

C3S: El Servicio de Cambio Climático de Copernicus



Climate Change

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European Centre for Medium-Range Weather Forecasts (ECMWF)

February 2022





Climate
Change

Outline

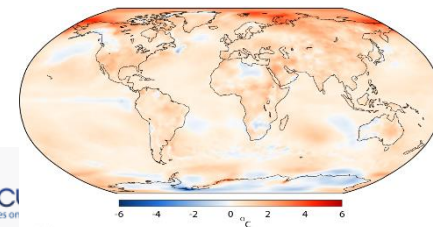
¿ Qué ofrece el Servicio Europeo de Cambio Climático (C3S) ?

¿ Cuáles son los productos más populares al servicio del usuario ?

¿Cómo acceder a los productos de C3S y qué herramientas de apoyo existen ?


¿ Para qué sirven los Sistemas de Información Sectorial (SIS) ?

¿ Algún otro componente en C3S ?



Abierto, completo, gratuito

Sentinels



CLIMATE CHANGE



MARINE MONITORING



ATMOSPHERE MONITORING



LAND MONITORING



SECURITY



EMERGENCY MANAGEMENT

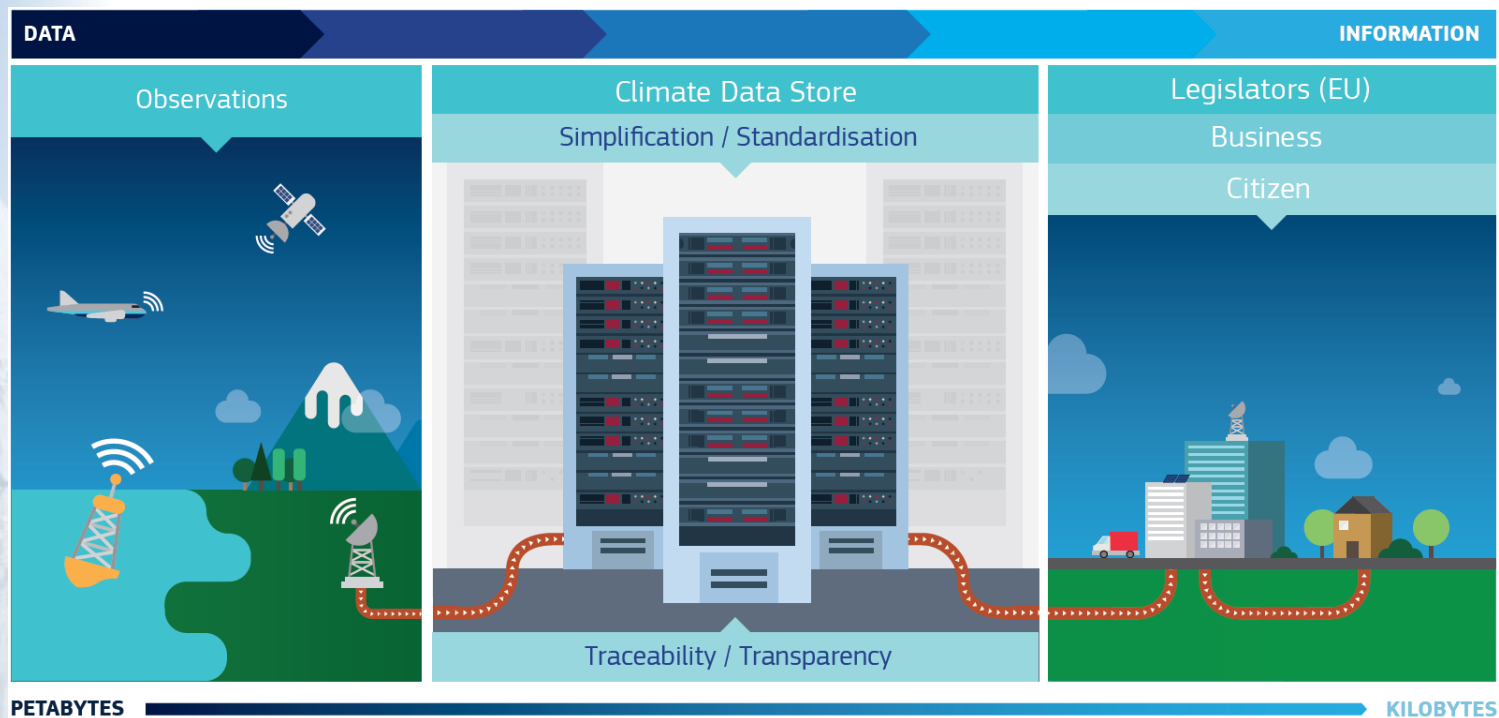
1st MFF (2014-2020): ~ 4300 M€

2nd MFF (2021-2027): ~ 5420 M€



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What is the Copernicus Climate Change Service (C3S)?



authoritative quality-controlled data and information based on Earth Observation about the past, present and future climate;



tools to inform climate change mitigation and adaptation strategies by policy makers and businesses;



examples of best practice in the use of climate information.

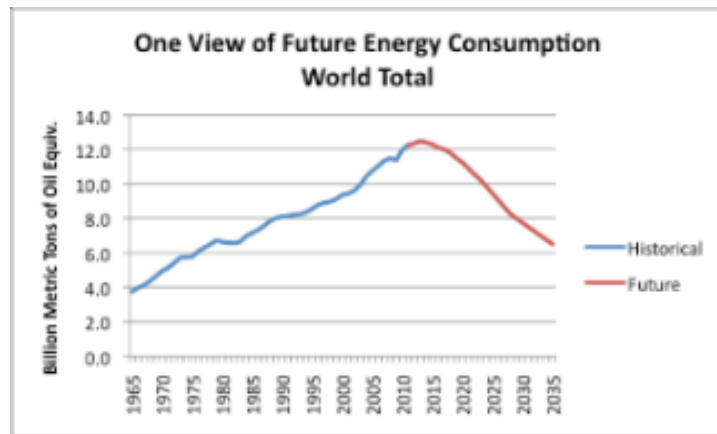
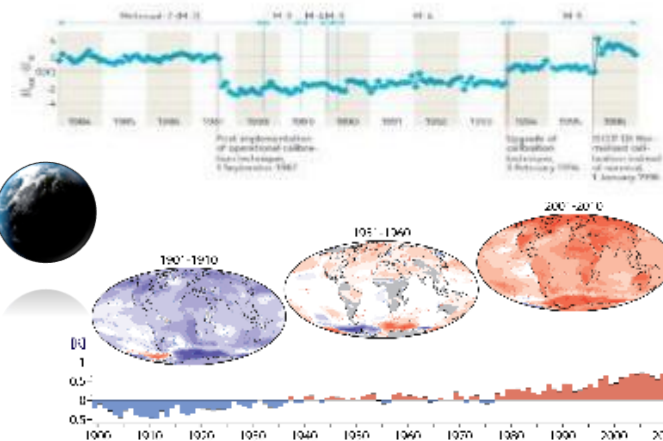


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El Servicio de Cambio Climático (C3S)

Temas tratados en el servicio:

- Cómo está cambiando el clima?
 - Observaciones de la Tierra
 - Reanálisis
- Continuará/se acelerará el cambio climático?
 - Predicciones
 - Proyecciones
- Cuáles son los impactos en la sociedad?
 - Indicadores del clima
 - Información sectorial





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Estructura de C3S

Evaluación & Control Calidad

Garantía de calidad
Integridad del Servicio
Necesidades de usuarios

European commission
e.g., FP7 Space call, H2020

EU estados miembros,
ESA, EUMETSAT, EEA,
WMO..

Climate Data Store

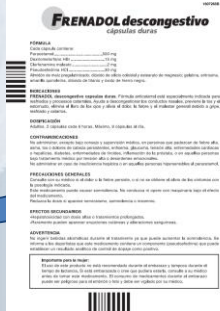
Sistemas de Información Sectorial



Usuarios & stakeholders



Divulgación & difusión





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Outline

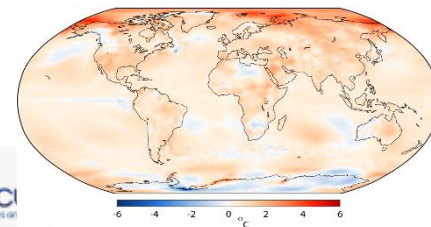
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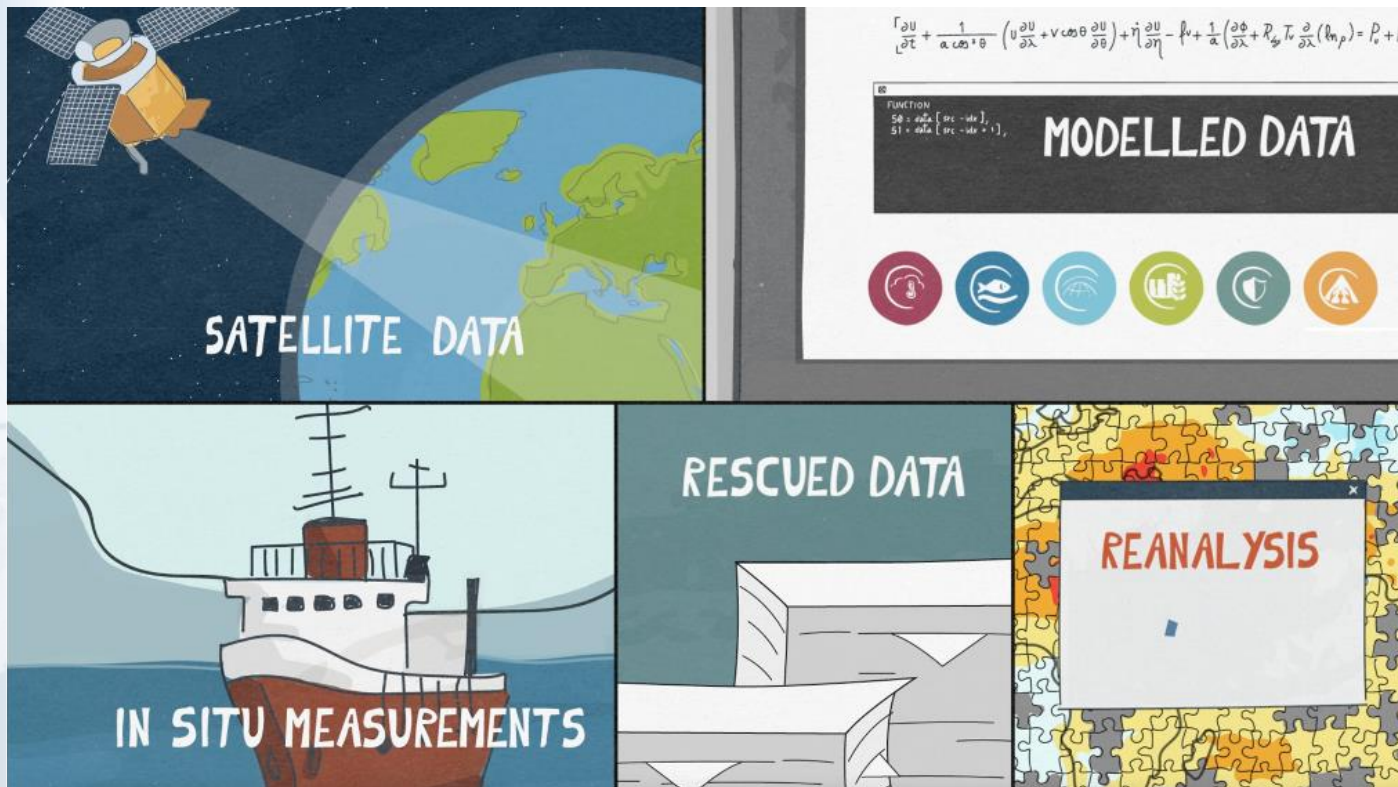
¿ Algún otro componente en C3S ?





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The Climate Data Store – ‘A one stop shop for climate data’

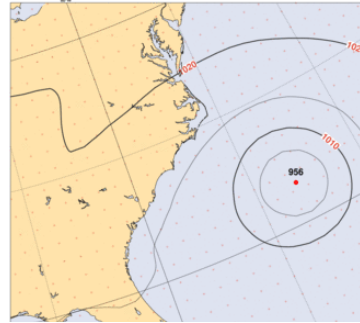




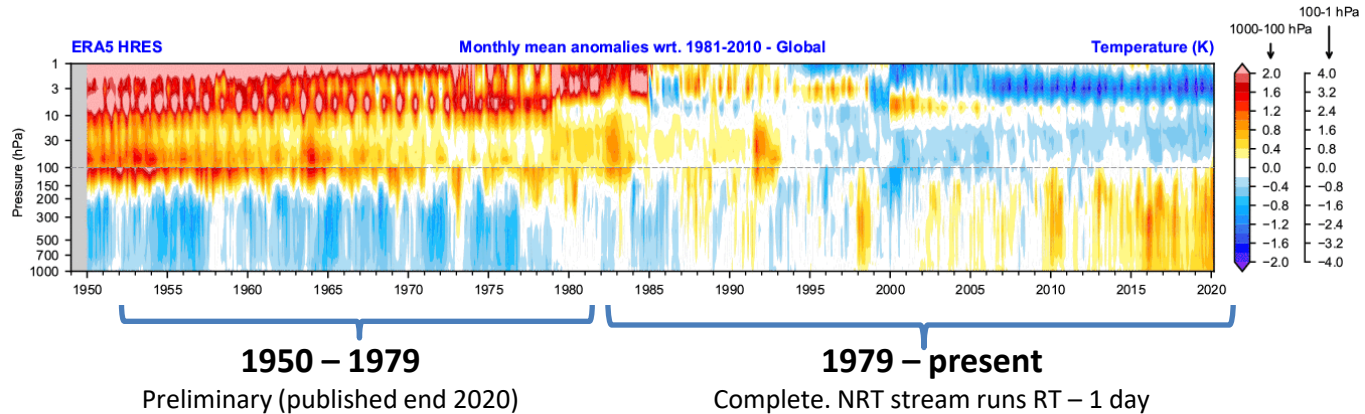
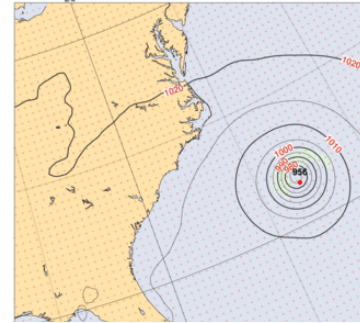
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Maps without gaps: global atmospheric reanalysis ERA5

Florence Thu 13 Sep 2018, 01 UTC for ERA-Interim



Florence Thu 13 Sep 2018, 01 UTC for ERA5



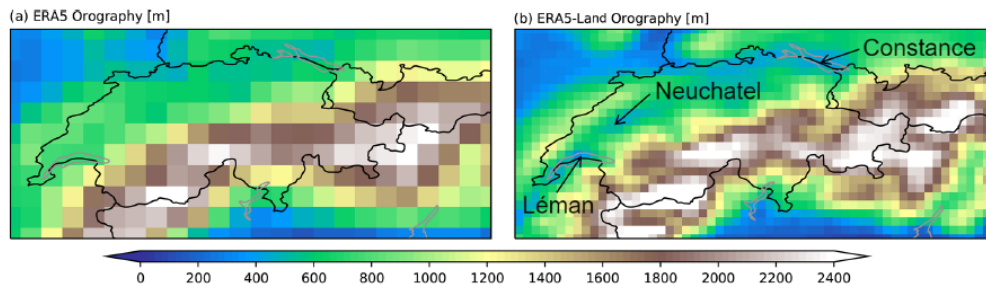
Hersbach et al., 2020 (Quart. J. Roy. Met. Soc.)



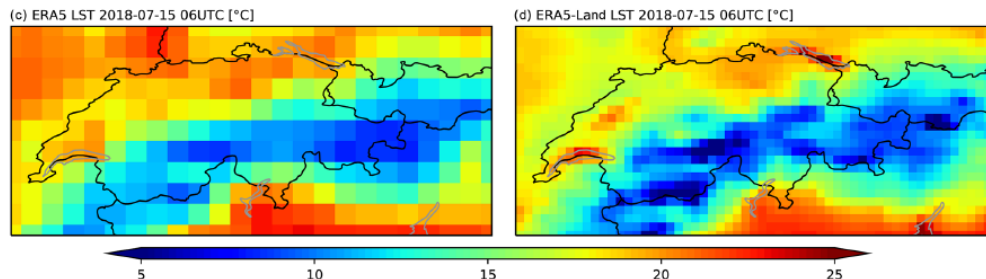
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High-resolution and consistency for the land evolution: ERA5-Land (1950-present)

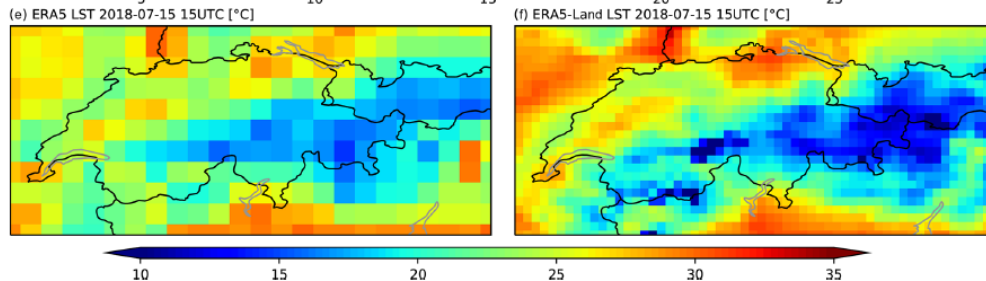
orography



**Soil Temperature
(15 July 2018
06UTC)**



**Soil Temperature
(15 July 2018
15UTC)**



Muñoz-Sabater et al., 2021 (Earth Syst. Sc. Data)



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Essential Climate Variables

We use historical observations from in-situ and satellite sensors to build Climate Data Records of Essential Climate Variables (ECVs)

Required to support the work of the UNFCCC and the IPCC



In total 54 ECVs



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ECVs evolution in C3S (satellite data)

		C3S_312a		C3S_312b			C3S2_312		
	GCOS	2017	2018	2019	2020	2021	2022	2023	2024
Atmospheric physics									
Precipitation	4.3.5								
Surface Radiation Budget	4.3.6								
Water Vapour	4.5.3								
Cloud Properties	4.5.4								
Earth Radiation Budget	4.5.5								
Atmospheric composition									
Carbon Dioxide	4.7.1	Lot 6							
Methane	4.7.2	Lot 6							
Ozone	4.7.4	Lot 4							
Aerosol	4.7.5	Lot 5							
Ocean									
Sea Surface Temperature	5.3.1	Lot 3							
Sea Level	5.3.3	Lot 2							
Sea ice	5.3.5	Lot 1							
Ocean Colour	5.3.7								
Land hydrology & cryosphere									
Lakes	6.3.4								
Glaciers	6.3.6	Lot 8							
Ice sheets and ice shelves	6.3.7								
Soil moisture	6.3.16	Lot 7							
Land biosphere									
Albedo	6.3.9	Lot 9							
Land Cover	6.3.10								
Fraction of Absorbed Photosynth	6.3.11	Lot 9							
Leaf Area Index	6.3.12	Lot 9							
Fire	6.3.15								
		2019	2018	2019	2020	2021	2022	2023	2024

Table 1: From proof-of-concept phase (9 Lots) to operations (5 Lots) of C3S ECV services. The column labelled GCOS shows the relevant section in the GCOS Status Report (GCOS-SR 2015).

Coordination with CM-SAF / ROM SAF / ESA CCI / Uni. Maryland / NASA / NOAA

Coordination with ESA-CCI and other national projects

Coordination with ESA-CCI

Coordination with ESA-CCI, GloboLakes, Arc-Lake, HydroWeb

Coordination with ESA-CCI, CGL, QA4ECV, LSA-SAF

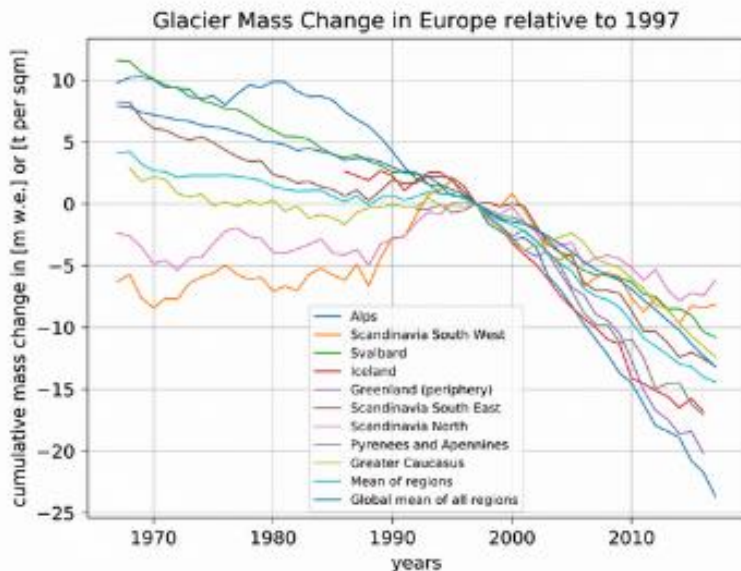


<https://cds.climate.copernicus.eu/#!/search?text=satellite>



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Glaciares



Copernicus



ECMWF

wgms
World Glacier Monitoring Service

Cumulative glacier mass changes in Europe from 1967-2017 for glaciers with long-term records in nine different regions. Cumulative mass balance values are given in the unit 'metre water equivalent (m w.e.)' relative to 1997. Data source: WGMS (2017, updated), Credit: WGMS / Copernicus Climate Change Service

Media global:

- Más de 20m de pérdida del grosor de hielo desde 1960s

Europe:

- La pérdida de hielo de los glaciares basada en observaciones varía entre los 2m en el sudoeste de Escandinavia a 34m en los Alpes

Copernicus
Europe's eyes on Earth

European
Commission

ECMWF



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Climate Predictions – Seasonal Forecasts

C3S multi-system seasonal forecast

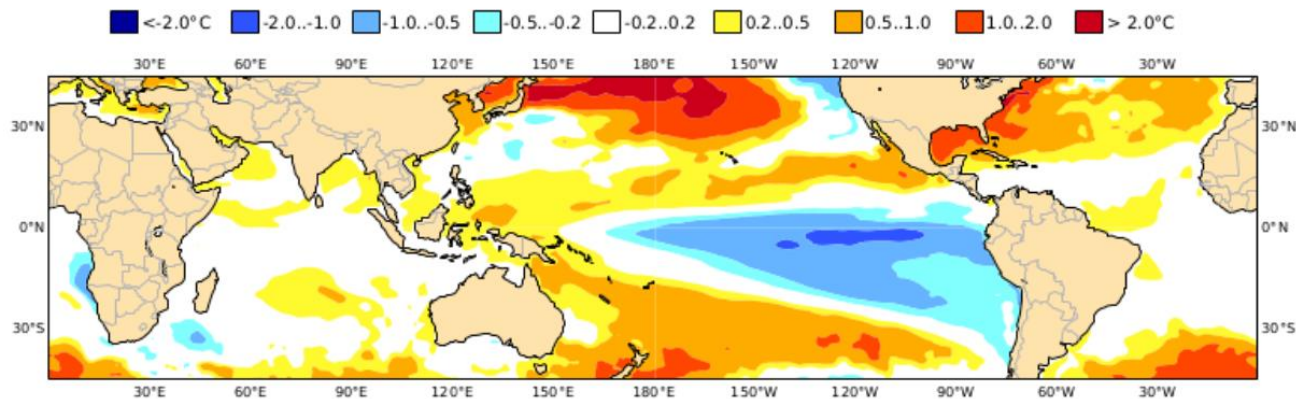
ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC

Mean forecast SST anomaly

FMA 2022

Nominal forecast start: 01/01/22

Variance-standardized mean



- Data – from world-leading producers
- Operational schedule – released monthly (12th of the month)
- Tools and computational environment

Free and open access to all these resources





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C3S Climate Projections

- **CMIP5 simulations:** in the Climate Data Store (CDS) since 2018
- **CMIP6 simulations:** published in CDS in March 2021
 - **New functionality** to improve handling of data **web-processing services**
- **World-wide CORDEX simulations:** European region in the CDS since 2019; continual update with data for other regions

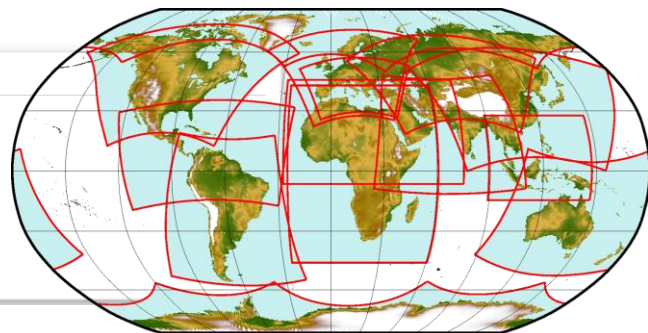
Domain ?

At least one selection must be made

- Africa
- Australasia
- East Asia
- Middle East and North Africa
- South-East Asia

- Antarctic
- Central America
- Europe
- North America
- South Asia

- Arctic
- Central Asia
- Mediterranean
- South America



IMPLEMENTED BY





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Outline

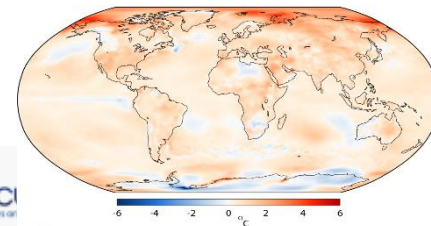
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The Climate Data Store

The screenshot shows the homepage of the Climate Data Store. At the top, there are logos for the European Union, Copernicus, and ECMWF, along with the text 'Climate Change Service'. A navigation bar includes links for Home, Search, Datasets, Applications, Your requests, Toolbox, FAQ, and Live. A prominent red banner displays '116,000 + users'. Below this, a central message reads 'Welcome to the Climate Data Store' and 'Dive into this wealth of information about the Earth's past, present and future climate.' It states that the service is free and provides a search bar with a dropdown menu and a 'Search' button. Three featured sections are visible: 'Climate Data Store Toolbox' with a line graph, 'Climate Data Store API' with a code snippet, and 'Access the CDS Forum' with a blue abstract image. The footer contains logos for the European Union, Copernicus, and ECMWF, along with links for 'About CDS', 'Contact us', 'Cookies', 'Disclaimer', and 'Privacy'.

<https://cds.climate.copernicus.eu>

The **Climate Data Store** also called CDS, is an **online open and free service**.

It allows users to browse and access the wide range of climate datasets via a searchable catalogue...

... It allows users to build their own applications, maps and graphs



Climate Change

... and a consistent and simple meta(data) access

Home Search Datasets Applications Toolbox FAQ Live

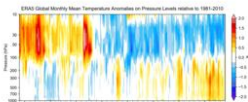
Your feedback helps us to improve the service

Log in/register

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 4 to 7 decades. Currently data is available from 1979. When complete, ERA5 will contain a detailed record from 1950 onwards. ERA5 replaces the ERA-Interim reanalysis.



Reanalysis combines observations into globally complete fields using the laws of physics with the method of data assimilation (4D-Var in the case of ERA5). ERA5 provides hourly estimates for a large number of atmospheric, ocean-wave and land-surface quantities. An uncertainty estimate is sampled by an underlying 10-member ensemble at three-hourly intervals. Ensemble mean and spread have been pre-computed for convenience. Such uncertainty estimates are closely related to the information content of the available observing system which has evolved dramatically over time. They also indicate flow-dependent sensitive areas.

The native resolution of the ERA5 atmosphere and land reanalysis is 31km on a reduced Gaussian grid (T1639) and 63km (TL1319) for the ensemble members. Ocean-wave products are produced at 0.36 degrees and 1 degree for the ensemble. The atmospheric component consists of 137 levels in the vertical from the surface up to 1 Pa (about 80km). This spans the troposphere, stratosphere and mesosphere. There are both analysis fields and short forecast fields that link the assimilation windows used in 4D-Var. A detailed description can be found in the online ERA5 documentation. The full data set resides in the MARS tape archive.

The data presented here is a post-processed subset of the full ERA5 data set. It is online on spinning disk, which should ensure fast and easy access. It should satisfy the requirements for most common applications.

Data has been regridded to a regular lat-lon grid of 0.25 degrees for the reanalysis and 0.5 degrees for the uncertainty estimate (0.5 and 1 degree respectively for ocean waves). There are two main sub sets: data on pressure levels and data on single levels. The data on pressure levels contain 16 atmospheric quantities on 37 pressure levels from 1,000 hPa (surface) to 1 hPa (around the top of the stratosphere). Single-level data are available for a number of atmospheric, ocean-wave and land surface quantities.

Data is available on their hourly (three-hourly) resolution. To facilitate many climate applications, monthly-mean averages have been calculated as well. Though, no monthly means are available for ensemble mean and spread.

Monthly mean updates are available about 3 days after the end of the month. Initial release date, i.e. data no more than three months behind real time, is called ERA5T. In the event that serious flaws are detected in ERA5T, this data could be different to the final ERA5 data. In practice, though, this will be very unlikely to occur. Based on experience with the production of ERA5 so far (and ERA-Interim in the past), our expectation is that such an event would not occur more than once every few years, if at all. In the unlikely event that such a correction is required, users will be notified as soon as possible.

The record in this page links to the "ERA5 monthly averaged data on pressure levels".

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Global
Horizontal resolution	Reanalysis: 0.25°x0.25° Ensemble members: 0.5°x0.5°
Vertical coverage	1000 hPa to 1 hPa
Vertical resolution	37 pressure levels
Temporal coverage	1979 to present
Temporal resolution	Hourly

Download form

levels from 1979 to present

Overview Download data Quality assessment Documentation

Product type

At least one selection must be made

Monthly averaged reanalysis Monthly averaged analysis by hour of day

Monthly averaged ensemble members Monthly averaged ensemble members by hour of day

Variable

At least one selection must be made

Divergence Fraction of cloud cover

Geopotential Geostrophic wind

Potential vorticity Relative humidity

Specific cloud ice water content Specific cloud liquid water content

Specific humidity Specific rain water content

Specific snow water content Temperature

U component of wind U component of wind (relative)

Vertical velocity Vertical velocity (relative)

Pressure level

At least one selection must be made

1 hPa 2 hPa 3 hPa 5 hPa 7 hPa 10 hPa

131 hPa 150 hPa 170 hPa 190 hPa 210 hPa

Contact: copernicus-support@ecmwf.int

Licence: Licence to Use Copernicus Products

Publication date: 2019-04-18

Overview

Contact: copernicus-support@ecmwf.int

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Publication date: 2019-04-18

EQC Information

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

This is a new feature, work in progress. Should any inconsistency be found, please report to copernicus.support@ecmwf.int

The EQC function is a new function of the Copernicus Quality and Control (EQC) function of CIS. EQC encompasses a specific quality harmonized across all dataset types available through the CIS. The EQC function is a new function of the Copernicus Quality and Control (EQC) function of CIS. EQC encompasses a specific quality harmonized across all dataset types available through the CIS. The EQC function is a new function of the Copernicus Quality and Control (EQC) function of CIS. EQC encompasses a specific quality harmonized across all dataset types available through the CIS.

Coming very soon (still under validation)

Contact us: Cookies, Disclaimer / Privacy

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

- ERA5 reference: Reference for the ERA5 reanalysis.
- ERA5 data documentation: Detailed information relating to the ERA5 data archive can be found in the web link above.

Contact: copernicus-support@ecmwf.int

Licence: Licence to Use Copernicus Products

Publication date: 2019-04-18

Documentation



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... and a consistent and simple meta(data) access

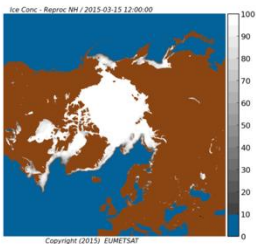
Download form

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview

Overview Download data Quality assessment Documentation

This dataset provides daily values for sea ice **concentration**, sea ice **edge** and sea ice **type** and monthly values for sea ice **thickness**. These four variables are important markers for climate change studies since sea ice greatly influences the surface albedo and exchanges of energy, moisture and carbon. The sea-ice distribution, including polynas and margins, also has an important influence on marine ecosystems. Changes in the distribution of sea ice affect these ecosystems and a number of activities such as shipping, logistic and tourist operations.



Sea ice edge, sea ice concentration and sea ice type were computed from satellite passive microwave brightness temperatures from the series of SMMR, SSM/I and SSMIS sensors. Sea ice thickness were computed from Ku-Band radar altimeter measurements collected during the Envisat and CryoSat-2 satellite missions. Ice thicknesses from Envisat satellite (October 2002 to October 2010) have less coverage and higher uncertainty than thicknesses from CryoSat-2 satellite (November 2010 - March 2015), however the combined dataset provides a valuable unique observational record of sea ice variability.

From 1978 up to April 2015 the data records provided by this dataset have sufficient length, consistency, and continuity to detect climate variability and change. From April 2015 onwards, satellite data were processed using the same algorithms and processing environment but consistency and continuity have not been extensively verified.

This dataset is produced on behalf of C3S, with the exception of sea ice concentration which is produced at the EUMETSAT Satellite Application Facility on Ocean and Sea Ice (OSI SAF).

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Sea ice concentration and edge: global ocean split in Northern and Southern hemisphere (Lambert EA projection). Sea ice thickness and type: northern hemisphere (Lambert EASE2 projection).
Horizontal resolution	Sea ice concentration and edge: 12.5 km grid resolution (true spatial resolution is about 40-50 km respectively). Sea ice thickness and type: 25 km grid resolution (true spatial resolution is about 1-10 km and 4 respectively).
Temporal coverage	Sea ice concentration: 1978 to present. Sea ice thickness: 2002 to present. Sea ice edge: 1979 to present. Sea ice type: 1979 to present.
Temporal resolution	Sea ice concentration, edge and type: daily (every second day in the period 1978-1987). Sea ice thickness: monthly (Arctic winter months from October - April).

Contact

copernicus-support@ecmwf.int

Licence

Licence to Use Copernicus Products
EUMETSAT OSI SAF products licence

Publication date

2018-06-14

EQC Information

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview Download data Quality assessment Documentation

- Product user guide for sea ice thickness. (2.9M PDF)
- Product user guide for sea ice type and edge. (1.2M PDF)
- Product user guide for sea ice concentration. (487.8K PDF)

The above documents summarize the characteristics of the dataset(s) in a concise manner with focus on: space and time extent and resolution; data formats, metadata and flags; descriptions of variables, strengths and limitations.

- Algorithm theoretical baseline document for sea ice thickness. (2.1M PDF)
- Algorithm theoretical baseline document for sea ice concentration. (489.5K PDF)
- Algorithm theoretical baseline document for sea ice type and edge. (2.9M PDF)

The above documents provide in-depth documentation on the algorithms used to derive the dataset(s).

- Product quality assessment report for sea ice thickness. (2.7M PDF)
- Product quality assessment report for sea ice concentration. (478.7K PDF)
- Product quality assessment report for sea ice type and edge. (1.1M PDF)

The above documents provide the latest report on data quality obtained according to methodologies described in the product quality assurance document.

Coming very soon (still under validation)

Documentation



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... with a robust CDS API access

<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input checked="" type="checkbox"/> 09
<input type="checkbox"/> 13	<input type="checkbox"/> 14	<input type="checkbox"/> 15
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<input type="checkbox"/> 25	<input type="checkbox"/> 26	<input type="checkbox"/> 27
<input type="checkbox"/> 31		

Format ⓘ

Zip file (.zip)

Terms of use

GHG-CCI Licence [View terms](#)

Please go to [the documentation page](#) for information on how to use the API.

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'satellite-methane',
    {
        'format': 'zip',
        'processing_level': 'level_2',
        'variable': 'xch4',
        'sensor_and_algorithm': 'sciamachy_wfmd',
        'year': '2004',
        'month': '03',
        'day': '09'
    },
    'download.zip')
```

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'satellite-methane',
    {
        'format': 'zip',
        'processing_level': 'level_2',
        'variable': 'xch4',
        'sensor_and_algorithm': 'sciamachy_wfmd',
        'year': '2004',
        'month': '03',
        'day': '09'
    },
    'download.zip')
```

pip install cdsapi

<https://cds.climate.copernicus.eu/api-how-to>

European
Commission





Climate Change

... with a workflow editor

00 Hello World

```

1 import cdstoolbox as ct
2
3 def application(title='Hello World!')
4     def output_figure():
5         """
6         HELLO WORLD!
7         This is your first application using the CDS Toolbox.
8         See, 3 basic tasks:
9         - retrieve the 2 meter temperature from the CDS
10        - print info about the data (see it in the 'Console'
11        tab)
12        - show the data on a map.
13        """
14
15        data = ct.catalogue.retrieve(
16            'reanalysis-era5-single-levels',
17            {
18                'variable': '2m_temperature',
19                'product_type': 'reanalysis',
20                'year': '2017',
21                'month': '01',
22                'day': '01',
23                'time': '12:00',
24                'grid': ['3', '3'],
25            })
26
27        print(data)
28
29        fig = ct.cdplot.geomap(data, title='01 January 2017')
30
31        return fig
32
33
34
35
36

```

Hello World!
01 January 2017

Min tested browsers: Chrome 60, Firefox 52, Safari 10.1, Edge 15

CDS Toolbox editor

41 Calculate GDD

```

1 import cdstoolbox as ct
2
3
4 def temp_cumsum(year):
5     data = ct.catalogue.retrieve(
6         'reanalysis-era5-single-levels',
7         {
8             'variable': '2m_temperature',
9             'grid': ['3', '3'],
10            'product_type': 'reanalysis',
11            'year': list(range(year, year + 1)),
12            'month': list(range(1, 12)),
13            'day': list(range(1, 31)),
14            'time': [
15                '09:00', '01:00', '02:00',
16                '03:00', '04:00', '05:00',
17                '06:00', '07:00', '08:00',
18                '09:00', '10:00', '11:00',
19            ])
20
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```

Growing degree days (>10) for the Chateau de Rouillac, Pessac-Leognan

Min tested browsers: Chrome 60, Firefox 52, Safari 10.1, Edge 15

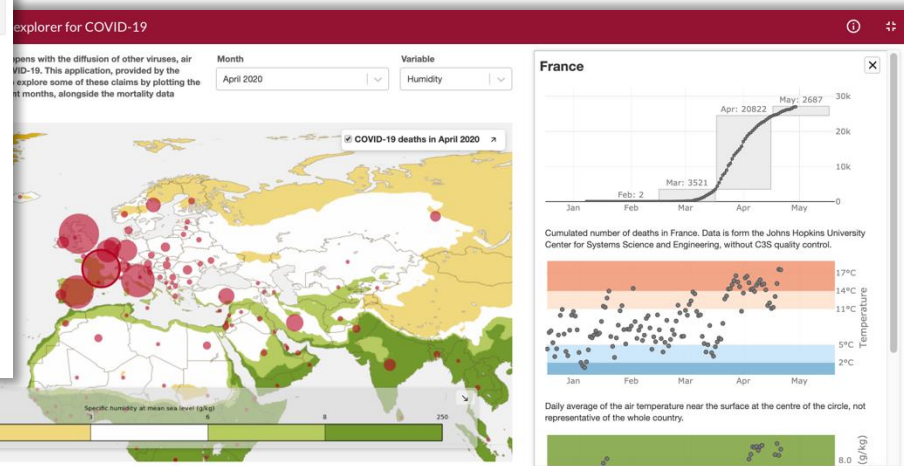
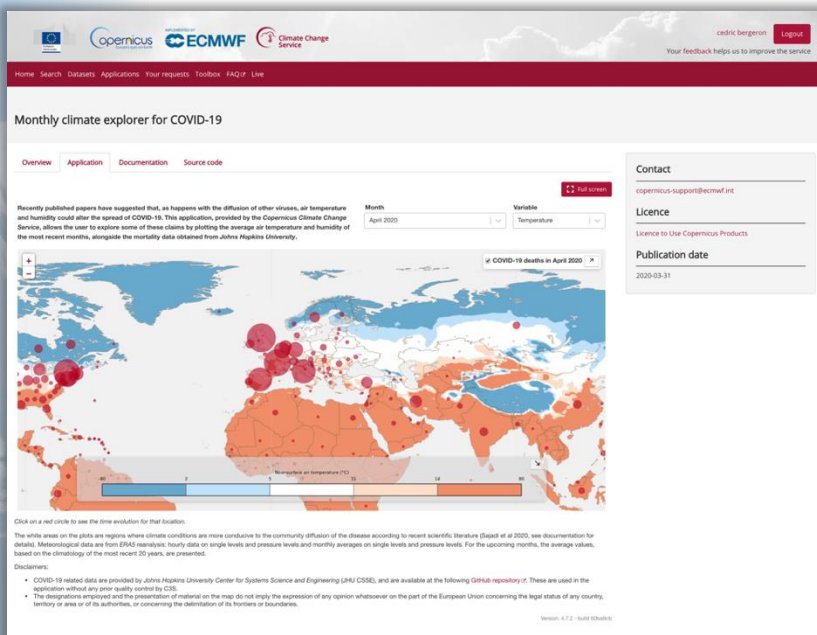
Python based workflows



Climate Change

... transforming workflows into public applications

Fast Toolbox application development in the COVID-19 crisis context



Improved visualisation tools and caching system (for a very fast response time)

Click on a red circle to see the time evolution for that location.

The white areas on the plots are regions where climate conditions are more conducive to the community diffusion of the disease according to recent scientific literature (Sajadi et al 2020, see documentation for details). Meteorological data are from ERA5 reanalysis: hourly data on single levels and pressure levels and monthly averages on single levels and pressure levels. For the upcoming months, the average values, based on the climatology of the most recent 20 years, are presented.

Disclaimers:

- COVID-19 related data are provided by Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE), and are available at the following [GitHub repository](#). These are used in the application without any prior quality control by CSS.
- The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.



Opemicus

IMPLEMENTED BY
ECMWF

Version: 4.7.2 - build 60balbc

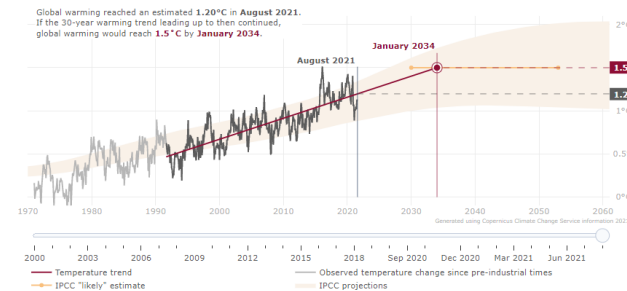


Global temperature trend monitor

Overview Application Documentation Source code

How close are we to reaching a global warming of 1.5°C?

Reaching 1.5°C of global warming - a limit agreed under the Paris agreement - may feel like a very distant reality, but it might be closer than you think. Experts suggest it is likely to happen between 2030 and the early 2050s. See where we are now and how soon we would reach the limit if the warming continued at today's pace. Use the slider to explore how the estimate changes in time.



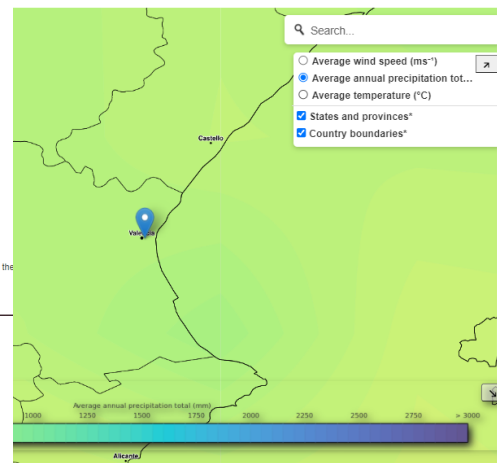
In this application:

- "Global warming" at a point in time refers to the increase in a 30-year average, centred on the specified time, of Earth's global surface temperature relative to the pre-industrial period.
- "Reaching the limit" refers to the moment when the central time of the 30-year average temperature equals 1.5°C above pre-industrial values;
- "Pre-industrial values" refers to the approximation of the surface air temperature of this era from the IPCC "Global warming of 1.5°C" report.

Datasets explorers

for a city to discover a range of local climate statistics for the period 1979-

in ECMWF atmospheric reanalysis of the global climate. Inspired by [Lobelia's Past Climate Explorer](#).



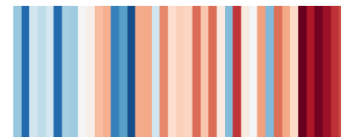
aterial on the map do not imply the expression of any opinion whatsoever on the part of the European Union or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Position: 39.48°N, 0.39°W

Temporal aggregation: Annual Variable: Temperature anomaly

Warming stripes provide an at-a-glance view of yearly temperature trends in Valencia for the period 1979-2020.

The colour of each stripe represents the **temperature anomaly** for a given year, or how much warmer (red) or colder (blue) that year was relative to the **long-term reference period** of 1981-2010.



Warming stripes inspired by [#ShowYourStripes](#).



Climate
Change

Outline

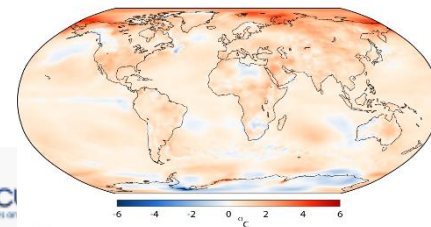
¿ Qué ofrece el Servicio Europeo de Cambio Climático (C3S) ?

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¿ Algún otro componente en C3S ?





Climate Change

What is the SIS and how it works



Agriculture



Insurance



Biodiversity



Shipping



Coastal areas



Storm surges



Energy



Tourism



Health



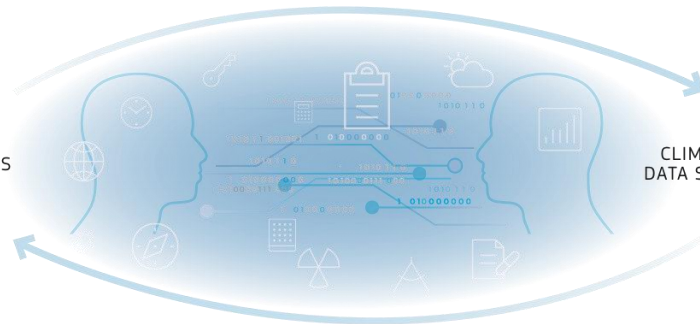
Water management



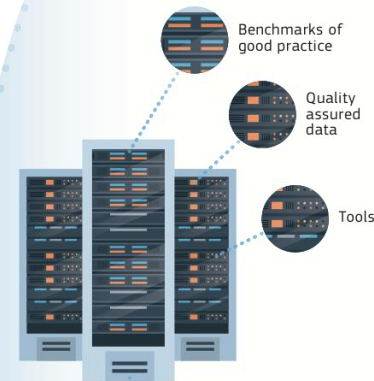
Infrastructure



USERS



CLIMATE DATA STORE



PRACTICAL EXAMPLES

Documentation



Tools and applications



Case studies



Sector relevant data





Climate
Change

User-relevant applications for impacts

The service chain produces climate knowledge relevant for supporting adaptation strategies in different sectors



Infrastructure, Transport
and Associated
Standards



Biodiversity



Energy



Disaster risk reduction



Health



Water management



Insurance



Coastal areas



Agriculture and forestry



Tourism

<https://climate.copernicus.eu/sectoral-specific-challenges>



Climate
Change

Case study in the biodiversity sector

Climate change impacts on the biodiversity of Tropical Ecosystems

- Los objetivos de desarrollo de Costa Rica están muy ligados a la biodiversidad, energías alternativas y agua.
- Información climática de calidad es escasa y por tanto el apoyo a políticas futuras de adaptación al cambio climático es un desafío.
- ¿Se puede proporcionar información climática adaptada al territorio e indicadores de biodiversidad relevantes proyectados en el futuro para la protección de los habitats naturales?

Resultados potenciales: Los resultados finales podrían ayudar las autoridades nacionales a la mejor gestión de áreas protegidas y el establecimiento de corredores biológicos (áreas sensibles al clima)





Climate
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Case study in the biodiversity sector

Methodology

- global data (GCM and GCM-CMIP5 ensemble bias-corrected to Hydro-GFD at 50km)
- Local station data



Land-use based biodiversity indicators were calculated for the national bio-corridor program

Land-use based biodiversity indicators were calculated for the national bio-corridor program

Precipitation & temperature based on local interpolated station data

National Holdridge Life Zone (HLZ) ecosystem classification as a biodiversity indicator

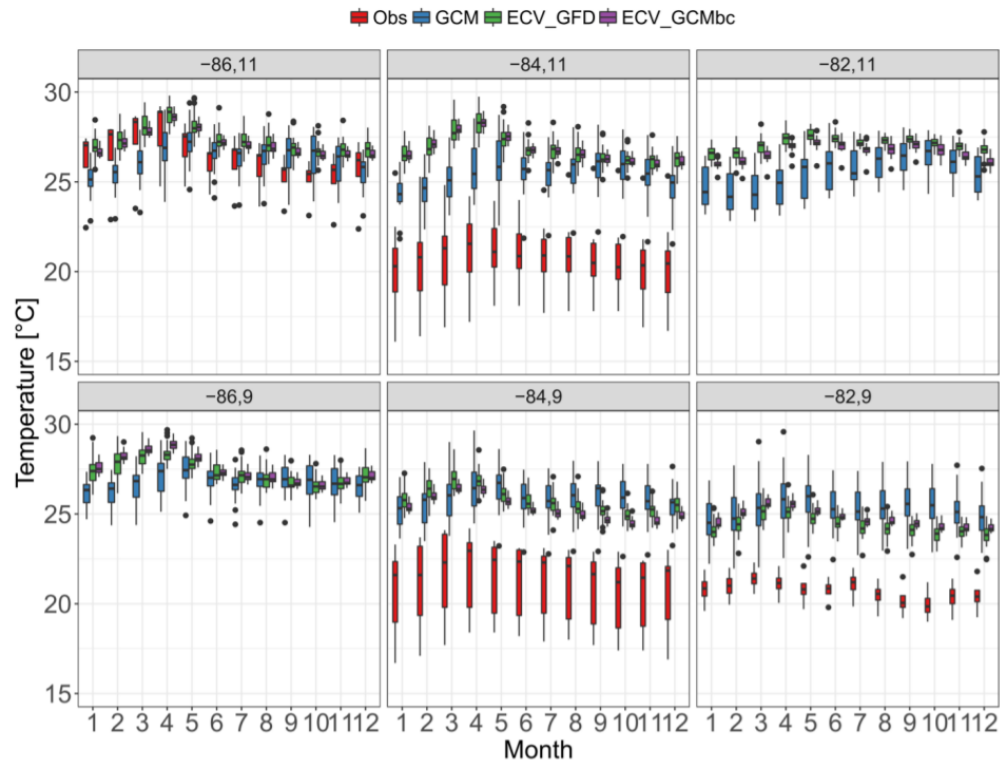


Climate
Change

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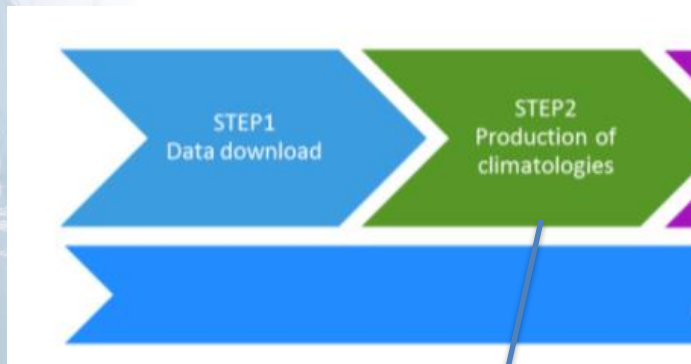




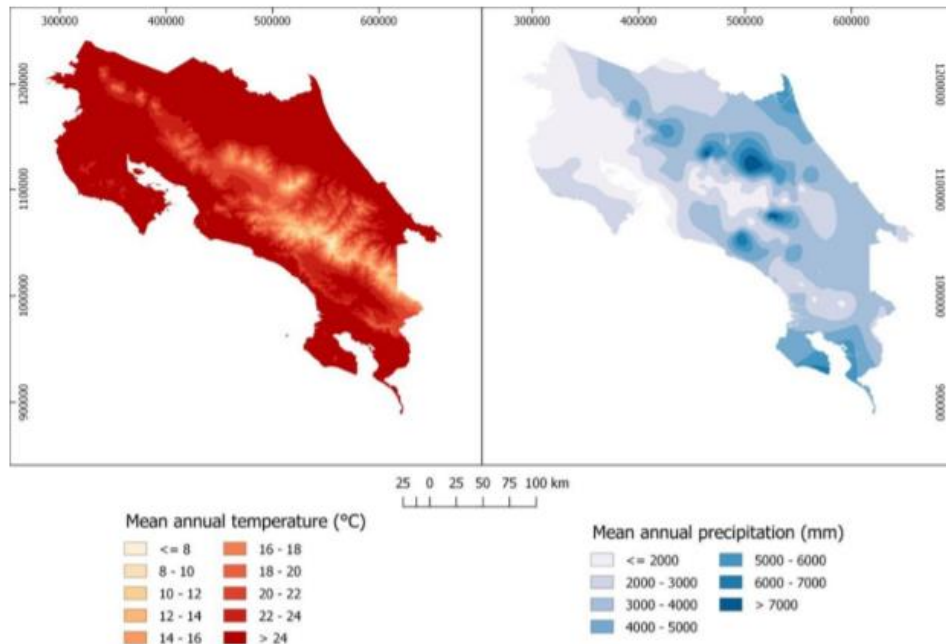
Climate
Change

Case study in the biodiversity sector

Methodology



Precipitation & **temperature** based on local interpolated station data



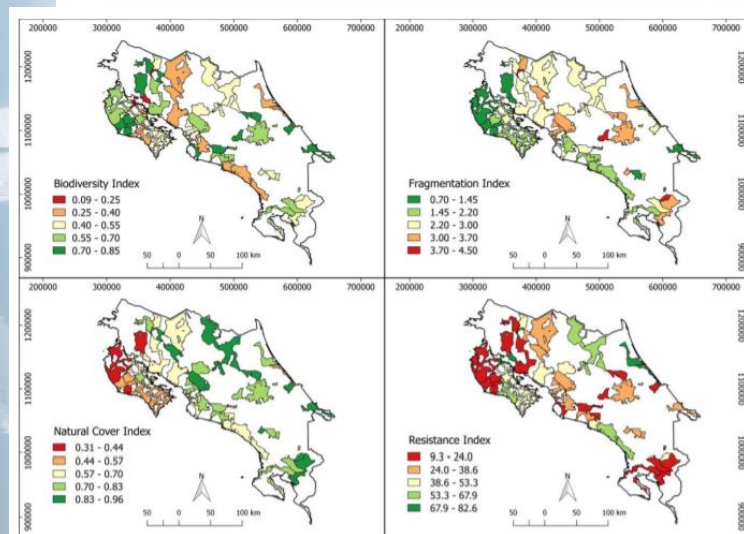


Climate
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Case study in the biodiversity sector

Methodology

Land-use based
biodiversity
indicators were
calculated for the
national bio-corridor
program



STEP3
Calculation of
land-use based
indicators

STEP4
Calculation of
biodiversity
indicators

STEP5
Merging of
indicators and
projection

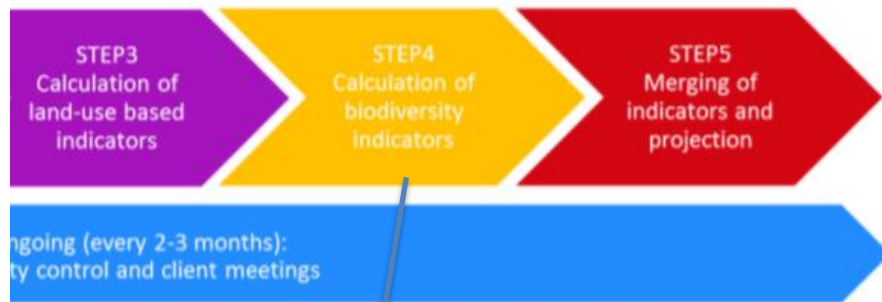
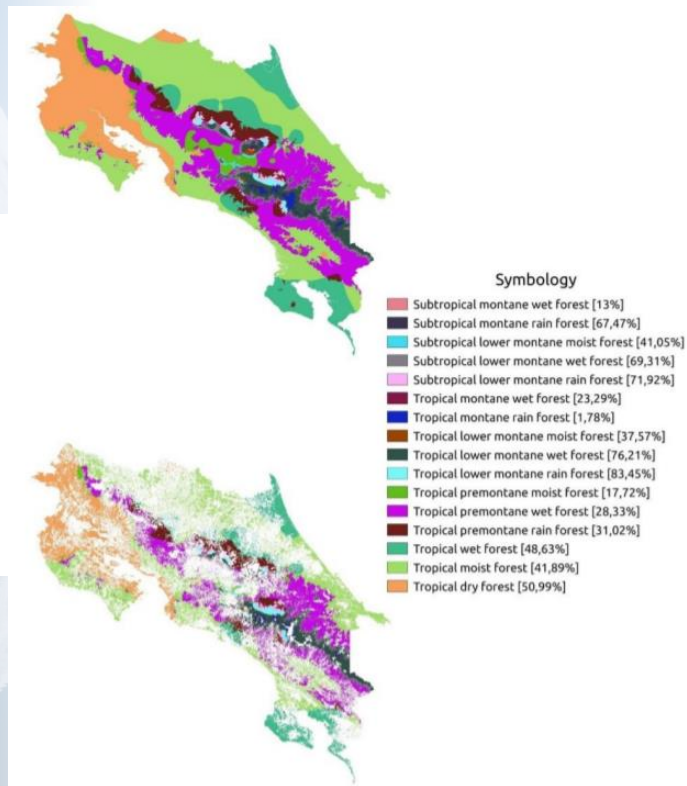
Ongoing (every 2-3 months):
quality control and client meetings



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Case study in the biodiversity sector

Methodology



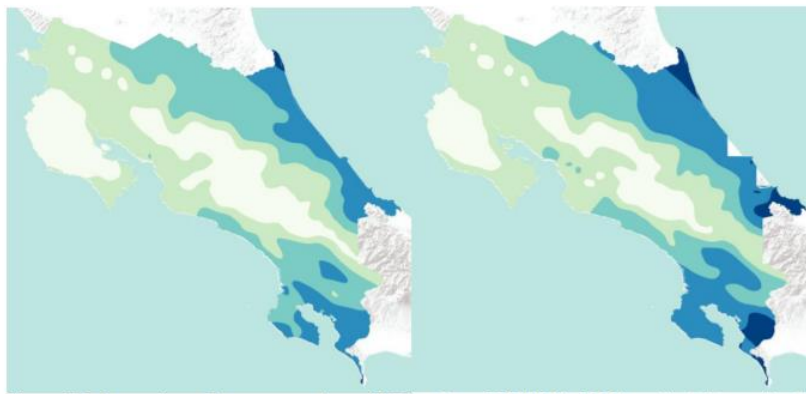
National Holdridge Life
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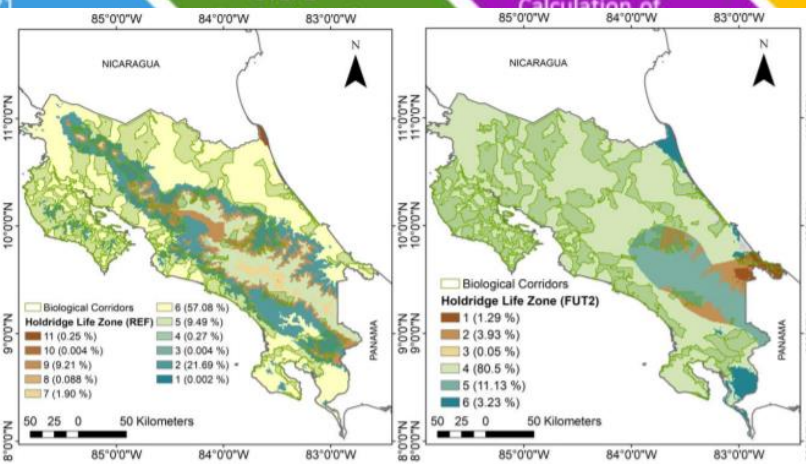
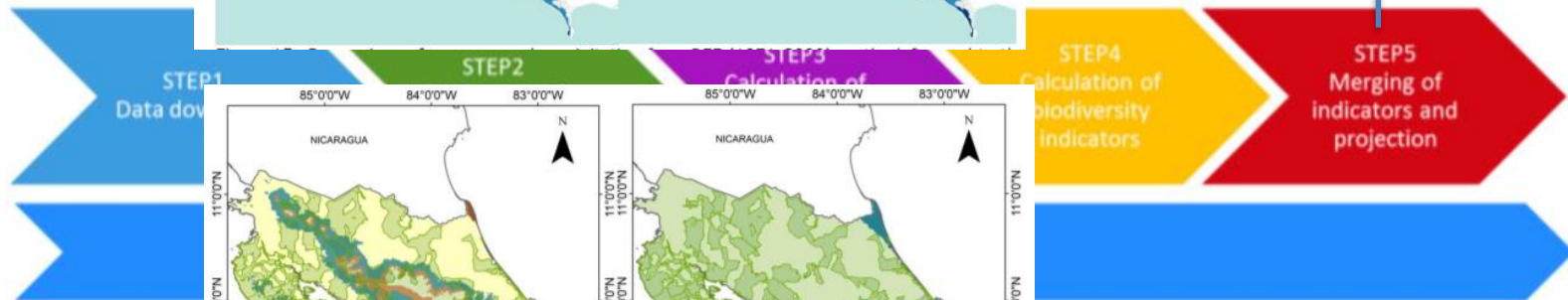
Climate Change

Case study in the biodiversity sector

Methodol



Land-use based biodiversity indicators were calculated for the national bio-corridor program





Climate
Change

Case study in the biodiversity sector

Conclusiones

- Probable tendencia de incremento de la temperatura media de Costa Roca alrededor de 1.5 °C hasta 2040.
- La tendencia de la precipitation muestra, en general, condiciones más húmedas y más prominentes en el Caribe y Pacífico Sur, aunque no se observa una sequedad en el norte de Costa Rica para el 2040.
- Cambios en los patrones actuales are mayoritariamente debidos a la tendencia de incremento de temperaturas en el país, independientemente de la altitude.
- Los cambios tienen más probabilidad de ocurrir a las alturas más elevadas, contrastando con los ecosistemas más resistentes a bajas altitudes.

→ Estos resultados pueden utilizarse para incrementar la resiliencia de los ecosistemas a través de medidas de adaptación para proteger los ecosistemas con mayor biodiversidad y más sensibles a cambios climáticos.



Climate
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Outline

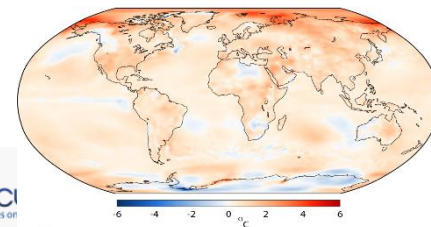
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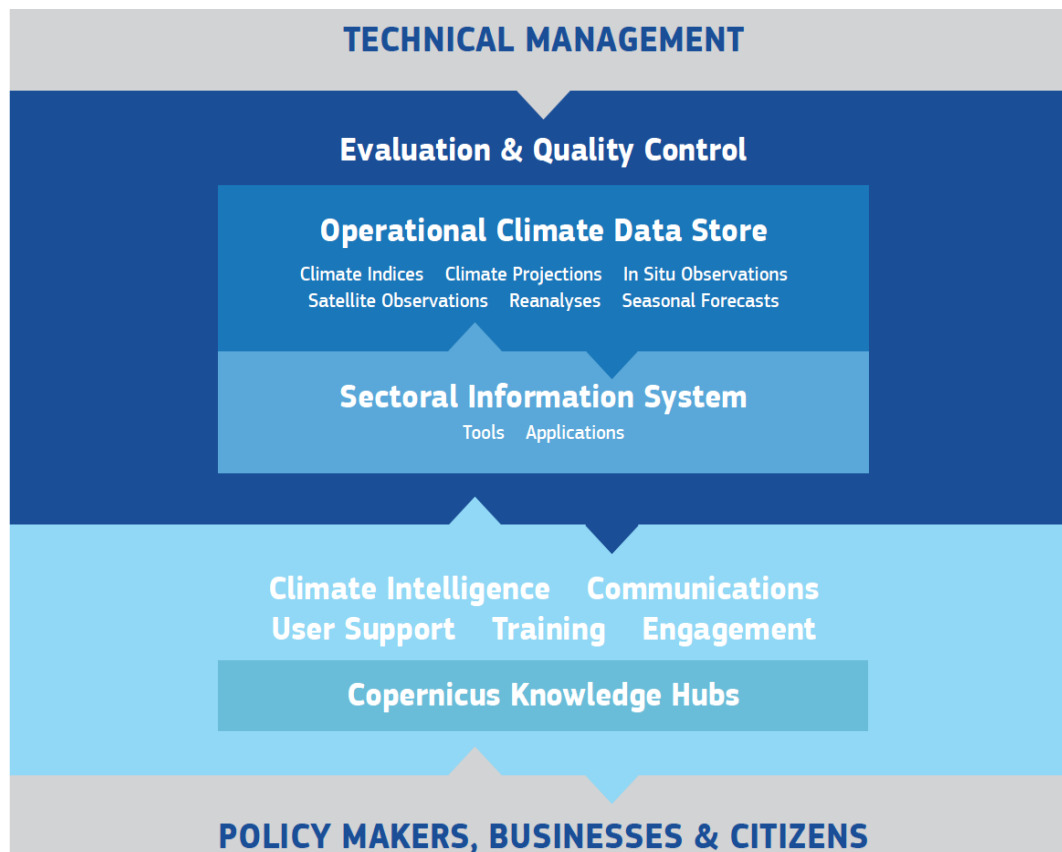
¿ Algún otro componente en C3S ?





Climate
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In summary....





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Can you answer these questions?

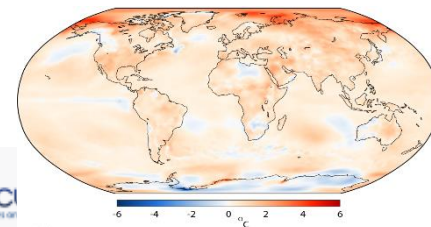
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Climate Change

We provide authoritative information about the past, present and future climate, as well as enable climate change mitigation and adaptation strategies by policy makers and business.

<https://climate.copernicus.eu>



@j_munoz_sabater
@CopernicusECMWF

Key products and services



Climate bulletins



Climate Data Store



Data in action



The European State of the Climate 2020, an essential snapshot of the region and a useful benchmark for future assessments of the environment.

In focus