

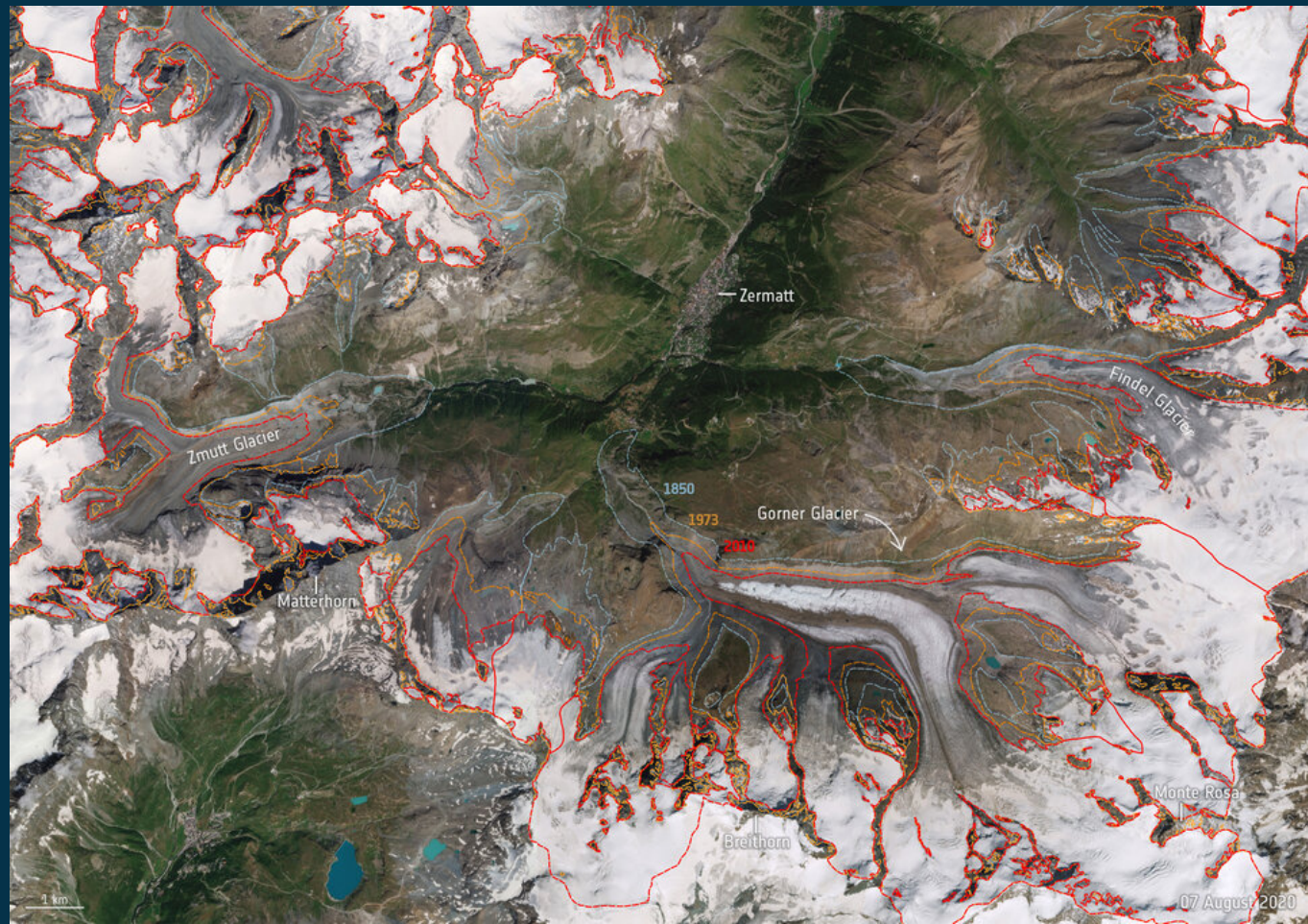
How observing the Earth from space supports our quest to tackle climate change



Susanne Mecklenburg

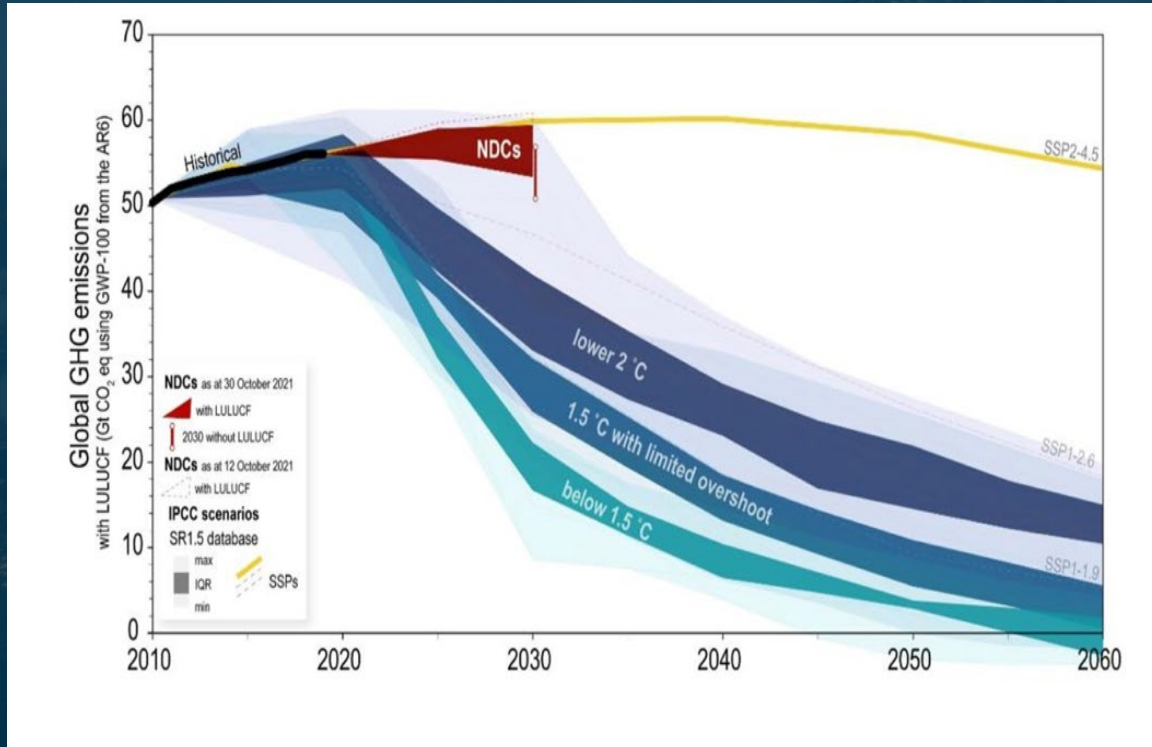
European Space Agency, Head of Climate Office
Harwell Campus, Didcot, UK

United Nations / Austria World Space Forum
Space4Climate Action| 7-9 December 2021



The retreating Gorner Glacier Zermatt, Switzerland, August 2021

13.7% rise in GHG emission level by 2030* when taking into account [the latest] NDCs



Comparison of emissions scenarios NDCs
https://unfccc.int/sites/default/files/resource/message_to_parties_and_observers_on_ndc_numbers.pdf

Several plurilateral deals made during the COP26 World Leaders Summit. These fall outside of the Glasgow Climate Pact inc:

- **Glasgow leaders' declaration on forests and land use**
 - 137-country deal to halt and reverse forest loss and land degradation by 2030'
 - covers 91% of the world's forest area
- **Global Methane Pledge**
 - pledge to cut emissions by 30% over 2020-30 & move to 'best available inventory methodologies' to quantify emissions
 - 109 countries, representing 46% of global methane emissions
 - Signatories include Belgium, Bulgaria, Canada, Croatia, Cyprus, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia, Spain, Sweden, Switzerland, UK
- **Other deals inc ...**
 - **Transitioning away from coal** | phasing out oil and gas production | ending finance for fossil fuels overseas | greening the international financial system

Intergovernmental Panel of Climate Change (IPCC)

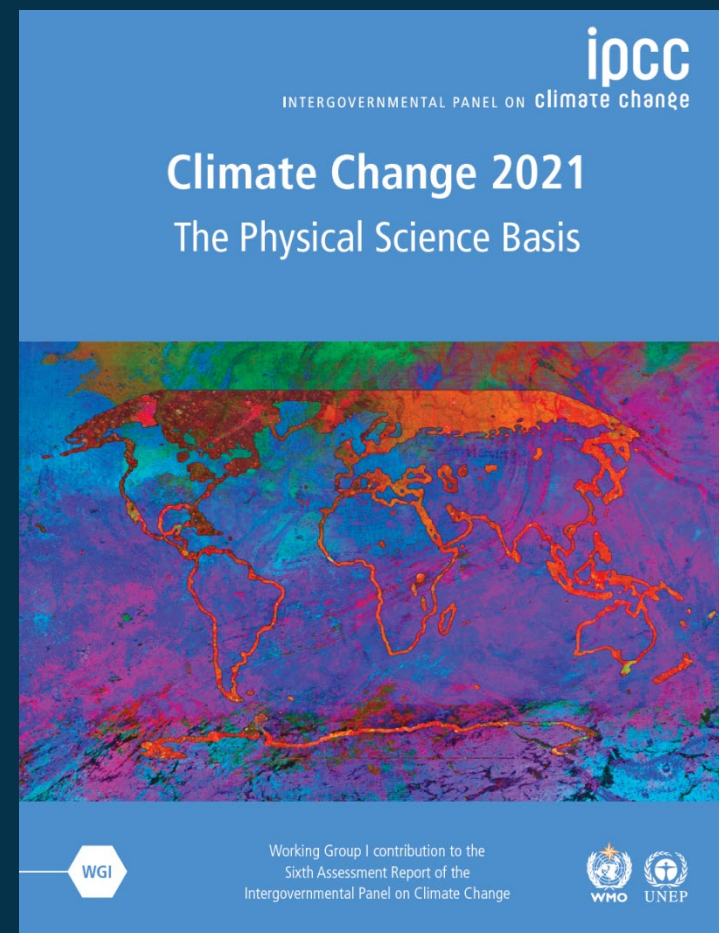
Assessment Report from WG I, August 2021

*“It is unequivocal that **human influence has warmed the atmosphere, ocean and land.** Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.”*

Warming accelerates: Each of the last four decades has been successively warmer than any decade that preceded it since 1850.

2001-2020: 0.99 [0.84 to 1.10] °C

2011–2020: 1.09 [0.95 to 1.20] °C

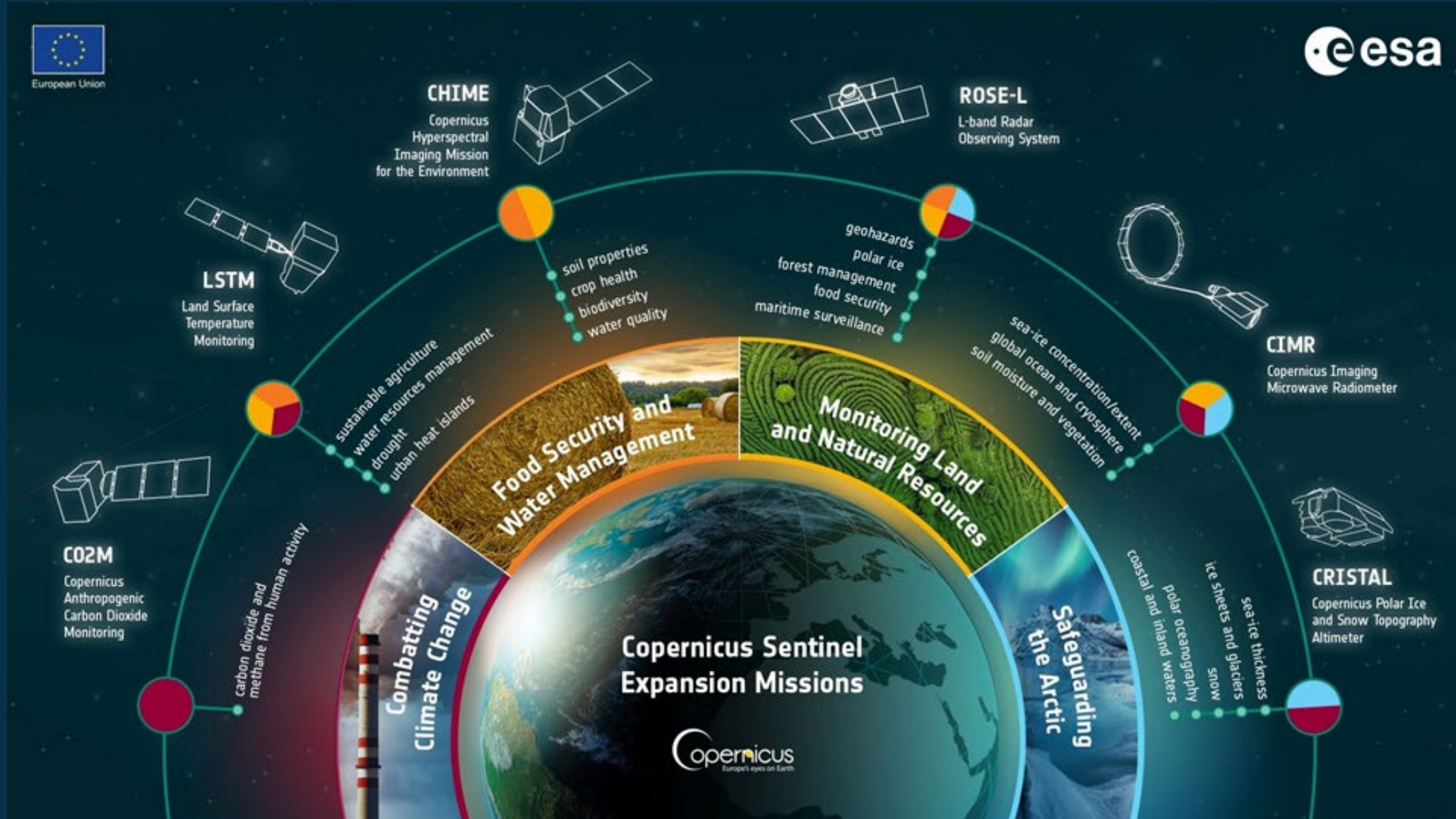


“Methodological advances and new datasets contributed approximately 0.1°C to the updated estimate of warming in AR6.”

OBSERVING THE EARTH FROM SPACE

long-term | continuous | timely | global | collocated

Sentinel Expansion Missions – the Future



FOCUS ON CLIMATE

ESA Climate Office

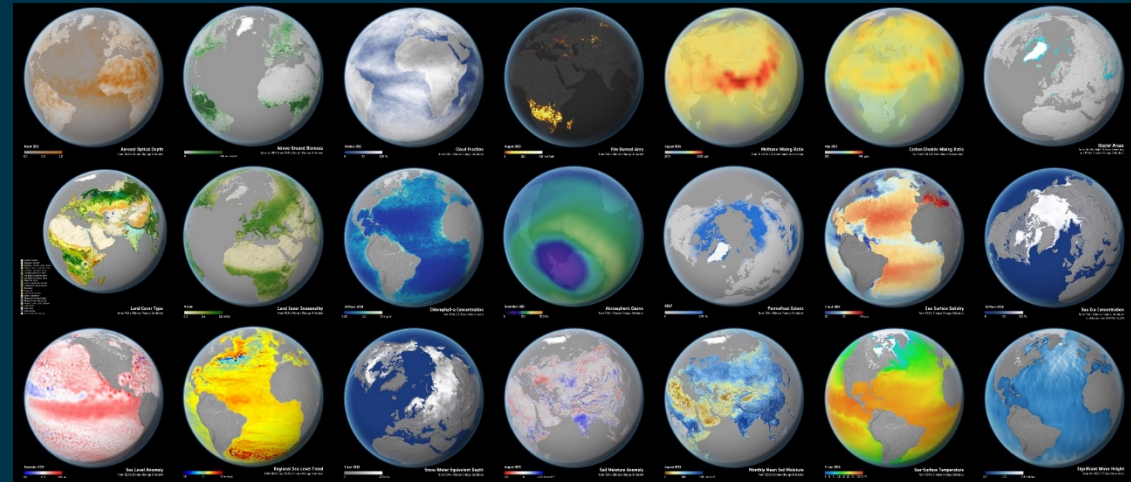
- ✓ Implement the **Climate Change Initiative** (CCI) Programme – our flagship programme

- ✓ Working on **international (policy) level** with EU, Copernicus Services, ECMWF, EUMETSAT, UNFCCC, IPCC, GCOS, CEOS, CGMS, WCRP, WMO, Future Earth, SCO etc

- ✓ Observer at **IPCC and UNFCCC**

Climate Change Initiative

WMO defined **54** Essential Climate Variables
36 benefit from space observations
21 generated by ESA Climate Change Initiative



climate modelling
user group
cci



sea level
budget closure
cci

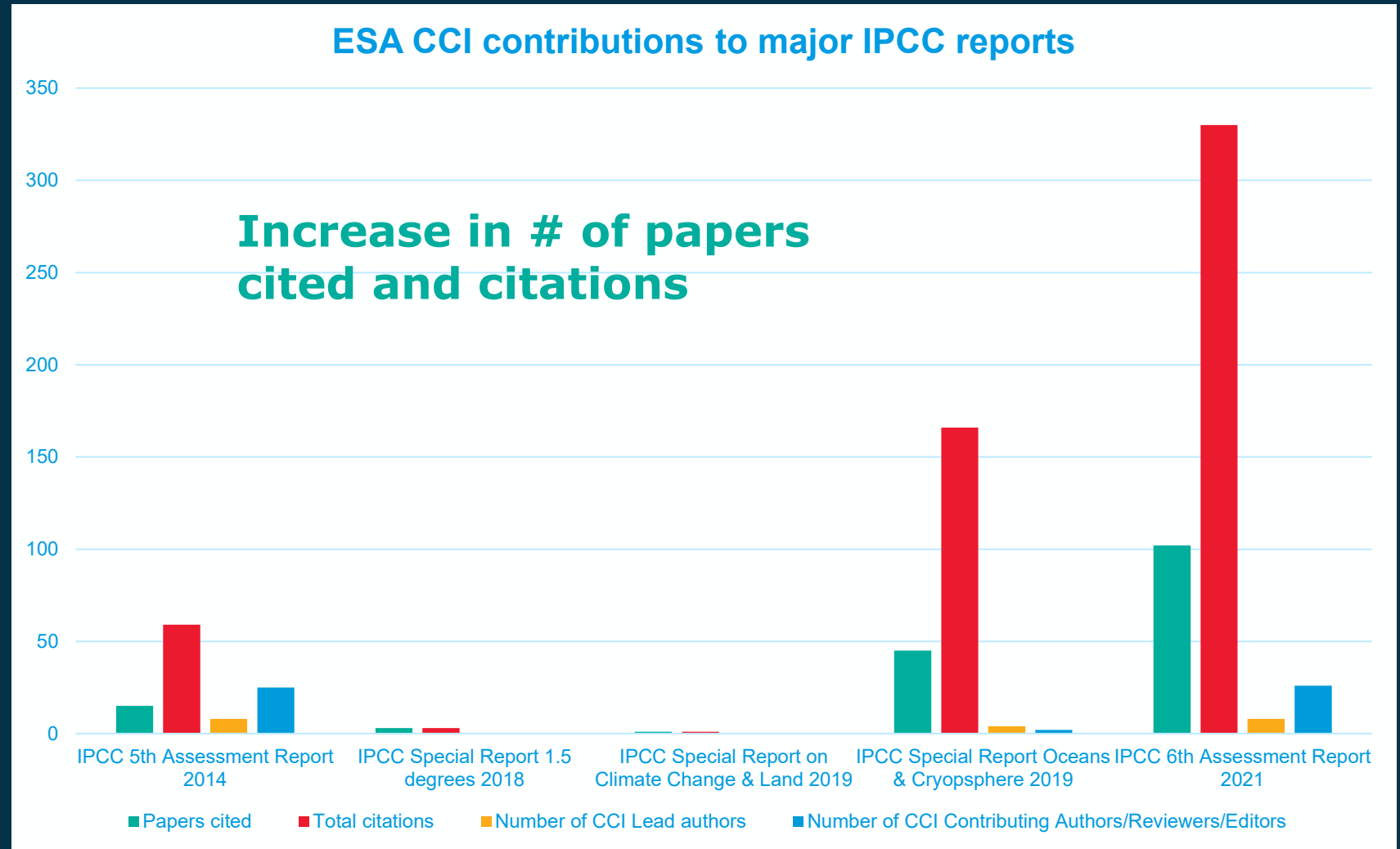


reccap-2
cci

www.climate.esa.int

ESA's Climate Change Initiative: contributions

AR6 WG1 report:
 8 lead/coordinating authors
 16 contributing authors
 ~10 expert reviewers
 ~100 papers cited
 +330 in-text citations

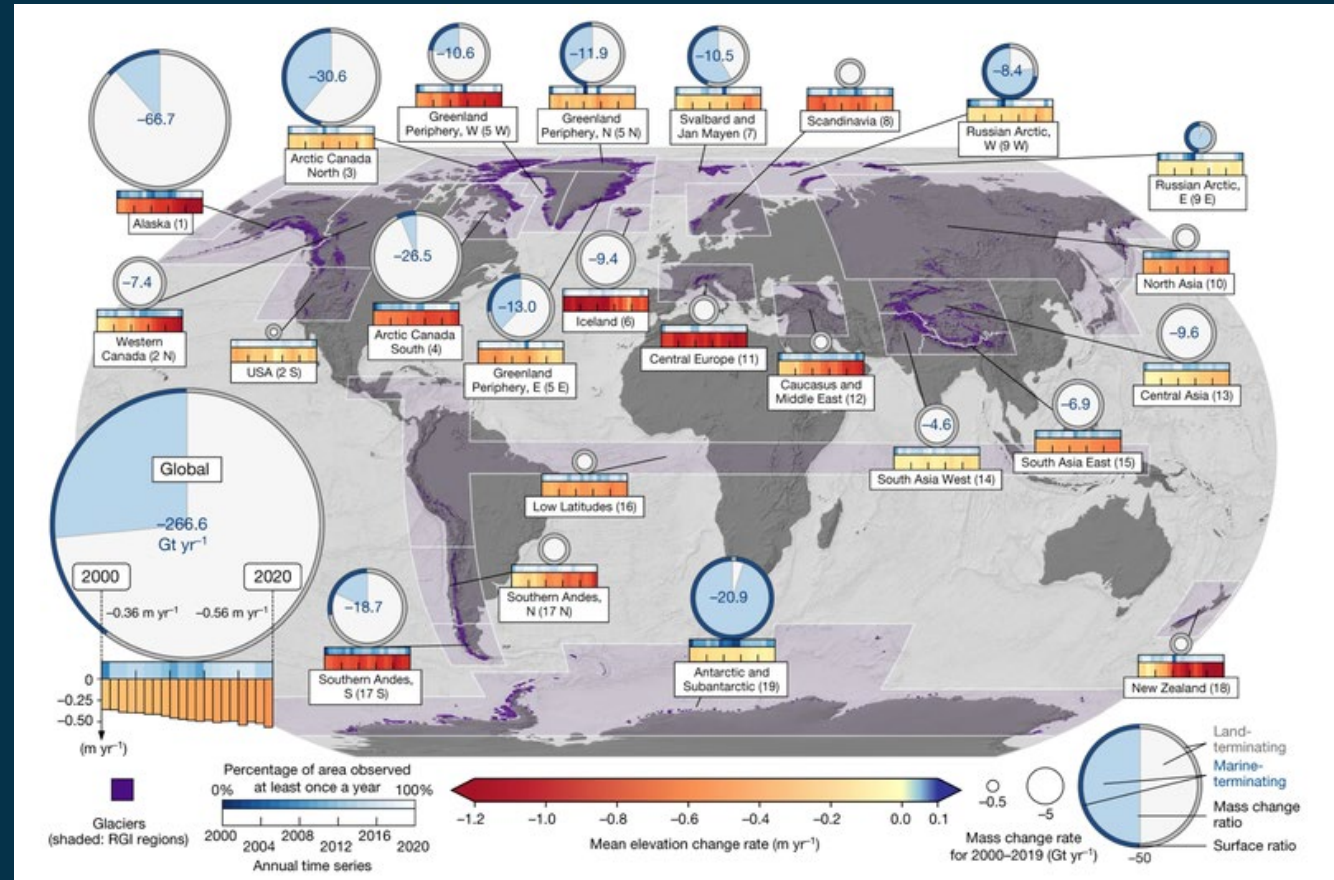


A FEW EXAMPLES



CCI_glacier: accelerated mass loss

- Complete global picture of glacier ice mass loss
- Study includes EO data for Earth's 220,000 glaciers (IPCC only reports on a subset)
- Annual losses 267 ± 16 Gt - 2000-2019; accelerating to 298 Gt from 2015
- Uses CCI methodology, processing tools, DEMs and glacier outlines submitted to Randolph Glacier Inventory
- Alaska, Iceland and Alps melting fastest
- Glaciers contribute 21% to sea level rise



Regional glacier mass changes and their temporal evolution from 2000 to 2019.

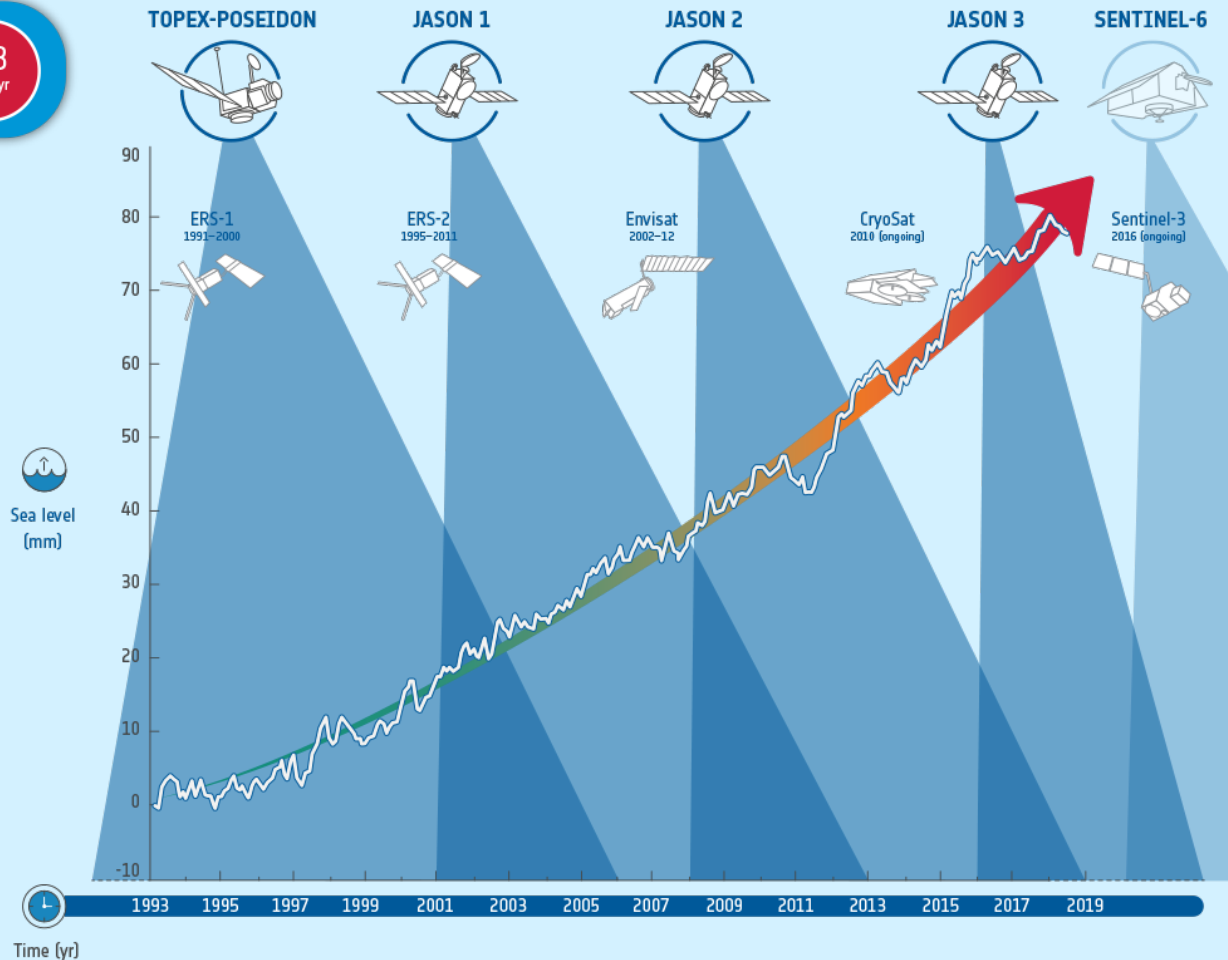
Hugonnet, R., McNabb, R., Berthier, E. et al. Accelerated global glacier mass loss in the early twenty-first century. *Nature* (2021). <https://doi.org/10.1038/s41586-021-03436-z>

IPCC AR WG I, 2021

A4.3 Heating of the climate system has caused global mean sea level rise through ice loss on land and thermal expansion from ocean warming. **Thermal expansion explained 50% of sea level rise during 1971–2018, while ice loss from glaciers contributed 22%, ice sheets 20% and changes in land water storage 8%. ...** Together, ice sheet and glacier mass loss were the dominant contributors to global mean sea level rise during 2006-2018.

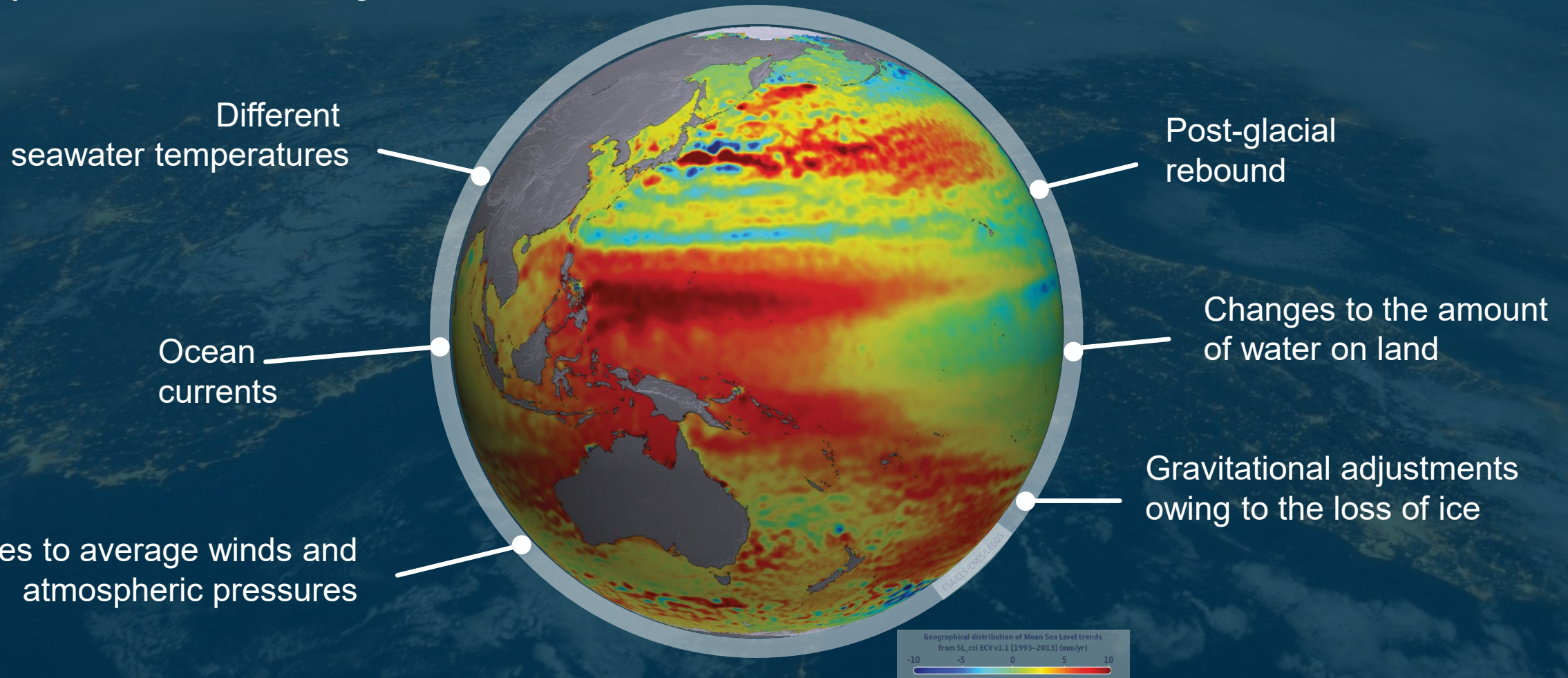
A1.7 Acceleration of SLR

- 1.3 mm/year 1901-1971
- 1.9 mm/year 1971 -2006
- 3.7 mm/year 2006-2018



Sea level is not the same everywhere

In some places sea level is rising by more than the average, while in others it is falling. There are many causes for these regional differences.



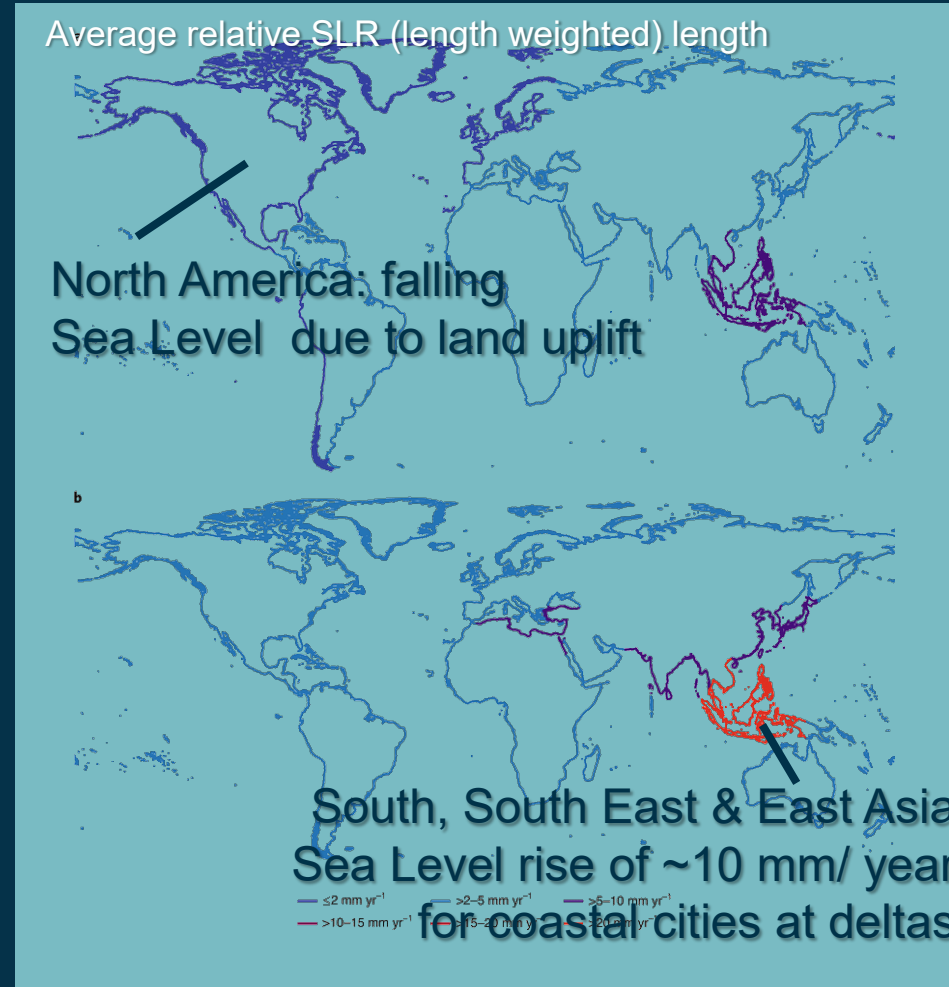
Coastal residents – relative sea level rise (SLR)

Irrawaddy Delta, Myanmar

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Nicholls, R.J., Lincke, D., Hinkel, J. *et al.* A global analysis of subsidence, relative sea-level change and coastal flood exposure. *Nat. Clim. Chang.* 11, 338–342 (2021). <https://doi.org/10.1038/s41558-021-00993-z>



Coastal residents experience sea level rise ~ four times faster than global mean sea level rise (7.8 - 9.9 v 2.6 mm yr⁻¹)

Global relative sea level rise derived from ESA CCI Sea Level data set, isostatic adjustment, subsidence data

Managing subsidence has a high potential for reducing coastal exposure for climate mitigation over the next 30 years

The challenge: Think “globally local”

Policy



Provide scientific evidence to support evolution of policy

Support to and guidelines for regional implementation



Support European climate services in providing information for adaptation and mitigation measures

National implementation and reporting

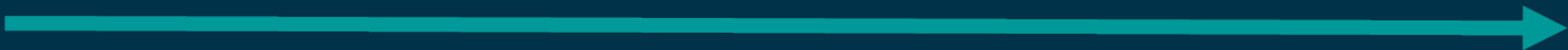


Data for assessing National Determined Contributions, national emission reporting, adaptation and mitigation measures

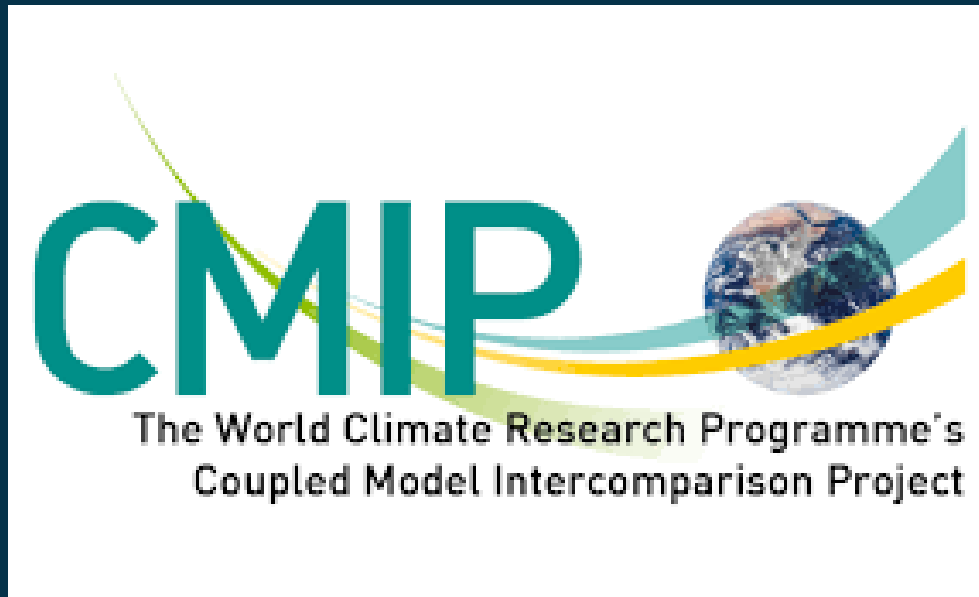
Global

Regional

National



- **New climate programme** - to be presented to ESA member states in 2022 with focus on
 - Maintaining and expanding the portfolio of high-quality Essential Climate Variables, and
 - Responding to the UNFCCC Paris Agreement



Linking climate observations and modelling: ESA will host the **World Climate Research Programme (WCRP) Coupled Model Intercomparison Project (CMIP) Project Office at ECSAT, Harwell Campus**

Are you ready to discover more?



www.esa.int

