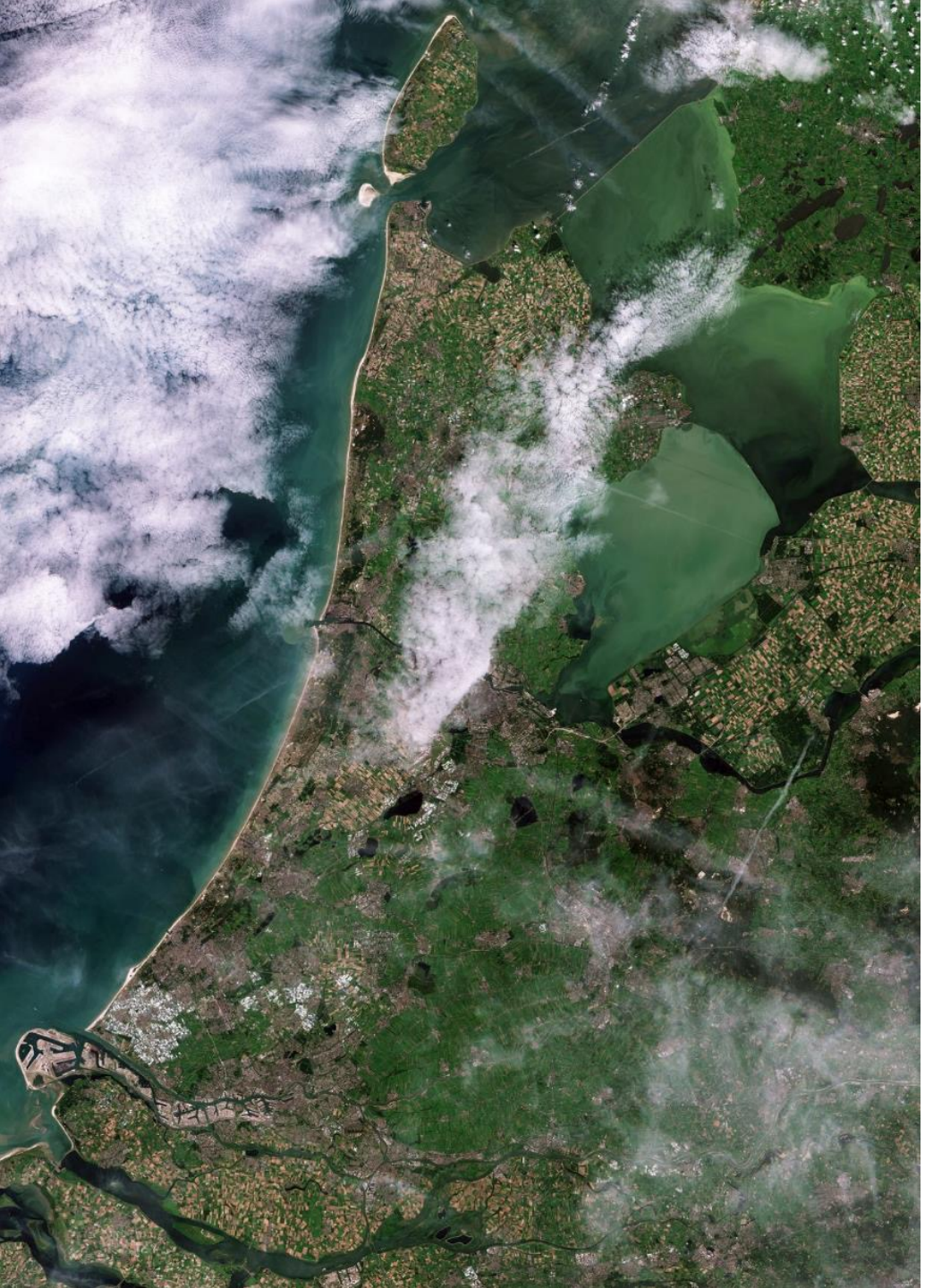


Destination Earth & Earth Observation Infrastructures

Raymond Sluiter – Netherlands Space Office

- Phyisical Geographer, PhD Hyperspectral Land Remote Sensing & GIS.
- Advisor data & applications @ NSO
- Delegate ESA-DOSTAG (Data Operations Scientific Technical Advisory Group)
- Expert Horizon Europe Space (CL4-Dest5)
- Delegate Copernicus Committee
- Expert DestinE Member States Coordination Groupe

Meteosat

Since 1977

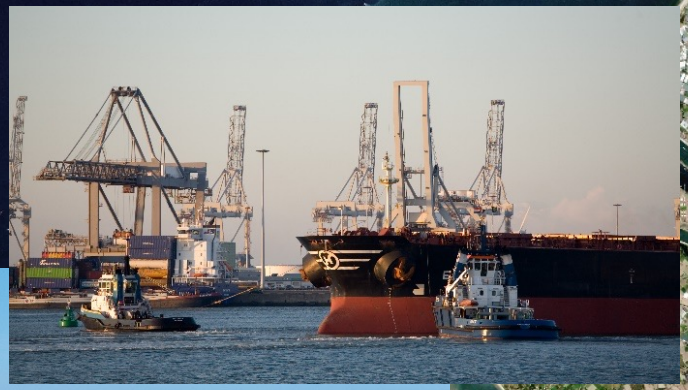
MEASURING SEA-LEVEL CHANGE

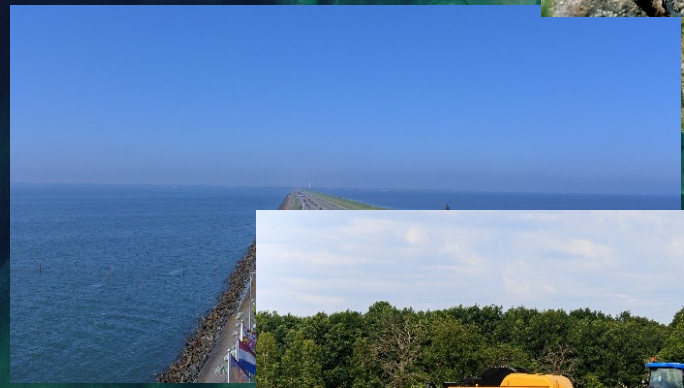
Since the early 1990s, satellite altimeters have revolutionised our understanding of sea-level change

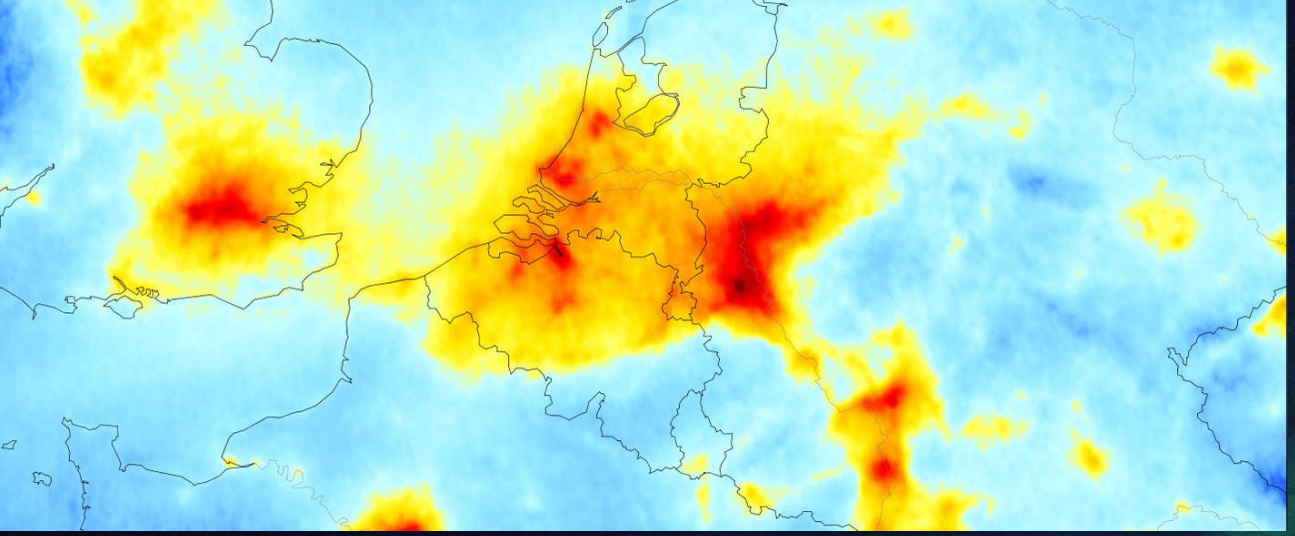
Global mean sea-level rise

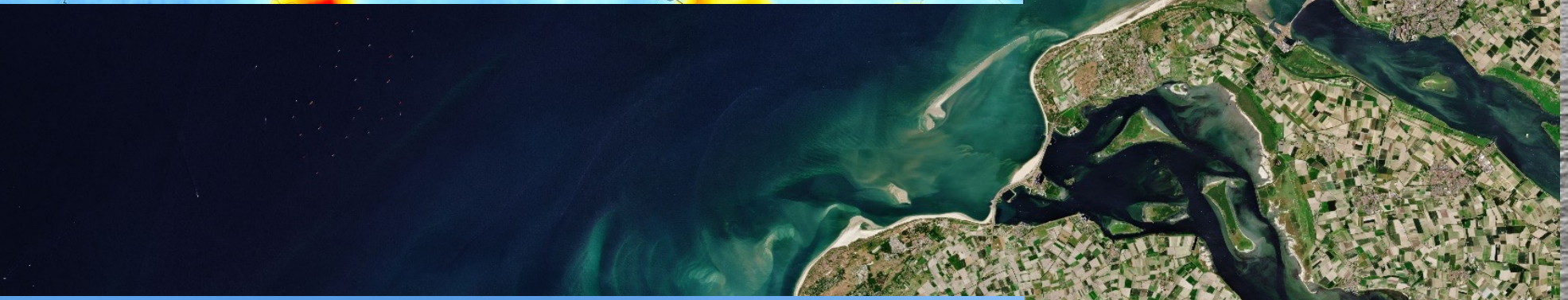
1993
2020

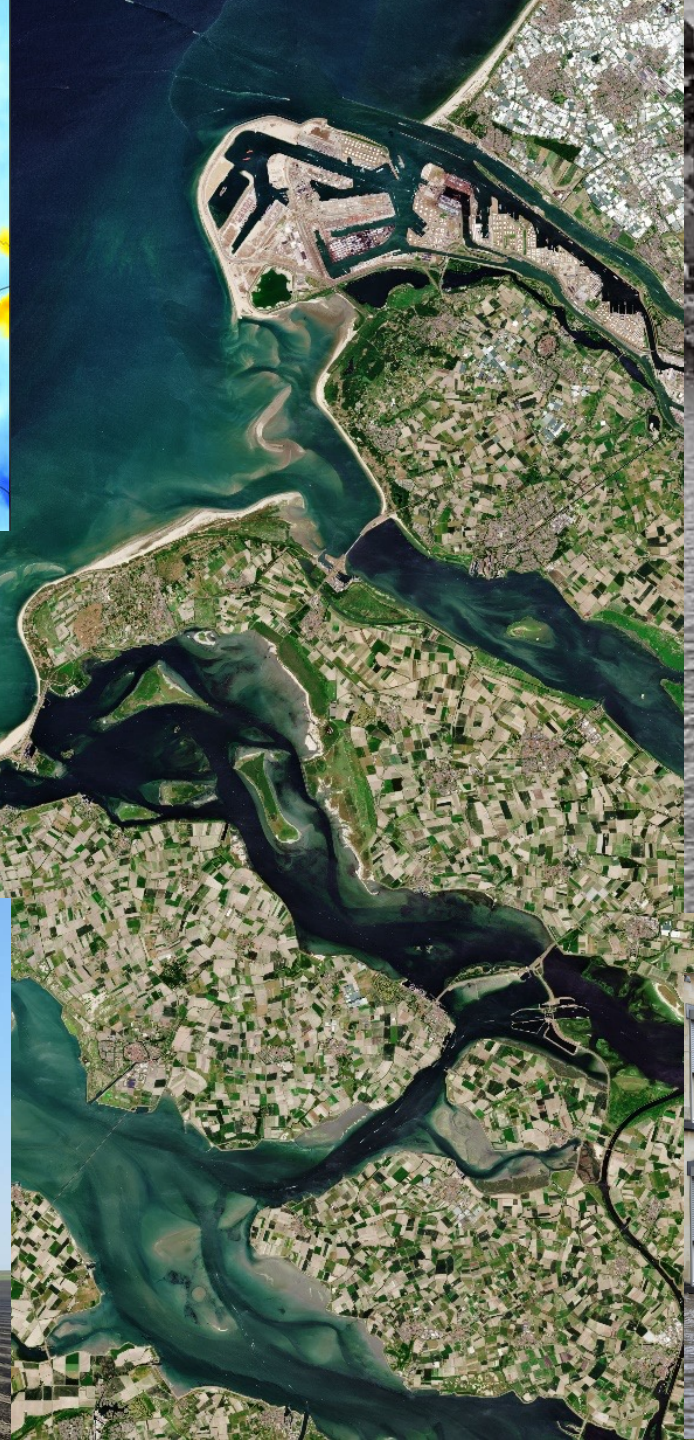
3.2
mm/yr











ESA-Developed Earth Observation Satellites

16 in operation
38 under development
14 under preparation

2010
ERS-1
ERS-2
Envisat
Proba-1
GOCE
SMOS
CryoSat

2015
Meteosat 10 (MSG)
MetOp-B
Meteosat 11 (MSG)
Sentinel-1A
Sentinel-2A
Sentinel-1B
Sentinel-2B
Proba-V
Swarm
Sentinel-3A
Sentinel-3B
Sentinel-5P
Aeolus

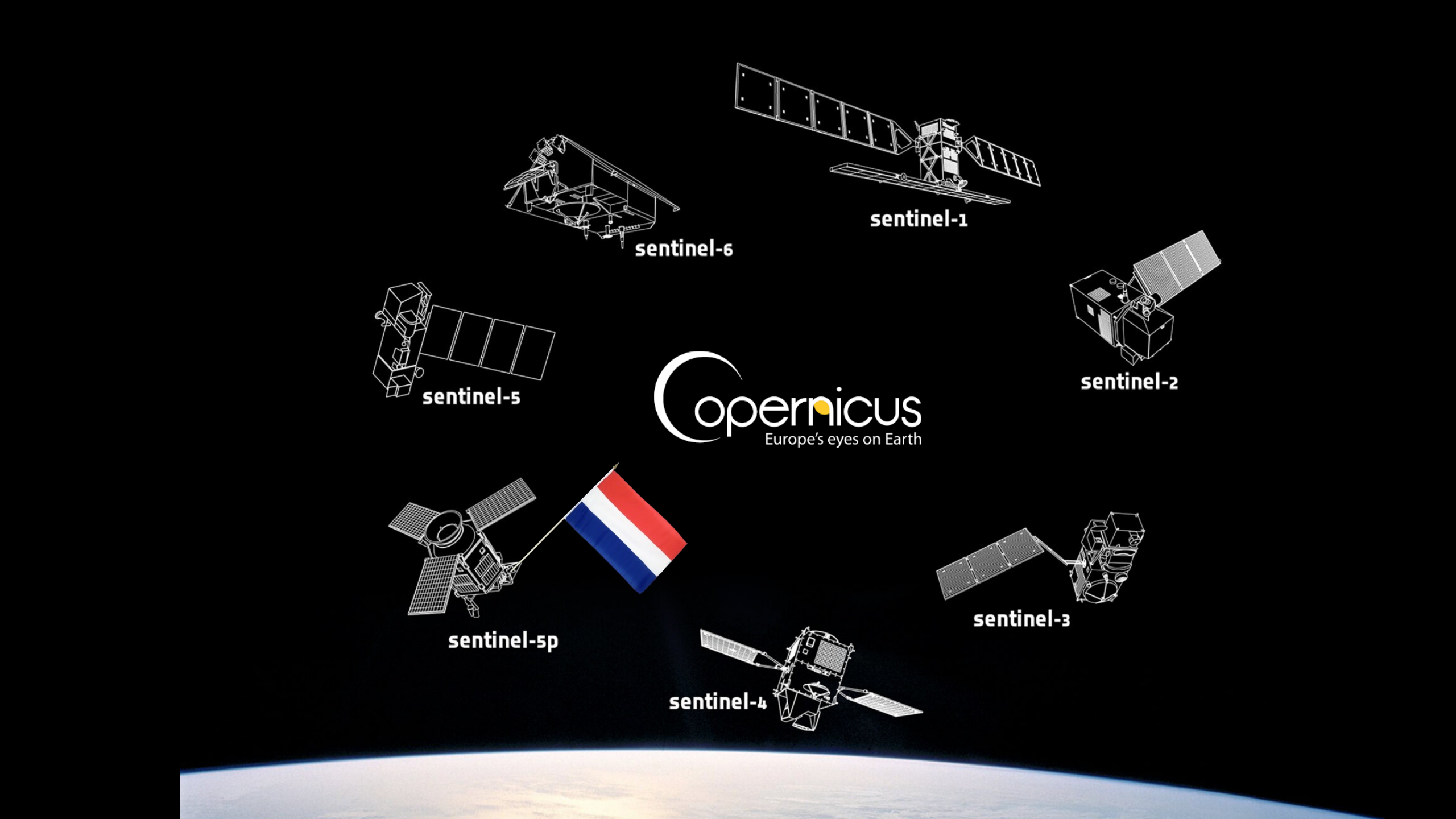
2020
MetOp-C
Sentinel-6 Michael Freilich
Sentinel-2C
Sentinel-1C
Sentinel-3C
ALTIUS
Biomass
Sentinel-1D
Sentinel-6B
Sentinel-2D
Sentinel-3D
EarthCARE
FLEX
TRUTHS
FORUM
Earth Explorer-10
Earth Explorer-11
CHIME
CO2M
CRISTAL
ROSE-L
LSTM
CIMR
MTG-I1
Sentinel-5A MetOp-SG-A1
Arctic Weather Satellite
Sentinel-4A MTG-S1

2025
MTG-I2
MetOp-SG-B1
Sentinel-5B MetOp-SG-A2

2030
Sentinel-4B MTG-S2
MTG-I3
MetOp-SG-B2
CRISTAL-B
ROSE-L-B
CHIME-B
LSTM-B
CIMR-B

Science
Copernicus
Meteorology
EUMETSAT

→ THE EUROPEAN SPACE AGENCY


sentinel-6
sentinel-1
sentinel-5
sentinel-2
Copernicus
Europe's eyes on Earth
sentinel-5p
sentinel-3
sentinel-4

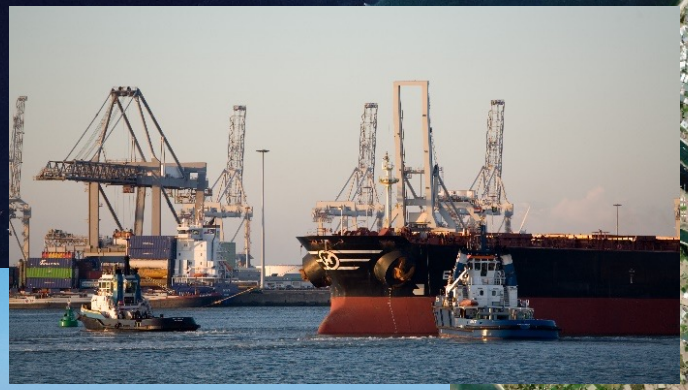
MEASURING SEA-LEVEL CHANGE

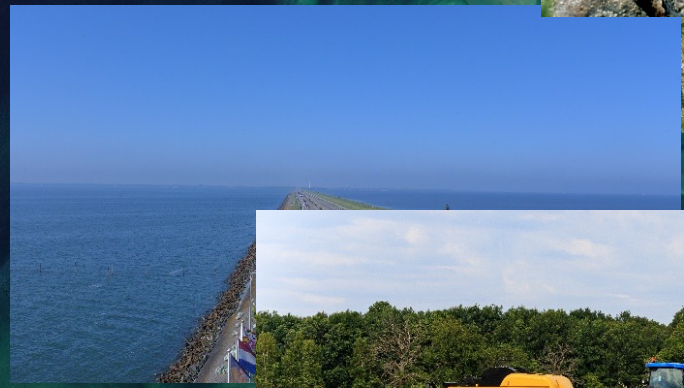
Since the early 1990s, satellite altimeters have revolutionised our understanding of sea-level change

Global mean sea-level rise

1993
2020

3.2
mm/yr





A European Green Deal
Striving to be the first climate-neutral continent

Climate change and environmental degradation
challenges, the European Green Deal will trans
ensuring:

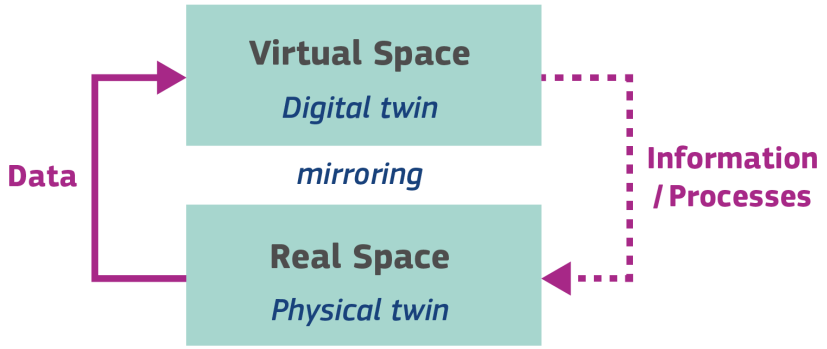
- no net emissions of greenhouse gases by 20
- economic growth decoupled from resource
- no person and no place left behind

The European Green Deal is also our lifeline ou
from the NextGenerationEU Recovery Plan, and

ts

Actions

- Climate
- Environment and oceans
- Energy
- Transport
- Agriculture
- Finance and regional development
- Industry
- Research and innovation



Digital Twin Earth - DestinE

First Digital Twins:

- Climate Extremes
- Climate Adaptation

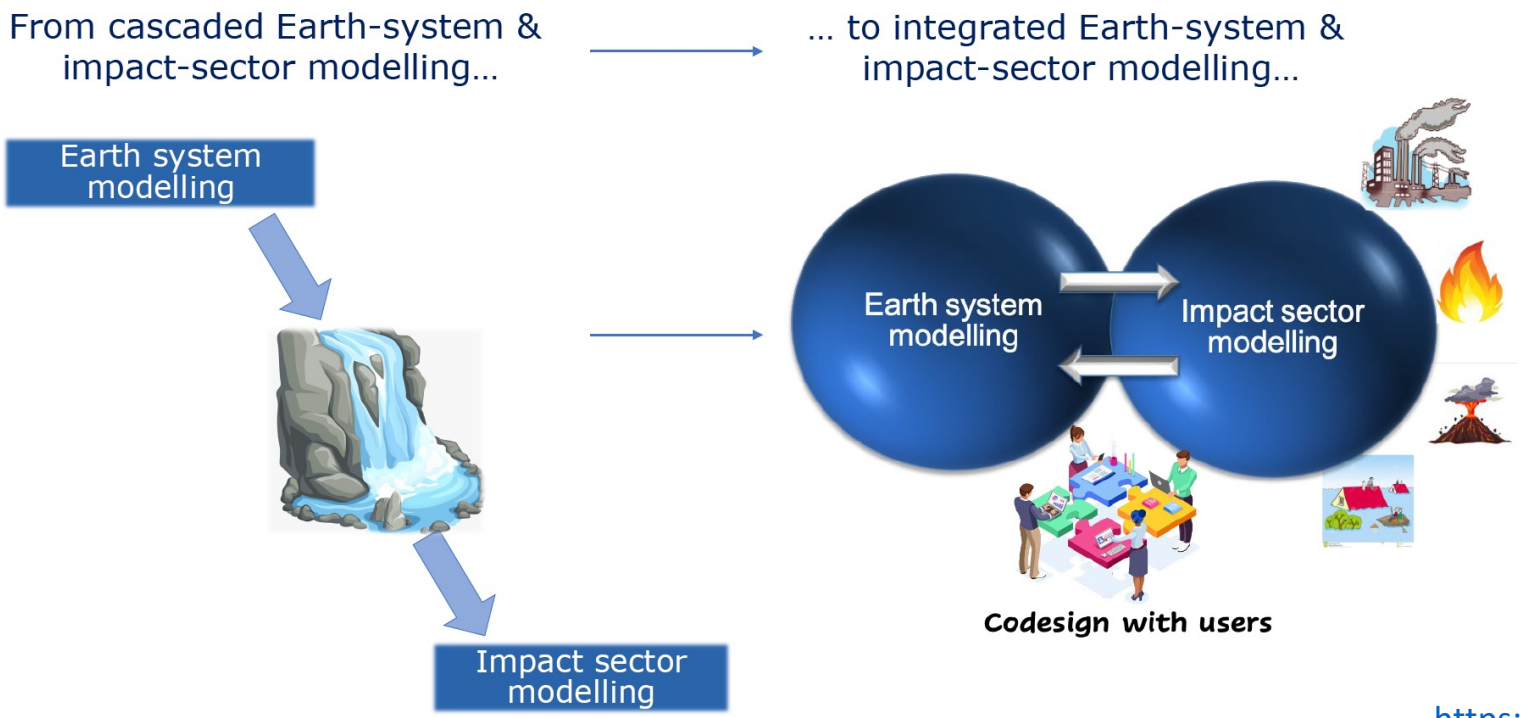
Core infrastructure by ESA, EUMETSAT &ECMWF

Destination Earth (DestinE)

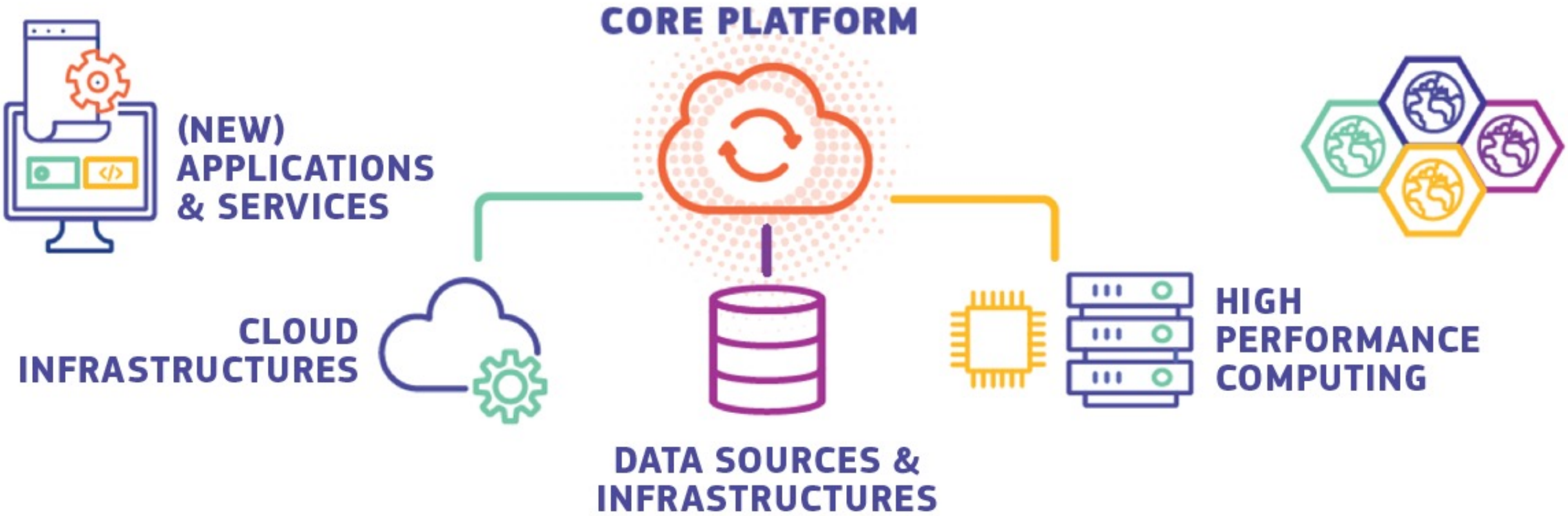
Objective: An interactive and highly reliable knowledge generation system to support decision-making and generate insights, to enhance our ability to anticipate environmental disasters and their resultant **socio-economic** crises for a sustainable future

To support tackling complex environmental challenges, **DestinE will help policy-makers to**:

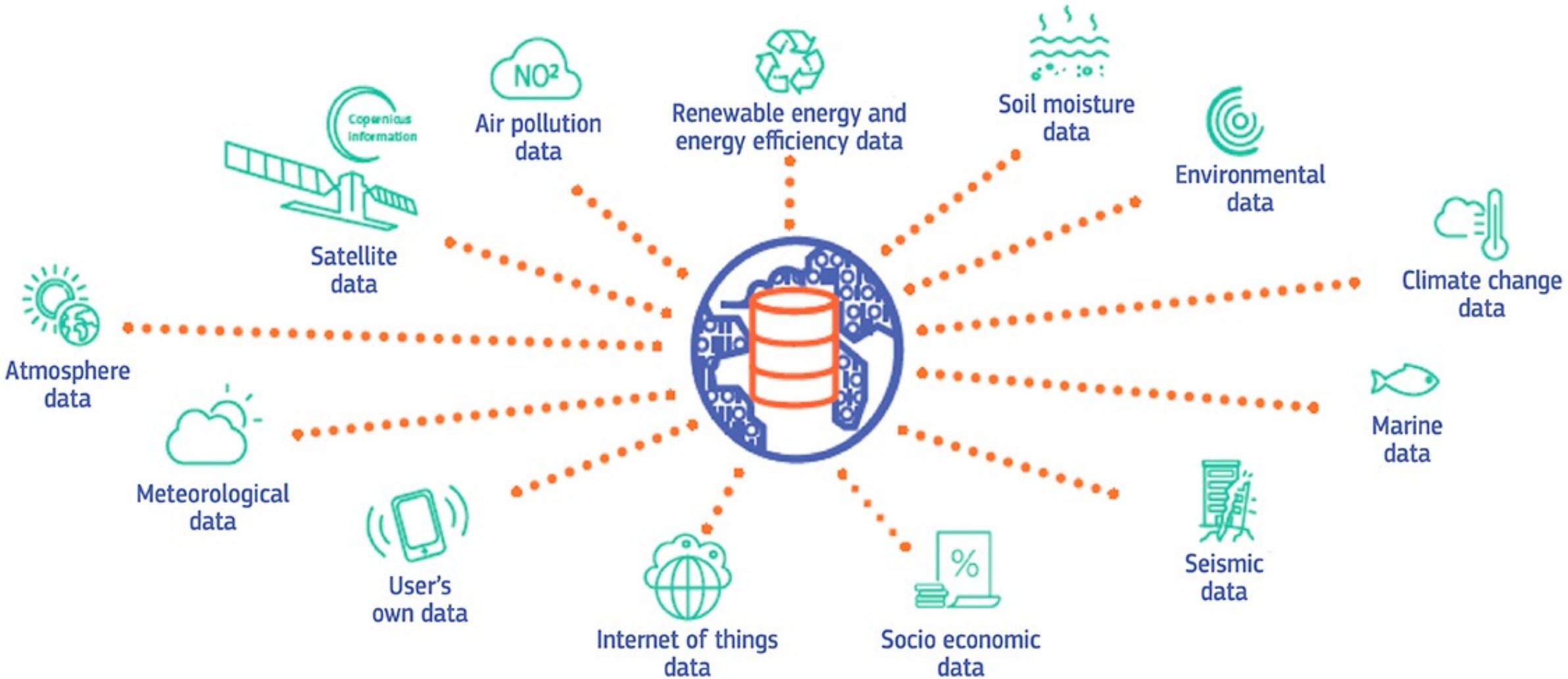
- **monitor and simulate the Earth's system developments (land, marine, atmosphere, biosphere) and human interventions**;
- anticipate environmental disasters and resultant **socio-economic** crises to save lives and avoid large economic downturns;
- **enable the development and testing of scenarios** for ever more sustainable development.



https://digital-strategy.ec.europa.eu/en/library/destination-earth



https://digital-strategy.ec.europa.eu/en/library/destination-earth

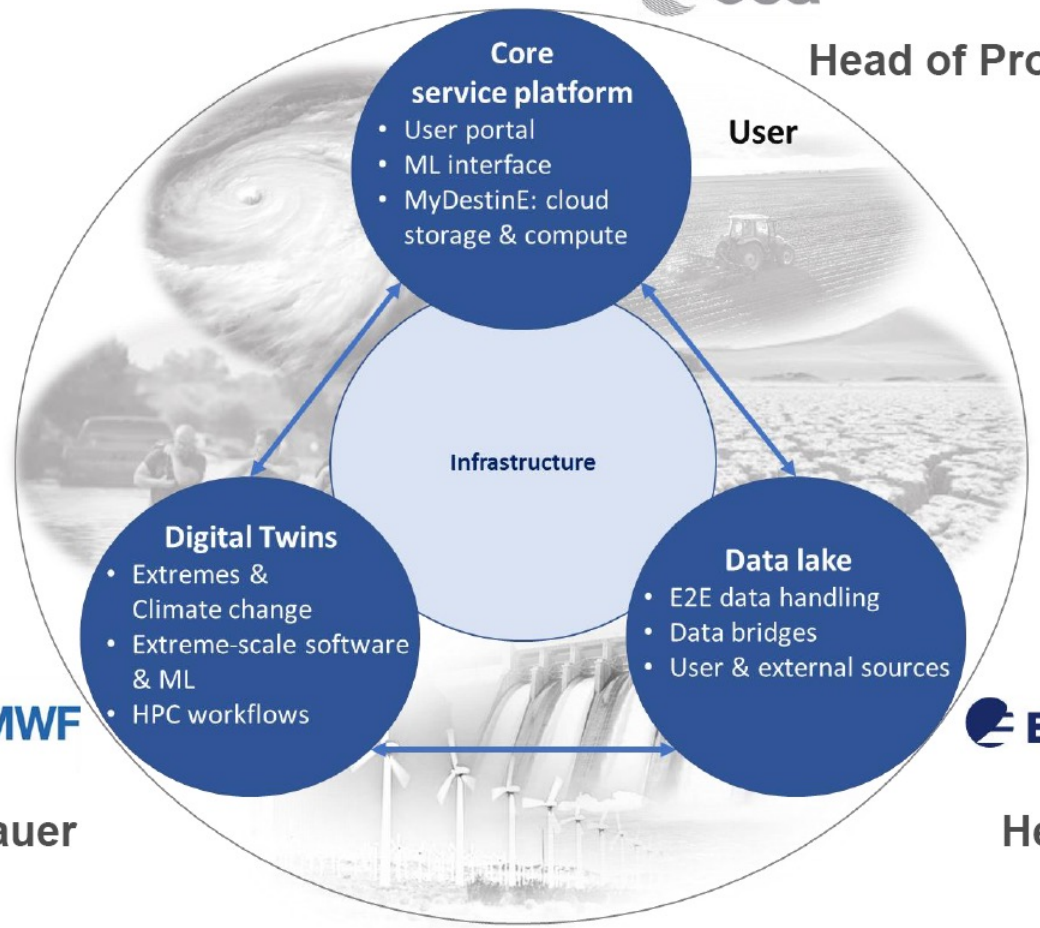


https://digital-strategy.ec.europa.eu/en/library/destination-earth

The Implementing Entities (3Es)

esa

Head of Project : Eric Monjoux



ECMWF

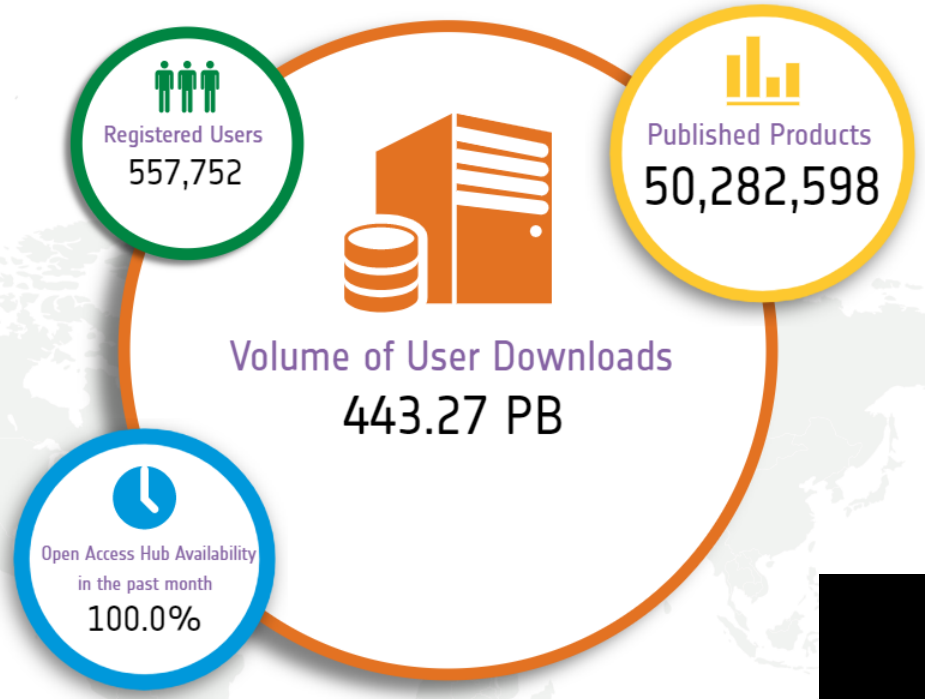
Head of Project : Peter Bauer

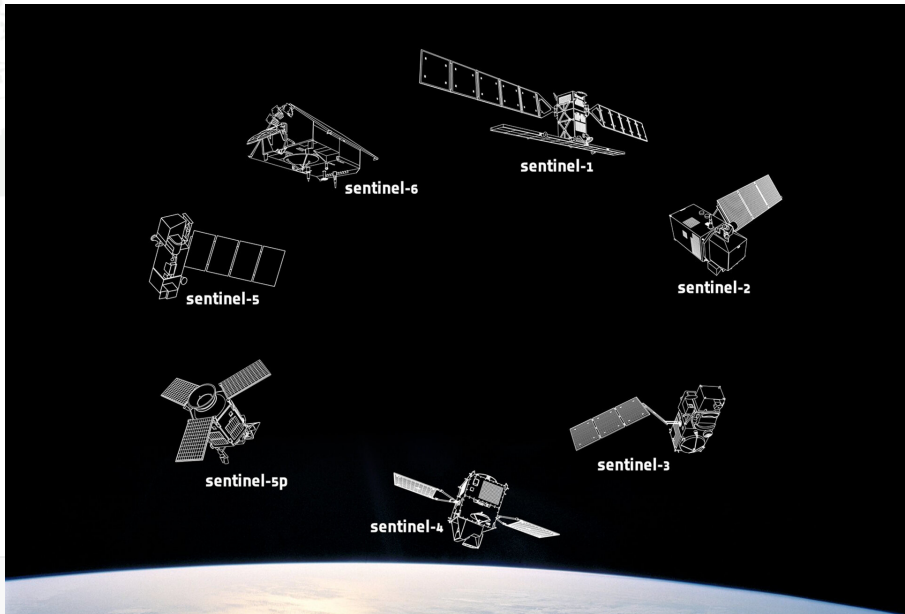
EUMETSAT

Head of Project : Lothar Wolf

European Commission

Sentinel Data Dashboard





https://dashboard.copernicus.eu/

Classic ways for data access…

Open Access Data Hub

Copernicus Services Data Hub

EUMETCast

Copernicus Online Data Access (CODA)

Collaborative Data Hub

https://earth.esa.int/eogateway

Land Monitoring Service (CLMS)

Marine Environment Monitoring Service (CMEMS)

Atmosphere Monitoring Service (CAMS)

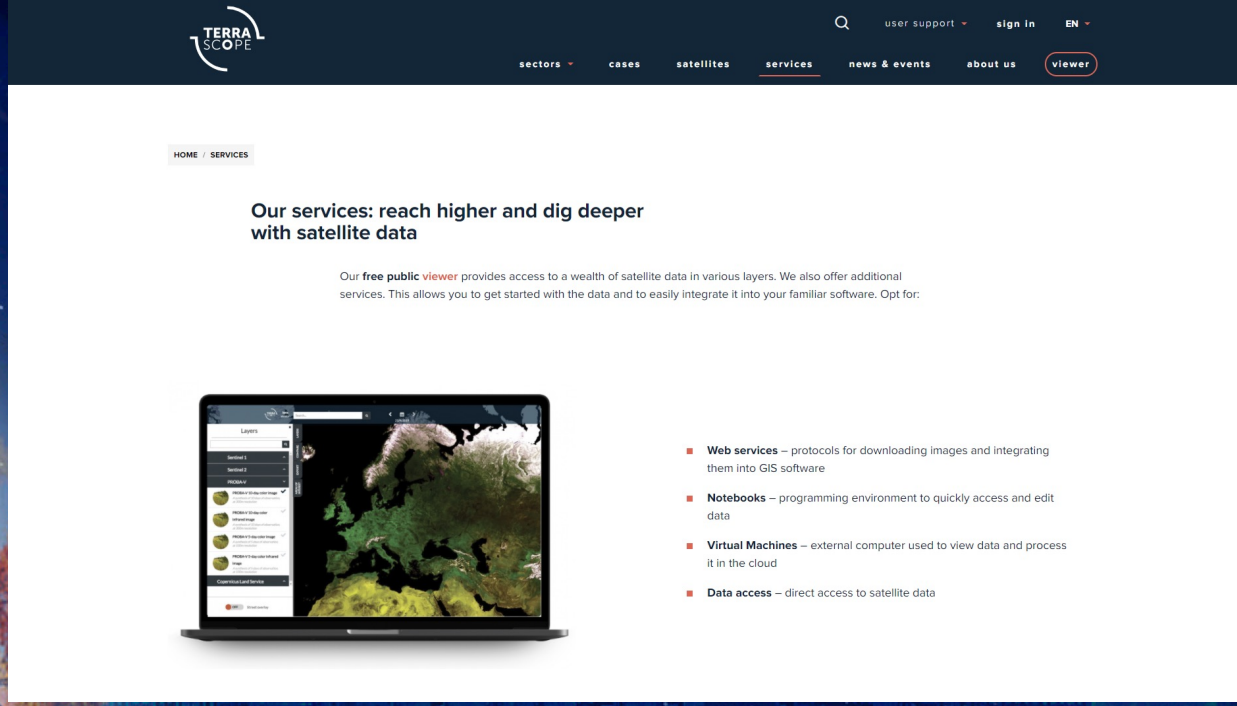
Emergency Monitoring Service (EMS)

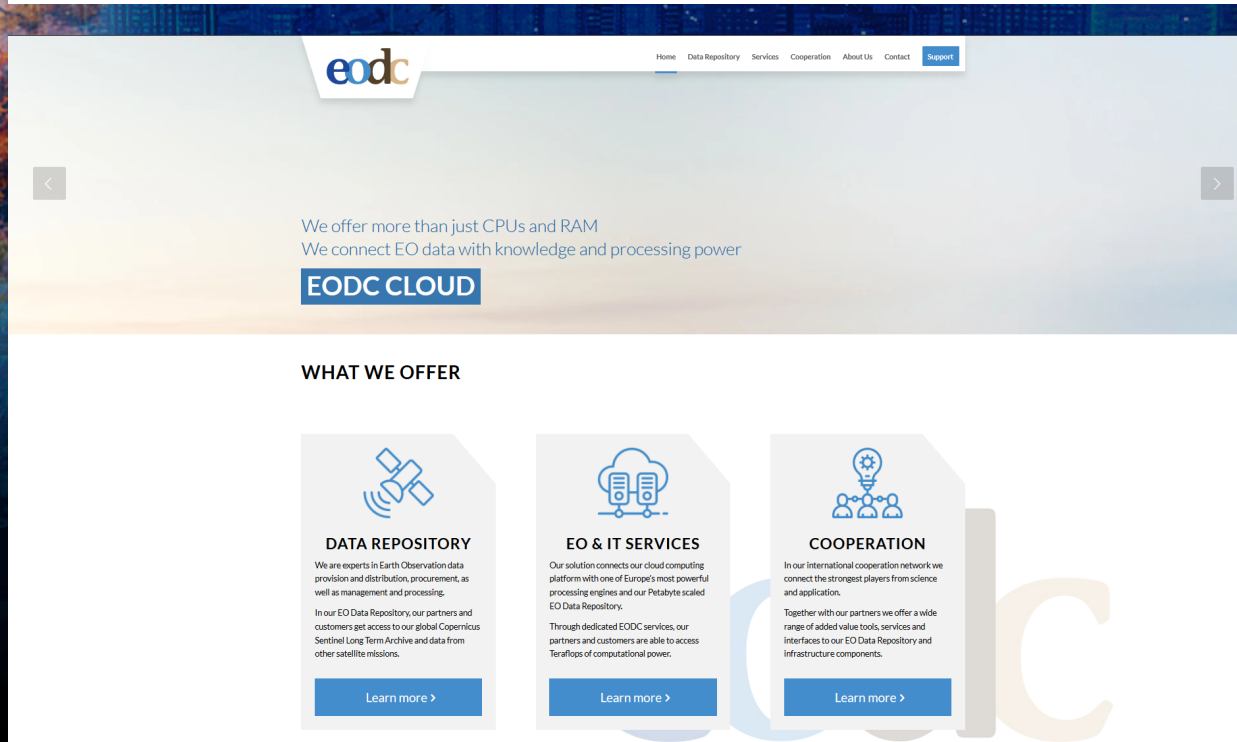
Security Service (CSS)

Climate Change Service (C3S)

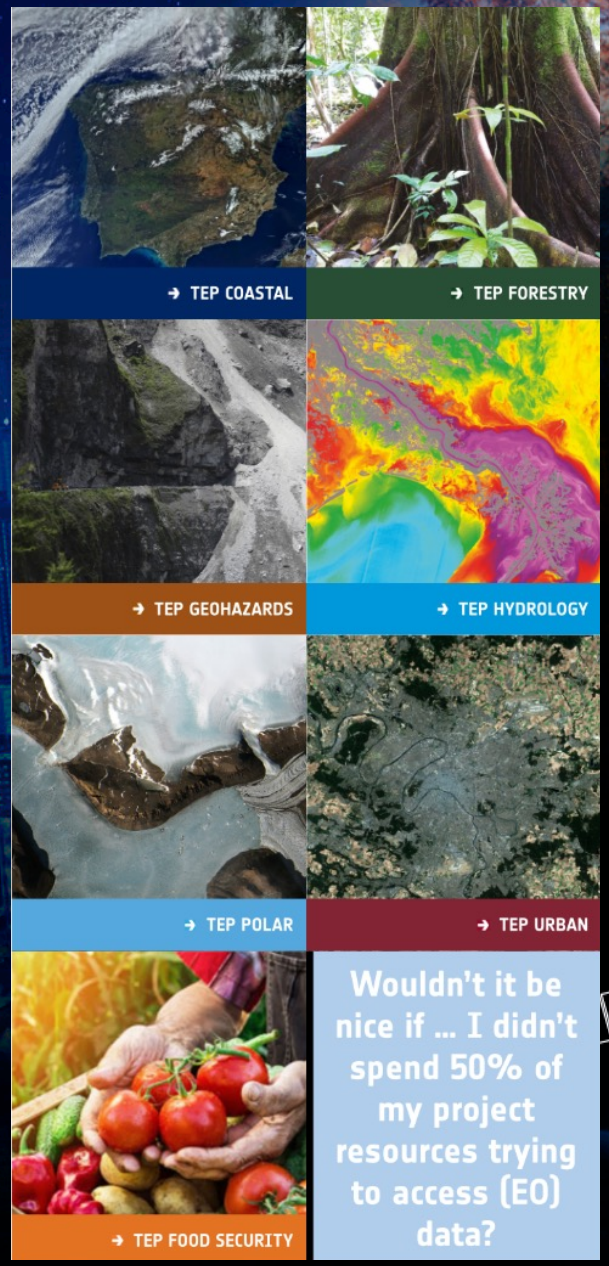
Collaborative Ground Segments (CGS)

- Belgium: **Terrascope**
- Austria: **EODC**
- Germany: **CODE-DE**
- UK: **CEDA / JASMIN**
- France: **PEPS**
- Norway
- Sweden
- Czech Republic
- Luxemburg
- Portugal
- Greece
- Italy
- Finland
- Estonia
- Ireland
- Poland
- Romania
- Hungary
- Spain





Thematic Exploitation Platforms (TEPs)



Data and Information Access Services (DIAS)

mundi WEB SERVICES

sobloo

WEkEO by COPERNICUS

NEW

CREODIAS

ONDA

Copernicus HUBS + DIAS = DAS

Datacubes

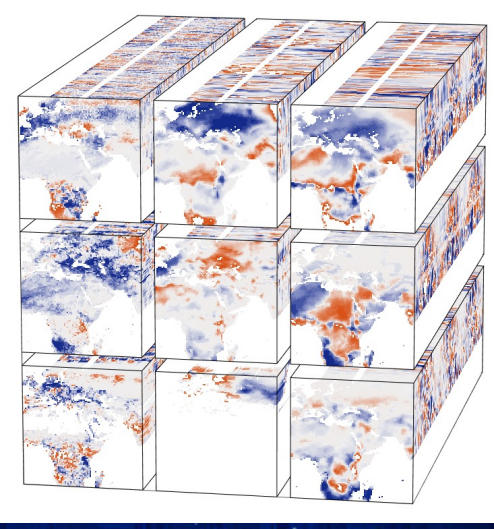
- Euro Datacube
- Open Data Cube
- CEOS Open data cube
- Australian Datacube
- ESA Open Earth Engine
- R Data Cubes
- Rasdaman

EURO DATA CUBE

OPEN DATA CUBE

CEOS DATA CUBE

Australian Geoscience DATA CUBE



ESA Earth Sytem Data Lab – Data Cube:

https://dlmultimedia.esa.int/download/public/videos/2018/07/030/1807_030_AR_EN.mp4 (0:50)

Google Earth Engine

Platform Datasets Noncommercial Commercial Timelapse Case Studies FAQ Sign Up

Earth Engine for commercial use: now generally available with Google Cloud. Get more details here

A planetary-scale platform for Earth science data & analysis

Powered by Google's cloud infrastructure

▶ Watch Video

Registry of Open Data on AWS

aws

About

This registry exists to help people discover and share datasets that are available via AWS resources. Learn more about sharing data on AWS.

See all usage examples for datasets listed in this registry.

See datasets from Allen Institute for Artificial Intelligence (AI2), Digital Earth Africa, Facebook Data for Good, NASA Space Act Agreement, NIH STRIDES, NOAA Big Data Program, Space Telescope Science Institute, and Amazon Sustainability Data Initiative.

Search datasets (currently 5 matching datasets)

copernicus

Add to this registry

If you want to add a dataset or example of how to use a dataset to this registry, please follow the instructions on the Registry of Open Data on AWS GitHub repository.

Unless specifically stated in the applicable dataset documentation, datasets available through the Registry of Open Data on AWS are not provided and maintained by AWS. Datasets are provided and maintained by a variety of third parties under a variety of licenses. Please check dataset licenses and related documentation to determine if a dataset may be used for your application.

Digital Earth Africa Sentinel-2 Level-2A

agriculture · deafrica · disaster response · earth observation · geospatial · natural resource · satellite imagery · sustainability

The Sentinel-2 mission is part of the European Union Copernicus programme for Earth observations. Sentinel-2 consists of twin satellites, Sentinel-2A (launched 23 June 2015) and Sentinel-2B (launched 7 March 2017). The two satellites have the same orbit, but 180° apart for optimal coverage and data delivery. Their combined data is used in the Digital Earth Africa Sentinel-2 product. Together, they cover all Earth's land surfaces, large islands, inland and coastal waters every 3-5 days. Sentinel-2 data is tiered by level of pre-processing. Level-0, Level-1A and Level-1B data contain raw data fr...

Details →

Usage examples

- Digital Earth Africa web services by Digital Earth Africa Contributors
- Digital Earth Africa Training by Digital Earth Africa Contributors
- Use Sentinel-2 data in the Open Data Cube by Alex Leith
- Digital Earth Africa Explorer by Digital Earth Africa Contributors

See 4 usage examples →

Sentinel-3

earth observation · environmental · geospatial · land · oceans · satellite imagery · sustainability

This data set consists of observations from the Sentinel-3 satellite of the European Commission's Copernicus Earth Observation Programme. Sentinel-3 is a polar orbiting satellite that completes 14 orbits of the Earth a day. It carries the Ocean and Land Colour Instrument (OLCI) for medium resolution marine and terrestrial optical measurements, the Sea and Land Surface Termperature Radiometer (SLSTR), the SAR Radar Altimeter (SRAL), the MicroWave Radiometer (MWR) and the Precise Orbit Determination (POD) instruments. The satellite was launched in 2016 and entered routine operational phase in 20...

Details →

Usage examples

- Catalogue of data set by Meteorological Enviornmental Earth Observation
- Accessing Sentinel-3 Data on S3 by MEEO by Meteorological Enviornmental Earth Observation
- Sentinel-3 Toolbox by European Space Agency
- Sentinel-3 Document Library by European Space Agency

See 4 usage examples →

Sentinel-5P Level 2

air quality · atmosphere · earth observation · environmental · geospatial · satellite imagery · sustainability

This data set consists of observations from the Sentinel-5 Precursor (Sentinel-5P) satellite of the European Commission's Copernicus Earth Observation Programme. Sentinel-5P is a polar orbiting satellite that completes 14 orbits of the Earth a day. It carries the

A Planetary Computer for a Sustainable Future

Supporting sustainability decision-making with the power of the cloud

The Planetary Computer combines a multi-petabyte catalog of global environmental data with intuitive APIs, a flexible scientific environment that allows users to answer global questions about that data, and applications that put those answers in the hands of conservation stakeholders.

Data Catalog

The Planetary Computer includes petabytes of environmental monitoring data, in consistent, analysis ready formats, accessible through our APIs as well as directly available via Azure Storage.

API

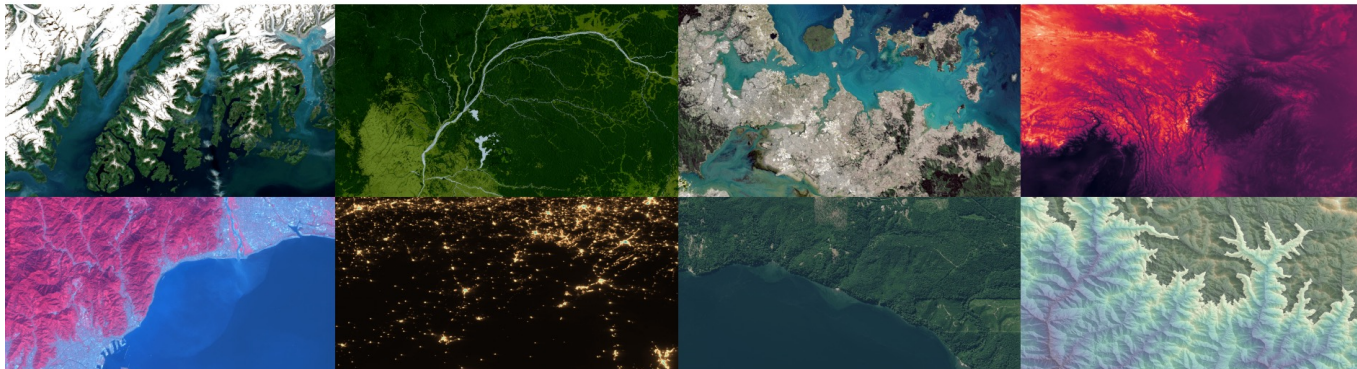
The Planetary Computer API makes it easy for users to find exactly the data they need, simplifying search and discovery across our Data Catalog.

Hub

The Planetary Computer Hub is a development environment that makes our data and APIs accessible through familiar, open source tools, and allows users to easily scale their analyses.

Applications

Partners all over the world are building on top of the Planetary Computer platform, providing the actionable information that is critical to sustainability practitioners.



The DestinE Data Infrastructure challenges:

- Federation !
- Multidomain, beyond Earth Sciences
- Integration of existing data platforms
- Integration of (national) research initiatives
- Quality and traceability of data within the DT ecosystem
- Reach the various users including policy makers