

# ECMWF Copernicus Procurement

## Invitation to Tender



## Copernicus Climate Change Service

Operational Extreme Event Monitoring and  
Attribution Service

## Volume II: Specification of Requirements

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## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>3</b>
<b>2</b>	<b>Technical Requirements .....</b>	<b>4</b>
2.1	Service scope and requirements.....	4
2.2	Work Package 1: Historical context of extreme events via interactive web application.....	5
2.3	Work Package 2: Operational extreme event attribution office .....	6
2.4	Work Package 3: Counter-factual dataset development.....	8
2.5	Work Package 0: Management and coordination .....	9
<b>3</b>	<b>General requirements .....</b>	<b>11</b>
3.1	Implementation schedule.....	11
3.2	Deliverables and milestones.....	11
3.3	Data Access and application provision via the CDS.....	12
3.4	Contribute to L2 support to Copernicus User Support Team.....	12
3.5	Communication .....	13
3.6	Support to user engagement activities .....	13
3.7	Evaluation and Quality Control.....	13
3.8	Data and IPR.....	14
3.9	Key Performance Indicators (KPIs).....	14
3.10	Payment Plan .....	15
<b>4</b>	<b>Tender Format and Content .....</b>	<b>16</b>
4.1	Page Limits .....	16
4.2	Specific additional instructions for the Tenderer’s response .....	16
<b>5</b>	<b>Additional information.....</b>	<b>17</b>
5.1	Acronyms .....	17
5.2	Appendices.....	18

# 1 Introduction

The Copernicus Climate Change Service (C3S), implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Union, develops and delivers authoritative, quality-assured information about the past, current and potential future states of the climate in Europe and globally. Research that links anthropogenic climate change to the changing frequency and intensity of extreme weather and climate events is a rapidly developing field. Extreme event attribution studies can inform users about existing climate risks and support planning for adaptation strategies. Climate change attribution assessments are likely to be even more useful for adaptation planning when the exposure and vulnerability of users to past extreme event hazards are also assessed in addition to when potential future changes in the extreme event probabilities are evaluated. Extreme event attribution may also be a useful tool for informing climate mitigation planning and decisions. With this Invitation to Tender (ITT) on operationalising extreme event attribution, C3S aims to:

- a) inform policy development to protect citizens from climate-related hazards such as high-impact weather events,
- b) understand risk of changes in hazard probabilities and improve adaptation planning practices for societal activities, and
- c) promote the development of new applications and services for the benefit of society.

C3S has an extensive programme of climate monitoring activities presented under the heading of “Climate Intelligence”<sup>1</sup> based on different datasets including reanalyses and observations, accessible from C3S' Climate Data Store (CDS)<sup>2</sup>. This programme includes climate monitoring products on a number of key climate variables at a range of different temporal scales including monthly and annual products supported by ‘on-demand’ products and highly accessible applications such as the recently released Climate Pulse<sup>3</sup>, providing automated maps and timeseries of global temperature, and Sea Surface Temperature (SST). These products are designed to be as accessible as possible with a strong focus on data visualisation and have had an extremely strong uptake by the media.

The impacts of climate change on both human and natural systems tend to be dominated by the effects of weather and climate extreme events. There is also increasing interest from decision makers and stakeholders to understand the detection and attribution of the influence of climate change on extreme weather and climate events. Responding to user requests, it is therefore timely for C3S to develop the ability to communicate clearly and authoritatively on extreme event monitoring and attribution (where possible) with an operational service and rapidly provide post extreme-event information. This new operational climate extreme events monitoring and attribution service developed by C3S and ECMWF will deliver applications and datasets to enable understanding of recent extreme events in the context of a changing climate. It must also respond to the advances made by the scientific community in recent years and make every effort to complement existing research and quasi-operational extreme event attribution efforts (e.g. Horizon Europe projects, World Weather Attribution, Climate Central’s Climate Shift Index, UK Climate Risk Indicators, etc).

This ITT invites Tenders for the delivery of an operational Extreme Event Attribution (EEA) service for C3S to be embedded alongside existing Climate Intelligence products and C3S infrastructure including the C3S website and the CDS. Whilst advancing the European capacity to deal with the challenges that climate change poses remains one of the top-level priorities of C3S, climate knows no boundaries. As the Summary for Policymakers of IPCC AR6 WGI eloquently shows (e.g., Figure SPM-3) there are many climate-vulnerable regions and insufficient information exists to assess how extreme events are changing. The contract that will result from this ITT is expected to help fill this gap, by not only considering extreme events affecting Europe,

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<sup>1</sup> <https://climate.copernicus.eu/climate-intelligence>

<sup>2</sup> <https://cds.climate.copernicus.eu>

<sup>3</sup> <https://pulse.climate.copernicus.eu/>

but also globally.

## 2 Technical Requirements

The main objective of this ITT is to implement an operational set of extreme events attribution service elements, including the development of (an) accessible, web-based interactive application(s) based on open source tools and the establishment of an attribution office. These service elements shall enable C3S to:

- clearly communicate past and future changes in extreme events to policymakers and other users, and enable them to easily examine changes for their own location.
- provide information on how a number of climate variables have changed in the historical context with anthropogenic climate change (focusing on changes during the well-observed period ~1950-2024).
- advance beyond single event attribution by developing methods and datasets for near real-time attribution of a subset of extreme events. This will help increase confidence in understanding and attribution of observed changes in different types of extreme events.
- provide a focus on communication of extreme event attribution, leveraging pre-existing C3S Climate Intelligence products and services. Effective communication on extreme events should also include fact sheets – or similar products, documentation on the development of relevant data and tools, and independent quality control.

### 2.1 Service scope and requirements

The Successful Tenderer shall develop and implement an extreme event attribution service that provides products and services aligned with existing C3S/ECMWF infrastructure and datasets in the following four areas:

1. historical extreme event interactive web application;
2. operational attribution workflow, including a triggering mechanism based on extreme forecast indices;
3. communication products, including data and tool documentation, as well as high-level fact sheets for operational attribution statements/communication;
4. new counterfactual dataset(s) based on ECMWF datasets, tools and/or models.

The Successful Tenderer shall:

- Propose a set of indicators of change for at least temperature and precipitation based extreme events.
- Define a procedure to calculate the value of extreme event indicators in near real-time using C3S available datasets.
- Define, develop, and deliver an (a set of) interactive application(s) running on ECMWF infrastructure and able to update a web interface so that the users can obtain the information they seek for the spatial domain of their choice (e.g. high-resolution spatial domain, regional, national level).
- Maintain the web interface and update it in response to ECMWF requests (informed by user feedback).
- Work with the relevant teams within ECMWF to develop a mechanism based on available technology (e.g. Extreme Forecast Index) for triggering the development of an extreme fact sheet even before the event occurs.
- Develop in close coordination with ECMWF Climate Intelligence and communications teams a fact sheet template that can be used for C3S communication about extreme events.
- Assure that a fact sheet can be obtained around 5 business days after the event analysis was triggered.

- In coordination with the Evaluation and Quality Control (EQC) function of C3S, define a set of procedures to quality assure and validate any user-facing output of the contract.
- Provide expert (level 2, cf. Section 3.4) support for the outputs provided.
- Contribute to the European State of the Climate report and other C3S Climate Intelligence activities.

All elements of the service shall:

- Provide a global perspective on extreme weather events and their relation to climate change;
- Represent mature science and best practices;
- Follow well-defined protocols and procedures;
- Operate and deliver on predictable timescales;
- Maintain consistency with the C3S vision, objectives and infrastructure;
- Implement safeguards to reputational risks where possible.

In addition, the service shall be designed to:

- Make use of relevant information from other Copernicus services, in particular the Emergency Management Service.
- Adapt to new science and emerging user requirements.

Furthermore:

- Tools developed (WP1 and WP2) must be incorporated into the C3S website or domain microsite (e.g. ClimatePulse); all communication of availability of new tools will be initially through C3S and ECMWF channels.
- Training materials to support users will have Jupyter Notebooks developed to share methodology<sup>4</sup>.
- The majority of code should be open source and be stored on open platforms (e.g. GitHub), and any new datasets and associated documentation will also be made available through the CDS (after quality assurance processes).

The Tenderer shall also clarify any dependencies on third parties for any of the activities listed here, including processing, provision of input data, research and development, or any other elements needed to fulfil the requirements for this ITT.

## 2.2 Work Package 1: Historical context of extreme events via interactive web application

This Work Package 1 (WP1) shall rapidly result in the development and deployment of an interactive online application (based on the Climate Data Store infrastructure and aligned with existing C3S applications, e.g. Climate Pulse / Climate Atlas) to enable users to interrogate historical changes in extreme events and display maps, time series and a set of site specific (e.g. high-resolution spatial domain, region, national level, cf. Climate Atlas<sup>5</sup>) metrics of changes in mean climate and extreme indices using ERA5 0.25deg gridded hourly data since 1950. The application shall be designed to allow users to easily obtain objective information about trends and their relationship with changes in global mean temperature, for example, using an observation-based attribution approach. It will be supported by technical and high-level (e.g. FAQs) documentation. The applications should follow the guidelines described in Appendix 2 (Application Style Guide), which includes instructions on the components libraries to use. An initial scoping exercise, to ensure coherence with WP2 with input from ECMWF (including the web infrastructure), will be necessary.

The primary deliverable should consider metrics based on 2m air temperature over land and sea surface temperature (SST) over the ocean, however, the extension to other indices or variables (e.g. precipitation and 10m wind speed) is essential. The underlying data used should be updated regularly to be close to real-

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<sup>4</sup> See Appendix 1 - How to submit Jupyter Notebook based training material to the CDS/ADS/CADS

<sup>5</sup> <https://atlas.climate.copernicus.eu/atlas>

time. This application should have the ability to be updated to use ERA6 when it becomes available (although the update itself is not a requirement).

The table hereinafter provides the Tenderer with an indicative list of deliverables, as well as the corresponding schedule and due dates, for WP1. This is not an exhaustive list; the Tenderer can propose additional or amended deliverables depending on their response.

<i>Deliverable</i>	<i>Resp.</i>	<i>Nature</i>	<i>Deliverable / Milestone title</i>	<i>Due date</i>
List of deliverables				
WP1-D1	Tenderer	Report	Technical description of the climate indices and the extreme events web application to be developed	By the end of month 3
WP1-D2	Tenderer	Other	Extreme events web application for temperature-based indices operational <i>(To be developed in accordance with WP1-D1)</i>	By the end of month 7
WP1-D3	Tenderer	Other	Operational extension of the extreme events web application <i>(this shall consider the other climate indices and variables used in WP2)</i>	By the end of month 12
WP1-D4.1	Tenderer	Other	First revision of the extreme events web application based on user feedback	By the end of month 21
WP1-D4.2	Tenderer	Other	Second revision of the extreme events web application based on user feedback	By the end of month 33
WP1-D5	Tenderer	Other / Report	Maintenance of the extreme events web application and reporting	By the end of month 42
WP1-D6	Tenderer	Other / Report	Contribution to L2 user support concerning the extreme events web application and reporting	By the end of month 42

Table 1: WP1 Deliverables

### 2.3 Work Package 2: Operational extreme event attribution office

The purpose of WP2 is to establish an attribution office able to rapidly produce (around 5 business days post trigger, cf. KPI.D2 in section 3.9 below) a climate attribution document (this may be in the form of a fact sheet or similar) in the immediate aftermath of an extreme event occurring. This is to be done following a pre-defined workflow, that should include, but is not limited to, a trigger mechanism, the definition of the event, event analysis and the production of the document. The events can have occurred anywhere in the world.

The trigger mechanism of a potential attribution analysis should include utilising the ECMWF operational IFS forecast or the new ECMWF AIFS before an extreme event occurs. This might make use of existing extreme forecast indices (e.g. [EFI](#)<sup>6</sup>), applying bias corrections if necessary. Several different variables should be considered (at least 2m temperature, accumulated precipitation and wind speeds). Once developed and implemented, this procedure will form part of the triggering mechanism for the development of more in-depth analysis of specific events. An on-demand trigger (e.g. in the case of poorly forecast events) shall also be considered.

<sup>6</sup> Extreme Forecast Index (EFI) <https://confluence.ecmwf.int/display/FUG/Section+8.1.9+Extreme+Forecast+Index+-+EFI%2C+and+Shift+of+Tails+-+SOT> e.g. for precipitation: [https://charts.ecmwf.int/products/efi2web\\_tp?area=Europe&base\\_time=202406120000&day=1&quantile=99](https://charts.ecmwf.int/products/efi2web_tp?area=Europe&base_time=202406120000&day=1&quantile=99)

The fact sheet should use a multiple lines of evidence approach based on C3S products, ECMWF forecasts (e.g. EFI, AIFS), CMIP6, Destination Earth climate and storyline simulations, information derived from WP1, European Climate Risk Assessment (EUCRA) as well as the existing climate literature to contextualise a specific extreme event with what we expect to see for such events as a consequence of anthropogenic climate change, considering both changes relative to the past and future changes. The structure of the fact sheet shall be predefined with the ECMWF Climate Intelligence and communication teams to ensure that it could be used as part of the C3S communication material with minimal (if any) modification.

The writing and the graphical material shall be of a similar quality to those you would expect to see in a peer-reviewed article, and should include high-level content adapted to a policy and media audience. The team is expected to produce an average of around 1-2 event fact sheets per month. For periods between ‘triggered’ extreme events, the attribution office should develop more in-depth analyses of a range of events chosen in collaboration with the ECMWF Climate Intelligence team, potentially including longer term climate events, e.g. droughts. Developing other communication material such as FAQs or explainer articles, etc. would also be appropriate.

The attribution office should be considered operational drawing primarily on activities within the structures of the Successful Tenderer (i.e. members of the bidding group), but also considering other complementary efforts in Europe and globally. Involvement of communication and other specialists (e.g. social science), and training for journalists & users, would be welcome. The decision points of the pre-defined operational attribution workflow shall also include members of the ECMWF Climate Intelligence team.

The Successful Tenderer may consider having one or more persons to visit ECMWF team based in Bonn for short period(s) to ensure full visibility of and alignment of the Successful Tenderer’s activities with ECMWF Climate Intelligence team workflows and practises. The Tenderer is therefore invited to specify in its technical proposal what is the best strategy to be implemented to ensure the aforementioned visibility and alignment, while the list of deliverables and milestones is expected to be updated accordingly (e.g. report(s) of activity from the involved staff whose frequency of delivery is to be adapted to the said strategy).

The table hereinafter provides the Tenderer with an indicative list of deliverables, as well as the corresponding schedule and due dates, for WP2. This is not an exhaustive list; the Tenderer can propose additional or amended deliverables depending on their response.

<i>Deliverable</i>	<i>Resp.</i>	<i>Nature</i>	<i>Deliverable / Milestone title</i>	<i>Due date</i>
List of deliverables				
WP2-D1	Tenderer	Report	Technical proposal for the EFI-based part of the triggering mechanism	By the end of month 3
WP2-D2	Tenderer	Report	Operational attribution workflow manual for the personnel involved in the attribution office	By the end of month 5
WP2-D3.1	Tenderer	Report	Fact sheet template (structure and design)	By the end of month 7
WP2-D3.2-X	Tenderer	Report	Review #X of event fact sheets and lessons learnt from the attribution office <sup>7</sup>	Every six months/aligned with payment milestones from

<sup>7</sup> This shall include a review and potential update of the fact sheet template, as well as a reporting of the activities performed during the period covered since last report (e.g. number of fact sheets submitted and reviewed, number of ad-hoc events studied) and for the Successful Tenderer to provide inputs about what could be improved/optimized (including about process and content) and how.

				month 15 onwards
WP2-D4.1	Tenderer	Other	Operational procedure to implement the triggering mechanism and display relevant information about extreme events by using ECMWF forecast products (for internal use only)	By the end of month 9
WP2-D4.2-X	Tenderer	Report	Review #X and revision of the triggering mechanism <sup>8</sup>	Every six months/aligned with payment milestones from month 15 onwards

Table 2: WP2 Deliverables

## 2.4 Work Package 3: Counter-factual dataset development

WP3 aims to advance beyond the attribution of single events by developing one or more datasets (based on ECMWF/C3S datasets, tools and/or models) consisting of counterfactual realisations of the observed weather over the whole globe for an extended recent period (e.g. the last decade or longer). These counterfactuals could be generated statistically and/or dynamically and/or using AI techniques for multiple climate variables. These data will allow users to explore the attribution of any extreme event in the period chosen and advance toward the attribution of e.g. compound events. The approach(es) adopted can be based on existing methodology or require research and development activities and must also include the potential to produce counterfactuals in near real-time. Counterfactuals could be developed for multiple different climates, including both cooler and warmer than modern. The dataset(s) shall be made available through the CDS.

By the end of the contract, the Tenderer is expected to have demonstrated the use of the counterfactual simulations in example attribution analyses for several recent events in multiple regions. The approach chosen should be such that it can be part of the evolution of the operational attribution workflow of WP2.

The table hereinafter provides the Tenderer with an indicative list of deliverables, as well as the corresponding schedule and due dates, for WP3. This is not an exhaustive list; the Tenderer can propose additional or amended deliverables depending on their response.

<i>Deliverable</i>	<i>Resp.</i>	<i>Nature</i>	<i>Deliverable / Milestone title</i>	<i>Due date</i>
List of deliverables				
WP3-D1	Tenderer	Report	Technical description of the proposed methodology for generating counterfactual dataset(s)	By the end of month 6
WP3-D2	Tenderer	Report	Progress demonstration comparing new counterfactual dataset and previously published results	By the end of month 18
WP3-D3	Tenderer	Other	Dataset(s) and documentation hosted on the CDS	By the end of month 32

<sup>8</sup> This shall include a review and potential update of the trigger mechanism, as well as a reporting of triggered (and missed) events during the period covered since last report and for the Successful Tenderer to provide inputs about what could be improved/optimized (including about process and content) and how.



WP3-D4	Tenderer	Report	Examples of attribution analyses for several recent events in multiple regions	By the end of month 38
WP3-D5	Tenderer	Other / Report	Contribution to L2 support concerning the counterfactual dataset(s) and reporting	By the end of month 42

*Table 3: WP3 Deliverables*

## 2.5 Work Package 0: Management and coordination

The following management and coordination activities are part of WP0 to ensure the correct implementation of the contract and shall be described and completed, if necessary, in the Tender:

- a. **Planning, coordination, and monitoring of all technical Work Packages activities** and corresponding resources.
- b. **Contractual obligations as described in the Volume V Framework Agreement**, especially in its Clause 2.3 “Reporting and Planning” and Annex 5 “Report content”.
- c. **Organising and/or attending the following meetings:**
  - ECMWF and the Successful Tenderer will organise a Kick-Off Meeting, during the first month of the contract’s implementation, at ECMWF premises in Bonn, Germany or Reading, UK.
  - ECMWF and the Successful Tenderer’s Service Manager and Technical Lead will organise Progress Review Meetings (teleconferences) on a quarterly basis unless otherwise agreed.
  - ECMWF will organise annual C3S General Assemblies that the Successful Tenderer’s Service Manager and Technical Lead are required to attend.
  - ECMWF will host regular ad-hoc teleconference meetings to discuss this C3S service provision and other topics. The Project Manager appointed by the Successful Tenderer, as well as a representative of the WP under discussion, will represent the Successful Tenderer in such meetings.
  - If considered necessary, the Tenderer can propose additional project meetings, whose added value must be precisely substantiated, as part of its Tender.
- d. **Quality assurance and control**, including in what concerns the sub-contractors’ activities if any. For the sake of clarity, the final quality check of all deliverables (contents, use of ECMWF’s templates for deliverables and reports, format, deliverables/milestones numbering and naming, typing errors, etc.) shall be made by the Successful Tenderer. The Tenderer shall provide a list of its quality assurance processes and management systems and if applicable, any quality related accreditations or certifications it holds.
- e. **KPI management:** the technical proposal shall include KPIs (cf. section 3.9) suitable for monitoring the contract performance. The Successful Tenderer shall report to ECMWF on these KPIs as part of the Quarterly and Annual Implementation Reports.
- f. **Risk Management:** the technical proposal shall include a risk register that describes identified risks for each WP, along with a mitigation strategy for each of the identified risks. This mitigation strategy shall be composed by both preventive and corrective measures. The risk register shall be updated regularly by the Successful Tenderer, and any update (related to new risks, likelihood or impact) shall be reported during the Progress Review Meetings, as well as part of the Quarterly and Annual Implementation Reports.
- g. **Proactive and dynamic communication** towards and between all parties involved in the contract.
- h. **Management of personal data** and how this meets the requirements of Clause 2.8 and Annex 6 “Personal Data Protection” of the Volume V Framework Agreement.

- i. **Sub-contractor(s) management**, if any, in accordance with the Volume V Framework Agreement, including dispute resolution (the Successful Tenderer will be responsible for settling disagreements, although advice/approval from ECMWF may be sought on the subject). The Tenderer shall also describe in its Tender how the Volume V Framework Agreement, in particular Clause 2.9 “Sub-contracting”, has been flowed down to all their sub-contractors.

The Tenderer is invited to outline and justify any other aspect of the proposed management methodology for this contract in its technical proposal.

The table hereinafter provides the Tenderer with the complete list of deliverables and milestones, as well as the corresponding schedule and due dates, for WPO:

<i>Deliverable / Milestone ID</i>	<i>Resp.</i>	<i>Nature</i>	<i>Deliverable / Milestone title</i>	<i>Due date</i>
List of deliverables				
WPO-QIR-YYYYQQ	Tenderer	Report	Quarterly Implementation Report YYYYQQ <i>YYYYQQ being here the previous quarter (e.g. 2024Q3)</i>	Quarterly on 15/04, 15/07 and 15/10
WPO-AIR1-YYYY	Tenderer	Report / Other	Annual Implementation Report for year YYYY – Part 1 including both: · the Quarterly Implementation Report YYYY Q4 and · the requested preliminary financial information for year YYYY <i>YYYY being here the Year n-1</i>	Annually on 15/01
WPO-AIR2-YYYY	Tenderer	Report	Annual Implementation Report for year YYYY – Part 2 <i>YYYY being here the Year n-1</i>	Annually on 28/02
WPO-FIR	Tenderer	Report	Final Implementation Report	Not later than 60 days after the end of contract and once all other activities duly performed
WPO-AIP-YYYY	Tenderer	Report	Annual Implementation Plan for year YYYY <i>YYYY being here the Year n+1</i>	Annually on 30/09
WPO-FIN-YYYY	Tenderer	Other	Copy of Contractor’s general financial statements and audit report for year YYYY <i>YYYY being here the Year n-1</i>	Annually, not later than on 15/12 <sup>(1)</sup>
WPO-KOM	Tenderer	Presentation and MoM	Kick-Off Meeting	Not later than 30 days after the start of contract
WPO-PRMxx	Tenderer	Presentation and MoM	Progress Review Meeting #xx <i>xx being here the iteration number of the PRM</i>	Circa every 3 months <sup>(2)</sup>
List of milestones				
WPO-C3SGA-YYYY	Tenderer	Meeting	C3S General Assembly YYYY <i>YYYY being here the concerned year</i>	Annually, not later than on 15/12 <sup>(3)</sup>

*Table 4: WPO Deliverables and Milestones*

These due dates are indicated to frame the corresponding deliverables and milestones schedule only, consequently the following shall be considered by the Tenderer:

- <sup>(1)</sup> the general financial statements shall be sent by the Successful Tenderer as soon as available,
- <sup>(2)</sup> the schedule of the Progress Review Meetings shall be aligned with the different Payment Milestones during the contract negotiation,
- <sup>(3)</sup> depending on the year, the C3S GA may take place at a different period of the year.

## 3 General requirements

### 3.1 Implementation schedule

**ECMWF intends to award a Framework Agreement for a period of maximum 42 months, which shall be implemented via a single Service Contract expected to commence in January 2025.**

The Tenderer shall provide a detailed implementation plan of proposed activities for the full contract period.

### 3.2 Deliverables and milestones

The Tenderer shall provide the list of deliverables and milestones (cf. ITT Volume IIIA “Pricing and deliverables”, Excel spreadsheet “Deliverables List”) for each Work Package. All deliverables and milestones must be consistent with the activities and objectives described in this ITT Volume II and especially with its Section 2:

- A deliverable is a substantial, tangible or intangible good or service produced as a result of a project (see also the deliverable definition in this ITT Volume V Clause 1.2 and Clause 3.2). In other words, a deliverable is a verifiable outcome produced in response to the specific objectives of the contract and is subject to approval by both ECMWF’s Technical Officer (TO) and Contract Management Officer (CMO) before being considered as contractually approved. All document deliverables shall be periodically updated and versioned as described in Section 2 above.
- Milestones should be designed as markers of demonstrable progress in service development and/or quality of service delivery during the contract implementation (see also the milestone definition in this ITT Volume V Clause 1.2). They should not duplicate deliverables.

The following shall apply to the deliverables and milestones:

- The deliverables and milestones should be consistent with and meet the technical requirements specified in Section 2 of this ITT Volume II;
- All contract deliverables shall be produced in English;
- The quality of reports shall be equivalent to the standard of peer-reviewed publications and practice;
- Unless otherwise specified in the contract, or requested by ECMWF during the contract implementation the final version of each deliverable shall be made available to ECMWF without any comments and tracked changes in electronic format (Microsoft Word/Microsoft Excel/HTML or compatible, PDF in case of signed version, while all other formats – if any – must be agreed during the contract negotiation) via the Copernicus Deliverables Repository portal – OpenText Core (OTC).

The following shall apply in ITT Volume IIIA “Pricing and deliverables” (cf. Excel spreadsheet “Deliverables List”):

- Deliverables and milestones shall respectively follow the referencing system used in Section 2 of this ITT Volume II. Additional deliverables and milestones, if any, shall follow the same referencing system.

- Each deliverable shall have an associated resource allocation and price (cf. column I “Nb of PM allocated” and column J “Estimated price”), while the only resource type to be considered is “payroll” (the total of these allocated resources and prices shall therefore amount to the total price associated with payroll in Volume IIIA spreadsheet “Costs and Prices”).
- Milestones shall not attract the budget under Volume IIIA in the Excel spreadsheet “Deliverables list”.

The Tenderer shall provide a due date for each proposed deliverable and milestone (in accordance with those indicated in Section 2 for each Work Package). Copernicus services are running in operational mode and timely delivery of services is essential. **The Tenderer shall therefore ensure that the proposed due dates for all deliverables and milestones are realistic and achievable**, i.e. the Tenderer shall also consider dependencies\*, the source of original data and assess the risk accordingly.

*(\*) Please note that any dependencies on input data, whose origin must be specified, shall be detailed by the Tenderer, and also accounted for in the risk register (cf. ITT Volume IIIB Section 5.6).*

### 3.3 Data Access and application provision via the CDS

The CDS has been designed as a distributed system that provides access to datasets, tools and applications through a unified web interface. The Successful Tenderer shall provide the data in a way that is compatible with the working practice of the CDS. This is not limited to the data format and standard but also covers metadata and documentation.

#### 3.3.1 Dataset registration

If new datasets are developed, this shall be documented so that ECMWF can consider its development as part of the evolution of the service. Data delivery includes the provision of data and files containing abstracts, detailed descriptions of dataset, variables, etc., following the integration process detailed at Appendix 3 (Guidelines for Data Integration).

#### 3.3.2 Bug fixing and maintenance of all service elements

The Successful Tenderer shall be responsible of debugging and maintaining the datasets, the applications as well as updating relevant user guides and associated documentation, as required. The Successful Tenderer will ensure quality of all scripts and tools used to generate and publish C3S datasets and applications, through an internal quality control procedure to be delivered together with datasets and applications. Workflow quality includes aspects such as optimised performance of the software, adequateness of the applications and workflows in terms of usability, accuracy, description of input and output variables, appearance, coding standards and style, functionality, and scientific quality.

### 3.4 Contribute to L2 support to Copernicus User Support Team

The objective of this task is to provide specialised support to users of the delivered products and services.

ECMWF has a well-established centralised User Support to provide multi-tiered technical support to all users of C3S data, products, tools and services. A service desk system is used for ticketing user requests and distributing these requests to specialists as needed. Dedicated staff at ECMWF promote and maintain self-help facilities (Copernicus Knowledge Base (CKB), user forum, FAQs and tutorials, etc.) and also provide individualised support on technical queries related to the CDS, data formats, data access, etc. In addition, ECMWF staff members provide specialised scientific support to address questions related to its industrial contributions to C3S, e.g., in the areas of global reanalysis and seasonal forecasting.

All C3S contractors are expected to contribute to the delivery of multi-tiered technical support for the data and/or services they provide. The Successful Tenderer shall provide expert (Level-2) support through a) the Jira ticketing system with agreed KPIs (for example, 85% of Level-2 tickets should be resolved within 15-

business days), and/or b) the [user forum](#)<sup>9</sup> by monitoring topics and providing responses. The Successful Tenderer shall provide an email address which acts as the single contact point.

### 3.5 Communication

The Successful Tenderer shall support ECMWF in its communication activities for the C3S services, where they are related to the activities described in this ITT, especially in what regards the contributions to the European State of the Climate report. Additional activities such as C3S website news items, C3S brochures and flyers, may be discussed on a case-by-case basis during the contract implementation.

All communication activity must be agreed with the ECMWF Copernicus Communication team in advance. This includes, but not exhaustively, communication planning, branding and visual style, media outreach, website and social media activity, externally facing written and graphic content and events. Such agreed communication activity would also need to be evaluated and reported on, once complete, so that success measures and KPIs can be provided to the European Commission.

### 3.6 Support to user engagement activities

While user engagement and training activities are not part of the scope of this contract, Tenderers shall accommodate for eventual needs in providing technical and scientific expertise in support of these activities. Tenderers shall specify in their proposal the experts intended to be allocated to provide this support.

Requests to support activities may be raised on, for example:

- Contribute with content specific input to training, education, and capacity building material: development and/or review of learning resources in the domain of the contract, participation in train-the-trainer events and MOOCs.
- Contribute with content specific input to user-oriented communication material such as slides, story maps and user testimonials.
- Contribute and attend User Uptake workshops and stakeholder meetings. Presentations in languages other than English (e.g. mother tongue of named experts) may be asked to be provided.
- Input to the C3S collection of user requirements (template will be provided to the Successful Tenderer at the start of contract), as well as sharing needs and aspirations as raised by potential new user communities.
- Provide input to conceptional assessments and developments of specific user engagement plans and actions as launched by ECMWF.
- Provide input to user stories and user testimonials.

The Successful Tenderer shall foresee providing support to the User engagement activities as necessary.

### 3.7 Evaluation and Quality Control

Evaluation and Quality Control (EQC) is a central component of C3S to establish the service as a trusted source of climate information, delivering quality-assured and authoritative service outputs such as datasets and applications that are traceable and reproducible.

EQC checks are independent from the Successful Tenderer, hence no specific commitment is expected. However, the EQC programme provides the general requirements framework and independent technical and/or scientific evaluation of the delivered services (datasets, applications, indicators, etc.). The Successful Tenderer shall foresee providing support to the EQC function as necessary.

---

<sup>9</sup> <https://forum.ecmwf.int/>

### 3.8 Data and IPR

**It is a condition of EU funding for C3S that ownership of any datasets developed with C3S funding passes from the suppliers to the European Union via ECMWF.** Ownership will pass from the date of creation of the datasets. Suppliers will be granted a non-exclusive licence to use the datasets which they have provided to C3S for any purpose.

All software and products used by the Successful Tenderer to produce the C3S datasets will remain the property of the Successful Tenderer, except for those components which are acquired or created specifically for C3S purposes, with C3S funding, and which are separable and useable in isolation from the rest of the Successful Tenderer's production system. The identity and ownership of such exceptional components will be passed to the European Union via ECMWF annually. The Successful Tenderer will be granted a non-exclusive licence to use them for any purpose.

A distinction ought to be made between:

- those datasets (or relating documentation) specifically created as a result of this ITT, which, as Deliverables, will be fully owned by the EU, and
- pre-existing datasets (or documentation), which are simply brokered / made accessible as part of the services.

Such brokered datasets (or documentation) will continue to be owned by their original owner. The Successful Tenderer will licence the relevant brokered data/documentation to ECMWF/EU or will procure on behalf of ECMWF a licence directly from the owner. Such licence will ensure the best available terms of accessibility and redistribution, bearing in mind the purpose of the Copernicus Programme and the free and open terms of accessibility and redistribution, established for Copernicus products in the Copernicus Data Regulation (see respective definition in Volume V Clause 1.2). At a minimum, the Successful Tenderer shall grant, or procure on behalf of ECMWF, the right for the brokered datasets (or documentation) to be made available via the Climate Data Store (CDS) on terms consistent with any applicable specifications of ECMWF and the Copernicus Data Regulation. The Successful Tenderer will be responsible to provide the license terms to ECMWF in a suitable format in order for ECMWF to make the brokered datasets (or documentation) available via the CDS. For this particular ITT, it is highly desirable for ECMWF that the brokered datasets (or documentation) are licenced under the Creative Commons Attribution 4.0 International (CC-BY-4.0) licence. The Successful Tenderer will inform ECMWF of any updates to such terms. In this case, ECMWF is procuring a service, rather than the datasets (or the documentation) themselves.

Detailed contractual terms, including terms to give effect to the arrangements described above, are set out in the ITT Volume V.

### 3.9 Key Performance Indicators (KPIs)

The Successful Tenderer shall report to ECMWF on a set of SMART (specific, measurable, actionable, realistic and time bound) Key Performance Indicators (KPIs) suitable for monitoring the following aspects of the service performance:

- Data and service quality (accuracy, stability, coverage, maturity).
- User support.
- Contract management.

The tables below provide examples of KPIs that may be used by the Tenderer, along with examples of performance targets, frequency of delivery and explanations, to build their Tenders.

Note that KPI.D1, KPI.D2, KPI.U1 and KPI.C1 in the tables below must be part of the contract.

The Tenderer may propose additional KPIs suitable but shall limit them to the sole KPIs whose reporting may help to optimize the performance of the contract in case of deviation per comparison with the performance targets.

List of **data and service quality KPIs**:

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
KPI.D1	Operational historical extremes web application	Up-time at least 80% of all time	Quarterly via QIR	
KPI.D2	Triggered extreme event attribution fact sheets	Delivered within 5 business days of event trigger	Quarterly via QIR	
KPI.D3	....	....	....	....

List of **user support KPIs**:

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
KPI.U1	User Support ticket response during last quarter	85% solved within 15 business days	Quarterly via QIR	Resolve user issue
KPI.Ux	....	....	....	....

List of **contract management KPIs**:

KPI #	KPI Title	Performance Target and Unit of Measure	Frequency of Delivery	Explanations / Comments
KPI.C1	Deliverables submitted on time for review during last quarter	100% of deliverables submitted on time	Quarterly via QIR	Due dates are the deadlines (inclusive) for the deliverables to be submitted for review by ECMWF
KPI.Cx	....	....	....	....

All KPIs shall be labelled and numbered as indicated in the tables above.

During the contract implementation, all KPIs shall be duly reported by the contractor in the Quarterly Implementation Reports (QIR, cf. deliverables WPO-QIR-YYYYQQ and WPO-AIR1-YYYY) in accordance with their frequency of delivery.

For the sake of clarity, the Tenderer shall provide preliminary versions of the completed tables as part of their Tender.

### 3.10 Payment Plan

The Tenderer can propose a draft Payment Plan in ITT Volume IIIA “Pricing and deliverables” (cf. Excel spreadsheet “Payment Plan preparation”):

- Given the total duration of the contract, it is recommended to abide by a 6-months frequency for all Payment Milestones and associated payments. Any other scheme can be proposed but shall be duly



- substantiated by the Tenderer.
- The frequency of the Progress Review Meetings might be adapted to synchronise with the anticipated date of completion of each Payment Milestone.
- In case of request for a payment at contract signature, please note that this shall be duly substantiated by the Tenderer (e.g. in terms of investment that would be necessary prior to or during first weeks/months of implementation for ensuring the initial set up of the project). It is necessary to relate this payment amount to activities subject to other Payment Milestones.

## 4 Tender Format and Content

General guidelines for the Tender are described in Volume IIIB of this ITT. This section describes specific requirements to prepare the proposal for this particular Tender, along with guidelines for minimum content expected to be included in the proposal, additional to the content described in the general guidelines of Volume IIIB. This is not an exhaustive description and additional information may be necessary depending on the Tenderer's response.

### 4.1 Page Limits

As a guideline, it is expected that individual sections of the Tenderer's response do not exceed the page limits listed below. These are advisory limits and should be followed wherever possible, to avoid excessive or wordy responses.

<i>Section</i>	<i>Page Limit</i>
<i>Executive Summary</i>	2
<i>Track Record</i>	2 (for general) and 2 (per entity)
<i>Quality of Resources to be Deployed</i>	2 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
<i>Technical Solution Proposed</i>	20 (Table 2 in Volume IIIB, the section on references, publications, patents and any background IP is excluded from the page limit and has no page limit)
<i>Management and Implementation</i>	6 (excluding Table 4 and Table 5 in Volume IIIB) + 2 per each Work Package description (Table 3 in Volume IIIB)
<i>Pricing Table</i>	No limitation

*Table 5: Page limits*

### 4.2 Specific additional instructions for the Tenderer's response

The following is a guide to the minimum content expected to be included in each section, additional to the content described in the general guidelines of Volume IIIB. This is not an exhaustive description and additional information may be necessary depending on the Tenderer's response.

#### 4.2.1 Executive Summary

The Tenderer shall provide an executive summary of the proposal, describing the objectives, team and service level.

#### 4.2.2 Track Record

The Tenderer shall demonstrate for itself and for any proposed sub-contractors that they have experience with relevant projects in the public or private sector at national or international level. ECMWF may ask for evidence of performance in the form of certificates issued or countersigned by the competent authority.



### 4.2.3 Quality of Resources to be deployed

The Tenderer shall propose a team providing the skills required for providing operational services that meet the technical requirements set out in Section 2. The team shall include a Service Manager with at least 5 years of experience in management of large-scale projects. The Tenderer shall describe the experience of the Service Manager and the technical project team in performing activities related to the various aspects of this Tender.

### 4.2.4 Technical Solution Proposed

The Tenderer shall provide a short background to the proposed technical solution to demonstrate understanding of the solution proposed and of the C3S context.

This section shall also include information on any other third-party suppliers that are used as part of the technical solution, and a statement of compliance for each requirement formulated throughout this document, describing how the proposed solution maps to the requirements.

An exhaustive and detailed description of the proposed technical solution for all Work Packages described above shall be given.

#### **IMPORTANT**

All ECMWF's inputs and/or support activities needed by the Tenderer and/or any of its sub-contractors to reach the objectives of the contract and abide by all of its requirements shall be precisely listed in a dedicated sub-section within the Volume IIIB Section 4 "Technical Solution Proposed". This will be duly discussed between the concerned parties.

### 4.2.5 Management and Implementation Plan

As part of the general project management description, and in addition to the guidance provided in Volume IIIB, Tenderers shall consider the elements described in section 2.5 above. Note that costs associated with fulfilling WPO requirements shall not exceed 10% of the total price of the Tender.

Furthermore, should any sub-contractors be proposed in the Tender, in order to ensure a comprehensive and realistic proposal, it is a mandatory requirement for the Tenderer to actively involve all such sub-contractors in the development of the proposal. This involvement should include, but is not limited to, collaborative planning, clear communication of project timelines, and agreement on deliverables and deadlines. The Tenderer must provide documented evidence of this collaboration, demonstrating that each sub-contractor has been consulted and has agreed to their respective roles, responsibilities, and deadlines as outlined in the proposal. This requirement is instituted to promote a cohesive and feasible project plan, reflecting a true and committed partnership among all participating entities.

## 5 Additional information

### 5.1 Acronyms

AI	Artificial Intelligence
AIFS	Artificial Intelligence/Integrated Forecasting System
C3S	Copernicus Climate Change Service
CDS	Climate Data Store
CI	Climate Intelligence
CKB	Copernicus Knowledge Base
CMIP5	Coupled Model Intercomparison Project Phase 5
CMIP6	Coupled Model Intercomparison Project Phase 6
DOI	Digital Object Identifier

ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	Extreme Event Attribution
EFI	Extreme Forecast Index
EQC	Evaluation and Quality Control
ERA5	Fifth generation ECMWF atmospheric reanalysis of the global climate
ERA6	Sixth generation ECMWF atmospheric reanalysis of the global climate
ESOTC	European State of The Climate
EU	European Union
FAQ	Frequently Asked Questions
IFS	Integrated Forecasting System
ITT	Invitation to tender
KPI	Key Performance Indicator
MoM	Minutes of Meeting
NetCDF	Network Common Data Form
QIR	Quarterly Implementation Report
SST	Sea-Surface Temperature
WMO	World Meteorological Organisation
WP	Work Package

## 5.2 Appendices

### [Appendix 1 How to submit Jupyter Notebook based training material to the CDS/ADS/CADS](#)

Tenderers should refer to the separate document attached. Note that the document may include links to other ECMWF and/or web resources, some of which may not be publicly available. This document is provided to facilitate Tenderers' understanding of what is expected in terms of standards, content and the information and deliverables required for the submission of training material in the form of Jupyter Notebooks, as well as to facilitate the assessment and costing of resources which Tenderers should allocate in their response for any such activities. Full access to ECMWF internal resources shall be provided to the Successful Tenderer at the start of the contract.

### [Appendix 2 Applications Style Guide](#)

Tenderers should refer to the separate document attached. Note that the document may include links to other ECMWF and/or web resources, some of which may not be publicly available. This document is provided to facilitate Tenderers' understanding of the general guidance that should be followed by contractors when designing Copernicus-branded web applications and to facilitate the assessment and costing of resources which Tenderers should allocate in their response for any such activities. Full access to ECMWF internal resources shall be provided to the Successful Tenderer at the start of the contract.

### [Appendix 3 Guidelines for Data Integration](#)

Tenderers should refer to the separate document attached. Note that the document may include links to other ECMWF and/or web resources, some of which may not be publicly available. This document is provided to facilitate Tenderers' understanding of the data integration process and to facilitate the assessment and costing of resources which Tenderers should allocate in their response for any such activities. Full access to ECMWF internal resources shall be provided to the Successful Tenderer at the start of the contract.

**C3S2\_451 Volume II**  
**Appendix 1**

**How to submit Jupyter Notebook based training material to  
the CDS/ADS/CADS**

Copernicus Contractors

Exported on 04/25/2024

## Table of Contents

1	Overview .....	3
2	Notebook contents and standards .....	4
2.1	Notebook templates .....	5
2.2	Hint and tips .....	5
2.2.1	Cross-references.....	5
3	Delivery .....	6
4	Training material integration workflow .....	7
5	TEMPLATE Training material checklist for COPCO-???	8
5.1	Note to Reviewers and Editors:.....	8
5.2	Instructions to Contractors: .....	8
5.3	Review Checklist .....	9
5.4	The components below this point are for internal CDS use only.....	11
5.4.1	Delivery/submission checklist (for CDS team) .....	11
5.4.2	Editorial Board Decisions .....	12

# 1 Overview

So that users can make best use of the data available in the CDS/ADS/CADS, data providers can provide training material in the form of Jupyter Notebooks which can be included in the [Copernicus training inventory](#)<sup>1</sup>, with accessible links added to the relevant dataset pages.

This page describes what is expected in terms of notebook standard and content and the information and deliverables required for the submission.

---

<sup>1</sup> <https://ecmwf-projects.github.io/copernicus-training-c3s/intro.html>

## 2 Notebook contents and standards

All training material delivered by the contractors need to be compliant with the CDS/ADS/CADS standards. The ultimate aim of the delivery is to publish the training material on the Copernicus and CDS/ADS/CADS websites. In order to be published, the training material needs to be SWUMP:

- **Self-explanatory**
  - All steps are clearly, correctly and succinctly explained
- **Well structured**
  - The flow of the notebook should make logical sense and produce an aesthetically pleasing page
  - A good balance between markdown and code as you progress through the notebook
- **Usable**
  - The notebook MUST run to completion without errors
  - The notebook MUST only include output and widgets which are compatible with JupyterBooks, see below.
- **Meaningful**
  - The content of the notebook should be relevant and provide a meaningful application of the data
  - The training material should provide a use-case with added value to the data available in the CDS
- **Proficient**
  - The notebook MUST meet our code standards tests which can be checked prior to submission using the commands provided below

### Code standards tests

```
# install necessary packages
pip install flake8-nb

# execute tests with CDS configuration options:
flake8_nb --max-line-length 100 --max-doc-length 100 $NOTEBOOK
```

## 2.1 Notebook templates

We recommend that you use one of the already [published training notebooks](#)<sup>2</sup> as a template to help you get started. It may even be useful to work through several of the Jupyter notebooks to help get a better understanding of what is expected.

## 2.2 Hint and tips

### Widgets and output

The widgets and output included in the Notebook must be compatible with JupyterBooks. JupyterBooks do not have a running python kernel, therefore they are not compatible with interactive widgets which require a running kernel, e.g. a number of ipywidgets, as documented here:

<https://jupyterbook.org/en/stable/interactive/interactive.html?highlight=widgets#ipywidgets>

### Inline images

Any additional images included in the notebook should be added using markdown hyperlink syntax, html syntax does not work with our jupyter-books.

#### Example image link

```

```

### 2.2.1 Cross-references

Please avoid using within notebook cross-references, i.e. links between sections of the notebook. Due to platform differences they are not rendered correctly on JupyterBook pages and causes many compilation warnings and errors. This means it is much harder for us to identify real issues in the notebook, slowing down the integration process.

---

<sup>2</sup> <https://ecmwf-projects.github.io/copernicus-training-c3s/intro.html>

## 3 Delivery

The method for delivering training material will be via ECMWF Contractors Portal ([COPCO](#)<sup>3</sup>), please select the Training Material option, [or click this link](#)<sup>4</sup>. You must have an ECMWF account to open a ticket, you can register [HERE](#)<sup>5</sup>.

As each piece of training material will have to go through the review process it is best to open a ticket for each piece submitted such that it is easier for everyone to follow the progress of submission.

The ticket should be created with the following information:

1. **Subject**

- The proposed title of the training material.

2. **Description**

- This should include the following:
  - Short description (1 or 2 sentences) of the contents of the notebook. This is for reference to help participants follow the progress of integration.
  - *Optional:* In lieu of an attached Jupyter notebook, you can provide a link to a github repository containing the Notebooks.

3. **C3S Contract category and number**

- Select the contract category and number associated with this submission

4. **Request participant**

- Any colleagues who may want to follow the progress of the submission. (They must also have an ECMWF account to be added as a participant)

5. **Attachment**

- a. Jupyter Notebook(s) containing training material
- b. Completed checklist
- c. Any other supporting documents and/or images?

The delivery of training material does not guarantee publication of the training material. All training material are subject to an internal review process which will ensure that the published content is of the standards expected (SWUMP).

---

<sup>3</sup> <https://jira.ecmwf.int/plugins/servlet/desk/category/cds-apps>

<sup>4</sup> <https://jira.ecmwf.int/plugins/servlet/desk/portal/12/create/233>

<sup>5</sup> [https://accounts.ecmwf.int/auth/realms/ecmwf/protocol/openid-connect/registrations?client\\_id=apps&response\\_type=code&scope=openid%20email&redirect\\_uri=https://www.ecmwf.int](https://accounts.ecmwf.int/auth/realms/ecmwf/protocol/openid-connect/registrations?client_id=apps&response_type=code&scope=openid%20email&redirect_uri=https://www.ecmwf.int)



## 4 Training material integration workflow

1. **The training material is developed inline with the objectives of the relevant contract(s)**
  - A technical officer will be assigned to ensure that the scientific and informative content of the training material is suitable.
  - The submitted version of the training material must be SWUMP
2. **The training material is delivered via a CDSAPP Jira ticket**
  - Please see the [Delivery \(see page 6\)](#) section
3. **The training material is checked and reviewed**
  - See [TEMPLATE Training material checklist \(see page 8\)](#)
  - The delivery is checked by the CDS team
    - i. Have all required fields been provided
    - ii. Does the notebook run to completion and meet the coding standards (Usable and Proficient)?
  - The training material is reviewed by 1/2 ECMWF members of staff
    - i. Is the notebook Self-explanatory, Well structured and Meaningful?
    - ii. We try to ensure reviewers are NOT specialist in the field to ensure that is understandable to non-experts
  - A final editorial decision is made
4. **The training material is published in the C3S/CAMS training library**

## 5 TEMPLATE Training material checklist for COPCO-???

JIRA	link for reviewing training material in the development pages

### 5.1 Note to Reviewers and Editors:

**Instructions:**

- To edit the page see the edit button at the top right
- If you are happy with an field (e.g. Title) just tick the box and move on
- If you are not happy with an element please list specific points that you would like address
- Start typing next to the checkbox, when you hit return you will get a new checkbox for a second point
- Leave these checkboxes unticked, this means the person responding to your review can tick them as they address the points
- The purpose of the review is to ensure that the content of the material is good enough, the CDS team will ensure that the notebook is functional and runs
- But don't let this stop you downloading and playing yourself if you are interested

### 5.2 Instructions to Contractors:

- Please respond to all the reviewer comments in the checklist table, unless there is a comment from the CDS team that states otherwise
  - When you have addressed the comment please tick the checkbox
  - If you have any comments please add them green below the relevant review comment
  - If you feel the review comment is not addressable please leave the box unchecked and provide an explanation why it has not been addressed.
- When you have completed the responses please inform your technical officer on the JIRA ticket.

### 5.3 Review Checklist

<b>Instructions for reviewers:</b> <b>If you are happy with a component please put a tick in the box.</b> <b>If you are not satisfied it is helpful if the comments are provided as a list of specific items which can be addressed.</b> <b>This is not to discourage general comments if, for example, a component is generally lacking in direction/purpose/clarity.</b>	<b>Technical Officer</b>	<b>Expert Review</b>	<b>User support</b>
<b>Title</b> <i>Is the title concise and correct?</i> <b>good example:</b> <i>"Tutorial on climatologies using ERA5 data"</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Introductory text</b> <i>Is the introductory text clear and understandable?</i> <i>It should explain what the notebook does and provide an outline of the order of computation</i>	<input type="checkbox"/>		
<b>Data description text</b> <i>Summary of the data used in the notebook</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>All other text in the notebook.</b> <b>Specific comments regarding any of the other text in the notebook, e.g. spelling, capitalisation and grammar or any other comments.</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Notebook flow</b> <i>Does the order of the Notebook make sense?</i> <i>Are the steps taken in an increasing order of complexity?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p><b>Notebook appearance</b>  <i>Is the layout of the Notebook clear and well structured?</i>  <i>Are the the plots/tables and other outputs of sufficient quality?</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Notebook relevance</b>  <i>Is the output produced by the Notebook meaningful, is it a useful application of the data?</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Notebook self-description</b>  <i>Is the Notebook self-explanatory, you do not need to go to other source to undertand the steps taken and why.</i>  <i>This does NOT mean the data or underlying software has to be fully explained, just clear reasoning for thhe steps taken within the Notebook</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Notebook code comments (Optional)</b>  Please provide any comments you have regarding the code quality and structure.  Please note that this is optional and all notebooks will be automatically screened for general code quality.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Contents side bar controls (right hand side)</b>  <i>Do the controls on the right hand work and have sensible headings?</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b>Any other comments</b></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p><b>Decision</b>  <i>Review should choose one of the following:</i></p> <ol style="list-style-type: none"> <li>1. <b>Accepted - The resource will go straight to the Editorial board</b></li> <li>2. <b>Accept, minor changes - The resource will go to the Editorial board after your points have been addressed</b></li> <li>3. <b>Reject, major changes required - The resource will be <b>returned to you</b> for evaluation that your points have been adequately addressed</b></li> </ol>			
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## 5.4 The components below this point are for internal CDS use only

### 5.4.1 Delivery/submission checklist (for CDS team)

Item <i>This is to check that the provider has made a sufficient submission prior to starting any review process. In some cases it will be best to make the changes</i>	CDS Team member:
<b>Ready for review</b>	<input type="checkbox"/>
<b>Jira Summary</b> "European energy and climate data explorer"	<input type="checkbox"/>
<b>JIRA Description</b> <i>Is the description good enough to follow progress</i> Does the description provide the Chapter where the TM should live?	<input type="checkbox"/>
<b>Labels</b>	<input type="checkbox"/>
<b>Provider checklist complete</b>	<input type="checkbox"/>
<b>Notebook visible in binder</b>	<input type="checkbox"/>

<b>Notebook host links</b>	<input type="checkbox"/>
<b>Notebook runs to completion</b>	<input type="checkbox"/>
<b>Notebook uses permitted data access methods (cdsapi/cads-toolbox)</b>	<input type="checkbox"/>
<b>Package install and import</b> <i>No output produced by package install. Packages should only be imported if they are used</i>	<input type="checkbox"/>
<b>Data access</b> <i>Accessing the data should follow our guidelines:</i> <ol style="list-style-type: none"> <li>1. <i>cdsapi to download, unzip with ZipFile, then open with xarray/pandas</i></li> <li>2. <i>cads-toolbox to do all of the above in a single step</i></li> </ol>	<input type="checkbox"/>
<b>Notebook passes code standard tests</b>	<input type="checkbox"/>
<b>No references to local locations in Notebook</b>	<input type="checkbox"/>
<b>Assign to appropriate chapter</b>	<input type="checkbox"/>
<b>Give appropriate sidebar link title</b>	<input type="checkbox"/>
<b>Any other business</b>	

## 5.4.2 Editorial Board Decisions

<b>The role of Editors is to ensure that:</b> <ul style="list-style-type: none"> <li>• <b>The training material provides added value to Copernicus (it is worth publishing)</b></li> <li>• <b>The review process has been followed</b></li> </ul> <b>Comments and suggestions are still welcome</b>	
<b>Agree on chapter and sidebar title (left)</b>	<input type="checkbox"/>
<b>Decision</b>	<input type="checkbox"/>
<b>Comments</b>	

**C3S2\_451 Volume II**  
**Appendix 2**

**Applications Style Guide**

Copernicus Contractors

Exported on 04/25/2024

# Table of Contents

1	Introduction .....	3
2	General Style .....	4
2.1	Colours .....	4
2.2	Fonts .....	4
3	Controls and Settings .....	5
3.1	Dropdowns .....	5
3.2	Buttons .....	5
3.3	Modals .....	6
3.4	Side panels .....	7
4	Interactive maps .....	8
4.1	General Layout .....	8
4.2	Mobile Layout.....	8
4.3	Interactivity .....	9
4.4	Projections .....	9
4.5	Visualisation Style.....	10
5	Static Maps .....	11
5.1	Software .....	11
5.2	Projections .....	11
6	Graphs and Plots.....	12
6.1	Software .....	12
6.2	Climate Projections .....	12
7	Logos and Attribution .....	14
8	Disclaimers.....	15



# 1 Introduction

This page provides general guidance that should be followed when designing Copernicus-branded web applications. These guidelines are not necessarily meant to be interpreted as a set of hard-and-fast rules, but rather a series of recommendations and principles that should help maintain a **consistent look and feel** across Copernicus interactive web content.

## Table of Contents

## 2 General Style

Copernicus applications should be **simple** and **clear**, and not **over-complicated**.

### 2.1 Colours

All application widgets should have a **white** background with **black** text.

### 2.2 Fonts

C3S-branded applications should use the font **Calibri**.

Content text should have a font size of **14px**; headings should have a font size of **18px**.

## 3 Controls and Settings

When developing control panels and user-input sections, consider how each component guides the user to find the information that's useful to them.

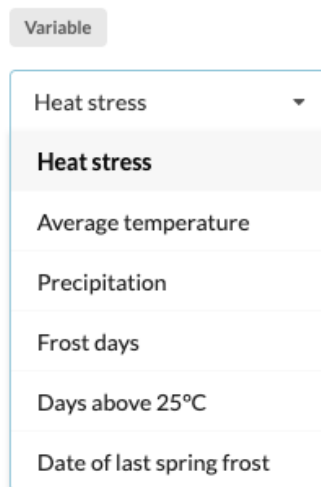
---

### 3.1 Dropdowns

Use a dropdown when:

- selection options are **naturally discrete**, e.g. data variables;
- the list of available options is **long** (>5).

Dropdowns hide non-selected options until the user interacts with them, creating a clear separation between each choice in the interface. This makes dropdowns most useful for input fields which are not intended for direct comparison.



### 3.2 Buttons

Use a series of buttons when selection options **naturally follow on from each other**, such as time horizons or emission scenarios - unless there is a long list of options available, in which case a dropdown might be more suitable.

Buttons show the user all available options at all times, encouraging interaction and comparison more than a dropdown would. Based on this principle, it's worth considering whether a series of buttons or a dropdown would be more appropriate for each input choice field.



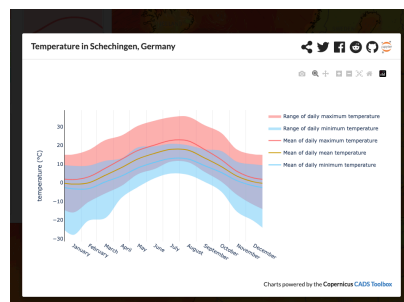
### 3.3 Modals

Use a modal to display **large blocks of text**, such as help or detailed information text.

Longer passages of text should always be delegated to modals where possible, to avoid cluttering the main interface with large amounts of text.

Modals should be **launched from buttons**; for example, instead of including a "How to use this application" section in the main interface, consider having a "How to use this application" button which triggers a modal containing the detailed text.

Modals can also be used for graphics and visualisations which demand lots of space or attention - for example, in some interactive map applications, clicking on a point can launch a modal to display statistics and graphs at the selected point.



## 3.4 Side panels

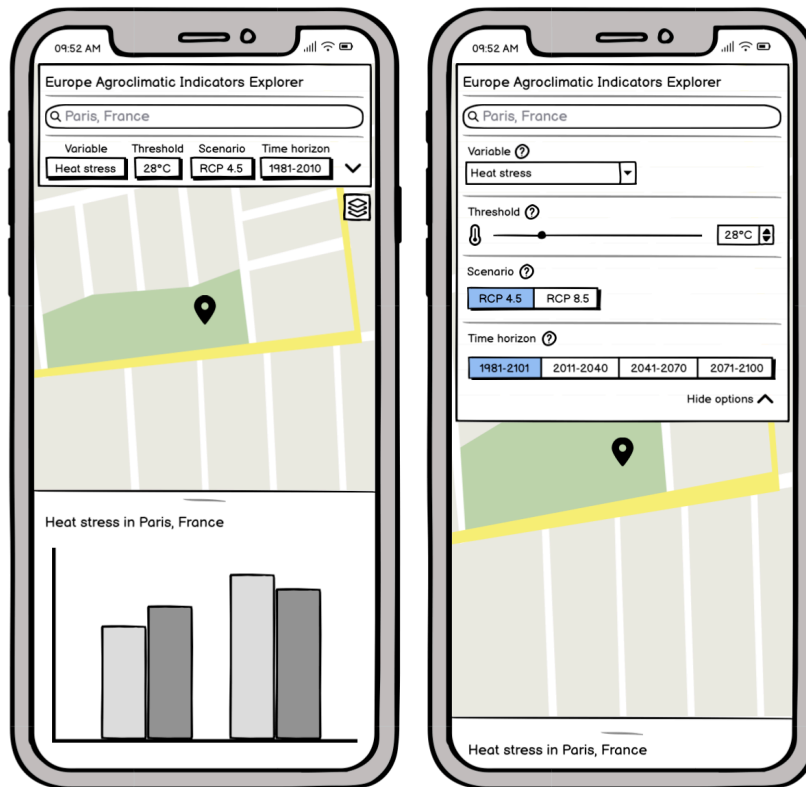
Use a side panel in an **interactive map** when there are lots of user-selectable options.

Side panels should always appear on the **left-hand side** of interactive maps.

Side panels can contain plots and figures if appropriate - especially when it's important to see both the map and the figure in the same frame.







### 4.3 Interactivity

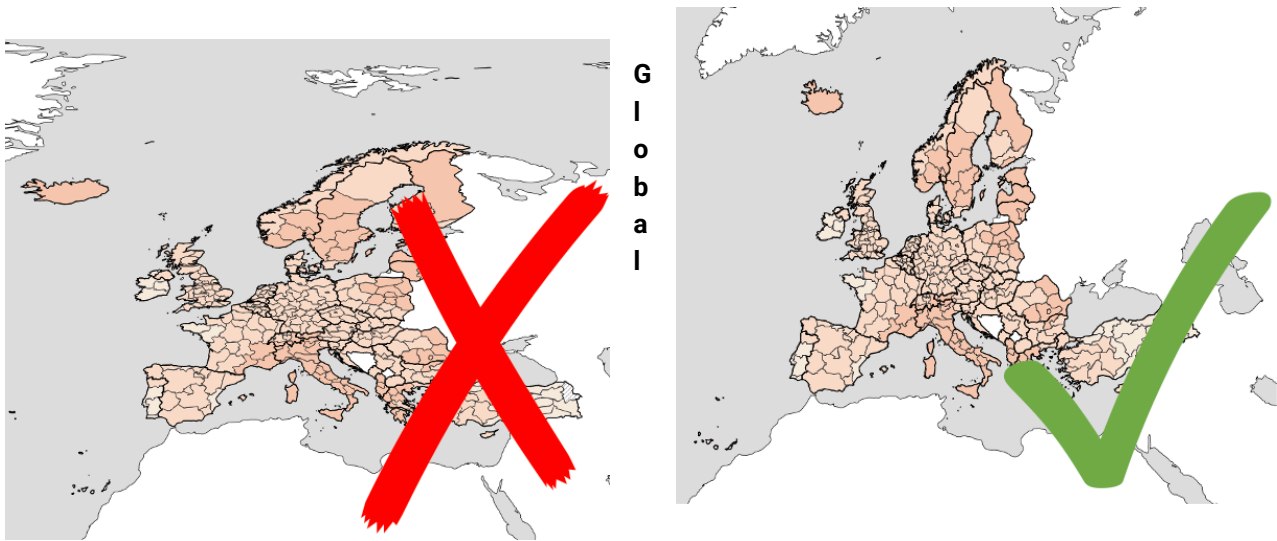
Interactive maps should always be **zoomable** and **pannable**, but appropriate limits should be set for maximum/minimum zoom - for example, if data is aggregated on European countries, the maximum zoom level should comfortably fit the smaller countries within the window.

### 4.4 Projections

Interactive maps should use a projection suitable for the data being visualised – for example, data focused on the North Pole should use a polar stereographic projection.

Projection choice is left to the discretion of the application designer, except for **European** and **Global** maps:

- **European** maps should use **EPSG:3035**



maps should use **EPSG:3857**

## 4.5 Visualisation Style

Data layers visualised on interactive maps should always be **opaque**, unless there is a very good reason for the layer to be transparent. Semi-transparent data layers on top of satellite/map layers are hard to interpret and often look messy.

Background map layers should have the **right level of detail** to compliment the data being visualised. In general, satellite/maps layers with roads, towns and buildings are **not** appropriate for use with climate model data, as the detail of these layers indicates a level of precision that is not consistent with the resolution and uncertainty in climate models.



## 5 Static Maps

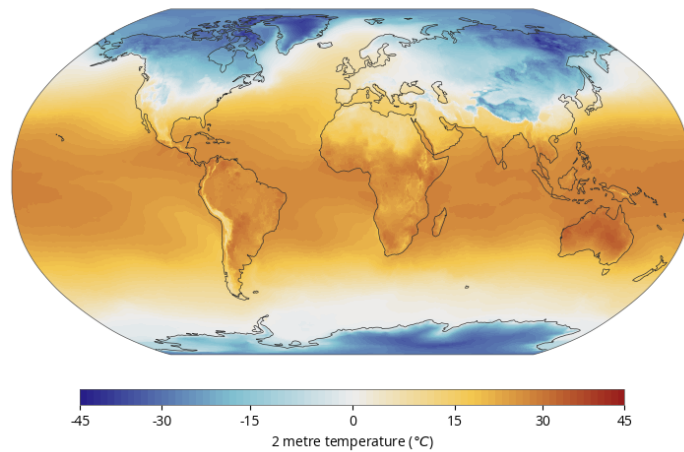
### 5.1 Software

Static maps should be generated using **earthkit-maps** or **matplotlib** and **cartopy**.

### 5.2 Projections

The same projection rules outlined for interactive maps above also apply to static maps - that is, the projection used should be suitable for the data being visualised. As with interactive maps, European maps should use **EPSG:3035** where possible; but global *static* maps should use the **Robinson** projection, as below.

ERA5 2 metre temperature monthly mean - January 2020



## 6 Graphs and Plots

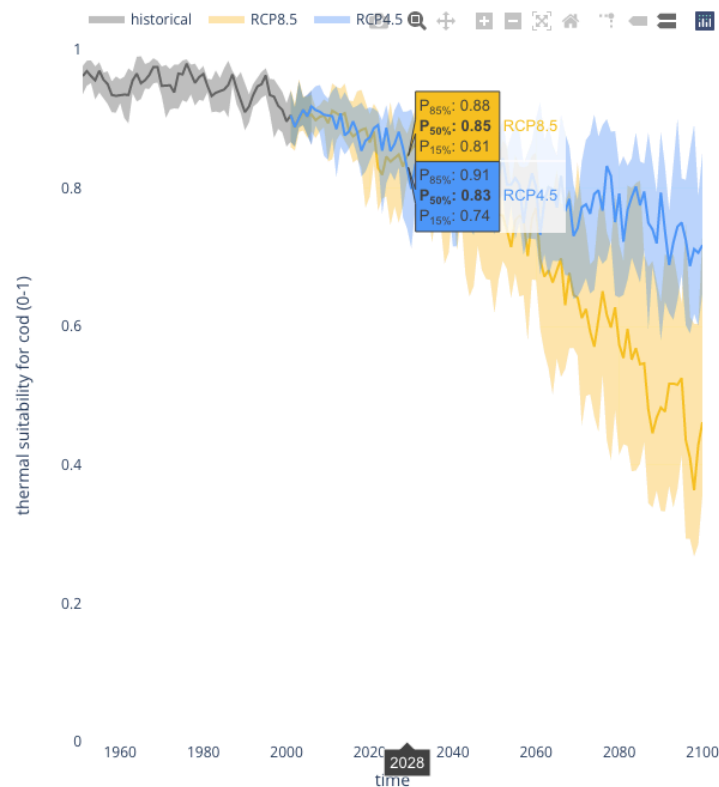
### 6.1 Software

Statistical graphs and plots should be generated using **earthkit-plots** or **Plotly**.

### 6.2 Climate Projections

Climate projection time series plots are one of the most common graphs produced in C3S applications. In order to maintain a consistent look and feel, and in order to help make our applications more directly comparable, we follow a style guide for these plots:

- each scenario should be represented by a **solid line** representing the multi-model "average" (usually the **50th percentile**) on top of a **semi-transparent shaded region** (40% opacity) representing the multi-model spread (usually the **15th - 85th percentile**)
- when using Plotly, the hover labels for climate projections should be **grouped** (see example below) - i.e. the labels for each percentile should be included in a single hover label for each emissions scenario. This is to avoid overcrowding the plot with hover labels (by default, 3 scenarios x 3 percentiles = 9 hover labels!)



The colours selected above are **grey** ( #666666 ) for **historical** data; **pink** ( #c31ff9 ) for **low-emissions scenario** data (not shown above); **blue** ( #5197f8 ) for **medium-emissions scenario** data; and **yellow** ( #f9c31f ) for **high-emissions scenario** data. These colours are not enforced, but have been selected to be **colourblind-friendly**, while also removing colour-emphasis from each scenario (i.e. plotting high-emission scenarios in red is likely to bias the interpretation of that scenario as "dangerous" or "hot", which should be avoided - even if accurate - because the data should speak for itself).

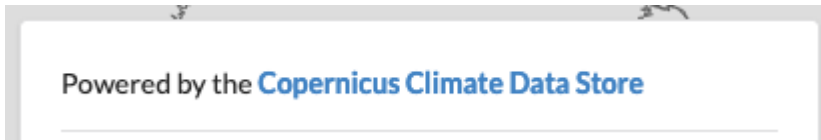
## 7 Logos and Attribution

All C3S-branded applications should include the text "**Powered by the Copernicus Climate Data Store**". Equivalently, all CAMS-branded applications should include the text "**Powered by the Copernicus Atmosphere Data Store**".

In interactive map applications, this text should be added to the standard "attribution" section in the bottom right-hand corner:



This text can also be placed at the top of a side panel, unless the application has a lot of controls and settings:



## 8 Disclaimers

In applications which show political boundaries, our legal department has recommended that we include the following text (usually best-placed inside a modal):

**"The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries."**

**C3S2\_451 Volume II**  
**Appendix 3**

**If you are a provider of data**

Copernicus Services

Exported on 04/25/2024

## Table of Contents

1 Provider's role: summary .....	4
2 How to start the integration of your data in the CDS Catalogue.....	5
3 Main processes in which you are expected to participate .....	6
4 Manifests, deprecation of data, versions, DOI, citation, acknowledgement and licence.....	9
5 Publishing under FAIR principles .....	17

### About this page

Scope	This page describes the main steps needed to integrate data in the CDS Catalogue. It <b>does not describe</b> what is needed to integrate documentation, the role of the technical officers and other aspects that are very important for a successful integration but that are the scope of other wiki pages.
Intended audience	<i>Copernicus CDS data providers.</i>
Outline	<i>The focus of this page is on what the data provider needs to supply to the CDS team and how to do it.</i>
Disclaimer	<i>The information in this page is not guaranteed to describe exactly the actual processes which are subject to change from time to time. But, the CDS team intends to keep the information in this page as close as possible of the actual practices.</i>



# 1 Provider's role: summary

## List of the expected contributions

The provider is expected to work closely with CDS team and the technical officer in order to resolve any issues that come up during the various stages of the publication process and afterwards. Communication is preferred through Jira ticket.

Below there is a list that had been laid out in chronological order with the main contributions.

1. Registers the Dataset: / [Dataset registration](#)<sup>1</sup> (*Integration process*)
2. Supplies the Information document: [Information document template](#)<sup>2</sup> (*Integration process*)
3. Supplies manifest file (See more about manifests below at *Manifest and pseudo-manifest files. Integration process.*)
4. Help the CDS team member to reply to the reviewer's and Editorial Board's comments (*Review process*)
5. Provide previous existent DOIs, licences and citations associated with each part of the data (see below: *DOI, citation and licence. Review process.*)
6. After entry published in the CDS Catalogue, the data provider should keep the manifest's filename and path exactly the same for the whole duration of the contract, even when the contents of the manifest is changed. (*Complementary processes: automatic updates*)
7. The data provider is expected to help the CDS team on keeping the entry working as expected when the data provider has the knowledge and the resources to do it (*Complementary processes: Maintenance*)
8. Follows CDS procedures for deprecating data ( see below: *Versions, deprecation of entries, replacement of data. Complementary processes: Maintenance*)

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<sup>1</sup> <https://confluence.ecmwf.int/pages/viewpage.action?pageId=402643456>

<sup>2</sup> <https://confluence.ecmwf.int/display/COPSRV/Information+document+template>

## 2 How to start the integration of your data in the CDS Catalogue

### JIRA ticket, Information document and manifest file

Provider's role	Description
<p><b>JIRA</b> When asked by the CDS management <a href="#">registers the dataset</a><sup>3</sup> and create a JIRA ticket at <a href="https://jira.ecmwf.int/servicedesk/customer/portal/5">https://jira.ecmwf.int/servicedesk/customer/portal/5</a></p>	<p>All information concerning the creation, modification, merging, updating, deprecation, additions of of data or documentation, DOIs, Citations, etc, is supposed to be managed through the JIRA ticket.</p>
<p><b>Manifest</b> Have a pseudo-manifest file (or a <a href="#">manifest file</a>) prepared.</p>	<p>This is the central piece of information needed by the CDS. So important that we have a whole section about it at the bottom of this page.</p>
<p><b>Information document</b> Attach to the JIRA ticket an "Information document" filled in with the information associated to the data that you are delivering for publication in the CDS Catalogue. The template for the information document can be found here: <a href="#">Information document template</a><sup>4</sup>.</p>	<p>The information document is the starting point for the integration process. In order to arrive at an agreed draft entry to submit for review, additional inputs may be required. The document contains fields and tables that should be completed with the information relevant for your data. Guidelines are provide along those fields and tables intending to help you to understand exactly which information is required and in which format.</p>

<sup>3</sup> <https://confluence.ecmwf.int/display/COPSRV/Dataset+registration>

<sup>4</sup> <https://confluence.ecmwf.int/display/COPSRV/Information+document+template>

### 3 Main processes in which you are expected to participate

#### Pre-publication process

The aim of this step is to check and agree on the main inputs for the subsequent publication process:

- path and filename conventions,
- the size of the files,
- the number of variables per file,
- where the data will be stored,
- manifest file

The CDS team expects to have access to the information in the list above as soon as possible through a JIRA ticket and at least 2 month before the actual delivery of the data.

For data for which the contents and the container is still modifiable, the CDS team expects to interact with the provider in order to influence the way the data is stored making it more suitable for the needs of the Catalogue and the needs of the Toolbox.

#### Publication process

The process that goes from the initial trigger of the integration of your data, to the publication of the Catalogue entry in the public Catalogue, is referred as the "publication process".

The publication process has two processes in sequence: the integration process and the review process. Your role in these two processes is summarised below.

Provider's role	Process	Description	
Creates JIRA ticket Supplies the Information document Supplies manifest file Replies to CDS team queries	<b>Integration process</b> (analogous to creating a draft of a paper to be submitted to a scientific journal)	Inputs	JIRA ticket and Information document
		Outputs	Draft Catalogue entry judged to be good enough to be submitted to review by the CDS team, the technical officer and the data provider
		Work	Based on the manifest file and the Information Document, a CDS team member (or associated) creates one or more possible drafts for the future entry in the Catalogue. When agreed that the draft is good enough to be submitted for publication this process ends.

Help the CDS team member to reply to the reviewer's and Editorial Board's comments.	<b>Review process</b> (analogous to the review process of a paper submitted to a scientific journal)	Inputs	Draft entry
		Outputs	Modified entry reviewed and approved by the Editorial Board published in the public CDS Catalogue
		Work	A CDS team member (or associated) runs an internal review process to guarantee that the entry respects the CDS expectations.

### Post-publication processes

After publication there are frequently some additions to be made or some issues to be addressed on the entry associated to your data. These are the two main processes where you may be asked to participate:

Provider's role	Process	Description	
Keep the manifest's filename and path exactly the same. Contents of the manifest is expected to change. But new additions to the contents, other than time extensions, should be discussed with the CDS team. See more about manifests below at <i>Manifest and pseudo-manifest files</i> .	<b>Automatic updates</b> (Updates date and time related widgets in the download form. This allows the automatic release of time extensions of data. Does not work for other widget's updates like new variables. new versions etc. )	Inputs	Entry already published in the Catalogue Manifest file or equivalent Update frequency agreed EC-Flow suite implemented
		Outputs	Entry updated with new dates
		Work	EC-Flow suite will read the manifest file and run CDS scripts able to recreate the download form.

<p>The data provider is expected to help the CDS team on keeping the entry working as expected. The main observed issues with published datasets are:</p> <ul style="list-style-type: none"> <li>• download form not providing the expected data</li> <li>• documentation tab not providing the expected documentation</li> <li>• mismatch between data and documentation</li> </ul> <p>When this or other issues are detected by the data provider, the CDS team will be grateful if the provider could notify the CDS team using the JIRA help desk (<a href="https://jira.ecmwf.int/service desk/customer/portal/5">https://jira.ecmwf.int/service desk/customer/portal/5</a>)</p> <p>Sometimes these issues are detected by users or the CDS team itself, in which case the CDS team will ask the data provider to help to fix the issue only when the data provider has the knowledge or the resources to do it</p>	<p><b>Maintenance</b> (new programmed versions, new documentation, deprecating data, unexpected issues with the data and the documentation, licences, etc)</p>	<table border="1"> <tr> <td data-bbox="735 311 924 461">Inputs</td> <td data-bbox="924 311 1425 461">Published entry Request for modification of the published entry</td> </tr> <tr> <td data-bbox="735 461 924 551">Outputs</td> <td data-bbox="924 461 1425 551">Modified entry</td> </tr> <tr> <td data-bbox="735 551 924 763">Work</td> <td data-bbox="924 551 1425 763">A CDS team member (or associated) modifies the entry as requested. The CDS team evaluates when the required modification needs agreement from the Editorial Board.</td> </tr> </table>	Inputs	Published entry Request for modification of the published entry	Outputs	Modified entry	Work	A CDS team member (or associated) modifies the entry as requested. The CDS team evaluates when the required modification needs agreement from the Editorial Board.
Inputs	Published entry Request for modification of the published entry							
Outputs	Modified entry							
Work	A CDS team member (or associated) modifies the entry as requested. The CDS team evaluates when the required modification needs agreement from the Editorial Board.							

## 4 Manifests, deprecation of data, versions, DOI, citation, acknowledgement and licence

### Manifest and pseudo-manifest files

#### Content of the Manifest

The manifest should contain the path and the file name for every file that the CDS catalogue is supposed to provide to the users. **Nothing more nothing else.** No empty lines, no comments.

For instance:

#### First lines of a manifest for cmip6 data saved in ESGF

```
- path: CMIP/NUIST/NESM3/historical/r1i1p1f1/Amon/evspsbl/gn/v20190705
  ds_id: c3s-
cmip6.CMIP.NUIST.NESM3.historical.r1i1p1f1.Amon.evspsbl.gn.v20190705
  var_id: evspsbl
  array_dims: time lat lon
  array_shape: 1980 96 192
  time: 1850-01-16T12:00:00 2014-12-16T12:00:00
  latitude: -88.57 88.57
  longitude: 0.00 358.12
- path: ScenarioMIP/CNRM-CERFACS/CNRM-CM6-1-HR/ssp245/r1i1p1f2/Amon/pr/gr/
v20191202
  ds_id: c3s-cmip6.ScenarioMIP.CNRM-CERFACS.CNRM-CM6-1-
HR.ssp245.r1i1p1f2.Amon.pr.gr.v20191202
  var_id: pr
  array_dims: time lat lon
  array_shape: 1032 360 720
  time: 2015-01-16T12:00:00 2100-12-16T12:00:00
  latitude: -89.62 89.62
  longitude: 0.00 359.50
- path: CMIP/CNRM-CERFACS/CNRM-CM6-1/historical/r1i1p1f2/Amon/tas/gr/v20180917
  ds_id: c3s-cmip6.CMIP.CNRM-CERFACS.CNRM-
CM6-1.historical.r1i1p1f2.Amon.tas.gr.v20180917
  var_id: tas
  array_dims: time lat lon
  array_shape: 1980 128 256
  time: 1850-01-16T12:00:00 2014-12-16T12:00:00
  level: 2.00 2.00
  latitude: -88.93 88.93
  longitude: 0.00 358.59
```

#### First ten lines of a manifest file for a dataset accessible through URL addresses

```
head ./Integration_of_satellite-earth-radiation-budget/manifest_c3s_312b_lot1_erb_c3s_icdr_latest.txt
http://gws-access.ceda.ac.uk/public/cds\_c3s\_cloud/c3s\_312b\_lot1/data/erb/c3s/icdr/r01/monthly/2017/01/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\_ORAC\_Sentinel-3a\_201701\_fv3.1.nc
http://gws-access.ceda.ac.uk/public/cds\_c3s\_cloud/c3s\_312b\_lot1/data/erb/c3s/icdr/r01/monthly/2017/02/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\_ORAC\_Sentinel-3a\_201702\_fv3.1.nc
http://gws-access.ceda.ac.uk/public/cds\_c3s\_cloud/c3s\_312b\_lot1/data/erb/c3s/icdr/r01/monthly/2017/03/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\_ORAC\_Sentinel-3a\_201703\_fv3.1.nc
```

[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/04/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201704\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/04/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201704_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/05/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201705\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/05/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201705_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/06/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201706\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/06/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201706_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/07/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201707\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/07/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201707_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/08/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201708\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/08/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201708_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/09/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201709\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/09/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201709_fv3.1.nc)  
[http://gws-access.ceda.ac.uk/public/cds\\_c3s\\_cloud/c3s\\_312b\\_lot1/data/erb/c3s/icdr/r01/monthly/2017/10/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR\\_ORAC\\_Sentinel-3a\\_201710\\_fv3.1.nc](http://gws-access.ceda.ac.uk/public/cds_c3s_cloud/c3s_312b_lot1/data/erb/c3s/icdr/r01/monthly/2017/10/C3S-312bL1-L3C-MONTHLY-ERB-SLSTR_ORAC_Sentinel-3a_201710_fv3.1.nc)

### First line of a manifest file for a dataset saved in MARS

head reanalysis-uerra-europe-soil-levels/mars.list

```

class=ur,expver=prod,levtype=sol,origin=eswi,stream=oper,type=an,param=260199/260360,levelist=1/2/3,time=00:00:00/06:00:00/12:00:00/18:00:00,date=1961-01-01/1961-01-02/1961-01-03/1961-01-04/1961-01-05/1961-01-06/1961-01-07/1961-01-08/1961-01-09/1961-01-10/1961-01-11/1961-01-12/1961-01-13/1961-01-14/1961-01-15/1961-01-16/1961-01-17/1961-01-18/1961-01-19/1961-01-20/1961-01-21/1961-01-22/1961-01-23/1961-01-24/1961-01-25/1961-01-26/1961-01-27/1961-01-28/1961-01-29/1961-01-30/1961-01-31
class=ur,expver=prod,levtype=sol,origin=eswi,stream=oper,type=an,param=260199/260360,levelist=1/2/3,time=00:00:00/06:00:00/12:00:00/18:00:00,date=1961-02-01/1961-02-02/1961-02-03/1961-02-04/1961-02-05/1961-02-06/1961-02-07/1961-02-08/1961-02-09/1961-02-10/1961-02-11/1961-02-12/1961-02-13/1961-02-14/1961-02-15/1961-02-16/1961-02-17/1961-02-18/1961-02-19/1961-02-20/1961-02-21/1961-02-22/1961-02-23/1961-02-24/1961-02-25/1961-02-26/1961-02-27/1961-02-28
class=ur,expver=prod,levtype=sol,origin=eswi,stream=oper,type=an,param=260199/260360,levelist=1/2/3,time=00:00:00/06:00:00/12:00:00/18:00:00,date=1961-03-01/1961-03-02/1961-03-03/1961-03-04/1961-03-05/1961-03-06/1961-03-07/1961-03-08/1961-03-09/1961-03-10/1961-03-11/1961-03-12/1961-03-13/1961-03-14/1961-03-15/1961-03-16/1961-03-17/1961-03-18/1961-03-19/1961-03-20/1961-03-21/1961-03-22/1961-03-23/1961-03-24/1961-03-25/1961-03-26/1961-03-27/1961-03-28/1961-03-29/1961-03-30/1961-03-31

```

### Pseudo-manifest

Dataset suppliers to the CDS shall provide a comprehensive description of their data at least two months prior to delivery, using a data registration process established by ECMWF. For the CDS team this means the delivery of a pseudo-manifest file.

A pseudo-manifest is a manifest file with expected path and filenames for the expected data to be created. Note that the pseudo-manifest should be as close as possible of the final delivery but the CDS team understands that modifications may be needed.

If a pseudo-manifest is provided, then a Catalogue entry can be created and its design agreed and tested. Filenames and paths can be checked to see if they allow a good building of the download form.

### Name of the manifest and updates of the contents of the manifest

The manifest should be named "manifest\_<Contract tag>\_<ECV\_name\_tag or SIS\_name\_tag>\_<optional\_tag>\_yyyymmdd.txt" where yyyymmdd is the date where this manifest was created.

It is expected that the providers replace the strings <...> in the manifest filename with the actual names for the dataset they are providing.

When a new manifest file is added to the the providers site, that manifest should also be copied to "manifest\_<Contract tag>\_<ECV\_name|SIS\_name>\_<optional\_tag>\_latest.txt".  
Remove the date and leave just the string "latest".

This convention is central for the CDS computers to find and access the correct manifest.

### Where to save the manifest file:

The manifest should be in a directory named <http://web/><sup>5</sup> address/c3s\_manifest/ accessible through wget and http(s)f or the CDS computers to automatically download/check it.  
Old manifest files may be removed from the providers site. The idea is to store 2 or 3 previous manifest files to track back any issues.  
At least one manifest file should be always present and that providers site: the latest manifest file.

### Why the CDS values so much the manifest file:

For the Catalogue a dataset is a manifest file. Not the description in the contracts, not overviews.  
Nothing else is so central and important than the manifest: it tells the CDS computers what should be present in the public Catalogue.

### How the download form is directly related with filenames and paths in the manifest?

The widgets in the download pages of the CDS Catalogue are the way by which the user builds the name and the path of the file that corresponds to the data the user wants to download.

In other words, there is a direct link between the filename and path convention and what we can offer for the user to click in the download form.

To see it better let's consider the CIMP5 datasets which has addressed like:

[:/output1/NOAA-GFDL/GFDL-CM3/historical/day/atmos/day/r3i1p1/ua/v20120227/ua\\_day\\_GFDL-CM3\\_historical\\_r3i1p1\\_19800101-19841231.nc](http://output1/NOAA-GFDL/GFDL-CM3/historical/day/atmos/day/r3i1p1/ua/v20120227/ua_day_GFDL-CM3_historical_r3i1p1_19800101-19841231.nc)<sup>6</sup>

the path and filename convention is:

```
/output1/(?P<__organisation>[\-\w]+)/(?P<model_1>[\-\w]+)/(?P<experiment_1>[a-zA-Z0-9]+)/(?P<frequency>[a-z0-9]+)/(?P<__realm>\w+)/(?P<__cmor_table_1>[a-zA-Z0-9]+)/(?P<ensemble_member_1>[a-z0-9]+)/(?P<variable_1>[a-zA-Z]+)/(?P<__version>[v0-9]+)/(?P<variable_2>[a-zA-Z]+)/(?P<__cmor_table_2>[a-zA-Z0-9]+)/(?P<model_2>[a-zA-Z0-9\-\-]+)/(?P<experiment_2>[a-zA-Z0-9]+)/(?P<ensemble_member_2>[a-z0-9]+)/(?P<period>\d{8}-\d{8}).nc
```

When one looks at <https://cds.climate.copernicus.eu/cdsapp#!/dataset/projections-cmip5-daily-pressure-levels?tab=form> it is easy to notice that the widgets on that download page are the ones defined in the convention.

By clicking on the boxes the user is in fact providing values to each part of the convention and building the name of the file that will be downloaded. Each part of the convention will eventually lead to a widget in the Catalogue for the dataset.

### CDS preferences:

The CDS prefer long names than short names. We prefer understandable than smart. For instance we prefer [L3-U.nc](http://l3-u.nc/)<sup>7</sup> than [L3U.nc](http://l3u.nc/)<sup>8</sup> since in the first case it is clear that 2 things are at play.

<sup>5</sup> <http://web/>

<sup>6</sup> [http://ua\\_day\\_gfdl-cm3\\_historical\\_r3i1p1\\_19800101-19841231.nc/](http://ua_day_gfdl-cm3_historical_r3i1p1_19800101-19841231.nc/)

<sup>7</sup> <http://l3-u.nc/>

<sup>8</sup> <http://l3u.nc/>



Filenames should follow conventions. More than one convention is OK. Different main variables should be preferably in different files.

Examples of what would be desirable for the filename conventions:

*If possible, in the filenames the underscore "\_" should be used to split between place holders and hyphen "-" to say that different words belong in fact to the same placeholder.*

*For instance:*

[sfcWind\\_climatology\\_prevaling/01/sfcWind\\_climatology\\_prevaling\\_01\\_v0.0.nc](#)<sup>9</sup>

*would be better as:*

[sfcWind-prevaling\\_climatology/01/sfcWind-prevaling\\_climatology\\_01\\_v0.0.nc](#)

<sup>10</sup>By using this grouping and splitting *this will help to design more well organised filenames that will be easier to use by the CDS scripts.*

### **Warning:**

*The same thing should be named in the same way whenever it is referenced.*

*For instance, for a computer "version\_0.0" is different from "v0.0". If we mean the same thing then the string should be exactly the same, no differences in capitalisation, or more letters or less letters. One can choose either v0.0 or version\_0.0 or another string one finds convenient but should then keep it the same everywhere when the same thing is meant.*

### **Versions, deprecation of entries, replacement of data**

<b>Amount of data to deprecate</b>	<b>Provider's role</b>	<b>CDS team</b>
Large amount of data	<ul style="list-style-type: none"> <li>• Provide old and new data in the same updated manifest file</li> <li>• Keep old and new data</li> <li>• Remove deprecated data and corresponding lines from the manifest at the end of the deprecation period</li> </ul>	<ul style="list-style-type: none"> <li>• Deprecate the whole entry and create a new one. The deprecated entry will not be searchable in the CDS, but API request will continue to work. ( This prevents new users to find and download deprecated data, allowing at the same time scientific traceability and reproducibility ), Example: <a href="#">Deprecated SST</a><sup>11</sup>. New entry with corrected data: <a href="#">Corrected SST</a><sup>12</sup></li> <li>• Remove the deprecated data after 1 to 3 year deprecation period</li> </ul>

<sup>9</sup> [http://global-shipping.copernicus-climate.eu/shipping\\_metocean\\_variables\\_monthly\\_climatology/v0.0/sfcWind\\_climatology\\_prevaling/01/sfcWind\\_climatology\\_prevaling\\_01\\_v0.0.nc](http://global-shipping.copernicus-climate.eu/shipping_metocean_variables_monthly_climatology/v0.0/sfcWind_climatology_prevaling/01/sfcWind_climatology_prevaling_01_v0.0.nc)

<sup>10</sup> [http://global-shipping.copernicus-climate.eu/shipping\\_metocean\\_variables\\_monthly\\_climatology/v0.0/sfcWind-prevaling\\_climatology/01/sfcWind-prevaling\\_climatology\\_01\\_v0.0.nc](http://global-shipping.copernicus-climate.eu/shipping_metocean_variables_monthly_climatology/v0.0/sfcWind-prevaling_climatology/01/sfcWind-prevaling_climatology_01_v0.0.nc)

<sup>11</sup> <https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-sst-esa-cci?tab=overview>

<sup>12</sup> <https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-sea-surface-temperature?tab=overview>

Small amount of data	<ul style="list-style-type: none"> <li>• Create new files with a different version tag for the corrected data</li> <li>• Include those files in the manifest</li> <li>• Manifest should contain both old and new versions</li> <li>• Remove deprecated data and corresponding entries in the manifest at the end of the deprecation period</li> </ul>	<ul style="list-style-type: none"> <li>• Deprecate the version of the data corresponding to the wrong data</li> <li>• Modify overview to explain the deprecation or use a new widget called "Known issues" under the Documentation tab</li> <li>• Modify the download form making clear the deprecated version of the data. (When the CDS will have the tools to do it: the deprecated data will only be accessible through the API).</li> <li>• Remove the deprecated data after 1 to 3 year deprecation period</li> </ul>
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## DOI, citation, licence and acknowledgement

### DOI

Type of data in the CDS Catalogue entry	Provider's role	CDS team
Data <b>without</b> DOI issued before the publication in the CDS Catalogue	<ul style="list-style-type: none"> <li>• No active role</li> </ul>	<ul style="list-style-type: none"> <li>• Provides a DOI to the Catalogue entry (which can be seen as a DOI for the data themselves)</li> </ul> <p>Example:  <a href="https://cds.climate.copernicus.eu/cdsapp#!/dataset/cems-glofas-reforecast?tab=overview">https://cds.climate.copernicus.eu/cdsapp#!/dataset/cems-glofas-reforecast?tab=overview</a></p>
Data <b>with</b> DOIs issued before publication in the CDS Catalogue	<ul style="list-style-type: none"> <li>• Provides a mapping between the data and the previous DOIs</li> </ul>	<ul style="list-style-type: none"> <li>• Create a DOI box allowing for multiple DOIs.</li> <li>• DOI's box will show <ul style="list-style-type: none"> <li>• all the DOIs supplied by the data provider (with a clear association to which data they refer to)</li> <li>• the DOI of the Catalogue entry itself</li> </ul> </li> </ul> <p>Example:  <a href="https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview">https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview</a>  <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-cloud-properties?tab=overview">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-cloud-properties?tab=overview</a></p>

<p>Mixing of data <b>with and without</b> DOIs issued before the publication in the CDS Catalogue</p>	<ul style="list-style-type: none"> <li>Provides a mapping between the data and the DOIs</li> </ul>	<ul style="list-style-type: none"> <li>Create a DOI box allowing for multiple DOIs.</li> <li>DOI's box will show                             <ul style="list-style-type: none"> <li>all the DOIs supplied by the data provider (with a clear association to which data they refer to)</li> <li>the DOI of the Catalogue entry itself</li> <li>data with no DOI attribute will be associated with the string: "no specific DOI"</li> </ul> </li> </ul> <p>Example:  <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=overview">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=overview</a></p>
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### Citations

Citations are like file formats, there are a few available, no one better than all the others in all situations.

The "Citation" link in the Catalogue entry **does not say how** people should cite the data, that depends on the journal, site and publisher where the data will be cited.

The "Citation" link in the Catalogue entry **is the Catalogue citing** the contents that it is exposing.

In this way it also shows how to cite the data, but that is just an example of how to cite the data and contents from where **people can extract all information** required to cite the data using other formats in other places.

<p><b>Type of data in the CDS Catalogue entry</b></p>	<p><b>Provider's role</b></p>	<p><b>CDS team</b></p>
<p>Data <b>without</b> citation issued before the publication in the CDS Catalogue</p>	<ul style="list-style-type: none"> <li>Interact with the CDS team on this. Most probably you will be asked for the names of the authors of the data.</li> </ul>	<ul style="list-style-type: none"> <li>Interact with the provider and create a Citation following the Catalogue citation format</li> </ul>

Data <b>with</b> citation issued before publication in the CDS Catalogue	<ul style="list-style-type: none"> <li>Provides those citations to the CDS team</li> </ul>	<ul style="list-style-type: none"> <li>Create a Citation box allowing for multiple citations.</li> <li>Citation's box will show             <ul style="list-style-type: none"> <li>all the Citations supplied by the data provider (with a clear association to which data they refer to)</li> <li>the Citation of the Catalogue entry itself</li> </ul> </li> </ul> <p>Example:  <a href="https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview">https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview</a>  <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-cloud-properties?tab=overview">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-cloud-properties?tab=overview</a></p>
Mixing of data <b>with and without</b> citations issued before the publication in the CDS Catalogue	<ul style="list-style-type: none"> <li>Provides those citations to the CDS team</li> </ul>	<ul style="list-style-type: none"> <li>Create a Citation box allowing for multiple citations.</li> <li>Citation's box will show             <ul style="list-style-type: none"> <li>all the Citations supplied by the data provider (with a clear association to which data they refer to)</li> <li>the Citation of the Catalogue entry itself</li> </ul> </li> </ul> <p>Example:  <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=overview">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=overview</a></p>

### Licence

Provider's role	CDS team
Provide all licences related to the data and a mapping between the licences and the parts of the data they are related to	For datasets with multiple licences use a "Origin" button in the download form making related to the name of the licence Example: <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=form">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=form</a>

### Acknowledgement

Provider's role	CDS team

<p>No active role but may want to have a look at: <a href="#">How to acknowledge and cite a Climate Data Store (CDS) catalogue entry and the data published as part of it</a><sup>13</sup> <a href="https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview">https://cds-test.climate.copernicus.eu/cdsapp#!/dataset/satellite-total-column-water-vapour?tab=overview</a></p>	<p>For datasets with multiple licences use a "Origin" button in the download form making related to the name of the licence Example: <a href="https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=form">https://cds-dev.copernicus-climate.eu/cdsapp#!/dataset/satellite-surface-radiation-budget?tab=form</a></p>
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<sup>13</sup> <https://confluence.ecmwf.int/display/CKB/How+to+acknowledge+and+cite+a+Climate+Data+Store+%28CDS%29+catalogue+entry+and+the+data+published+as+part+of+it>

## 5 Publishing under FAIR principles<sup>14</sup>

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<sup>14</sup> <https://confluence.ecmwf.int/display/PS/Publishing+under+FAIR+principles>

# **Publishing under FAIR principles**

Production Section

Exported on 04/25/2024

## Table of Contents

1 Core interpretation of the FAIR principles .....	4
2 ECMWF data: Extending the FAIR principles to all our data .....	6





# 1 Core interpretation of the FAIR principles

The core principles of the FAIR guidelines have not changed since they were first published in 2016 (\*), and have since been widely adopted by the scientific community as a way to improve the quality and usability of research data. However, the principles are intended to be flexible and adaptable, and different organizations and communities may have different interpretations and implementations of the principles. It's also possible that the principles may be updated or refined over time as the field of data science and technology evolves.

FAIR principles are a set of guidelines for making data more Findable, Accessible, Interoperable, and Reusable:

1. Is the data Findable?  
Can the data be easily discovered by those who need it, using relevant keywords and metadata?
2. Is the data Accessible?  
Can the data be accessed, read, and understood by a machine or a human? Is it available in a widely used, open format?
3. Is the data Interoperable?  
Can the data be easily integrated with other data sources, using common standards and formats?
4. Is the data Reusable?  
Can the data be used and reused for multiple purposes, without significant effort or additional licensing restrictions?

If the data meets all of these criteria, it can be considered "FAIR." It's important to note, however, that the FAIR principles are guidelines rather than strict rules, and different organizations and communities may have different interpretations and implementations of the principles.

(\*) Wilkinson, M., Dumontier, M., Aalbersberg, I. *et al.* The FAIR Guiding Principles for scientific data management and stewardship. *Sci Data* **3**, 160018 (2016). <https://doi.org/10.1038/sdata.2016.18>



Source : Australian National Data Service (ANDS)

Entire FAIR resources graphic is licensed under a Creative Commons Attribution 4.0 International License

## 2 ECMWF data: Extending the FAIR principles to all our data

At the ECMWF, we are committed to making our data as useful and accessible as possible. That's why we aim to publish all our data in accordance with the FAIR principles.

Our data is carefully curated and described using relevant metadata, that provides detailed information about the variables and parameters included in the data. For each variable, we provide a clear definition, specify the units, and include any relevant notes or caveats that users should be aware of, ensuring that the data can be used accurately and reliably.

We use DOIs (Digital Object Identifiers) to provide persistent, stable links to our data, allowing users to easily find and access the data they need. We also use open, standardized formats for our data and provide API (Application Programming Interface) access, allowing users to easily integrate our data with other systems and applications.

And we provide clear licensing information, enabling users to freely reuse and repurpose the data for their own purposes.

By following the FAIR principles, we are helping to make our data more valuable and useful for a wide range of users, from meteorologists and researchers to policymakers and the general public. We are proud to be part of the growing community of organizations that are working to make data more FAIR (\*).

(\*) OGC FAIR Climate Services: [ECMWF is co-chair for the OGC Climate Resilience Domain Working Group](#)<sup>1</sup>

- [Decommissioning plan of ECMWF public datasets service](#)<sup>2</sup>

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<sup>1</sup> <https://www.ogc.org/blog/4460>

<sup>2</sup> <https://confluence.ecmwf.int/display/PS/Decommissioning+plan+of+ECMWF+public+datasets+service>