

# ESA CLIMATE OFFICE

→ OBSERVING | OUR CLIMATE | OUR FUTURE

Susanne Mecklenburg

24 June 2021



# Today's meeting

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**10:00** Welcome, introduction and meeting objectives (FFG)

**10:10** Austrian climate activities and strategy (BMK)

**10:20** ESA presentation (ESA)

- Current status / implementation of CCI+ phase 2
- Austrian involvement in CCI+
- The content of the future ESA climate programme

**11:20** Q&A session, discussion (ALL)

**11:50** Wrap-up (ESA, FFG)

**12:00** End of the event

(CET)

# Where do we stand – *Implementation of CCI + phase 2*

## Focal point for climate activities in ESA



- ✓ 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/UNFCCC**

# The implementation: current status



WMO defined 54 Essential Climate Variables

36 benefit from space observations

21 generated by ESA Climate Change Initiative



climate modelling  
user group  
cci



climate change initiative

Oceanic



sea level  
budget closure  
cci

Terrestrial



reccap-2  
cci

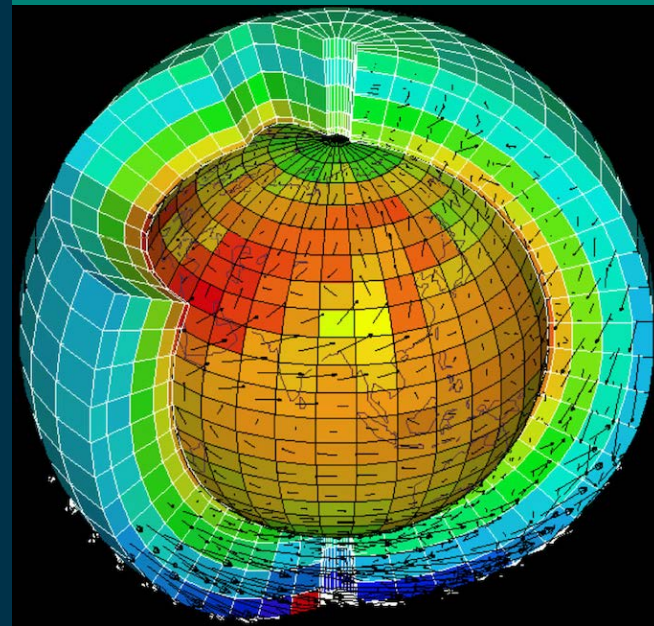
Atmospheric

[climate.esa.int](http://climate.esa.int)

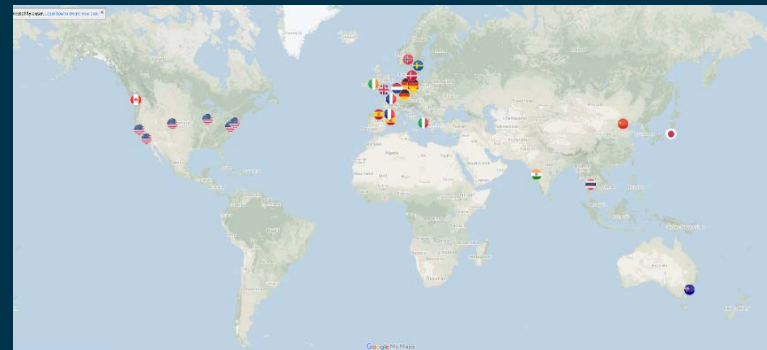
- Dedicated forum for collaboration between the Earth Observation Data and Climate Modelling Communities
- **Improved interaction through**
  - New cross-project Climate Science Working Group (CSWG)
  - Providing tailored satellite based ECV products for CMIP model evaluation activities
  - 50% of ECVs implemented into ESMValTool (Earth System model Evaluation Tool)
  - Support to WCRP's Obs4MIPs (Observations for Model Inter-comparison Project)

**Note:** Close interaction with WCRP data advisory council through ESA representation and ESA currently co-chair for Obs4MIPs

Project team: Met Office, ECMWF, Météo France, MPI-M, SMHI, DLR, IPSL, BSC



- WCRP **flagship** programme, established in 1995 under WMO
- **Scope is to**
  - Better understand past, present and future climate changes arising from natural and anthropogenic changes
  - Assess model performance in the past and future, including the representation in models
  - Investigate predictability of the climate system on various time and space scales as well as making predictions from observed climate states
  - Make multi-model output publically available (in a standardized format)
- **Focal point** for the leading national and international entities in **climate modelling worldwide**
- Work is directed by the **Working Group on Coupled Modelling (WGCM)**
- **Currently in its 7<sup>th</sup> cycle**



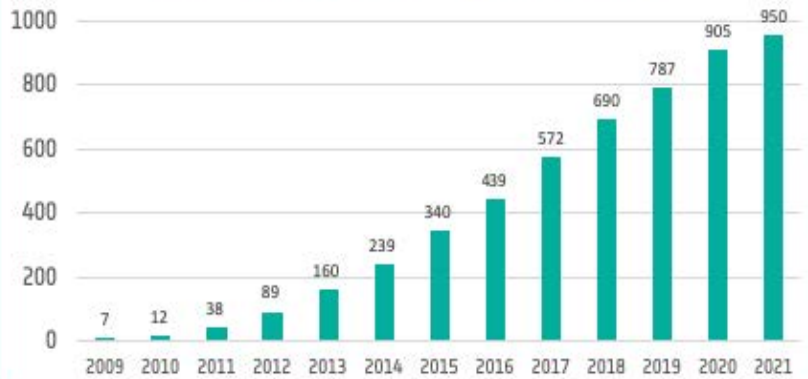
**CMIP-6 Modelling Groups 16 out of 28 in Europe**

**Implementation on-going**

### CCI input to IPCC reports since AR5

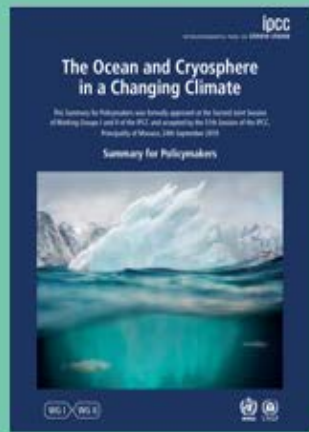
- 64** – number of CCI papers
- 229** – number of citations
- 17** – lead authors
- 35** – contributing authors/editors

### Cumulative peer-reviewed CCI publications



### 5th Assessment report input

- 15** – papers cited
- 59** – citations



### Oceans & Cryosphere report input

- 45** – papers cited
- 166** – citations



## CCI-C3S cooperation agreement

- Provision of CDR
- Coordination of R&D activities
- Collaboration on pre-operational developments

GCOS-195	CCI	CCI+	uptake	C3S
<b>Atmospheric surface</b>				
4.3.1	Air temperature			
4.3.2	Wind speed and direction			
4.3.5	Precipitation			
4.3.6	Surface radiation budget			
<b>Atmospheric upper air</b>				
4.5.1	Air temperature			
4.5.2	Wind speed and direction			
4.5.3	Water vapour			
4.5.4	Cloud properties			
4.5.5	Earth radiation budget			
<b>Atmospheric composition</b>				
4.7.1	Carbon dioxide			
4.7.2	Methane			
4.7.3	Other long-lived greenhouse gases			
4.7.4	Ozone			
4.7.5	Aerosol			
<b>Ocean surface</b>				
5.3.1	Sea-surface temperature			
5.3.2	Sea-surface salinity			
5.3.3	Sea level			
5.3.4	Sea state			
5.3.5	Sea ice			
<b>Ocean biogeochemistry</b>				
5.3.7	Ocean colour			
5.3.8	Carbon dioxide partial pressure			
5.3.9	Ocean surface acidity			
<b>Ocean sub-surface</b>				
5.4.1	Temperature			
5.4.2	Salinity			
5.4.3	Current			
<b>Land hydrology &amp; cryosphere</b>				
6.3.4	Lakes			
6.3.5	Snow cover			
6.3.6	Glaciers and ice caps			
6.3.7	Ice sheets			
6.3.8	Permafrost			
6.3.16	Soil moisture			
<b>Land biosphere</b>				
6.3.9	Albedo			
6.3.10	Land cover (including vegetation type)			
6.3.11	Fraction of absorbed photosynthetically active radiation			
6.3.12	Leaf area index			
6.3.13	Above-ground biomass			
6.3.15	Fire			
6.3.17.1	Land-surface temperature			

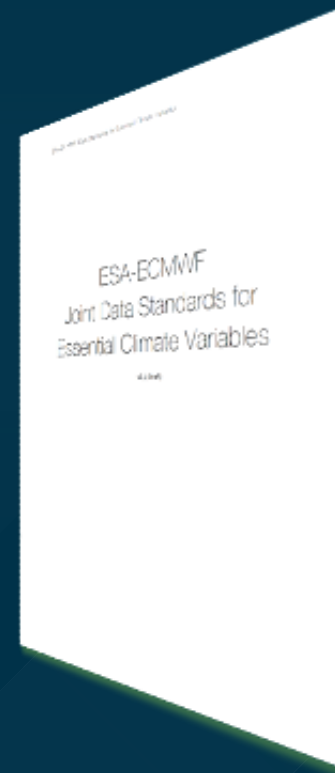
- **Complementarity and synergy**
- Collaborate on **common R&D**
- Provide **pre-operational development** for operational climate services: **16 ECVs transferred** to operational climate services including C3S (and EUMETSAT)
- **Further collaboration** on
  - Interoperability
  - Quality Assurance
  - Data provenance
  - User Information

## Based on dedicated workshops on

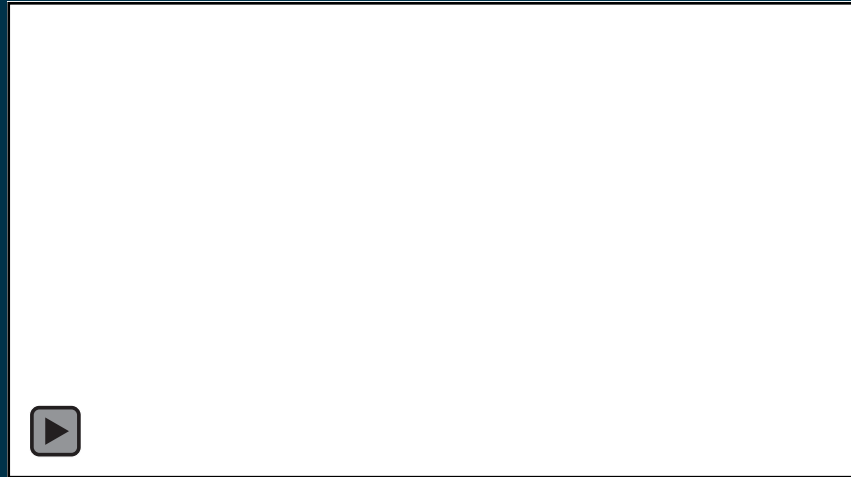
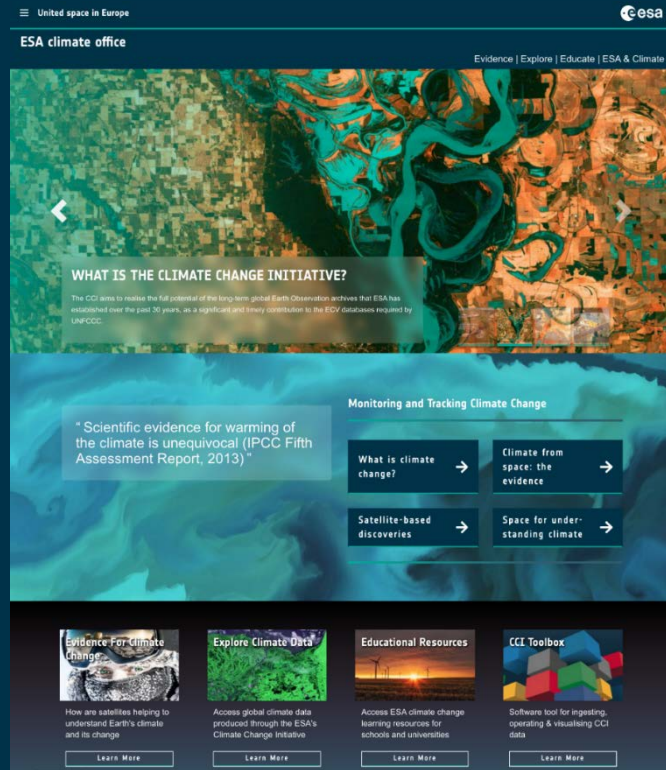
- R&D Gap Analysis and common interests
- Joint ESA-C3S Data Standards for Satellite-Based ECVs
- Dataset Mapping Between C3S & CCI
- Harmonising C3S & CCI Toolboxes Workflows

## Main points of discussion for common R&D focus on

- Including experience from “new” ECVs: biomass, permafrost and LST
- Link to modelling: root-zone soil moisture, vegetation
- New topics: vegetation, biodiversity, terrestrial hydrology/ river discharge
- Detailed summary note available, base for new C3S and CCI activities



# NEW Climate Office Webpage now available: [climate.esa.int](https://climate.esa.int)



## Climate from Space App [cfs.climate.esa.int](https://cfs.climate.esa.int)

- Showcase ESA Climate (ECV) datasets
- Interactive 3D globes & maps
- For teaching & exhibitions
- Mobile | tablet | desktop

☰ 🔍 🗺️ • THE EUROPEAN SPACE AGENCY

- Englisch
- Französisch
- Deutsch**
- Niederländisch
- Spanisch

**DIE ESA CLIMATE CHANGE INITIATIVE**

ESA hat in den letzten 30 Jahren langfristige, globale Beobachtungsdatensätze aufgebaut. Den Ziel der CO<sub>2</sub>-Werte, einen Fortschritt zu nutzen und damit einen bedeutsamen und aktuellen Beitrag zu leisten, um die UNFCCC globalen TCO-Ziele zu realisieren.

**Den Klimawandel überwachen und verfolgen**

“CCI nutzt Wissen über das Klima einerseits, und die technischen Fähigkeiten andererseits, die es in allen ESA-Mitgliedsstaaten gibt, zur Unterstützung von Forschung und Entwicklung.“

- Satellit **→** Klima
- Erkenntnis **→** aus dem
- Wissen **→** Welt
- Was ist der Klimawandel? **→** Klimatrends
- aus dem Weltklima

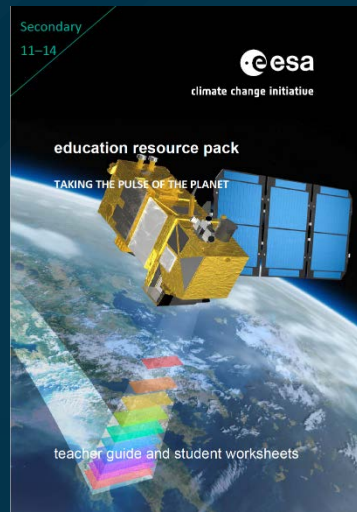
**CCI Toolbox**  
Software-Tool für Datenzugang, Verarbeitung und Visualisierung von CO<sub>2</sub>-Daten

**Evidenz für den Klimawandel**  
Wie helfen Satelliten dabei, den Klimawandel zu verstehen?

**Klimawandel-Evidenz**  
Zugang zu globalen Klimadaten, die im Rahmen von ESA CCI erstellt wurden

**Klimatrends**  
Zugang zu den ESA-Lehrmaterialien zum Thema Klimawandel für Schulen und Universitäten

Webseite: in Deutsch



- Primary & Secondary (upper and lower)
- Teacher guide & Student worksheets
- Integrates use of **ESA's Climate from Space** web app
- Supports STEM curricula
- Languages Eng – end Q2 DE, FR, ES, NL

# Anatomy of classroom resources



## IS OZONE GOOD OR BAD? Overview

The discovery of the Antarctic ozone hole

<b>Author</b>	ESA and partners, students and teachers
<b>Age range</b>	8-11 years old
<b>Topic</b>	Health and safety
<b>Duration</b>	1 hour
<b>Level</b>	Primary
<b>Resources</b>	Handouts for use in lessons, UV beads, handout for students to use at home, handout for teachers to use at home, handout for students to use at home, handout for teachers to use at home

Having studied through these activities, students will be able to:

- Summarise the effects of ozone at different parts of the atmosphere on the Earth.
- Describe the role of the Antarctic ozone hole, including the role of satellite observations in identifying its presence.
- Plan the use of an experiment to test the role of UV in the formation of ozone.
- Explain the effectiveness of a suntan lotion.
- Carry out a practical test to verify the effectiveness of suntan lotion.
- Use the Climate Year Space web activities to explore ozone in detail.
- Identify key information from a range of sources to prepare a concise summary of ozone-related research.

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## Ozone in the atmosphere: background information

### Greenhouse gases

Light from the sun passes through our atmosphere and warms the Earth. The Earth, in turn, radiates heat into outer space. Greenhouse gases in the atmosphere let in sunlight but trap the heat it produces, reducing the cooling effect (Figure 3). Ozone, a form of oxygen (O<sub>3</sub>), is one such greenhouse gas.



Figure 3: The greenhouse effect (Source: Earth Science, University of Texas)

### Ozone and ultraviolet light

Invisible ultraviolet (UV) light from the sun causes sunburn and skin damage. It is categorised as UVA (low energy, UVB (medium energy) and UVC (highest UV energy). Ozone high in the atmosphere (20–30 km) absorbs all the UVC radiation but allows some UVA and UVB through. UVA creates ozone by splitting oxygen molecules (O<sub>2</sub>) into individual atoms, which quickly react with other oxygen molecules to form ozone (O<sub>3</sub>). UVB destroys ozone by splitting it up into an oxygen molecule and individual atoms, which pair up to form more oxygen molecules (Figure 4).

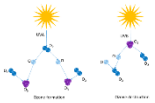


Figure 4: Natural creation and destruction of ozone (Source: Earth Science, University of Texas)

These two processes would usually balance out, but other chemicals, such as those emitted during the burning of fossil fuels, can affect how quickly ozone is created and destroyed. This leads to a reduction in the amount of ozone high in the atmosphere and leaves a higher concentration of ozone nearer the surface (Figure 5). Ground-level ozone can cause breathing difficulties and even lung damage, particularly for people who already have conditions such as asthma.

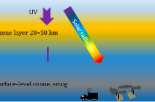


Figure 5: Good and bad ozone (Source: Earth Science, University of Texas)

It is important to remember that 'good' ozone in the upper atmosphere and 'bad' ozone lower down are both the same substance.

## IS OZONE GOOD OR BAD?

### Summary of activities

Activity	Description	Outcome	How learning is assessed	Time
1	Why Spacex ozone matter?	Complete comprehension exercise based on a story relating ozone measurements to real life.	None	20-30 minutes
2	How good is my sunscreen?	Practical activity using UV lamps to investigate the protective effect of various types of sunscreen.	None	45-90 minutes
3	The ozone hole	Research activity using Climate Year Space web application.	Use the Climate Year Space web application to investigate changes to global ozone concentrations. Record the information from a range of sources to prepare a concise summary of independent research.	35-20 minutes + research time (before lesson) and feedback time

These given and for the main resources, assuming full access or partial distribution of specific calculations and plots around the class. The main time for sharing results, but not preparation or collection of the relevant data on the part of the class and groups. Alternative approaches may take longer.

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# TEACHER GUIDE

## Setting up your experiment

Bead	What to do with it	This bead is like ...
1	Nothing (this is the control)	me when I've been sitting outside for a little while (the sunscreen has worn off a bit)
2	Cover it in sunscreen	me without sunscreen
3	Cover it in sunscreen, dip it in the water for 1 second	me after a swim
4	Cover it in sunscreen, dip it in the water for 5 seconds	me when I've been running around in the sun (getting quite sweaty)
5	Cover it in sunscreen, swoosh it about in the water for 5 seconds	me with sunscreen on
6		

## Results

The results below were obtained using purple UV beads exposed to light from a UV torch for about 30 s. (The beads may take several minutes to develop similar colours in weak sunlight.) The sunscreen used was SPF 10 and normally waterproof. Bead 6 was covered in sunscreen, swooshed in the water, then wiped off – equivalent to using a towel after a swim.

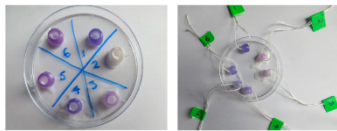


Figure 7: Two different methods for labelling UV sensitive beads (Source: ESA/CSC)

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11

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## Information sheet 1: IS OZONE GOOD OR BAD?

Bees love the pollen in a form of Acute. At the end of each meeting, in groups you can discuss the following questions. You can also use the 'Bees and Ozone' cards to help you. You can also use the 'Bees and Ozone' cards to help you. You can also use the 'Bees and Ozone' cards to help you.

When the bees have finished, bring the cards to the table. We'll be back.

It is important to remember that 'good' ozone in the upper atmosphere and 'bad' ozone lower down are both the same substance.

How do you know about the hole in the ozone layer? It is a hole in the ozone layer. It is a hole in the ozone layer. It is a hole in the ozone layer.

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## Information sheet 2: THE OZONE HOLE

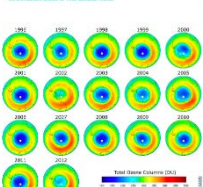


Figure 8: The Antarctic ozone hole (Source: ESA/CSC)

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## Worksheet 2: HOW GOOD IS MY SUNSCREEN?

What you need:

- 6 UV sensitive beads
- Sunscreen
- A beaker of water
- A clock or watch

Making a colour scale

You need a scale like this so you can compare the colour of your beads.

Colour in this box to show the correct colour your bead went.



Leave this box white to show the colour of the bead when it has been in the dark or under a cloth. Shade the boxes in between from light to dark to make your scale.

### Setting up your experiment

Draw arrows from each bead to the box that best describes what it represents.

Bead	What to do with it	This bead is like ...
1	Nothing (this is the control)	me when I've been sitting outside for a little while (the sunscreen has worn off a bit)
2	Cover it in sunscreen	me without sunscreen
3	Cover it in sunscreen, dip it in the water for 1 second	me after a swim
4	Cover it in sunscreen, dip it in the water for 5 seconds	me when I've been running around in the sun (getting quite sweaty)
5	Cover it in sunscreen, swoosh it about in the water for 5 seconds	me with sunscreen on
6		

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12

European Space Agency Climate change initiative

# OVERVIEW

ESA UNCLASSIFIED - For Official Use

# STUDENT WORKSHEET





- A unique, free glacier expedition for young women aged 15-17 from diverse backgrounds, designed to stimulate a passion for science and nature.
- All female mountaineering expedition to support young women, build their self-confidence and help remove any self-limitations.
- To address the overarching gender imbalance in the sciences.

# GIRLS ON ICE AUSTRIA

[inspiringgirls.org/goi-austria](https://inspiringgirls.org/goi-austria)

20 – 29 August 2021  
Ötztal, Tyrol



- ESA is supporting this activity in 2021
- Suggesting an Open Forum session at LPS 2022 where expedition leader and a participant present their experiences.

# Austria's role in CCI +

*... in numbers ...*

## AUSTRIAN CONTRIBUTION

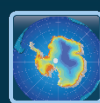
### Involved in



biomass  
cci



glaciers  
cci



antarctic  
ice sheet  
cci



greenland  
ice sheet  
cci



high resolution  
land cover  
cci



permafrost  
cci



snow  
cci



soil moisture  
cci

### Prime for

**6** Institutions

- Enveo
- TU Wien
- EODC
- Geoville
- IIASA
- b.geos

**8** ECV projects

(from a total of 23 CCI

ECV)

**4** ECVs transferred

to



Climate  
Change Service  
climate.copernicus.eu

**4** new ECV projects

(of 9 new CCI projects)



**356**

peer-reviewed papers  
(CCI total 1,600)

**ipcc**

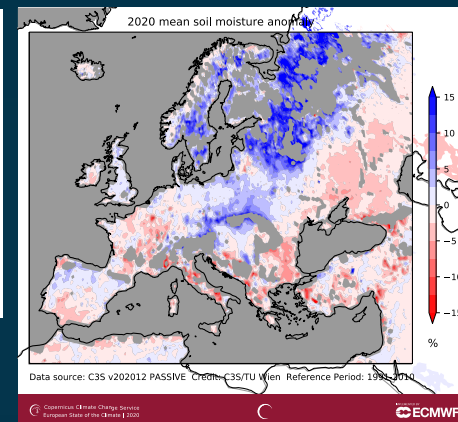
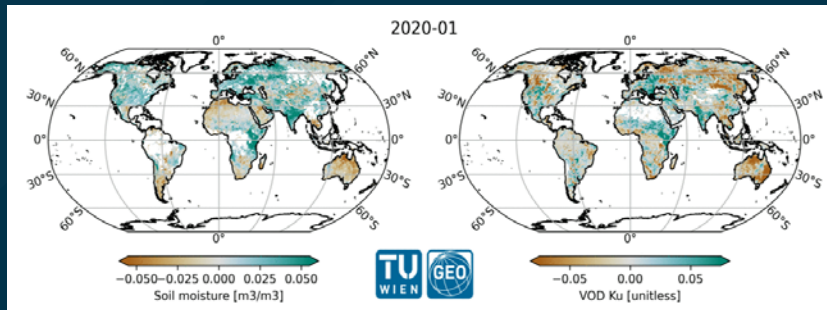
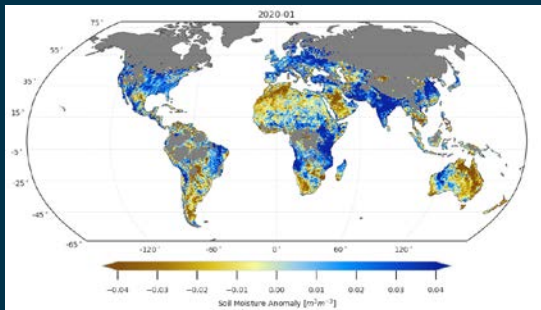
**9** authors of CCIs with Austrian  
involvement contributed to AR5 WGI  
statements on: glaciers and ice sheets



**23** citations in Special Report  
Oceans & Cryosphere related to CCIs  
with Austrian involvement (total CCI  
citations 47)

# Austria's role in CCI +

*... scientific excellence ...*

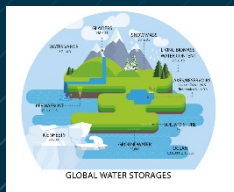


## NEW: >40 years climate data record

- Most accurate product to date
- Duration: 1978 – 2020
- Substantial algorithm updates: new sensors, products, reanalysis (e.g. Preimesberger et al., 2021)

## Contribution to BAMS State of the Climate in 2020

- Monthly anomalies of ESA CCI\_soil moisture & vegetation state from microwave observations (vd.Schalie et al. & Dorigo et al., in review)

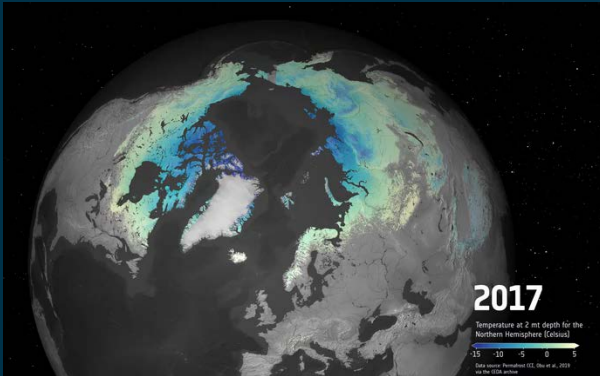
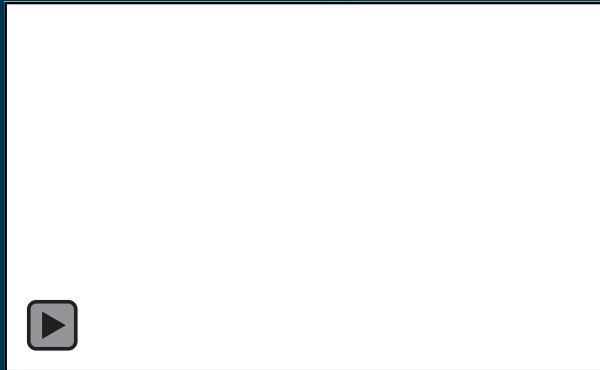


- BAMS PAPER:** Closing the water cycle from observations across scales: Where do we stand? Dorigo et al. (2021)

## C3S State of European Climate 2020

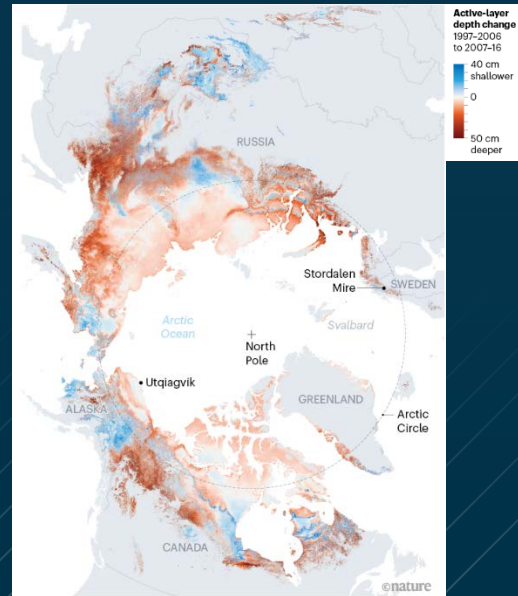
- Below-average soil moisture conditions, similar magnitude to 2019.
- Especially in France, near the Black Sea and Caspian Sea.

## Active thickness, extent &



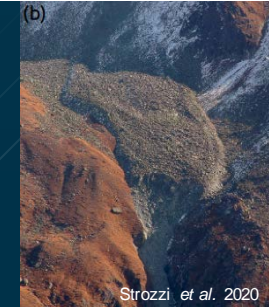
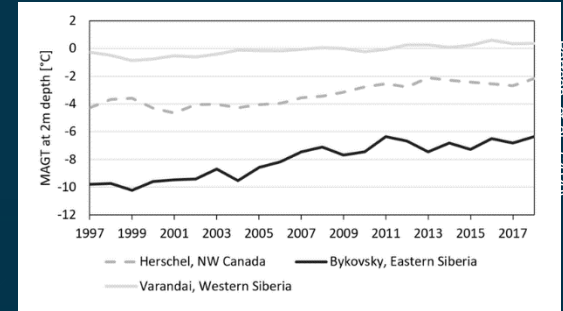
## 'How microbes in permafrost could trigger a massive carbon bomb'

- Northern Hemisphere active layer thickness deepened by 2.5cm (2007-2016) compared to previous decade
- 5% NH area by 30cm



Data from Permafrost\_cci.: Obu et al.

- Average ground temperatures rising  $1^{\circ}\text{C decade}^{-1}$
- Coastal erosion observed - east Russia and northwest Canada bordering the Beaufort sea

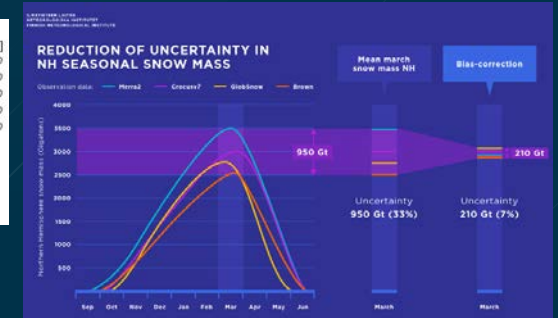
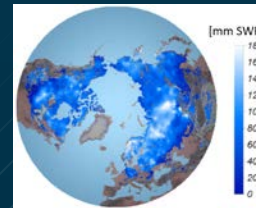
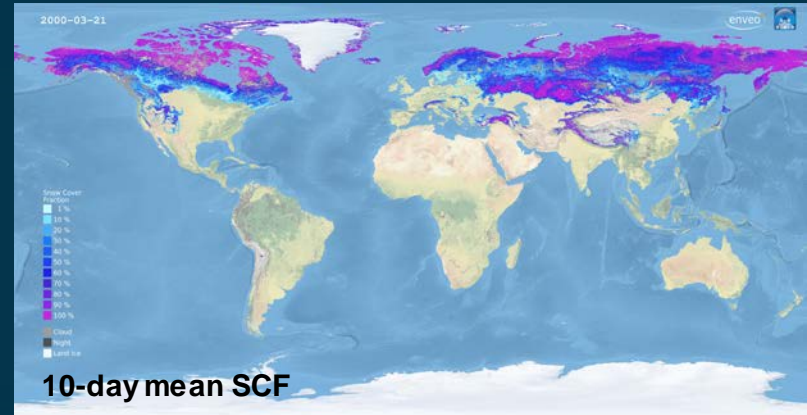


- Rock glacier kinematics as a new parameter of the ECV permafrost with Sentinel-1 SAR

Strozzi et al. 2020

- **Daily, global homogenised snow extent and snow water equivalent products** with uncertainty (~1980→) using products from *cci\_landcover* and *cci\_cloud*
- Exploitation of **AI to generate snow reference data** from Sentinel-2 and Landsat
- **Temporal trends and snow mass anomalies** derived from snow products
- *Cci\_snow* products used in CMIP6 and ESM-SnowMIP evaluations, in Pan-Arctic hydrological models, and for comparison with ECMWF-ERA5.

## Snow Cover Fraction (SCF) & uncertainty maps (1 km)



# The new climate programme COMPASS

Climate Observations and Monitoring  
for Policy Action Support from Space



**STAKEHOLDERS**

WMO  
GCOS  
WCRP  
CGMS  
CEOS  
ipcc  
GEO  
Sustainable Development Goals  
SCO  
National Space Agencies  
National Authorities responsible for emission inventories, NDCs, NAPs

- Defining requirements for ECVs & scientific focus
- International policy  
Global Stocktake  
Mitigation & Adaption
- National & regional interests

**ESA'S ROLE**

- Providing expert input (data and science)
- Addressing ECV requirements & associated science
- Pre-operational development and R&D
- Providing scientific evidence as input to policy decision

**USERS**

Climate Change  
EUMETSAT  
GFCS  
CMIP  
ipbes  
GEO BON  
World Health Organization  
National Climate Modelling Community  
National Climate Services

- Climate Science and Modelling
- Climate services
- New user communities?

# The international climate network

## Main drivers

- UNFCCC Paris Agreement/ IPCC
- 2030 Agenda for Sustainable Development
- Sendai Framework for Disaster Risk Reduction 2015–2030
- Green Deal
- UN conventions for biodiversity and ecosystems

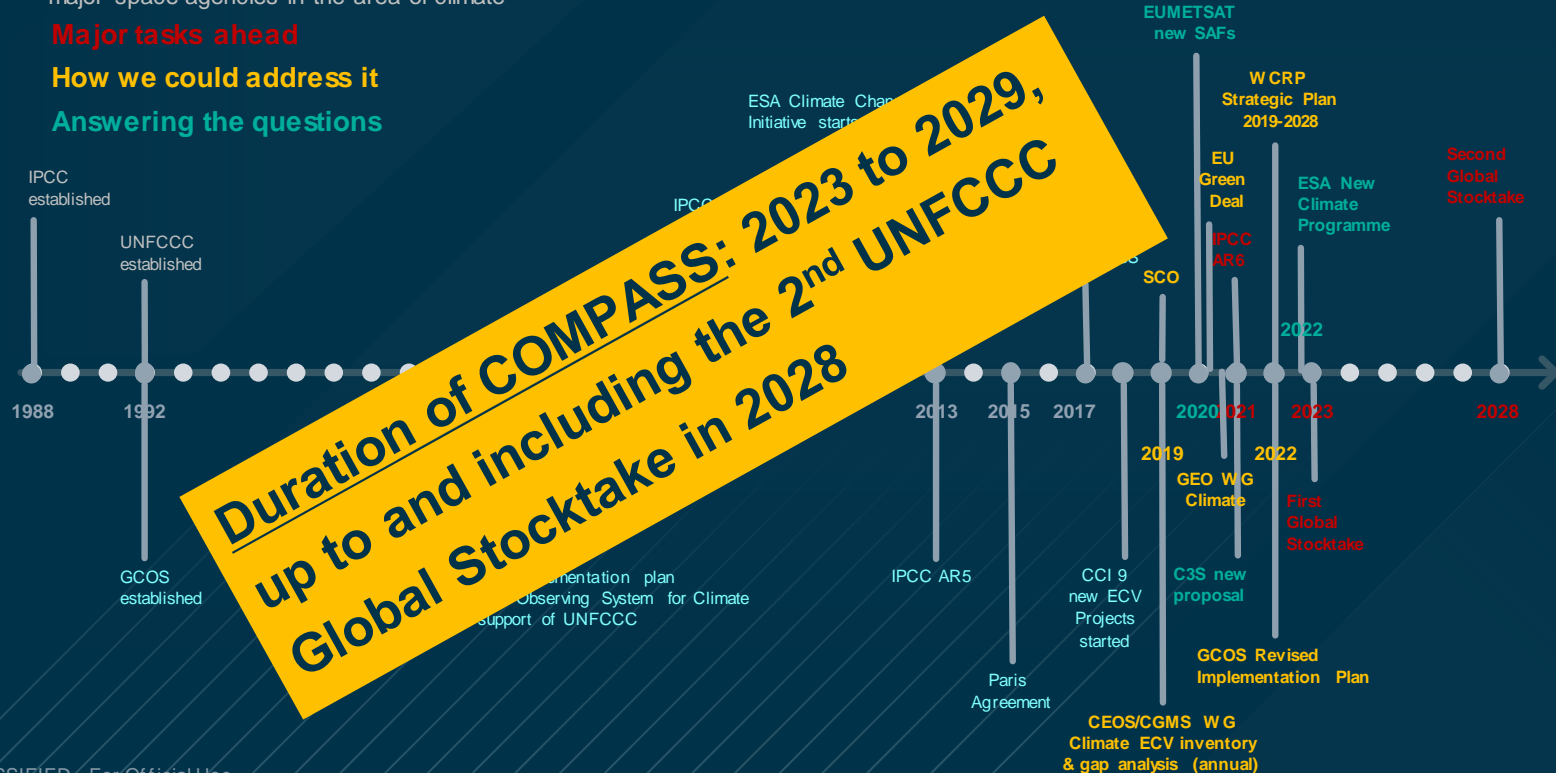
# Developments in climate research and systematic observations – past and future

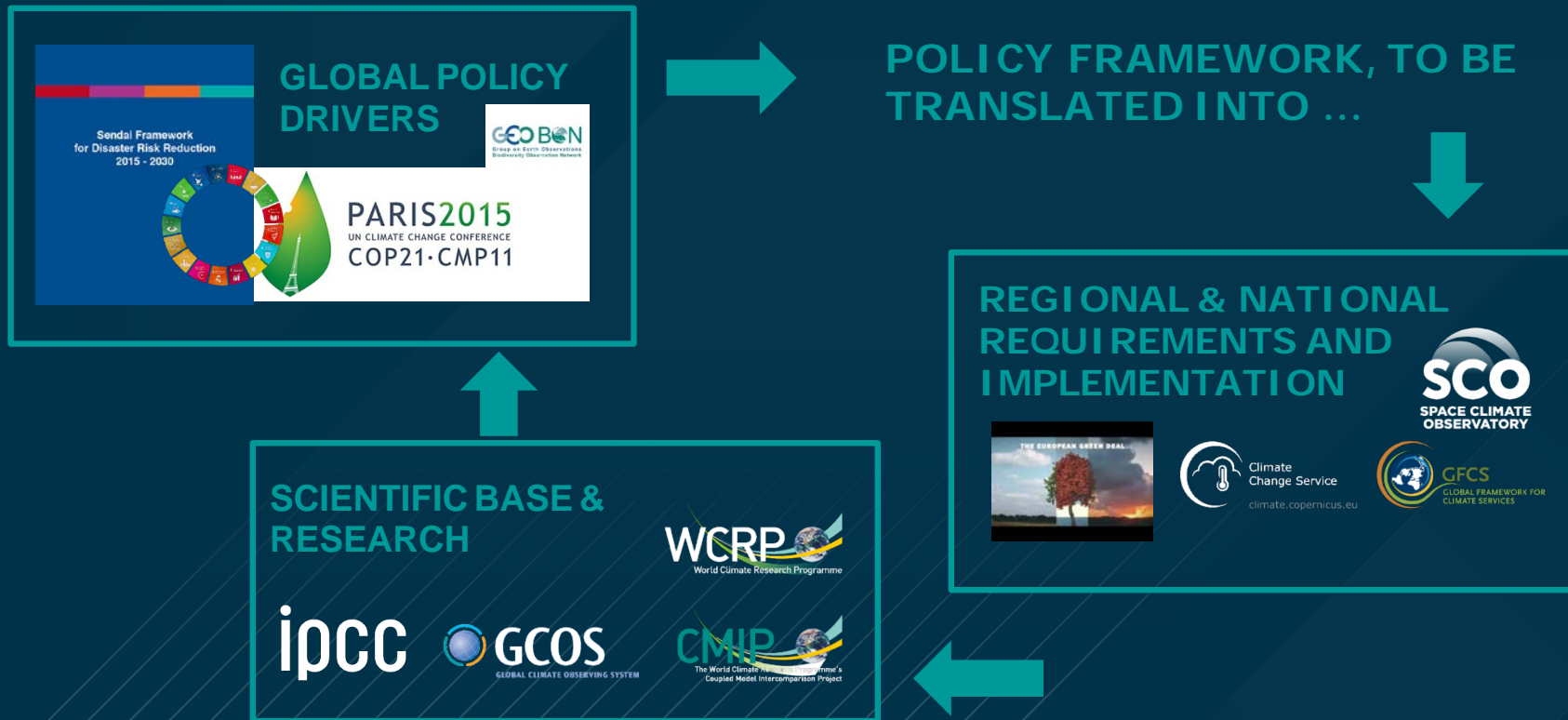
CEOS Working Group to encourage collaboration between major space agencies in the area of climate

Major tasks ahead

How we could address it

Answering the questions





## 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



# COMPASS will

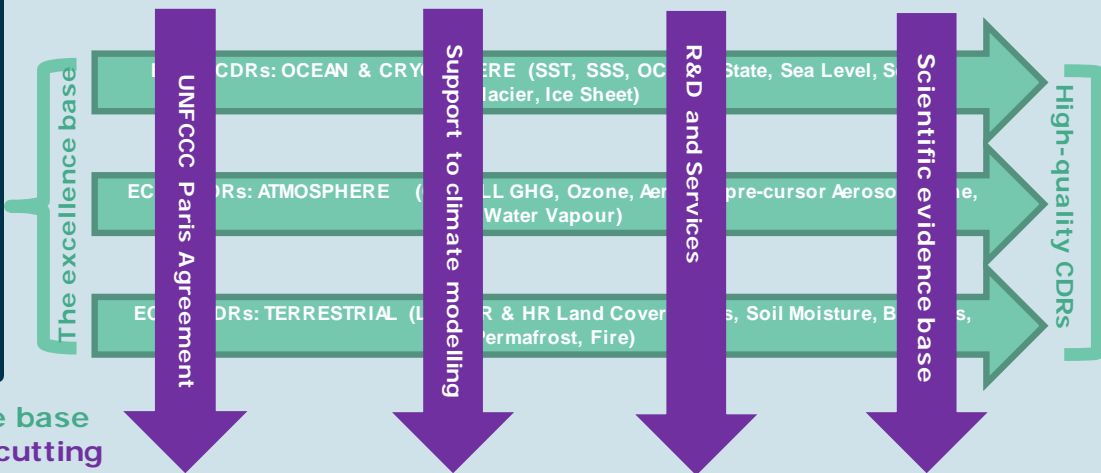
- **Continue and expand** the work supported over the last decade by the successful ESA Climate Change Initiative, and
- Additionally respond to **new requirements** for EO to support the UNFCCC Paris Agreement (Global Stocktake, AFOLU, GHG emissions quantification, supporting national and regional adaptation plans), as well as climate aspects of the UN SDGs, and other international drivers such as CBD, UNCCD, IPBES.
- Perform **R&D** to maximise the value of information from European space infrastructure, supporting member states' needs, collaborating through CEOS,
- Support activities undertaken by ESA's partners within Europe, such as the EC (e.g. CHE, VERIFY and CoCO2), EUMETSAT (e.g. CM SAF), and member states,
- Take advantage of relevant R&D under CCI, EOEP and FutureEO.

## ESA's role ...

## International Climate Network

UNFCCC | IPCC | GCOS | WCRP | Future Earth | CEOS | CGMS | GEO | EUMETSAT | ECMWF | C3S | SCO | CMIP ...

**INPUT**  
Addressing requirements from international climate network and drivers, such as GCOS, WCRP, UNFCCC, IPCC, climate services/C3S, State of the Climate reports.



Using the excellence base to expand on cross-cutting activities

Support member states in responding to the requirements of the Paris Agreement:

- Serving requirements of national GHG inventory agencies and for Global Stocktake (top-down GHGs, AFOLU, natural sources and sinks)
- Serving Adaptation and Loss & Damage requirements in partnership with GDA and FutureEO

Linking observation and modelling community:

CMIP IPO, CMUG, providing data for CMIP7+ model initialisation, verification and reanalysis (e.g. ESMValTool, obs4MIPs)

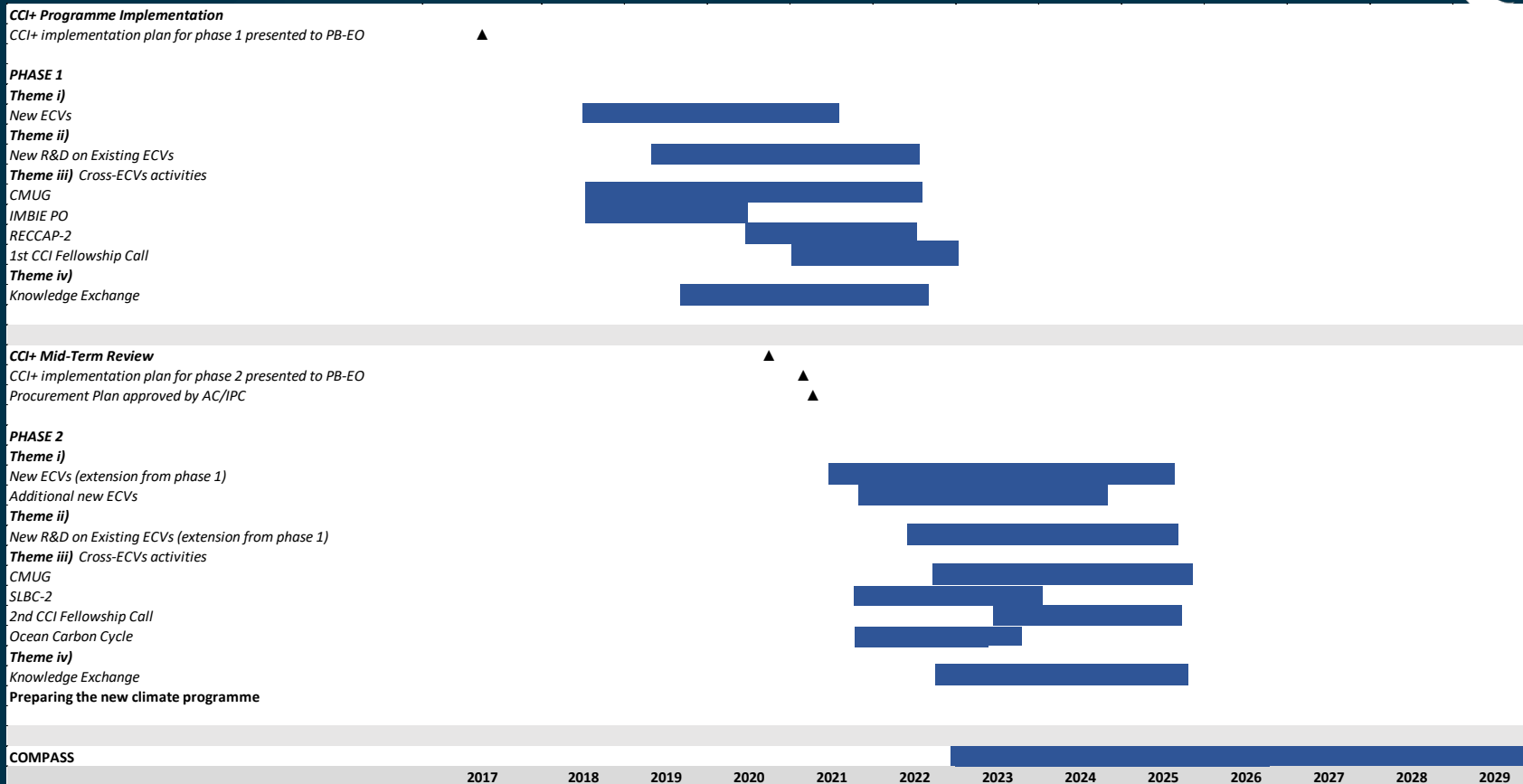
R&D: Carbon, water and energy cycles, tipping points, climate trends, cross ECV, R&D and pre-operational development for climate services

State of the Climate, IPCC, WMO etc

OUTPUT

Knowledge Exchange: data access & curation, communication, education and outreach

Delivering Climate Observations to Society  
Climate Ambassador



# The consultation

- Climate **Modelling** User Group: “Foresight Report”: high level requirements for the use of EO in climate research and services, led by Richard Jones, UK Met Office, IPCC AR6 lead author. **completed** →
- RECCAP-ESA: feasibility of producing updated estimates of GHG balance anomalies (natural and anthropogenic) at country level constrained by EO & dialogue with national inventory agencies, **link to EU’s CHE/COCO-2/VERIFY on-going**
- Study on the potential for “EO support to the **UNFCCC Paris Agreement**”: case studies and network of leading experts to define R&D agenda. **on-going**
- European Space Policy Institute (ESPI) Horizon study: EO-based climate data to support **climate policies in Europe on-going**
- **Tipping Points** in the Earth’s Climate, Forum at ISSI, Bern, 27-29 January 2021, With Future Earth AIMES project **on-going**
- **CCI-C3S collaboration** on common R&D **on-going**

*Conclusion: "EO plays a critical role underpinning climate change research and providing information relevant to intl. and national policies and action on climate change."*

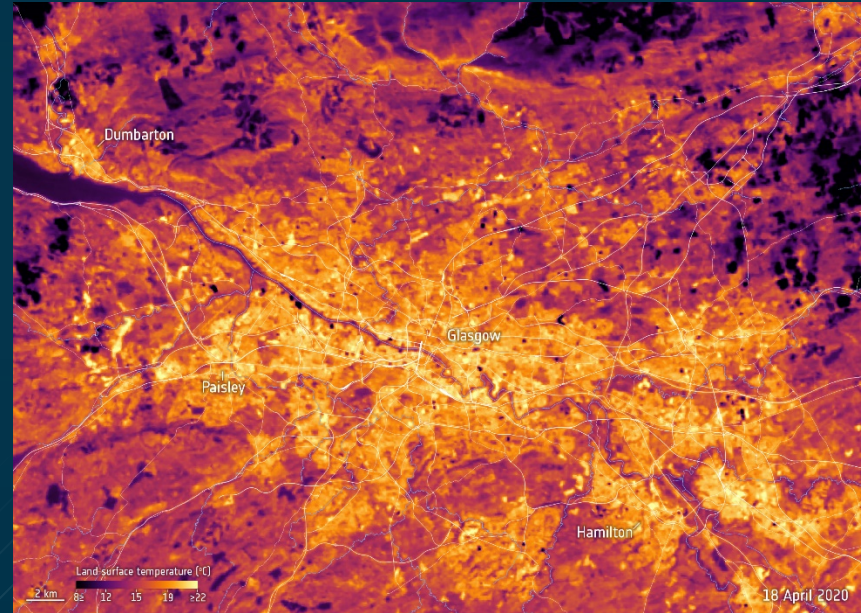
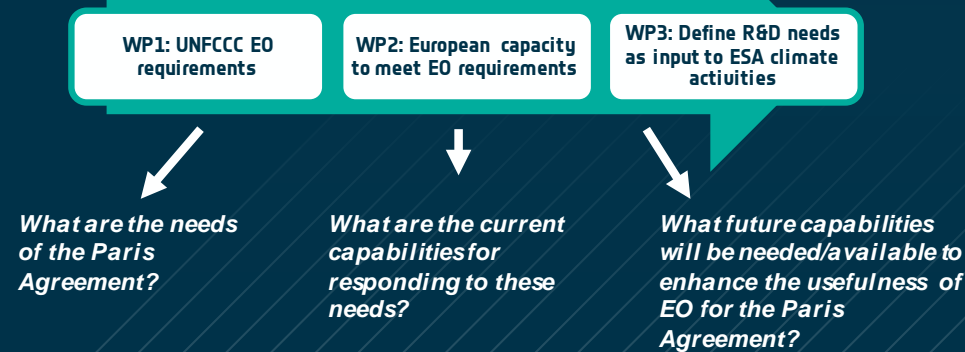


European Space Policy Institute



## STUDY SUMMARY

- Led by Michaela Hegglin, Univ of Reading
- 10 month study to assist ESA identify how Earth Observations can help support the Paris Agreement and support future directions of ESA's climate programme
- Involving UNFCCC, national agencies to define stakeholder needs, EO community and climate experts



**Glasgow, April 2020**  
EO retrievals of Land Surface Temperature could be used to support future adaptation and resilience measures

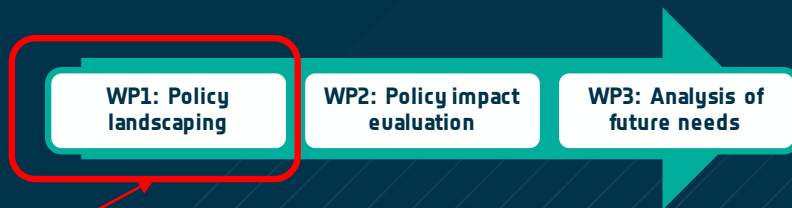
# Supporting national climate policy

Turning ESA's excellent science into solutions for the climate challenge

## Study Summary



- To support ESA Climate Office in understanding how EO-based data support climate policies in Europe and examine how this contribution could be further improved in the future
- Study Scope: ESA Member States and European Union



We are here

## Climate Policy – Austria

### Goals

- Carbon neutrality by 2050
- Reduce GHG emissions by 36% by 2030 (below 2005 levels)

### Policy documents

- Austrian Strategy for Sustainable Development (2010)
- Austrian Adaptation Strategy (2012)
  - Main risks: prolongation of the growing season, flooding and heavy rainfall, increase in average annual temperature and maximum temperatures, heat waves, increase in low-water discharge in winter.
- Austrian Forest Strategy (2020)
- Austrian National Park Strategy (2020)

## Dedicated sessions on

- CCI's contribution to international climate initiatives
- Cross-ECV – from current to future activities, lessons learned and setting priorities for future activities
- Earth Observation for UNFCCC Paris Agreement
- AI Contribution to Climate Data and Modelling
- Collaboration between CCI and C3S
- Evolution of CCI into phase 2 and beyond to a new ESA Climate programme - the views of the Science Leaders

... “Recommended science gaps for **CCI & AI** – *Teleconnections, Explainable AI, Inferring Precipitation, Cloud Masking, Intelligent Gap Filling, Water Cycle Change Prediction, Atmospheric ECVs & Ground Phenomena, Extreme Weather Events & Climate.*”...

... “Science Leads’ feedback on **cross-ECVs**: High interest from our climate community for:

- Lateral connectivity – fluxes
- Coastal interface
- Consistency study on regional water cycle closure/budget (using CCI ECVs but not only)”...

Feedback from all sessions available online [www.climate.esa.int](http://www.climate.esa.int)

- National Climate Days – summer 2021
- Workshop to present programme proposals for Ministerial Council 2022 – Sept 2021 at PB-EO
- First presentation of full programme proposal – PB-EO November 2021
- Subsequent iterations until May/September 2022
- Ministerial Council 2022 – Q4 2022

# Are you ready to discover more?



[www.esa.int](http://www.esa.int)

