ESA's Contribution to Climate Change Science and Mitigation

All4Climate
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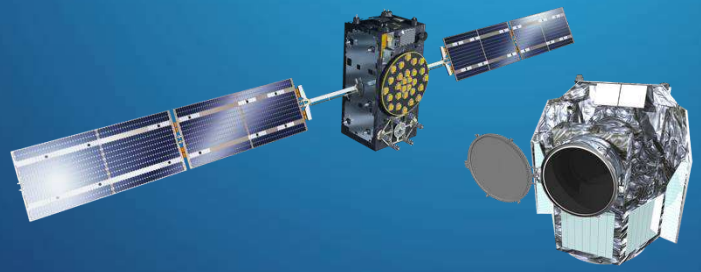
ESA

The European Space Agency

esa

Make Space
for Europe



5 500+
ESA Workforce

Over 80 satellites
developed, tested, and
operated **since 1975**

22
Member States
3 Associate Members
1 Cooperative Member

2021 Budget

6.49 billion =
12 per European

→ THE EUROPEAN SPACE AGENCY

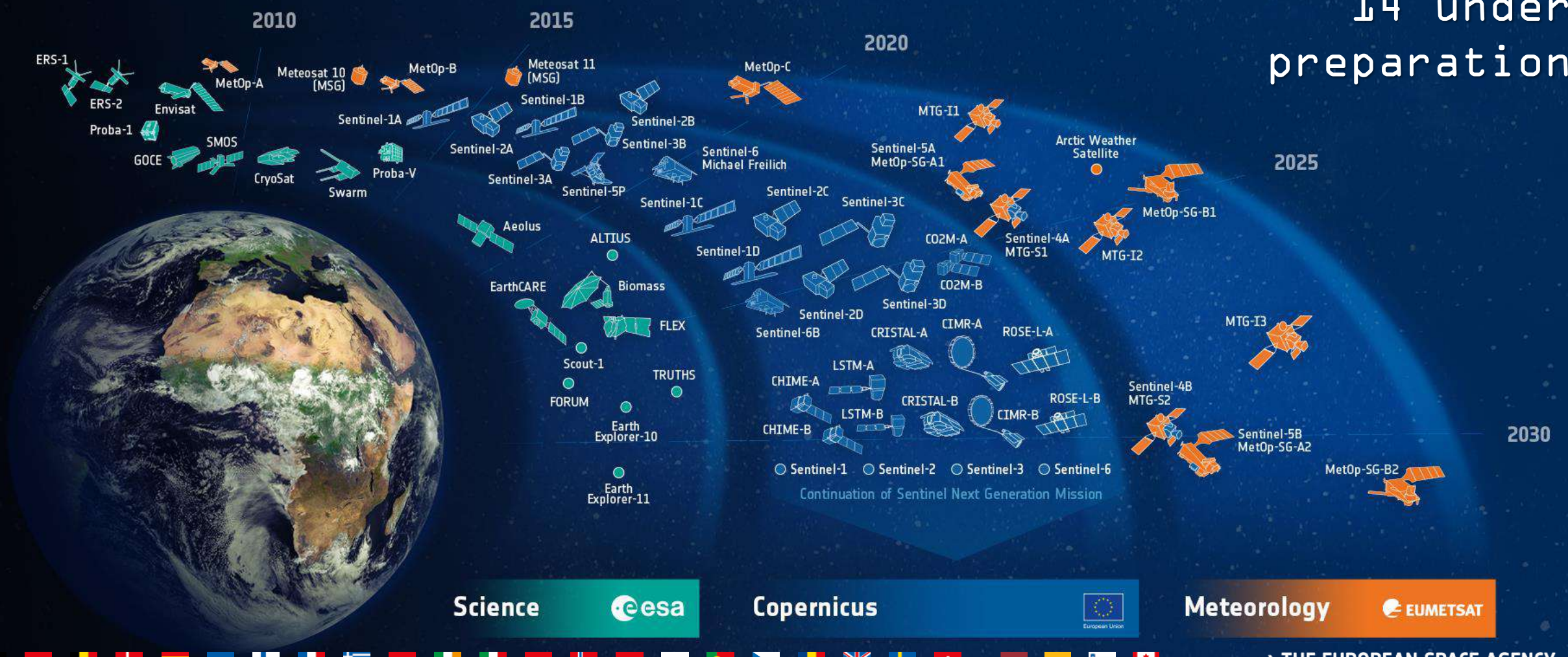
ESA EO Vision

Taking the Pulse of our Planet

→ THE EUROPEAN SPACE AGENCY

ESA EO Mission – Development of EO Missions

11 in operation
38 under development
14 under preparation



Supporting diverse Global and European Climate Agendas & Initiatives

Sustainable Development
UN SDGs

Climate Change
UNFCCC

Climate Change
SPACE CLIMATE OBSERVATORY FRAMEWORK

The **Sendai Framework** - Mitigating environmental threats to society and strengthen Global Resilience through novelty

The **European Green Deal** - Benefitting strongly from ESA Earth Observation capabilities, both now and in the future

ESA Climate Change Initiative Achievements

450
European scientists

178
Institutions

21
ECVs

13
ECVs transferred to Copernicus

Copernicus
Europe's eyes on Earth

Open data

133
terabytes

100+
datasets

4.2
million files

640
Peer-reviewed articles

IPCC AR5

28
Contributing authors

15
Papers, cited 60 times

Copernicus contribution to Climate Science

European Earth Observation System

- Led by the EU
- EU-ESA Collaboration

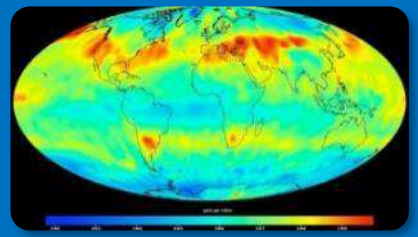
European response to global needs for:

- managing the environment
- mitigating the effects of climate change
- ensuring civil security

European independence, contribution to global system (GEOSS)

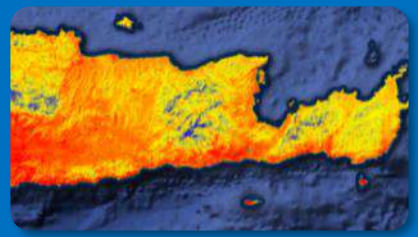
Copernicus grows with Sentinel Expansion Missions

CO2M - Anthropogenic CO_2 Monitoring



Causes of
Climate Change

LST – Land Surface Temperature Mission



Agriculture & Urban
Management

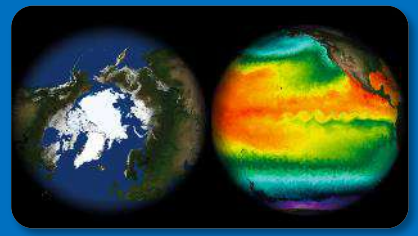
CRISTAL – Polar Ice & Snow Topography

Effects of
Climate Change

CHIME – Hyperspectral Imaging Mission

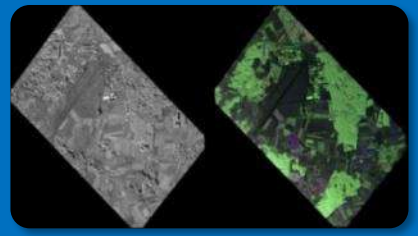
Food Security, Soil,
Minerals, Biodiversity

CIMR – Passive Microwave Radiometer



Sea: Surface Temp.
& Ice Concentration

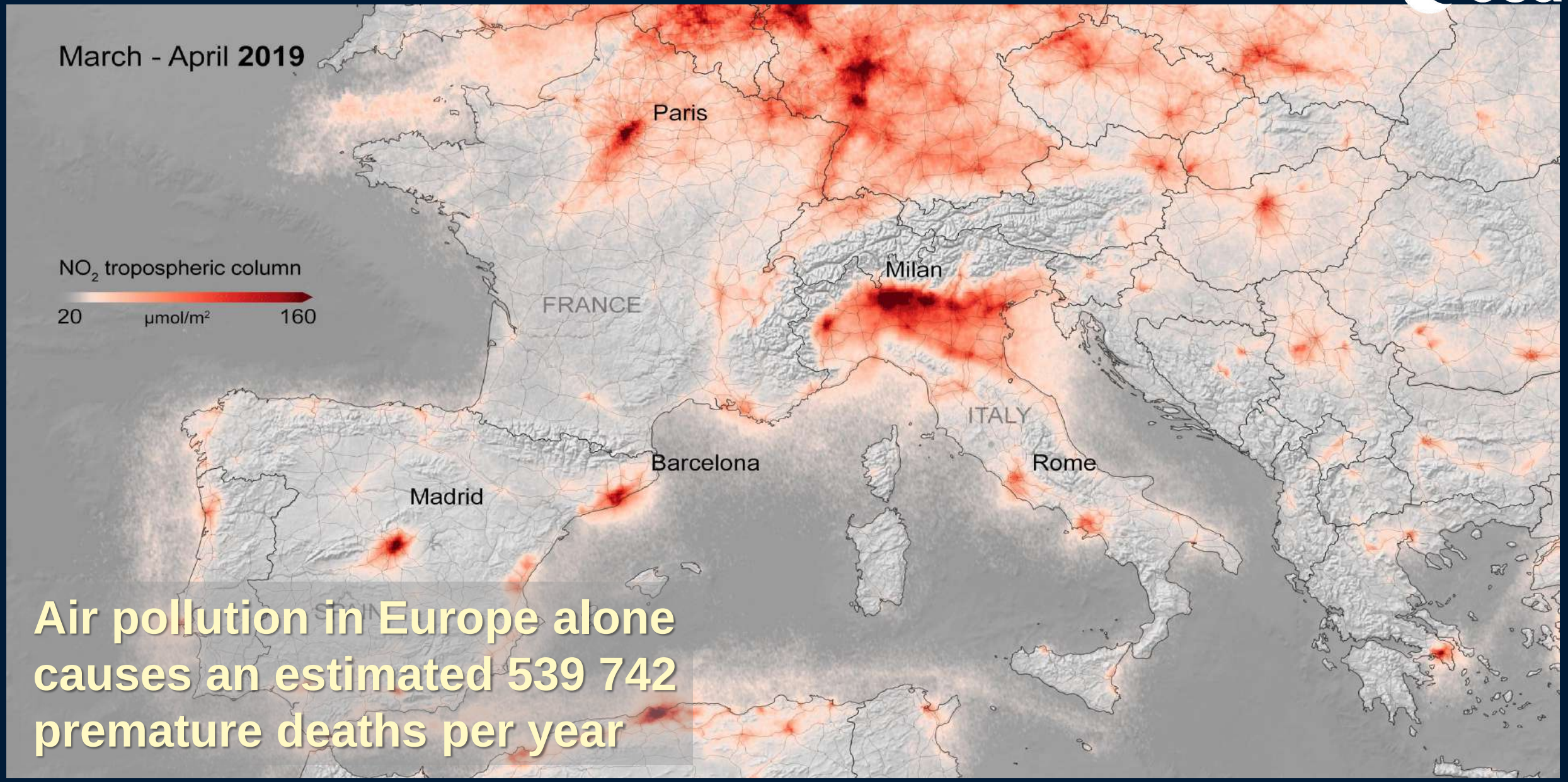
ROSE-L – L-band SAR Mission



Vegetation & Ground
Motion & Moisture

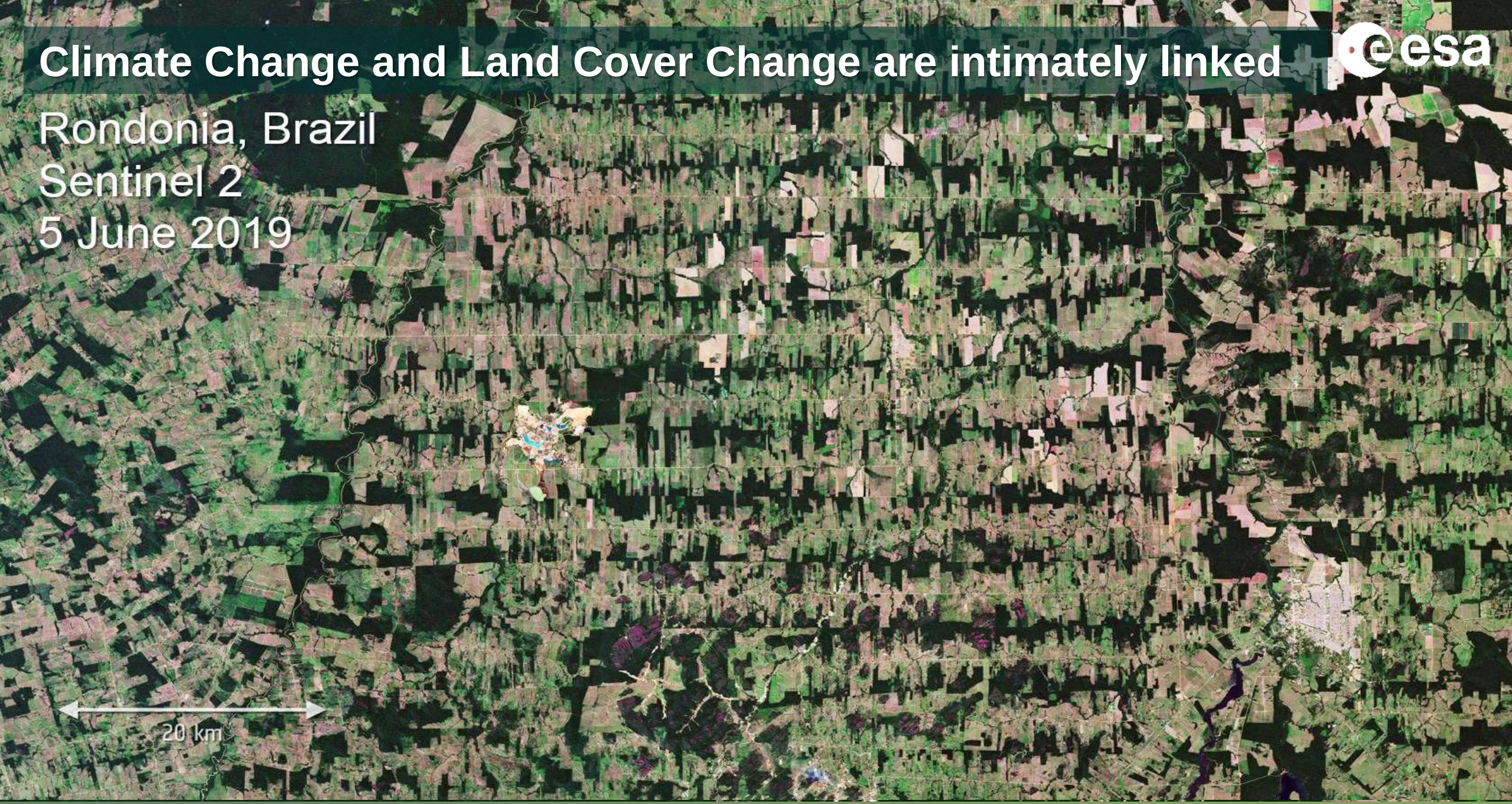
RACE: Rapid Action on Coronavirus and EO

AIR POLLUTION



Air pollution in Europe alone causes an estimated 539 742 premature deaths per year

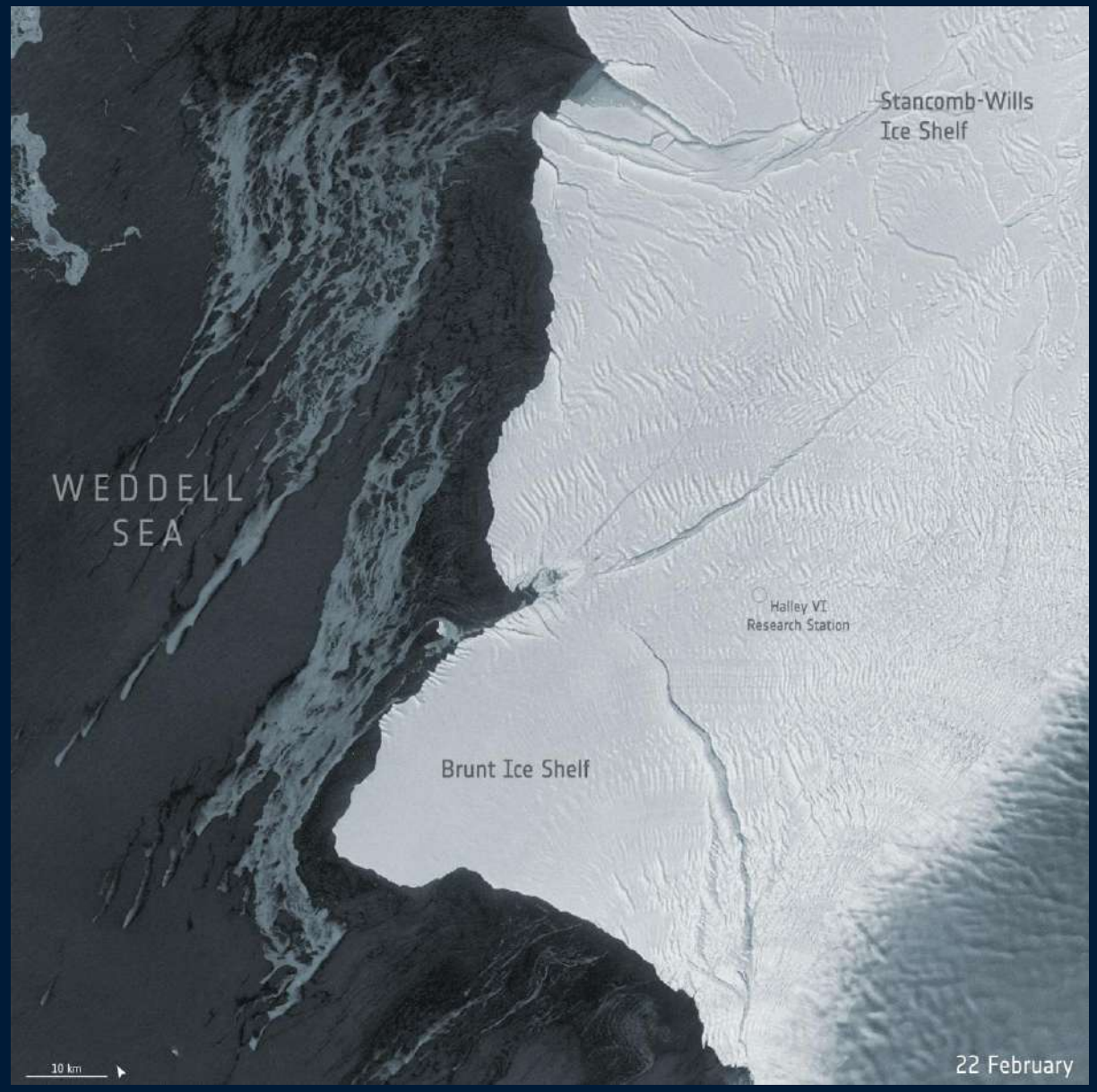
Climate Change and Land Cover Change are intimately linked



Giant iceberg breaks off Brunt Ice Shelf in Antarctica

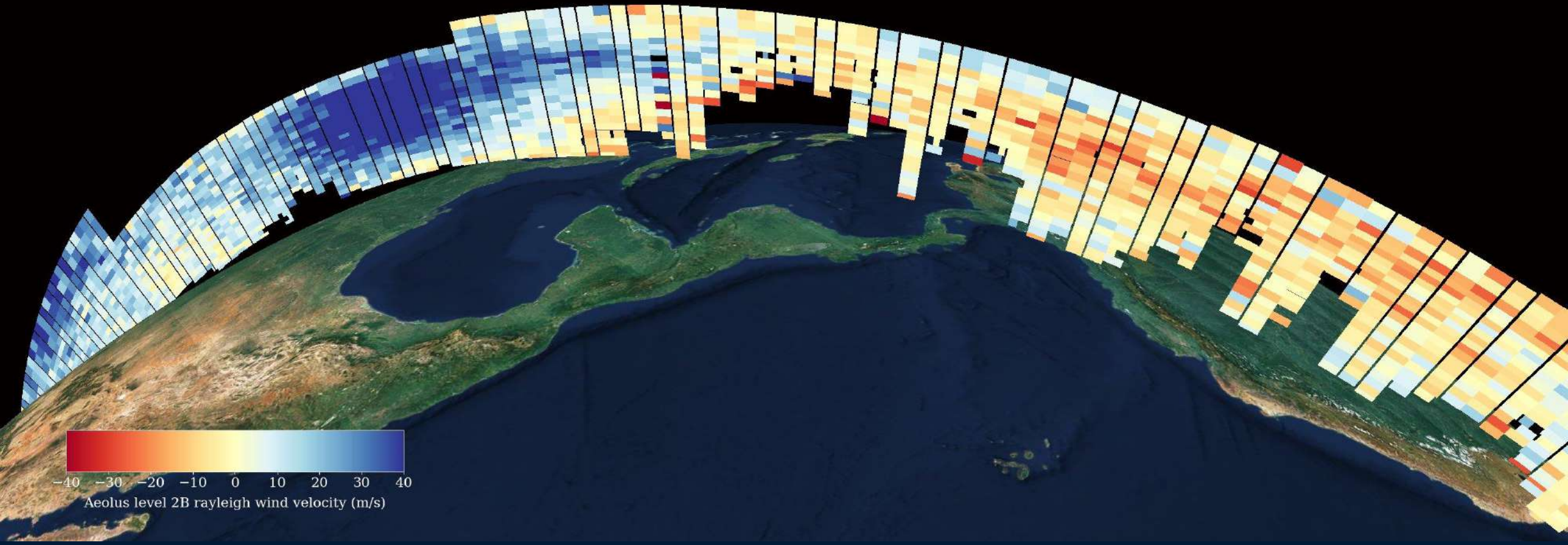
22 and 28 February 2021

Copernicus Sentinel-1



Aeolus data operational & impactful

Aeolus gauges hurricane Lota wind velocities
17 November 2020



Almost three decades of ice sheet and sea level data

11 satellites including ESA's ERS-1, ERS-2, Envisat and CryoSat, Sentinel-1 and Sentinel-2

Greenland and Antarctica are losing ice six times faster than in the 1990s.

Polar ice sheets are now responsible for a third of all sea level rise.

Losses are on track with the IPCC's worst-case climate warming scenario.

Sea level monitoring continues with S-6 Michael Freilich

27 years of sea level monitoring

Levels show accelerated rise in recent decades from 3.2 mm/yr to 4.8 mm/yr due to increasing rates of:

- **ice sheet loss** from the Greenland and Antarctic ice sheets (*very high confidence*) as well as continued
- **glacier mass loss** and
- **ocean thermal expansion**

IPCC Special Report on Oceans and Cryosphere in a changing climate (2019)
Proceedings of the National Academy of Sciences, February 2018

Launched 21 November 2020
Sentinel-6 Michael Freilich continues long term sea level monitoring with its Poseidon-4 synthetic-aperture radar (SAR) altimeter