

ESA contribution to International Climate Initiatives

Climate Change Initiative Mid-Term Review

26 November 2020

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Director of Earth Observation Programmes

ESA EO Vision:



Taking the Pulse of our Planet

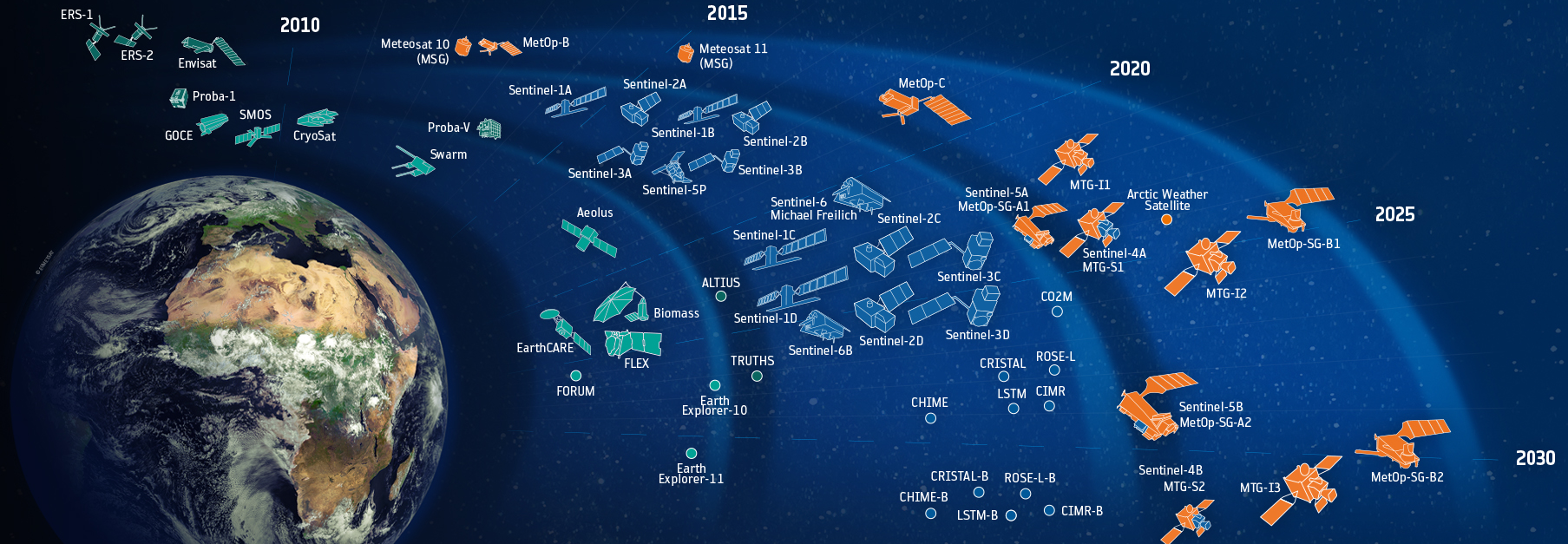


→ THE EUROPEAN SPACE AGENCY

ESA-Developed Earth Observation Satellites



16 in operation
38 under development
14 under preparation



Science
Copernicus
Meteorology



Accelerating climate change Global biodiversity collapse



*“I’ve witnessed
startling
changes;
changes that are
today threatening
our various
civilizations”*

Sir David
Attenborough

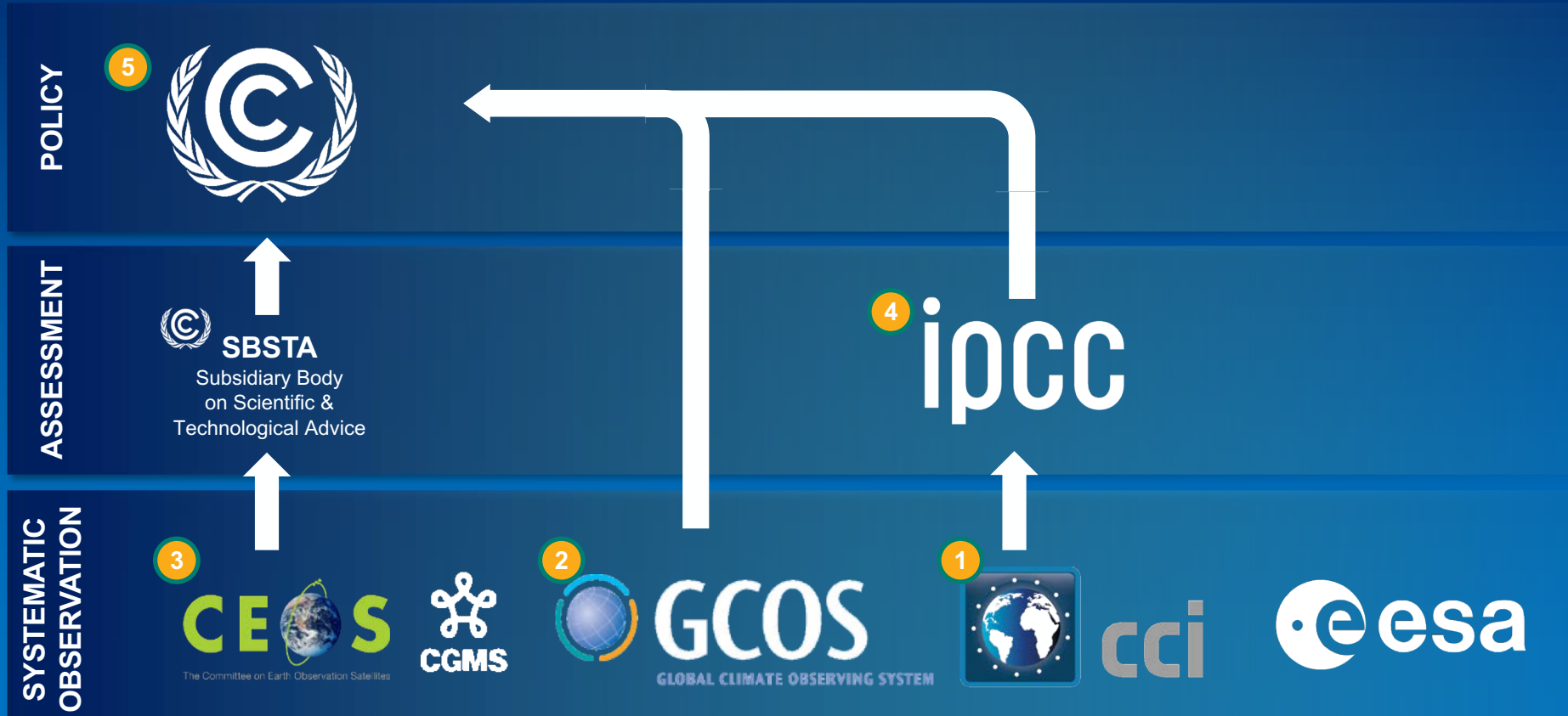
Earth Observation is key in understanding our natural world and its complexity



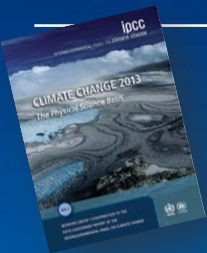
Amazon
rainforest
collapsing?



Ice-free Arctic in 2030s?



IPCC Fifth Assessment Report



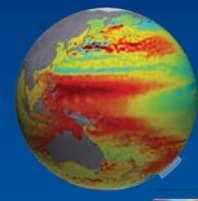
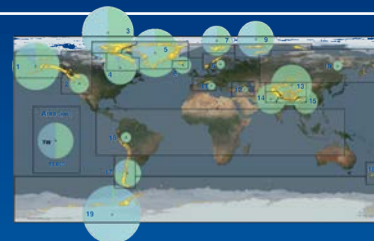
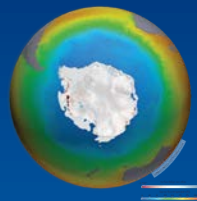
15 papers

60 citations

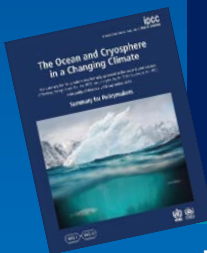


28

contributing authors



Special Report: The Oceans and Cryosphere in a Changing Climate



38 papers

162 citations



authors

von Shuckmann

Käab

Meysignac

Marzeion



sea level
cci



sea level
budget closure
cci



ocean colour
cci



antarctic
ice sheet
cci



greenland
ice sheet
cci



sea ice
cci



glaciers
cci

IPCC Sixth Assessment Report

ar6

9 chapters
with CCI
authors



authors

Sathyendranath (OC), Eyring (CMUG)

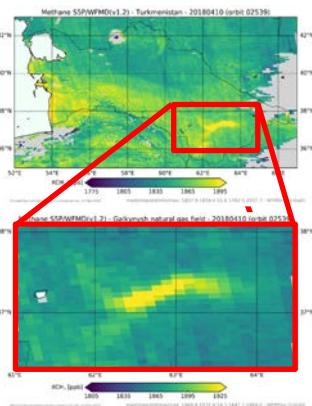
Dufresne (CMUG), Doblas-Reyes (CMUG)

Notz (CMUG), Henson (OC), Jones (CMUG)

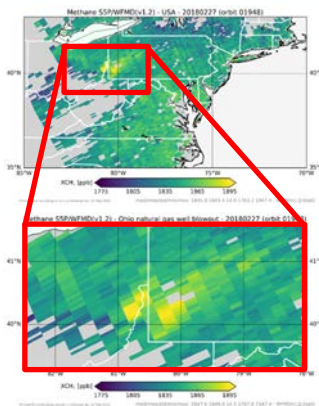
Seneviratne (Soil), von Shuckmann (SLBC), Racaultis (OC)



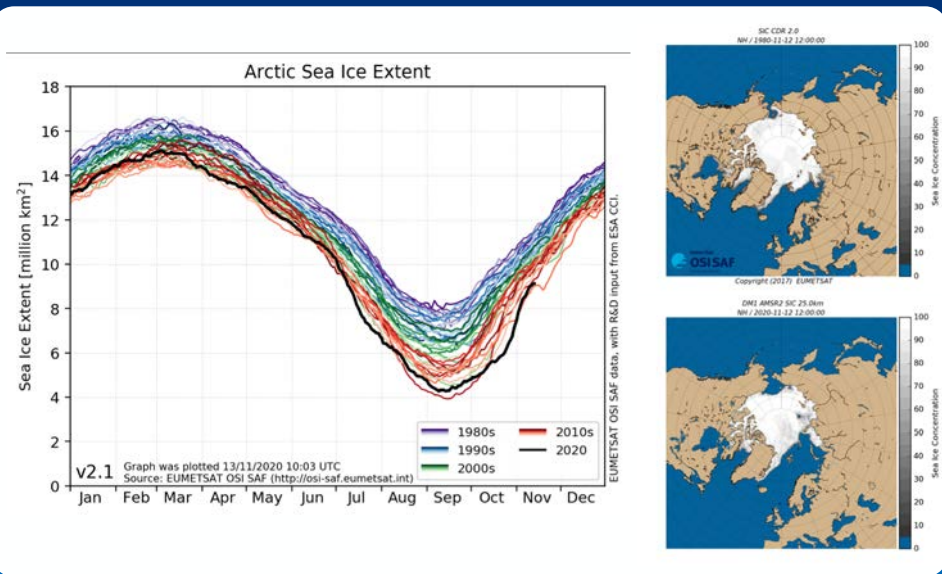
Data product: ESA funded scientific algorithm WFMD (v1.2), University of Bremen, Germany. See also: Schneising et al., AMT, 2019



Galkynysh natural gas field
Turkmenistan



Natural gas well blowout,
Ohio, USA



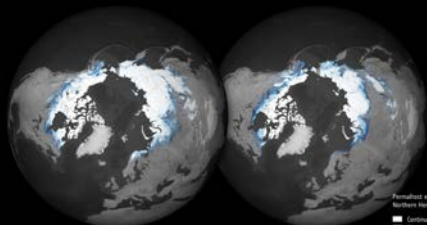
R&D to support future operational products

C3S GHG-cci+ Copernicus Sentinel-5P XCH4 product, generated with the WFMD retrieval algorithm can derive Methane emissions of major gas and oil fields.

Improving the 40 year sea ice record

CCI R&D is improving operational products developed by EUMETSAT OSI SAF - extending the data record back in time, while improving the spatial resolution.

Expanding the suite of Essential Climate Variables



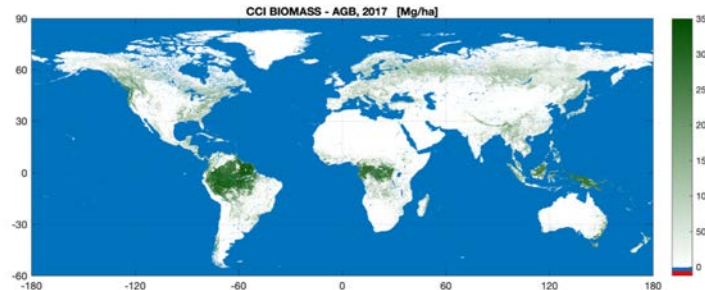
2003

2017

Permafrost extent for the Northern Hemisphere
 ■ Continuum
 ■ Discontinuum
 ■ Sporadic
 ■ Subirrigated
Data source: Permafrost (C), Obu et al., 2019
 via the Copernicus

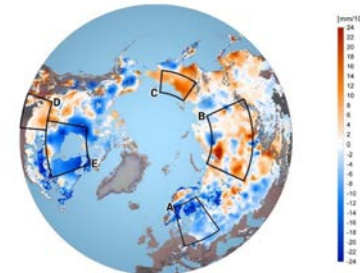
PERMAFROST

Obu, J et .al (2019)



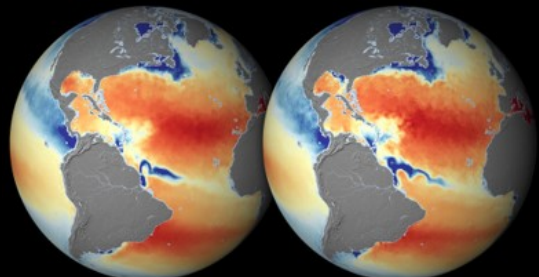
ABOVE GROUND BIOMASS

Santoro, M et .al (2019)



SNOW

Pulliaainen J et al (2020) Nature



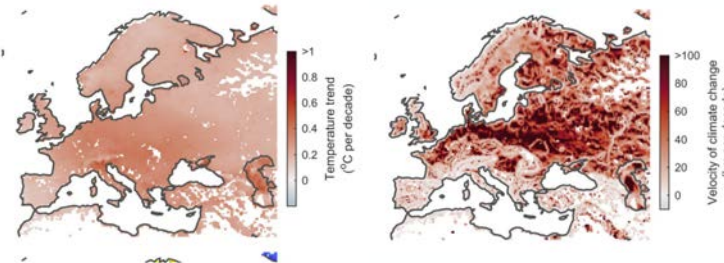
August – September 2012

August – September 2017

Sea surface salinity from microwave satellite data
32 33 34 35 36 37 38

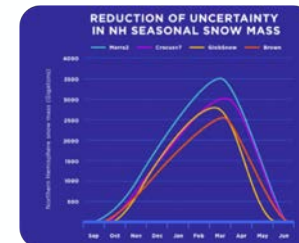
SEA SURFACE SALINITY

Boutin, J et .al (2020)



LAKES

Woolway, R. I. & Maberly S. C. (2020)
 Nature Climate Change



Other datasets to come:

Land Surface Temperature

Water Vapour

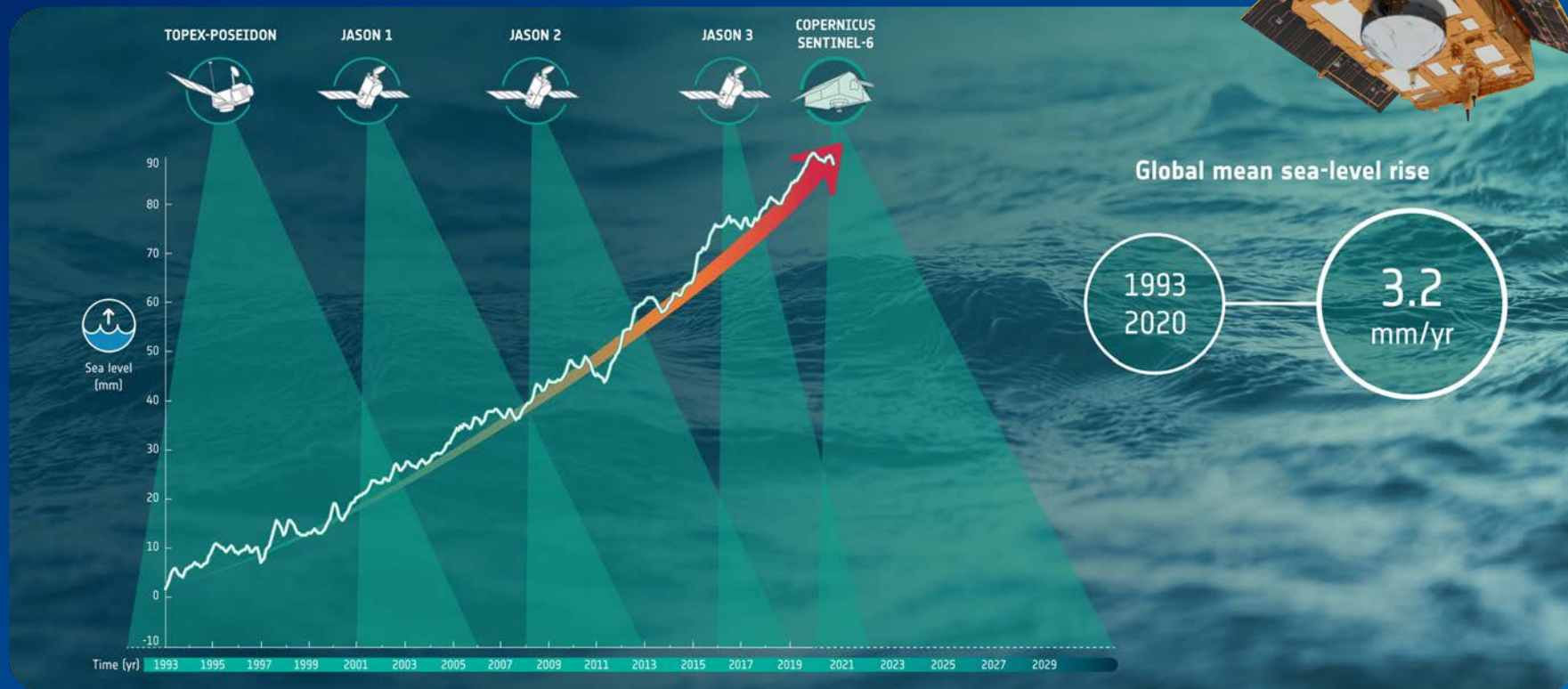
HR Land Cover

New and upcoming ESA EO Climate Monitoring Capabilities

Sentinel-6 Michael Freilich was just launched



It will continue to measure sea-level changes





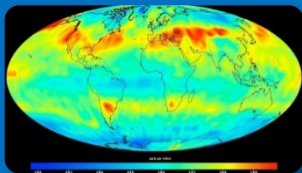
Key for climate science

By measuring radiation emitted by Earth into space, FORUM will provide new insight into the planet's radiation budget and how it is controlled

Covers Earth's top-of-atmosphere emission spectrum from 6.25 – 100 micrometer with a spectral resolution of 0.5 cm^{-1}

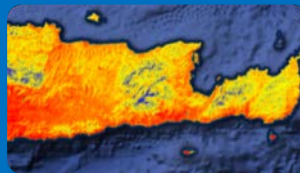
Copernicus: Sentinel Expansion Missions

CO2M - Anthropogenic CO₂ Monitoring



Causes of
Climate Change

LST – Land Surface Temperature Mission



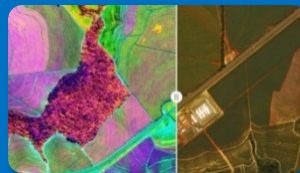
Agriculture & Urban
Management

CRISTAL – Polar Ice & Snow Topography



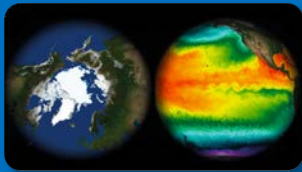
Effects of
Climate Change

CHIME – Hyperspectral Imaging Mission



Food Security, Soil,
Minerals, Biodiversity

CIMR – Passive Microwave Radiometer



Sea: Surface Temp.
& Ice Concentration

ROSE-L – L-band SAR Mission



Vegetation & Ground
Motion & Moisture

New Climate Initiative

- Provide scientific evidence to support to UNFCCC Paris Agreement (Global stocktake) and IPCC
- Earth System approach focussing on ECV Clusters across individual ECV communities and Future Earth's "tipping points"
- Bring together the climate modelling and observation community
- Reach out to emerging users community and continued custodianship for climate data records



TRUTHS Implementation

Operational hyperspectral mission to establish a spaceborne optical calibration observation system for improved confidence in climate forecasting

Thanks for your attention!

[@AschbacherJosef](#)

www.esa.int