CCI colocation & CMUG integration meeting 2026

CCI & Climate Space status

Clement Albergel
Head of section for Actionable Climate Action
With contribution from the ESA Climate team & Friends

24-26 March 2026

CCI: Development of Essential Climate Variables (ECVs)…

…and more!

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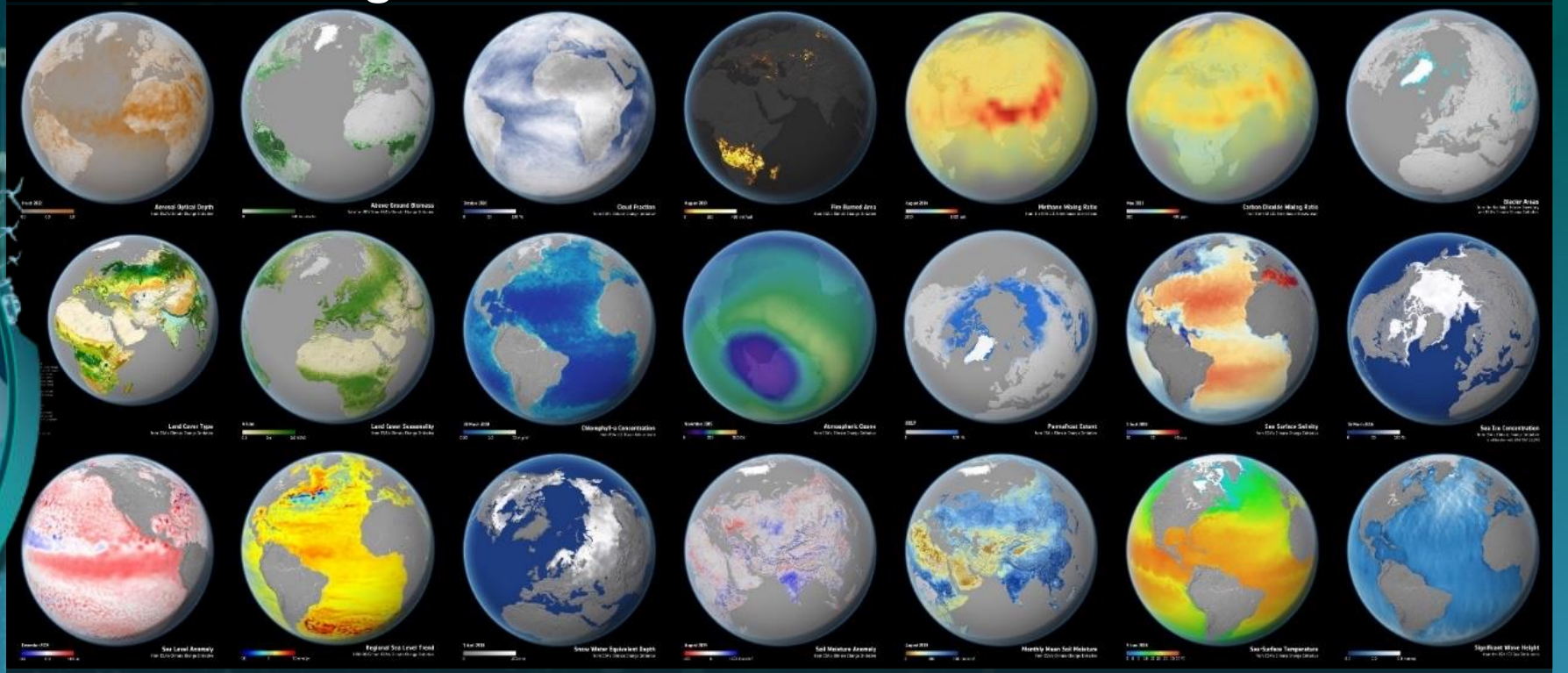
27 ECVs Being Monitored



climate modelling user group cci

sea level budget closure cci

reccap-2

Cross-ECVs studies:

Addressing critical knowledge gaps identified by the international climate scientific community

CMIP Coupled Model Intercomparison Project

Hosts the WCRP's CMIP International Project Offices

→ THE EUROPEAN SPACE AGENCY

ESA Climate Change Initiative – Colocation 2024

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Linking satellite observations and modelling communities

CMIP Coupled Model Intercomparison Project

Crucial lines of evidence for informed decision-making

Advancing climate science

Cross-ECVs

Supporting the Paris Agreement and Global Stocktake

Developing satellite-derived climate data records

CLIMATE CHANGE INITIATIVE

Exchanging knowledge

ESA Climate Change Initiative – Colocation 2026

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Linking satellite observations and modelling communities

Interfacing Obs./Model

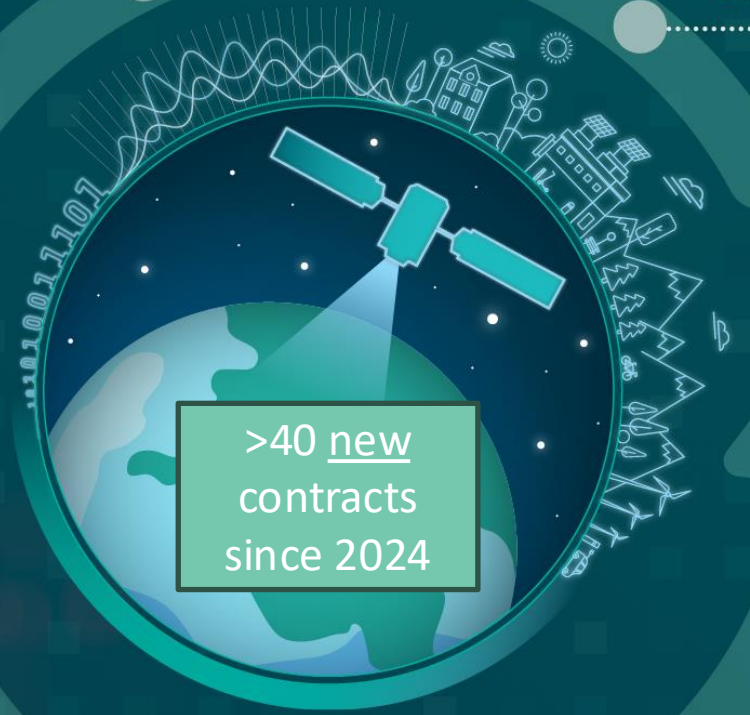
CMIP Coupled Model Intercomparison Project

Advancing climate science

Cross-ECVs

Developing satellite-derived climate data records

Additional ECVs



Crucial lines of evidence for informed decision-making

Tipping Elements

Biodiversity

Cities

Health

Adaptation

SRM

Supporting the Paris Agreement and Global Stocktake

Campaigns

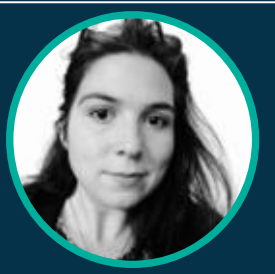
Exchanging knowledge

ESA CLIMATE TEAM

Roberto Sabia
Earth Observation Ocean Scientist

Susanne Mecklenburg
Head of Division

Clement Albergel
Head of Section



Anna Maria Trofaier
Cryosphere Scientist

Simon Pinnock
EO Application Engineer

Michael Eisinger
Applications Scientist

Rochelle Schneider
Copernicus Ecosystem Operations Engineer

Marin Tudoroiu
Data Quality and Cal/Val Engineer

Sarah Connors
Climate Applications Scientist

Sophie Hebden
Climate Applications Scientist

Claire Macintosh
Applications Scientist

Paul Fisher
Communications

Ed Pechorro
Climate Data Engineer

Fabrizio Ramoino
Earth Observation Scientific Projects Exploitation

Dirk Schuettemeyer
Campaigns coordinator

Victoria Ayala
Team Assistant

Freya Muir
Research Coordinator Future Earth / ESA

Will Jones
Internal Research Fellow

Amy Campbell
Junior Professional for AI in Climate Science

Klara Gunnarsson
ESA Graduate Trainee

Luisa Rizzo
Contracts Officer

CMIP IPO team

The IPO is staffed by HE Space Operations Space Limited under contract to ESA.

Eleanor O'Rourke, Director

Briony Turner, Programme Manager

Beth Dingley, Science and Communications Officer

Paul Smith, Science and Infrastructure Officer

Alice Kolesnikov, Admin Assistant

Daniel Ellis, Technical Officer

CROSS-ECV STUDIES

Science exploitation studies using ESA Climate Change Initiative satellite data records.

To address critical knowledge gaps identified by the international science community (including the World Climate Research Programme, Global Climate Observing System and IPCC) and of direct relevance to IPCC climate assessments.

ARCFRESH

The Arctic Freshwater Budget (ARCFRESH) project aims to enhance knowledge of Arctic freshwater processes by maximising the use of EO-derived datasets from the ESA Climate Change Initiative

Visit Project →

GLANCE

Examining the socio-ecohydrological connections between people, water, and forests in the Mediterranean, using ESA Climate Change Initiative data records to explore the impacts of aGricultural Land AbandoNment and ClimatE change

Visit Project →

Karakoram Anomaly

Deepening understanding of Karakoram glaciers' response to climate change through model development and assessing consistency of regional anomalies with climate reanalysis data and ESA Climate Change Initiative satellite records.

Visit Project →

MOTECUSOMA

A project MOnitoring The Energy Cycle for a better UnderStanding Of cliMate chAnge (MOTECUSOMA) by harnessing ESA Climate Change Initiative satellite data records

Visit Project →

SATACI

SATellite observations to improve our understanding of Aerosol-Cloud Interactions and associated Radiative Forcing using satellite data records generated by the ESA Climate Change

Visit Project →

XFires

Gaining a holistic understanding of extreme fires and their impact in the Earth system using satellite data records generated by the ESA Climate Change Initiative

Visit Project →

climate.esa.int/en/Cross_ECV_Projects/

TIPPING ELEMENTS

Exploring the application of ESA Climate Change Initiative satellite records - and other remote sensing data - to **address uncertainties relating to potential tipping points and abrupt changes in the Earth system, their interactions and potential impacts.**

climate.esa.int/en/tipping-points-research/

RESETlakes

Enhancing understanding of the risk and processes associated with tipping elements, abrupt changes or transitions in lake ecosystems using Earth observation data and numerical modelling

Visit Project →

CryoTipping

CryoTipping combines Earth Observation and numerical modelling to detect marine ice sheet instabilities in the Amundsen Sea Sector, with a focus on Thwaites glacier.

Visit Project →

PREDICT

Predicting Resilience and Early Detection of Impending Climate Transitions in key tipping elements including Amazon rainforest dieback, dryland vegetation, and permafrost thaw.

Visit Project →

Tipping Points in the Southern Ocean Overturning (TiPSOO)

Exploring early warning signals and evaluating the risks linked to tipping points in the Southern Ocean Overturning Circulation and potential effects on global climate.

Visit Project →

SIRENE

Satellite Information for Resilience Monitoring and Early warning of Ecosystem Tipping Points (SIRENE) project

Visit Project →

Tipping Points and Abrupt Changes in Marine Ecosystems (TIME)

Improving early warnings of marine tipping points using satellites, models, and in-situ data.

Visit Project →

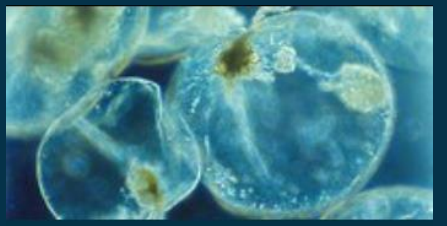
NEW ECVS

Development of **additional** Climate Data Records (CDRs) from space that are not yet present in the current ESA CCI Essential Climate Variable portfolio

Land Evaporation

Generating long-term global land evaporation records using Earth observation data

Visit Project →



Phytoplankton biomass and diversity Climate Change Initiative (PHYTO-CCI)

Developing satellite-based data products for phytoplankton carbon biomass and pigment diversity

Visit Project →

Sea Ice Age and Drift (SAGE)

Creating the first global data records of sea ice age and drift to support climate research

Visit Project →

Ocean Surface Heat Flux

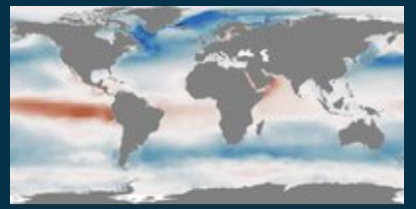
Developing a total Ocean Surface Heat Flux data record, a key variable in understanding Earth's energy balance

Visit Project →

climate.esa.int/en/projects/

Supporting the UNFCCC Paris Agreement

ESA is exploiting Earth observation satellite data to support progress toward the mitigation and adaptation goals of the UNFCCC Paris Agreement



Ocean Carbon 4 Climate

Developing a climate-quality time series to assess the ocean carbon sink and refine air-sea CO_2 flux estimates

Visit Project →

RECCAP-2 Climate Space

The RECCAP-2 Climate Space project refines greenhouse gas budgets for critical regions of the globe, supporting climate goals with advanced satellite and atmospheric data.

Visit Project →

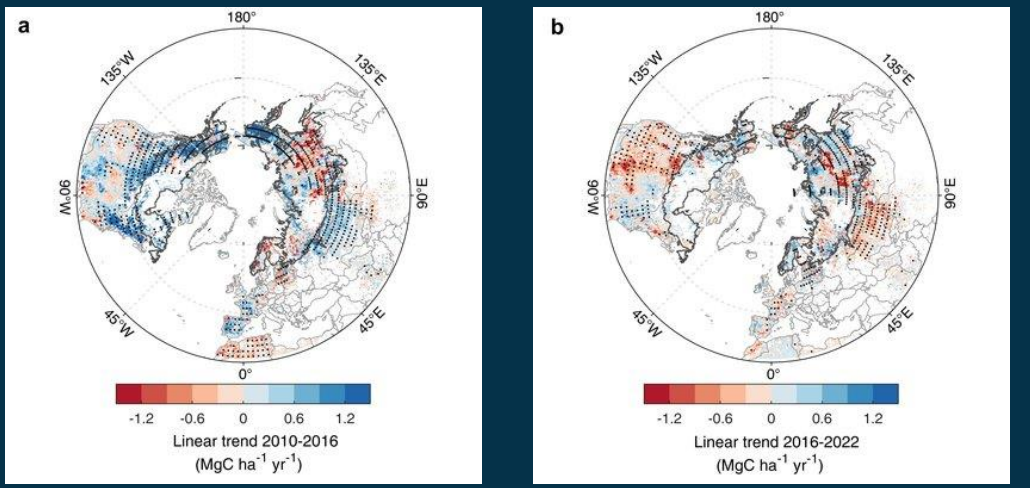
Methane Emissions Detection Using Satellites Assessment

Comparing and evaluating methane data products on hot spot and point sources (super-emitters) from a large variety of satellites.

Visit Project →

climate.esa.int/en/supporting-the-paris-agreement/

RECCAP-2 study reveals that North. hemisphere forests have shifted from carbon sinks to carbon emitters



Temporal changes in annual live biomass carbon in northern latitude ecosystems. Per-pixel linear trend in biomass carbon for (a) the period 2010-2016, (b) the period 2016-2022

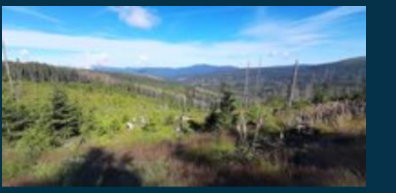
BIODIVERSITY

Investigate the role of biodiversity in carbon storage and climate regulation, and **how climate change is impacting the different dimensions of biodiversity and ecosystem function** and structure in order to predict change and inform nature-positive action.

FORTRACK

Tracking Interactions of Tree Mortality, Functional Diversity & Ecosystem Responses to Climate Stressors with Earth Observation

Visit Project →



Ecosystem Monitoring and Scaling for Climate Change Impacts (ECOMOSAIC)

Developing scalable, open tools to monitor ecosystem health, linking climate & biodiversity data 4 policy & global goals

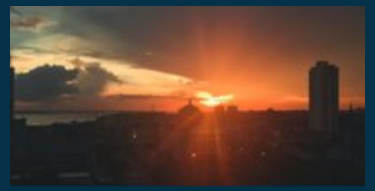
Visit Project →

Climate Impacts on Freshwater Biodiversity, Ecosystems and Resources (CIBER)

EO-driven freshwater biodiversity monitoring

Visit Project →

HEALTH



clim4health

Developing Earth Observation-driven risk algorithms to anticipate health impacts prototype local-scale Early Warning Systems

Visit Project →

Climate–Health Adaptation through New Generation Earth Observations (CHANGE)

Using Earth Observation to understand and address climate-related health impacts.

Visit Project →

CLIMAte Change and Health Emergency CARE (clima-care)

Using Earth observation and ambulance data to assess climate-driven heat and air-quality risks and impacts to improve health services

Visit Project →

Exploring the application of ESA Climate Change Initiative satellite records - and other remote sensing data, **to identify, assess and support the reduction of climate-related health risks.**

climate.esa.int/en/supporting-the-paris-agreement/

CITIES

Exploring the application of ESA Climate Change Initiative satellite records - and other remote sensing data, to **study on cities and urban environments and their interactions with climate change**

Align with the upcoming IPCC Special Report on Climate Change and Cities (SRCCC)

Climate Analysis In African Cities (CAIAC)

Harnessing Earth Observation data to enhance model simulation of urban climate conditions in Africa

Visit Project →

MOMO-NBS

MOnitoring urban MOrphology and Nature-Based Solutions

Visit Project →

EO4UrbanClimate

Integrating satellite data and climate models to support city-scale evaluation of urban heat risks and adaptation options

Visit Project →

Flood Risk Assessment in a Changing Climate for Cities using EO (FRACCEO)

Combining satellite data & models to improve coastal flood prediction and risk assessment in a changing climate

Visit Project →

SRM

Reduce uncertainties in climate projections and assess the feasibility, risks, and governance of solar radiation modification (SRM) technologies as a supplementary climate intervention strategy

ACtIon4Cooling

Aerosol Cloud Interactions for Cooling (ACtIon4Cooling) project

Visit Project →

STATISTICS

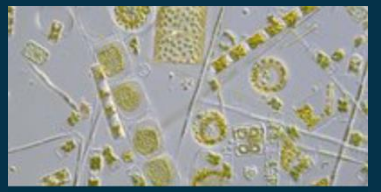
Satellite and Model Data to Inform Solar Radiation Modification Techniques (STATISTICS) project

Visit Project →

climate.esa.int/en/supporting-the-paris-agreement/

OBSERVATIONS & MODELLING

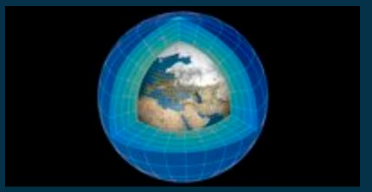
- Strengthen collaboration between EO and climate modelling communities
- Facilitate scientific exploitation of satellite climate data records for model assimilation, calibration and parameterisation
- Leading to better understanding and improved predictions
- Supporting provision of forcing data sets for CMIP



Climate and Marine Production (CAMP)

Advancing ocean productivity modelling and its response to climate change

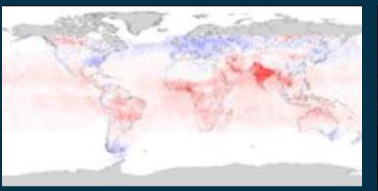
Visit Project →



Exploiting Satellite Observations for climate model analysis (ESO4Clima)

Enhancing ESMValTool climate model evaluation and analysis ahead of CMIP7

Visit Project →



PIRAMID

Progress in the Interpretation of Remotely-sensed Atmospheric Climate using Modelling, Inversion and Data assimilation

Visit Project →

PISCO

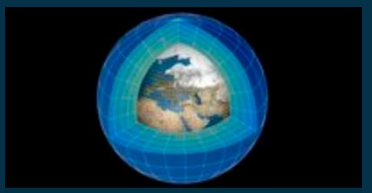
Processes for Ice Sheets in Climate models and Earth Observation

Visit Project →

Climate Observation and Modelling Expertise Team (COMET)

Advancing ocean & sea ice modelling using ESA CCI climate data to support CMIP7 and the next IPCC assessment cycle

Visit Project →



CMIP forcing - GHG concentrations

This project is developing new methods to create climate model inputs from ice cores, ground-based and satellite observations to improve greenhouse gas data input to Coupled Model Intercomparison Project.

Visit Project →

CMIP forcing - ozone

Visit Project →

CMIP forcing - volcanic

The project is producing stratospheric aerosol optical properties and volcanic stratospheric sulphur emission datasets from 1750 to present-day. They are key for climate model simulations run as part of the Coupled Model Intercomparison Project and feed into IPCC assessments.

Visit Project →

https://climate.esa.int/en/observations-and-modelling/

Observations for GHG inventories and reporting

Improving emissions factors: ESA/INPE/UFOPA airborne campaign

The Amazon is a potential near-future tipping point of terrestrial carbon emissions. Despite this, significant uncertainty remains regarding the region's current and projected GHG emissions

A large-scale field experiment (Pará State, Brazil) is providing new and detailed observations to better understand the carbon dynamics (stock & fluxes) associated with different land cover types and fire

LBA KM67 flux tower in the Tapajos protected forest (left to right) from the ground, the top, and from the hyperspectral system onboard the aircraft

➔ **climate.esa.int/carbonara**

CLIMATE SPACE & ESA EO SCIENCE STRATEGY

A science-first, 2040 vision to address the threats of, climate change biodiversity loss, pollution and extreme events.

- 4 key areas for action: *Frontier science and discovery, From science to societal benefits, Reducing critical knowledge gaps, Filling critical observation gaps*
- Driven by 23 Guiding Science Questions (SQs), each of which has specific objectives and requirements for Geophysical Observables

➔ **Assessing the contribution that Climate Space is making to achievement of ESA's strategic goals through three mechanisms:**

- ➔ Enhancing the quality, consistency and traceability of Geophysical Observables from EO data through the generation of ECVs
- ➔ Advancing the specific objectives of SQs by improving process understanding
- ➔ Contributing to ESA's Strategic Objectives through education, outreach and promoting the use of EO in the policy domain

ESA_Earth_Observation_Science_Strategy_issued_Sept_2024.pdf

Evolution of the Essential Climate Variables (ECV) framework: Rational

Evolution of requirements of major drivers in the international climate network:

- **GCOS** is reviewing and updating the ECV definitions
- **IPCC 7th assessment report** cycle started in 2024 takes into account recommendations made in terms of gaps and evolving requirements from previous report
- Support the **UNFCCC** Global Goal on Adaptation “indicators” enabling countries to track progress towards adaptation measures
- Strengthen the link between the climate observation and **modelling communities** (e.g., WCRP CMIP & CORDEX IPOs)
- Support the needs of the **operational climate services** (C3S, CAMS, CMEMS, CGLS, EUMETSAT and national climate services)

Evolution of the Essential Climate Variables (ECV) framework

Thematic area	ECVs covered
Land and biosphere	▪ Aboveground Biomass Carbon Stocks and Change ▪ Soil Moisture ▪ Land Cover & Land Cover Change, Vegetation Parameters ▪ Fire ▪ Lakes and River Discharge
Cryosphere	▪ Ice Sheets and Glaciers ▪ Snow and Permafrost ▪ Sea Ice
Ocean and coastal areas	▪ Sea level and Sea state ▪ Sea Surface Salinity ▪ Ocean Colour & Productivity, Ocean Carbon Storage
Atmosphere	▪ Clouds, aerosols, radiation budget ▪ Ozone, water vapour, precursors ▪ Greenhouse gases (CO_2, CH_4, N_2O, F-gases)
Cross-sphere	▪ Land Surface Temperature, Sea Surface Temperature and Ice Surface Temperature

We can discuss

Thank You!

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clement.albergel@esa.int

ESA RECCAP-2

Amazon Rainforest experiment
ESA/INPE/UFOPA

climate.esa.int/CarbonARA/