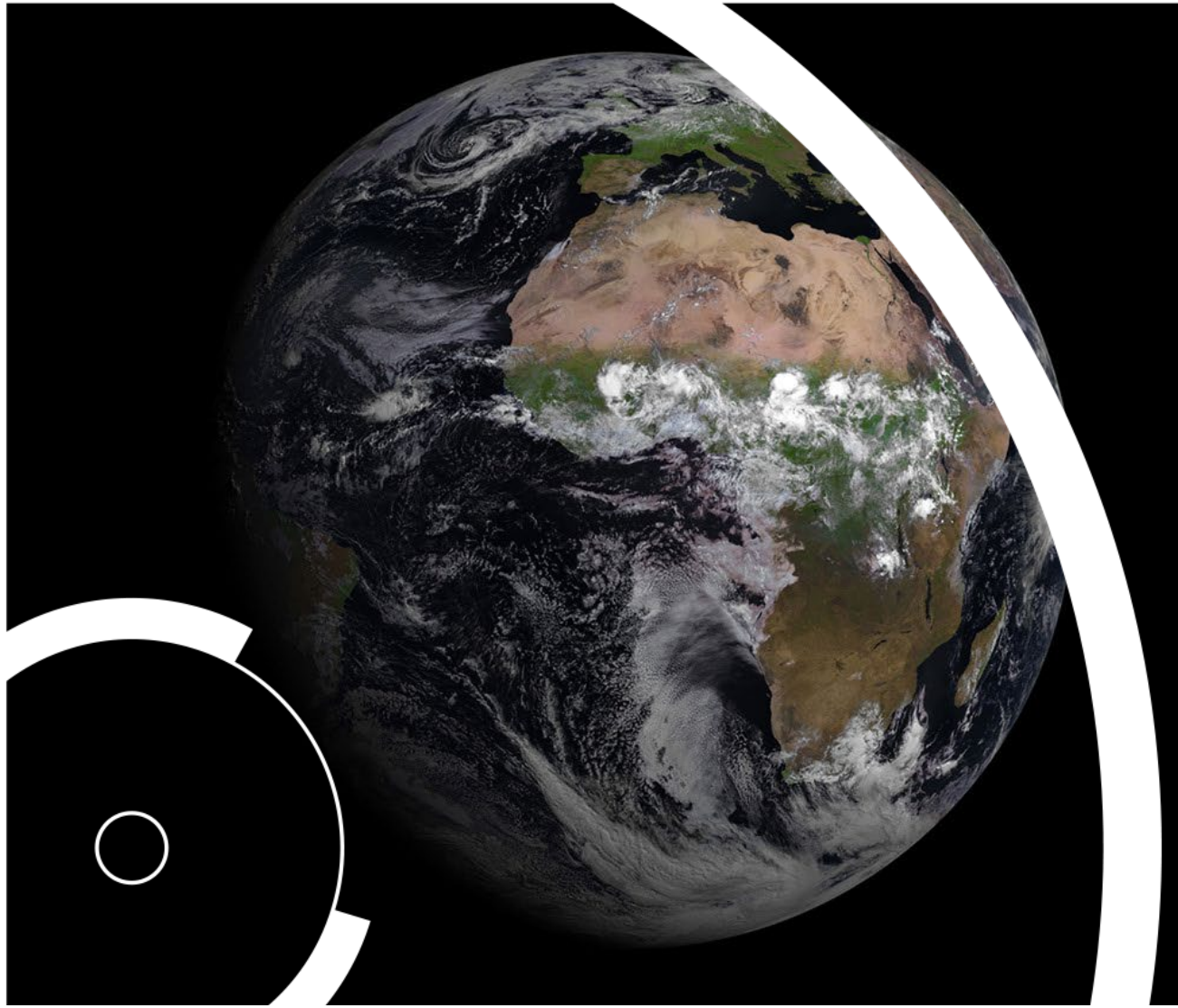
EUMETSAT



Sustainable provision of climate data for research and climate services by EUMETSAT

Jörg Schulz, M. Doutriaux-Boucher, M. Grant, V. O. John, P. Poli, and L. Schüller

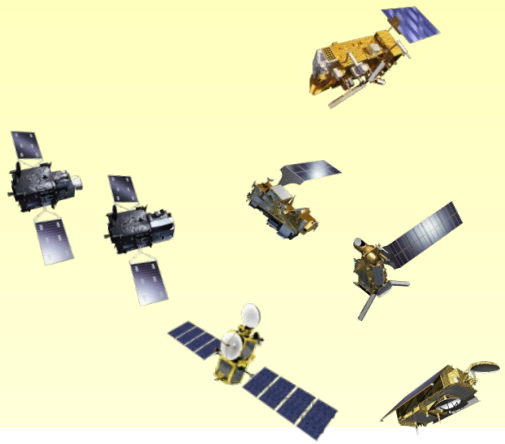
European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)

Climate data value chain

Sensing

EUMETSAT

- Long term satellite programs
- Patrimonial archive (decades)
- Data rescue (go back in time as far as possible)
- Expansion of product portfolio

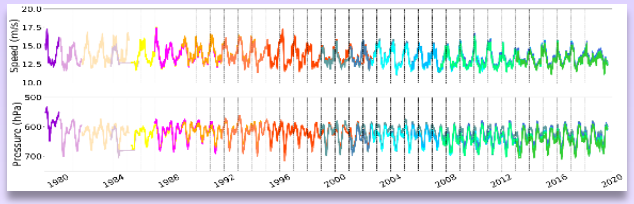


Climate Records

EUMETSAT

EUMETSAT SAF
SATELLITE APPLICATION FACILITY NETWORK

- Consistent calibration
- Geophysical parameters
- Uncertainty
- Data Access
- Cooperation with users
- Training



Applications

National Climate Service providers

Research

WCRP World Climate Research Programme

International Science Council

IAMC

Copernicus Europe's eyes on Earth

Climate Change

Assessment

ipcc INTERGOVERNMENTAL PANEL ON climate change

- Climate variability, trends
- Climate extremes, changes in extremes
- Climate processes and cycles (energy, water, carbon)
- Climate model initialisation, evaluation, …

Decision Making

Policy

United Nations Framework Convention on Climate Change

PARTIES

SBSTA / SBI
COP/ CMA/ CMP

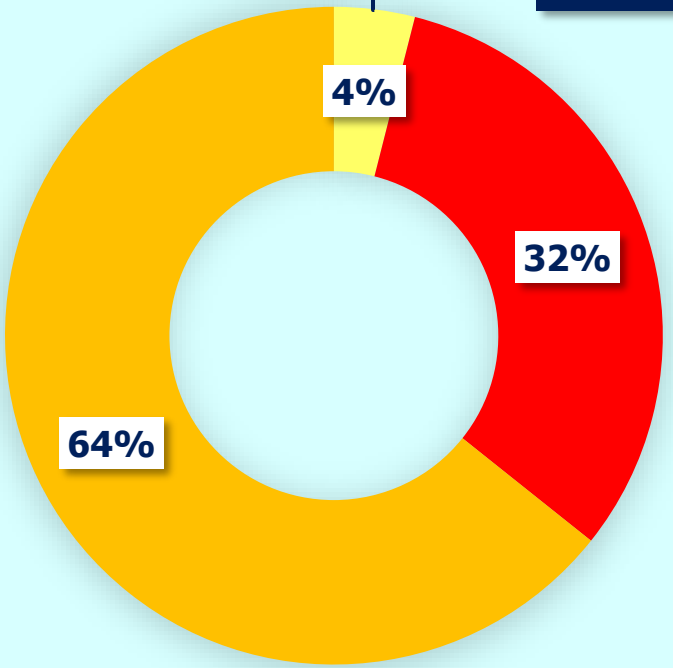
- Mitigation
- Adaptation
- Infrastructure
- Energy
- Agriculture
- Fisheries
- Water
- Health
- Tourism

IPCC WG-1 AR6 – EUMETSAT contribution

www.eumetsat.int

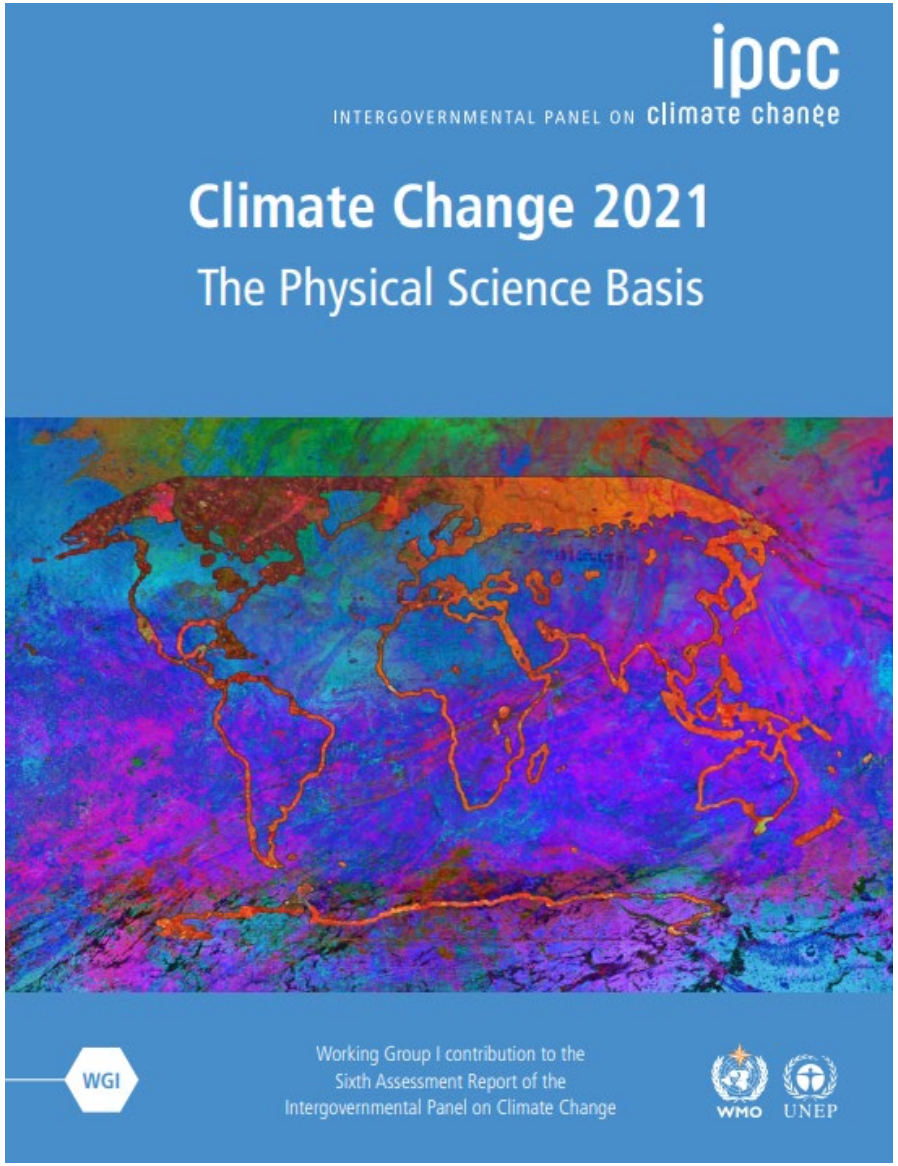
IPCC Data USAGE

EUMETSAT SAF
SATELLITE APPLICATION FACILITY NETWORK



- EUM Climate Data Records
- EUM Satellite Data
- Other Agencies Satellite and Analysis

Pie Chart corresponds to 126 (45% of total number) data sets labelled as remote sensing and reanalysis or combinations



EUMETSAT and SAF contribution to the Copernicus State of the Climate Report 2021

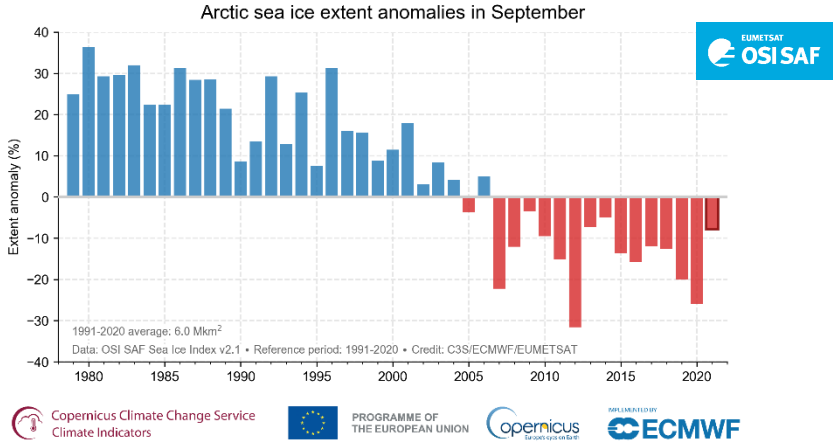
Copernicus Climate Change Service

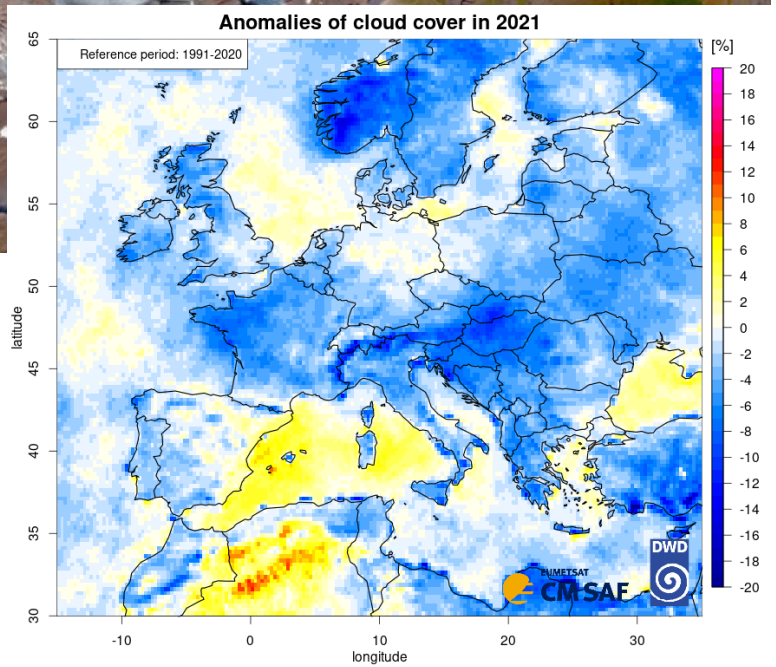
About Us | What we do | Data

European Commission | Copernicus | IMPLEMENTED BY ECMWF

European State of the Climate 2021

Welcome to the summary of the European State of the Climate 2021, compiled by the Copernicus Climate Change Service (C3S), implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Commission.

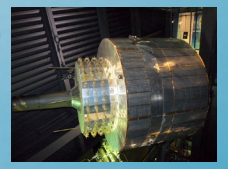




Datasets used in 'Europe 2021' and 'Arctic 2021'

- ERA5
- ERA5-Land
- E-OBS surface air temperature and precipitation
- E-OBS climate indices
- Station data from ECA&D and the National and Regional Meteorological Services
- Reports from the National Meteorological Services and other agencies
- Copernicus EMS fire danger data record
- Copernicus EMS active fire and burnt area data
- Copernicus EMS model-derived river discharge
- CAMS Global atmospheric composition forecasts
- CAMS wildfire data record
- CM SAF sunshine duration climate data record
- CM SAF data record on cloud products
- C3S Climate and energy indicators for Europe
- C3S Ocean Colour CDR/ICDR v5.0
- C3S Sea Ice Edge and Type CDR/ICDR v2.0
- C3S Sea Ice Thickness CDR/ICDR v2.0
- C3S Soil Moisture data record v202012 PASSIVE
- Vegetation Optical Depth Climate Archive (VODCA)
- ESA CCI/C3S SST Level-4 Analysis Climate Data Record v2.1
- EUMETSAT OSI SAF Global Sea Ice Concentration CDR/ICDR v2.0
- EUMETSAT OSI SAF Global Low-Resolution Sea Ice Drift (OSI-405-c)
- EUMETSAT OSI SAF Sea Ice Index v2.1
- GloboLakes/C3S lake surface water temperature data record
- GPCP monthly precipitation
- UTCI based on ERA5
- SoilClim GCRI

EUMETSAT mission data and new products



YEAR... 1977 ... 2016

METEOSAT FIRST GENERATION

YEAR... 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

METEOSAT SECOND GENERATION

METEOSAT-8

METEOSAT-9

METEOSAT-10

METEOSAT-11

METEOSAT THIRD GENERATION

MTG-I-1 : IMAGERY

MTG-S-1: SOUNDING

MTG-I-2: IMAGERY

MTG-I-3: IMAGERY

MTG-S-2: SOUNDING

MTG-I-4: IMAGERY

EUMETSAT POLAR SYSTEM (EPS)

METOP-A

METOP-B

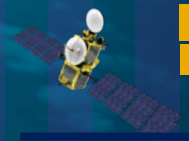
METOP-C

EUMETSAT POLAR SYSTEM SECOND GENERATION (EPS-SG)

METOP-SG A: SOUNDING AND IMAGERY

METOP-SG B: MICROWAVE IMAGERY

Mandatory Programmes



JASON (HIGH PRECISION OCEAN ALTIMETRY)

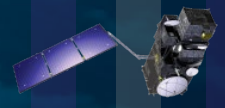
JASON-2

JASON-3

SENTINEL-6 (JASON-CS)

Optional Programmes

Latest addition is the Sentinel-6 Michael Freilich satellite



COPERNICUS

SENTINEL-3 A/B/C/D

SENTINEL-4 ON MTG-S

SENTINEL-5 ON METOP-SG A

Third Party Programmes

YEAR... 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

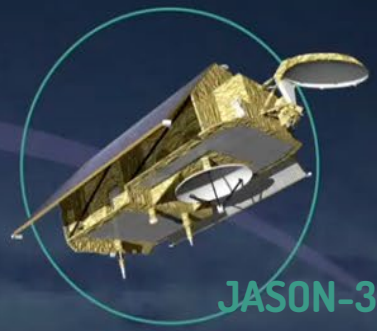
Synergy with Copernicus

The European Commission has entrusted EUMETSAT with exploiting the four Sentinel missions (Sentinel -3, -4, -5 and -6) dedicated to the monitoring of atmosphere, ocean and climate on its behalf.

Complementarity with EUMETSAT's METEO missions

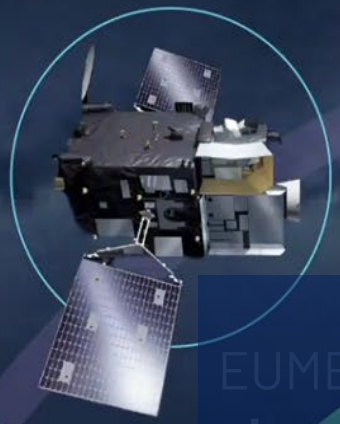
SENTINEL-5 ON EPS-SG A SATELLITES

SENTINEL-6

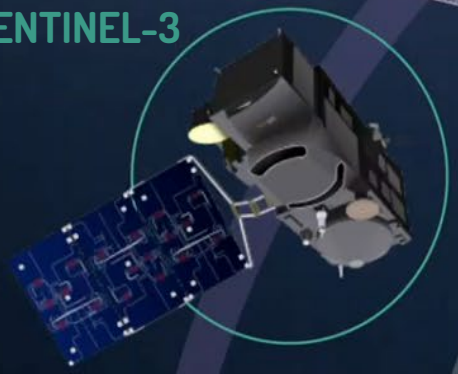


JASON-3

SENTINEL-4 ON MTG-S SATELLITES



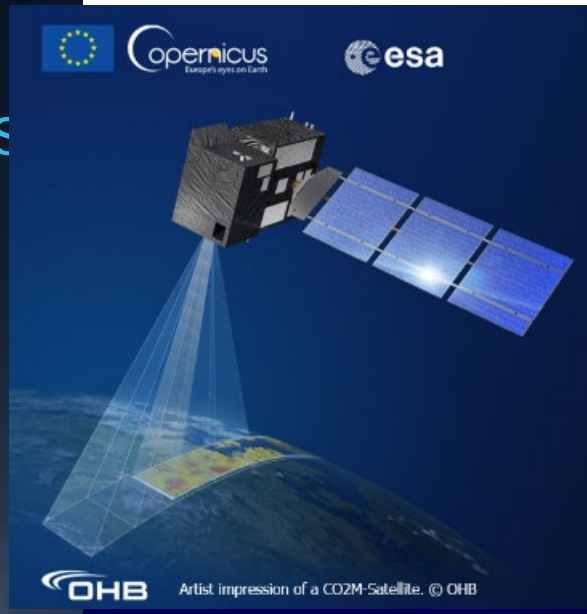
SENTINEL-3



EUMETSAT Contributions focus on **oceans**, **atmosphere** and **climate**

Planned EUMETSAT contribution in Copernicus 2.0:

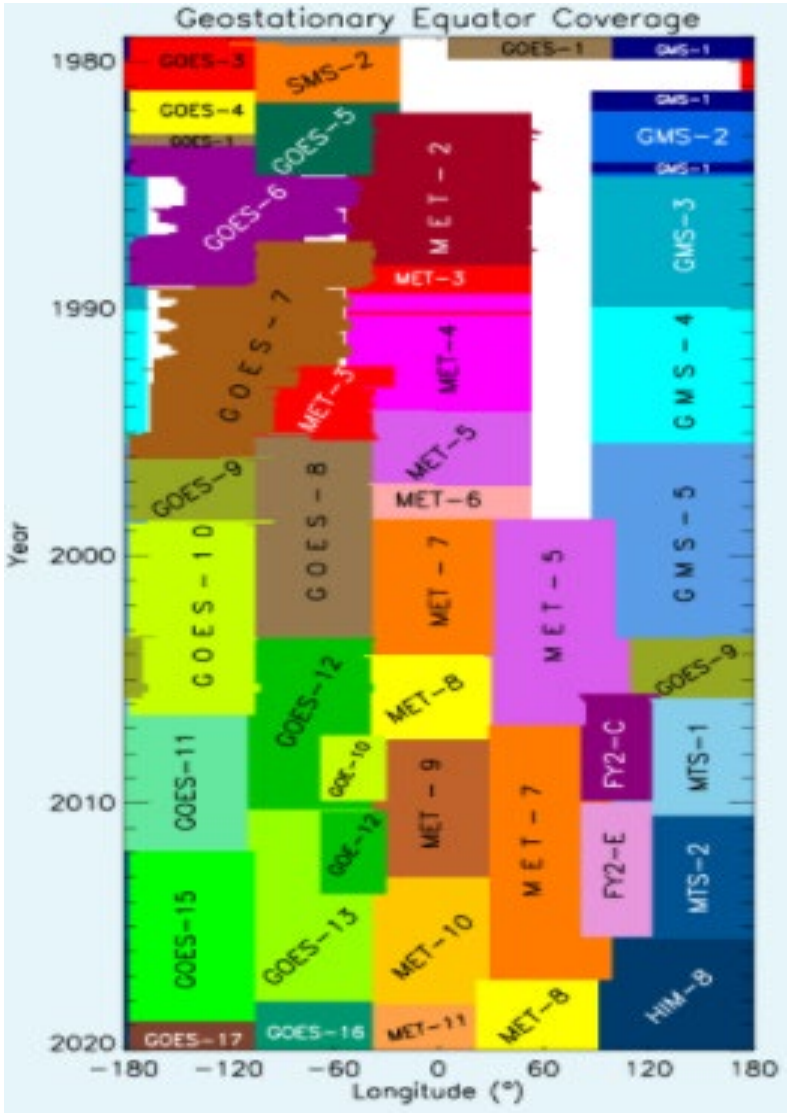
- **CONTINUITY** of Sentinel operations
- **EXPANDING** the Observation scope



CO2M Mission: Monitor Greenhouse Gases (GHG)

EUMETSAT

International collaboration approach



Geo Quilt (from https://www.ncdc.noaa.gov/gridsat/isccp-b1-info.php)

- Long history of measurements provide a treasure and are essential for climate science and services with thousands of users
- Measurements continue with more and more satellites having enhanced capabilities, with data volumes increasing sharply and access becoming more difficult for users
- Utilisation of past, current, and future observations for climate monitoring is a challenge as up to 50 geostationary satellite missions are part of the record with a variety of instrumentation since the 1970s
- **For climate a consistently quality controlled, recalibrated, and remapped radiance data set from all geostationary satellites is required and modern methods are available**
- Coordination and cooperation with other space agencies is a must
- Cloud infrastructure appears very advantageous as a means of consolidating the historical data and provides continuity to current and new missions including organised product access

Support to the Copernicus Climate Change Service (C3S)

EUMETSAT

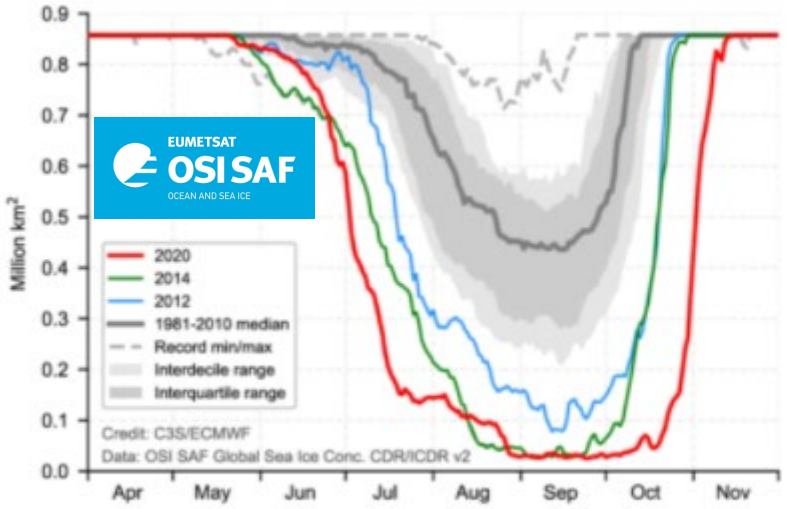
Data from many satellites assimilated including series produced by EUMETSAT

Satellite Product

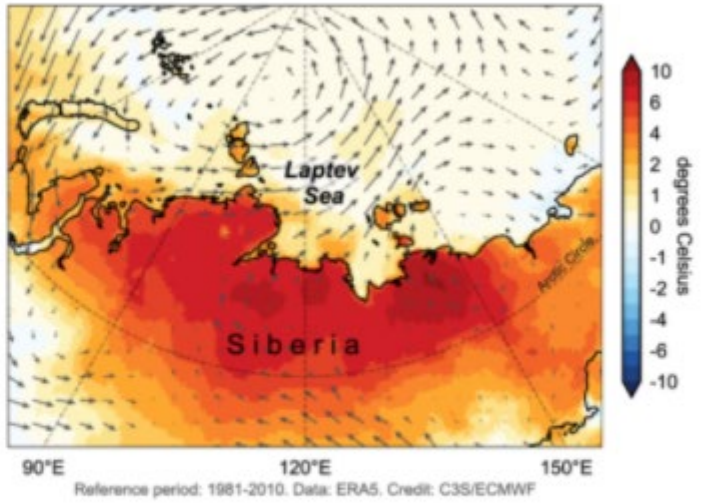
ERA5 Reanalysis

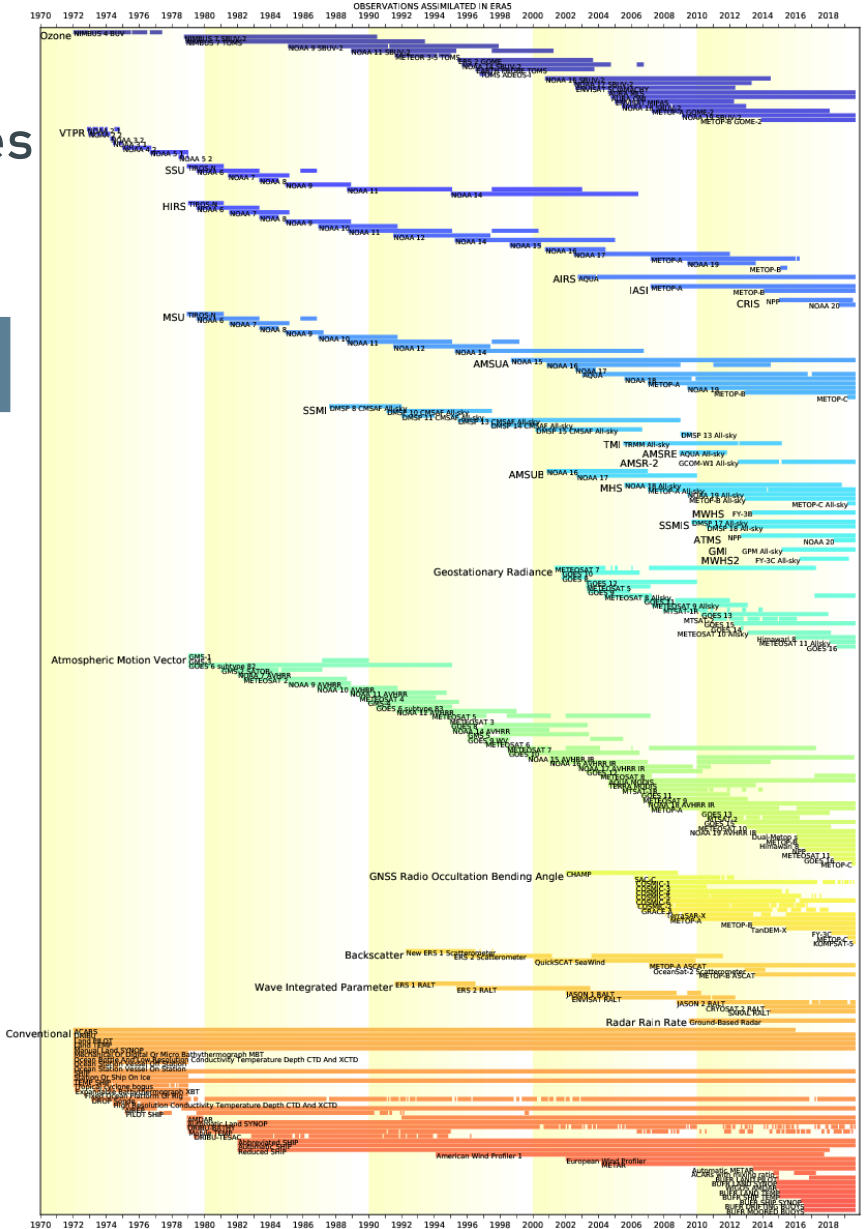
INPUT

Daily sea ice extent in Laptev Sea



Surface temperature anomaly and wind in June 2020





Copernicus Climate Change Service
European State of the Climate | 2020

Copernicus

ECMWF

EUMETSAT's contribution to ECMWF ERA5 reanalysis

EUMETSAT contributes 16 of 54 data records to the ERA5 at ECMWF

EUMETSAT H SAF – SUPPORT TO OPERATIONAL HYDROLOGY AND WATER MANAGEMENT

METOP-A/B* ASCAT soil moisture

EUMETSAT OSI SAF – OCEAN AND SEA ICE

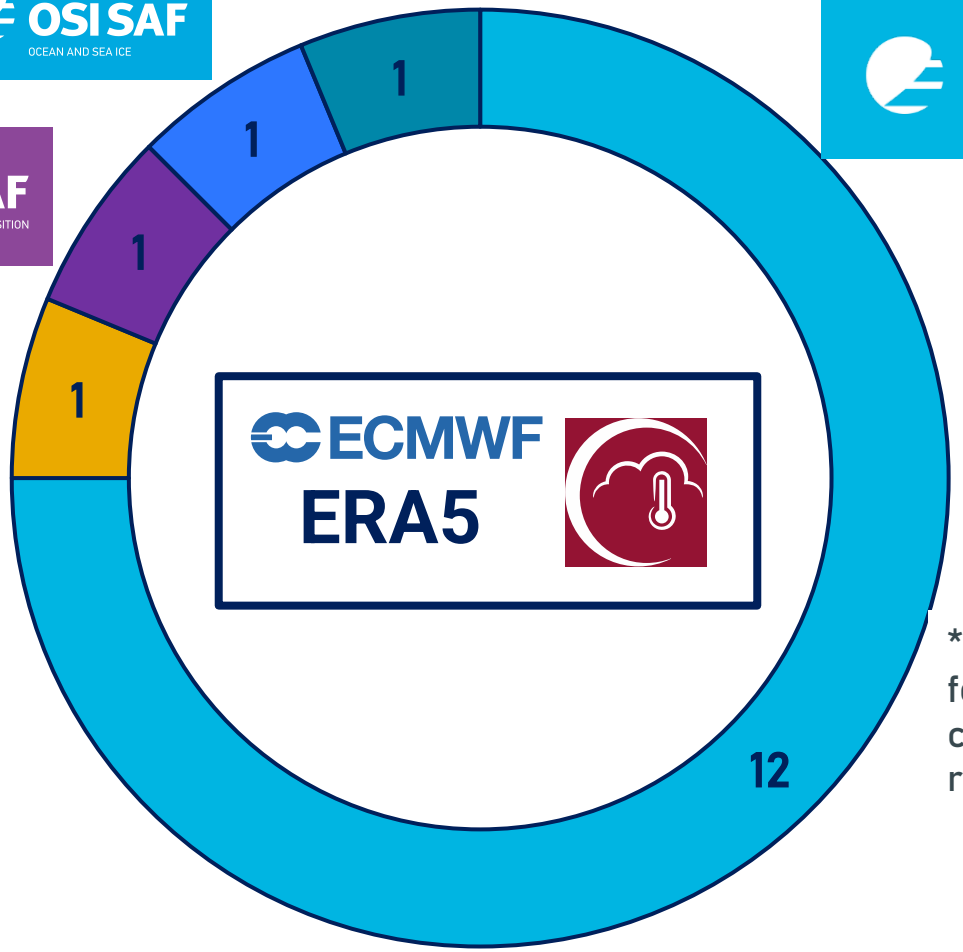
OCEANSAT-2, OSCAT, backscatter sigma0, wind vector

EUMETSAT AC SAF – ATMOSPHERIC COMPOSITION MONITORING

Metop-A*/B* GOME-2 Ozone

EUMETSAT CM SAF – CLIMATE MONITORING

DMSP-08*/10*/11*/13*/14*/15* SSM/I brightness temperature



- Metop A/B AMSU-A brightness temperature
- Metop A/B IASI brightness temperature
- Metop A/B MHS brightness temperature
- METEOSAT 5/7 MVIRI brightness temperature
- METEOSAT-8*/9*/10 SEVIRI brightness temperature
- METEOSAT-2*/3*/4*/5*/7* MVIRI wind vector
- METEOSAT-8*/9*/10 SEVIRI wind vector
- Metop A AVHRR wind vector
- Metop A/B GRAS Bending Angle
- METOP-A*/B* ASCAT backscatter sigma0
- JASON-2, Poseidon-3, wave height
- SARAL, AltiKa, wave height

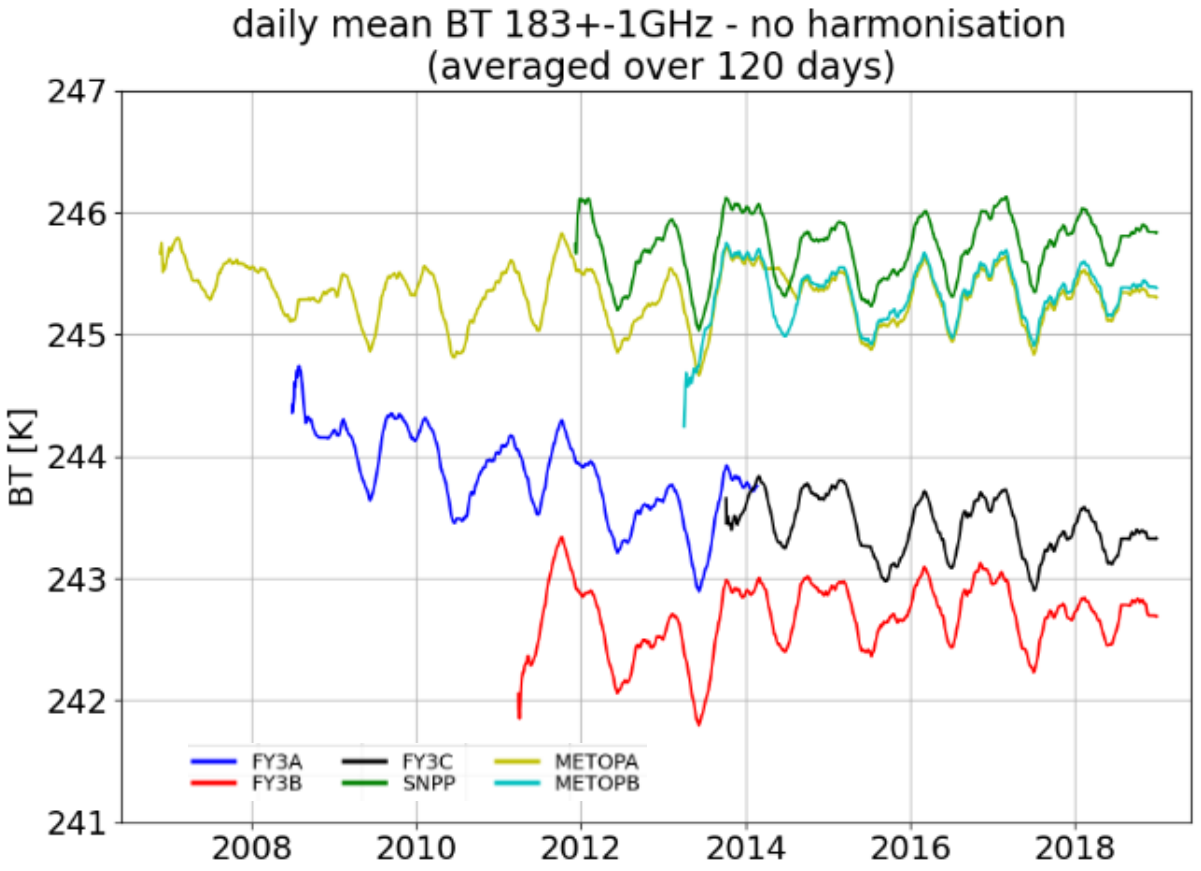
Additional contributions

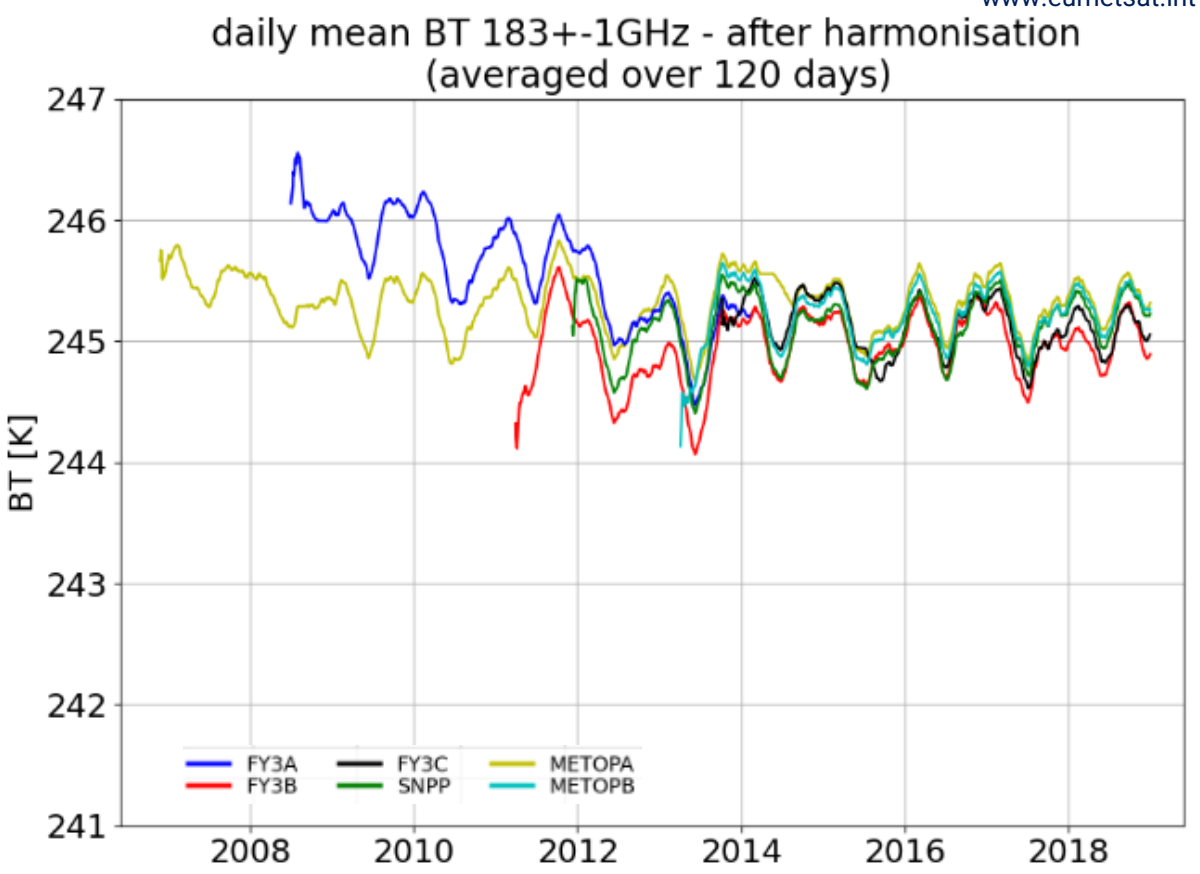
EUMETSAT NWP SAF – NUMERICAL WEATHER PREDICTION — **RTTOV tool**

EUMETSAT ROM SAF – RADIO OCCULTATION METEOROLOGY — **ROPP tool**

* indicates reprocessed data sets, cut-off date for data was 2018, many reprocessed data sets could not be utilised due to missing time and resources for data assimilation experiments.

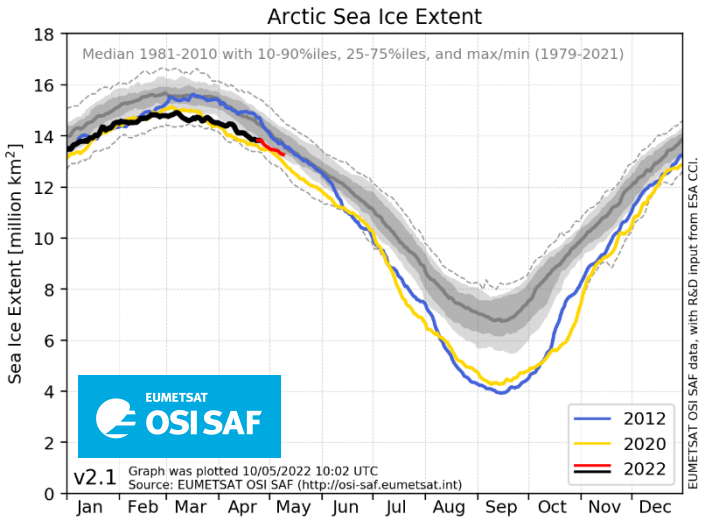
Uncertainty characterised and harmonised instrument data

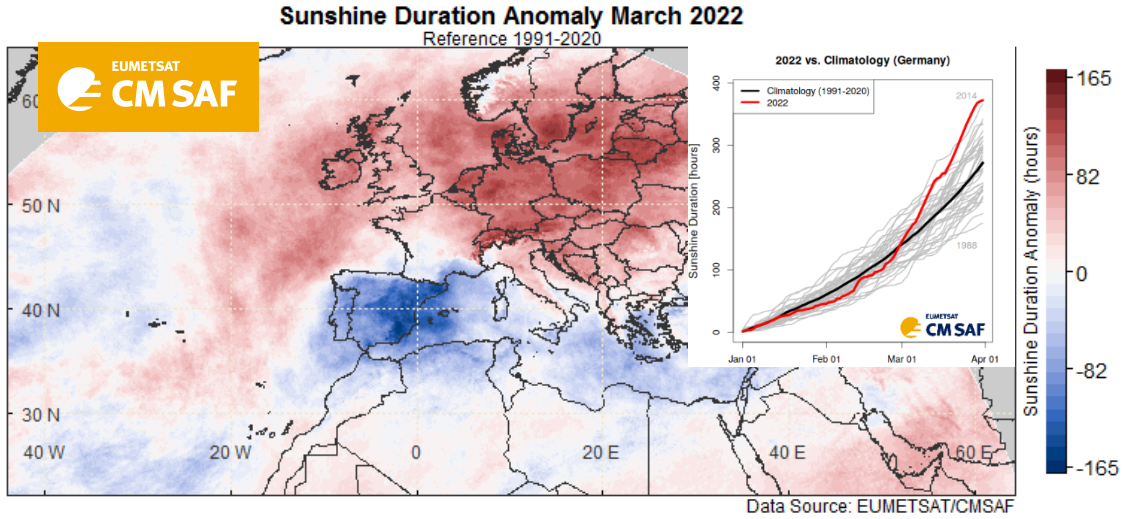


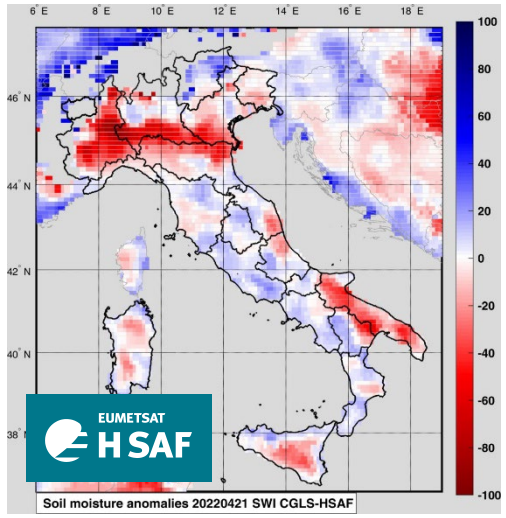


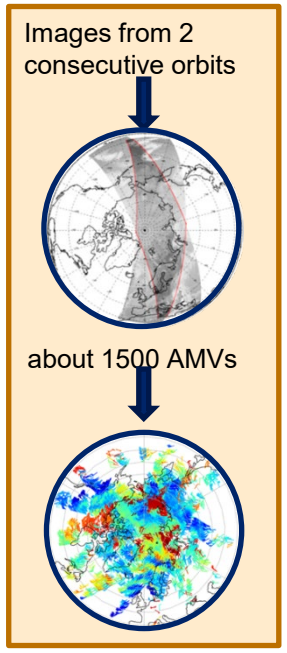
- AMSU-B and SSM/T2 are currently being incorporated and a harmonised FCDR for all the instruments will be released in Q3/2023
- EPS-SG MWS can be integrated as well
- Supports data assimilation bias correction and retrieval of upper tropospheric humidity

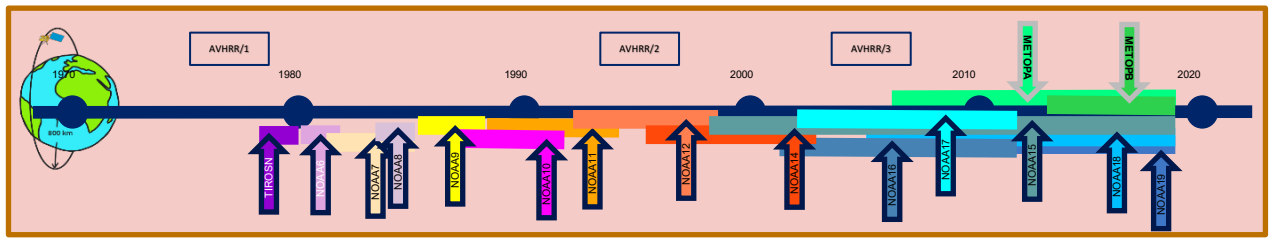
GCOS ECV data records

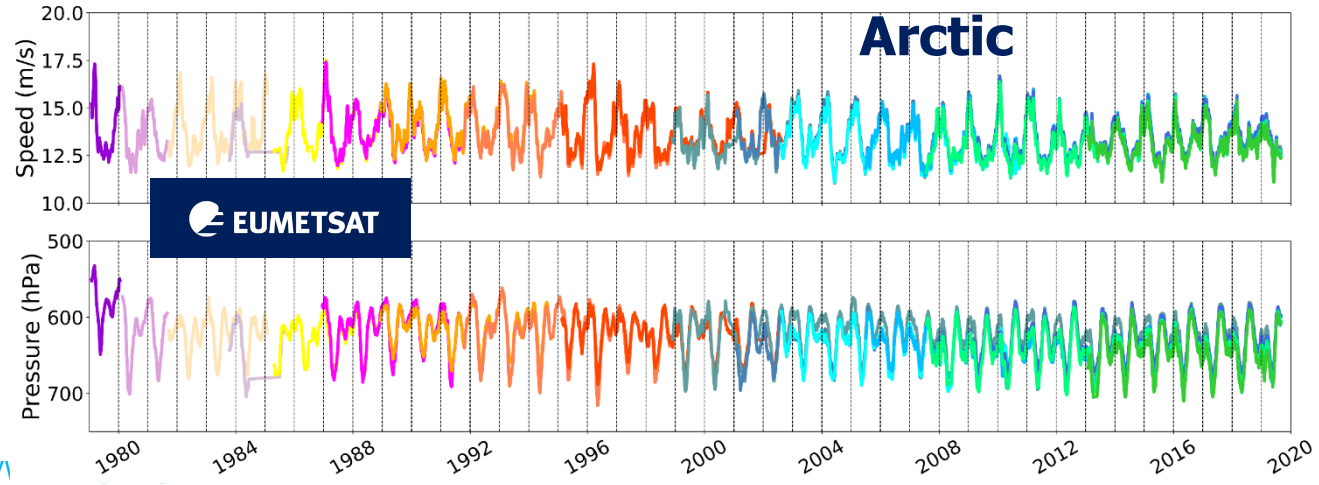


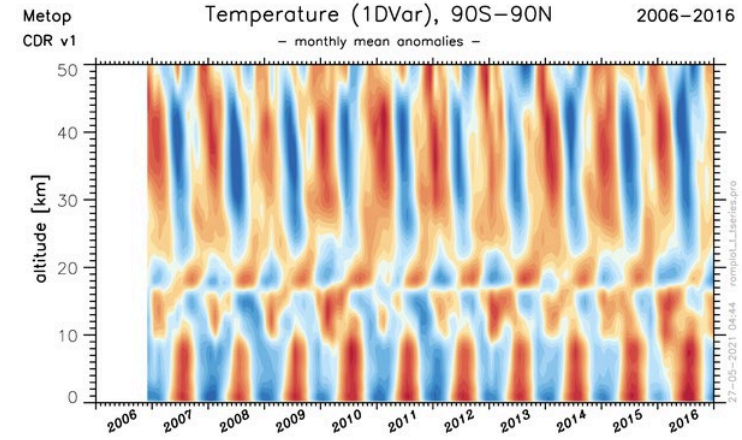


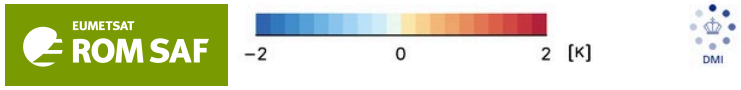








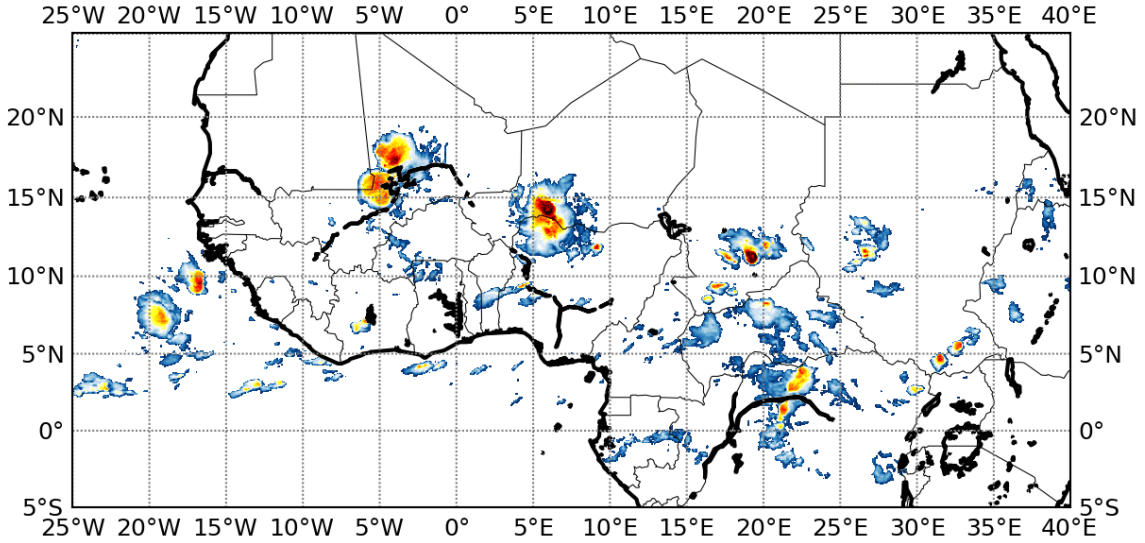




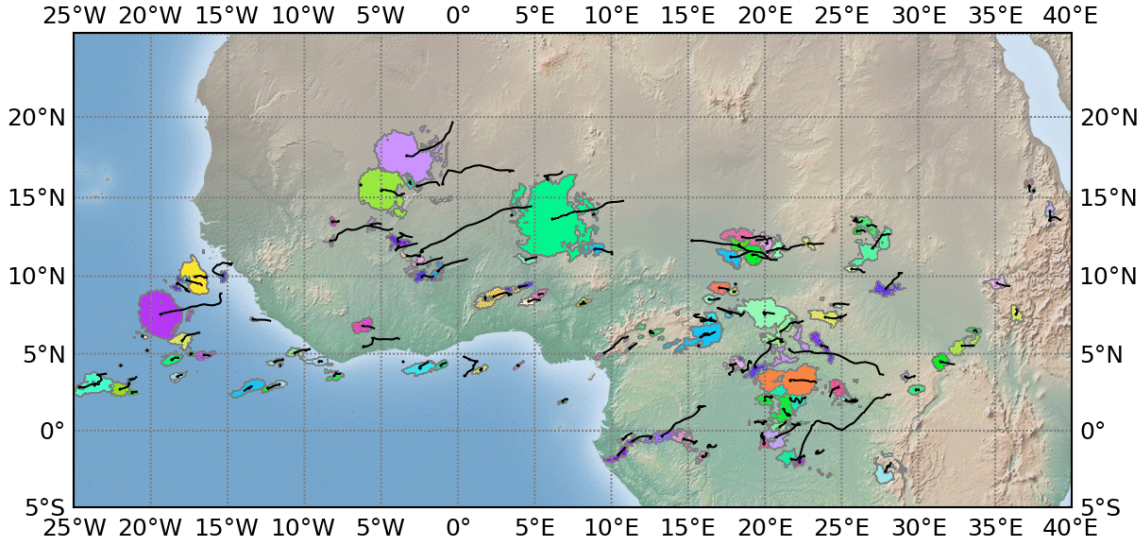
Climate information products

Objective: Elaboration of a 30min/full resolution global tropical and homogeneous Database of MCS for as many as possible geostationary satellites starting late 1970s.

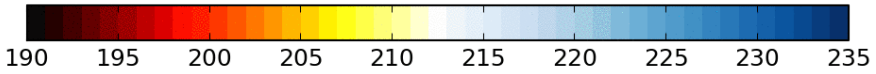
1999/07/10-01



TOOCAN MCS



Brightness Temperatures



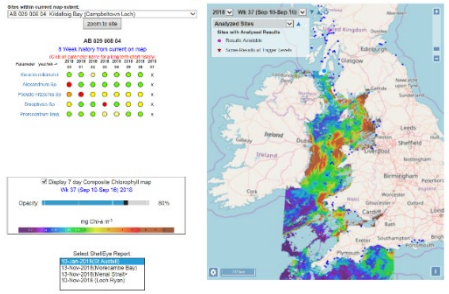
Collaboration on the European Weather Cloud with:

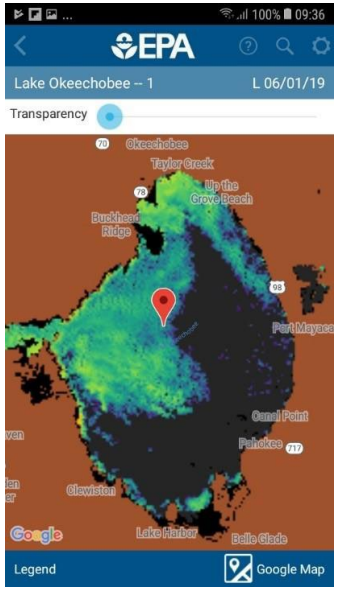
T. Fiolleau, R. Roca, D. Bouniol. S. Cloché, P. Raberanto

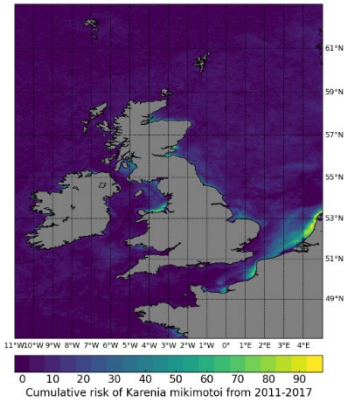
LEGOS/CNRS, Toulouse, France

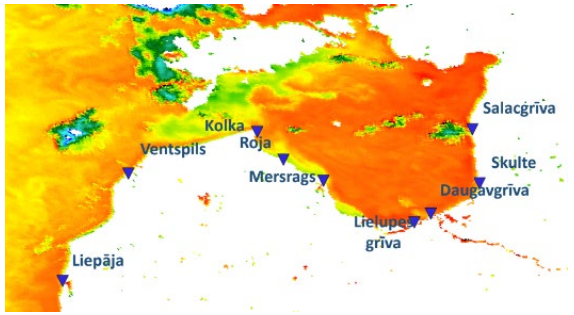
Enhanced User Engagement

End User | Service Delivery | Service Content | Tailored Service | Product Analysis | Product | Data processing | Data ID and specification









Sector Stakeholders

Thematic subject experts

Thematic subject experts

Expert EO users e.g. Universities, Research organisations

Agencies e.g. EUMETSAT, ESA, EC

Data Access - Services portfolio

Pull data services and software
Normal office hours support

Push data services
24/7 support

EUMETSAT will open a call for research projects using the ECW on 31 August.

See me at the EUMETSAT booth for more details

EUROPEAN WEATHER CLOUD
CLOUD COMPUTING-BASED INFRASTRUCTURE, FOCUSED ON THE NEEDS OF THE METEOROLOGICAL COMMUNITY

Provides access to data services in controlled computing environment together with ECMWF

https://navigator.eumetsat.int/start
https://www.eumetsat.int/access-our-data

Conclusion

- EUMETSAT provides a broad range of data for climate services and science
- Sustained satellite programmes including mandatory, Copernicus and partner programmes are the foundation for success
- We specifically support C3S; the reanalysis and the provision of ECV climate data records
- Data rescue as well as development of data records and climate information products is challenging scientific and engineering work
- EUMETSAT will further strengthen user engagement activities for climate data in partnership with other organisations
- Data access is key and modernised including the European Weather Cloud