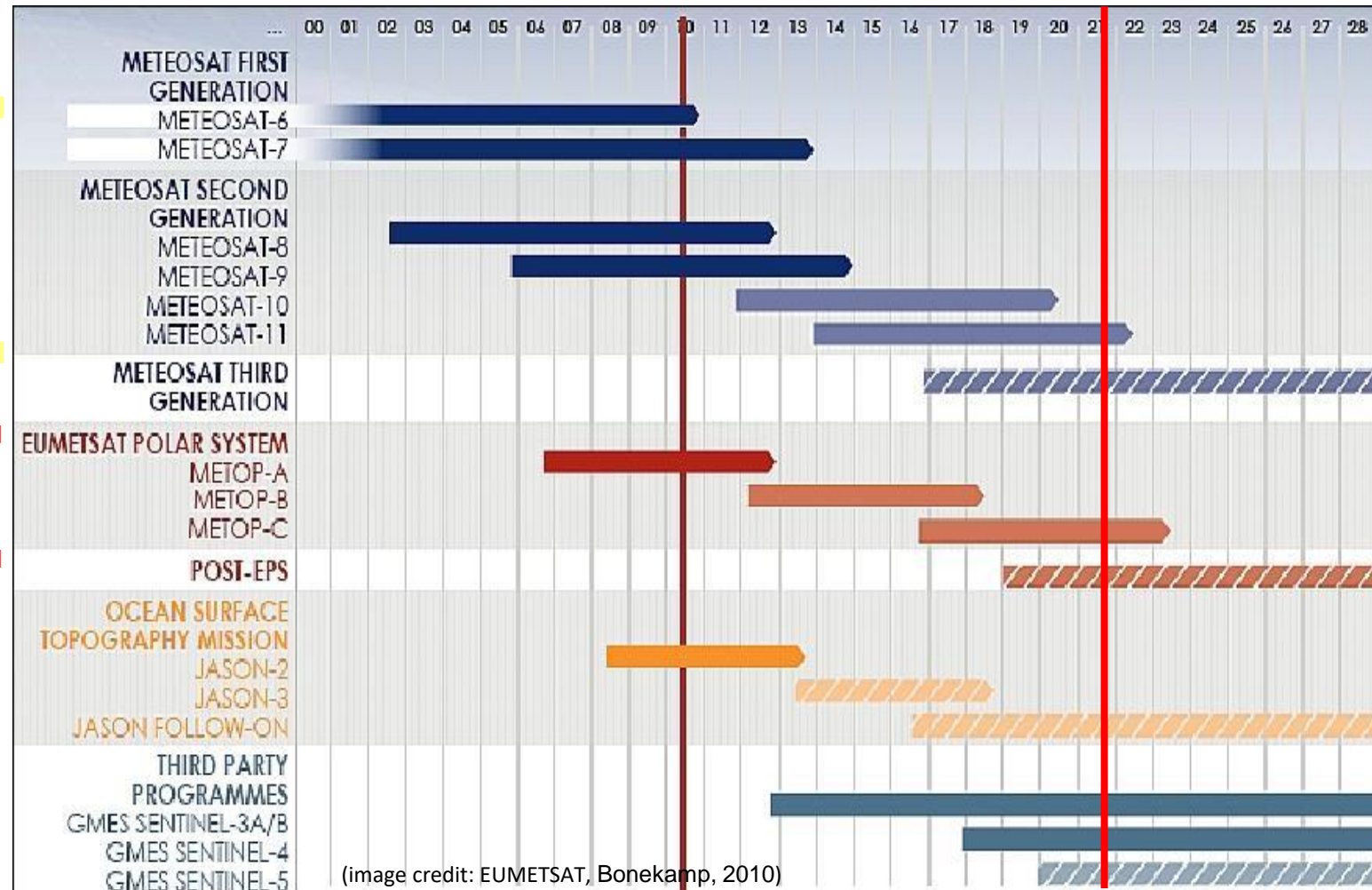
ET: Evapotranspiration

ETREF: Reference Evapotranspiration





## EUMETSAT space segment



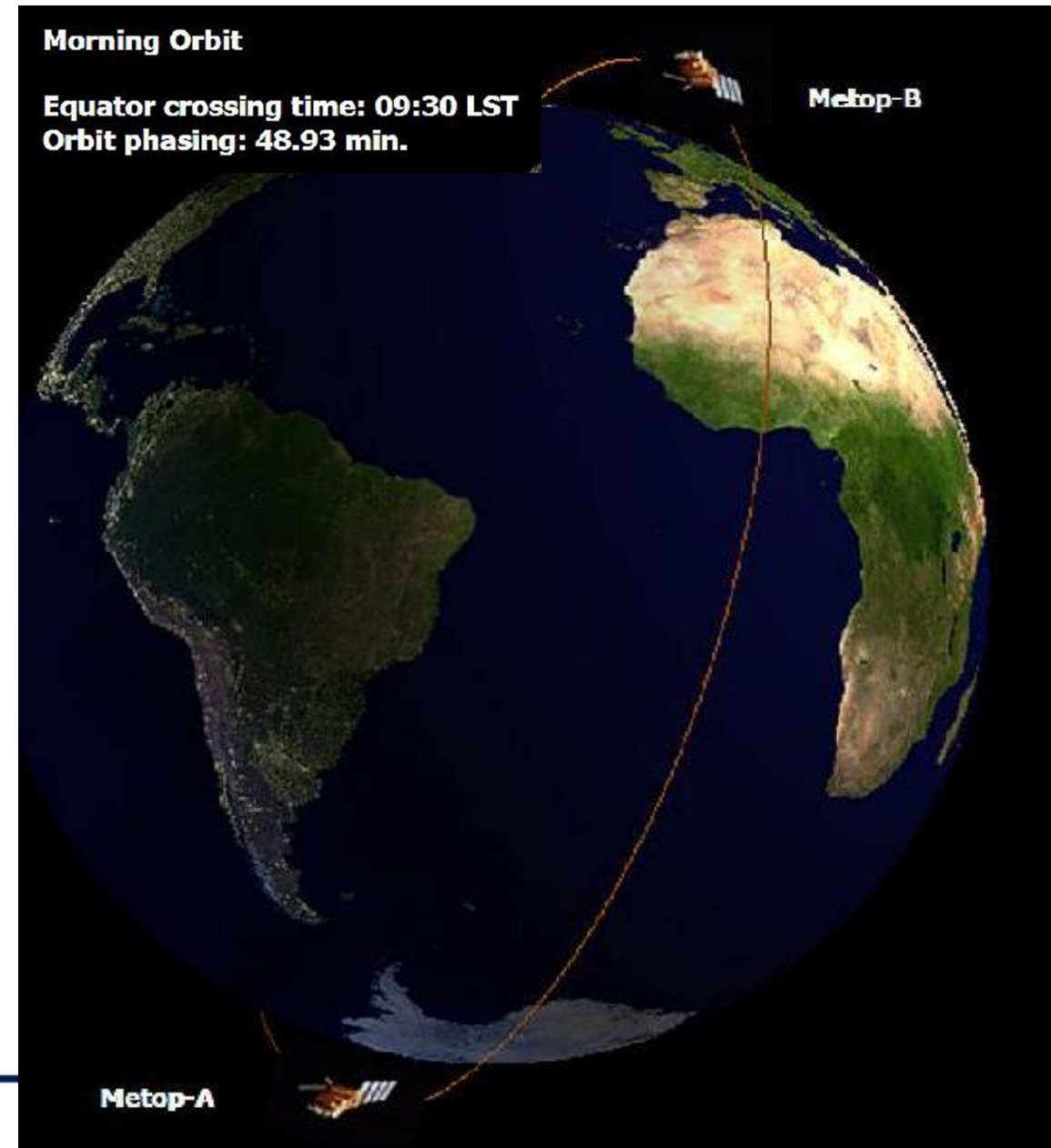
## Metop (EUM Polar-Orbiter)

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

- 5 channels
- 2 observations/day GLOBAL
- c.a. 1 km at sub-satellite point

### Metop (Polar-Orbit) – Payload:

- AVHRR
- HIRS
- AMSU-A



## SURFACE RADIATION BUDGET

EPS LST: Land Surface Temperature

EPS AL: Albedo

## VEGETATION 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

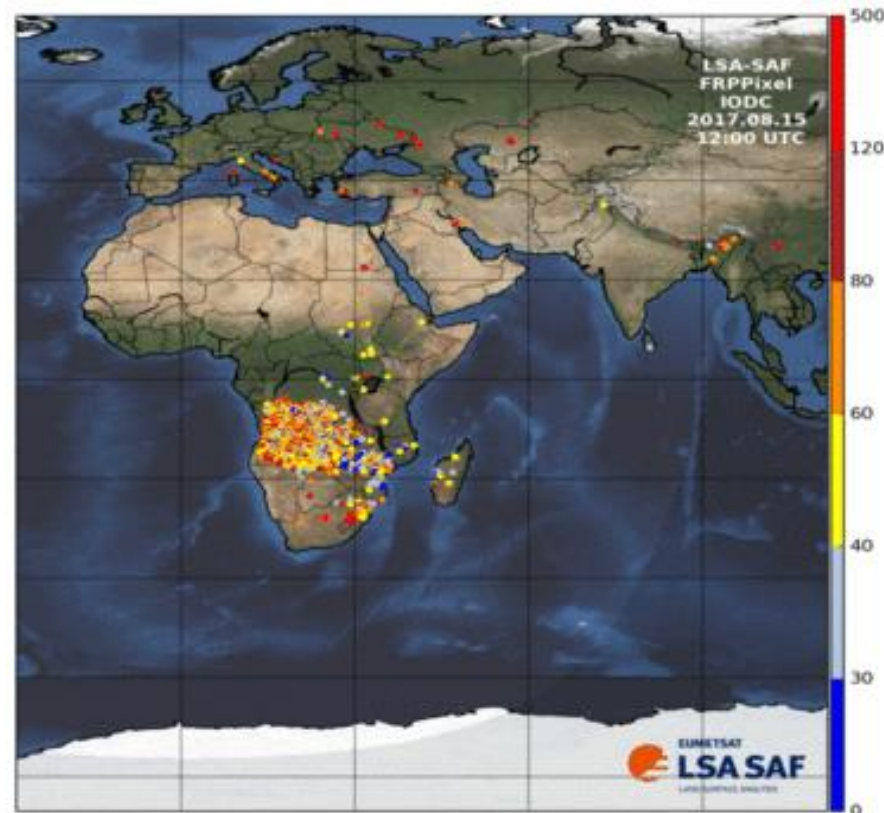
Reprocessed from 2007 onwards using

- the latest product algorithms – in line with “Near Real Time” products
- level 1b AVHRR data

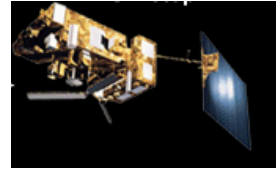
Atmospheric Fields: ERA-5

## 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.



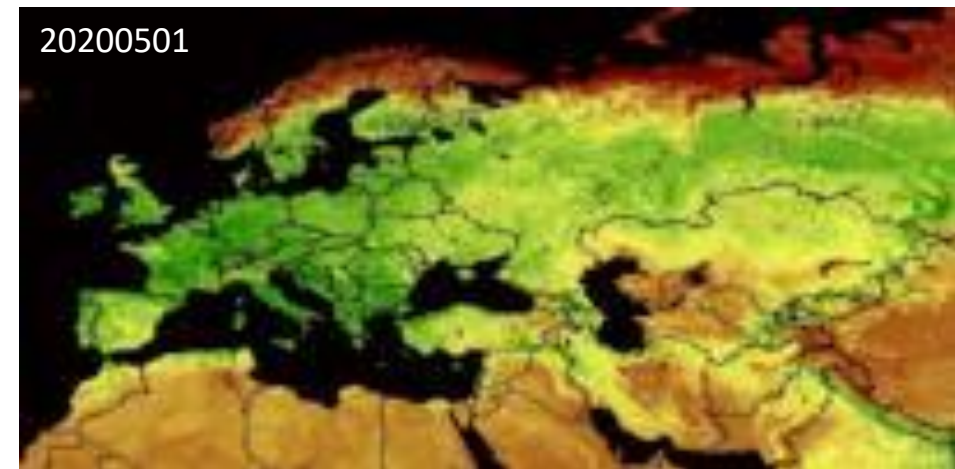
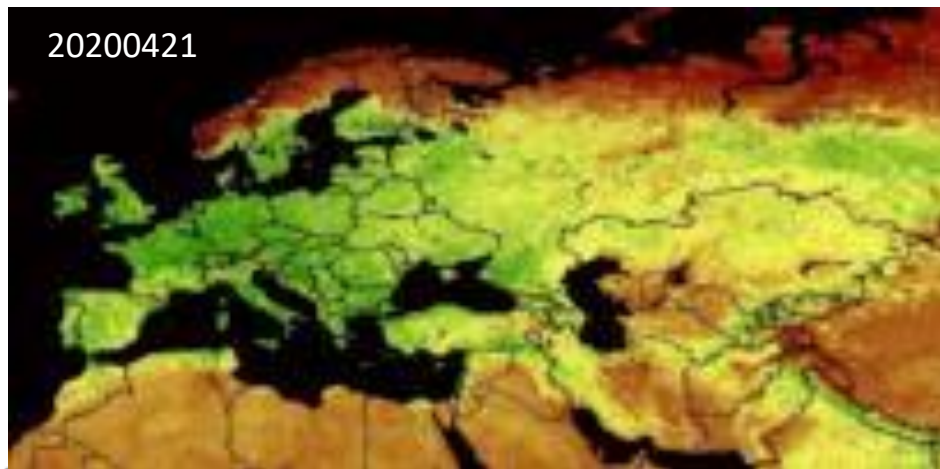
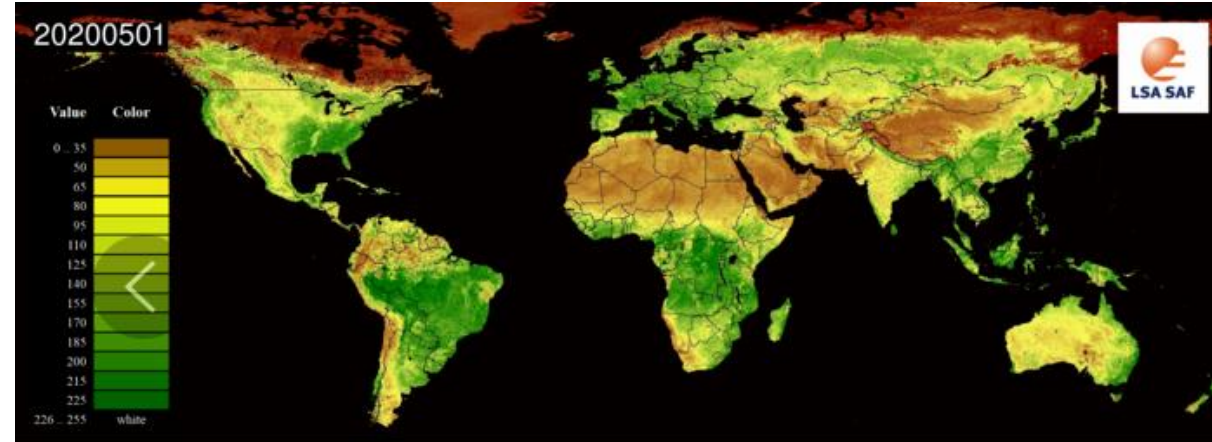
# LSA-SAF (EPS Products)



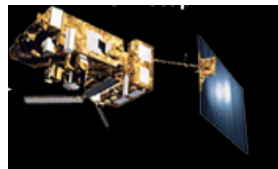
## NDVI

10 days

2007 - Present



# LSA-SAF (EPS Products)

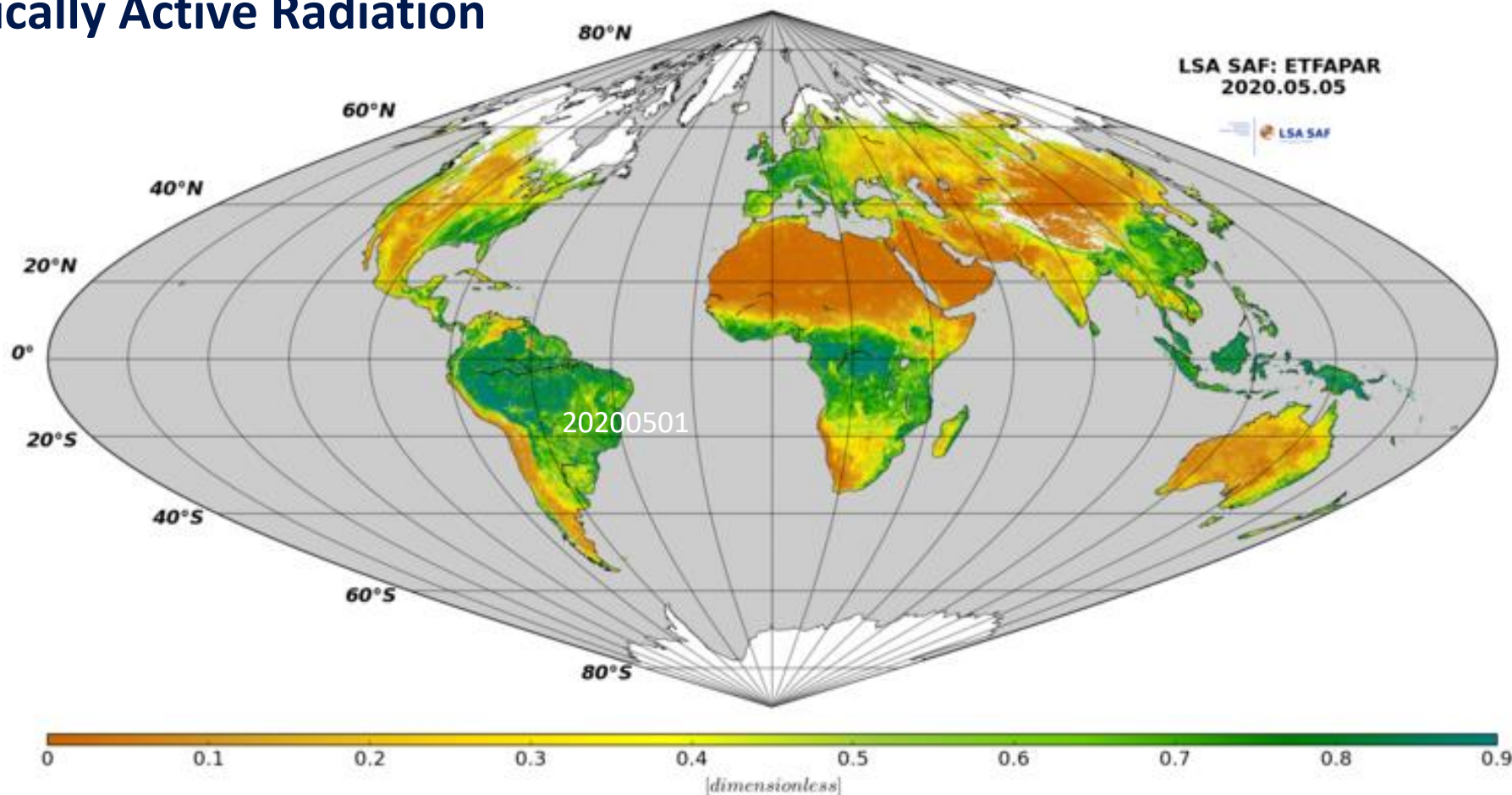


## Fraction of Photosynthetically Active Radiation (fAPAR)

Daily/10 days since 2007

Fraction of radiation in the PAR region ( $0.4 \mu\text{m} - 0.7 \mu\text{m}$ ) 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

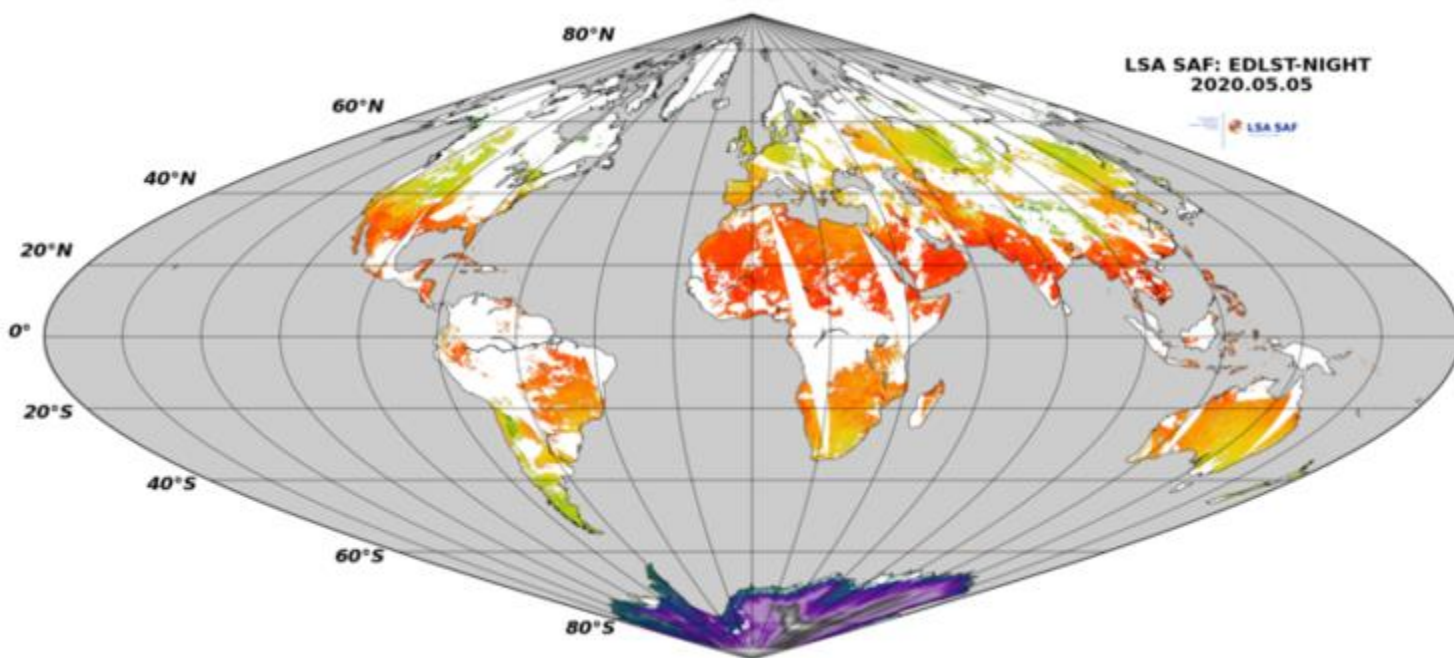
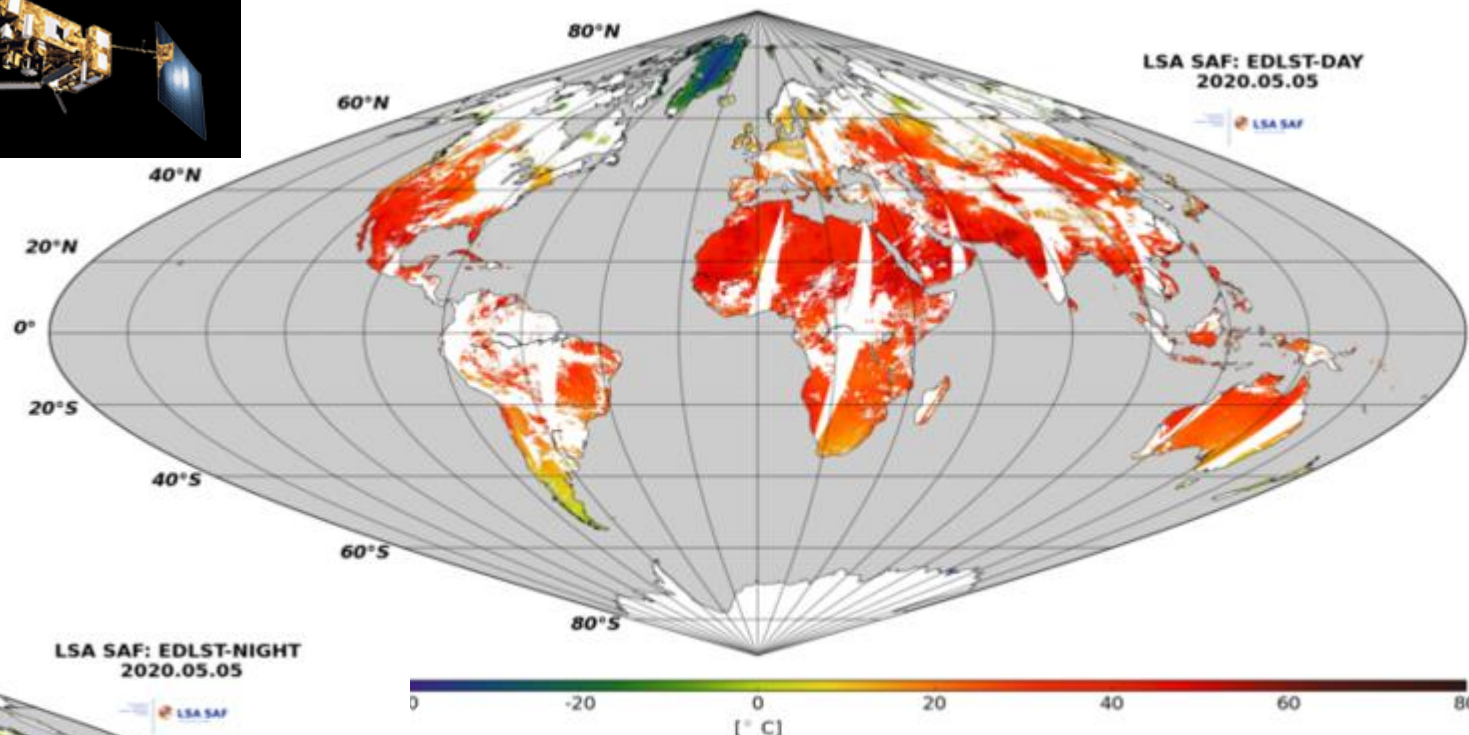
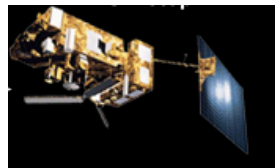


# LSA-SAF (EPS Products)

## LST

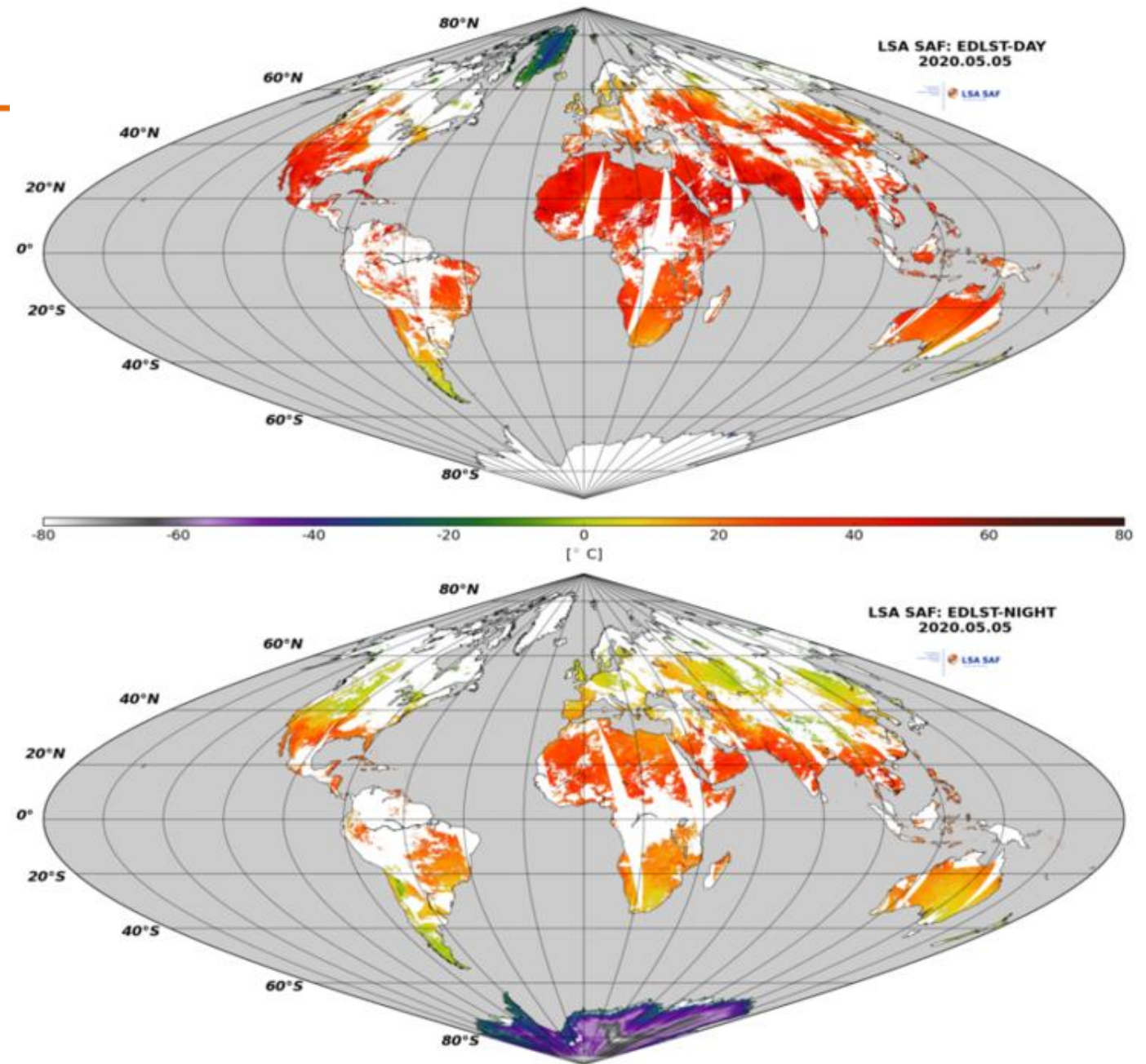
Daily: Day and Night

2007-2020 (will be available begin 2021)



The **EDLST (EPS Daily Land Surface Temperature)** provides a day-time and night-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.

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# LSA-SAF (MSG Products)

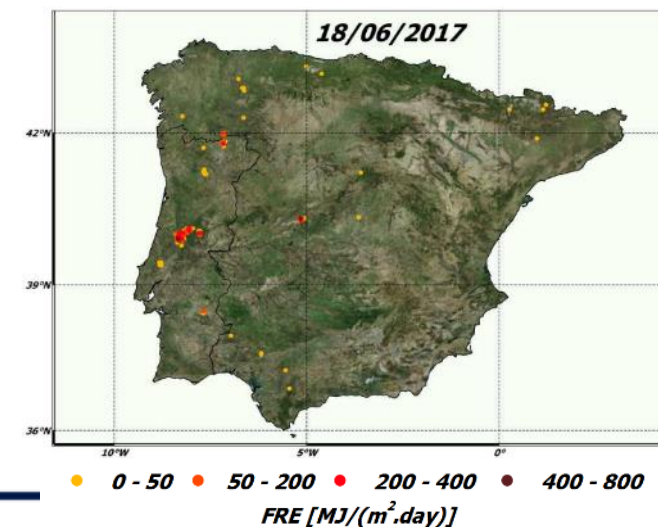
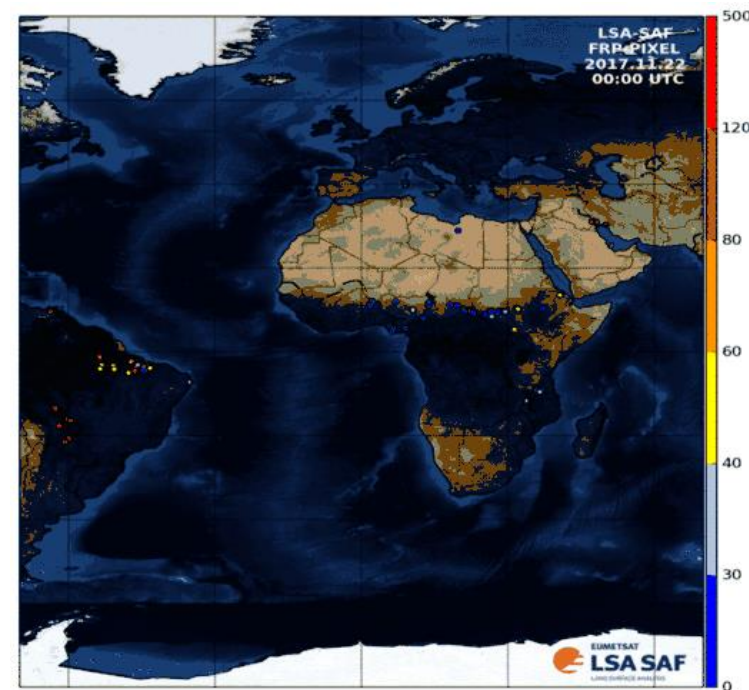


## Fire Radiative Power (FRP)

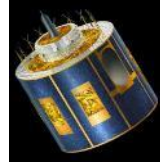
The product records information on the location, timing and fire radiative power (**FRP**, in **MWatt**) of landscape fires detected every **15 minutes** across the full **Meteosat Disk** at the native spatial resolution of the SEVIRI sensor.

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).

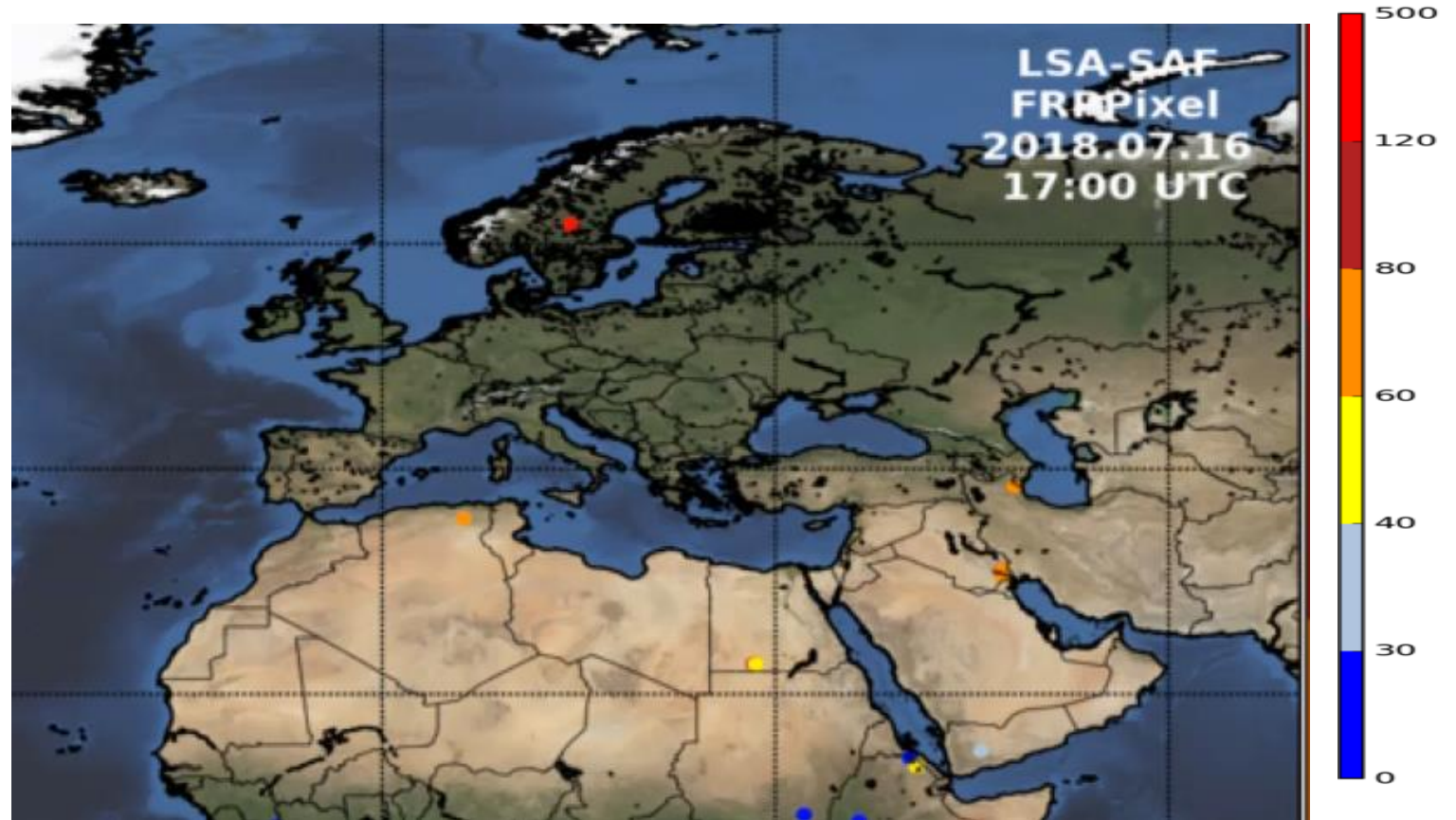


# LSA-SAF (MSG Products)



## Fire Radiative Power (FRP)

Wildfires in Sweden : 16th July 2018.



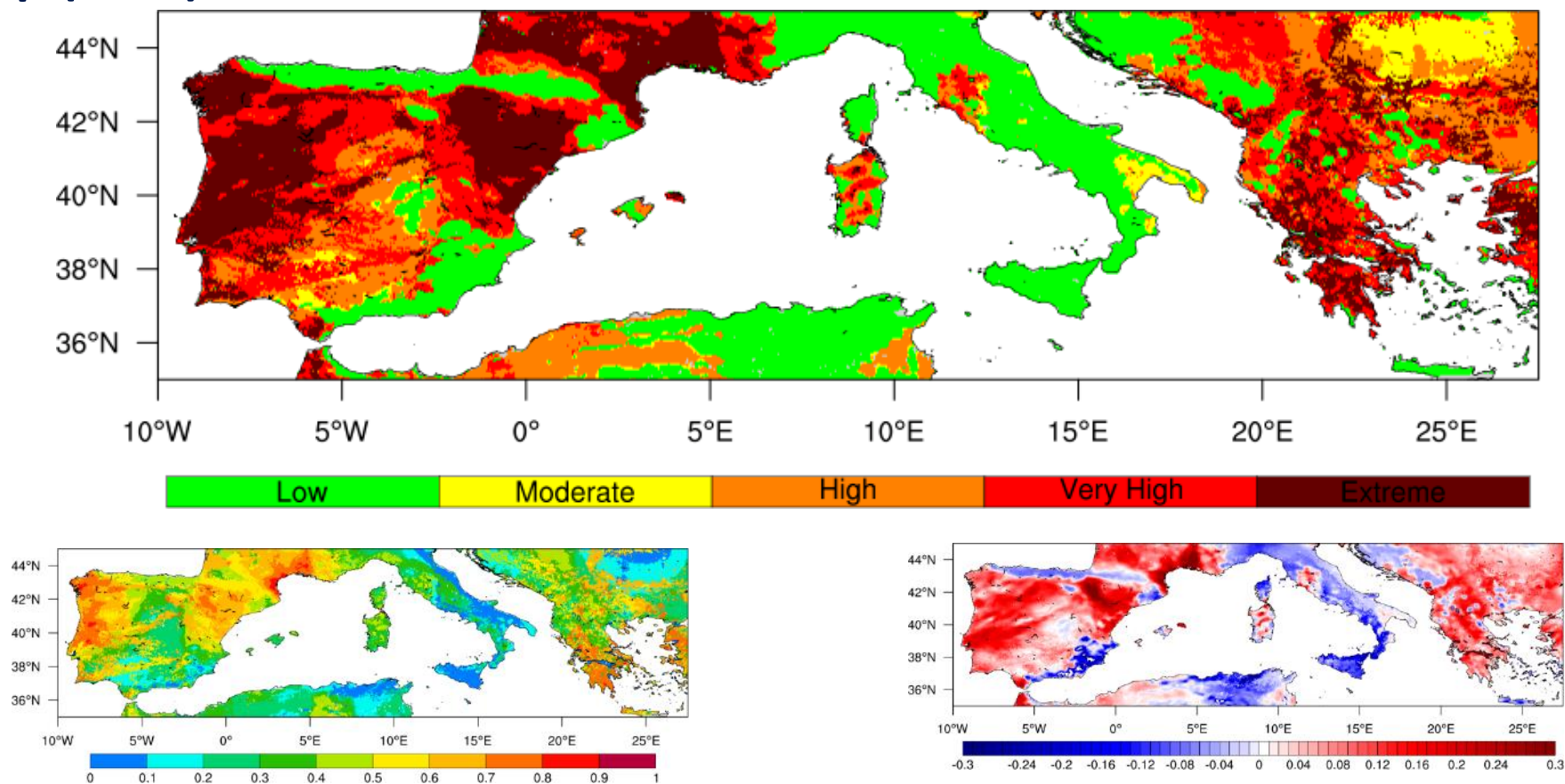
# LSA-SAF (MSG Products)



Mediterranean Europe

5 days of forecast risk (new!)

## Fire Risk Map (FRM)



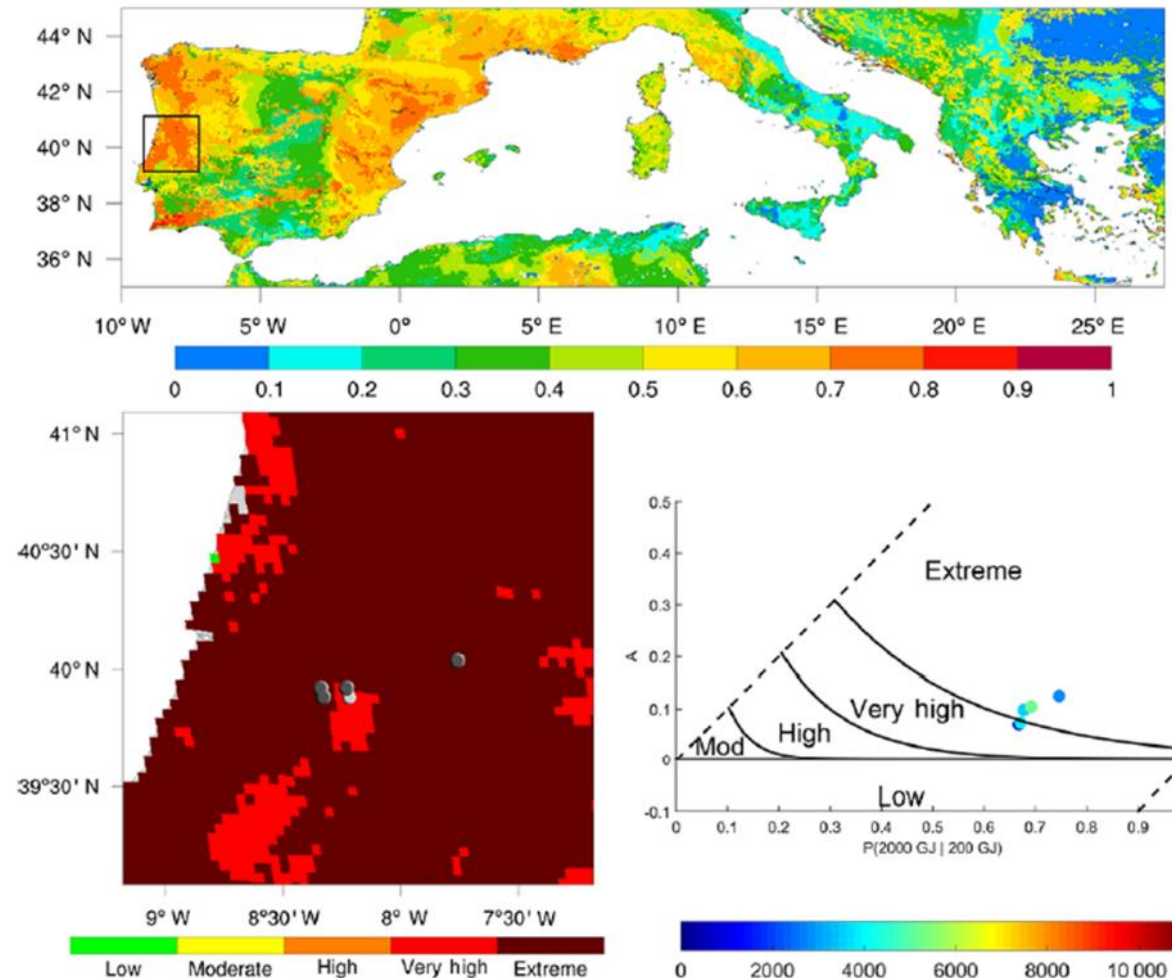
# LSA-SAF (MSG Products)



## Fire Risk Map (FRM)

Applications: Pedrogão Fire (Portugal)  
18<sup>th</sup> June 2017

High Probability of exceedance and low  
anomalies of probability



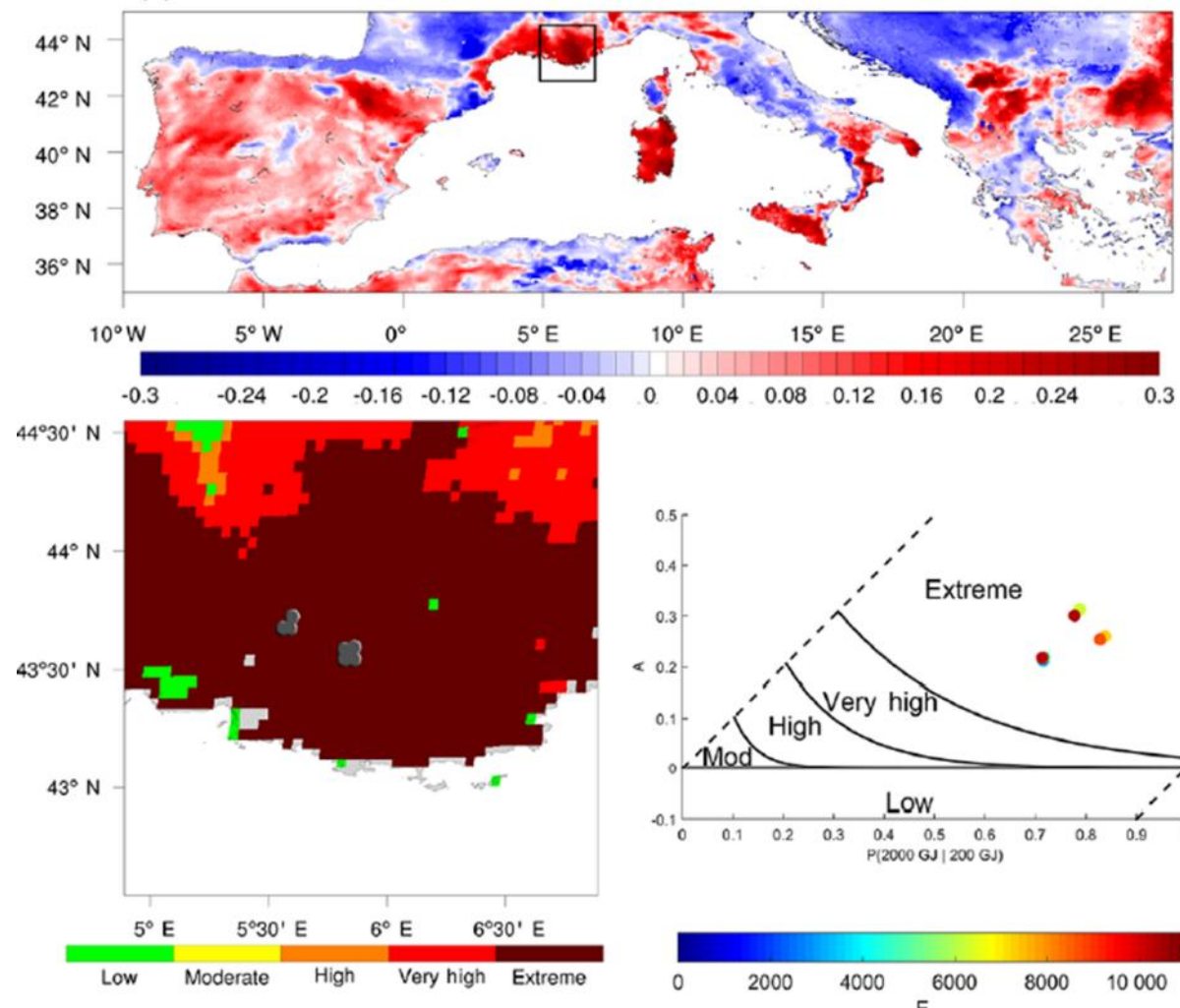
# LSA-SAF (MSG Products)



## Fire Risk Map (FRM)

Applications: Marselha Fire (France)  
25<sup>th</sup> 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

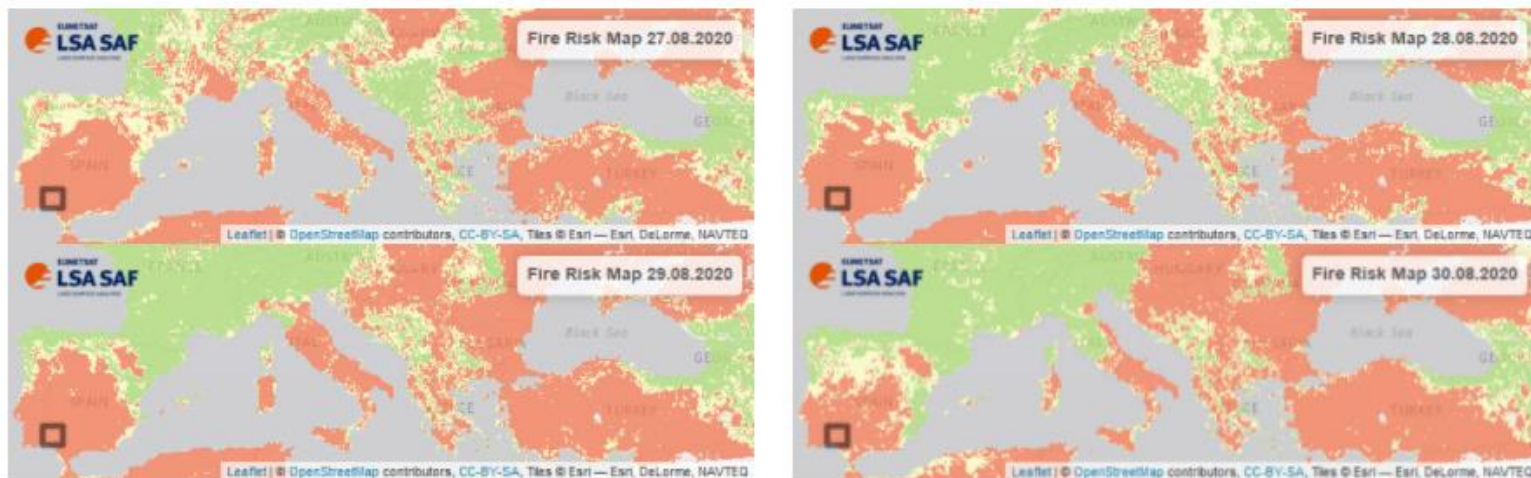


Figure 1 - Daily fire risk classes for Mediterranean Europe at the end of August 2020, using the FRM product. Green, yellow and orange correspond to low, moderate and high risk of fire for the next 24 hours. Black square corresponds to 24 hours fire risk in province of Huelva.



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 FRP 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.

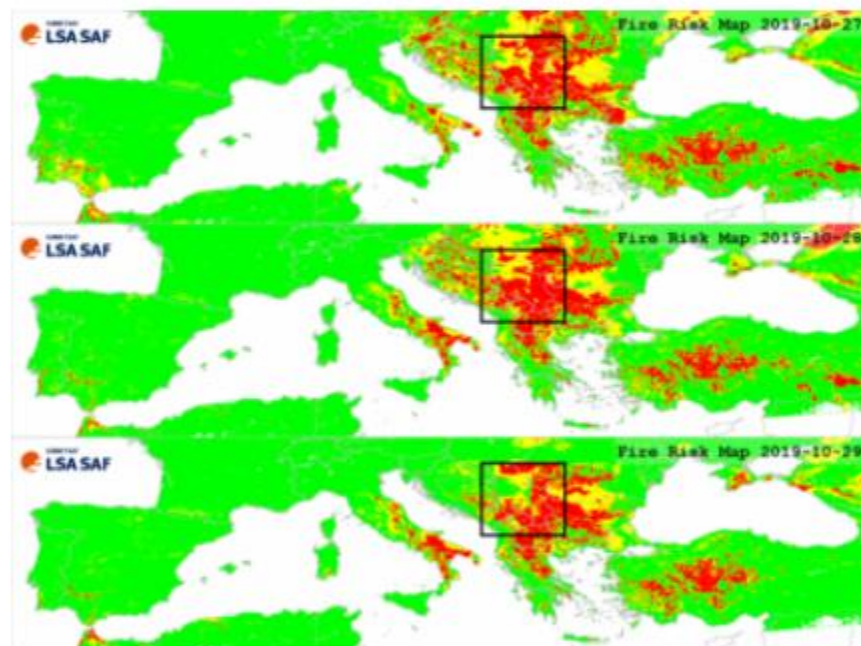


Figure 1 - Daily fire risk classes for Mediterranean Europe at the end of October from the FRM product. Green, yellow and red correspond to low, moderate and high risk of fire. Parts of Southeast Europe with high fire risk are framed by the black square.

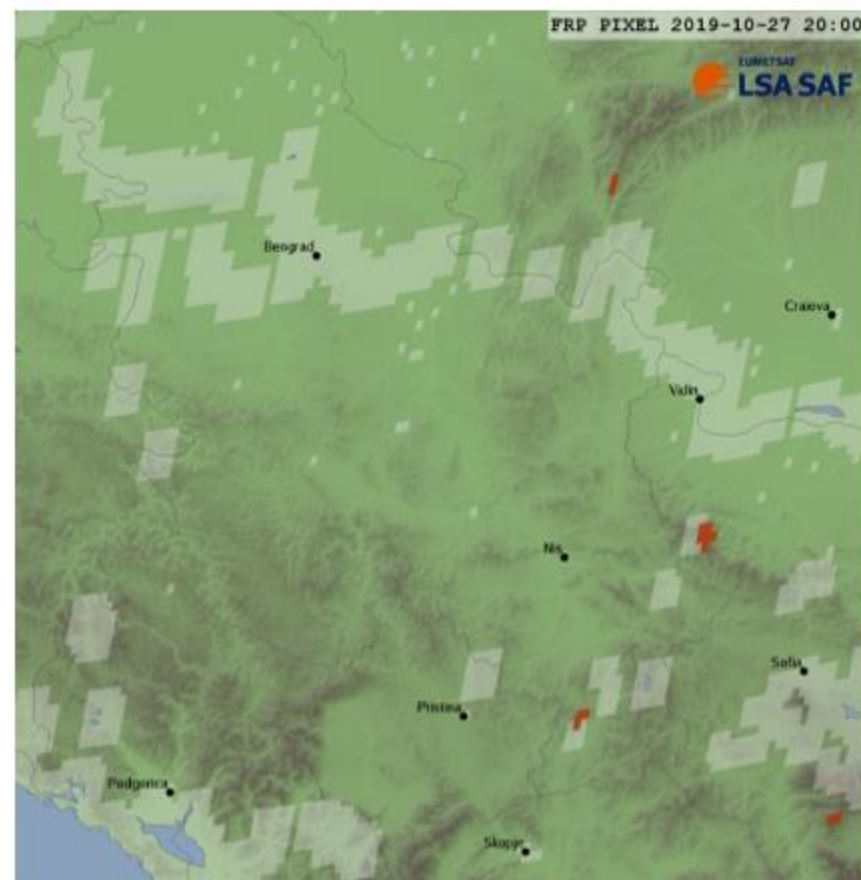


Figure 2 - Fire pixels (FRP Pixel product) in Serbia for the end of October are displayed. Fires are shown in red; cloudy and unclassified satellite pixels are indicated in the shades of light grey.

## 'Ecological disaster' feared as Greece battles forest fire

Marina Rafenberg

AFP Staff  
Contact

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



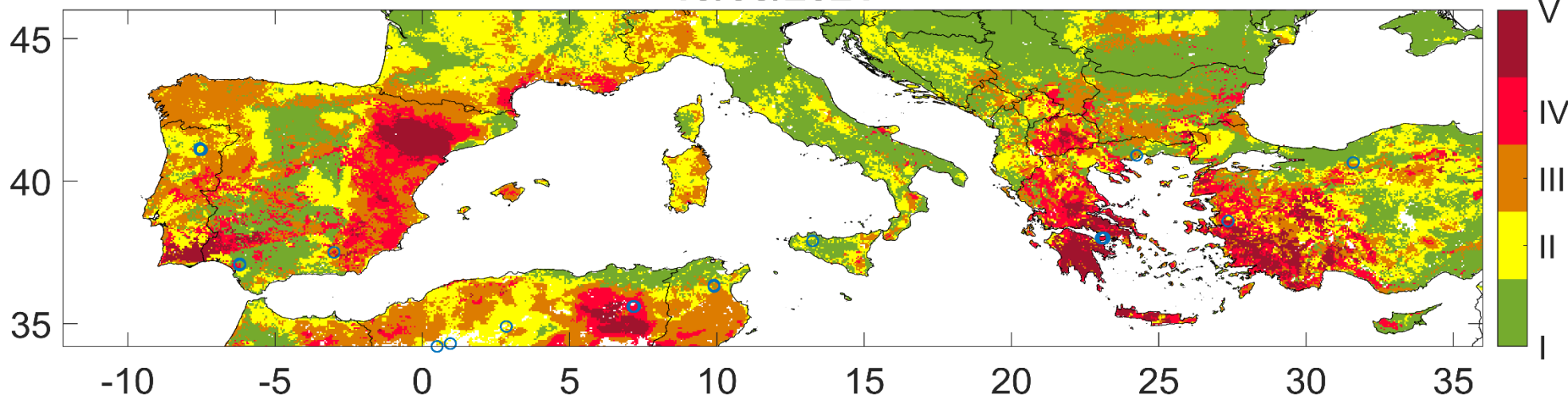
The blaze started late on Wednesday near the village of I

SHARE: [Share](#) 1 [Tweet](#) [Reddit](#) [Share](#)

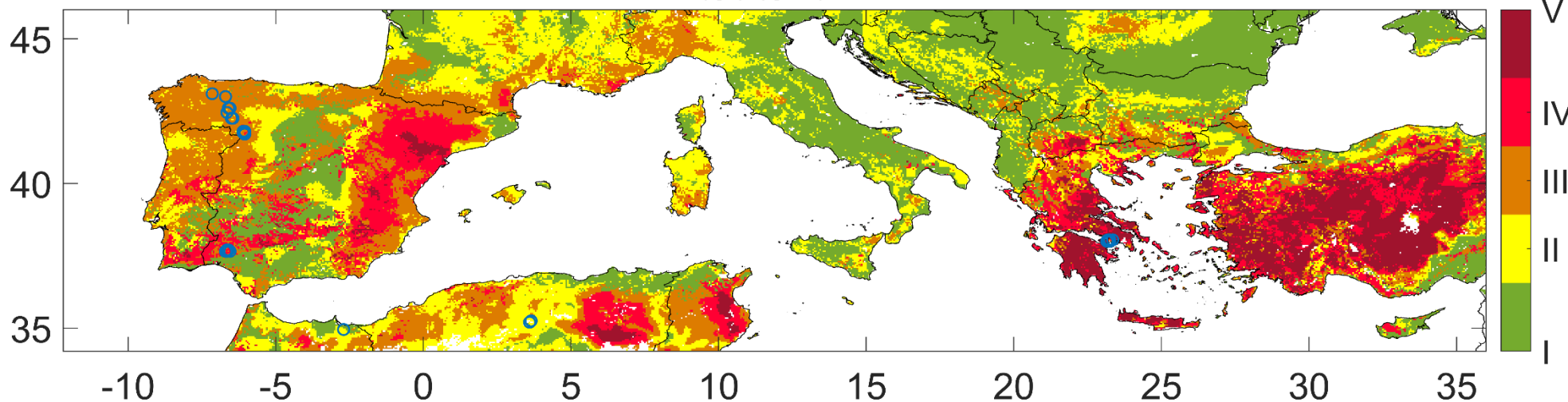
ATHENS – Hundreds of firefighters t  
on Saturday, as experts warned of a  
area near Athens.

The fire, which broke out late Wedne  
(55 miles) west of the capital, is "one  
come early in the season," fire chief :

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, ....

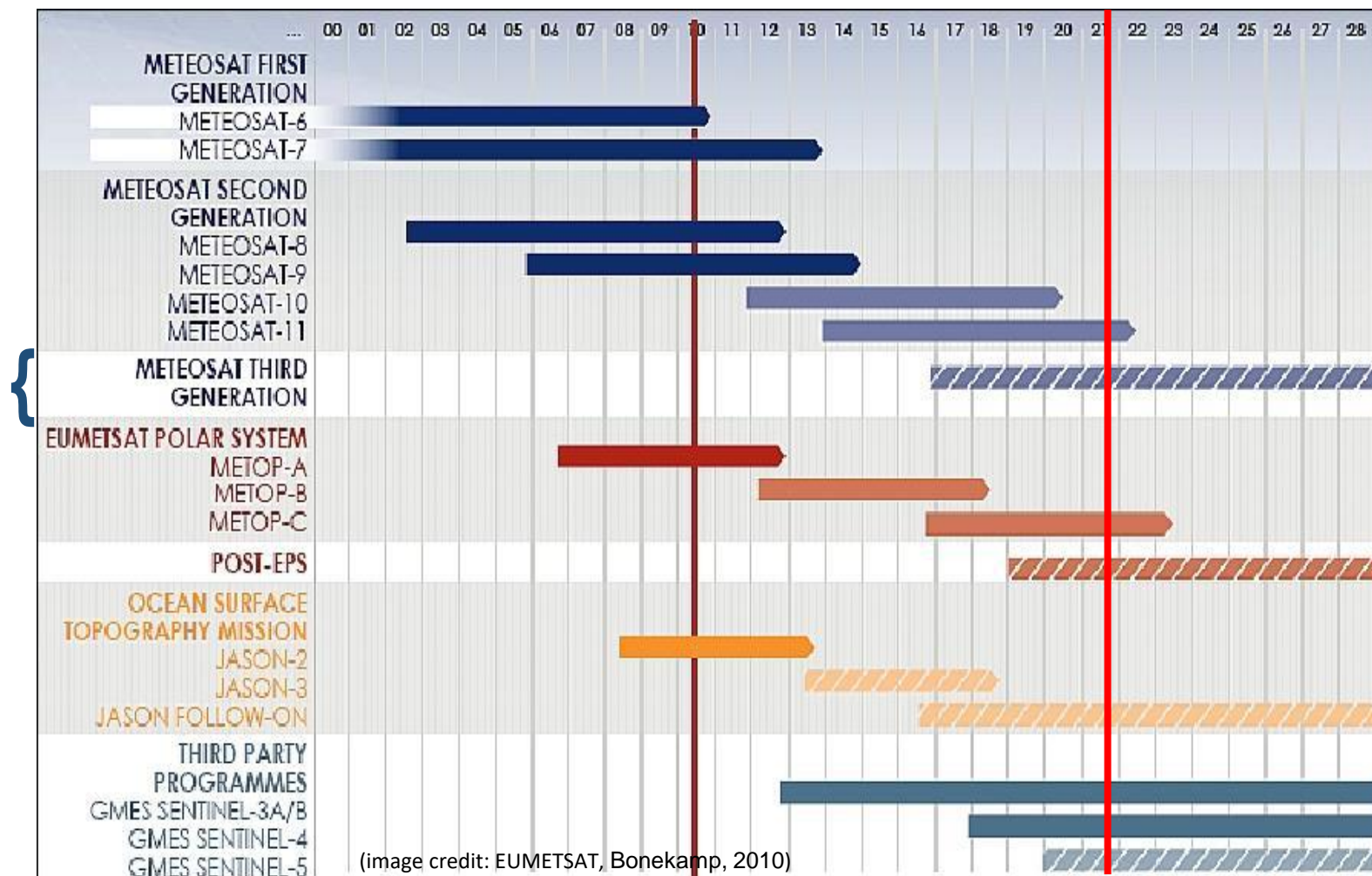
## EPS – Second Generation

- Metop-SG B1 to be launched in 2024/2025
  - ✓ Microwave Imager Radiometer (MWI)
  - ✓ Ice Cloud 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 ( $0.754/0.625 \text{ cm}^{-1}$ ; 30-60 minute)
  - ✓ Sentinel-4 (UV-VIS-NIR)

## EUMETSAT space segment

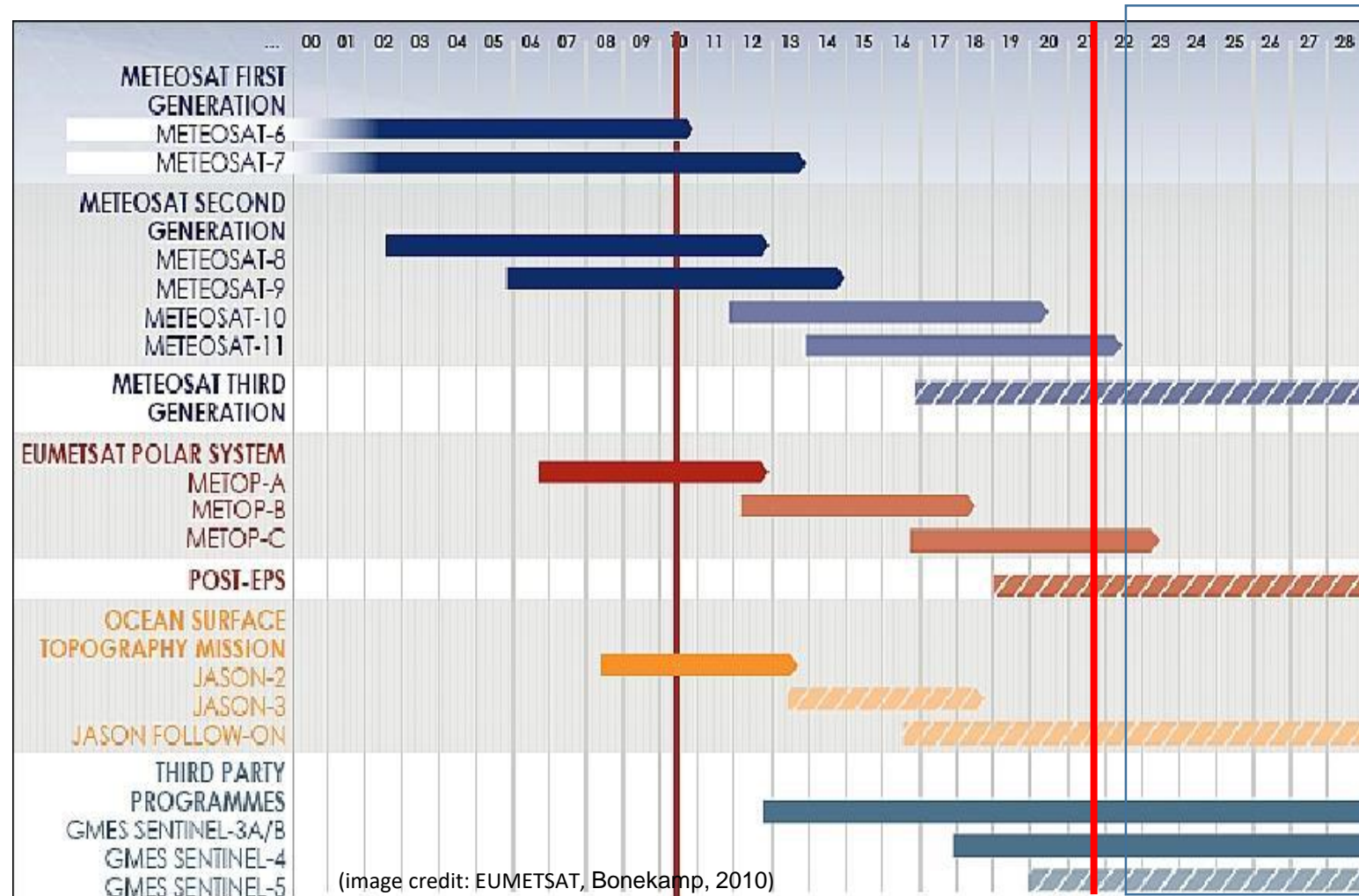


(image credit: EUMETSAT, Bonekamp, 2010)

## New Products (High resolution)

Burnt Area  
FRP

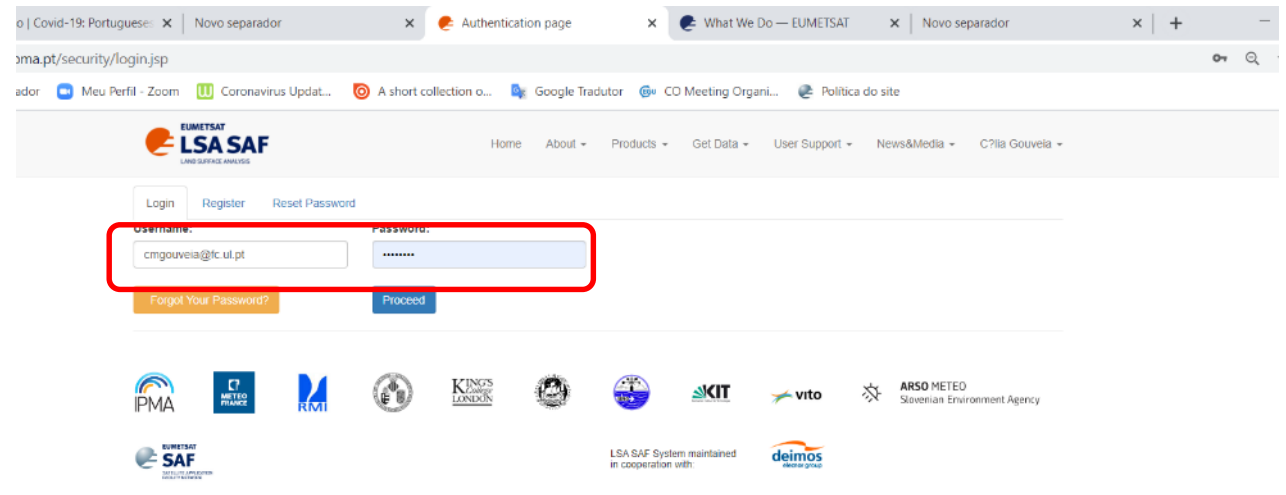
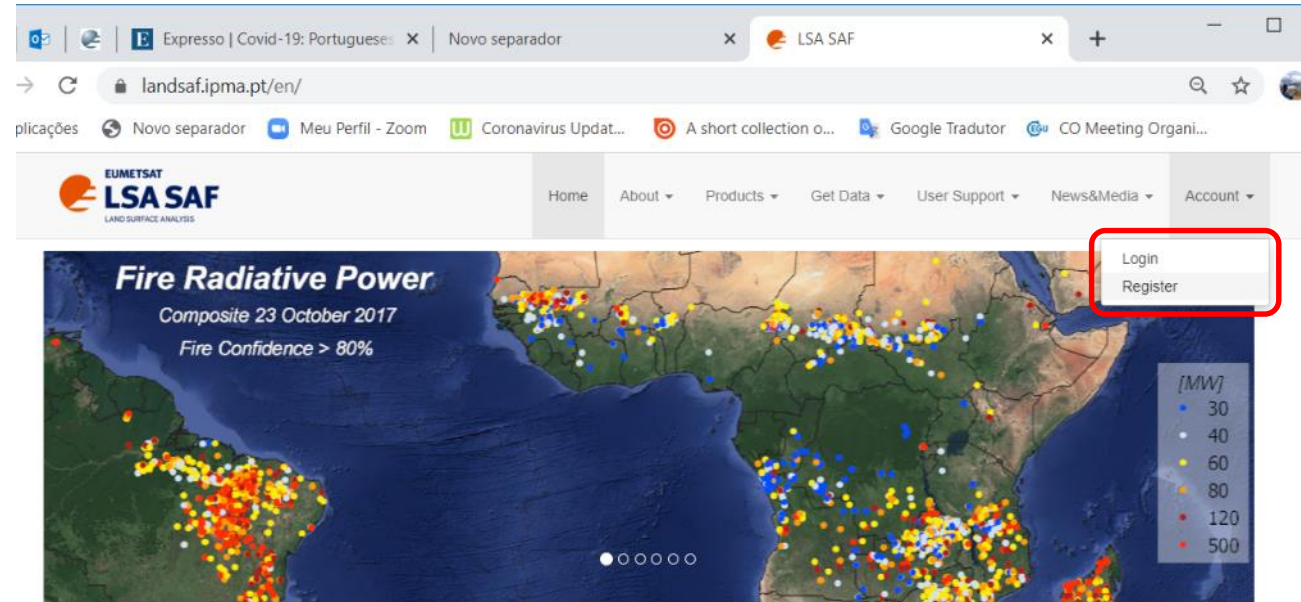
## EUMETSAT space segment



# How to access LSA-SAF data

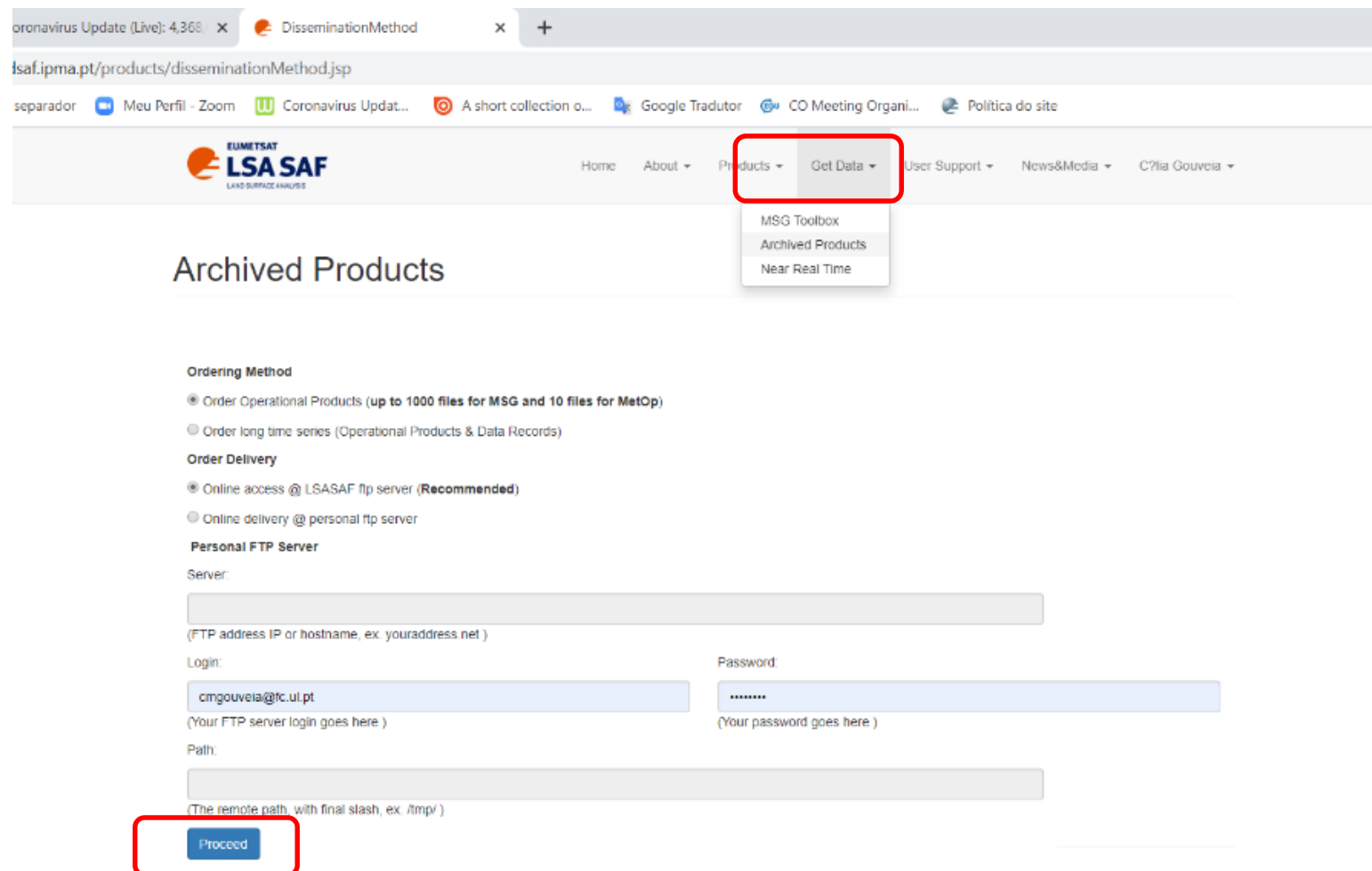
- Users must be registered and need to be logged in before an actual order can be set

- Login with provided credentials



# How to access LSA-SAF data

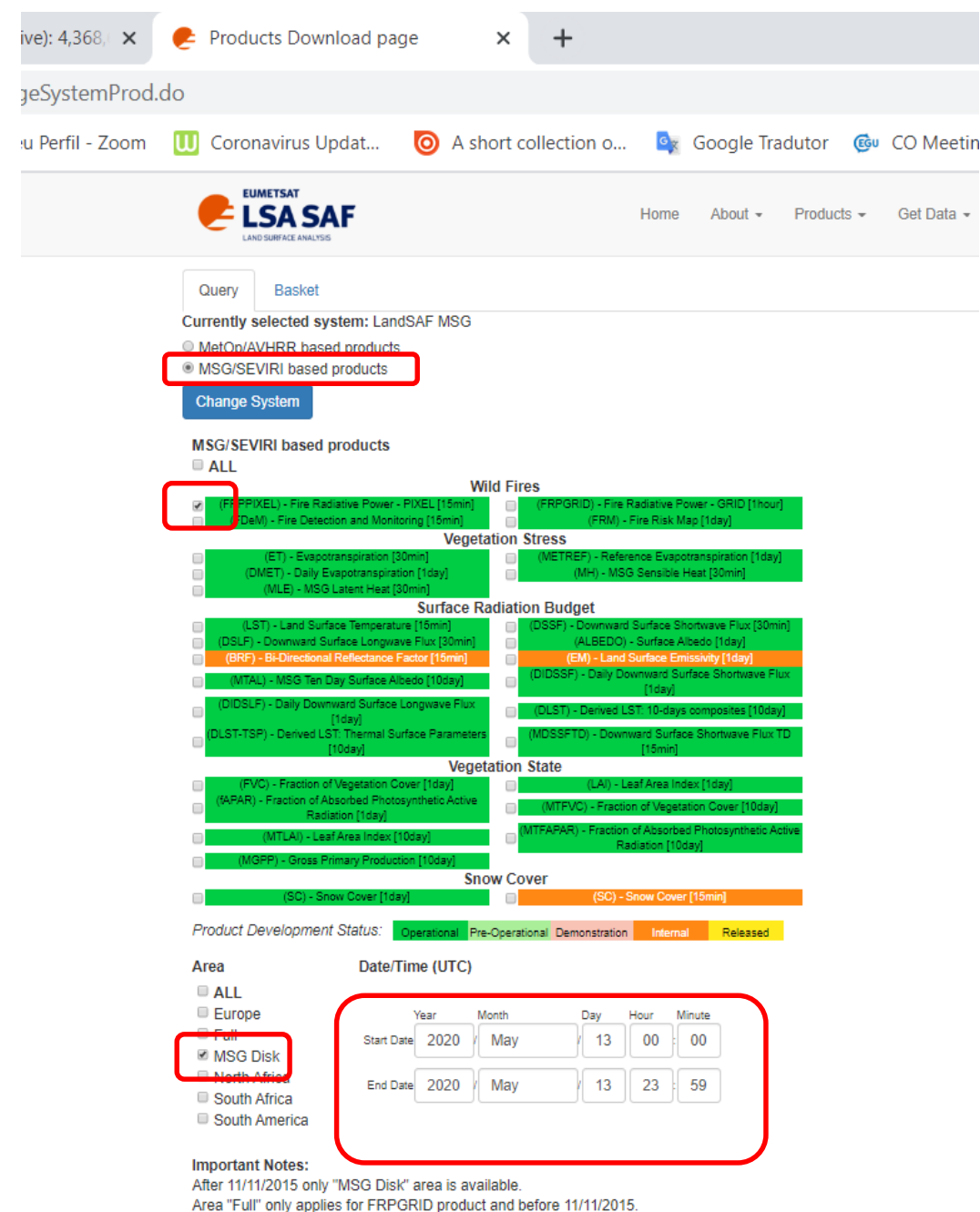
Get Data → Archived Products → Proceed



The screenshot shows a web browser window with the URL `lsaf.ipma.pt/products/disseminationMethod.jsp`. The page title is "Archived Products". The navigation bar includes links for Home, About, Products, Get Data (highlighted with a red box), User Support, News&Media, and C?lia Gouveia. A dropdown menu for "Get Data" is open, showing options for MSG Toolbox, Archived Products, and Near Real Time. The main content area is titled "Archived Products" and contains sections for "Ordering Method" and "Order Delivery". The "Order Delivery" section has two radio buttons: "Online access @ LSASAF ftp server (Recommended)" and "Online delivery @ personal ftp server". Below this is a "Personal FTP Server" section with fields for "Server:", "Login:", "Password:", and "Path:". The "Login:" field contains the email address `cmgouveia@fc.ul.pt`. The "Password:" field contains a masked password `*****`. The "Path:" field is empty. A blue "Proceed" button is located at the bottom of the form, highlighted with a red box.

# How to access LSA-SAF data

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



Products Download page

geSystemProd.do

u Perfil - Zoom Coronavirus Updat... A short collection o... Google Tradutor CO Meetin

EUMETSAT LSA SAF LAND SURFACE ANALYSIS

Home About Products Get Data

Query Basket

Currently selected system: LandSAF MSG

MetOp/AVHRR based products

**MSG/SEVIRI based products**

Change System

MSG/SEVIRI based products

ALL

Wild Fires

(FRPPIXEL) - Fire Radiative Power - PIXEL [15min]

(FRPGRID) - Fire Radiative Power - GRID [1hour]

(DeM) - Fire Detection and Monitoring [15min]

(FRM) - Fire Risk Map [1day]

Vegetation Stress

(ET) - Evapotranspiration [30min]

(DMET) - Daily Evapotranspiration [1day]

(MLE) - MSG Latent Heat [30min]

(METREF) - Reference Evapotranspiration [1day]

(MH) - MSG Sensible Heat [30min]

Surface Radiation Budget

(LST) - Land Surface Temperature [15min]

(DLSF) - Downward Surface Longwave Flux [30min]

(BRF) - Bi-Directional Reflectance Factor [15min]

(MTAL) - MSG Ten Day Surface Albedo [10day]

(DIDSLF) - Daily Downward Surface Longwave Flux [1day]

(DLST-TSP) - Derived LST Thermal Surface Parameters [10day]

(DSSF) - Downward Surface Shortwave Flux [30min]

(ALBEDO) - Surface Albedo [1day]

(EM) - Land Surface Emissivity [1day]

(DIDSSF) - Daily Downward Surface Shortwave Flux [1day]

(DLST) - Derived LST 10-days composites [10day]

(MOSSFTD) - Downward Surface Shortwave Flux TD [15min]

Vegetation State

(FVC) - Fraction of Vegetation Cover [1day]

(FAPAR) - Fraction of Absorbed Photosynthetic Active Radiation [1day]

(MTLAI) - Leaf Area Index [10day]

(MGPP) - Gross Primary Production [10day]

(LA) - Leaf Area Index [1day]

(MTFVC) - Fraction of Vegetation Cover [10day]

(MTFAPAR) - Fraction of Absorbed Photosynthetic Active Radiation [10day]

Snow Cover

(SC) - Snow Cover [1day]

(SC) - Snow Cover [15min]

Product Development Status: Operational Pre-Operational Demonstration Internal Released

Area

ALL

Europe

Full

**MSG Disk**

North Africa

South Africa

South America

Date/Time (UTC)

Year Month Day Hour Minute

Start Date 2020 May 13 00 00

End Date 2020 May 13 23 59

Important Notes:

After 11/11/2015 only "MSG Disk" area is available.

Area "Full" only applies for FRPGRID product and before 11/11/2015.

# How to access LSA-SAF data

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

Products Download page

SystemProd.do

Perfil - Zoom Coronavirus Updat... A short collection o... Google Tradutor CO M

**EUMETSAT LSA SAF**  
LAND SURFACE ANALYSIS

Home About Products Get D

Query Basket

Currently selected system: LandSAF EPS

☒ MetOp/AVHRR based products  
☐ MSG/SEVIRI based products

Change System

MetOp/AVHRR based products

☐ ALL

☒ (EDLST) - EPS Daily Land Surface Temperature [1day] ☐ (ETAL) - EPS 10-days Surface Albedo [10day]

☐ (EDSC) - EPS Daily Snow Cover [1day]

☐ (ETFVC) - EPS 10-days Fraction of Vegetation Cover [10day] ☐ (ETfAPAR) - EPS 10-days Fraction of Absorbed Photosynthetic Active Radiation [10day]

☐ (ETLAI) - EPS 10-days Leaf Area Index [10day] ☒

Product Development Status: Operational Pre-Operational Demonstration Internal Released

☐ Predefined Areas  
☒ Area Of Interest (BETA, not yet available for EDSC)

Area Of Interest (BETA) Date/Time (UTC)

Max Latitude:   
 Min Latitude:   
 Max Longitude:   
 Min Longitude:   
 Area Name:

Start Date: Year: 2020 Month: May Day: 13 Hour: 00 Minute: 00  
 End Date: Year: 2020 Month: May Day: 13 Hour: 23 Minute: 59

Proceed Reset Clear Results

**Thank you for your attention!**

**QUESTIONS?**  
[celia.gouveia@ipma.pt](mailto:celia.gouveia@ipma.pt)