Space and Climate Change

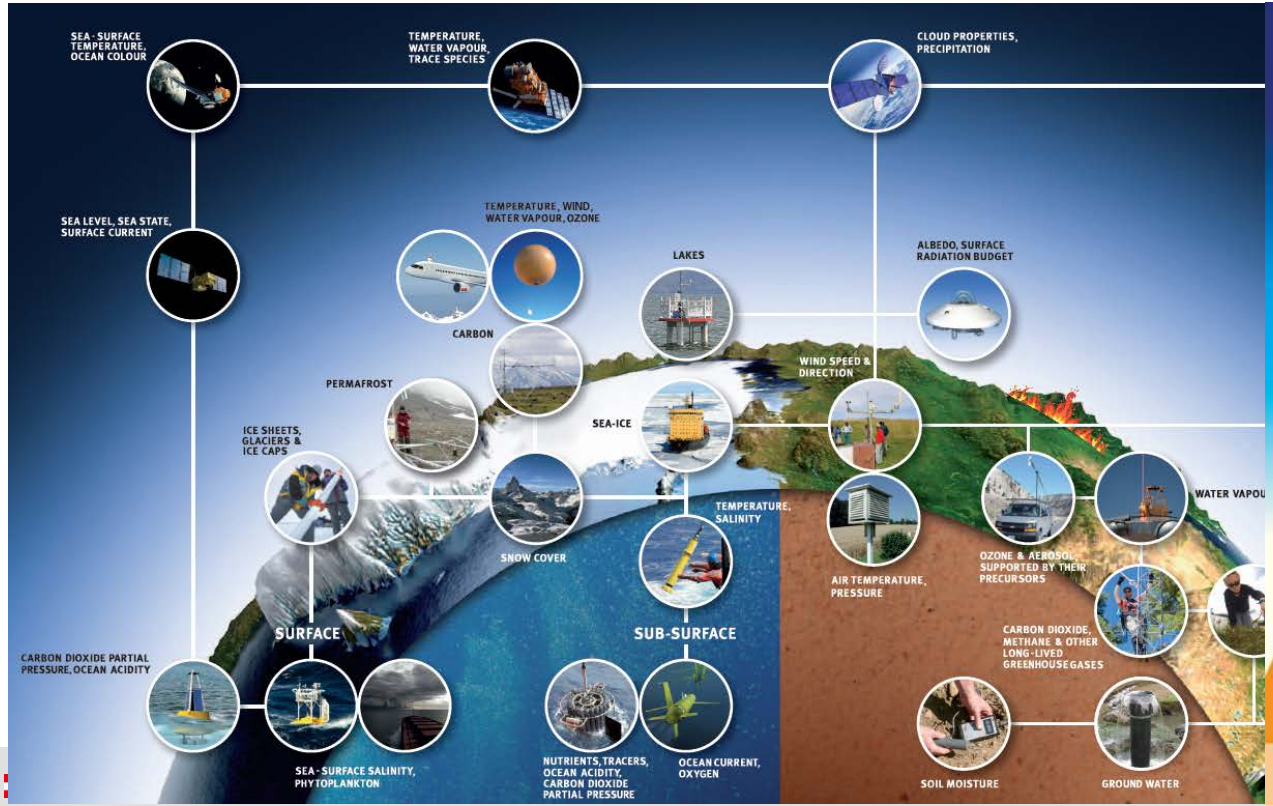
COPUOS, STC
Vienna, 6 February 2017

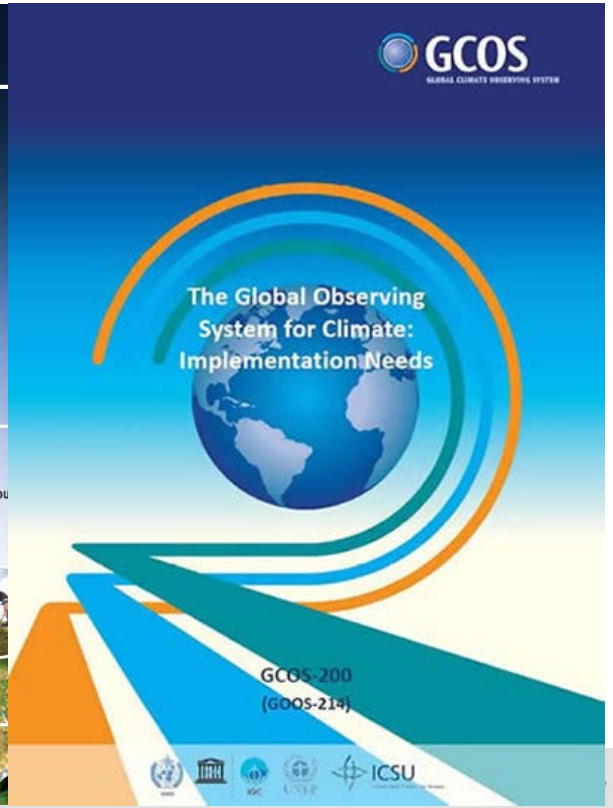
Josef Aschbacher
Director of Earth Observation Programmes,
European Space Agency (ESA)

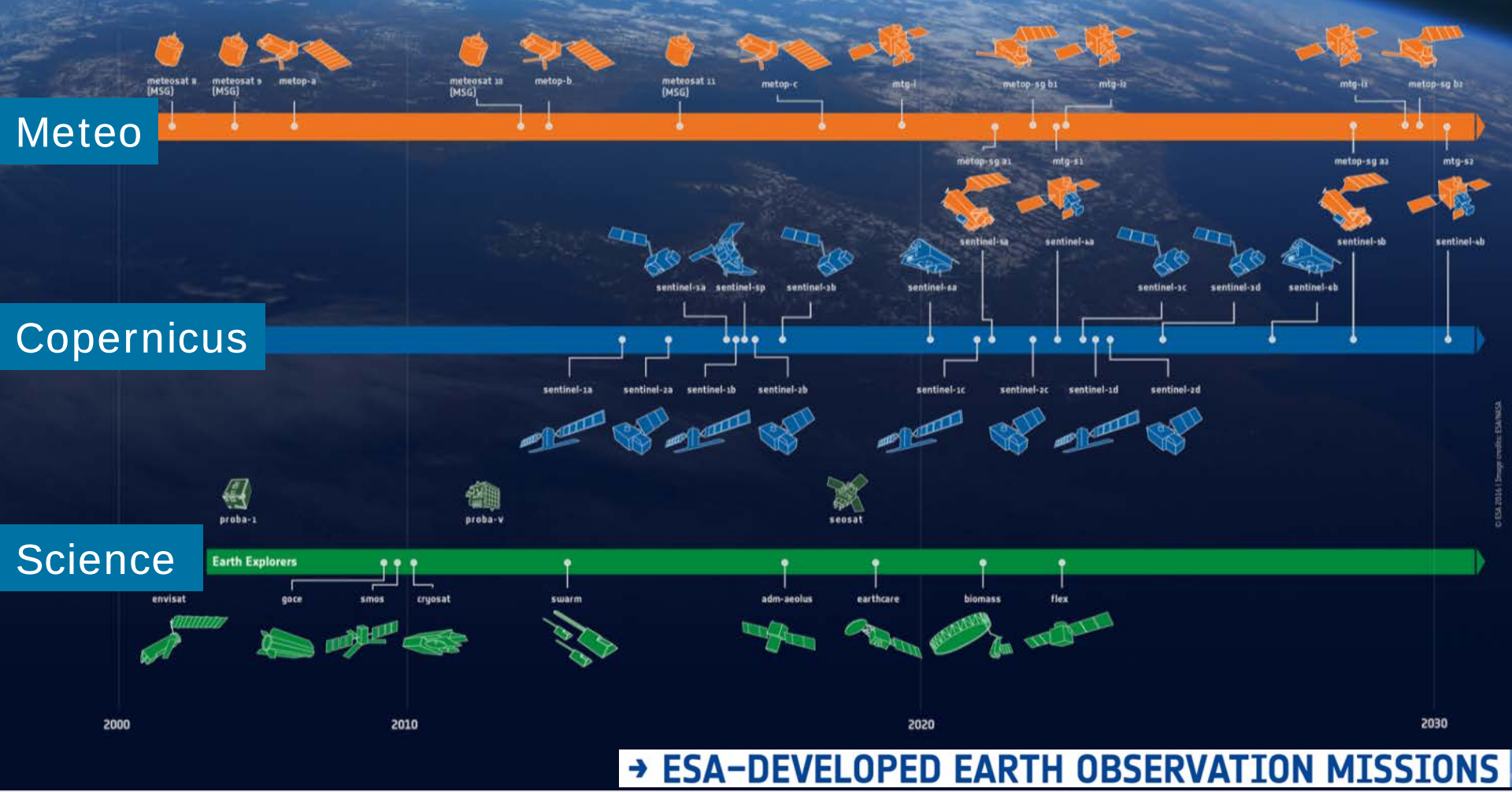
Space-based EO and Climate Change

- Complete, coherent and long-term measurements of geophysical parameters needed for climate models
- Global Climate Observing System (GCOS) has identified 50 Essential Climate Variables (ECV)
- For half of these satellite EO is the primary data source

Essential Climate Variables and GCOS



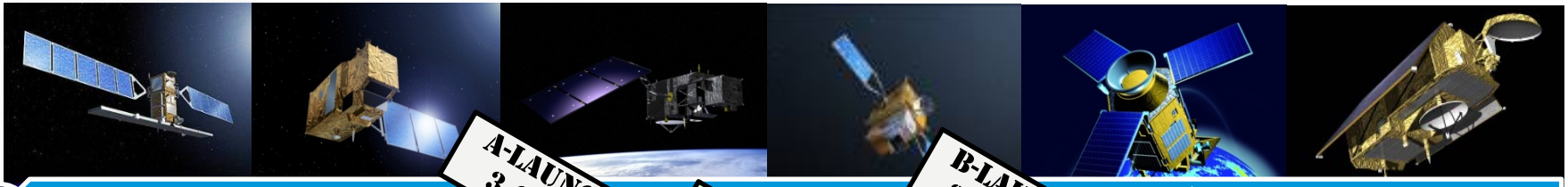



Meteo
Copernicus
Science
meteosat 8 (MSG)
meteosat 9 (MSG)
metop-a
meteosat 10 (MSG)
metop-b
meteosat 11 (MSG)
metop-c
mtg-i1
metop-sg b1
mtg-i2
mtg-i3
metop-sg b2
metop-sg a1
mtg-s1
metop-sg a2
mtg-s2
sentinel-5a
sentinel-4a
sentinel-5b
sentinel-4b
sentinel-3a
sentinel-3b
sentinel-3c
sentinel-3d
sentinel-6a
sentinel-6b
sentinel-1a
sentinel-2a
sentinel-1b
sentinel-2b
sentinel-1c
sentinel-2c
sentinel-1d
sentinel-2d
proba-1
proba-v
seosat
Earth Explorers
envisat
goce
smos
cryosat
swarm
adm-aeolus
earthcare
biomass
flex
2000
2010
2020
2030
→ ESA-DEVELOPED EARTH OBSERVATION MISSIONS

Copernicus Climate Change Service

- Copernicus Climate Change Service (C3S) in development phase
- ECMWF operates the C3S Climate Change Service on behalf of the European Union
- C3S will provide key indicators on climate change drivers such as carbon dioxide and impacts – for example, reducing glaciers.

Copernicus Sentinel Missions
Sustained “Systematic Observations”



A-LAUNCHED 3.04.2014

A-LAUNCHED 23.06.2015

B-LAUNCHED 25.04.2016

A-LAUNCHED 16.02.2016

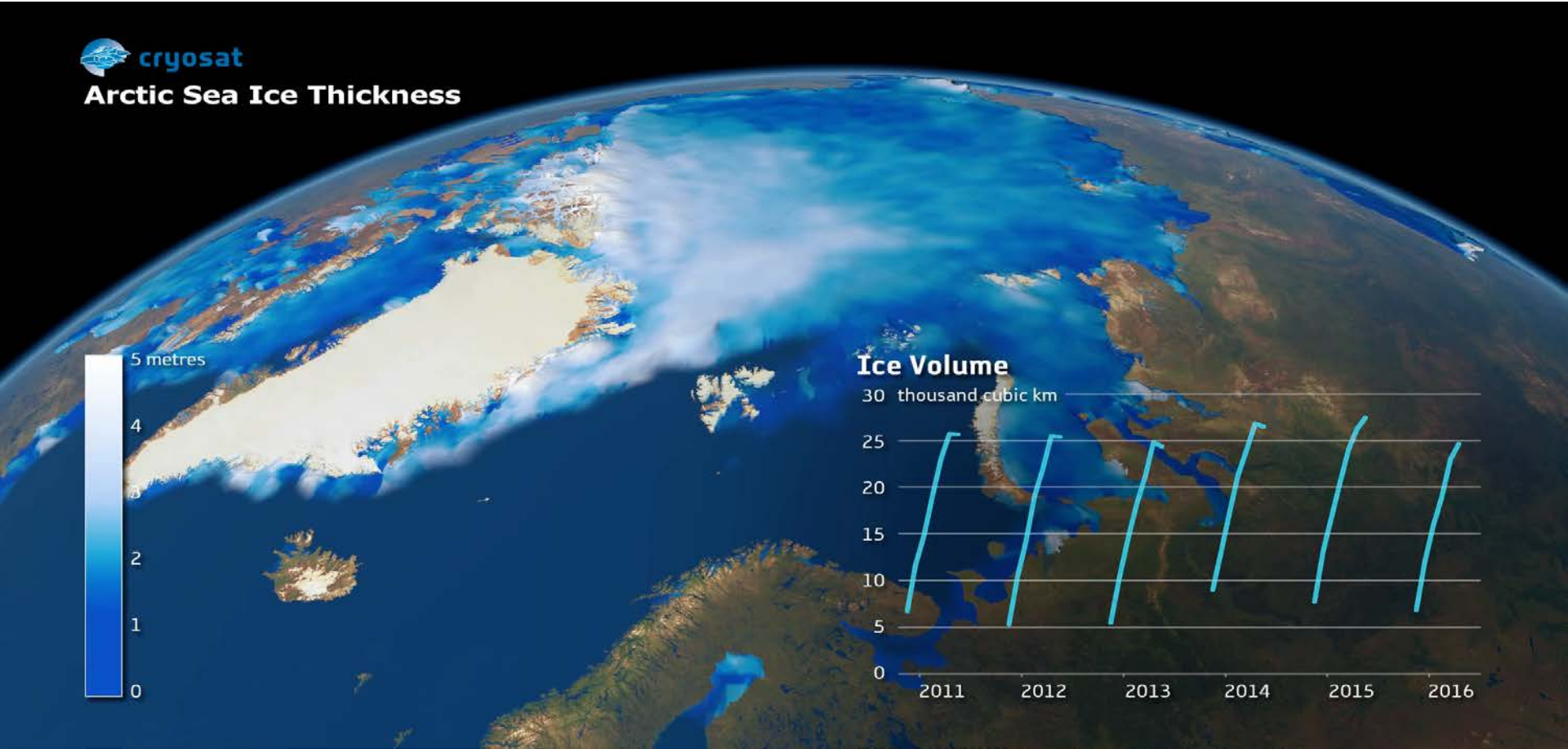
B-LAUNCH 6.03.2017

B-LAUNCH Q4.2017

LAUNCH Q2-2017

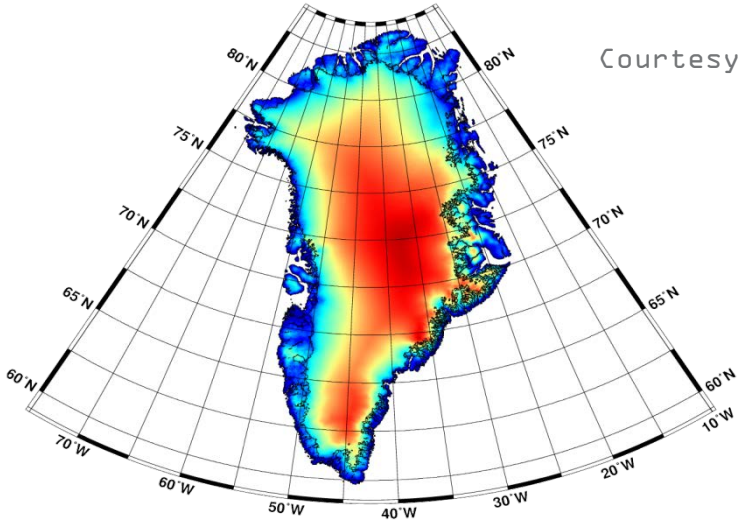
- **S1:** Radar Mission
- **S2:** High Resolution Optical Mis
- **S3:** Medium Resolution Imaging and Alti Mission
- **S4:** Geostationary Atmospheric Chemistry Missi n
- **S5P:** Low Earth Orbit Atmospheric Chemistry Precurs sion
- **S5:** Low Earth Orbit Atmospheric Chemistry Mission
- **S6 (Jason-CS):** Altimetry Mission

Cryosat and the Arctic

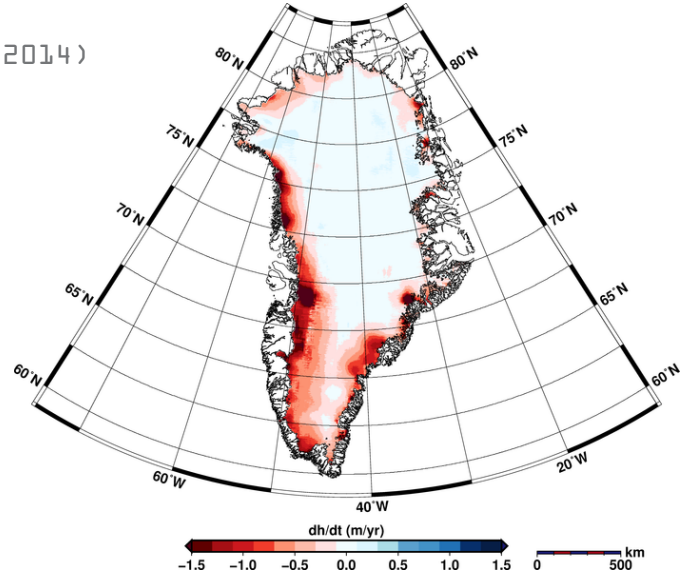



esa
2014
1996
1978
Sentinel-1A
ERS-2
Seasat
→ 36 YEARS OF GLACIER RETREAT
southeast Greenland
5 km

Cryosat: Greenland Ice Loss



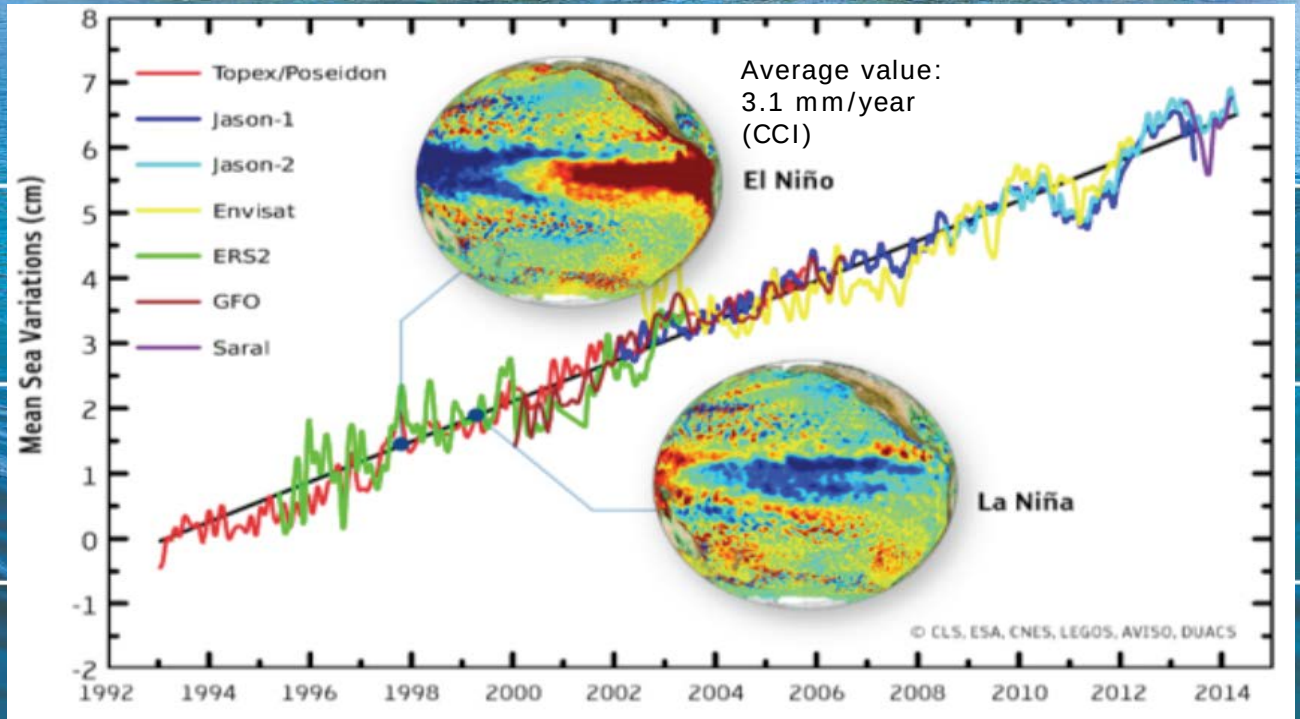
Courtesy: Helm et al. (2014)



Digital Elevation Model

2003-2008	2011-2012
IMBIE	CryoSat
-189±20 km³/yr	**-352±29 km³/yr**

Rising Sea Levels



CoP 21, Paris

Global average temperature increase: limited to +2°C; working towards +1.5°C

Reporting every 5 years, from 2023 onwards

Key to success: Intended Nationally Determined Contributions (INDC)

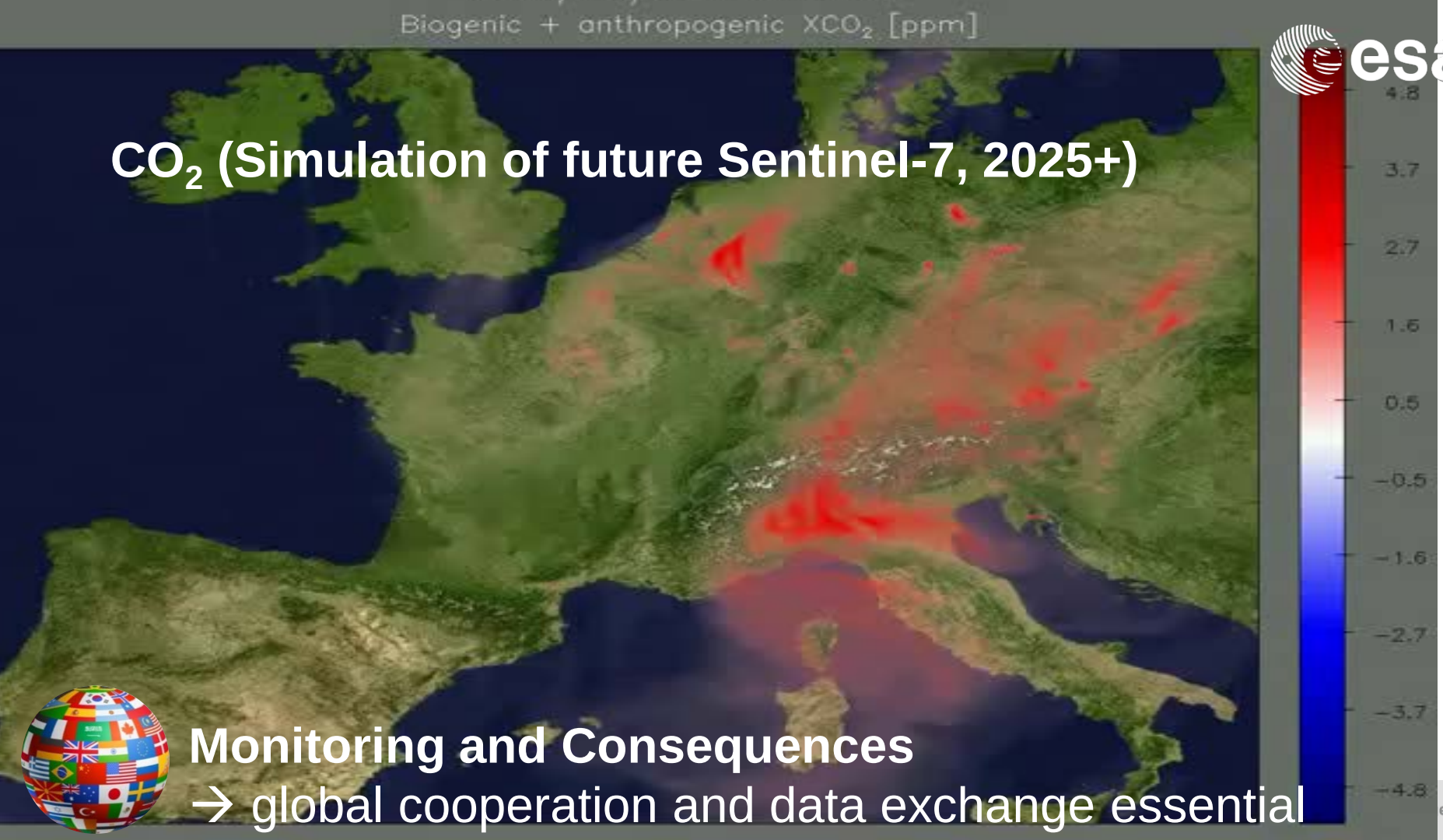
The Paris Agreement

Agreement on:

- Climate Mitigation
- Climate Adaptation
- Transparency, Global Stocktake
- Loss and Damage
- Support

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

ESA Programmes will support key actions

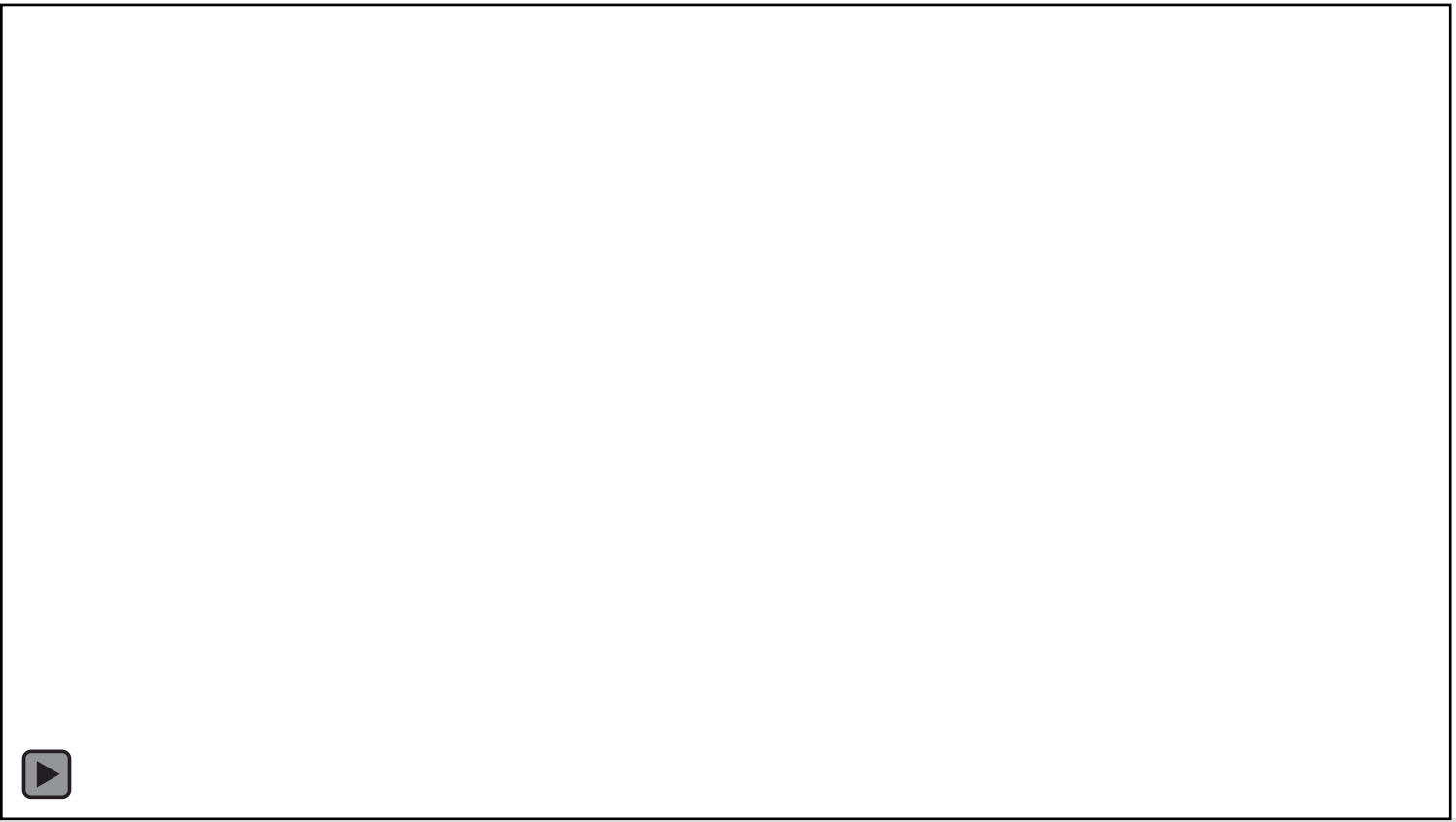


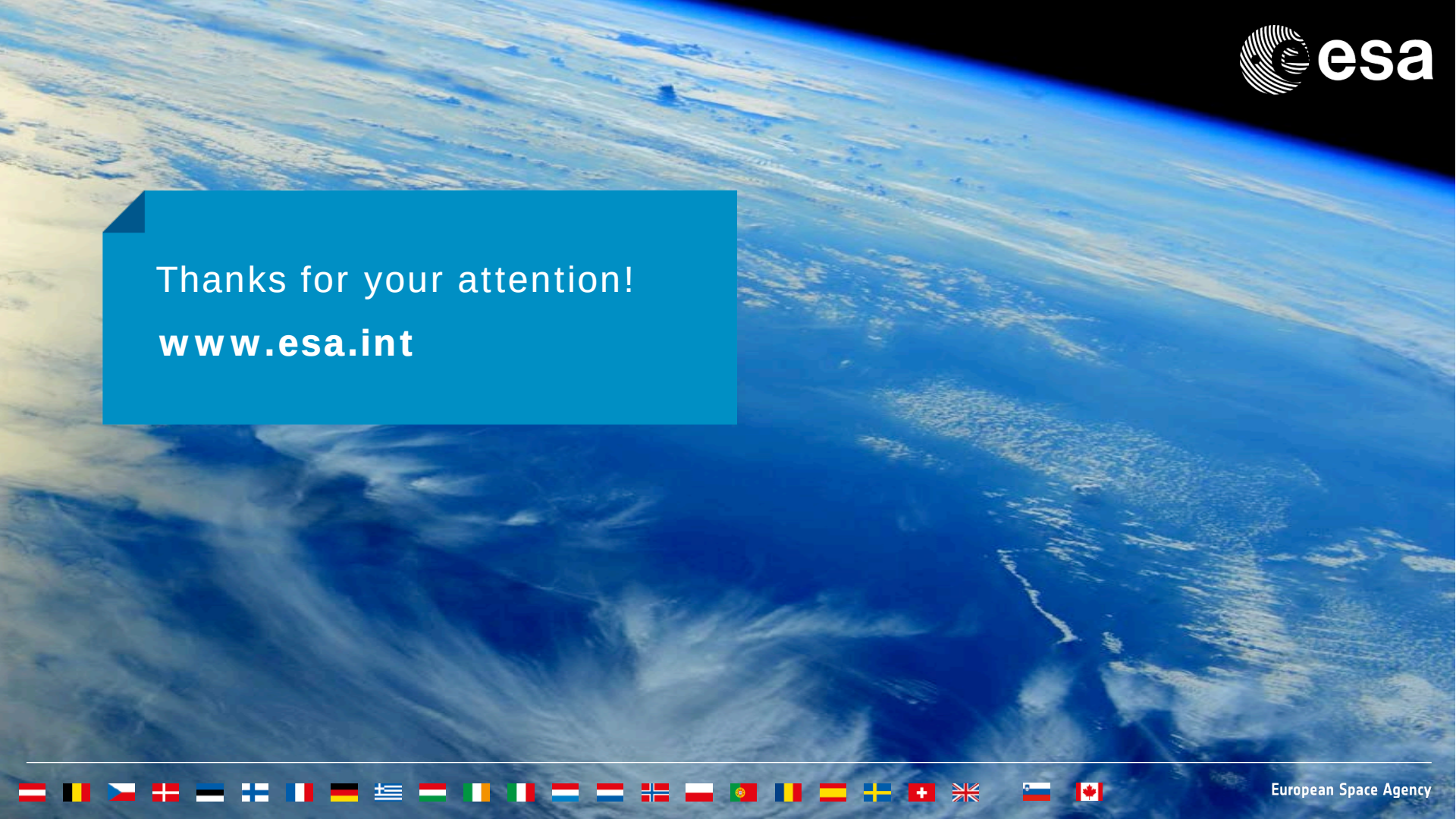
CO_2 (Simulation of future Sentinel-7, 2025+)

Monitoring and Consequences

→ global cooperation and data exchange essential

ESA's Climate Change Initiative




Thanks for your attention!
www.esa.int