

Evaluation and Quality Control Function of the Climate Data Store and the Sectoral Information System



Climate Change

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with contributions from the C3S_512 and
C3S_513 contracts





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C 3 S E Q C

The Copernicus Climate Change Service (C3S) comprises several main components, including the Climate Data Store (CDS) and the Sectoral Information System (SIS). Alongside these, there is an Evaluation and Quality Control (EQC) function.

The **purpose of the EQC function** in the C3S is to independently **assess the quality of all C3S products and services**, and to ensure that **users have the information they need** in order to use the products and services for their own purposes. This is a **pioneering effort** in climate service delivery.



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EQC of the CDS

The Climate Data Store (CDS) is a complex infrastructure that requires an ***Evaluation and Quality Control (EQC)*** function providing a comprehensive quality assurance service:



CDS datasets: provide information about the technical and scientific quality and fitness-for-purpose, along with independent assessment of the datasets



CDS toolbox: assessment of maturity and fitness for purpose of the software provided to explore the datasets



CDS service: performance assessment of the CDS infrastructure (e.g. speed, responsiveness, system availability)



CDS users: user requirement assessment to measure users' satisfaction with the CDS. Map evolving user needs into viable user requirements to ensure a user-oriented evolution of the CDS





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EQC of the CDS datasets

QAR available
in the CDS

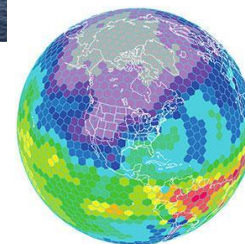
The Quality Assurance Reports (QAR) are organised in a database integrated in the CDS and hold all the available EQC information according to user requirements

A challenge: the CDS datasets include a wide variety of data types:

- Satellite observations
- In-situ observations
- Reanalysis
- Seasonal forecasts
- Global and regional climate projections

This poses challenges to provide a ***seamless and homogeneous EQC information*** for the whole CDS datasets

To overcome this issue a ***synthesis table*** is integrated in the CDS web portal





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EQC of the CDS datasets

Overview Download data Documentation **EQC**

Processing level ⓘ

Level 3 Level 4

Variable ⓘ

Ozone mole content Ozone mixing ratio
 Ozone concentration Ozone concentration anomaly
 All ozone variables from nadir sensors

Vertical aggregation ⓘ

Total column Tropospheric column
 Vertical profiles from limb sensors Vertical profiles from nadir sensors

Sensor

Combination of MIPAS, GOMOS, SCIAMACHY and OSIRIS sensors
 Combination of 15 sensors using gap-filling assimilation methods
 ACE (Atmospheric Chemistry Experiment)
 GOME (Global Ozone Monitoring Experiment-I)
 GOME2A (Global Ozone Monitoring Experiment-II onboard METOP-A)

- The information will be made available via a new tab in the CDS web pages with the same look and feel as the download option
- The user selects the dataset and variable of interest
- A set of information is presented by displaying the synthesis table with the web page being created dynamically

Show EQC information





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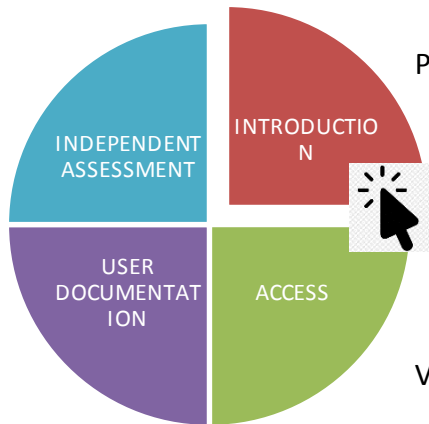
EQC of the CDS datasets

Overview

Download data

Documentation

EQC



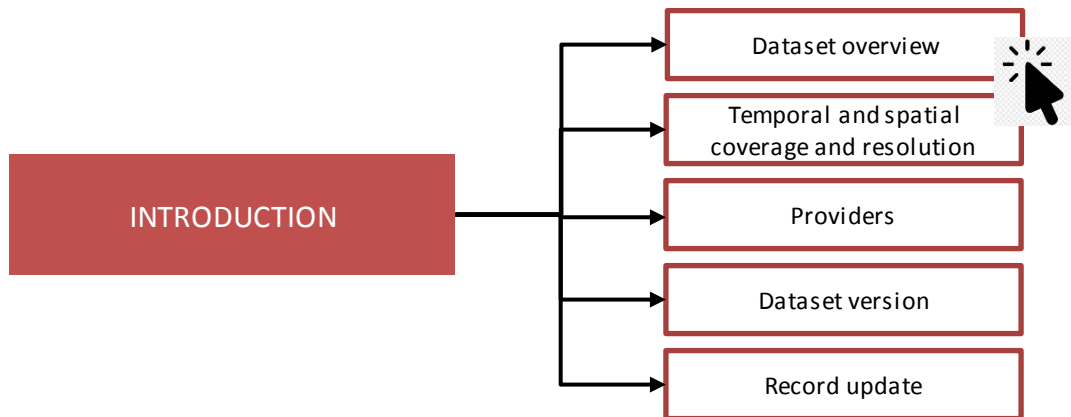
PRODUCT NAME: *Ozone monthly gridded data from 1970 to present*

VARIABLE: *Ozone concentration*

PROCESSING LEVEL: *Level 3*

SENSOR: *ace (atmospheric chemistry experiment)*

VERTICAL AGGREGATION: *vertical profiles from limb sensors*



- The EQC information is organized and homogenised across all datasets
- The layout is agnostic of the product type selected
- The user can dig into the EQC information created dynamically through successive clicks on the box of interest



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EQC of the CDS datasets

Dataset overview

Temporal and
spatial

Providers

Dataset version

Record update

INTRODUCTION

Product Name*	Product version number	Product ID
<input type="text" value="e.g. GlobAlbedo"/>	<input type="text"/>	<input type="text"/>
ECV	Physical Quantity Name	
<input type="text" value="Above-ground biomass"/>	<input type="text" value="Active Fire Maps"/>	
DOI		
✚ URL		
<input type="text" value="Link to digital object identifier of this QAR"/>		
<input type="button" value="Add another item"/>		
Processing Level of product	Timeliness	Organisation(s)
<input type="text" value="- None -"/>	<input type="text"/>	<input type="text"/>
Point of contact		
<input type="text" value="Name"/>	<input type="text" value="Email"/>	
Product status	Date product last updated	Date product made available
<input type="text"/>	<input type="text"/>	<input type="text"/>

The synthesis table web pages are built dynamically, based on the information stored and displayed through a Content Management System (CMS) that is an integral part of the CDS



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EQC of the CDS toolbox

The toolbox documentation tab has the list of the software tools where the user is offered the possibility to see the related EQC information.

Home Search Datasets Applications Your requests Toolbox Help & support

Toolbox editor

Applications Data Documentation

Search for app or example

your workspace

- 51 Calculate zonal means
- 11 Calculate time mean and standard deviation
- 21 Calculate regional mean and anomalies
- 03 Extract time series and plot graph
- 01 Retrieve data - Training
- 02 Plot map-1
- 02 Plot map
- 00 Hello World

examples

- 00 Hello World
- 01 Retrieve data
- 02 Plot map
- 03 Extract time series and plot graph
- 11 Calculate time mean and standard deviation
- 12 Calculate climatologies
- 21 Calculate regional mean and anomalies
- 31 Calculate trends
- 41 Calculate GDD
- 42 Use cdo functions
- 51 Calculate zonal means
- 52 Format maps to allow visual comparison

```
52 Format maps to allow visual comparison Console
Layout Copy Run

import cdstoolbox as ct

@ct.application(title='Format maps to allow visual comparison')
@ct.output.figure()
def ice():
    """
    Application main steps:
    - retrieve a sample dataset (sea ice area fraction)
    - compare sea ice area fraction in August 1992 and August 2003 on two different maps.
    """

    sic = ct.catalogue.sample('OSTIA', 'sic', 'day')
    time_92 = '1992-08-03'
    time_03 = '2003-08-03'
    sic_1992 = ct.cube.select(sic, time=time_92)
    sic_2003 = ct.cube.select(sic, time=time_03)

    projection = ct.cdsplot.crs.LambertAzimuthalEqualArea(central_latitude=90)
    fig = ct.cdsplot.figure(nrows=1, ncols=2, subplot_kw={'projection': projection}, adjust_kwangs={'wspace': .4})
    ct.cdsplot.geomap(
        ct.cube.select(sic_1992, lats=(55., 90.)), fig=fig, figcol=0,
        title=time_92, pcolormesh_kwangs={'cmap': 'terrain'}
    )
    ct.cdsplot.geomap(
        ct.cube.select(sic_2003, lats=(55., 90.)), fig=fig, figcol=1,
        title=time_03, pcolormesh_kwangs={'cmap': 'terrain'}
    )

    return fig
```

Format maps to allow visual comparison

1992-08-03 2003-08-03

sea ice fraction (1)

sea ice fraction (1)

0.0 0.2 0.4 0.6 0.8 1.0

0.0 0.2 0.4 0.6 0.8 1.0

OpenCMISS

Climate Change Service

Version: 3.5.12 - build 3a14702



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EQC of the CDS toolbox

```
variable2, link=2n_temperature - 3, mean_sea_level_pressure - 4,
values=['2n_temperature', 'mean_sea_level_pressure']
)
@ct.input.dropdown('frequency1', when=1, values=['dayofyear', 'weekofyear', 'month'])
@ct.input.dropdown('frequency1', when=2, values=['dayofyear', 'month'])
@ct.input.dropdown('frequency2', when=3, values=['dayofyear', 'weekofyear', 'month'])
@ct.input.dropdown('frequency2', when=4, values=['dayofyear', 'month'])
@ct.output.livefigure()
def workflow(variable1, variable2, frequency1, frequency2):
    'Here goes the workflow.'
```

`cdstoolbox.input.checkbox(name, values, default=None, type=<class 'str'>, label=None, link=False, when=None, description="", help=") → Callable` [\[source\]](#)

Insert a dropdown menu as input widget for the workflow. It must be used as a decorator to the main function of the workflow.

- Parameters:
- **name** – String. Name of the variable that will be set to selected value or default value.
 - **values** – List of values selectable.
 - **default** – Default value if no selection is made.
 - **type** – Data type to be set for value.
 - **label** – String for the widget title.
 - **description** – Add a description of the input widget.
 - **help** – Add an helper tooltip of the input widget.

Show EQC
information



`cdstoolbox.input.constant(name, value, type=<class 'str'>, label=None, link=False, when=None, description="", help=") → Callable` [\[source\]](#)

Insert a constant text field as input widget for the workflow. It must be used as a decorator to the main function of the workflow.

- Parameters:
- **name** – String. Name of the variable that will be set.
 - **value** – Default value.

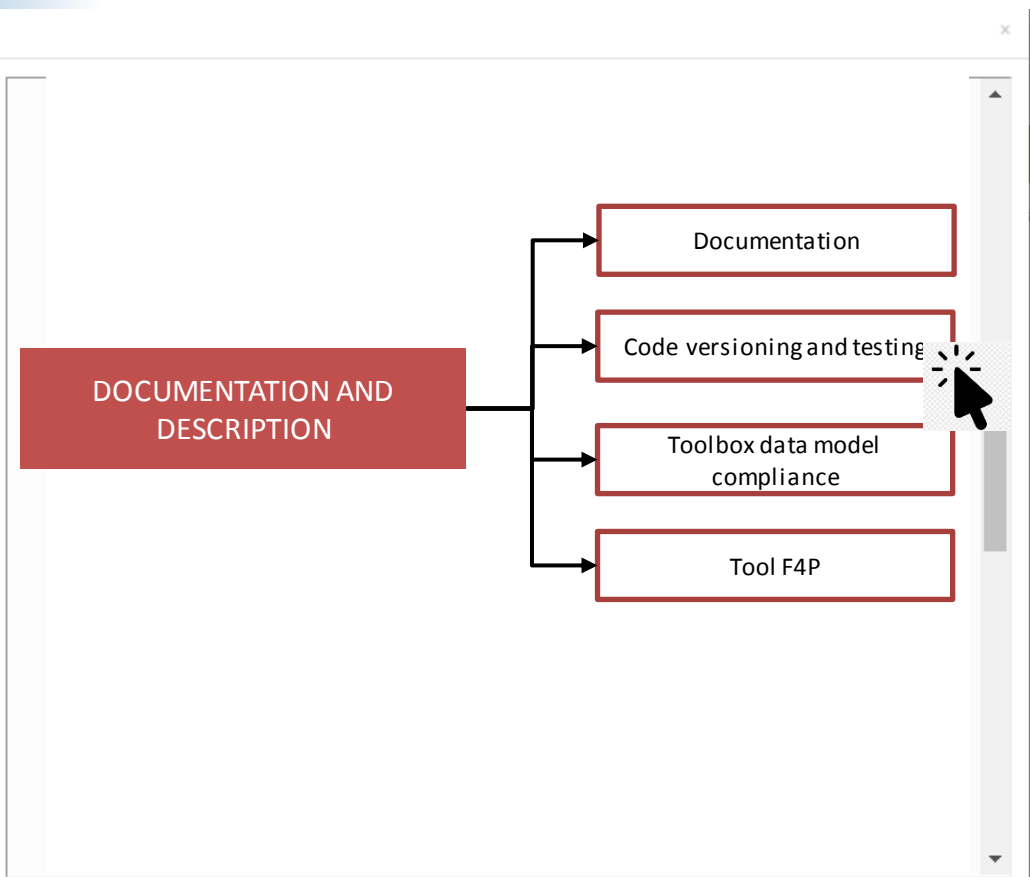
- When the user clicks one of the tools, a web page opens describing briefly the tool function
- The user will be offered the possibility to access the details of the related EQC information

Close



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EQC of the CDS toolbox



- A web page will be built dynamically, (from the information available in the CMS) showing the EQC information organised and homogenised in a synthesis table
- The user clicks on the box of interest and will be directed to another web page (also created dynamically) displaying the specific EQC element



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EQC OF THE CDS TOOLBOX

The Toolbox should have an EQC tab where additional EQC information is reported about workflows, the editor, the CDM, etc.

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Toolbox editor

Applications Data Documentation **EQC**

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    return fig
```

Format maps to allow visual comparison

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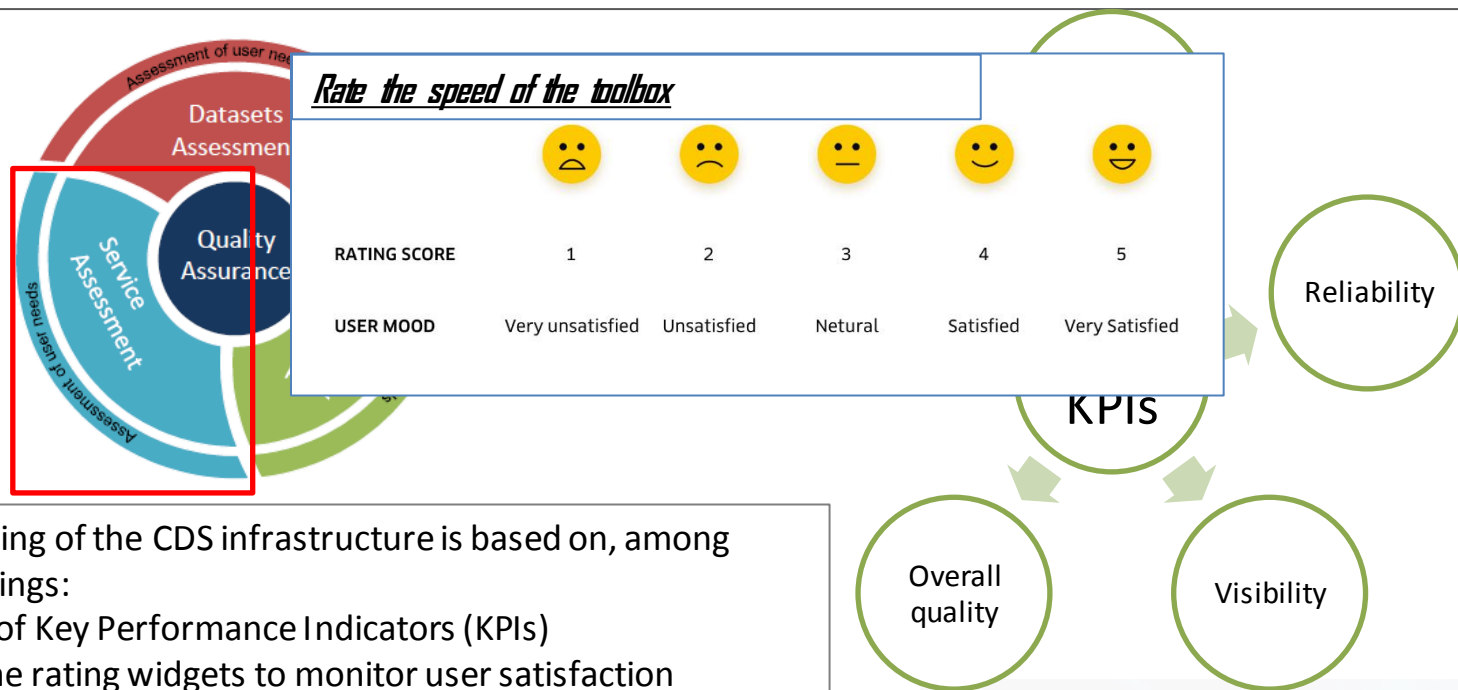
Version: 3.5.12 - build 3a14702



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EQC of the CDS service

The EQC function measures and reports the technical quality of the whole service (e.g. system availability, response time). A number of KPIs have been defined inspired by the internationally-recognized standard ISO/IEC 25010 and 25011.



Monitoring of the CDS infrastructure is based on, among other things:

- A set of Key Performance Indicators (KPIs)
- On-line rating widgets to monitor user satisfaction
- Development of a web dashboard hosting the KPIs and widget statistics



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EQC for SIS

The aim of this contract (C3S_513) is to guarantee **fitness-for-purpose, user relevance** and **quality of SIS activities**.

This is achieved through **two main objectives**:

- Define an EQC for SIS Framework that provides ECMWF and C3S users with the ability to assess whether the SIS services and data are fit-for-purpose
- Ensure that SIS Workflows and Applications accepted into the CDS are of good quality and will generate outputs that uphold the standards required for ensuring C3S is a trustworthy source of climate information



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EQC for SIS



WATER
MANAGEMENT



AGRICULTURE &
FORESTRY



TOURISM



INSURANCE



TRANSPORT



ENERGY



HEALTH



INFRASTRUCTURE



DISASTER
RISK
REDUCTION



COASTAL AREAS

C3S Sectors

SIS activities and outputs covered by C3S_513 includes:

- SIS datasets, such as climate impact indicators
- SIS tools and workflows, to be made available in the CDS toolbox
- SIS applications that users can use to interact with datasets and workflows
- Related SIS documentation, user guides, tutorials, etc.



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C3S EQC for SIS

The **main activities** as part of the C3S_513 contract are:

- Review of procedures currently in use to guarantee the quality of services
- Develop and implement an EQC for SIS Framework
- Implement and maintain an operational C3S User Requirement Database (URDB)
- Analyse SIS requirements collected in the URDB
- Organise user engagement activities to ensure user relevance of the SIS



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EQC benefits

The benefits of the C3S EQC framework for users includes:

- **Feedback** from users on C3S will be gathered and recorded
- We will make **recommendations** for C3S evolution to meet user needs
- Improve the **accessible provision** of quality assurance information
- Support **fitness-for-purpose** assessment of C3S outputs
- Enabling the use of C3S information in **decision making** by C3S users