Using ECMWF's Forecasts (UEF2019)
Reading, UK, 3 - 6 June 2019

Climate Change

Seasonal forecasts from the Copernicus Climate Change Service

Eduardo Penabad Ramos, Simona Briceag, Anca Brookshaw

European Commission | Copernicus Europe's eyes on Earth | ECMWF

Climate Change

Contents

- Copernicus
  - Copernicus Programme and ECMWF
  - Copernicus Climate Change Service (C3S)
- The Climate Data Store (CDS)
  - Description
  - Catalogue
  - Access: download, API, applications, Toolbox
- C3S seasonal forecast activity
  - Description
  - Current status and live-demo
  - Next steps

European Commission

Europe's eyes on Earth

ECMWF

Climate Change

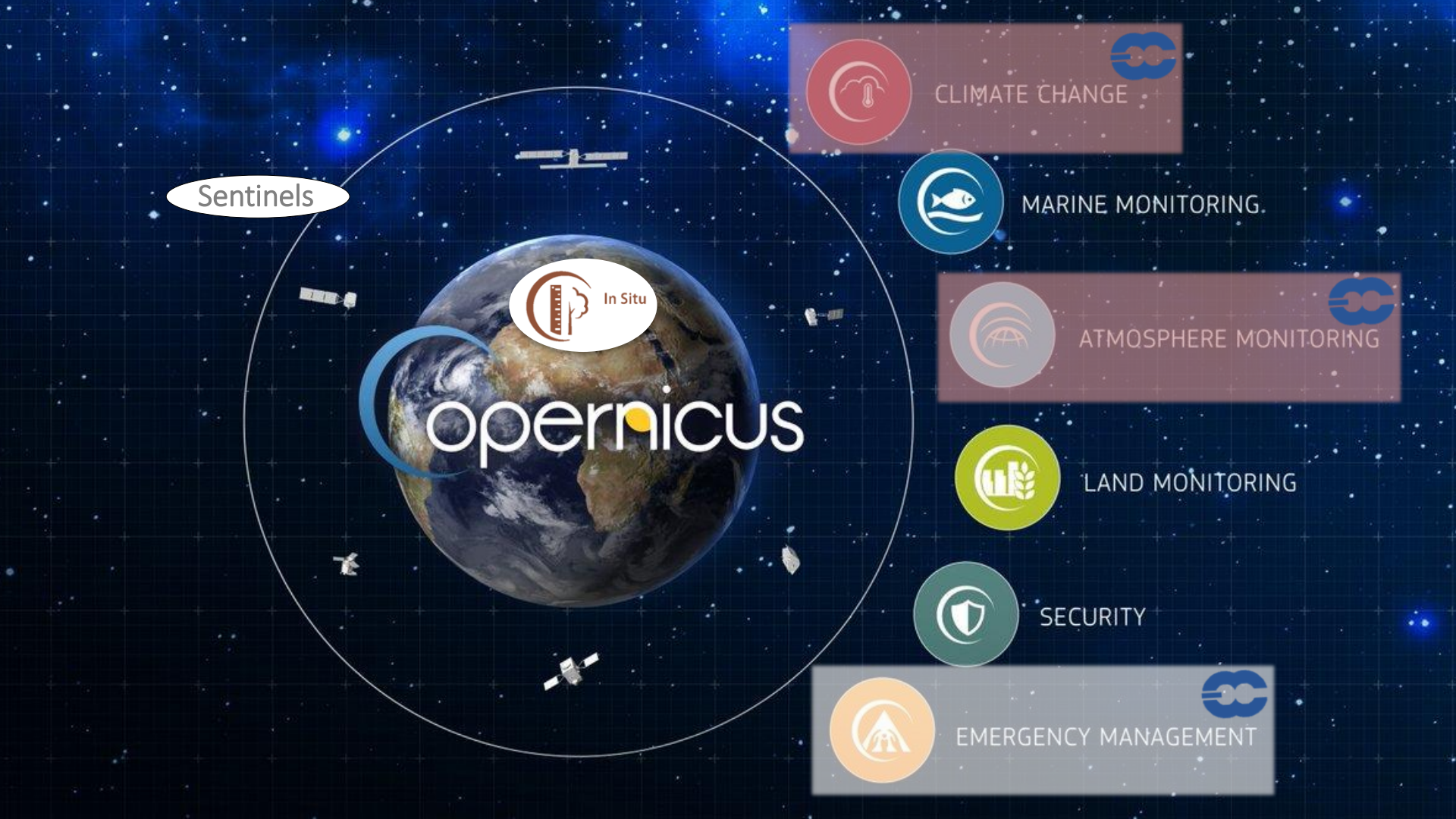
Contents

- Copernicus
  - Copernicus Programme and ECMWF
  - Copernicus Climate Change Service (C3S)
- The Climate Data Store (CDS)
  - Description
  - Catalogue
  - Access: download, API, applications, Toolbox
- C3S seasonal forecast activity
  - Description
  - Current status and live-demo
  - Next steps

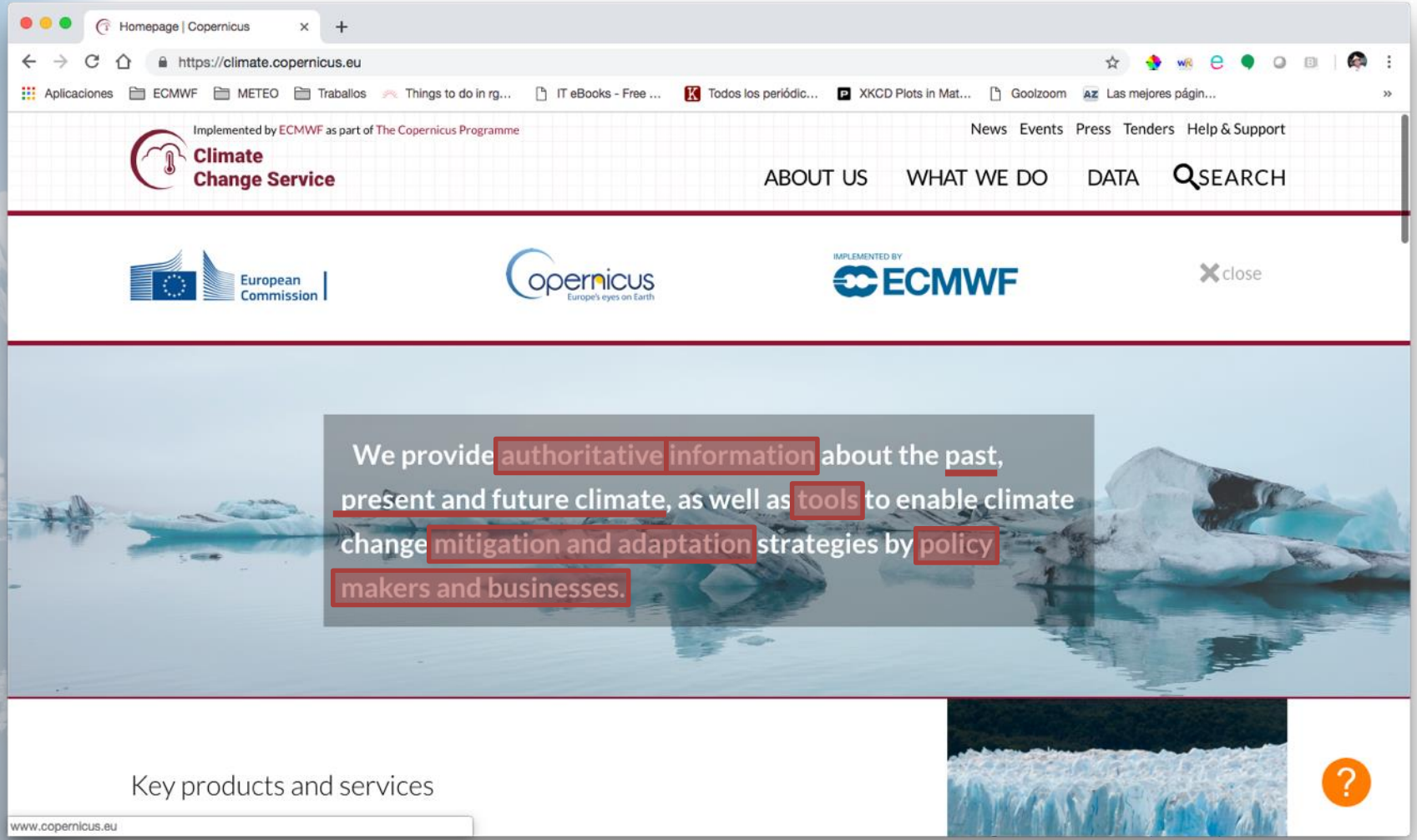
European Commission

Europe's eyes on Earth

ECMWF


Sentinels
In Situ
opernicus
CLIMATE CHANGE
MARINE MONITORING
ATMOSPHERE MONITORING
LAND MONITORING
SECURITY
EMERGENCY MANAGEMENT

Climate Change



Climate Change

Contents

- Copernicus
  - Copernicus Programme and ECMWF
  - Copernicus Climate Change Service (C3S)
- The Climate Data Store (CDS)
  - Description
  - Catalogue
  - Access: download, API, applications, Toolbox
- C3S seasonal forecast activity
  - Description
  - Current status and live-demo
  - Next steps

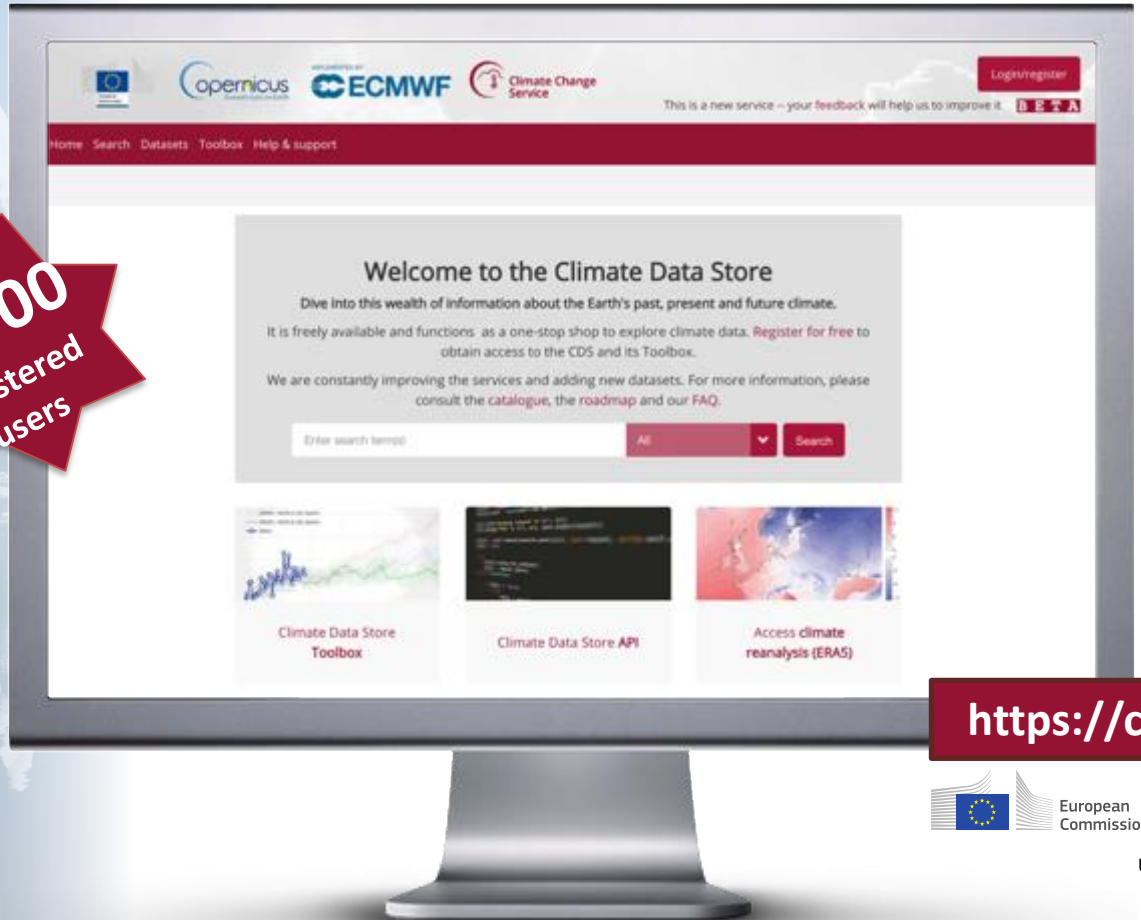
European Commission

Europe's eyes on Earth

ECMWF

The C3S Climate Data Store (CDS)

Climate Change



15000 registered users

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

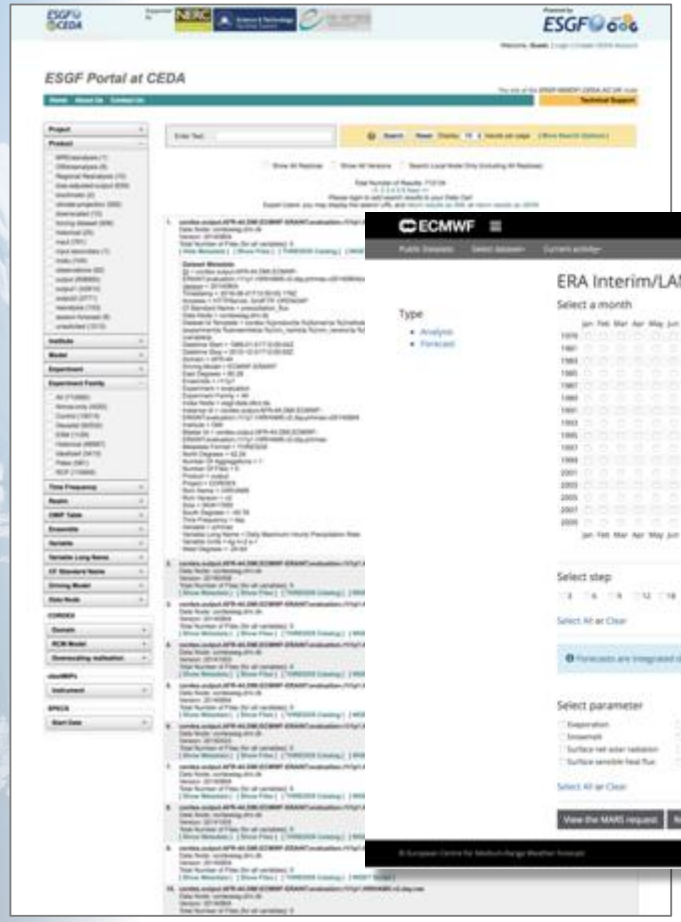
https://cds.climate.copernicus.eu

European Commission

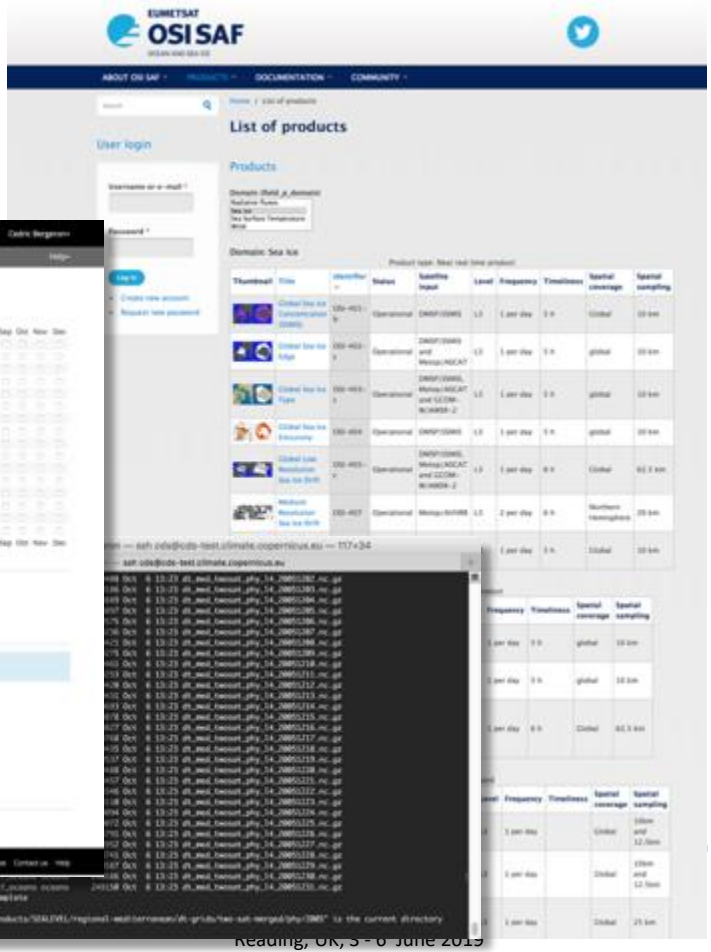
Europe's eyes on Earth

ECMWF

Finding datasets before the CDS…



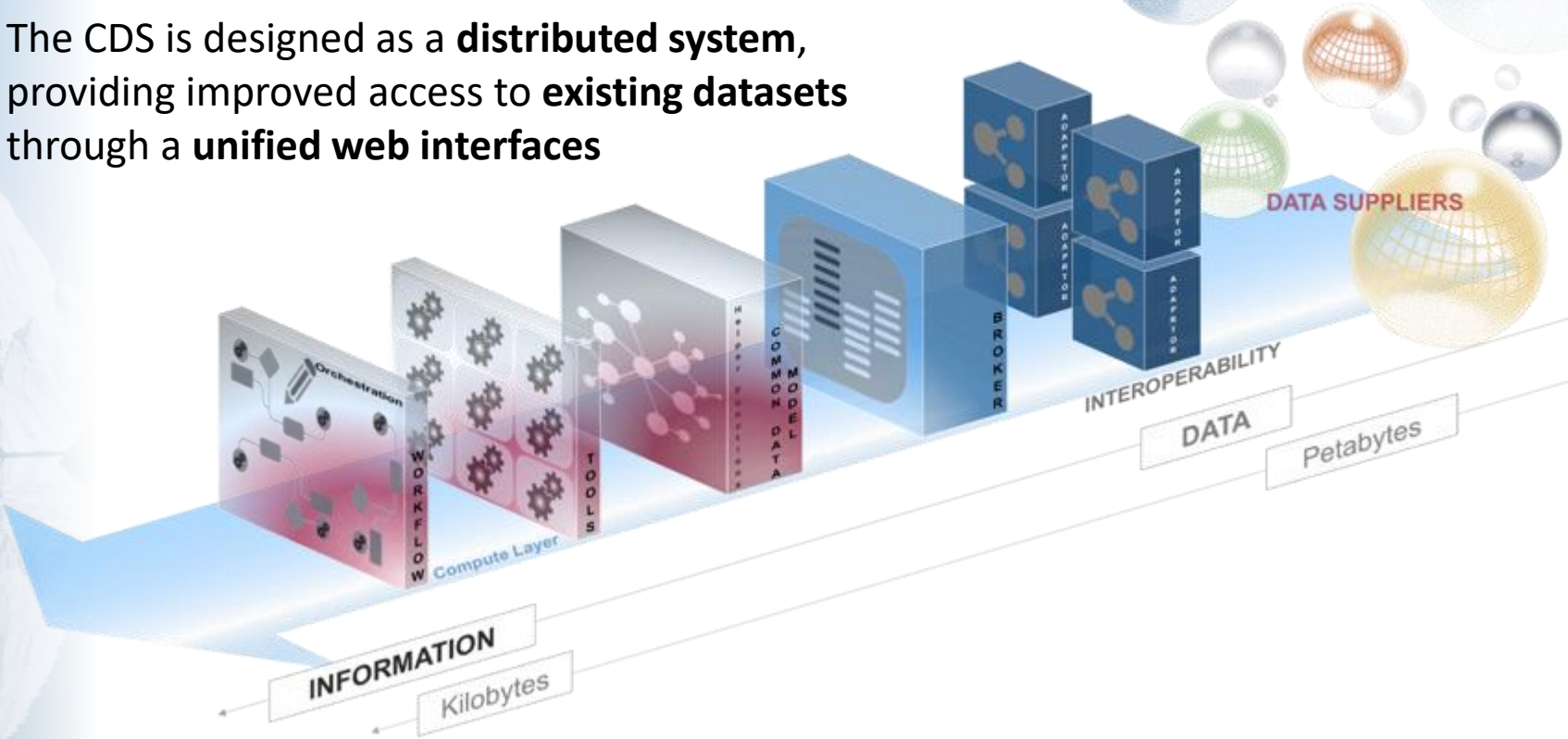
?



Climate Change

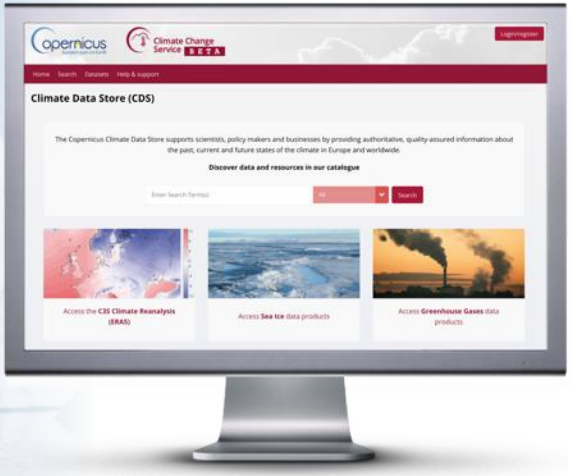
What is the CDS concept?

The CDS is designed as a **distributed system**, providing improved access to **existing datasets** through a **unified web interfaces**



Climate Change

Climate Data Store – Data catalogue

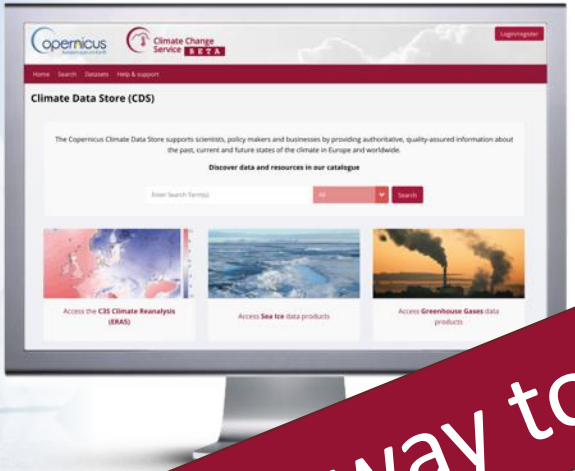


- Global reanalysis
- Regional reanalyses: Europe, Arctic
- ECVs global estimates
- Multi-system seasonal forecasts
- Climate projections
- Sectoral indices (SIS)

Past Climate | Present Climate | Future Climate

Climate Change

Climate Data Store – Data catalogue



- Global reanalysis
- Regional reanal… …etic
- ECVs gl…
- …easonal forecasts
- …te projections
- Sectoral indices (SIS)

Gateway to climate information

Past Climate | Present Climate | Future Climate

European Commission

Europe's eyes on Earth

ECMWF

CDS – Datasets catalogue

Climate Change

Login/register

Your feedback helps us to improve the service

Home Search Datasets Applications Toolbox FAQ

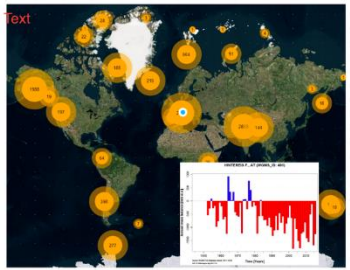
Glaciers elevation and mass change data from 1850 to present from the Fluctuations of Glaciers Database

Overview | Download data | Documentation

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 evidence of past or present flow. There are several types of glaciers such as glacierets, mountain glaciers, valley glaciers and ice fields, as well as ice caps. Some glacier tongues reach into lakes or the sea, and can develop floating ice tongues or ice shelves. Glacier changes are recognized as independent and high-confidence natural indicators of climate change. Past, current and future glacier changes affect global sea level, the regional water cycle and local hazards.

This product consists of two data sets providing time series of glacier changes: 1. The glacier elevation change series, and 2. the glacier mass balance series. These data sets are an extract of the World Glacier Monitoring Service (WGMS) Fluctuations of Glaciers database.

Glacier Elevation



Worldwide distribution of glaciological series. The blue dot refers to the location of the Hintereis Ferner glacier in Austria. Its glaciological serie is shown in the graph.

Both data layers are provided as ESRI shapefiles containing the location of each glacier label point in geographic coordinates (longitude and latitude in degrees) in the World Geodetic System 1984 (WGS84) datum and some general statistical information about each glacier. Both shapefiles come with one ancillary .csv file containing the individual glacier change series linked to the corresponding point shapefile through the World Glacier Monitoring Service identification number (WGMS ID).

Contact

copernicus-support@ecmwf.int

License

UZH Glaciers licence

Publication Date

2018-06-14

Related data

Glaciers distribution data from the Randolph Glacier Inventory for year 2000

CDS – Evaluation and Quality Control (EQC)

Climate Change

Login/register

Your feedback helps us to improve the service

Home Search Datasets Applications Toolbox FAQ

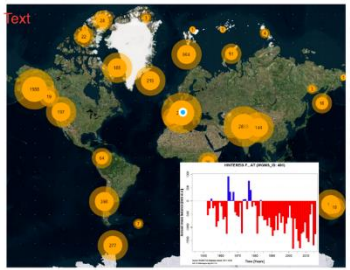
Glaciers elevation and mass change data from 1850 to present from the Fluctuations of Glaciers Database

Overview | Download data | Documentation | Data quality

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 evidence of past or present flow. There are several types of glaciers such as glacierets, mountain glaciers, valley glaciers and ice fields, as well as ice caps. Some glacier tongues reach into lakes or the sea, and can develop floating ice tongues or ice shelves. Glacier changes are recognized as independent and high-confidence natural indicators of climate change. Past, current and future glacier changes affect global sea level, the regional water cycle and local hazards.

This product consists of two data sets providing time series of glacier changes: 1. The glacier elevation change series, and 2. the glacier mass balance series. These data sets are an extract of the World Glacier Monitoring Service (WGMS) Fluctuations of Glaciers database.

Glacier Elevation



Worldwide distribution of glaciological series. The blue dot refers to the location of the Hintereis Ferner glacier in Austria. Its glaciological serie is shown in the graph.

Both data layers are provided as ESRI shapefiles containing the location of each glacier label point in geographic coordinates (longitude and latitude in degrees) in the World Geodetic System 1984 (WGS84) datum and some general statistical information about each glacier. Both shapefiles come with one ancillary .csv file containing the individual glacier change series linked to the corresponding point shapefile through the World Glacier Monitoring Service identification number (WGMS ID).

Contact

copernicus-support@ecmwf.int

License

UZH Glaciers licence

Publication Date

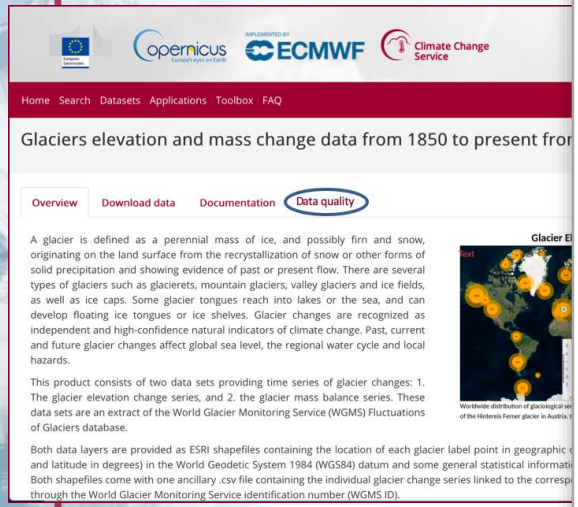
2018-06-14

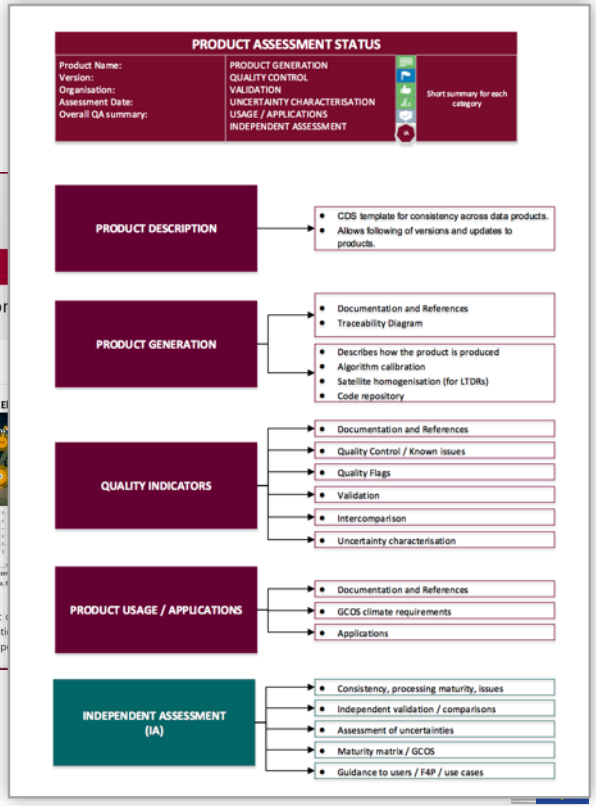
Related data

Glaciers distribution data from the Randolph Glacier Inventory for year 2000

CDS – Evaluation and Quality Control (EQC)

Climate Change





Quality of data
- Assessments
- User guidance
- Gaps and limitations

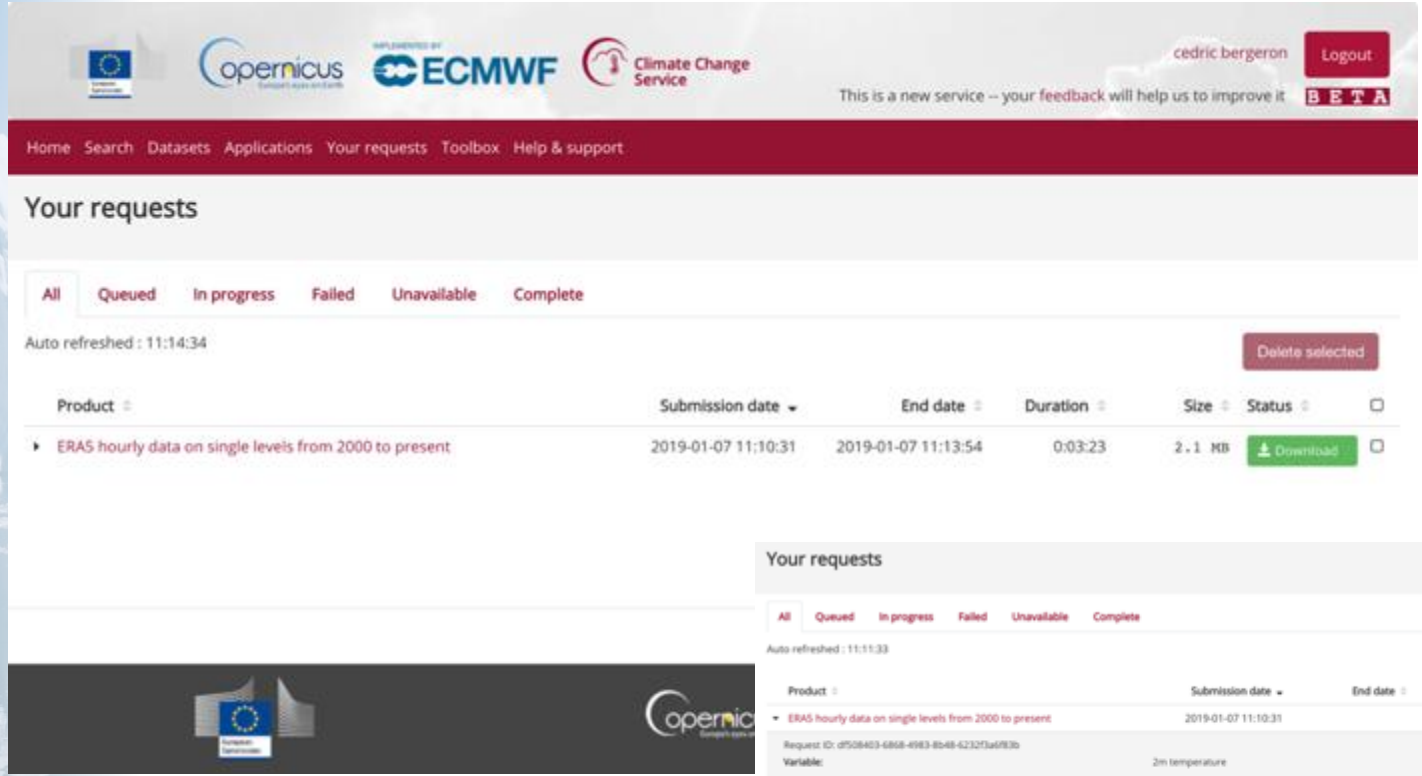
Quality of tools
- Fitness for purpose
- Best practices

Quality of service
- Speed, responsiveness
- System availability, …

European Commission | Europe's eyes on Earth | ECMWF

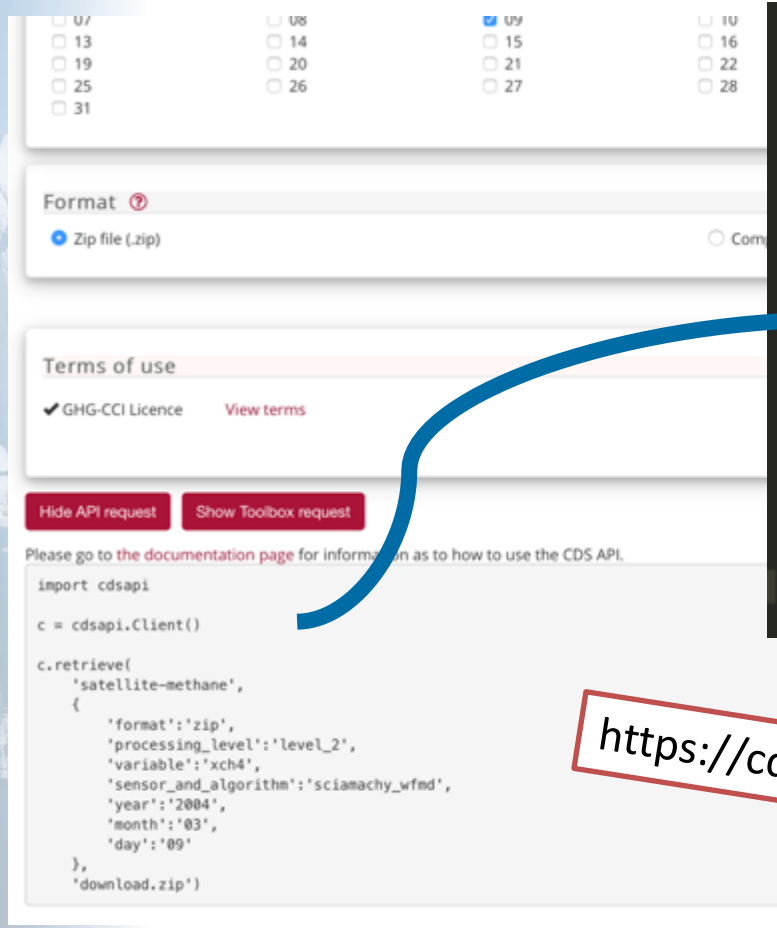
Climate Change

CDS - Personal Space



CDS – The CDS API

Climate Change




```python
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')
```

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

pip install cdsapi

ECMWF

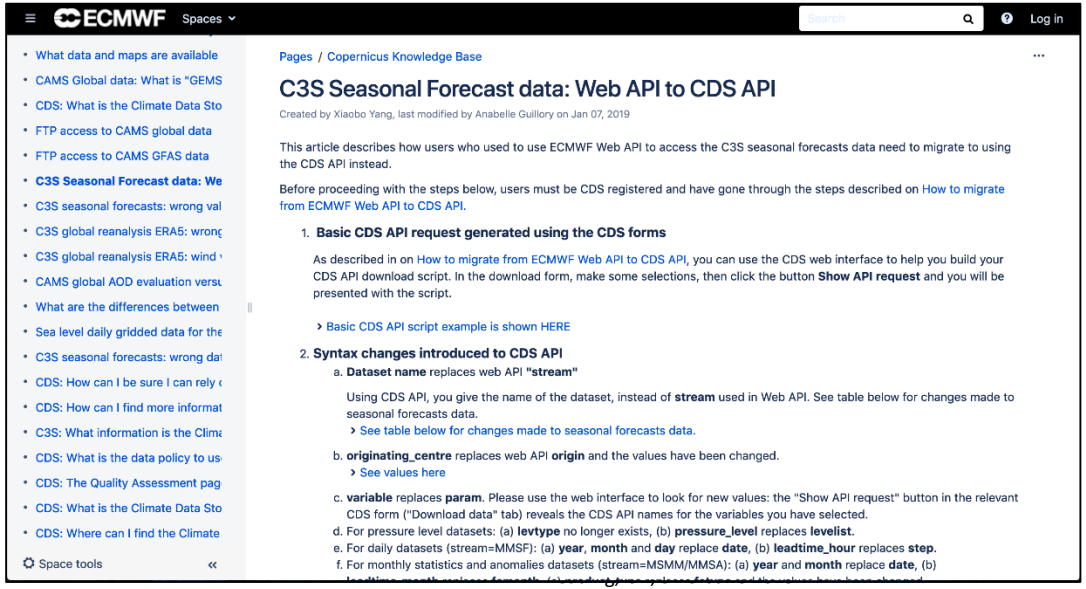
CDS – The CDS API (for ECMWF webAPI users…)

Climate Change

- Were you using webAPI? Are you familiar with EUROSIP?

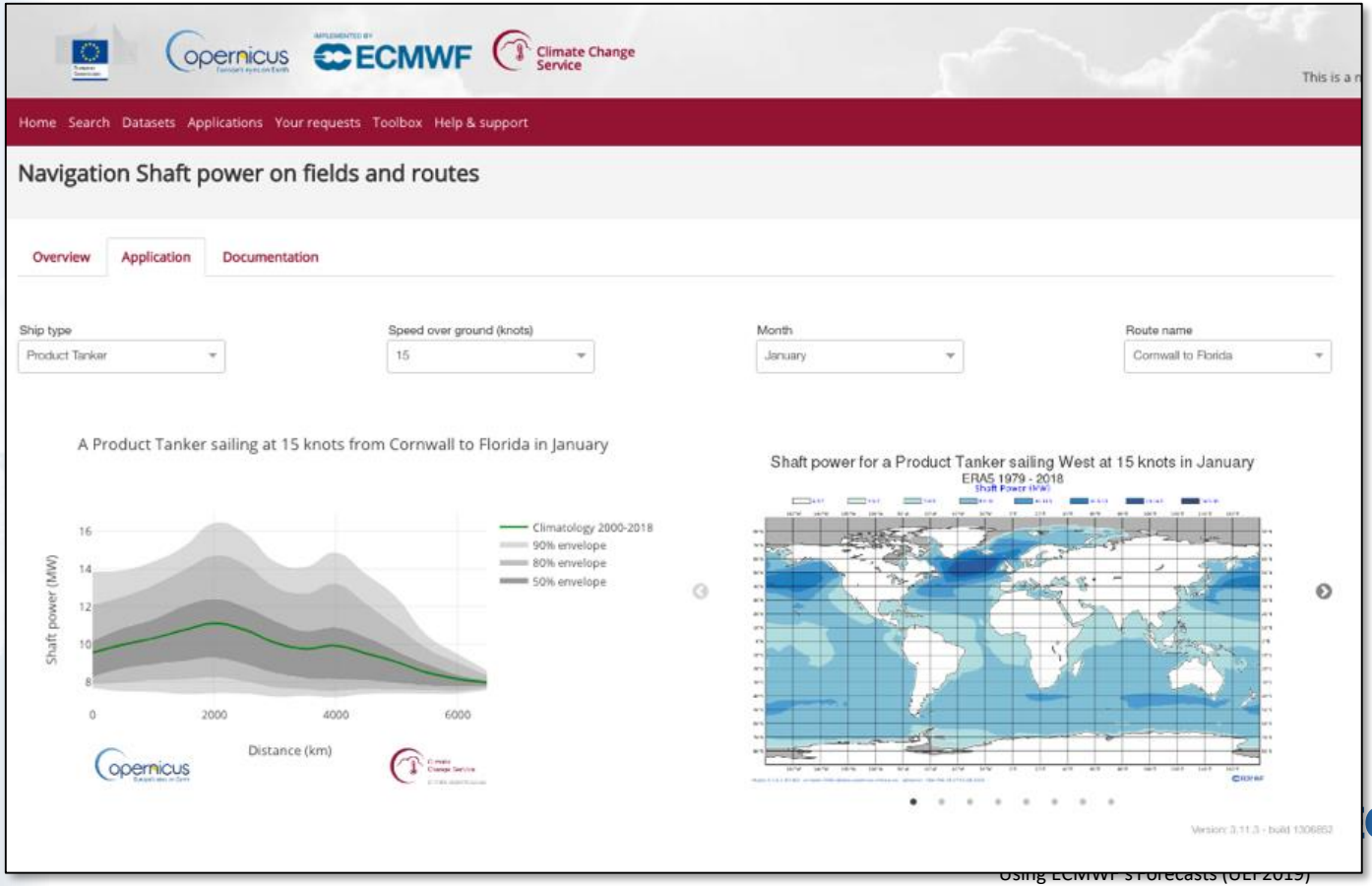
Copernicus Knowledge Base

https://confluence.ecmwf.int/display/CKB



CDS – Applications catalogue

Climate Change



CDS – Toolbox Editor

Climate Change

Home Search Datasets Applications Your requests Toolbox FAQ

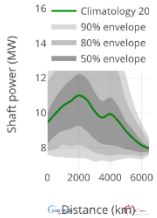
shaft-power-on-fields-and-rou... Console Your queue

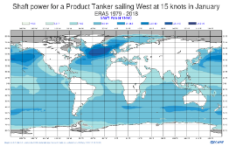
Layout Copy Run

```
import calendar
import collections
import math

import cdstoolbox as ct
import cdstoolbox.navigation as navigation

BEARINGS = collections.OrderedDict([
    ('West', 180.),
    ('South-West', -135.),
    ('South', -90.),
    ('South-East', -45.),
    ('East', 0.),
    ('North-East', 45.),
    ('North', 90.),
    ('North-West', 135.),
])

SHIP_TYPE = {
    'Product Tanker': {
        'id': 'product_tanker',
        'contour_list': [4., 5.5, 7., 8.5, 10., 11.5, 13., 14.5, 16.],
    },
    'New Panamax Containership': {
        'id': 'new_panamax_containership',
        'contour_list': [60., 65., 70., 75., 80., 85., 90., 95., 100.],
    },
}

KNOTS_TO_M_PER_S = 0.514444

MAP_CONFIG = {
    'contour': {
        'contour': "off",
        'legend': "on",
        'contour_label': 'off',
        'contour_shade': "on",
        'contour_shade_method': 'area_fill',
        'contour_shade_colour_method': 'palette',
        'contour_level_selection_type': "level_list",
```

Ship type: Product Tanker | Speed over ground (knots): 15 | Month: January | Route name: Cornwall to Flo

Tanker sailing at 15 knots from Cornwall to Florida





European Commission

Europe's eyes on Earth

ECMWF

Climate Change

Contents

- Copernicus
  - Copernicus Programme and ECMWF
  - Copernicus Climate Change Service (C3S)
- The Climate Data Store (CDS)
  - Description
  - Catalogue
  - Access: download, API, applications, Toolbox
- C3S seasonal forecast activity
  - Description
  - Current status and live-demo
  - Next steps

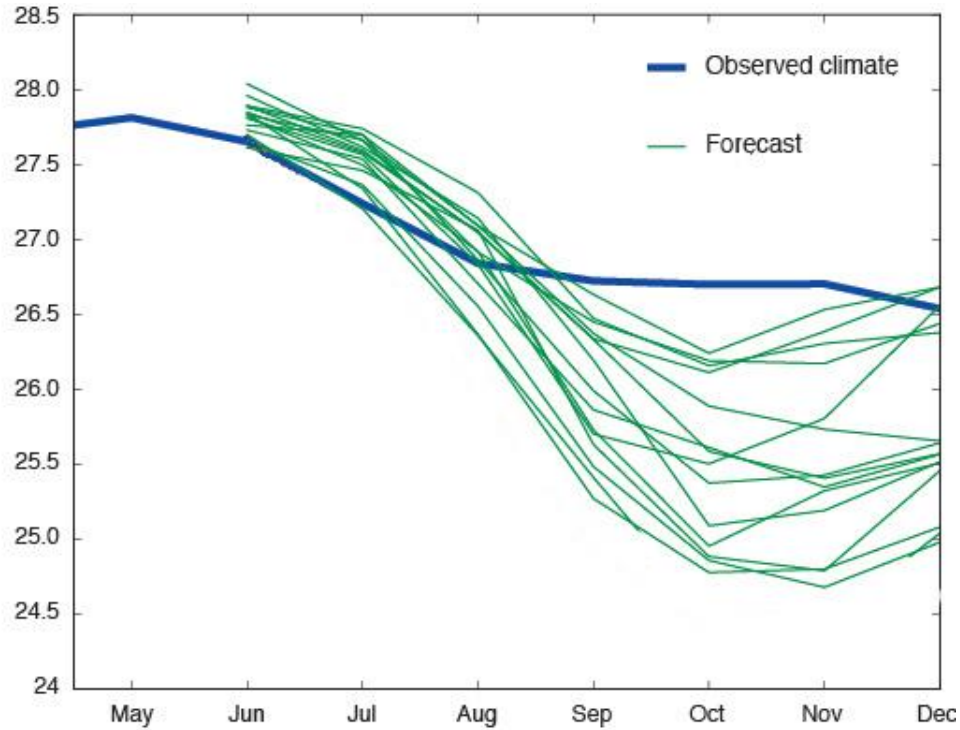
European Commission

Europe's eyes on Earth

ECMWF

Climate Change

C3S Seasonal Forecasts



www.menti.com 81 18 55

European Commission

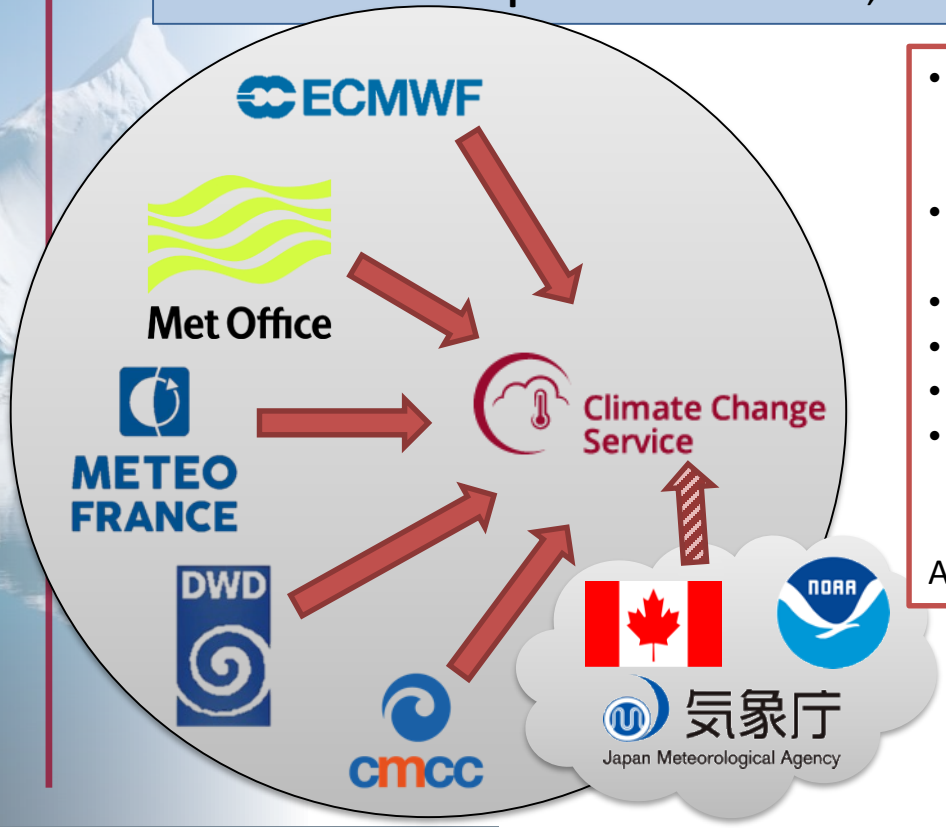
Europe's eyes on Earth

ECMWF

Climate Change

C3S Seasonal Forecasts - Introduction

Aim: to generate **seasonal forecast** products based on the **best information available**, to an **operational schedule**, and make them **publicly available**.



- Issued every month on the 13th (to be moved to the 10th)

- Large ensembles (members: ~50 forecast, ~25 hindcast)
- Common reference period (1993-2016)
- Common horizontal resolution (1-degree)
- ~30 single-level variables (every 6h or 24h)
- 5 variables in pressure levels (every 12h) (11 levels from 925hPa to 10hPa)

Agreed NetCDF specification C3S-0.1 (based on CF)

European Commission

Europe's eyes on Earth

ECMWF

C3S Seasonal Forecasts – Forecast systems

Climate Change

Status on 07 Nov 2018	Time range (forecasts and hindcasts)	Forecast initial conditions	Forecast ensemble size	Hindcast initial conditions	Hindcasts ensemble size	Hindcast period	Hindcast production schedule
ECMWF (ecmf)	215 days	1st of month	51 members	1st of month	25	1981-2016	fixed
UKMO (egrr)	215 days	each day of month	2 members/day	1st, 9th, 17th, 25th of month	7 members/start time	1993-2016	on-the-fly
Météo-France (lfpw)	215 days	20th, 25th of previous month 1st of month	25 members each 1 member	20th, 25th of previous month 1st of month	12 members each 1 member	1993-2016	fixed
DWD (edzw)	6 calendar months	1st of month	50 members	1st of month	30 members	1993-2017	fixed
CMCC (cmcc)	6 calendar months	1st of month	50 members	1st of month	40 members	1993-2016	fixed

C3S Seasonal Forecasts

- Live demonstration…

https://climate.copernicus.eu

C3S Seasonal Forecasts – Next steps

Climate Change

- Generate and display **verification scores for products** presented in the graphs (By Q2 2019)
  - Add monthly mean based products to the plots
- Add **new providers to the multi-system** (By Q3 2019)
  - NCEP, JMA, ECCC
- Produce example **workflows/applications** and develop **tools in the CDS Toolbox**
- Introduce **new products** in the C3S suite of outputs
  - probability forecasts for ENSO indices
  - indices of atmospheric circulation (NAO, SOI)
  - products based on within-season statistics (frequency/length of spells)
  - …

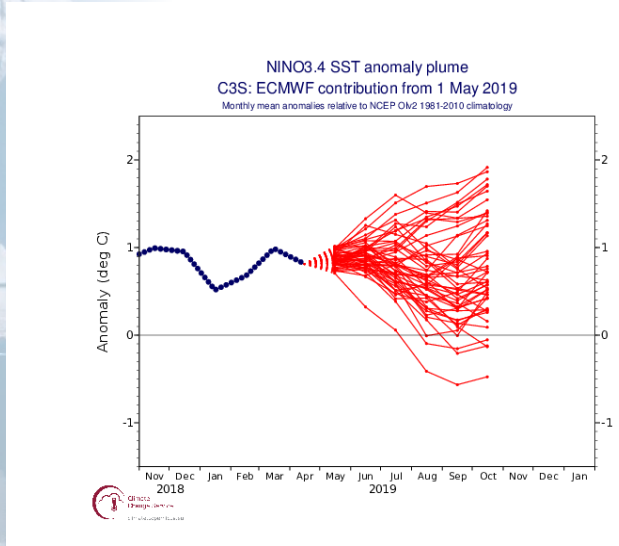
European Commission

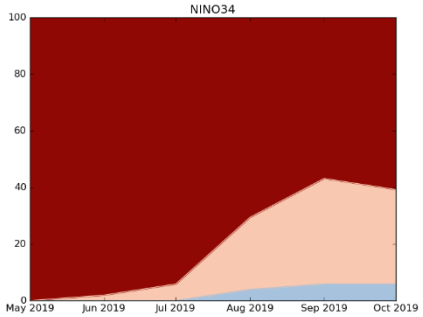
Europe's eyes on Earth

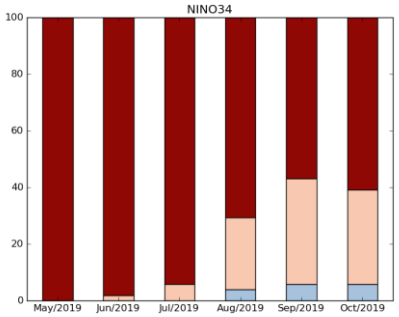
ECMWF

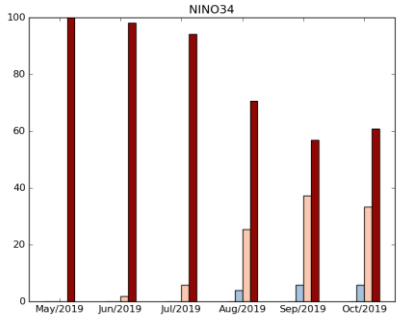
C3S Seasonal Forecasts – Next steps

- Example of new products: El Niño probabilities









www.menti.com 42 56 53

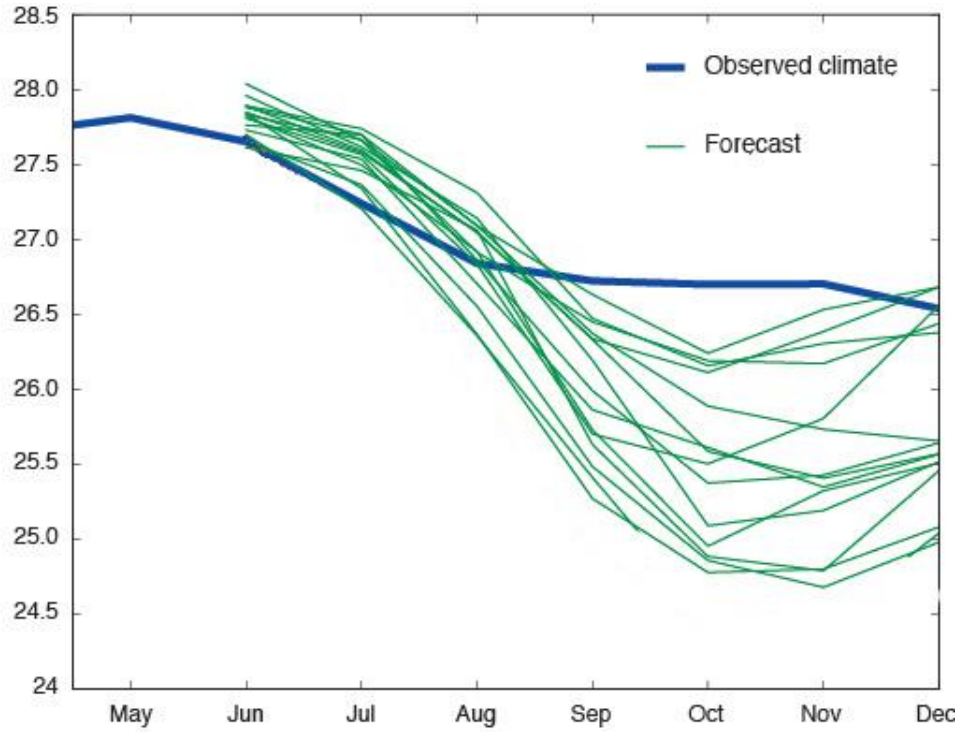
European Commission

Europe's eyes on Earth

ECMWF

Climate Change

C3S Seasonal Forecasts



www.menti.com 81 18 55

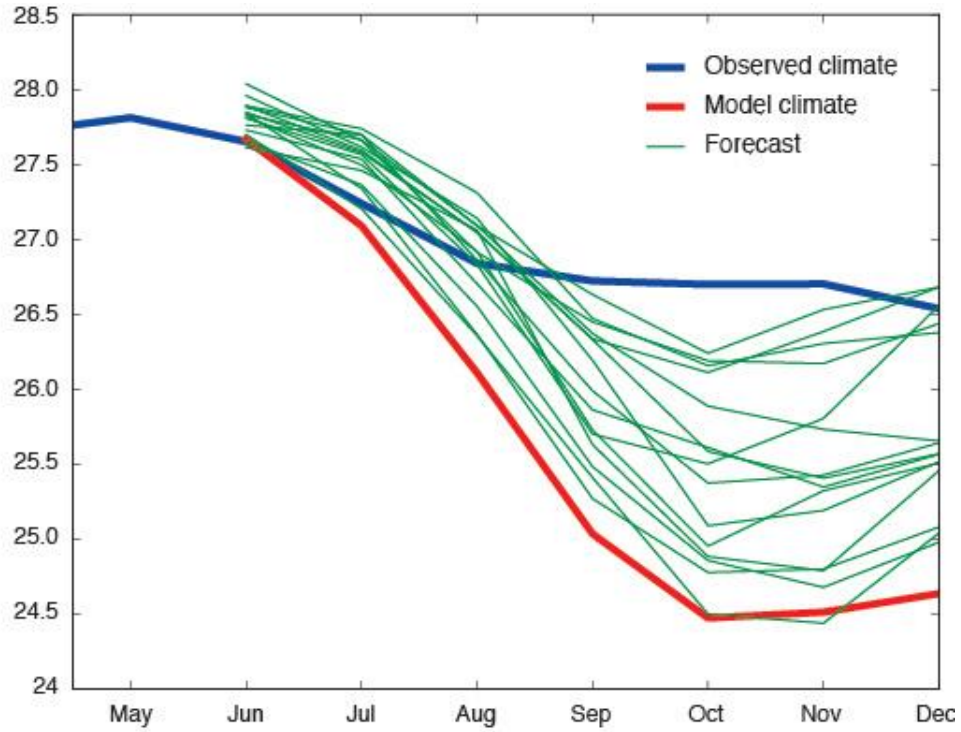
European Commission

Europe's eyes on Earth

ECMWF

Climate Change

C3S Seasonal Forecasts



www.menti.com 81 18 55

European Commission

Europe's eyes on Earth

ECMWF

Using ECMWF's Forecasts (UEF2019)
Reading, UK, 3 - 6 June 2019

Climate Change

Seasonal forecasts from the Copernicus Climate Change Service

Eduardo Penabad Ramos, Simona Briceag, Anca Brookshaw

European Commission | Copernicus Europe's eyes on Earth | ECMWF

Climate Change

Bonus track

Training

https://climate.copernicus.eu/user-learning-services

User Support

https://climate.copernicus.eu/help-support

European Commission

Europe's eyes on Earth

ECMWF

Thank you!

Eduardo Penabad Ramos
eduardo.penabad@ecmwf.int

Using ECMWF's Forecasts (UEF2019)
Reading, UK, 3 - 6 June 2019

European Commission

opernicus
Europe's eyes on Earth

IMPLEMENTED BY
ECMWF