



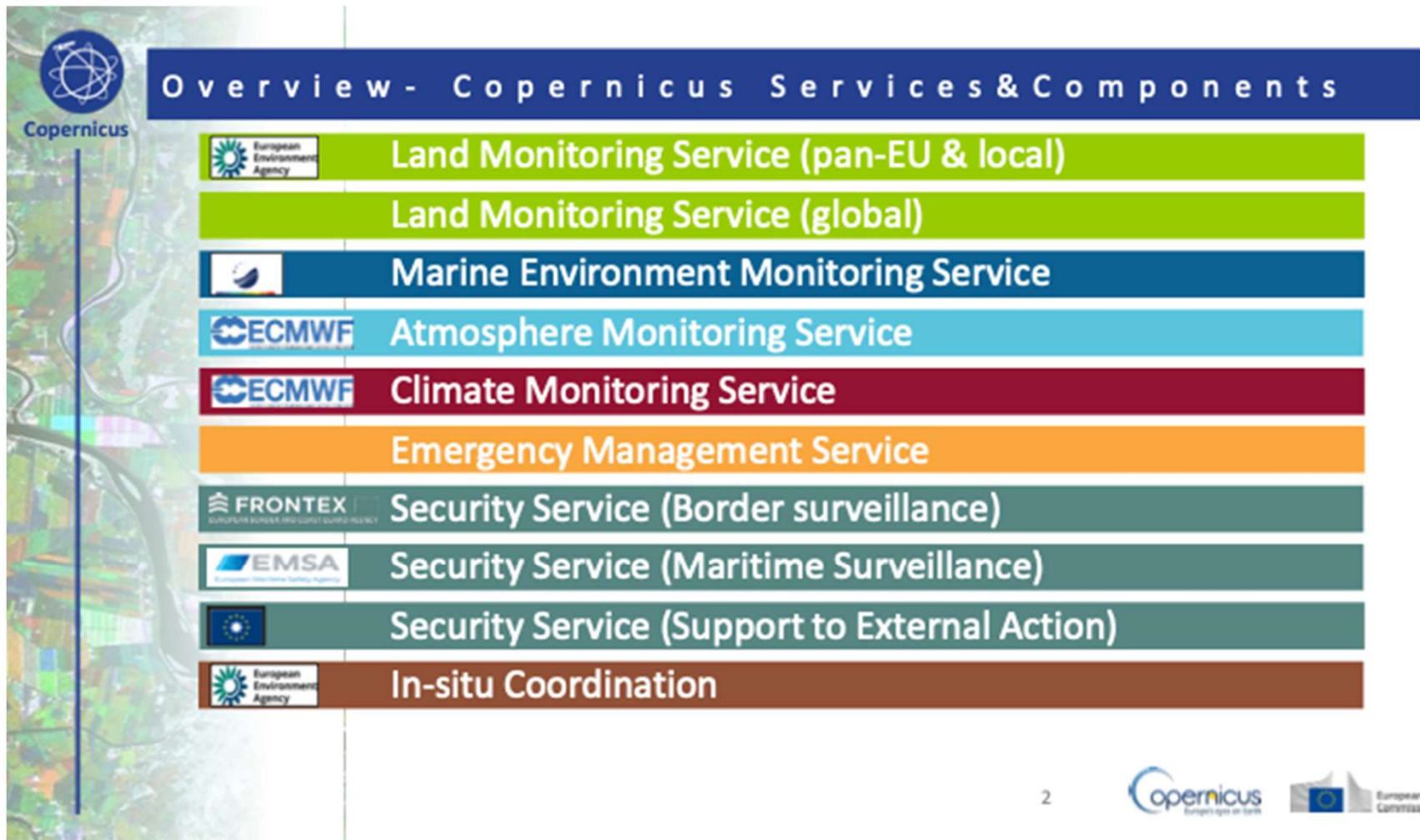
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FINNISH METEOROLOGICAL INSTITUTE

# **EU Earth Observation program Copernicus now and in the future**

Mikko Strahlendorff,  
Copernicus delegate for Finland



# Copernicus.eu Services





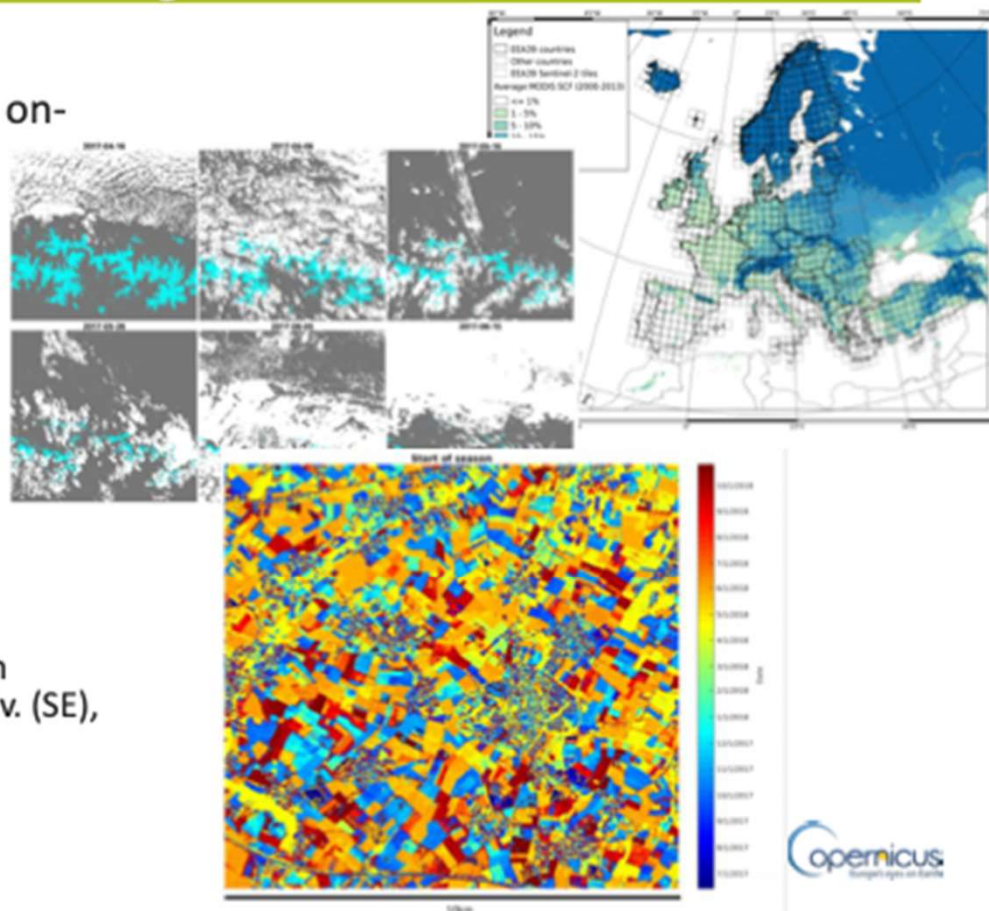
# Land.Copernicus.eu examples



Land  
Monitoring

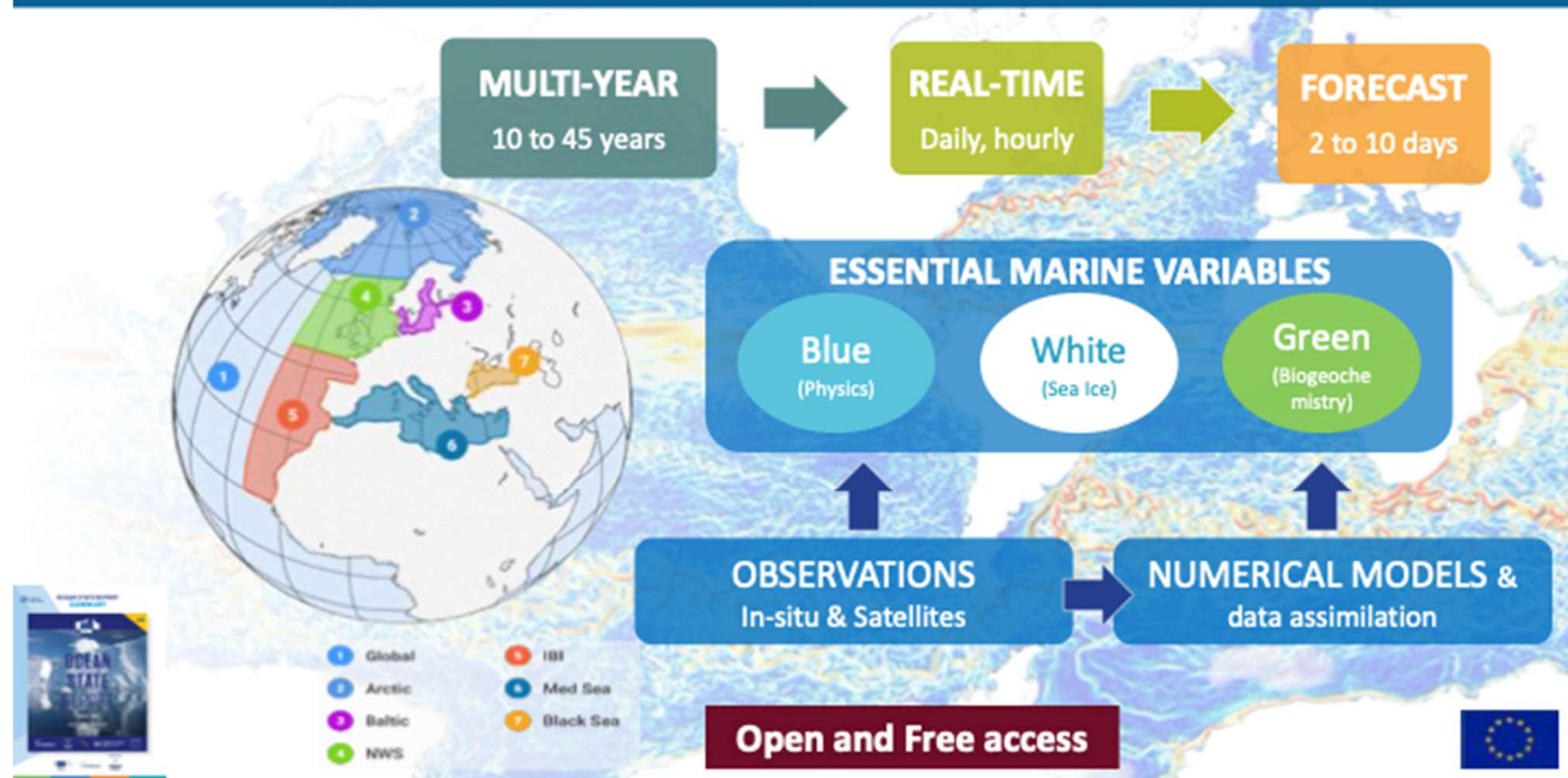
## Biophysical monitoring

- HR Snow & Ice part 1 (S2 based products): production on-going
  - Agreement reached for production on WEKEO
- HR Snow & Ice part 2 (S1 based products):
  - 2 offers received
  - Evaluation on-going
- HR Vegetation Phenology and Productivity (HR-VPP):
  - Contract awarded to a consortium composed of: VITO (BE), Lund Univ. (SE), EOlab (ES) and ZAMG (AT)
  - Kick-off first half of February



# Marine.Copernicus.eu service

## THE COPERNICUS MARINE SERVICE MONITORING AND FORECASTING THE OCEAN



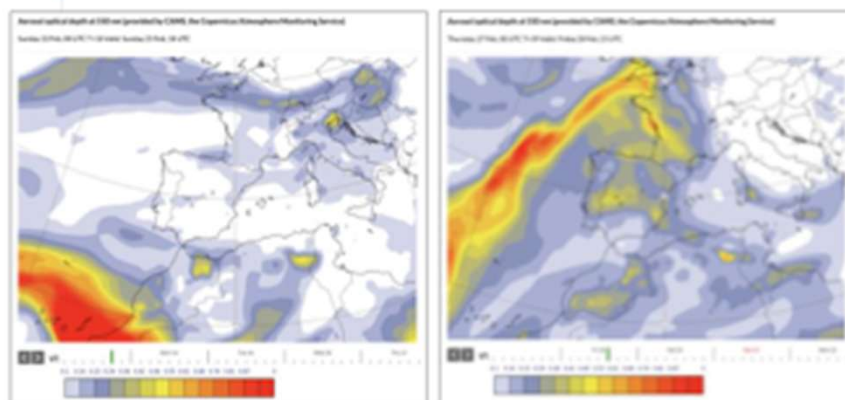


# Atmosphere.Copernicus.eu example



Atmosphere  
Monitoring

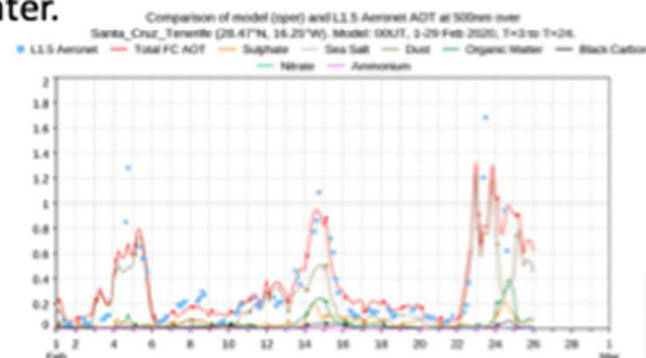
## SAHARAN DUST SEASON IS ALREADY ON



*CAMS Forecasts of Aerosol Optical Depth for Sunday 23/02 at 1800 UTC (forecast based Sunday 23/02 at 0000 UTC) and for Friday 28/02 at 1500 UTC (forecast based Thursday 27/02 at 0000 UTC).*

CAMS has provided support during the high Saharan dust case in the Canary islands on 23-25/02 and forecasted its impact on air quality over the Iberian Peninsula a couple days later.

*Aerosol Optical Depth  
forecasts vs observations  
in Tenerife: CAMS has  
captured very well the 3  
dust episodes of February.*

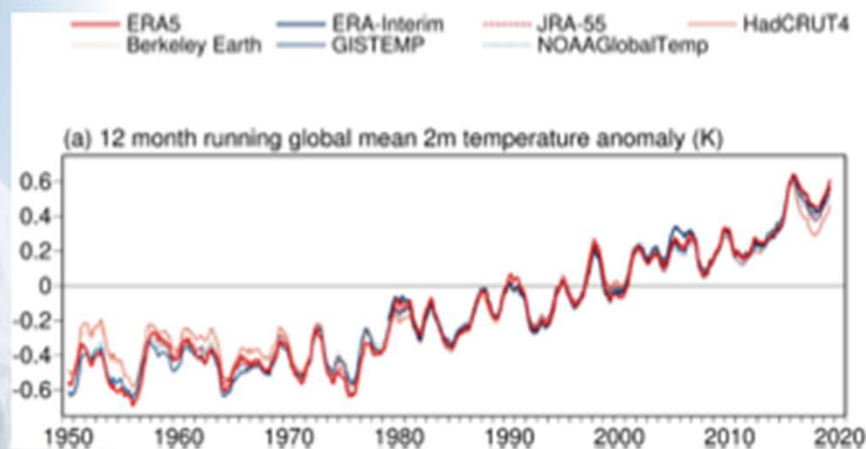


# Climate.Copernicus.eu example



Climate  
Change

## Global reanalysis



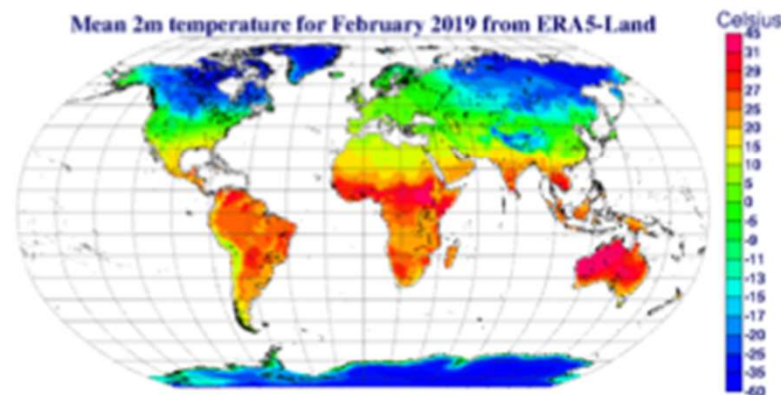
### ERA5 land: now available in the CDS from 1981

- Regularly updated; currently up to Nov 2019.
- 9km Land downscaling from ERA5
- Back-extension to 1950 is in the making

### ERA5 is available in the CDS from 1979 onwards

- ✓ Most popular dataset in the CDS
- ✓ This now includes a near real-time update (5 days).
- ✓ Back extension to 1950 is in the making and should be completed by Q1 and made available on the CDS in Q2.

Mean 2m temperature for February 2019 from ERA5-Land



European  
Commission



# Emergency.Copernicus.eu example



Emergency  
Management

## Rapid Mapping (RM)

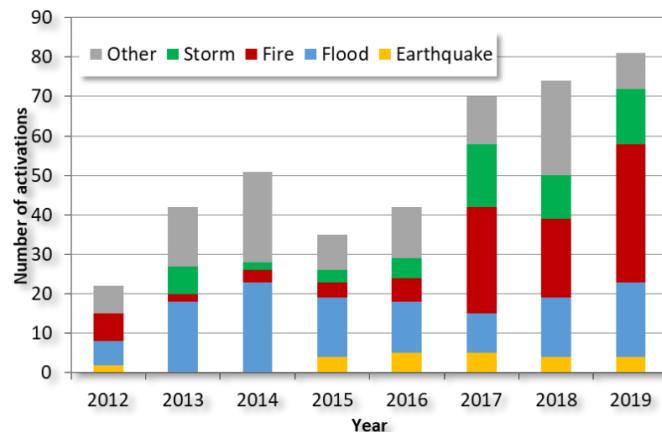
Highlights since last CC meeting

8 November – 25 February

24 activations (10 during same period in 2018)

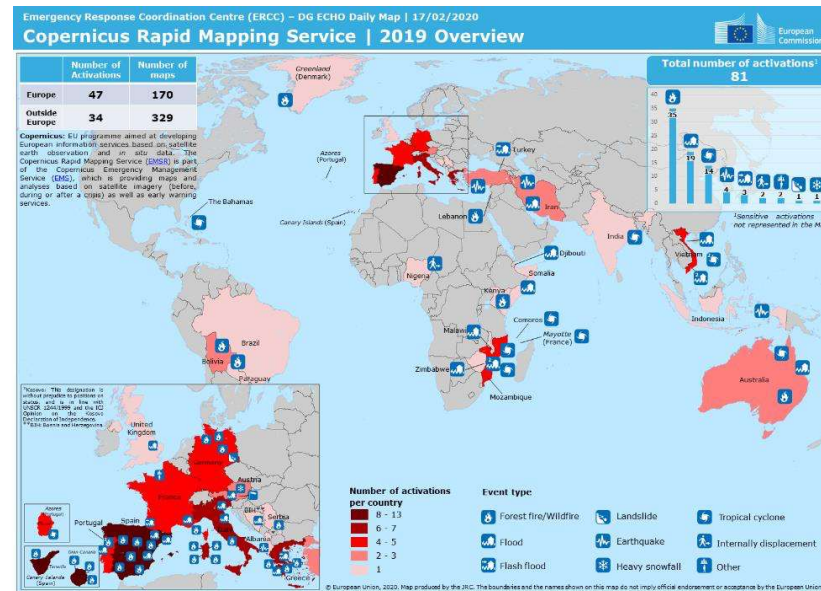
- 67% for events in Europe, 33% for events outside Europe
- 58% floods, 17% fires, 13% other, 8% earthquakes, 4% storms
- Collaboration with the International Charter during Australia fires

Activation volume 2012-2019



3.5 months test phase for new CCM image tasking scenarios completed ★

- first-good-delivery overall improves timeliness of image provision (esp. optical VHR1)
- pro-active tasking using GDACS alerts has potential but requires more fine tuning



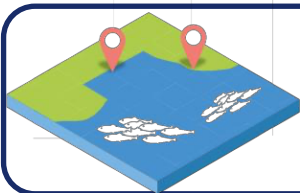
# Security service for EMSA



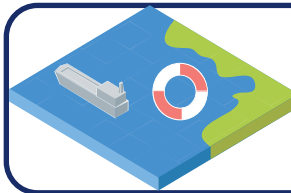
Security

## Uptake of products

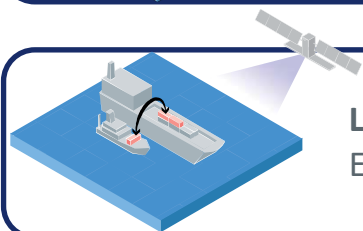
No of EO Services delivered (Nov 2019 – Feb 2020):



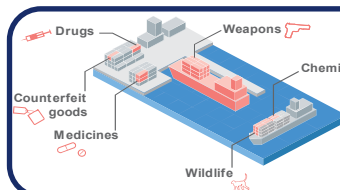
**Fisheries Control**  
EO Services: 38



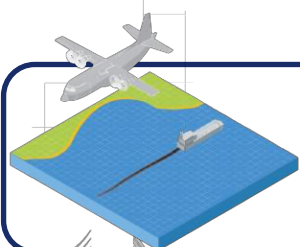
**Maritime Safety and Security**  
EO Services: 139



**Law Enforcement**  
EO Services: 984



**Customs**  
EO Services: 219



**Marine Environment (Pollution Monitoring)**  
EO Services: 123



**Support to International Organisations**  
EO services: 10

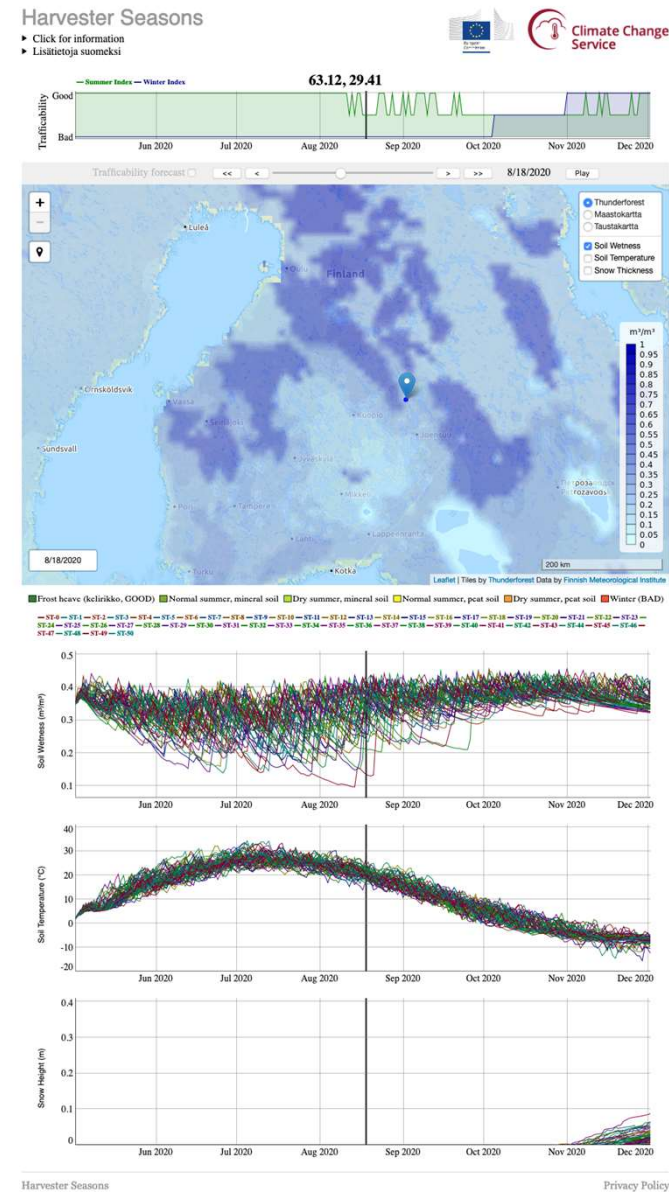
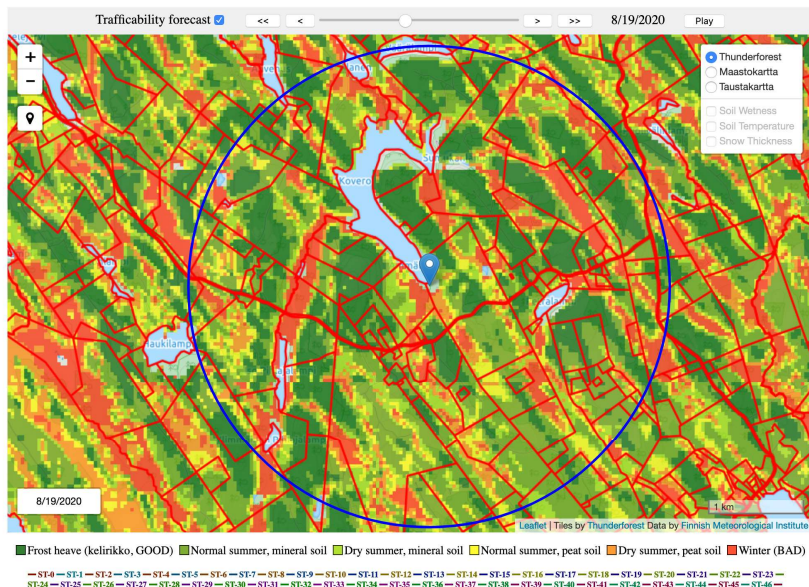




# Copernicus Apps for EU growth

Example of a Finnish Downstream App for Forestry

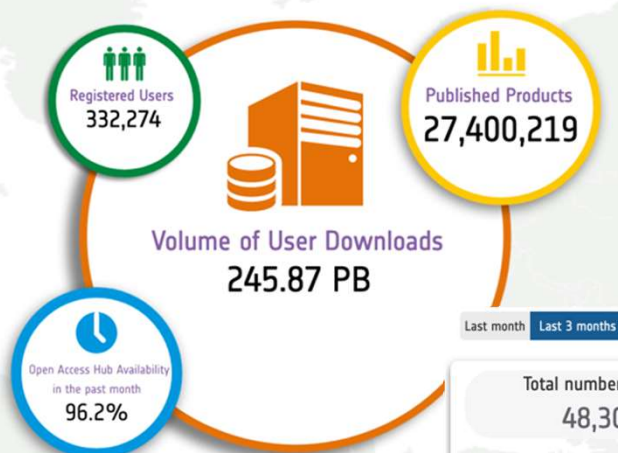
- Copernicus data: C3S seasonal forecasts/reanalysis
- Forest roads and terrain trafficability is predicted
- Harvesting operations can be planned longer ahead
  - <https://harvesterseasons.com>
- Development funded by C3S and H2020
- Horizon Europe enables the same in all domains



# Lots of (satellite) data available

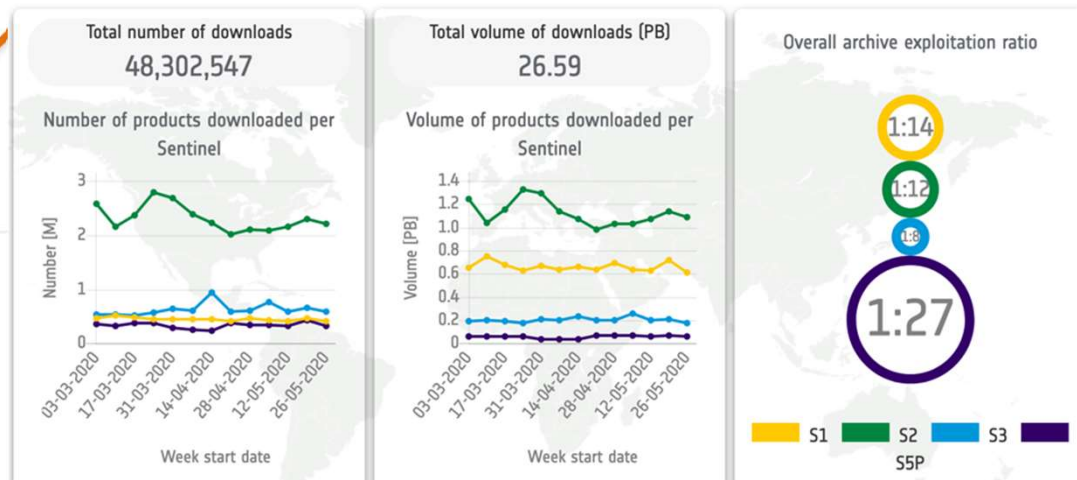
openicus

Sentinel Data Dashboard



- 7 Sentinel missions have produced data since 2014 with a growing user base
- 8 to 27 \* data volume downloaded and very few users download everything
- S2 is downloaded over 1 PB / week

Publication and dissemination: Trends

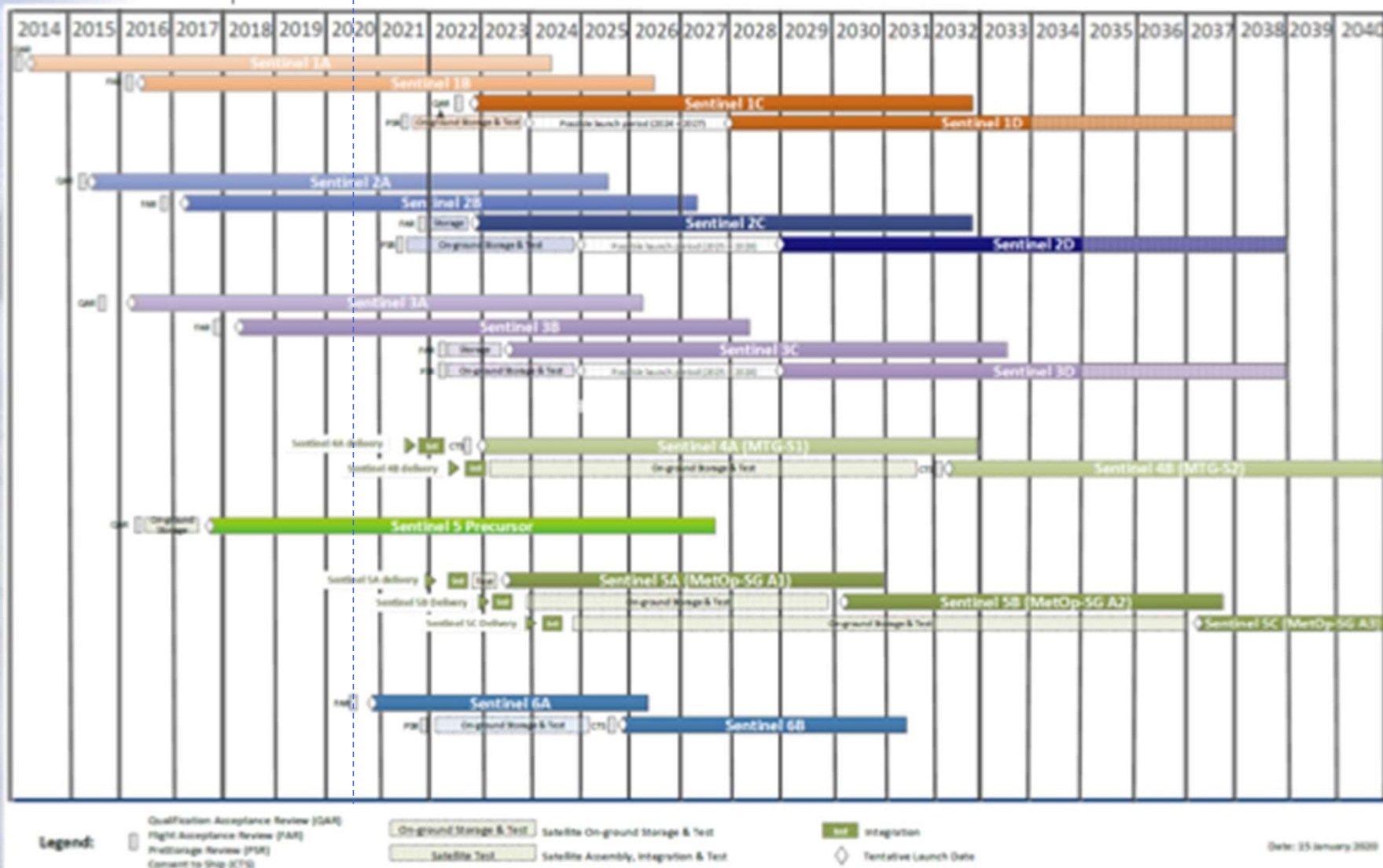


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# CSC Development Status: Space Segment

## Indicative Copernicus Constellation Deployment Schedule



Date: 25 January 2020

# Sentinel-1 SAR



Space  
Component

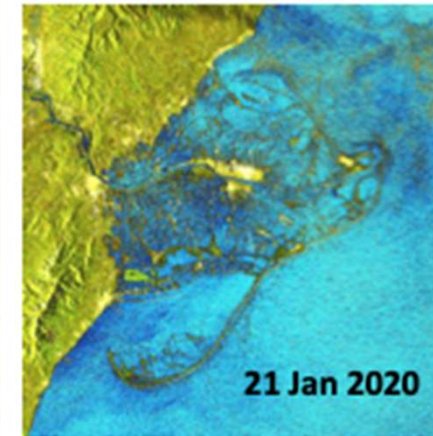
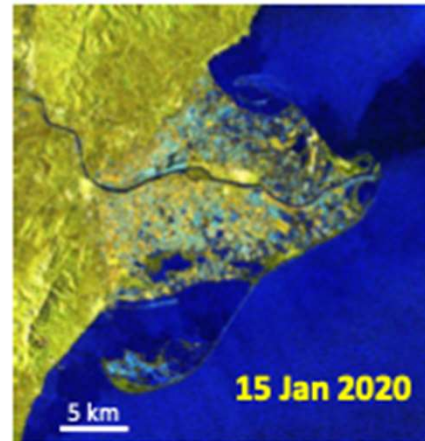
## Sentinel-1 mission status



- Sentinel-1 operated close to its **full mission capacity** (i.e. difficulty to accommodate additional observations)
- Substantial **contribution to emergency situations** continues, in particular in response to Copernicus EMS and International Charter activations, for flood monitoring in particular.

### Major Flood of Ebro delta, Spain


*Storm Gloria* has caused a storm surge that has ravaged the Ebro delta, resulting in severe damage to the rice paddies



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processed by ESA using EO Browser with P. Markuse script




# Sentinel-2 optical HiRes

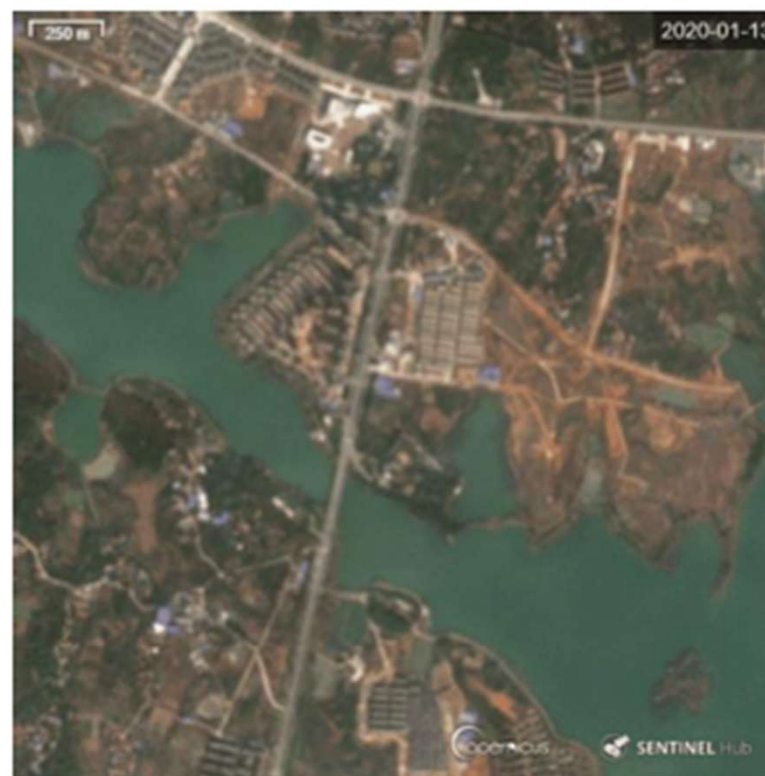


Space  
Component

## Sentinel-2 mission status

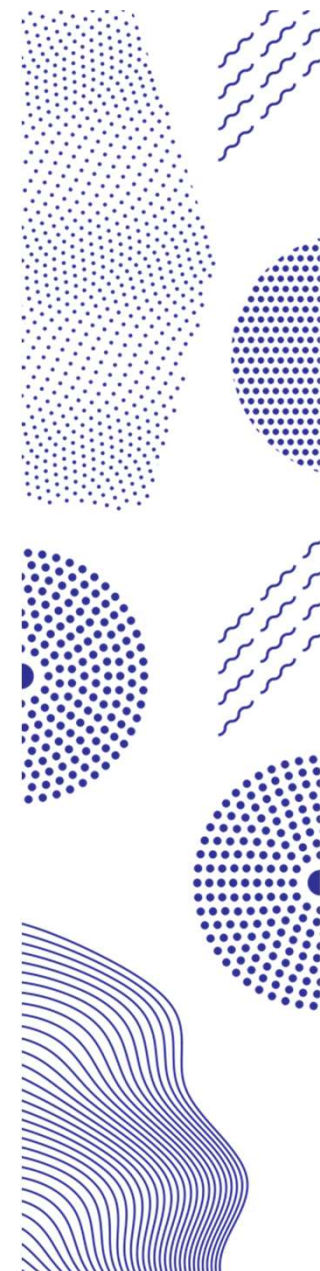


- The Sentinel-2 Observation scenario is being operated beyond the initial requirements, as reported in Q4 2019.
- The Validation activities for integrating the Global Reference Image (GRI) and the new Copernicus DEM in the Sentinel-2 processing are on-going, including the assessment on the runtime performance. Operational deployment is target to start mid 2020.
- A high demand to Sentinel-2 products from LTA is being observed, resulting in difficulties being experienced by users. The situation is being analysed and mitigation measures being investigated.



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*Coronavirus Huoshenshan Hospital construction  
(Wuhan, China)*



# Sentinel 3 optical MediumRes

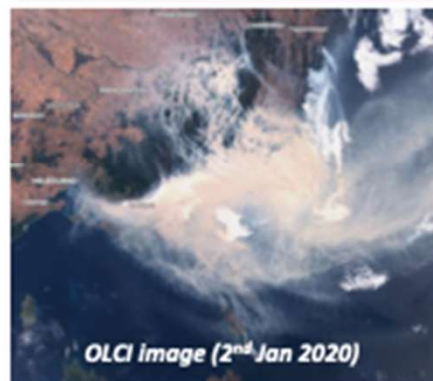
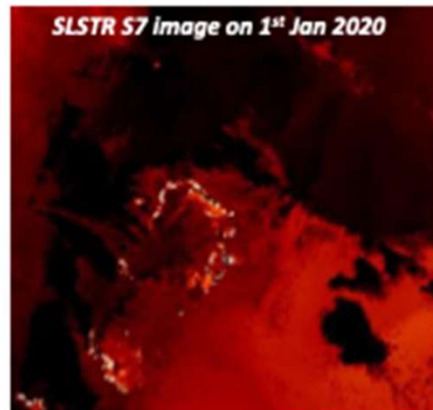


Space  
Component

## Sentinel-3 mission status

- The activity concerning the improvement of precision for the Aerosol Optical Depth (AOD) and Fire Radiative Power (FRP) has been completed in January 2020, with the release of the new processing baseline to operations.
- Aerosol Optical Depth (AOD) and Fire Radiative Power (FRP) products are routinely generated and made available to expert users, for completing their analysis and validation."

SLSTR S7 Image on 1<sup>st</sup> Jan 2020



OLCI Image (2<sup>nd</sup> Jan 2020)



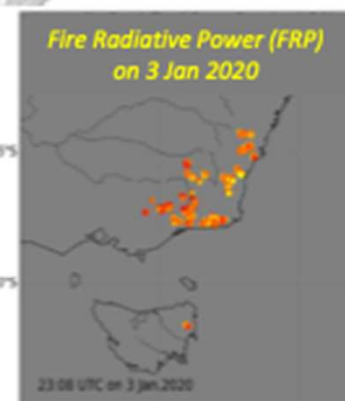
Fires detected by the  
ESA Sentinel-3 World  
Fire Atlas Prototype

- October 2019
- November 2019
- December 2019
- January 1-6 2020



Fires in  
Australia

Fire Radiative Power (FRP)  
on 3 Jan 2020




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Sentinel data (2020) processed by ESA



European  
Commission



# Sentinel 5p atmospheric composition








Space  
Component

## Sentinel-5P mission status

- **The timeliness of the Methane product dissemination is improved** (~2 days as compared to ~7 days) since December 2019 thanks to a new interface to access the NOAA provided S-NPP VIIRS cloud products.

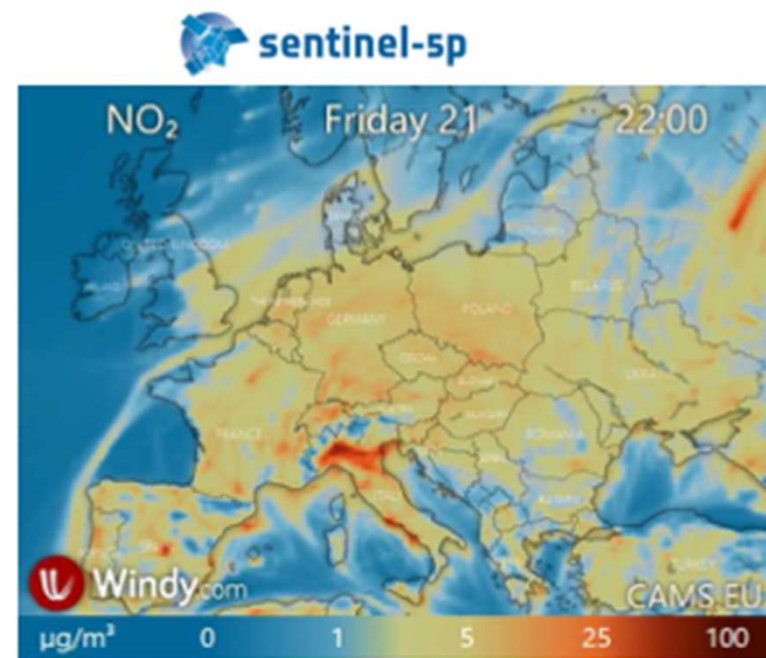
This timeliness allows now the **Copernicus Atmospheric Monitoring Service (CAMS)** to start including Sentinel-5P Methane products into their data assimilation system.

### From Sentinel-5P data to citizens



Atmosphere  
(CAMS)

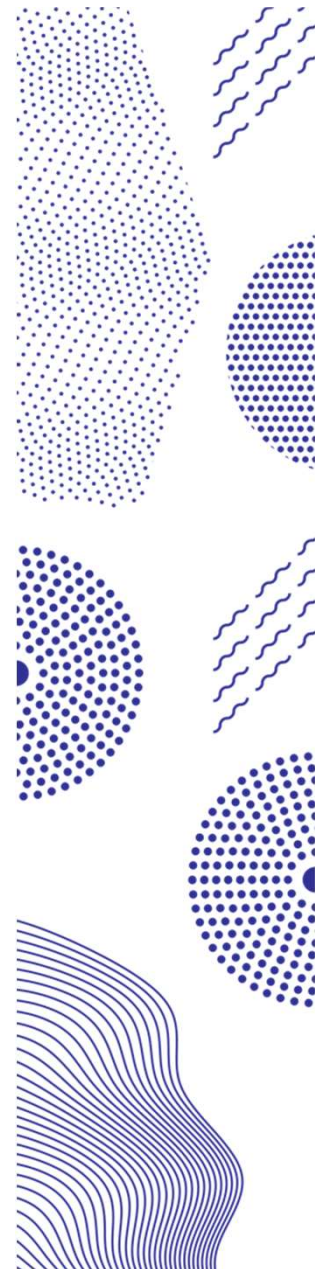
windy.com



Copyright: Contains modified Copernicus Sentinel data (2020)  
processed by CAMS/ECMWF. Video by windy.com

# 2021-2027 state of play

- Top priority is continuity and improvement of current missions - their next generation foreseen after 2027
- 6 new missions for EU priorities (Green Deal, Climate, Africa and Arctic) proposed for 2021-27 - High Priority Candidate missions
  - CO<sub>2</sub>, Arctic (sea-ice, snow), L-Band SAR, Thermal mapping, Hyperspectral imaging
- Copernicus is a co-funded program and ESA Ministerial in 2019 already raised 1,8 b€ (0,4 b€ over envelope!)
- ESA and EU will procure jointly





# EU 2021-27 proposal 14,9 b€

## MULTIANNUAL FINANCIAL FRAMEWORK 2021-2027 (IN COMMITMENTS)

Current prices	2021	2022	2023	2024	2025	2026	2027	2021-2027	Under NextGenerationEU	TOTAL
<b>1. Single Market, Innovation and Digital</b>	<b>21.805</b>	<b>22.219</b>	<b>22.546</b>	<b>22.362</b>	<b>22.677</b>	<b>23.280</b>	<b>23.540</b>	<b>158.429</b>	<b>75.965</b>	<b>234.394</b>
1. Research and Innovation	13.395	13.491	14.057	14.103	14.254	14.692	14.784	98.775	14.647	113.422
Horizon Europe	12.265	12.510	12.760	13.015	13.276	13.541	13.812	91.178	14.647	105.825
Euratom Research and Training Programme	266	271	276	281	288	294	305	1.981	-	1.981
International Thermonuclear Experimental Reactor (ITER)	864	710	1.020	806	690	856	667	5.614	-	5.614
Other	0,3	0,3	0,3	0,3	0,3	0,3	0,3	2	-	2
2. European Strategic Investments	5.044	5.294	4.987	4.684	4.779	4.873	4.972	34.633	61.318	95.951
InvestEU Fund	478	487	88	90	92	94	96	1.424	33.000	34.424
Connecting Europe Facility - Transport	1.952	1.992	2.032	2.072	2.115	2.157	2.200	14.521	-	14.521
Connecting Europe Facility - Energy	785	800	817	834	850	867	885	5.838	-	5.838
Connecting Europe Facility - Digital	277	283	289	295	301	306	314	2.065	-	2.065
Digital Europe Programme	1.338	1.514	1.539	1.166	1.190	1.213	1.237	9.196	-	9.196
Other	22	23	23	24	24	25	25	165	28.318	28.483
Decentralised agencies	191	195	199	203	207	212	216	1.424	-	1.424
3. Single Market	889	906	922	939	955	973	988	6.572	-	6.572
Single Market Programme (incl. COSME)	575	584	592	601	610	620	626	4.208	-	4.208
EU Anti-Fraud Programme	20	20	21	21	22	23	24	150	-	150
Cooperation in the field of taxation (FISCALIS)	36	37	38	38	39	40	41	269	-	269
Cooperation in the field of customs (CUSTOMS)	127	130	133	136	138	141	144	950	-	950
Other	11	11	11	12	12	12	12	81	-	81
Decentralised agencies	120	124	127	132	134	137	140	915	-	915
4. Space	2.034	2.074	2.118	2.163	2.207	2.252	2.298	15.145	-	15.145
European Space Programme	1.997	2.037	2.080	2.125	2.167	2.211	2.255	14.873	-	14.873
Decentralised agencies	36	37	37	38	40	41	43	272	-	272
Margin	444	454	463	473	482	491	498	3.304	-	3.304

- Earth Observation/Copernicus part probably >5,2 b€, 7 % less than 2018 proposal
- With ESA extra and 3<sup>rd</sup> party countries joining this should mean all plans can be put in action

# Let's make more EO Apps, thanks for listening!

Questions are welcome now or via email:

[Mikko.Strahlendorff@fmi.fi](mailto:Mikko.Strahlendorff@fmi.fi)



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