

C3S: El Servicio de Cambio Climático de Copernicus



Climate Change

Joaquín Muñoz Sabater
European Centre for Medium-Range Weather Forecasts (ECMWF)

Introducción a los servicios climáticos – Universidad Politécnica de Valencia, 11 July 2022

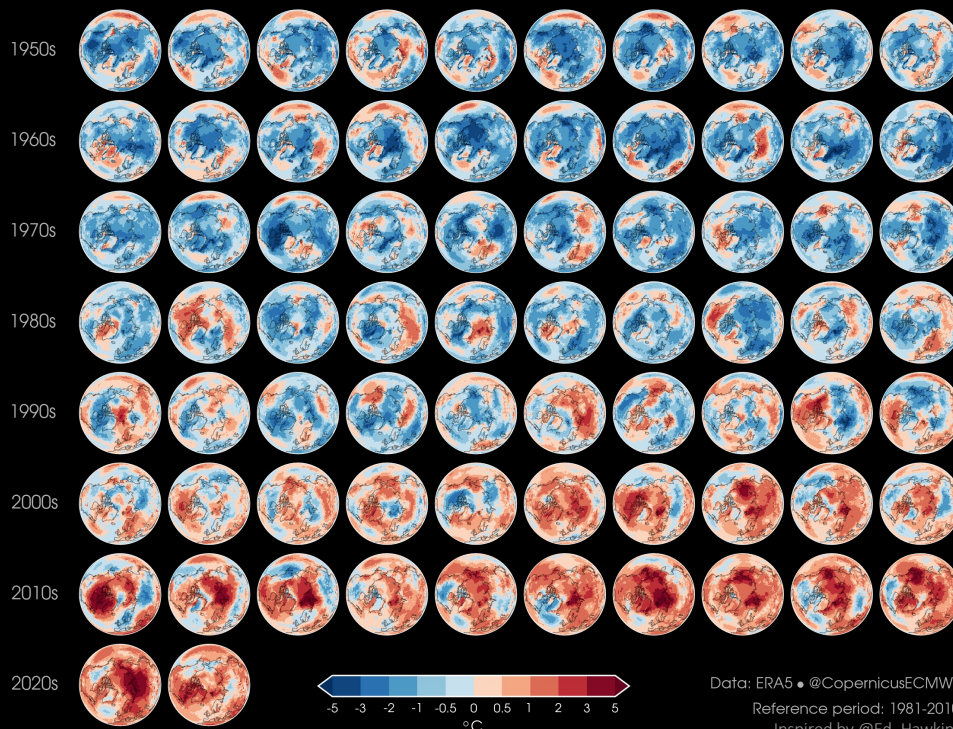




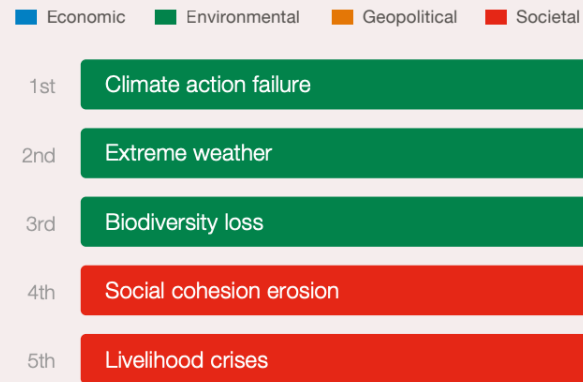
Climate Change

Climate insights have never been more important

Mapping changes in surface temperature: every year from 1950 to 2021



World Economic Forum 2022: Global Risks Report: “most severe risks on a global scale over the next 10 years”



There are more climate related disasters now than ever before. Improving our ability to describe them and predict them would equip our society to better manage them.



PROGRAMME OF THE EUROPEAN UNION



implemented by ECMWF



Climate
Change

Outline

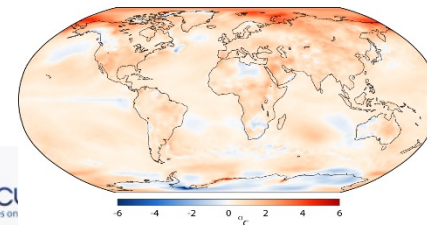
¿ Qué es el Servicio Europeo de Cambio Climático (C3S) ?

¿ Qué productos se ofrecen ?

¿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

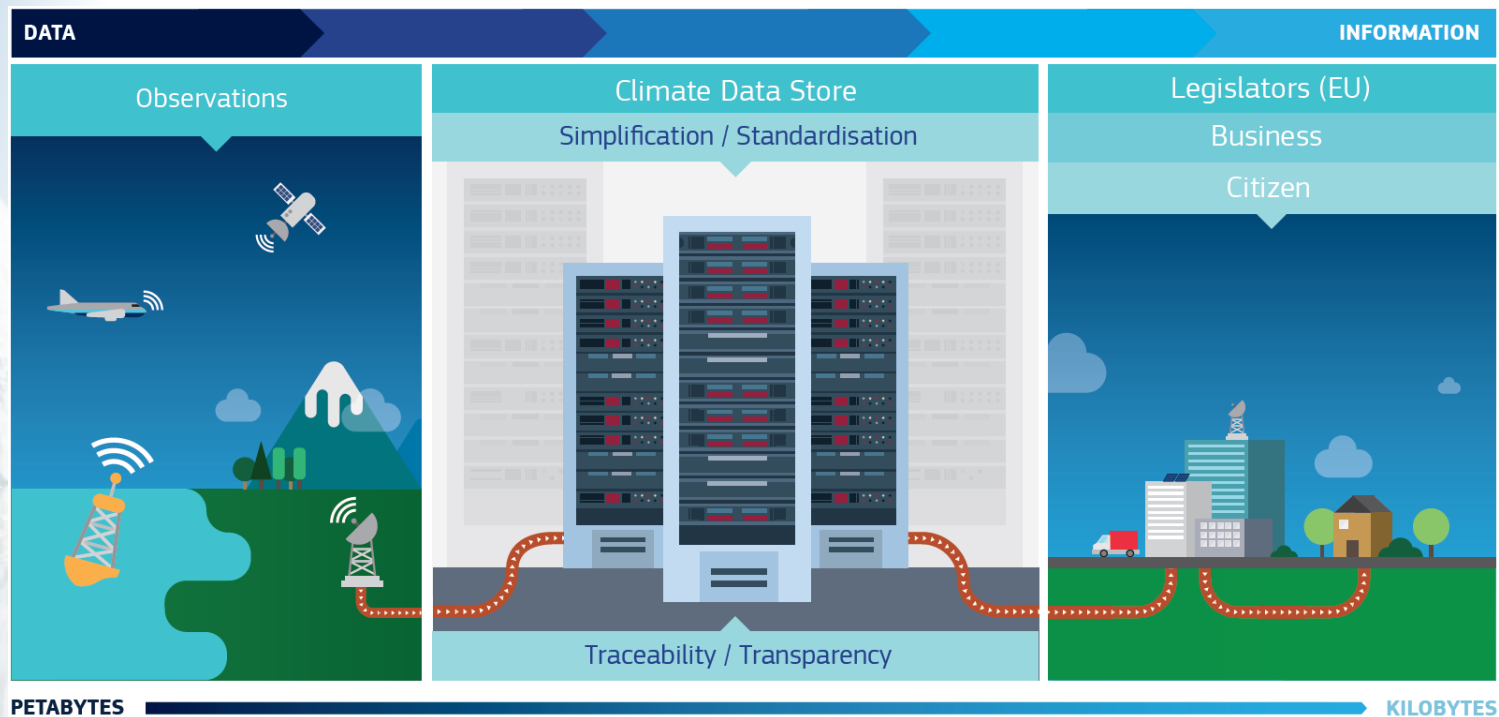
1st MFF (2014-2020): ~ 4300 M€

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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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



ENERGY



WATER
MANAGEMENT



INSURANCE



AGRICULTURE
& FORESTRY



INFRASTRUCTURE

Usuarios & stakeholders



Divulgación & difusión



Climate
Change

Outline

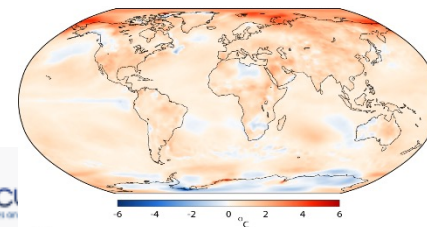
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The Climate Data Store – ‘A one stop shop for climate data’





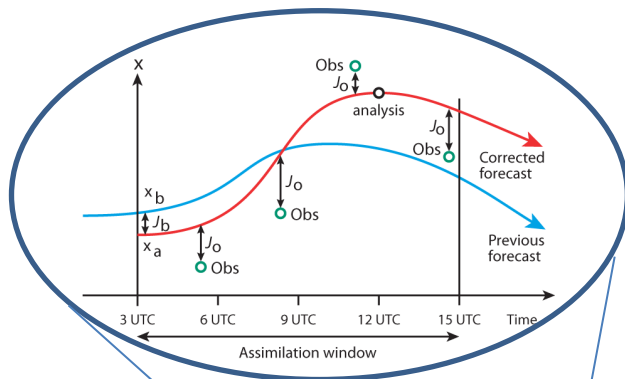
Climate
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What is the reanalysis?

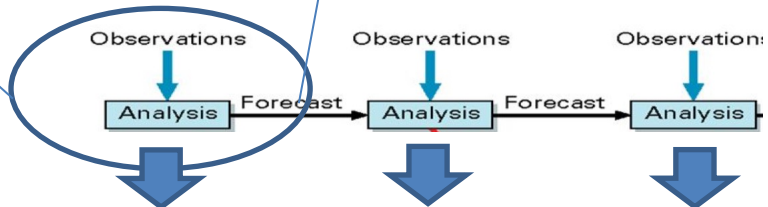
MODELING



OBSERVATIONS



Data assimilation & reanalysis
Combining information from observations and models to provide an estimate of weather and climate over multi-decadal timescales



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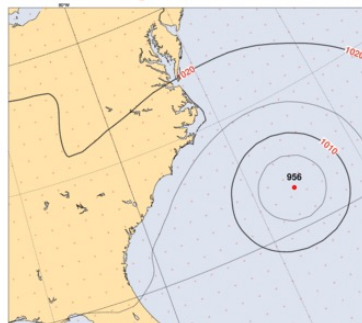
Climate
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Maps without gaps: global atmospheric reanalysis ERA5

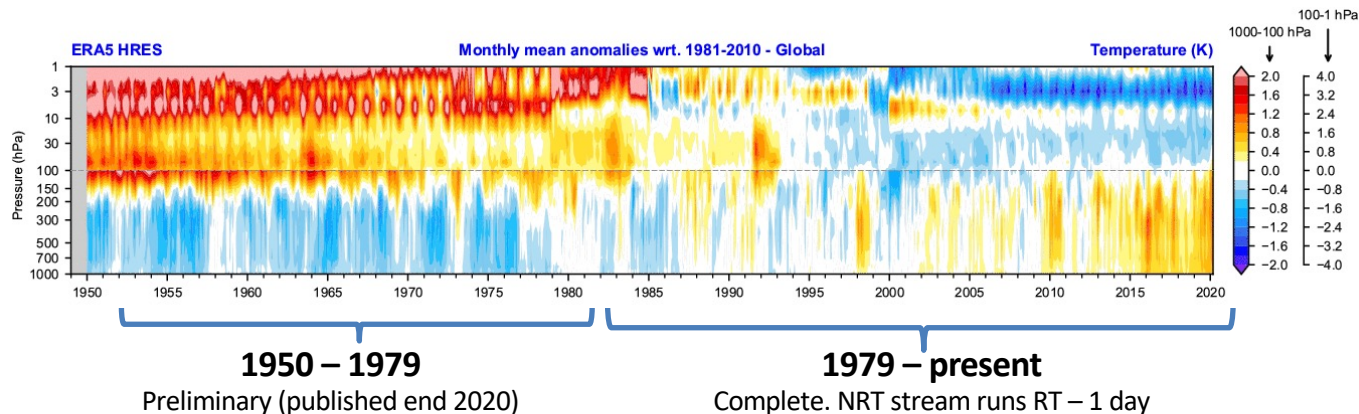
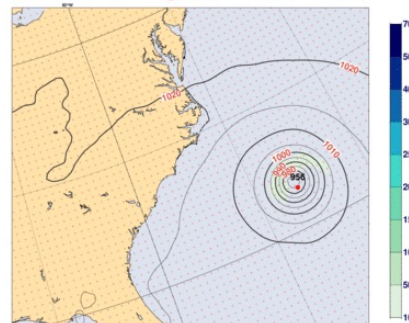
ERA5:

Spatial resolution: 31 km
Temporal resolution: hourly
Period: 1950-present

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.),

<https://doi.org/10.1002/qj.3803>

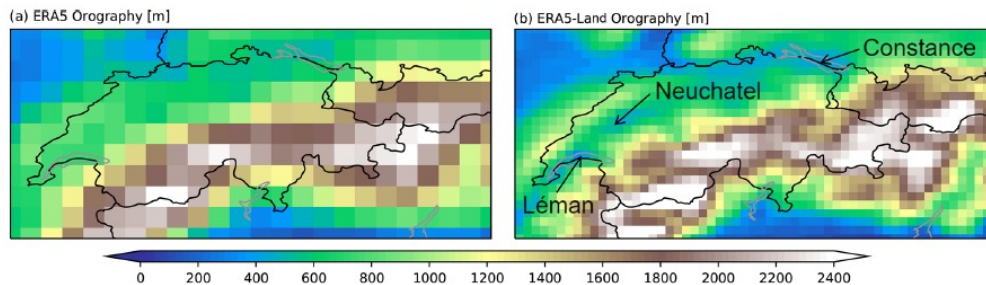




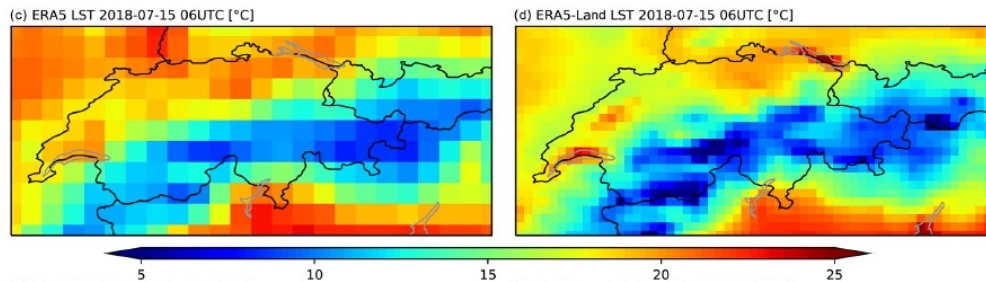
Climate
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High-resolution and consistency for the land evolution: ERA5-Land (1950-present)

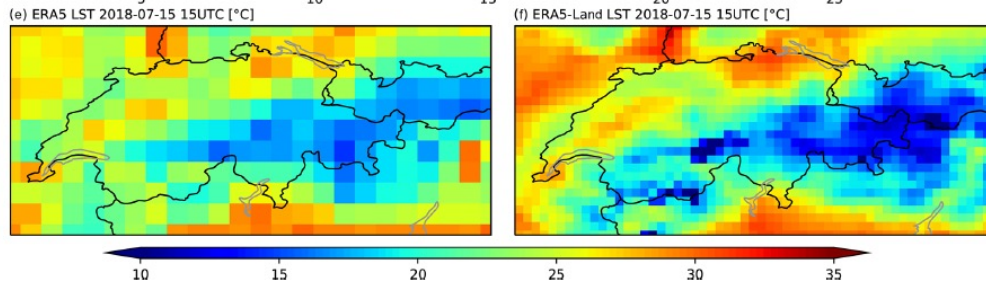
orography



Soil Temperature
(15 July 2018
06UTC)



Soil Temperature
(15 July 2018
15UTC)



ERA5-Land:
Spatial resolution: 9 km
Temporal resolution: hourly
Period: 1950-present
Land consistency

Muñoz-Sabater et al., 2021 (Earth Syst. Sc. Data),
<https://doi.org/10.5194/essd-13-4349-2021>

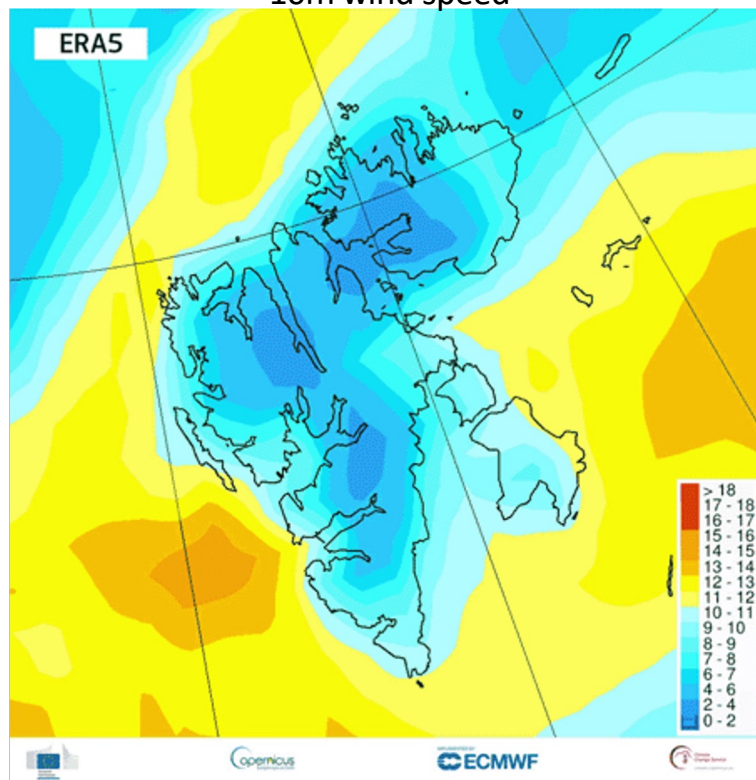




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Regional reanalysis for the Arctic region (CARRA)

10m wind speed



Copernicus Arctic Regional Reanalysis (CARRA)

- Driven by ERA5
- Two subdomains of the European Arctic @2.5 km (non-hydrostatic) horizontal resolution
- Improved orography and land-use
- Additional local observations assimilated
- Now available on the CDS for the period September 1990 - June 2021

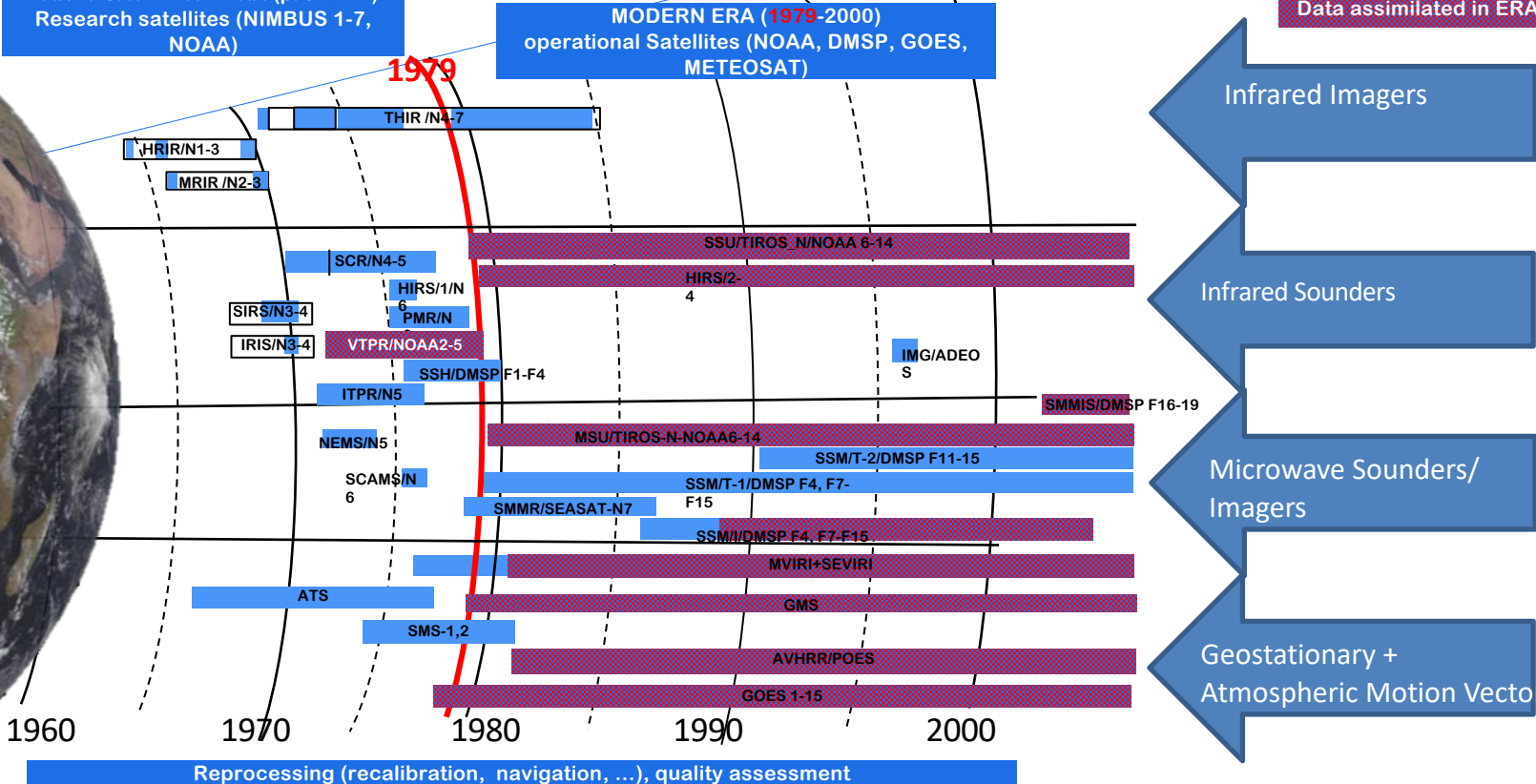
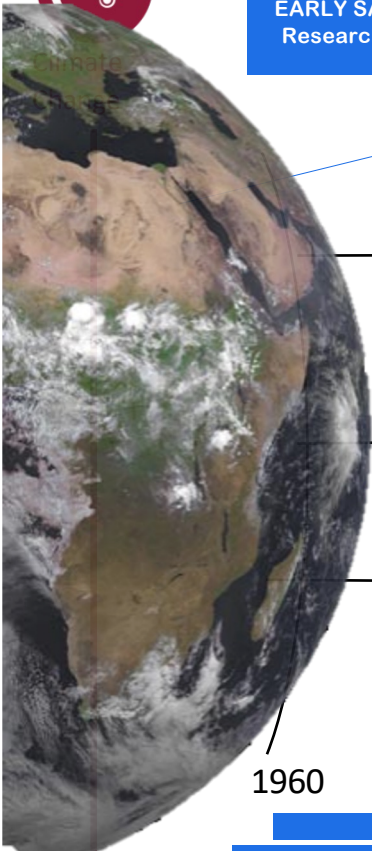
Satellite data rescue

EARLY SATELLITE ERA (pre-1979)
 Research satellites (NIMBUS 1-7, NOAA)

MODERN ERA (1979-2000)
 operational Satellites (NOAA, DMSP, GOES, METEOSAT)

Data not yet assimilated

Data assimilated in ERA5



Reprocessing (recalibration, navigation, ...), quality assessment

Data Rescue: decoding original data, reformatting, archiving & QC



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Importance of data rescue



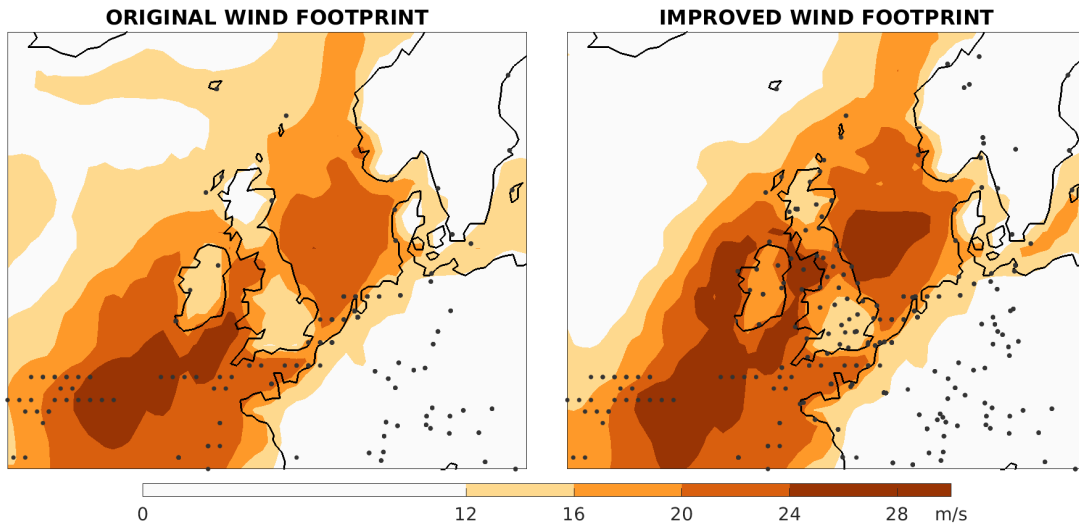
GREAT STORM, FEBRUARY 27, 1903.
Phoenix Park—2,048 Trees blown down (1,242 Forest Trees, 1,706 Thorns).

DAILY WEATHER REPORT
for 8 a.m. on Friday, 27th February, 1903.
Issued by the METEOROLOGICAL OFFICE, 68, Victoria Street, London. W. N. SHAW, Secretary.

STATIONS.	VELOCITY SYSTEM (See note on last page)				WINDS							PART M. INDEX				
	Dir.	Force	Wind	Wave	Dir.	Force	Dir.	Force	Dir.	Force	Dir.	Force	Dir.	Force	Dir.	Force
Haggranda ...	27 27	2	W	0	29.35	57	32	7	107	5	2	0	—	7	16	+ 1.7
Herrnsood ...	27 26	2	W	0	29.36	55	32	7	107	5	2	0	—	7	16	+ 0.6
Stockholm ...	27 26	2	W	0	29.46	54	32	7	107	5	2	0	—	7	16	+ 0.6
Widby ...	27 27	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Karlbad ...	27 27	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Färder (Svea Park)	27 27	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Boda ...	27 27	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Christiansund ...	27 23	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Skudenes ...	27 21	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Samburgh Head ...	27 25	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Stormoway ...	27 25	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Main Head ...	27 27	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Blackod Pt. ...	27 25	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Valerick ...	27 25	2	W	0	29.23	54	32	7	107	5	2	0	—	7	16	+ 0.6
Roche's Point ...	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Parsonstown ...	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Donaghadee ...	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Liverpool Obay ...	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Holyhead ...	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Penrhynde (St. Ann's)	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6
Castle (St. Mary's)	27 27	2	W	0	29.27	52	32	7	107	5	2	0	—	7	16	+ 0.6

'Ulysses' windstorm of February 1903, which hit Ireland and UK

- Data for many European locations rescued from paper.



- Wind footprint in a reanalysis of the event was not severe enough to cause known damage. Adding rescued data (new black dots) produced a credible reanalysis of the storm.



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implemented by ECMWF



What is the climate system?

CRYOSPHERE



Snow



Ice Sheets and Ice Shelves



Glaciers



Permafrost

COP1

-  = satellite ECVs
-  = ECVs from reanalysis

SURFACE ATMOSPHERE



Surface Radiation Budget



Surface Pressure



Surface Temperature



Surface Water Vapour



Surface Wind Speed and Direction



Precipitation

UPPER-AIR ATMOSPHERE



Upper-air Temperature



Upper-air Water Vapour



Upper-air Wind Speed and Direction



Lightning



Earth Radiation Budget



Clouds

ATMOSPHERIC COMPOSITION



Precursors for Aerosols and Ozone



Aerosols



CO₂, CH₄, and other GHGs



Ozone

SURFACE OCEAN PHYSICS



Surface Currents



Surface Stress



Sea Surface Temperature



Sea Ice



Ocean Surface Heat Flux



Sea Level



Sea Surface Salinity



Sea State

SUBSURFACE OCEAN PHYSICS



Subsurface Temperature



Subsurface Currents



Subsurface Salinity

OCEAN BIOLOGY / ECOSYSTEMS



Plankton



Marine Habitats

OCEAN BIOGEOCHEMISTRY



Ocean Colour



Transient Tracers



Inorganic Carbon



Oxygen



Nitrous Oxide



Nutrients



HYDROSPHERE



Soil Moisture



Lakes



Groundwater



River Discharge



Evaporation from Land

ANTHROPOSPHERE



Anthropogenic Water Use



Anthropogenic Greenhouse Gas Fluxes

BIOSPHERE



Soil Carbon



Albedo



Fire



FAPAR*



Leaf Area Index (LAI)



Land Surface Temperature



Above-ground Biomass



Land Cover

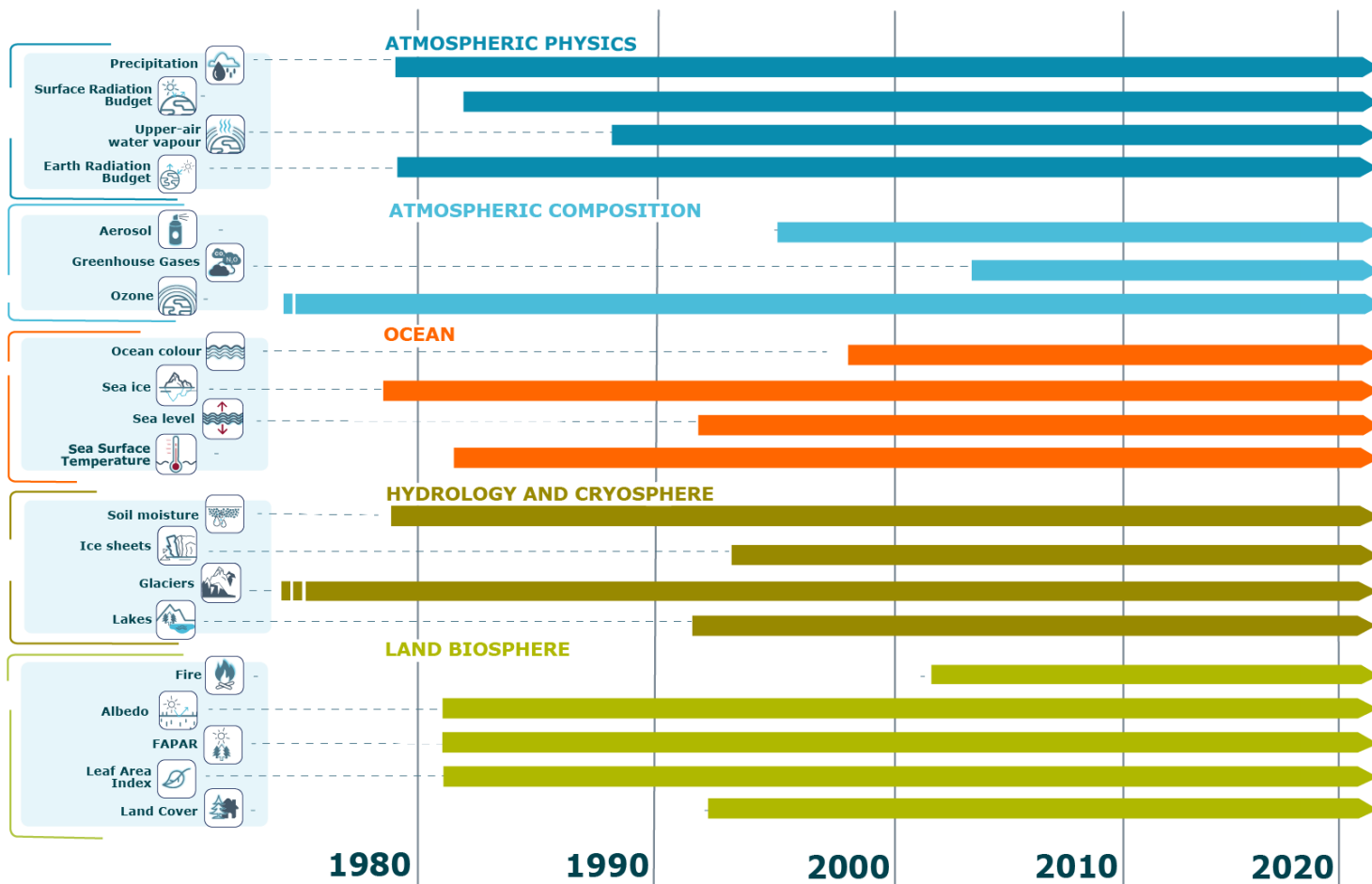
*Fraction of Absorbed Photosynthetically Active Radiation





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Satellite ECV data records



IN COLLABORATION with more than **50** organisations.



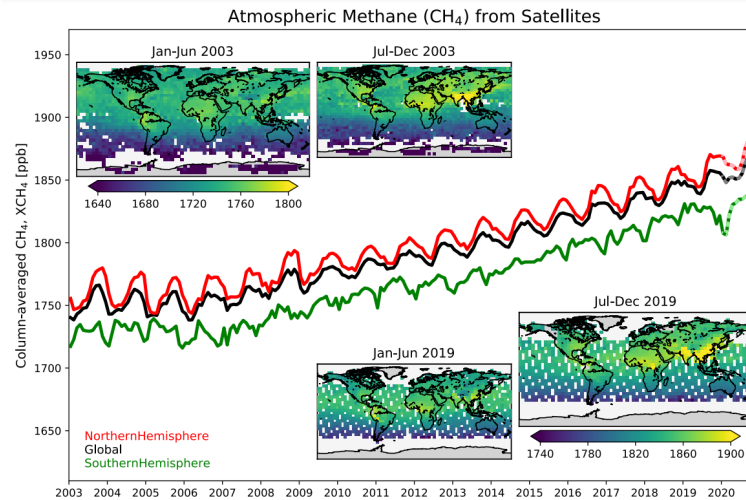
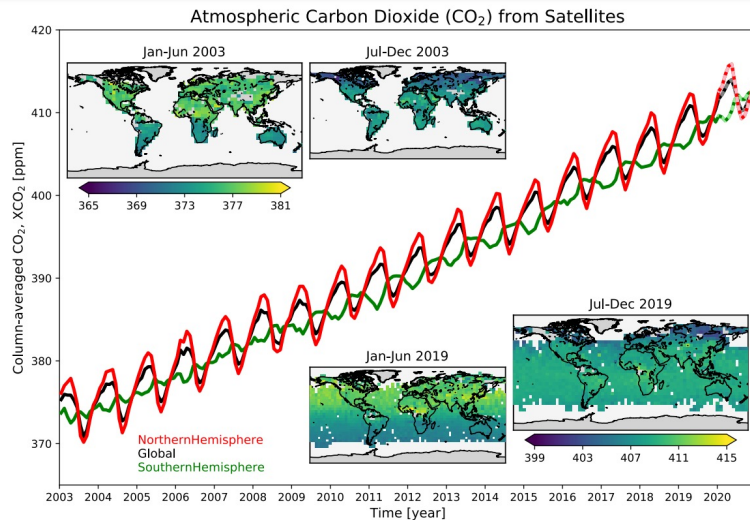
Mainly use Sentinel-3 data
Future use of other Sentinel data



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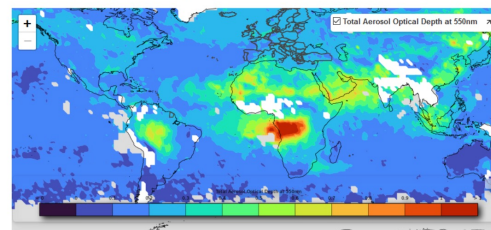
Atmospheric Composition ECVs Hub

Generation of key information for policy makers, published in the ESOTC



- New toolbox applications/viewers to be implemented in 2022,

Retrieve and plot Data (latest versions)



Aerosol optical depth, SLSTR on SENTINEL 3A, ENS version v1.2, 2019-08



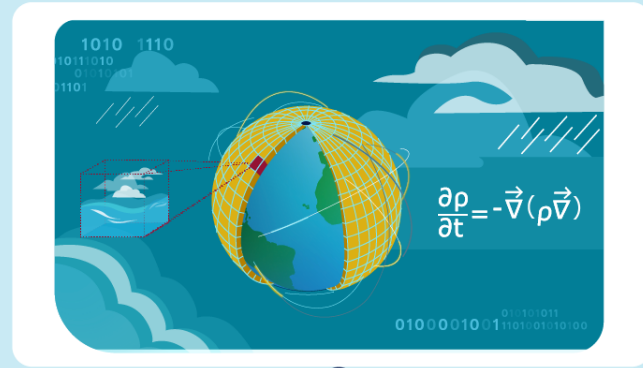
Climate Change

What is a climate prediction?

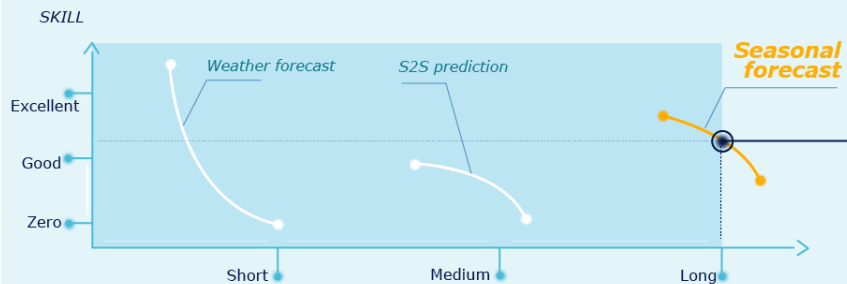
OBSERVATIONS OF THE CURRENT STATE OF THE CLIMATE



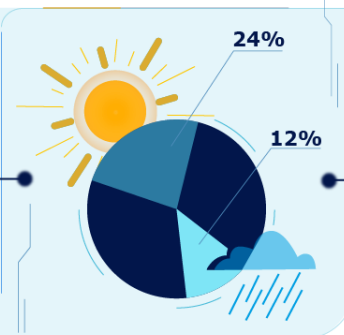
CLIMATE MODELS



PREDICTIONS



EARLY WARNING FOR:





Climate Change



C3S seasonal predictions: components

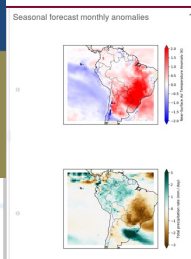


DATA PRODUCTS

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

Datasets available in the Climate Data Store:

- Daily and subdaily data (6h, 12h, 24h)
- Monthly statistics (mean, max., min. and standard deviation)
- Bias corrected data (monthly anomalies)

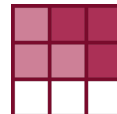


CDS Toolbox

```
import cdsapi
c = cdsapi.Client()

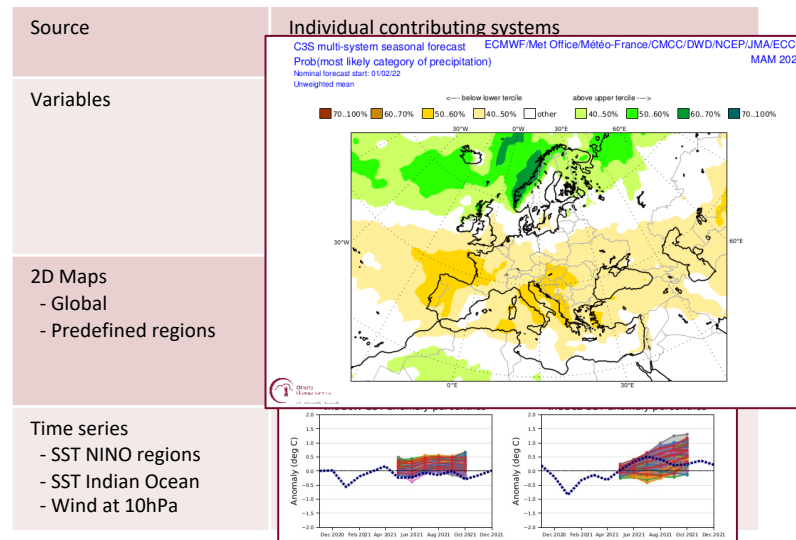
c.retrieve(
    'seasonal-monthly-single-levels',
    {
        'format': 'grib',
        'originating_centre': 'meteo_france',
        'variable': 'total_precipitation',
        'product_type': 'ensemble_mean',
        'ensemble_member': 'hindcast_climate_mean'
    },
    {
        'year': '2018',
        'month': '09',
        'leadtime_month': ['1', '2', '3', '4', '5', '6']
    },
    {'cds_seasonal_output.grib'})
```

CDS API



GRAPHICAL PRODUCTS

https://climate.copernicus.eu/charts/c3s_seasonal/





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Climate Predictions – Seasonal Forecasts

C3S multi-system seasonal forecast

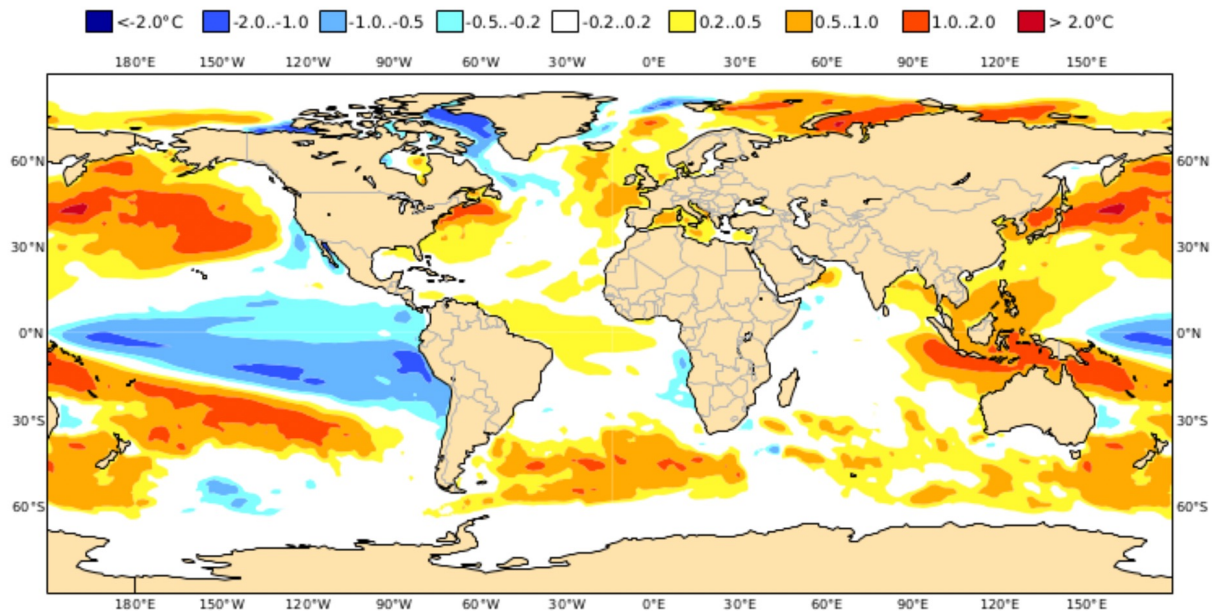
ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCE

Mean SST anomaly

JAS 2022

Nominal forecast start: 01/06/22

Variance-standardized mean





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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

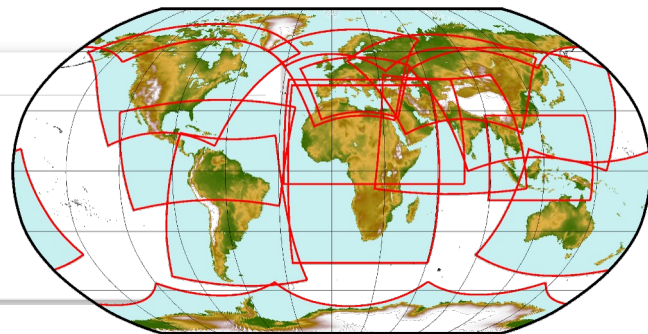
Domain ?

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





Climate
Change

Outline

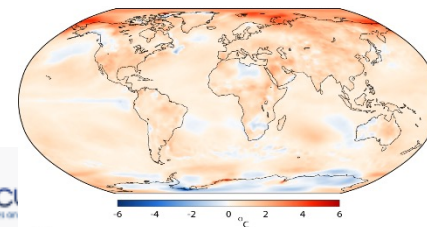
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The Climate Data Store

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 '140,000 + 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

Download form

Home Search Datasets Applications Toolbox FAQ Live

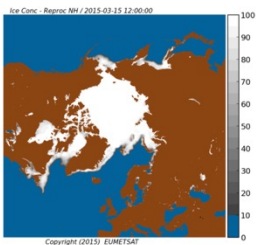
Your feedback helps us to improve the service

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 polynyas 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 and respectively). Sea ice thickness and type: 25 km grid resolution (true spatial resolution is about 1-10 km and 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 summarise the characteristics of the datasets in a concise manner with focus on: space and time extent and resolution; data format, 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. (2.5M PDF)

The above documents provide in-depth documentation on the algorithms used to derive the datasets.

- 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.

Download data from 1978 to present derived from satellite sensors

Overview Download data Quality assessment Documentation

Year

At least one selection must be made

1978 1979 1980 1981 1982 1983
 1984 1985 1986 1987 1988 1989
 1990 1991 1992 1993 1994 1995
 1996 1997 1998 1999 2000 2001
 2002 2003 2004 2005 2006 2007
 2008 2009 2010 2011 2012 2013
 2014 2015 2016 2017 2018 2019

Month

At least one selection must be made

January February March April May June
 July August September October November December

Variable

At least one selection must be made

Sea ice concentration Sea ice edge Sea ice type Sea ice thickness

Contact

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Publication date

2018-06-14

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

Overview Download data Quality assessment Documentation

Any inconsistency be found, please report to copernicus.support@ecmwf.int

The Evaluation and Quality Control (EQC) function of C3S. EQC encompasses a framework for high quality harmonized access to all dataset types available through the C3S. During the EQC filter is synchronized and data are checked for usability and reliability.

Sea ice concentration

Variable: Sea ice concentration

INTRODUCTION	USER DOCUMENTATION	ACCESS	INDEPENDENT ASSESSMENT
Dataset overview	User guide	Toolbox compatibility	Data check
Edge and	C-OSI/EC/Technology	Archive	Expert evaluation
	Uncertainty quantification		Dataset maturity
Validation			Summary of independent assessment
Inter-comparison			

Contact

copernicus-support@ecmwf.int

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Publication date

2018-06-14

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★★★★★

Submit

Documentation



Climate
Change

... with a robust CDS API access

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| <input type="checkbox"/> 31 | | |

Format ⓘ

Zip file (.zip)

Terms of use

GHG-CCI Licence [View terms](#)

Hide API request

Show Toolbox request

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

```

Hello World!
01 January 2017

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

Python based workflows

CDS Toolbox editor

41 Calculate GDD

```

1 import cdstoolbox as ct
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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



Climate Change

... transforming workflows into public applications

Monthly climate explorer for COVID-19

Overview Application Documentation Source code

Recently published papers have suggested that, as happens with the diffusion of other viruses, air temperature and humidity could alter the spread of COVID-19. This application, provided by the Copernicus Climate Change Service, allows the user to explore some of these claims by plotting the average air temperature and humidity of the most recent months, alongside the mortality data obtained from Johns Hopkins University.

Month: April 2020 Variable: Temperature

COVID-19 deaths in April 2020

Temperature (°C)

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 C3S.
- 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.

Version: 4.7.2 - build 60abcb

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

Fast Toolbox application development in the COVID-19 crisis context

Monthly climate explorer for COVID-19

Recently published papers have suggested that, as happens with the diffusion of other viruses, air temperature and humidity could alter the spread of COVID-19. This application, provided by the Copernicus Climate Change Service, allows the user to explore some of these claims by plotting the average air temperature and humidity of the most recent months, alongside the mortality data

Month: April 2020 Variable: Humidity

COVID-19 deaths in April 2020

Specific humidity at mean sea level (g/kg)

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.

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Version: 4.7.2 - build 60abcb

France

Cumulated number of deaths in France. Data is from the Johns Hopkins University Center for Systems Science and Engineering, without CS3 quality control.

Daily average of the air temperature near the surface at the centre of the circle, not representative of the whole country.

Temperature (°C)



Copernicus

IMPLEMENTED BY ECMWF

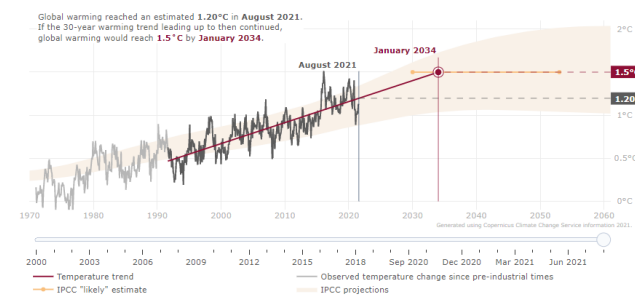
Version: 4.7.2 - build 60abcb



Global temperature trend monitor

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](#).



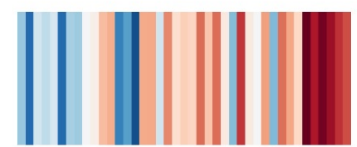
aterial on the map do not imply the expression of any opinion whatsoever on the part of the European Union area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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

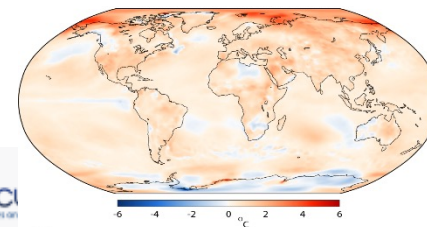
¿ Qué es el Servicio Europeo de Cambio Climático (C3S) ?

¿ Qué productos se ofrecen ?

¿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 ?





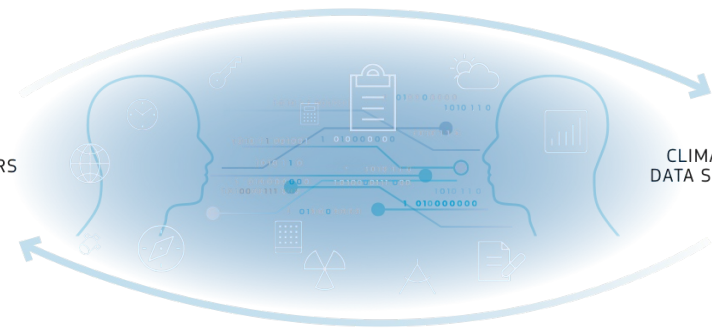
Climate Change

What is the SIS and how it works

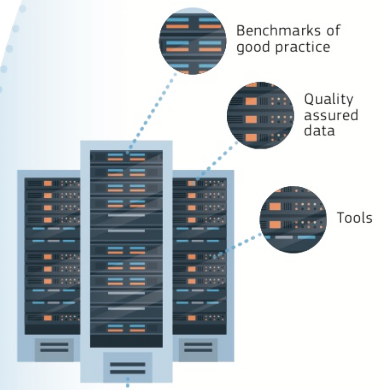
- Agriculture
- Insurance
- Biodiversity
- Shipping
- Coastal areas
- Storm surges
- Energy
- Tourism
- Health
- Water management
- Infrastructure



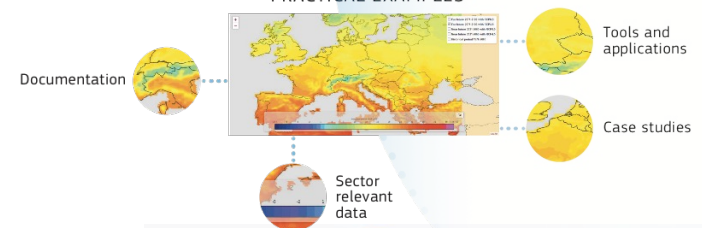
USERS



CLIMATE DATA STORE



PRACTICAL EXAMPLES





Climate Change

Many examples of applications (more than can possibly be shown here)

JANUARY 2021
Climate cl
The Danish M
Denmark.

FEBRUARY 2021
SCO FLAude: Understanding extreme hydrometeorological events in Aude and Occit:

DECEMBER 2020
By analy
propose
Usin
deliv
WECTOU, climate and environmental information customised for the tourism sector

OCTOBER 2020
CLIMTAG, the CLimate InforMation Tool for AGriculture

JUNE 2020
ba:
col
Climate-smart risk management for ports

OCTOBER 2020
Us
M:
Climate data for sustainable infrastructure
The International Institute for Sustainable Development has integrated climate data from the Copernicus Climate

NOVEMBER 2020
ESOX from Lautec – using climate data to simulate offshore wind power operations

DECEMBER 2020
The impact of climate change on the cotton industry
EOXPLORE and Terranea are using data and tools from the C3S Climate Data Store (CDS) to develop novel information sources to help the cotton industry understand and adapt to changes in the environment and climate.



ABOUT - EU POLICY - COUNTRIES, TRANSNATIONAL REGIONS, CITIES - KNOWLEDGE - NETWORKS

Home » Knowledge » European Climate Data Explorer

European Climate Data Explorer

Help Overview list of all Indices



PROGRAMME OF THE EUROPEAN UNION



implemented by ECMWF



Climate
Change

Outline

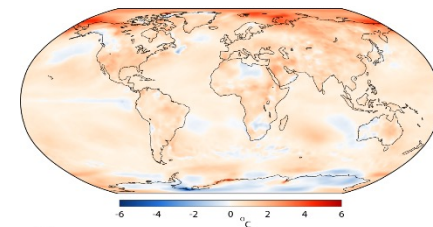
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PROGRAMME OF
THE EUROPEAN UNION

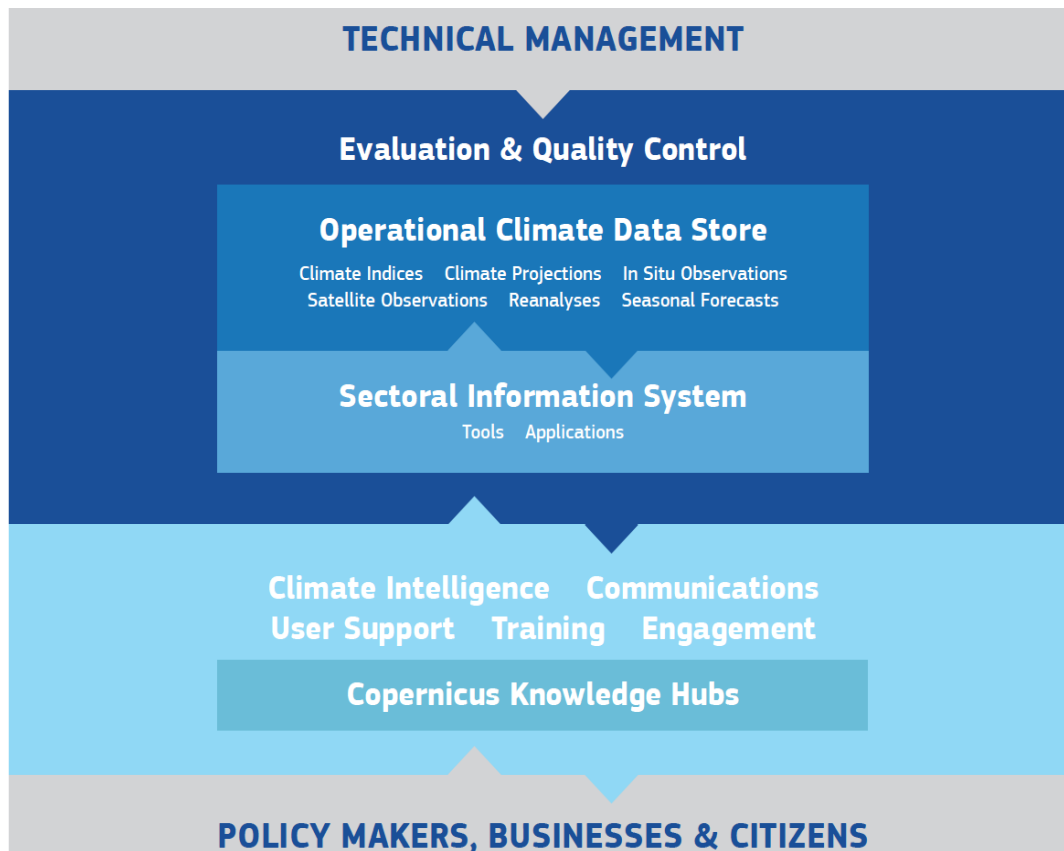


WF



Climate
Change

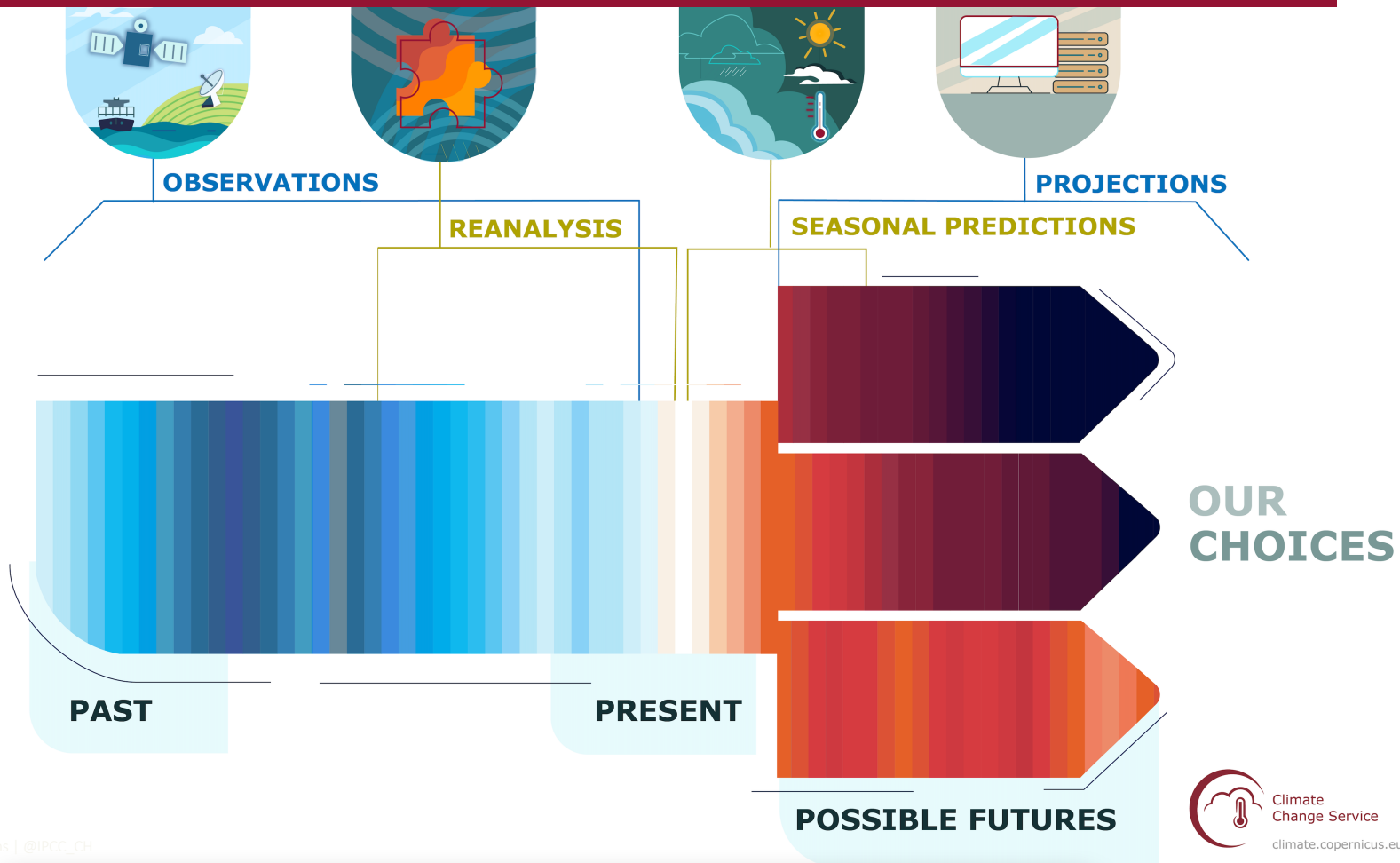
In summary....





Climate
Change

Smart data for smart decisions



Climate Change

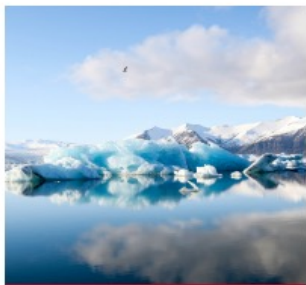
We provide authoritative information about the past, present and future climate, as well as enable climate change mitigation and adaptation strategies by policy makers and business.

<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