CCI Knowledge Exchange

Eduardo Pechorro, ESA
Technical Officer, CCI Knowledge Exchange

17 October 2024

A Common Goal of CCI Community

"Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement."

UNFCCC Paris Agreement Article 12.

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UNFCCC Paris Agreement Article 12.

CCI Knowledge Exchange (2019-2024) has now ended.

CLIMATE-SPACE Knowledge Exchange (2024-2027) kicks-off tomorrow.

↓

Supporting new ESA EO Science Strategy

Knowledge Exchange Project 2019-2024 (CCI)

Serving the CCI community | Listening & acting on your needs, inputs and feedback

A Website	Communicating activities of the ESA Climate Office to science communities and public	ESA Climate Office site | climate.esa.int
Storytelling	Communicating role of satellite-derived data in climate science of CCI to science communities & public	Climate from Space | cfs.climate.esa.int
Training & Education Resources	Building knowledge and skills of science communities and public	CCI Training Packs | climate.esa.int/education
A Data Toolbox	Analysis and manipulation of ESA ECV datasets for scientific use particularly in a multi-ECV context.	CCI Toolbox | github.com/esa-cci
A Data Management Centre	Data curation, discoverability, access, metadata, quality control, interoperability, standards.	CCI Open Data Portal | climate.esa.int/data

Examples

CCI knowledge products have been showcased at over 45 events since 2019.

European Journalism Conference, Oct 2023

Images and animations like Glacier Volumes have had over 135k views on ESA media channels alone, and have also supported COP, LPS, and other events.

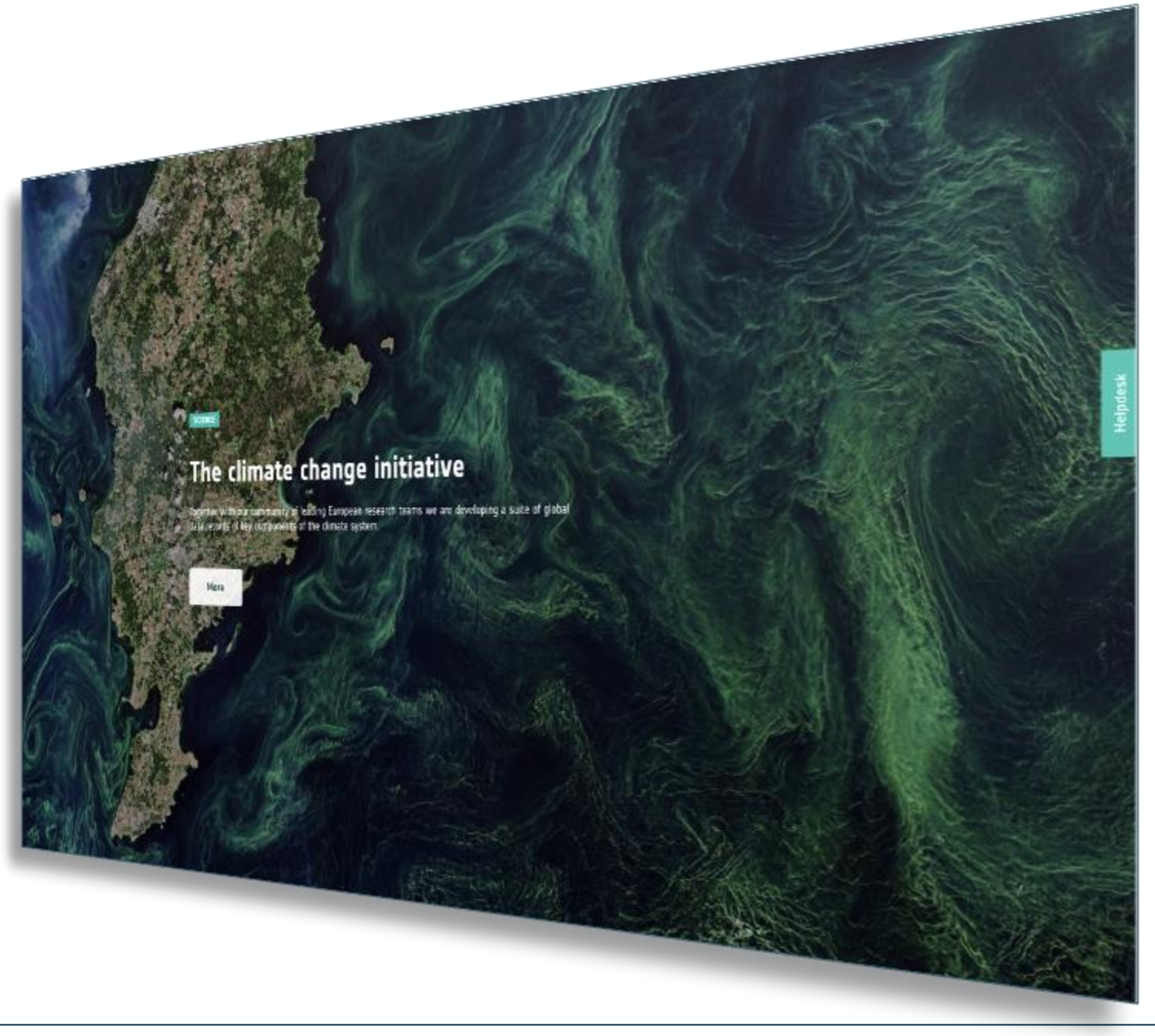
Ars Electronica Festival, Sept 2023

Our climate science website.

climate.esa.int

For all science users - Climate science professionals, policy makers, trainers and educators, early professional and the public.

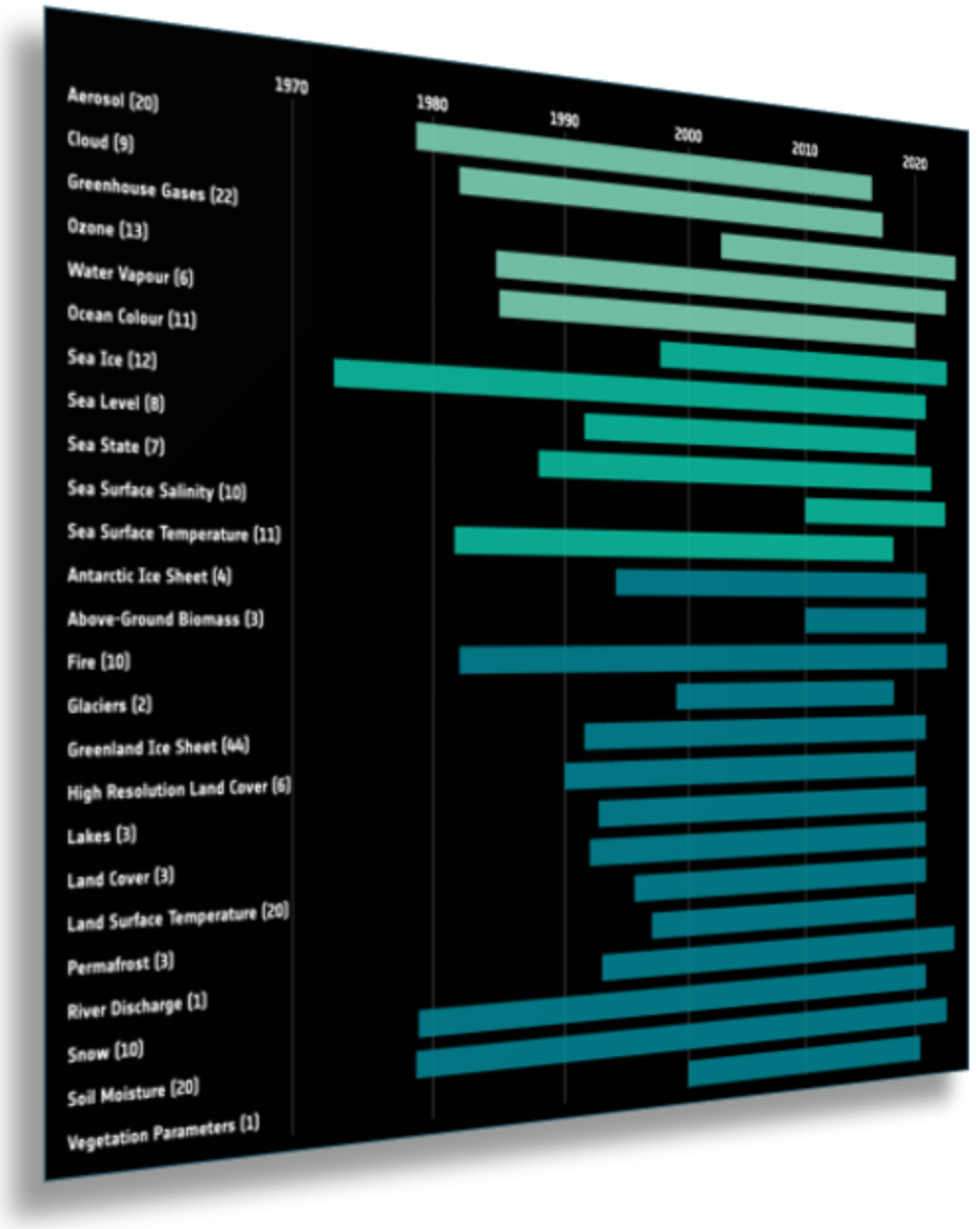
65k visits since 2019.
7,800 resource downloads.



Climate from Space (cfs.climate.esa.int)

Storytelling with data for science trainers, tertiary education & the public.

41,000 visitors since 2020.

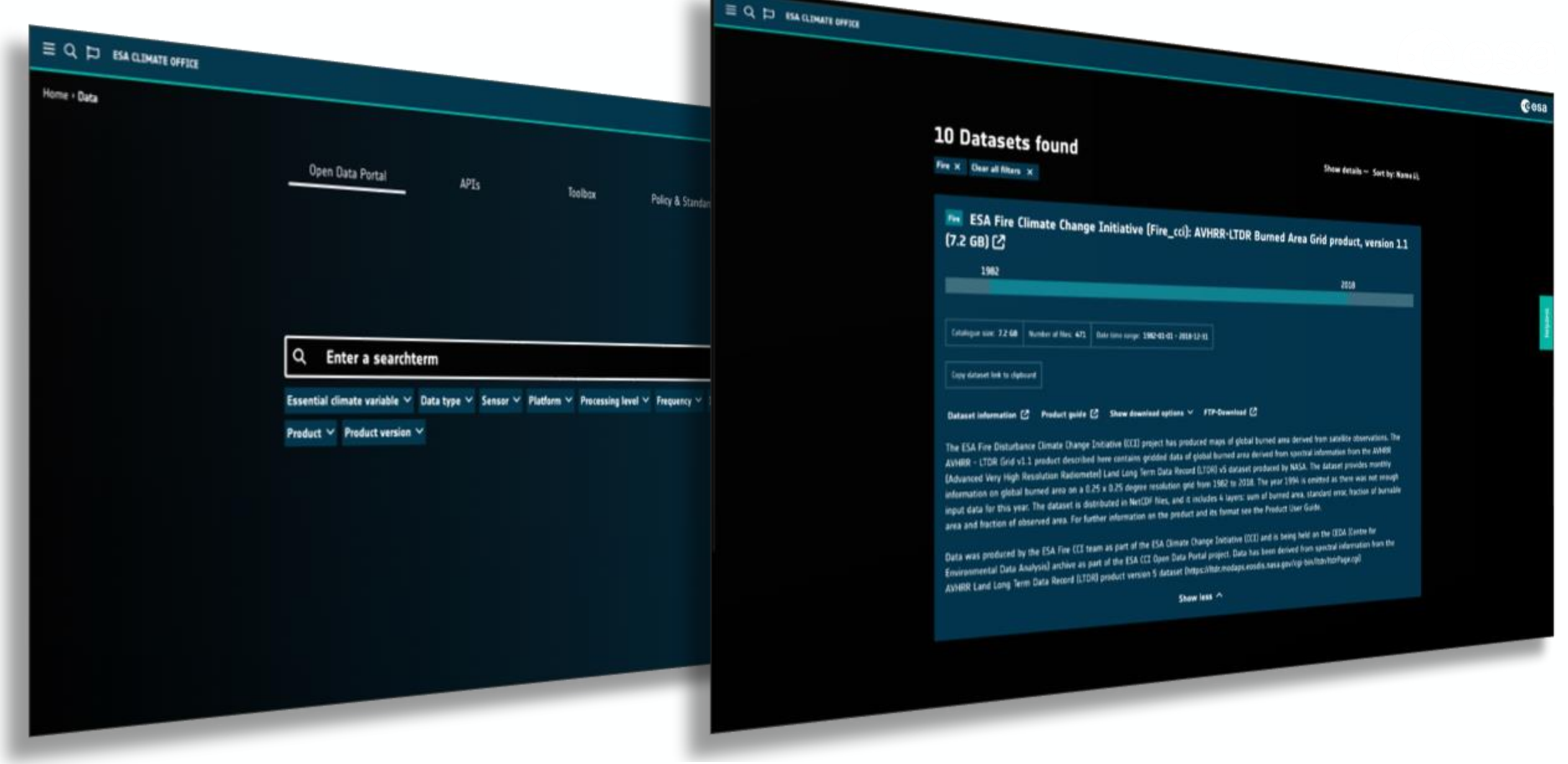


CCI Open Data Portal
climate.esa.int/data

An easy-to-use interactive CCI data dashboard for novice science data users, early professionals, educators and trainers.

The ‘big picture’ of the CCI programme.

5 to 20 million data accesses by 4 to 18 thousand users, each quarter (across all user and machine interfaces)



A faceted search tool for climate science professionals

CCI Data Application Programming Interfaces (APIs)

Programmatic access to CCI data is available through a variety of methods including the following -

OpenSearch. Access all data of the CCI Open Data Portal through OpenSearch, a suite of web-based search engine and search protocol standards. An OpenSearch description provides the web interface of the CCI Open Data Portal

THREDDS. A THREDDS web server provides access to data and metadata on the CCI Open Data Portal via the Web Map Service (WMS) and Web Coverage Service (WCS) standards of the Open Geospatial Consortium and the Open-source Project for a Network Data Access Protocol (OPeNDAP) standard

Earth System Grid Federation. CCI Obs4MIPs datasets are available through the Earth System Grid Federation (ESGF). These provide observational CCI products technically aligned with climate model data, specifically that made available from the Coupled Model Intercomparison Project (CMIP). ESGF provide a RESTful API.

FedEO. The CEOS Federated EO Gateway (FedEO) Clearinghouse STAC index provides interoperable access, following ISO/OGC interface guidelines, to Earth Observation metadata. The FedEO service periodically ingests the latest CCI Open Data Portal catalogue of all CCI datasets

ESA Data Discovery Portal (data.esa.int). The ESA Data Discovery Portal crawls publicly available metadata of ESA datasets and indexes the metadata, providing a unified view of all ESA data holdings including in a machine-readable way so it can be processed by search engines that index structured data.

CCI-C3S Metadata Bridge. Due for release. Interogate and render the dataset-level mappings from CCI to C3S.

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Making our CCI data interoperable for use by many—both across ESA and elsewhere - aligns with ESA broader ambitions for 2025 and beyond.

Ensures interoperability with other ESA programmes and European institutions, reinforcing our commitment to broader collaboration in the climate and data space.

CCI Toolbox

The CCI Toolbox is a python package that provides access and operations to CCI data.

Data Stores. The CCI Toolbox comes with two pre-configured data stores, built with the xcube Python package. The CCI Open Data Portal data store (esa-cdc) provides programmatic access to all CCI data. The Zarr data store (esa-cdc-zarr) provides access to selected CCI data in Zarr format for faster performance.

Datasets. Datasets are accessed through Data Stores. By providing a dataset identifier the CCI Toolbox loads only the metadata and structure of the dataset, with the full dataset loaded only when needed for operations. Opened datasets are represented through data structures defined by Python packages xarray, pandas, and geopandas.

Operations. The CCI Toolbox provides climate analyses operations geared to CCI data for coregistration, resampling, spatial and temporal subsetting, time series extraction, outlier detection, merging, normalising, spatial adjustment, temporal adjustment, and providing the means for operation registration. In addition, the Python packages xarray, pandas, and geopandas provide a rich and powerful low-level data processing interface for datasets opened through the CCI Toolbox. See the API reference for details.

552 registered users until 2023, then switch to python library with 4,844 downloads

CCI Toolbox

Making our CCI data usable in other realms — both across ESA and elsewhere - aligns with ESA broader ambitions for 2025 and beyond.

The CCI Toolbox is now a Python package, making it adaptable for use across many platforms, environments and infrastructure.

climate.esa.int / data

Knowledge Exchange Project 2019-2024 (CCI)

Summing up, what we as a CCI community have developed together so far -

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Knowledge Exchange Project 2024-2027 (CLIMATE-SPACE)

Alignment CCI Knowledge Exchange 2024-2027 to **ESA EO Science Strategy**

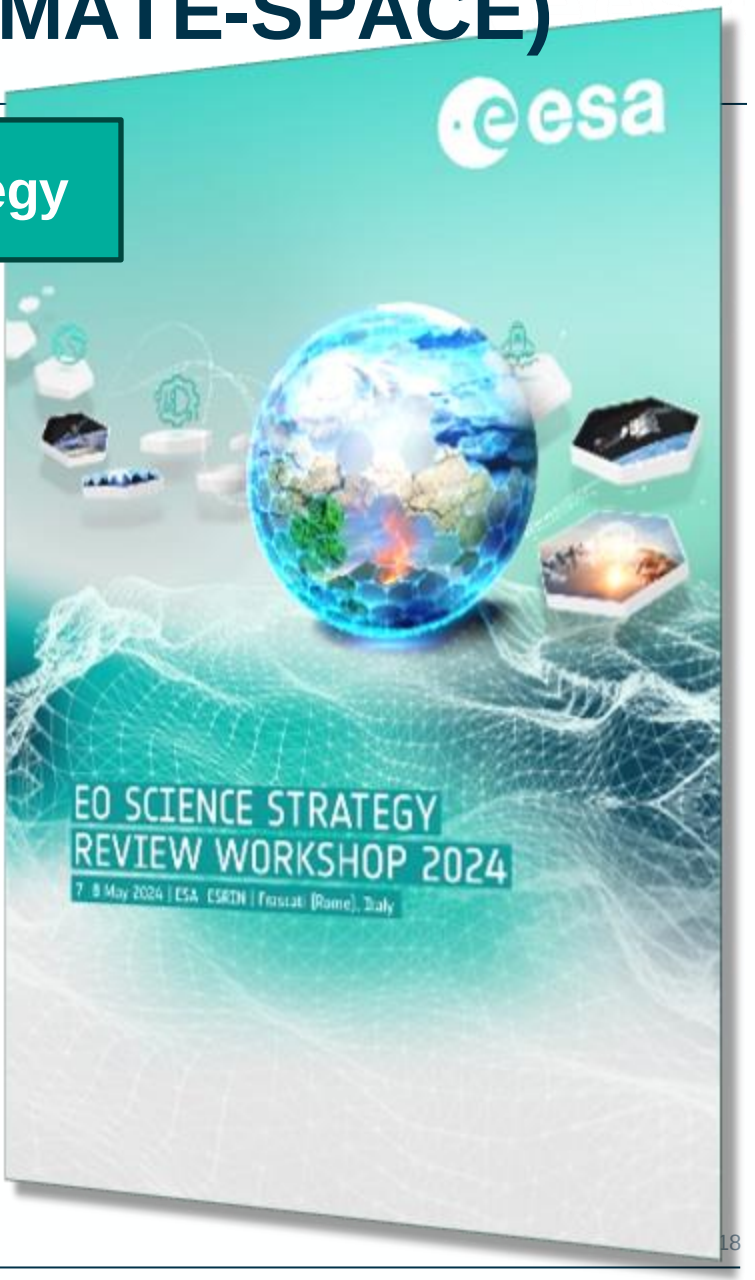
The new Earth Observation Science Strategy presents a vision for ESA's Earth science through 2040, aligning consistently with **ESA Strategy 2040**.

STRATEGIC OBJECTIVE 11. Dedicate appropriate level of support to the preparation of the next generation of European EO scientists through dedicated training and education activities.

STRATEGIC OBJECTIVE 12. Maximise the outreach and communications of ESA EO scientific results towards the general public, policy-makers and younger generations.

STRATEGIC OBJECTIVE 14. To foster the development of a culture and practice of openness in EO science, applications and industry, and of a sustainable open innovation ecosystem.

STRATEGIC OBJECTIVE 15. To develop and enhance European capabilities for harnessing digital innovation, such as AI, to maximise the exploitation of EO data for scientific and socio-economic benefits.



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CLIMATE-SPACE KE - Training & Education

STRATEGIC OBJECTIVE 12. Maximise the outreach and communications of ESA EO scientific results towards the general public, policy-makers and younger generations.

CLIMATE-SPACE KE - Comms, Narratives

STRATEGIC OBJECTIVE 14. To foster the development of a culture and practice of openness in EO science, applications and industry, and of a sustainable open innovation ecosystem.

CLIMATE-SPACE KE – Open Data, Tooling, Facility -> FAIR

STRATEGIC OBJECTIVE 15. To develop and enhance European capabilities for harnessing digital innovation, such as AI, to maximise the exploitation of EO data for scientific and socio-economic benefits.

AI Strategy for Climate & Long Term Action

Knowledge Exchange Project 2024-2027 (CLIMATE-SPACE)

Communications	Communications strategy ; Communications management ; supporting events ; venture building ; content production tailoring; channel management ; community liaising ; Communications expertise ; briefing notes
Storytelling	Storytelling content and platform ; new and refined stories ; new ways of storytelling ; graphics and animations
Training & Education	Training events ; seminars ; competitions
A Data Toolbox	CCI Toolbox : cross-ECV merging, AI operators ; Demonstrators for Google Earth Engine, D3.js & EuroDataCube ; a Jupyter notebook per CCI project.
A Data Management Centre	CCI Open Data Portal : Data curation ; Google Earth Engine deployment ; EOEPCA Common Architecture ; ESA facility data & document preservation
Communications Innovation Lab	Investigating potential for other very high scalability, like LLMs (ChatGPT), gamification, curation of CCI datasets specifically for AI usage downstream, etc.

Knowledge Exchange Project 2024-2027 (CLIMATE-SPACE)

Communications ESA EO Science Strategy – Objective #12	Communications strategy ; Communications management ; supporting events ; venture building ; content production tailoring; channel management ; community liaising ; Communications expertise ; briefing notes
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A Data Management Centre ESA EO Science Strategy – Objective #14	CCI Open Data Portal : Data curation ; Google Earth Engine deployment ; EOEPCA Common Architecture ; ESA facility data & document preservation
Communications Innovation Lab ESA EO Science Strategy – Objective #15	Investigating potential for other very high scalability, like LLMs (ChatGPT), gamification, curation of CCI datasets specifically for AI usage downstream, etc.

Knowledge Exchange Project 2024-2027 (CLIMATE-SPACE)

Your further feedback, inputs and ideas are essential.

Knowledge Exchange plenary – interactive brainstorm

Today @ 3.20-4.10pm

Thank you

Eduardo Pechorro, ESA
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