

The Copernicus Climate Change Service

A European Response to Climate Change



Jean-Noël Thépaut, ECMWF

Climate Change

Email: jean-noel.Thepaut@ecmwf.int

Twitter: @JeanNoelThepaut





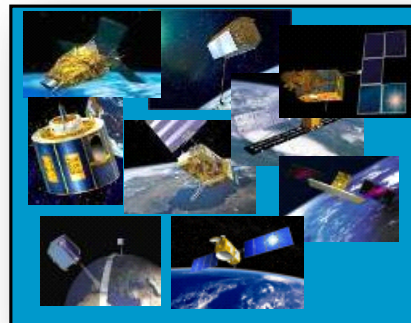
Climate
Change

Copernicus Architecture



Sentinels

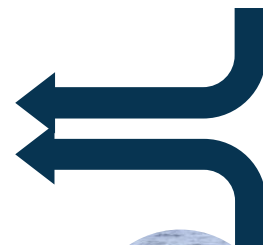
6 services use Earth
Observation data to
deliver ...



Contributing missions



...added-value products



in-situ



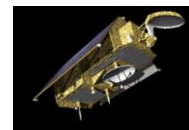
European
Commission





Climate Change

Copernicus Space Component: Dedicated Missions



S1: Radar Mission



S2: High Resolution Optical Mission



S3: Medium Resolution Imaging and Altimetry Mission



S4: Geostationary Atmospheric Chemistry Mission

2022?



S5P: Low Earth Orbit Atmospheric Chemistry Precursor Mission



S5: Low Earth Orbit Atmospheric Chemistry Mission

2021?



S6 (Jason-CS): Altimetry Mission

2020?





Climate
Change

Copernicus: Earth observations and information services





Climate
Change

The C3S mission

To support European adaptation and mitigation policies by:

- Providing consistent and authoritative information about climate (past, present, future)
- Building on existing capabilities and infrastructures (nationally, in Europe and worldwide)
- Stimulating the market for climate services in Europe





Climate
Change

Achievements since the signature of the Delegation Agreement

Celebrating C3S transitioning from a concept to an
operational Service*

[Video 1](#)

*: C3S second General Assembly, Berlin, 24-28 September 2018





Climate
Change

The C3S mission

To support European adaptation and mitigation policies by:

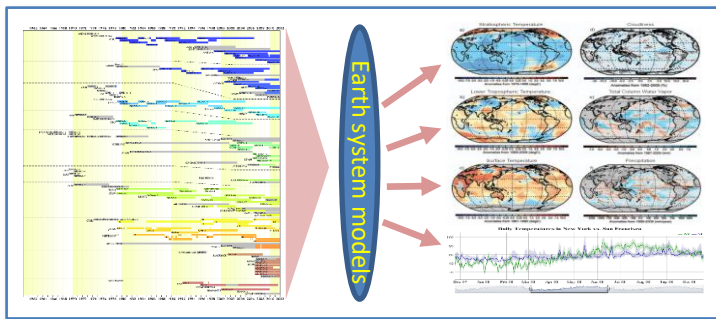
- Providing consistent and authoritative information about climate (past, present, future)
- Building on existing capabilities and infrastructures (nationally, in Europe and worldwide)
- Stimulating the market for climate services in Europe





Climate Change

Access to past, present and future climate information

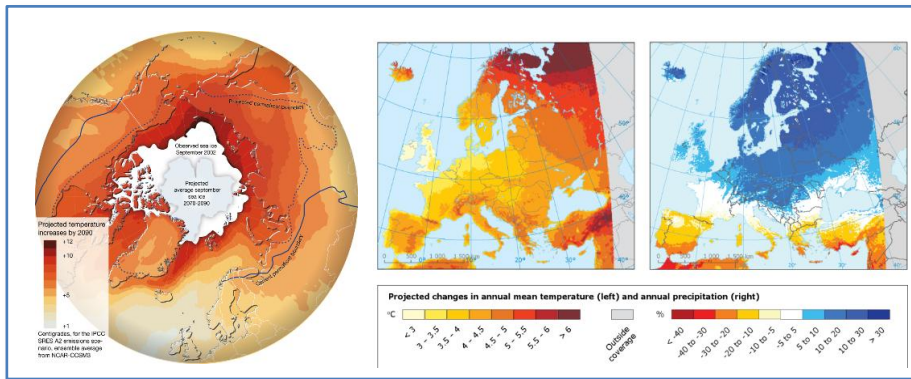
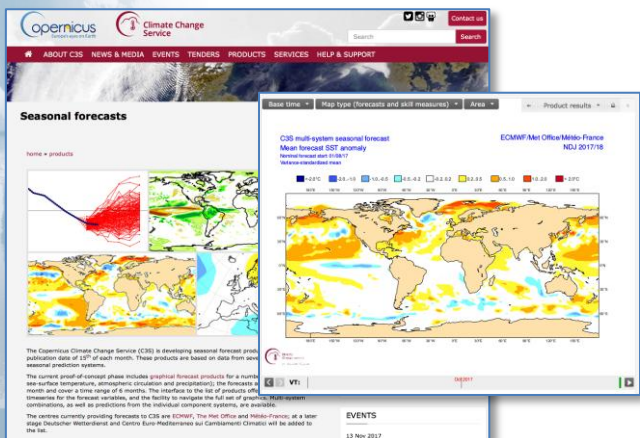


Observations and climate reanalyses

Seasonal forecast data and products

Climate model simulations

Sectoral climate impact indicators





Climate Change

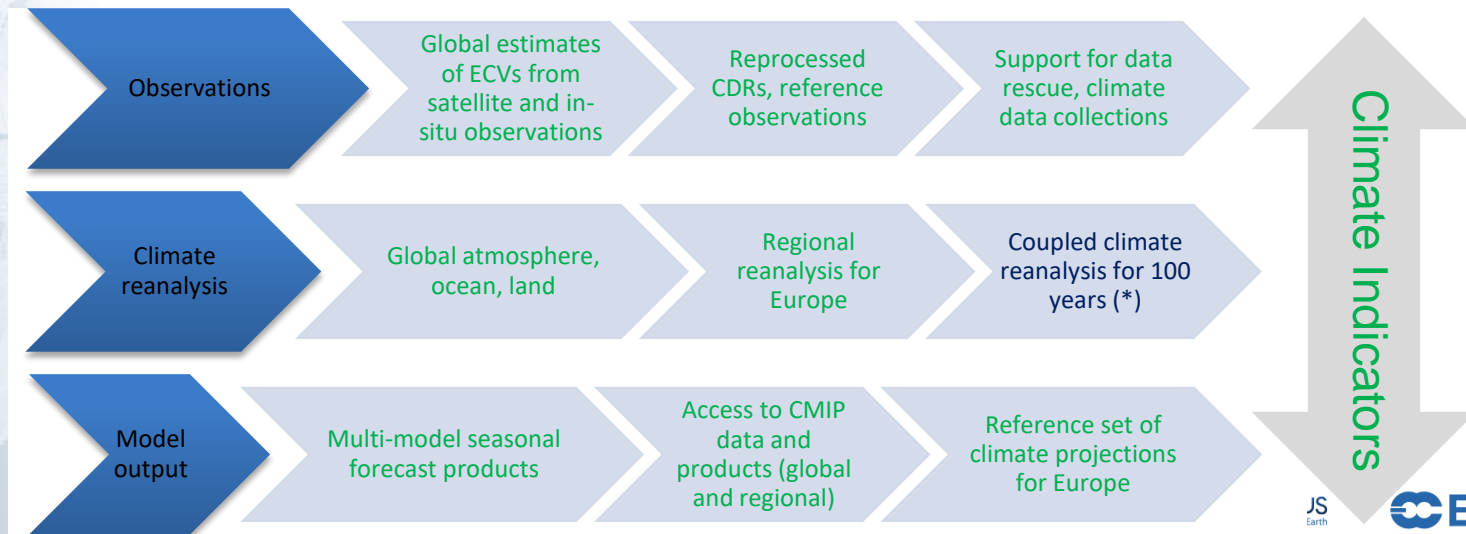
Climate Data Store content (November 2018)



Scientific basis:

- Essential Climate Variables as defined by GCOS
- GCOS Status Report and Implementation Plan
- IPCC, CMIP

■ Action engaged
■ In progress
■ Not started



(*): To be produced 2021-2022 based on FP7 ERA-CLIM2 outcomes (CERA-20C)



Climate
Change

The C3S mission

To support European adaptation and mitigation policies by:

- Providing consistent and authoritative information about climate (past, present, future)
- Building on existing capabilities and infrastructures (nationally, in Europe and worldwide)
- Stimulating the market for climate services in Europe





Climate
Change

Entities contributing to C3S

dd . 29 / 10 / 2018

C3S: a truly European effort

*249 different entities from
29 EU and ECMWF Member States,
International Organisations and
third countries*



Powered by Bing
© GeoNames, MSFT, Navteq, Wikipedia





Climate Change

C3S and the ecosystem



Climate Change

etc...



National Climate Services

- Value chain at local level, governments, etc.
- Provision of pan-European dimension for national businesses



EEA (Climate Adapt):

- State of Climate for Europe
- Climate Indicators
- CDS toolbox
- CC IV report

DG-Clima



NOAA:

- Coordination on observations and CDR issues with NCEI
- In-kind contribution of NCEP seasonal forecasts



GFCS:

- Global products (ECVs, reanalyses, seasonal forecasts and projections)
- WIS compliance
- Training and outreach
- Global SIS
- Liaison with RCCs



H2020/ERA4CS/JPI/KIC/etc.:

- CDS as a data resource
- Liaison with RD projects
- Underpinning science

Coordination with DG-DevCO



GEO & UNFCCC:

- C3S discoverable through GEOSS portal
- Contribution to many SDGs



WMO & GCOS:

- C3S ECVs and global indicators
- WMO State of the Climate





Climate
Change

Climate Data Store Content



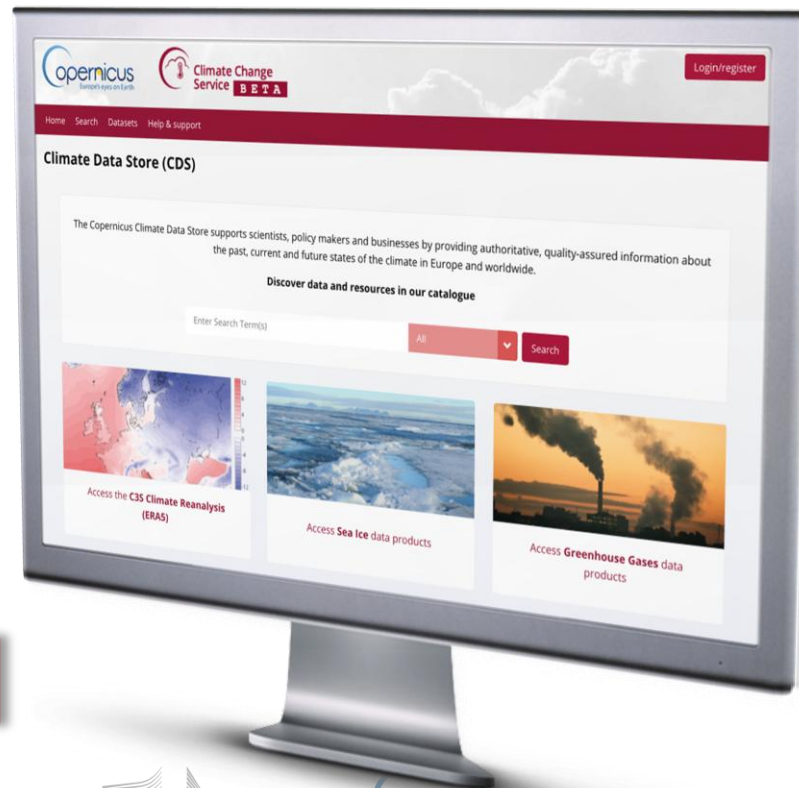


Climate
Change

What C3S offers to its users

- Access to climate data
- Tools needed to use the data
- Information on sectoral impacts
- Quality assurance
- User support and training
- Climate change assessments
- Outreach and communication

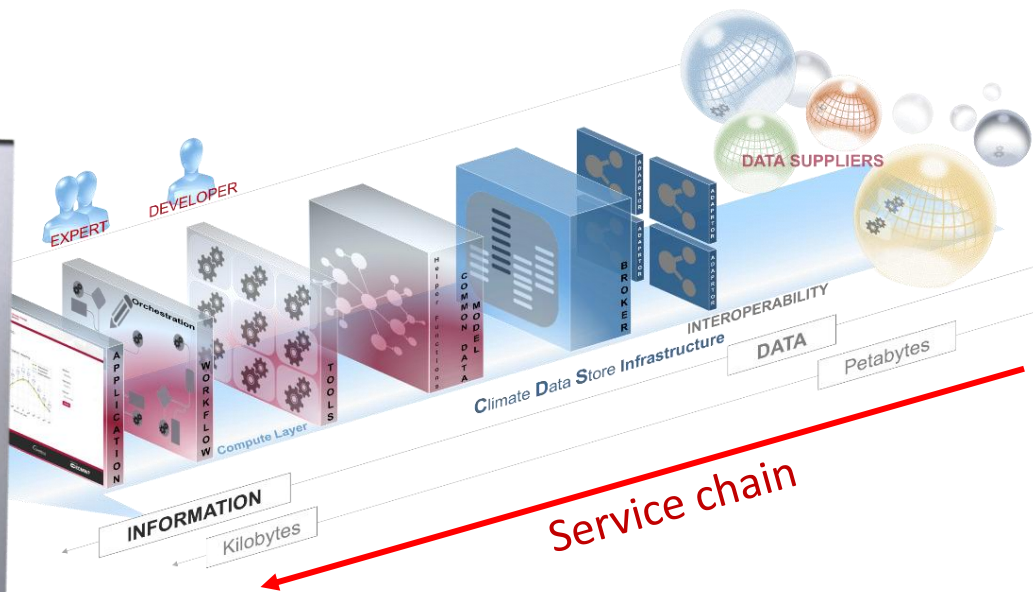
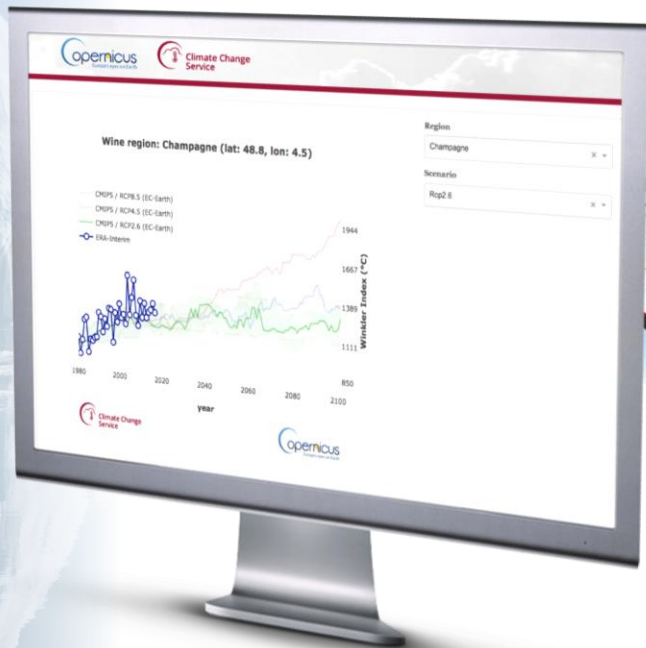
A one-stop Climate Data Store





Climate
Change

CDS toolbox, workflows and applications



Quality assured information and tools for users:
scientists, consultants, decision makers.



Climate Change

Access to climate datasets before the CDS...

ESGF Portal at CEDA

Search: Enter text: [] Search Reset Display: 10 results per page [More Search Options]

Project: MIP-reanalysis (1), DCC-reanalysis (0), Regional Reanalysis (10), etc.

Dataset Metadata: **ERA-Interim/LAND**
 Data Node: `concord/era4r-44.DMI.ECMWF-ERAINT/evaluation/1191`
 Version: 20140004
 Total Number of Files (for all variables): 0
 [Hide Metadata] [Show Files] [THREDDS Catalog]

Domain: + AFRI-44
 Driving Model: ECMWF-ERAINT
 East Longitude: 60.28
 West Longitude: -114.00
 North Latitude: 90.00
 South Latitude: -90.00

Type: Analysis, Forecast



ERA Interim/LAND

Select a month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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											

Select step

3 6 9 12 18 24

Select All or Clear

Forecasts are integrated daily, from 00:00UTC, for +step hours.

Select parameter

Evaporation, Snowmelt, Surface latent heat flux, Surface net solar radiation, Surface net thermal radiation, Surface runoff, Surface sensible heat flux, Total precipitation

Select All or Clear

View the MARS request | Retrieve GRIB | Retrieve NetCDF

OSISAF OCEAN AND SEA ICE

ABOUT OSISAF | PRODUCTS | DOCUMENTATION | COMMUNITY

List of products

Domain: Sea Ice

Thumbnail	Title	Identifier	Status	Satellite Input	Level	Frequency	Timeliness	Spatial coverage	Spatial sampling
	Global Sea Ice Concentration (SSM/I)	OSI-401-b	Operational	DMS/SSMIS	L3	1 per day	5 h	Global	10 km
	Global Sea Ice Edge	OSI-402-c	Operational	DMS/SSMIS and Metop/ASCAT	L3	1 per day	5 h	global	10 km
	Global Sea Ice Type	OSI-403-c	Operational	DMS/SSMIS, Metop/ASCAT and GCOM-W/AMSR-2	L3	1 per day	5 h	global	10 km
	Global Sea Ice Emissivity	OSI-404	Operational	DMS/SSMIS	L3	1 per day	5 h	global	10 km
	Global Low Resolution Sea Ice Drift	OSI-405-c	Operational	DMS/SSMIS, Metop/ASCAT and GCOM-W/AMSR-2	L3	1 per day	6 h	Global	62.5 km
	Medium Resolution Sea Ice Drift	OSI-407	Operational	Metop/AVHRR	L3	2 per day	6 h	Northern Hemisphere	20 km

```

ssh cds@cds-test.climate.copernicus.eu -- 117x34
cds-test.climate.copernicus.eu
646 06 6 13-23 dt_med_twosot_phy_14_20051207.nc.gz
186 06 6 13-23 dt_med_twosot_phy_14_20051203.nc.gz
389 06 6 13-23 dt_med_twosot_phy_14_20051204.nc.gz
897 06 6 13-23 dt_med_twosot_phy_14_20051205.nc.gz
976 06 6 13-23 dt_med_twosot_phy_14_20051206.nc.gz
26 06 6 13-23 dt_med_twosot_phy_14_20051207.nc.gz
421 06 6 13-23 dt_med_twosot_phy_14_20051208.nc.gz
975 06 6 13-23 dt_med_twosot_phy_14_20051209.nc.gz
453 06 6 13-23 dt_med_twosot_phy_14_20051210.nc.gz
253 06 6 13-23 dt_med_twosot_phy_14_20051211.nc.gz
174 06 6 13-23 dt_med_twosot_phy_14_20051212.nc.gz
411 06 6 13-23 dt_med_twosot_phy_14_20051213.nc.gz
693 06 6 13-23 dt_med_twosot_phy_14_20051214.nc.gz
874 06 6 13-23 dt_med_twosot_phy_14_20051215.nc.gz
827 06 6 13-23 dt_med_twosot_phy_14_20051216.nc.gz
176 06 6 13-23 dt_med_twosot_phy_14_20051217.nc.gz
435 06 6 13-23 dt_med_twosot_phy_14_20051218.nc.gz
537 06 6 13-23 dt_med_twosot_phy_14_20051219.nc.gz
488 06 6 13-23 dt_med_twosot_phy_14_20051220.nc.gz
457 06 6 13-23 dt_med_twosot_phy_14_20051221.nc.gz
446 06 6 13-23 dt_med_twosot_phy_14_20051222.nc.gz
118 06 6 13-23 dt_med_twosot_phy_14_20051223.nc.gz
894 06 6 13-23 dt_med_twosot_phy_14_20051224.nc.gz
927 06 6 13-23 dt_med_twosot_phy_14_20051225.nc.gz
791 06 6 13-23 dt_med_twosot_phy_14_20051226.nc.gz
852 06 6 13-23 dt_med_twosot_phy_14_20051227.nc.gz
743 06 6 13-23 dt_med_twosot_phy_14_20051228.nc.gz
587 06 6 13-23 dt_med_twosot_phy_14_20051229.nc.gz
106 06 6 13-23 dt_med_twosot_phy_14_20051230.nc.gz
227 06 6 13-23 dt_med_twosot_phy_14_20051231.nc.gz

```

© European Centre for Medium-Range Weather Forecast

Accessibility | Privacy | Terms of Use | Contact Us | Help

Transfer complete
f52d.pwd
227 / 61-C3s/Products/SEALEVEL/regional/med/terranon/d1-grids/two-sat-merged/phy/2005/ is the current directory



Climate Change

Catalogue of climate datasets

Home Search Datasets Toolbox Help & support

Search results

Search dataset [input] [button] All Datasets

Sort by Relevancy

Product type

- Climate projections (4)
- Reanalysis (2)
- Satellite observations (11)
- Seasonal forecasts (6)
- Sectoral climate indices (2)

Variable domain

- Atmosphere (composition) (3)
- Atmosphere (surface) (4)
- Atmosphere (upper air) (4)
- Land (Biosphere) (1)
- Land (Cryosphere) (2)
- Land (Hydrology) (2)
- Ocean (physics) (5)

Spatial coverage

Temporal coverage

Glaciers elevation and mass change data from 1894 to 2014 from the Fluctuation of Glaciers Database
A glacier is defined as a perennial mass of ice, and possibly firn and snow, originating on the land surface from the recrystallization of snow or other forms of solid precipitation and showing eviden...

Glaciers extent data from 1995 to 2015 from the Randolph Glacier Inventory
A glacier is defined as a perennial mass of ice, and possibly firn and snow, originating on the land surface from the recrystallization of snow or other forms of solid precipitation and showing eviden...

Methane data from 2002 to present derived from satellite sensors
Methane (CH4) is the second most significant greenhouse gases that has increased in concentration in the atmosphere directly due to human activities, from the viewpoint of the radiative forcing of cli...

Sea surface temperature daily gridded data from 1991 to 2010 produced by ESA-CCI
This dataset provides daily values for sea surface temperature and sea ice fraction over a regular grid with no missing values in space or in time. The initial satellite data from the Along Track Scan...

Water quality indicators for European rivers
This dataset contains modelled data for phosphorous and nitrogen concentrations and loads. The data comes from the Swedish Meteorological and Hydrological Institute E-HYPE model at catchment level f...

Water quantity indicators for Europe
This dataset contains modelled data for water runoff and wetness, river flow, snow water equivalent, soil water content and other water related quantities for the European region. These variables wer...

CMIP5 daily data on pressure levels
This catalogue entry provides daily climate projections on pressure levels from a large number of models, members and time periods computed in the framework of fifth phase of the Coupled Model Intercomp...

CMIP5 daily data on single levels
This catalogue entry provides daily climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Coupled ...

CMIP5 monthly data on pressure levels
This catalogue entry provides monthly climate projections on pressure levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Cou...

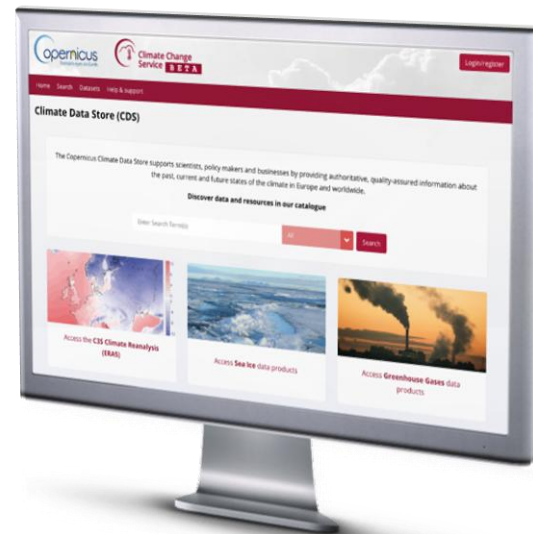
Seasonal forecast monthly statistics on single levels from 2017 to present
Seasonal forecasts provide a long-range outlook of changes in the Earth system over periods of a few weeks or months, as a result of predictable changes in some of the slow-varying components of the s...

Seasonal forecast monthly statistics on pressure levels from 2017 to present
Seasonal forecasts provide a long-range outlook of changes in the Earth system over periods of a few weeks or months, as a result of predictable changes in some of the slow-varying components of the s...

Seasonal forecast daily data on pressure levels from 2017 to present
Seasonal forecasts provide a long-range outlook of changes in the Earth system over periods of a few weeks or months, as a result of predictable changes in some of the slow-varying components of the s...

ERA5 hourly data on pressure levels from 2000 to present
ERA5 is the fifth generation ECMWF atmospheric reanalysis of the global climate. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset...

Seasonal forecast daily data on single levels from 2017 to present
Seasonal forecasts provide a long-range outlook of changes in the Earth system over periods of a few weeks or months, as a result of predictable changes in some of the slow-varying components of the s...





Climate Change

ECV products from Earth observations

Sea ice monthly and daily gridded data from 1978 to present

Home Search Datasets Applications Your requests Toolbox Help & support

Search results

Search dataset All Datasets

Sort by Relevancy

Showing 1-11 of 11 results for Satellite observations

Product type

- Climate projections (4)
- Reanalysis (2)
- Satellite observations (11)
- Seasonal forecasts (6)
- Sectoral climate indices (2)

Variable domain

- Atmosphere (composition) (3)
- Land (biosphere) (1)
- Land (cryosphere) (2)
- Ocean (physics) (5)

Spatial coverage

- Global (8)
- Northern hemisphere (1)
- Southern hemisphere (1)

Temporal coverage

- Past (11)

Glaciers elevation and ma from the Fluctuation of G

Glaciers extent data from 1995 to 2015 from the Randolph Glacier Inventory

Methane data from 2002 to present derived from satellite Sensors

Sea surface temperature daily gridded data from 1991 to 2010 produced by ESA-CCI

Sea ice monthly and daily gridded data from 1978 to present

Overview Download data Documentation

This dataset provides daily values for sea ice concentration, sea ice edge and sea ice type and monthly values for sea thickness. These four variables are important markers for climate change studies since sea ice greatly influences the surface albedo and an exchanges of energy, moisture and carbon. The sea-ice distribution, including polynyas and margins, also has an important infl on marine ecosystems. Changes in the distribution of sea ice affect these ecosystems and a number of activities such as shippingistic 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 SSM/IS sensors. Sea ice thickness were computed from Ku-Band radar altimeter measurements collecting the Envisat and CryoSat-2 satellite missions. Ice thicknesses from Envisat satellite (October 2002 to October 2010) have less coverage and highertainty than thicknesses from CryoSat-2 (November 2010 - March 2015), however the combined dataset provides a valuable unique observational record ice variability.

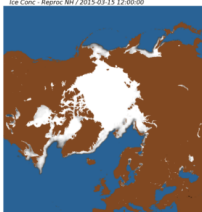
From 1978 up to April 2015 the data records provided by this dataset have sufficient length, consisten continuity to dete climate variability and change. From April 2015 onwards, satellite data were processed us same algorithms and processingronment but consistency and continuity have not been extensively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

More details about the product are given in the Documentation section.

DATA DESCRIPTION

Normal coverage: Sea ice of all stages: Global ocean split in Northern and Southern Hemisphere (EASE0.5ASE2 projection)

Sea ice thickness and type: northern hemisphere (Lambert EA02 projection)



Sea ice monthly and daily gridded data from 1978 to present

Overview Download data Documentation

Variable

At least one selection must be made

Sea ice concentration Sea ice edge Sea ice type

Sea ice thickness Select all

Year

At least one selection must be made

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

Select all

At least one selection must be made

January February March

April May June

Coming soon:

- Quality upgrades for several ECV datasets
- Data products for additional ECVs (22 ECVs)



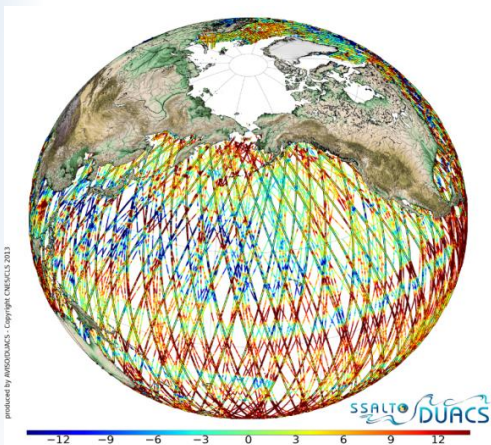
European Commission





Climate
Change

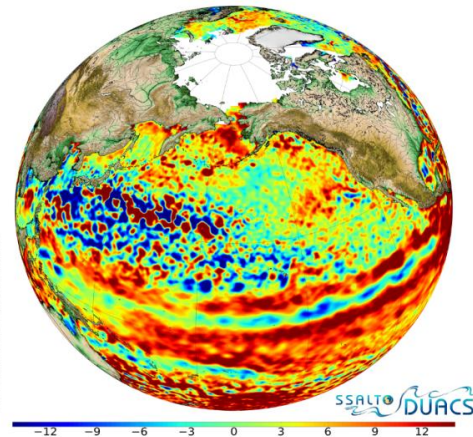
From satellite tracks to long-term global coverage



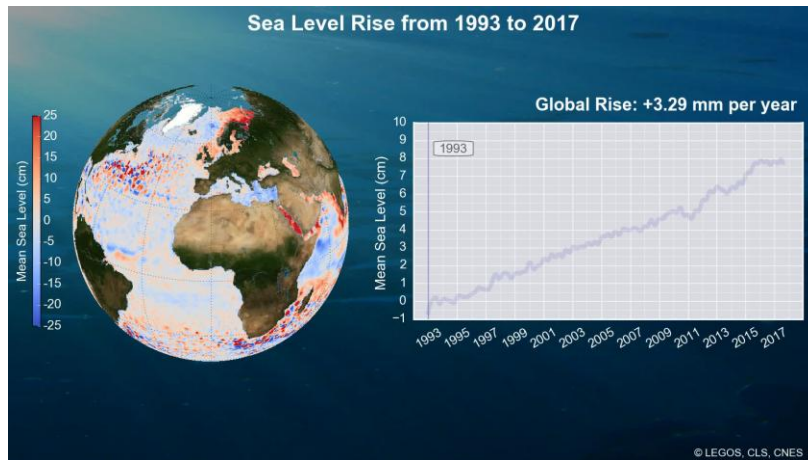
From satellite **along-track** measurements...



... to sea level gridded maps...



... to derive
Ocean
Monitoring
Indicators





Climate Change

Climate reanalysis

Home Search Datasets Applications Your requests Toolbox Help & support

Search results

Search dataset

Sort by

Relevancy

Title

Product type

- Climate projections
- Reanalysis
- Satellite observations
- Seasonal forecasts
- Sectoral climate indices

Spatial coverage

- Global

Temporal coverage

- Past

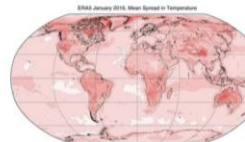
Coming soon :

- ERA5 data 1979 – present, updated daily, within 2-5 days
- ERA5-Land: Global land surface at 9 km resolution
- Regional reanalysis data for Europe (UERRA) and the Arctic

ERA5 hourly data on pressure levels from 2000 to present

Overview Download data Documentation

ERA5 is the fifth generation ECMWF atmospheric reanalysis of the global climate. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. This principle, called data assimilation, is based on the method used by numerical weather prediction centres, where every so many hours (12 hours at ECMWF) a previous forecast is combined with newly available observations in an optimal way to produce a new best estimate of the state of the atmosphere, called analysis, from which an updated, improved forecast is issued. Reanalysis works in the same way, but at reduced resolution to allow for the provision of a dataset spanning back several decades. Reanalysis does not have the constraint of issuing timely forecasts, so it is more time to collect observations, and when going further back in time, to allow for the ingestion of improvements of the original observations, which all benefit the quality of the reanalysis product.



The assimilation system is able to estimate biases between observations and to sift good-quality data from poor. The laws of physics allow for estimates at locations where data coverage is low, such as for surface temperature in the Arctic. The provision of estimates at each grid point around the globe for each regular output time, over a long period always using the same format, makes reanalysis a very convenient and popular dataset to work with.

The observing system has changed drastically over time, and although the assimilation system can resolve data at the initially much sparser networks will lead to less accurate estimates. For this reason, ERA5 includes an update

ERA5 hourly data on pressure levels from 2000 to present

Overview Download data Documentation

Variable

At least one selection must be made

- Divergence
- Ozone mass mixing ratio
- Specific cloud ice water content
- Specific snow water content
- V-component of wind
- Fraction of cloud cover
- Potential vorticity
- Specific cloud liquid water content
- Temperature
- Vertical velocity
- Geopotential
- Relative humidity
- Specific humidity
- Specific rain water content
- U-component of wind
- Vorticity (relative)

Pressure level

At least one selection must be made

- 1 hPa
- 2 hPa
- 3 hPa
- 5 hPa
- 7 hPa
- 10 hPa
- 20 hPa
- 30 hPa
- 50 hPa
- 70 hPa
- 100 hPa
- 125 hPa
- 150 hPa
- 200 hPa
- 250 hPa
- 300 hPa
- 350 hPa
- 400 hPa
- 450 hPa
- 500 hPa
- 550 hPa
- 600 hPa
- 650 hPa
- 700 hPa
- 750 hPa
- 800 hPa
- 850 hPa
- 900 hPa
- 950 hPa
- 975 hPa

Year

At least one selection must be made

- 2000
- 2003
- 2006
- 2001
- 2004
- 2007
- 2002
- 2005
- 2008

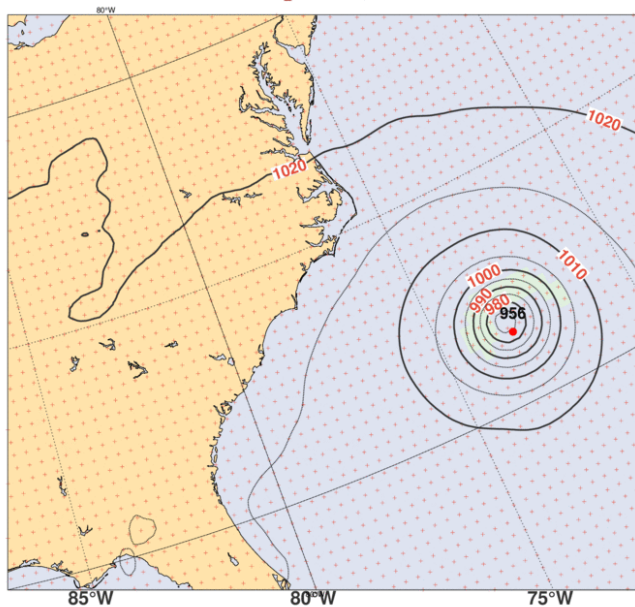




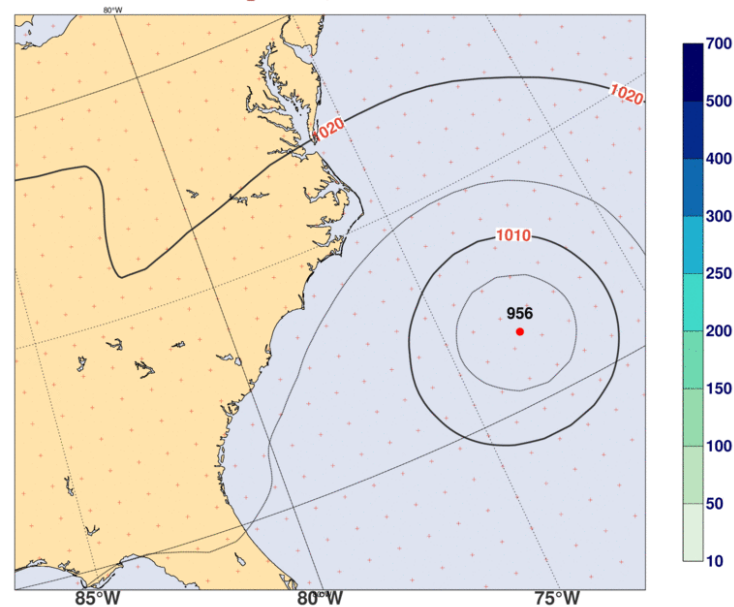
Climate
Change

Going from ERA-Interim to ERA5

Florence Thu 13 Sep 2018, 01 UTC for ERA5



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





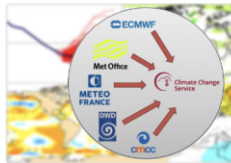
Climate Change

Multi-system seasonal forecasts

Seasonal forecast monthly statistics on single levels from 2017 to present

Overview Download data Documentation

Seasonal forecasts provide a long-range outlook of changes in the Earth system over periods of a few weeks or months, as a result of predictable changes in some of the slow-varying components of the system. For example, ocean temperatures typically vary slowly, on timescales of weeks or months; as the ocean has an impact on the overlaying atmosphere, the variability of its properties (e.g. temperature) can modify both local and remote atmospheric conditions. Such modifications of the 'usual' atmospheric conditions are the essence of all long-range (e.g. seasonal) forecasts. This is different from a weather forecast, which gives a lot more precise detail - both in time and space - of the evolution of the state of the atmosphere over a few days into the future. Beyond the chaotic nature of the atmosphere limits the possibility to predict precise changes at local scales. This is one reason long-range forecasts of atmospheric conditions have large uncertainties. To quantify such uncertain range forecasts use ensembles, and meaningful forecast products reflect a distributions of outcomes.



Given the complex, non-linear interactions between the individual components of the Earth system, the best long-range forecasting are climate models which include as many of the key components of the system and typically, such models include representations of the atmosphere, ocean and land surface. These models are with data describing the state of the system at the starting point of the forecast, and used to predict the ev

...this state in time. While uncertainties coming from imperfect knowledge of the initial conditions of the system (the Earth system) can be described with the use of ensembles, uncertainty arising from approximations in models are very much dependent on the choice of model. A convenient way to quantify the effect approximations is to combine outputs from several models, independently developed, initialised and operate

To this effect, the C3S provides a multi-system seasonal forecast service, where data produced by state

Seasonal forecast monthly statistics on single levels from 2017 to present

Overview Download data Documentation

Originating centre

At least one selection must be made

- ECMWF
- UK Met Office
- Météo France

Select all

Variable

At least one selection must be made

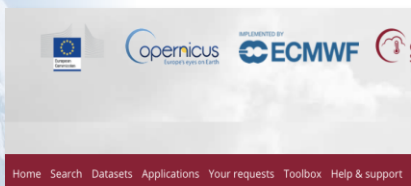
- 10m u-component of wind
- 10m v-component of wind
- 10m wind gust since previous post-processing
- 10m wind speed
- 2m dewpoint temperature
- 2m temperature
- East-west surface stress rate
- Evaporation
- Maximum 2m temperature in the last 24 hours
- Mean sea level pressure
- Minimum 2m temperature in the last 24 hours
- North-south surface stress rate of accumulation
- Runoff
- Sea surface temperature
- Sea-ice cover
- Snow density
- Snow depth
- Snowfall
- Soil temperature (level 1)
- Surface latent heat flux
- Surface sensible heat flux
- Top solar radiation
- Top thermal radiation
- Total cloud cover

Select all

Product type

At least one selection must be made

- Ensemble



Search results

Search dataset [] [] All Datasets

Showing 1-6 of results for Seasonal fo

- Sort by
- Relevancy
- Title
- Product type
 - Climate projections
 - Reanalysis
 - Satellite observations
 - Seasonal forecasts
 - Sectoral climate indices
- Spatial coverage
 - Global
- Temporal coverage
 - Future
 - Past

New:

- Products available on 13th of each month (6 month outlook)
- Additional forecast providers: DWD and CMCC

Coming soon:

- Verification information for all forecast products



Climate Change

Climate projections from CMIP5

Home Search Datasets Applications Your requests Toolbox Help & support

Search results

Showing 1-4 of 4 results for **Climate projections**

Sort by **Relevancy**

Product type

- Climate projections (4)
- Reanalysis (2)
- Satellite observations (11)
- Seasonal forecasts (6)
- Sectoral climate indices (2)

Variable domain

- Atmosphere (surface) (4)
- Atmosphere (upper air) (4)

Spatial coverage

- Global (4)

Temporal coverage

- Future (4)
- Past (4)
- Present (4)

CMIP5 daily data on pressure levels

Overview Download data Documentation

This catalogue entry provides daily climate projections on pressure levels from a large number of models, members and time periods computed in the framework of fifth phase of the Coupled Model Intercomparison Project (CMIP5) for the Historical experiment. Information on how to access the complete CMIP5 dataset can be found in the Documentation section.

The term "pressure levels" is used to express that the variables were computed at multiple vertical levels, which may differ in number and location among the different models. The term "experiments" refers to the four main categories of CMIP5 simulations:

- Pre-industrial control experiments (PI-control) with prescribed, non-evolving concentrations of and aerosols as they are supposed to be before the industrial period;
- Historical experiments which cover the period where climate observations do exist;
- Ensemble of experiments from the Atmospheric Model Intercomparison Project (AMIP), which oceanic variables for all models and during the all period of the experiment. This configuration complexity of ocean-atmosphere feedbacks in the climate system;
- Ensemble of climatic-projection experiments following the Representative Concentration Path 6.0 and 8.5.

Typically, the same experiment was done using different models. In addition, for each model, it was repeatedly done using slightly different conditions producing in that way an ensemble of related. Each member of that ensemble is named after a triad of integers associated to the letters members and time periods computed in the framework of fifth phase of the Coupled ...

CMIP5 daily data on pressure levels

This catalogue entry provides daily climate projections on pressure levels from a large number of models, members and time periods computed in the framework of fifth phase of the Coupled Model Intercomp...

CMIP5 daily data on single levels

This catalogue entry provides daily climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Coupled ...

CMIP5 monthly data on pressure levels

This catalogue entry provides monthly climate projections on pressure levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Cou...

CMIP5 monthly data on single levels

This catalogue entry provides monthly climate projections on single levels from a large number of experiments, models, members and time periods computed in the framework of fifth phase of the Couple...

CMIP5 daily data on pressure levels

Overview Download data Documentation

Variable

At least one selection must be made

- Temperature
- U-component of wind
- Geopotential height

Model

At least one selection must be made

- inmcm4 (INM, Russia)
- ACCESS1-0 (BoM-CSIRO, Australia)
- CMCC-CM (CMCC, Italy)
- GFDL-CM3 (NOAA, USA)
- HadGEM2-CC (UK Met Office, UK)
- IPSL-CM5B-LR (IPSL, France)
- NorESM1-M (NCC, Norway)
- ACCESS1-0 (BoM-CSIRO, Australia)
- CMCC-CM (CMCC, Italy)
- GFDL-ESM2G (NOAA, USA)
- HadGEM2-ES (UK Met Office, UK)
- MPI-ESM-LR (MPI, Germany)
- bcc-csm1-1 (BCC, China)
- bcc-csm1-1-m (BCC, China)
- CNRM-CM5 (CNRM-CERFACS, France)
- GFDL-ESM2M (NOAA, USA)
- IPSL-CM5A-LR (IPSL, France)
- IPSL-CM5A-MR (IPSL, France)
- MPI-ESM-MR (MPI, Germany)

Ensemble member

- r1i1p1
- r2i1p1
- r3i1p1
- r4i1p1
- r5i1p1
- r6i1p1

Period

At least one selection must be made

- 18600101-18641231
- 18610101-18651231
- 18650101-18691231



Climate Change

Evaluation and Quality Control (EQC)

A suitable EQC framework has been developed for quality assurance of CDS datasets

Key feature: Quality Assurance R

Sea ice monthly and daily gridded data from 1978

Overview Download data Documentatio **Quality**

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 aa exchanges of energy, moisture and carbon. The sea-ice distribution, including polynyas and margins, also has an important infl on marine ecosystems. Changes in the distribution of sea ice affect these ecosystems and a number of activities such as shippingistic and tourist operations.

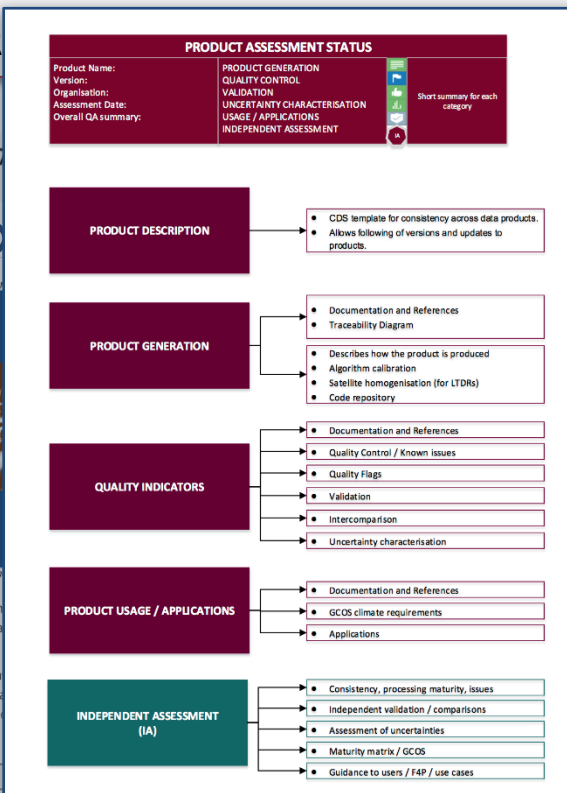
Sea ice edge, sea ice concentration and sea ice type were computed from satellite passive microwave brightness temperatures from the series of SMMR, SSM/I and SSMIS sensors. Sea ice thickness were computed from Ku-Band radar altimeter measurements collecting the Envisat and CryoSat-2 satellite missions.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

From 1978 up to April 2015 the data records provided by this dataset have continuity to detect climate variability and change. From April 2015 onwards, same algorithms and processing environment but consistency and continuity have not been maintained.

More details about the product are given in the Documentation section.

DATA DESCRIPTION

Horizontal coverage	Sea ice concentration and edge: global ocean split in Northern and Southern hemisphere (Lambert EASE/EASE2 projection).
	Sea ice thickness and type: northern hemisphere (Lambert EASE2 projection).



Quality of data:

- assessments
- user guidance
- gaps and limitations

Quality of tools:

- fitness for purpose
- best practices

Quality of service:

- speed, responsiveness
- system availability, ...





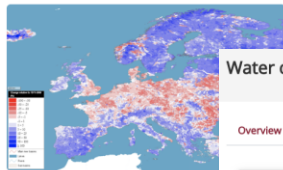
Climate Change

Data on sectoral impacts

Water quality indicators for European rivers

Overview Download data Documentation

This dataset contains modelled data for phosphorous and nitrogen concentrations and loads. The data comes from the Swedish Meteorological and Hydrological Institute E-HYPE model at catchment level for Europe. These water quality indicators were computed as a part of a proof of concept contract designed to speed up the workflow in impact assessments and to simplify climate change adaptation of water management practices across Europe.



These indicators are provided as averages over 30 year periods, either for each calendar month or for the whole period. For the reference period (1971-2000) the absolute values are given, whereas for the future periods the relative changes are provided. In addition to total organic and inorganic parts are provided for nitrogen. For phosphorous, in addition to the total amount and soluble parts are provided. Values of the temperature of the water is provided for the same periods.

More details about the product are given in the Documentation section.

DATA DESCRIPTION

Horizontal coverage	Pan European domain.
Horizontal resolution	Irregular catchment polygons, median catchmentsize 215 km ² .

Water quality indicators for European rivers

Overview Download data Documentation

Variable

At least one selection must be made

- Inorganic nitrogen concentrations
- Soluble phosphorous concentrations
- Inorganic nitrogen loads
- Soluble phosphorous loads
- Water temperature
- Organic nitrogen concentrations
- Total nitrogen concentrations
- Organic nitrogen loads
- Total nitrogen loads
- Particulate phosphorous concentrations
- Total phosphorous concentrations
- Particulate phosphorous loads
- Total phosphorous loads

Select all

Emissions scenario

At least one selection must be made

- RCP 2.6
- RCP 4.5
- RCP 8.5

Select all

Time aggregation

At least one selection must be made

- 30 year average
- Month average

Select all

Period

At least one selection must be made

- 1971-2000 (reference)
- 2011-2040
- 2041-2070

Select all



Home Search Datasets Applications Your requests Toolbox Help & support

Search results

Search dataset [input] [magnifying glass] All Datasets

Sort by

Relevancy

Title

- Product type
 - Climate projections (4)
 - Reanalysis (2)
 - Satellite observations (11)
 - Seasonal forecasts (6)
 - Sectoral climate indicators (2)
- Variable domain
 - Land (hydrology) (2)
- Spatial coverage
 - Europe (2)
- Temporal coverage
 - Future (2)

Showing 1-2 of 2 results for Sectoral climate indicators for European rivers

Coming soon: Indicators for European rivers

This dataset contains modelled data for phosphorous and nitrogen concentrations and loads. The data comes from the Swedish Meteorological and Hydrological Institute E-HYPE model at catchment level F...

Water quantity indicators for Europe

- Indicator datasets to support additional sectors: energy, agriculture, tourism, health, shipping, fisheries, coastal



Climate
Change

C3S reanalysis data: A use case

C3S reanalysis data as a business model for an SME in the renewable energy sector

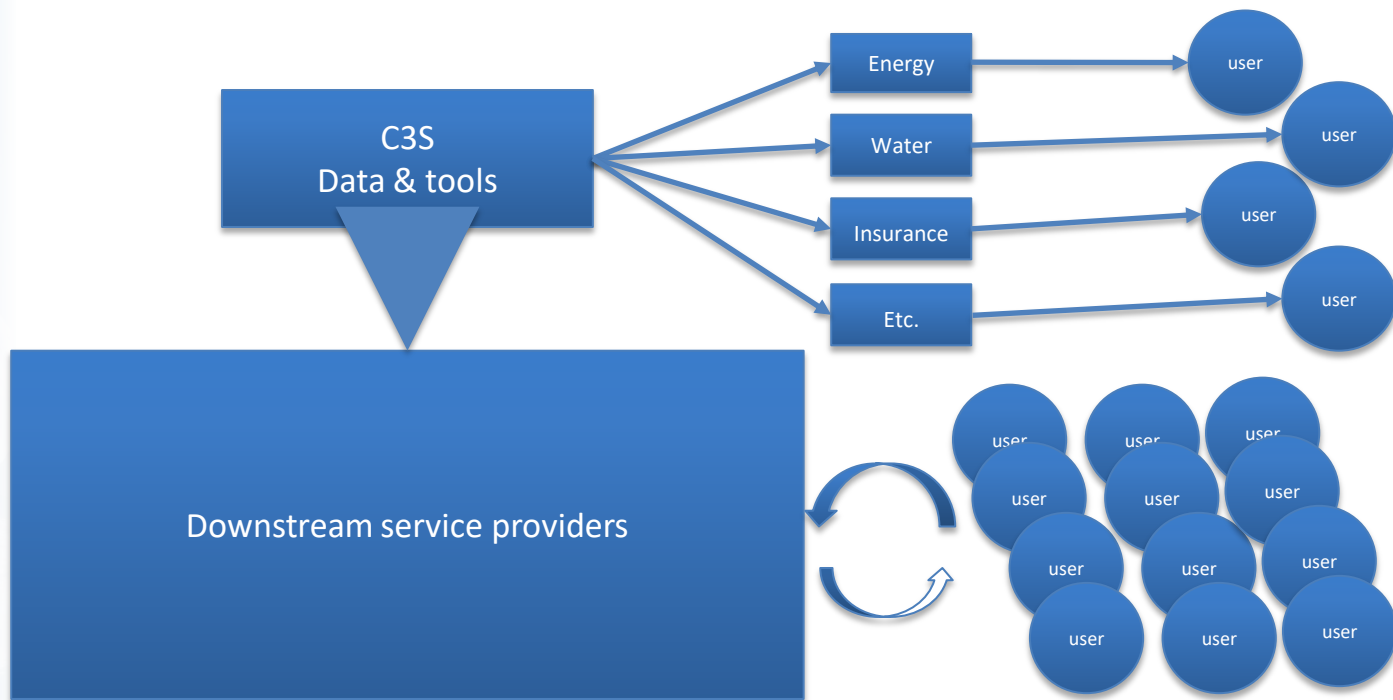
[Video 2](#)





Climate
Change

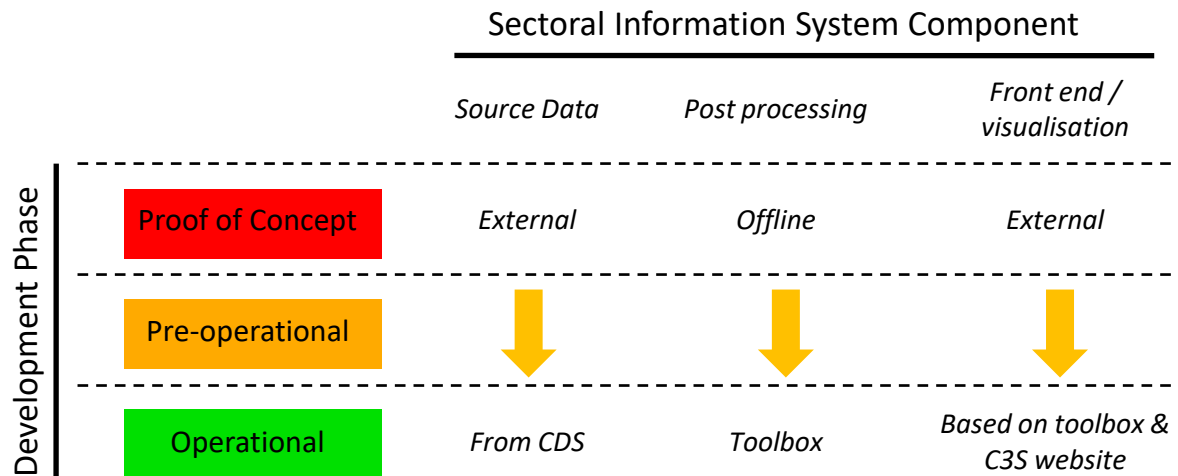
Enabler for downstream exploitation





Climate
Change

Sectoral Information System

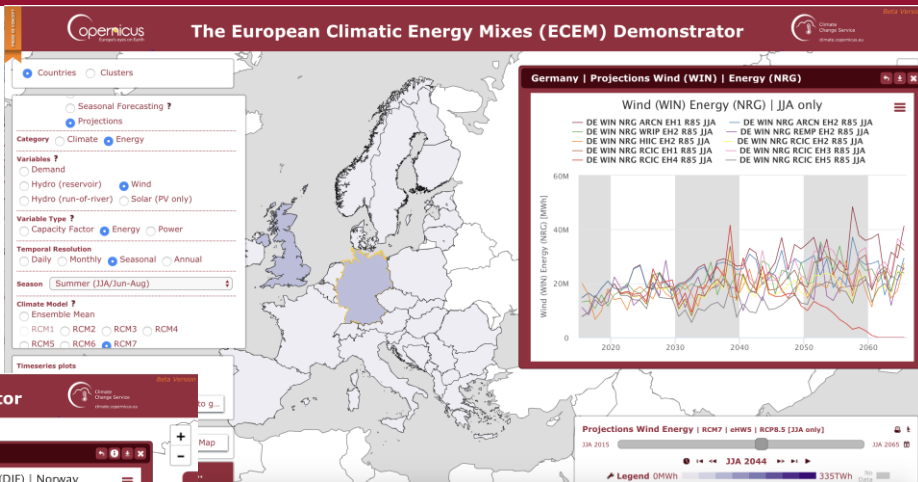
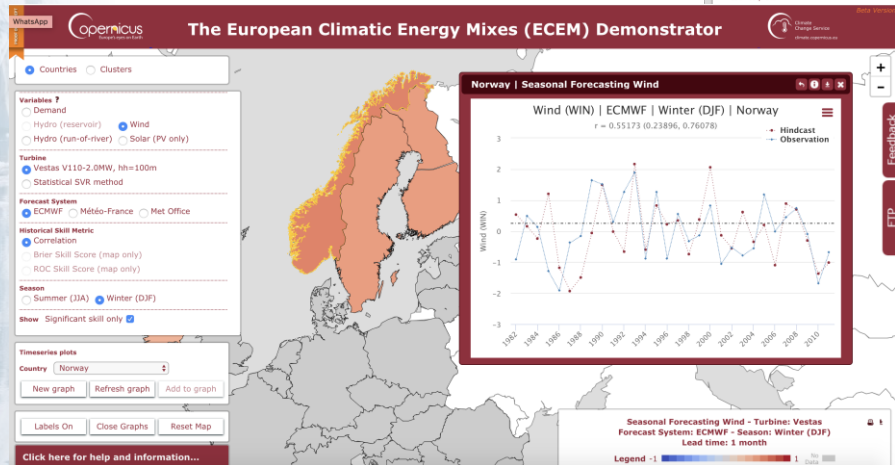




Climate Change

Energy

Integrating climate and energy scenarios to learn how well prepared our infrastructure is to cope with the climate of the future. Will the renewable dominated energy mix of the future be able to cope with the expected change in the energy demand profile?



Using a combination of historical data, reanalysis, seasonal predictions and climate projections the SIS contracts have demonstrated how it will be possible to address some of these questions through the CDS.

Contract led by UEA



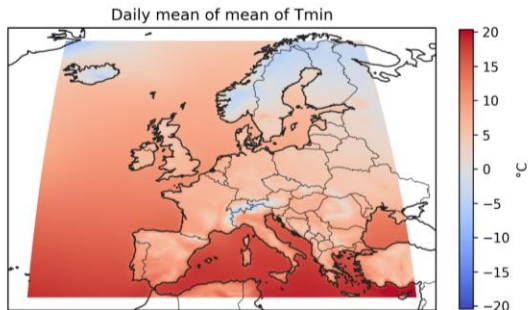


Climate Change

Health exposure demonstrator

Secure | https://cds.climate.copernicus.eu/apps/355/heat_exposure?sdk_version=2.8.1

Heat_exposure



Variable

Tmin

City

Rome

Statistic

Mean

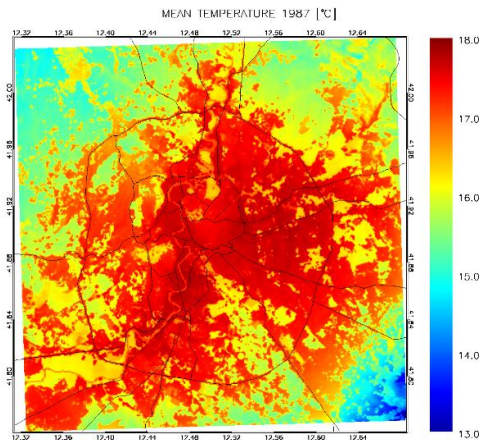
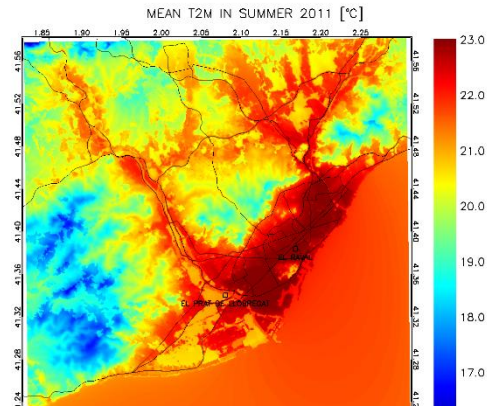
Period

Annual



Timeseries of mean of Tmin for Rome

“Talk is cheap, show me your code” *Linus Torvalds 2000-05-02*



European Commission





Climate
Change

Our strength



European
Commission

Europe's eyes on Earth

COMET



Climate
Change

Indicators, global agriculture contract

- Biologically Effective Degree Days, Growing Season Length, Maximum number of consecutive dry days, Maximum number of consecutive frost days (Cold spell), Cold Spell Duration Index, Maximum number of consecutive summer days (Hot spell), Maximum number of consecutive wet days (Wet spell), Mean of diurnal temperature range, Frost Days, Ice Days, Heavy precipitation days, Very heavy precipitation days, Precipitation sum, Wet Days, Simple Daily Intensity Index (Mean precipitation per wet day), Summer Days, Mean of daily mean temperature, Mean of daily minimum temperature, Minimum value of the daily minimum temperature, Maximum value of the daily minimum temperature, Tropical nights, Mean of daily maximum temperature, Minimum value of daily maximum temperature, Maximum value of daily maximum temperature, Warm Spell Duration Index, Warm and wet days, AgERA5 wind speed, AgERA5 dewpoint temperature, AgERA5 air temperature, AgERA5 precipitation type, AgERA5 relative humidity, AgERA5 snow, AgERA5 solar radiation, AgERA5 cloud cover, AgERA5 precipitation, AgERA5 vapour pressure, Soybean development stage, Soybean Total above-ground production, Soybean Total weight storage organs (yield), Wheat development stage, Wheat Total above-ground production, Wheat Total weight storage organs (yield), Rice development stage, Rice Total above-ground production, Rice Total weight storage organs, (yield), Maize development stage, Maize Total above-ground production, Maize Total weight storage organs (yield), evapotranspiration



Climate Change

2016

2017

2018

2019

2020

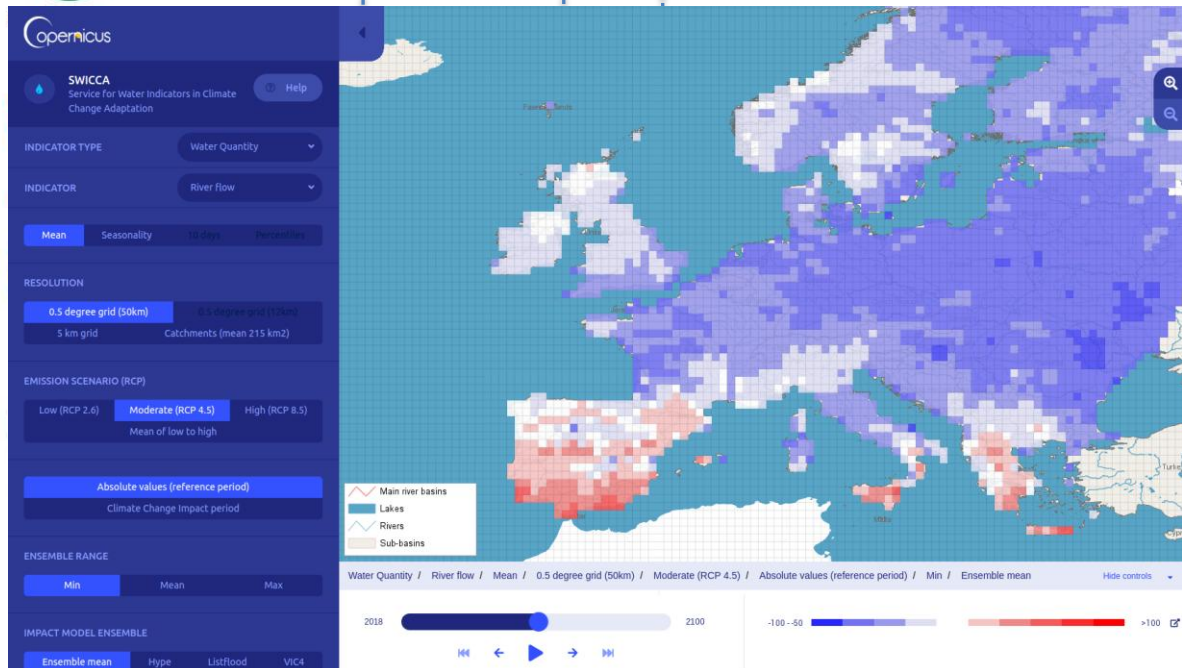
2021

Proof of concept Operational Phase



Agriclass

POC to Operations



Previous C3S GA March 2017

CDS / Toolbox launched

Present





Climate Change



Global Services

European Services



AGRICULTURE & FORESTRY



WATER MANAGEMENT



TRANSPORT



FISHERIES



TOURISM



HEALTH



COASTAL AREAS

2016

2017

2018

2019

2020

2021

Proof of concept

Agriclass

Global Agriculture (WenR)

Global Impacts (SMHI)

Global Shipping (OSM)

European Fisheries (PML)

European Tourism (TEC)

European Health (VITO)

European Storm Surges (Deltares)

Previous C3S
GA March 2017

CDS / Toolbox
launched

Present



About

The European Health Service, as a part of C3S, provides users with tailor-made climate information for the health domain. This information consists of climate-health indicators concerning:

- heat and cold stress
- vector-borne diseases





Climate Change



2016

2017

2018

2019

2020

2021

Proof of concept

Operational Phase



DISASTER RISK REDUCTION



BIODIVERSITY



INFRASTRUCTURE

DRR

Biodiversity

Standards & Infrastructure

Application development (TBC)

Evaluation & Quality Control SIS

User Cases

Have a look at:

<https://climate.copernicus.eu/complete-list-tenders-issued-c3s>

And develop a Use/Demo Case!

Toolbox launched

Present



European Commission



Climate change affects us all. How would you use our data to help key climate-sensitive sectors adapt?



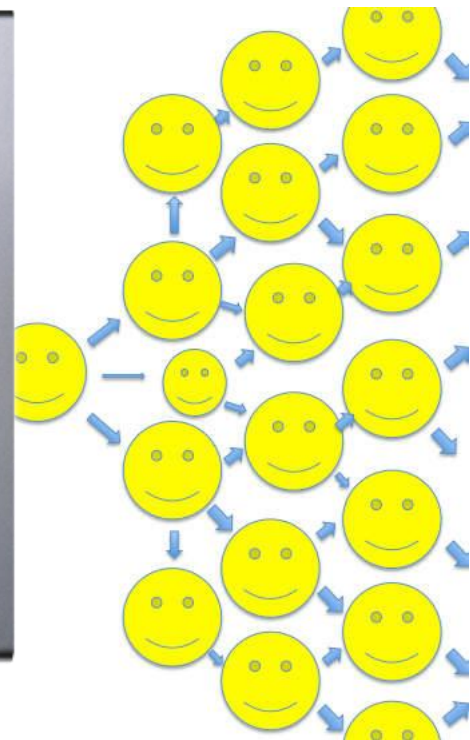
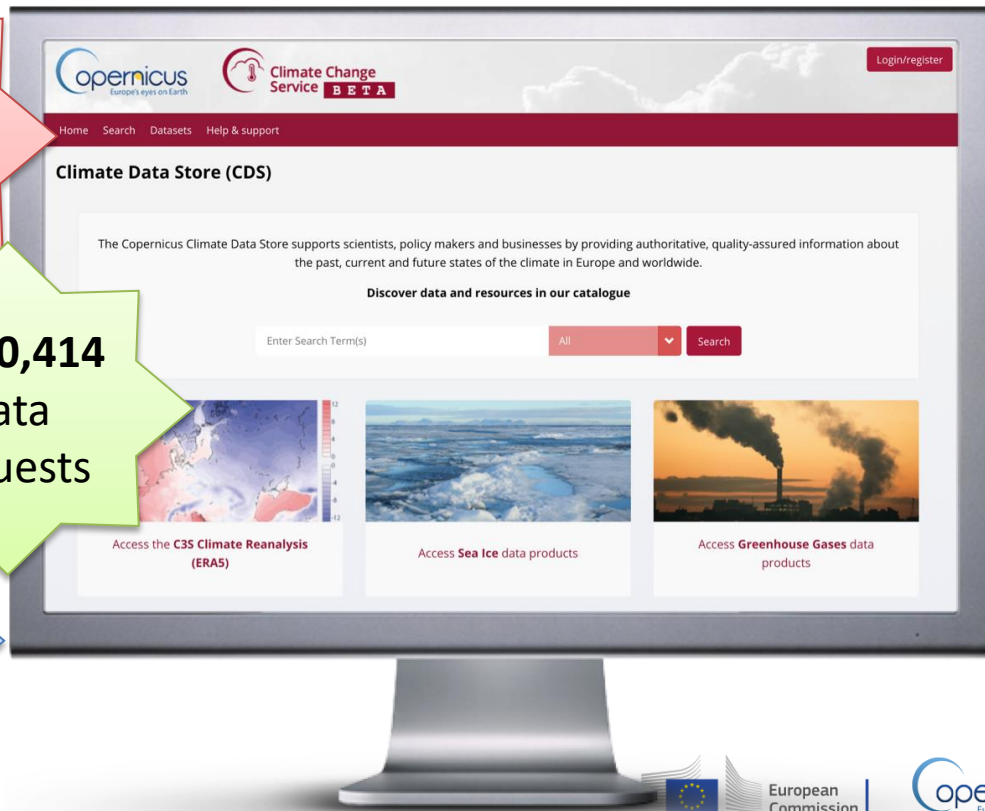
Climate
Change

CDS out of the starting blocks... (21 November 2018)

4,431
registered
users

1,710,414
data
requests

873 Tb
data volume
delivered





Climate
Change

C3S for climate monitoring





Climate
Change

Monthly climate bulletins

Implemented by ECMWF as part of The Copernicus Programme

Climate Change Service

News Events Press Tenders Help & Support

ABOUT US WHAT WE DO DATA QSEARCH

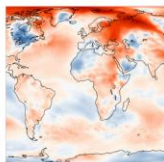
WHAT WE DO ► CLIMATE BULLETIN

Climate bulletins

Through our monthly maps, we present the current condition of the climate using key climate change indicators. We also provide analysis of the maps and guidance on how they are produced.

HIGHLIGHTS OF THE LATEST MONTHLY SUMMARIES MONTHLY CLIMATE UPDATE FEATURED STORY MONTHLY SUMMARIES

Monthly summaries



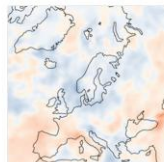
Surface air temperature

This series of monthly maps and charts, generated from ERA-interim data, covers



Sea ice

We produce sea-ice maps every month. Based on ERA-interim reanalysis data, these provide near real-time



Hydrological variables

This series of monthly maps and charts, based on ERA-interim data, covers several



Surface in-situ monitoring for Europe

Monthly and yearly State-of-the-European-climate reports provided

Monthly climate update

15TH OCTOBER 2018

In Europe, it was the warmest September on record. Portugal and western Spain were particularly warm.

Iceland, Ireland and Scotland saw generally cooler than average temperatures.

Japan was hit by two devastating storms, Jebi and Trami following rains, landslides, floods and record-breaking heat this year.

Strong tropical cyclone Mangkhut caused at least 134 fatalities in the Philippines, Hong Kong and China.



Featured story

29TH OCTOBER 2018



A stormy September

One of the **warmest summers on record** has come to an end with a September full of storms. Modelling of historic storms can help us prepare for such events. We use two of the recent storms to demonstrate the improvements we have made with the release of our new **dataset**.

[Read more](#)

➤ climate.copernicus.eu/climate-bulletins





Climate Change

European State of the Climate



WHAT WE DO ► EUROPEAN STATE OF THE CLIMATE 2017

REPORT

European State of the Climate 2017

ABOUT CLIMATE IN 2017 HEADLINE CLIMATE INDICATORS CONTRIBUTORS

About

The European State of the Climate 2017 covers two main themes, the Climate in 2017 and Headline Climate Indicators.

The key findings for each section can be found in the *European State of the Climate 2017 Summary*. The summary and the sections themselves are aimed at a non-expert audience interested in the climate events of

2 main sections

- Climate in 2017
- Headline climate indicators

Based on

- Reanalysis, in-situ, satellite data

With contributions from

- CAMS, CMEMS, EEA and GCOS
- 13 further European research institutions

➤ climate.copernicus.eu/copernicusESC

Focus Region: Southwest Europe

During 2017, the southwest of Europe stood out with high temperatures, drought and repeated wildfire events.

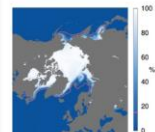
2017 was an exceptionally dry and warm year in the southwest of Europe.

Annual temperatures were the highest on record and soil moisture was the lowest. In particular, spring and summer showed large positive temperature anomalies. Spring and summer were among the two warmest on record, both at close to 1.7°C above the 1981-2010 average. In large areas the hottest summer day was close to or even exceeded 40°C. The annual number of dry days was much below average. Soil moisture reached seasonal record lows in spring and autumn. Estimated annual total fire emissions were the highest since 2003, when records began.



Focus Region: European Arctic

During the final months of 2017, some land areas of the north Atlantic Arctic experienced monthly temperatures more than 5°C above the 1981-2010 average.



Despite temperatures at the beginning of 2017 not being record breaking, the sea ice area remained much lower than average during the first three months of the year. January showed the largest negative anomaly on record. During spring and summer the sea ice area was below the 1981-2010 average, but not exceptionally so. As for temperatures, the end of the year showed larger sea ice anomalies. September to December's anomalies are among the three lowest on record.

Source: ERA Interim, Copernicus Climate Change Service, analysed by ECMWF

Image: Sea ice in the Arctic Ocean, ESA

Climate Indicators

The headline climate indicators show the long-term evolution of several key climate variables. These can be used to assess the global and regional trends of a changing climate. The arrows show the long-term increasing or decreasing trends of these indicators.

Temperature

- Global: around 1.1°C increase since start of industrial era
- Europe: around 1.8°C increase since latter half of the 19th century

The temperature datasets covering all or parts of 1850 to 2017

Greenhouse gases

Current rate of increase in abundance in air:

- CO₂: about 5 Ppt/year or 2.5 ppm/year
- CH₄: about 0.4 Ppt/year
- N₂O: about 1.8 Tt/year

*Estimated via flux data for CO₂, N₂O, CH₄ covering 1975, 1996, 2008 to 2016.

Sea ice

- Arctic: 2016 maximum and 2012 minimum area based on record
- Antarctic: 2017 maximum and minimum area based on record

*Sea ice data retrieved covering 1979-2017

Sea level

During last 25 years:

- Global ocean mean sea level increase of 3.4 mm/year
- European regions: mean sea level increase by 1.2 to 19 mm/year in most coastal areas

*Sea level data retrieved covering January 1993 to May 2017

The aim of the Paris Agreement is to limit global temperature rise to well below 2°C compared to the pre-industrial era, and to pursue efforts to limit it to 1.5°C. The latest five-year average global temperature is the highest on record, and it shows a warming of around 1.1°C since the start of the industrial era.

The estimated net surface fluxes into the atmosphere of the three greenhouse gases carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) have been increasing during recent decades. Anthropogenic emissions of CO₂ have been partly compensated by a natural flux sink in the oceans and vegetation. It is estimated that Europe represents a vegetation sink for CO₂, but the relative magnitude of the sink has been decreasing since the 1990s.

Arctic sea ice area shows a downward trend that becomes apparent after the year 2000. In the Antarctic, variability rather than trend predominates. Spots of notably above-average sea ice area occurred in 2007-2009 and 2013-2015, but Antarctic sea ice area has been substantially below average since September 2016.

Global mean sea level rise amounts to 3.4 mm/year during the last 25 years. The translates to a global increase in sea level of about eight centimetres. The regional trends during this period can deviate considerably from the global mean and in the European Seas, the sea level changes can differ in the open ocean and in coastal areas due to various geographical processes.

Glaciers

- Global average: more than 200 km³ of observed loss in ice thickness since 1960s
- Europe: observed loss in ice thickness since 1960s ranges between 20 to 500 thousand Scandinavia and 54m in the Alps

*Reference date: winter with mean 30 years of temperature data.

Non-retreating Glacier: Gletscher
*Data by the Copernicus Sentinel 2A satellite (2017), ESA

Glaciers both globally and in Europe have seen a strong and continued retreat loss since around 2000. In the 20th century, the rate of retreat loss was slow, including some periods of mass gain at regional and decadal scale.



Climate Change

Contributing to EEA, GCOS and the WMO

WORLD METEOROLOGICAL ORGANIZATION
Weather · Climate · Water

English

Our mandate · Programmes · Projects · Resources · Media · Events · About us · Extranet

Home — Media — Press Releases — WMO confirms 2017 among the three warmest years on record

Main · News · Press Release · News from Members · Multimedia · Contact us

WMO confirms 2017 among the three warmest years on record

Tags: Climate change · Greenhouse gases · Climate

18 Published 18 January 2018

Press Release Number: 18-01-2018

European Environment Agency

Search

Topics · Countries · Data and maps · Indicators · Publications

Data and maps · Indicators · Global and European temperature · Global and European ...

Global and European temperature

Indicator Assessment — Prod-ID: 190-4-en Alpha known as: CS3 012, CLM 001 — Created 21 Mar 2018 — Published 16 May 2018 — Last modified 16 May 2018 — 19 min read

Topics: Climate change adaptation

Key messages

- According to different observational records of global average annual near-surface (land and ocean) temperature, the last decade (2008–2017) was 0.89 °C to 0.93 °C warmer than the pre-industrial average, which makes it the warmest decade on record. Of the 17 warmest years on record, 16 have occurred since 2000. The year 2017 was one of the world's three warmest years on record together with the years 2016 and 2015.
- The average annual temperature for the European land area for the last decade (2008–2017) was between 1.6 °C and 1.7 °C above the pre-industrial level, which makes it the warmest decade on record. In Europe, 2017 was colder than the previous 3 years.
- Climate models project further increases in global average temperature over the 21st century (for the period 2081–2100 relative to 1986–2005) of between 0.3 °C and 1.7 °C for the lowest emissions scenario (RCP2.6) and between 2.6 °C and 4.8 °C for the highest emissions scenario (RCP8.5).



change caused by ...

WORLD METEOROLOGICAL ORGANIZATION
Weather · Climate · Water

English

Our mandate · Programmes · Projects · Resources · Media · Events · About us · Extranet

Home — Programmes — Global Climate Observing System — Global Climate Indicators

Temperature and Energy · Atmospheric Composition · Ocean and Water · Cryosphere

Surface Temperature · Atmospheric CO₂ · Ocean Acidification · Glacier Mass Balance · Ocean Heat · Sea Level · Arctic and Antarctic Sea Ice Extent

Global Climate Indicators

Contact: gcios@wmo.int

The Global Climate Indicators are a set of seven parameters that describe the changing climate without reducing climate change to only temperature. They comprise key information for the most relevant domains of climate change: temperature and energy, atmospheric composition, ocean and water as well as the cryosphere.

Temperature

Running 60-month averages of global air temperature at a height of two metres (left-hand axis) and estimated change from the beginning of the industrial era (right-hand axis) according to different datasets: ERA-Interim (Copernicus Climate Change Service, ECMWF); GISTEMP (NASA); HadCRUT4 (Met Office Hadley Centre); NOAA-GlobTemp (NOAA); and JRA-55 (JMA). Credit: Copernicus Climate Change Service/ECMWF

60-month average global temperature

Change during industrial era

1800 1850 1900 1950 2000 2020

13.5 14.5 15.5 °C

0 0.5 1.0 1.5

ERA-Interim GISTEMP JRA-55 NOAA-GlobTemp

ECMWF

Global average near surface temperatures relative to the pre-industrial period

Key messages

Scenarios have agreed on the long-term goal of keeping the increase in global average temperature to well below 2 °C above pre-industrial levels and have agreed to aim to limit the increase to 1.5 °C. For the three highest of the four RCPs, the global average temperature is projected to exceed 2 °C compared with pre-industrial levels by 2050. The projected temperature over Europe is projected to increase by the end of this century (2071–2100 relative to 1971–2000) in the order RCP4.5 and 2.5 °C to 5.5 °C under RCP8.5, which is more than the projected global average increase. The projected increase across north-eastern Europe and Scandinavia in winter and southern Europe in summer. The number of days exceeding the 90th percentile threshold of a baseline period) have doubled between 1960 and 2017. Several extreme heat waves since 2000 (2003, 2006, 2007, 2010, 2014, 2015 and 2017). Under a high emissions scenario, extreme heat waves as strong as these or even stronger are projected to occur as often as every two years in the second half of the 21st century. In southern Europe, they are projected to be particularly strong.

Global average temperature stay below 2 °C above pre-industrial levels?

Surface temperatures relative to the pre-industrial period

Global average near surface temperatures relative to the pre-industrial period



Climate
Change

C3S latest press coverage highlights

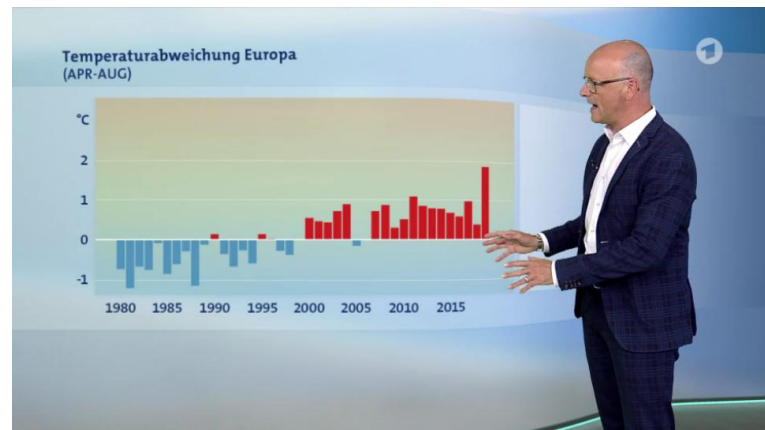
TV presenters around Europe continue to use C3S monthly maps – latest example was from German national TV broadcaster

ARD where C3S data and maps were shown at **prime time** evening news.

Reach: 8m

<https://www.daserste.de/information/nachrichten-wetter/wetter/videos/rueckblick-sommer-2018-100.html>

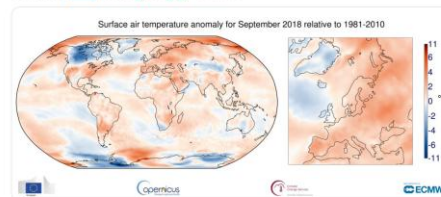
- C3S Monthly maps are also regularly featured via social media channels such as Twitter



Copernicus ECMWF
@CopernicusECMWF

Follow

T #Temperature highlights for September - #Copernicus #C3S. Most of Europe was warmer than average, esp Portugal & Spain. Iceland, Ireland & Scotland generally cooler than average. Globally it was around 0.4°C warmer than the average September. Read more bit.ly/2yg42LM



2:17 am - 5 Oct 2018

35 Retweets 36 Likes



Copernicus
Europe's eyes on Earth

ECMWF



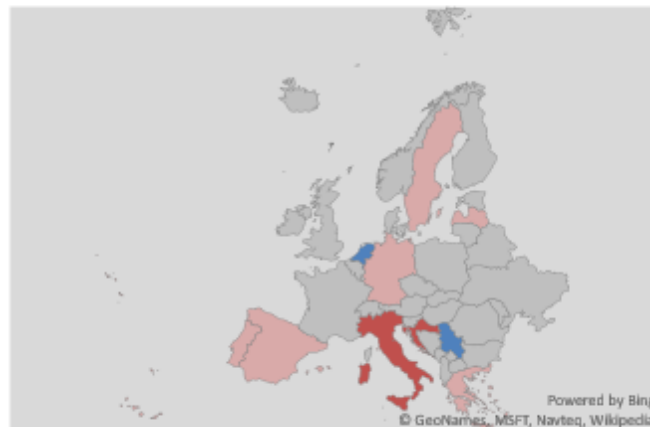
Climate
Change

C3S outreach activities

- Presence at conferences, meetings and fairs
- Press tour
- Hackathon
- User workshops
- C3S user learning services
- “Ad-hoc” training

Train the trainer events

- completed (2018) ■ planned (2018)
- tentative (2019)



➤ uls.climate.copernicus.eu





Implemented by ECMWF as part of The Copernicus Programme

**Climate
Change Service**

[News](#) [Events](#) [Press](#) [Tenders](#) [Help & Support](#)

[ABOUT US](#)

[WHAT WE DO](#)

[DATA](#)

[SEARCH](#)



[X](#) close

Get involved with the Copernicus Climate Change Service

Questions?

