

The world is how we shape it*



Funded by
the European Union

Destination Earth

IMPLEMENTED BY

EUMETSAT

esa

ECMWF

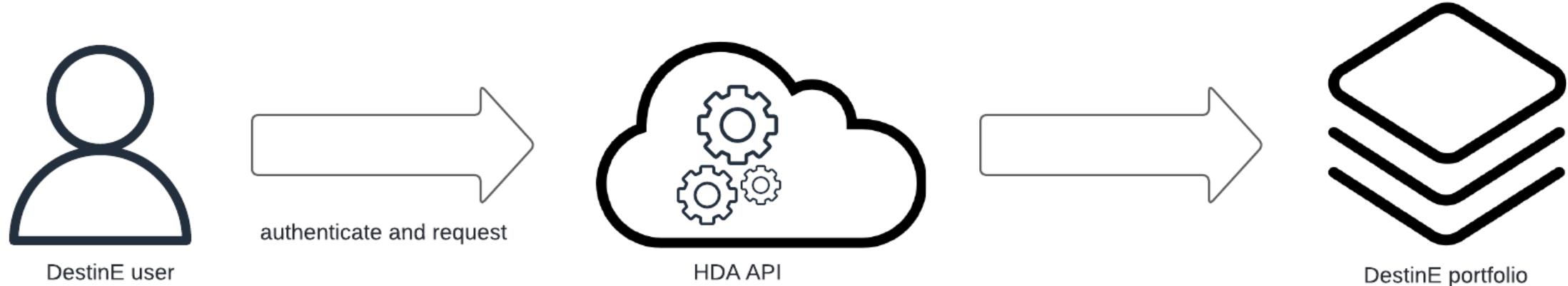
Harmonized Data Access service

A unified API for DestinE Data Portfolio



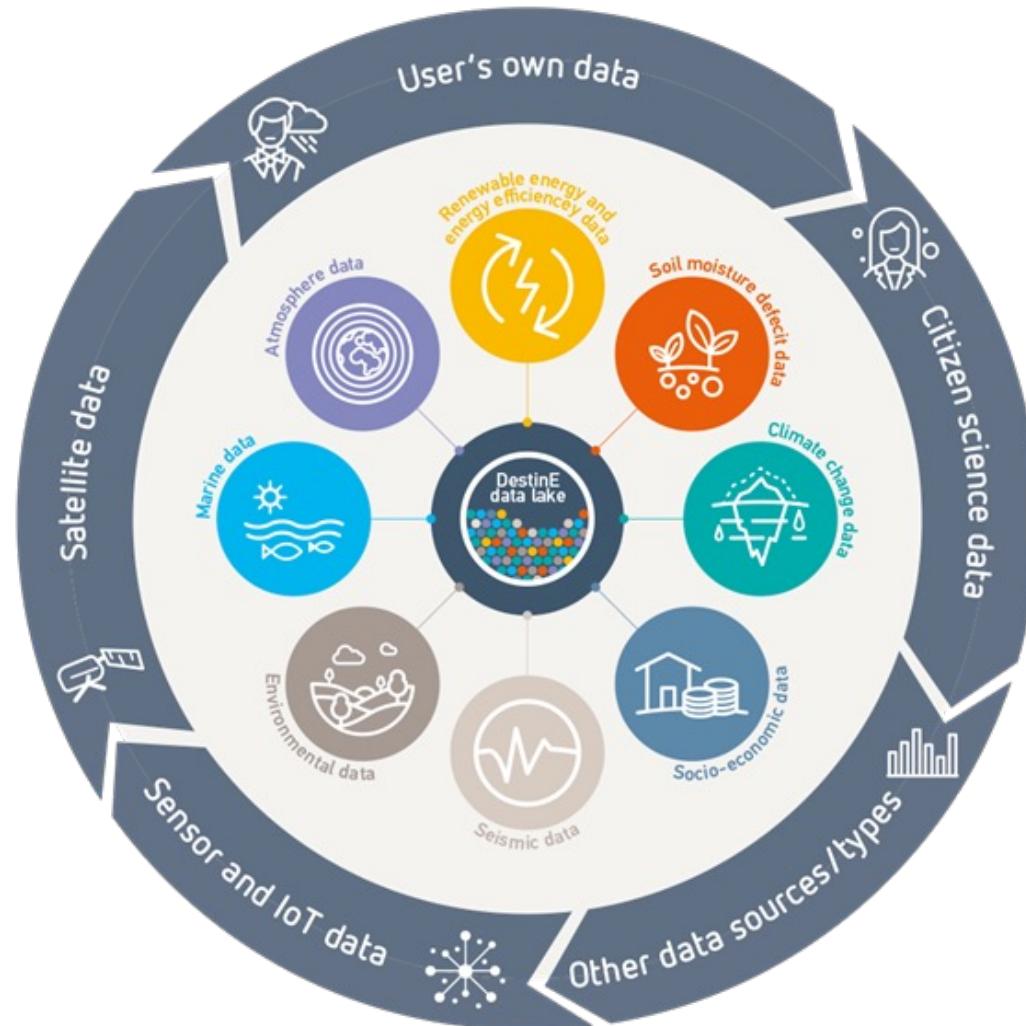
A Harmonized Data Access

- **1** set of credentials
- **1** API
- More than **150** datasets



A diverse data portfolio

- Earth Observation (EO)
- Weather, Climate, Hydrology
- Survey, statistics and knowledge
 - Ground
 - Population
 - Biological
 - Socio-economic data
- Digital Twin Outputs



A federation of data providers

- Federation first
- A local cache
- Redundancy



A standard interface

- SpatioTemporal Asset Catalog (STAC)
- Filter by
 - Temporal extent
 - Spatial extent
 - Sort
 - Custom properties

STAC API - Core Part of STAC API v1.0.0-rc.3 - Core definition

GET `/stac` DEDL STAC capabilities discovery

GET `/stac/conformance` information about specifications that this API conforms to

STAC API - Collections Part of STAC API v1.0.0-rc.3 - Collections definition

GET `/stac/collections` The feature collections in the dataset.

GET `/stac/collections/{collectionId}` Describe the feature Collection for the given `collectionId`.

STAC API - Features Part of STAC API v1.0.0-rc.3 - Features definition

GET `/stac/collections/{collectionId}/items` List of items available in a given collection

GET `/stac/collections/{collectionId}/items/{featureId}` Fetch a single feature.

STAC API - Item Search Part of STAC API v1.0.0-rc.3 - Item Search definition

GET `/stac/search` Search STAC items with simple filtering.

POST `/stac/search` Search STAC items with full-featured filtering.



Discover datasets that matter

- Intuitive data discovery
- Filter by
 - Temporal extent
 - Title, description, keywords
 - Categories
- A web portal

<https://hda.data.destination-earth/ui>

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DestinE Data Portfolio

The DestinE data lake federates with existing data holdings as well as with complementary data from diverse sources like in-situ, socio-economic, or data-space data.

Filter datasets

Air Quality

Aerosol Europe airPollution Atmospheric conditions Reactive gas Past ...

CAMS European air quality forecasts
This dataset provides daily air quality analyses and forecasts for Europe.
Aerosol Europe airPollution Atmospheric conditions Reactive gas Past ...

CAMS European air quality reanalyses
This dataset provides annual air quality reanalyses for Europe.
Aerosol Reanalysis Europe airPollution Atmospheric conditions Reactive gas ...

CAMS global atmospheric composition forecasts
The forecasts consist of more than 50 chemical species (e.g. ozone, nitrogen dioxide, carbon monoxide) and seven different types of aerosol (desert dust, sea salt, organic matter, black carbon, sulphate, nitrate and ammonium aerosol).
Aerosol Global airPollution Atmospheric conditions Reactive gas Past ...

CAMS global biomass burning emissions based on fire radiative power (GFAS)
This dataset provides geographical distributions of the radiative forcing (RF) by key atmospheric constituents.
Aerosol Global airPollution Atmospheric conditions Reactive gas Past ...

CAMS global emission inventories
This data set contains gridded distributions of global anthropogenic and natural emissions.
Aerosol Global airPollution Atmospheric conditions Reactive gas Past ...

CAMS global greenhouse gas reanalysis (EGGA)
This dataset is part of the ECMWF Atmospheric Composition Reanalysis focusing on long-lived greenhouse gases: carbon dioxide (CO₂) and methane (CH₄).
Global Reanalysis airPollution Atmospheric conditions Past ...

Atmosphere (composition) ...

Atmosphere

Biomass/Vegetation

Climate

Climate/Weather

Climate/Wind

DEMs

Demographic

Fire

Ice

Imagery

Land cover

Other

Soil

Solar

Temperature

Water

Wind



Identify available filters

- Queryables API

The screenshot shows two entries in a list:

- GET /stac/queryables** Get the JSON Schema defining the list of variable terms that can be used in CO
- GET /stac/collections/{collectionId}/queryables** Get the JSON Schema defining the list of variable terms

The screenshot shows a user interface for selecting filters:

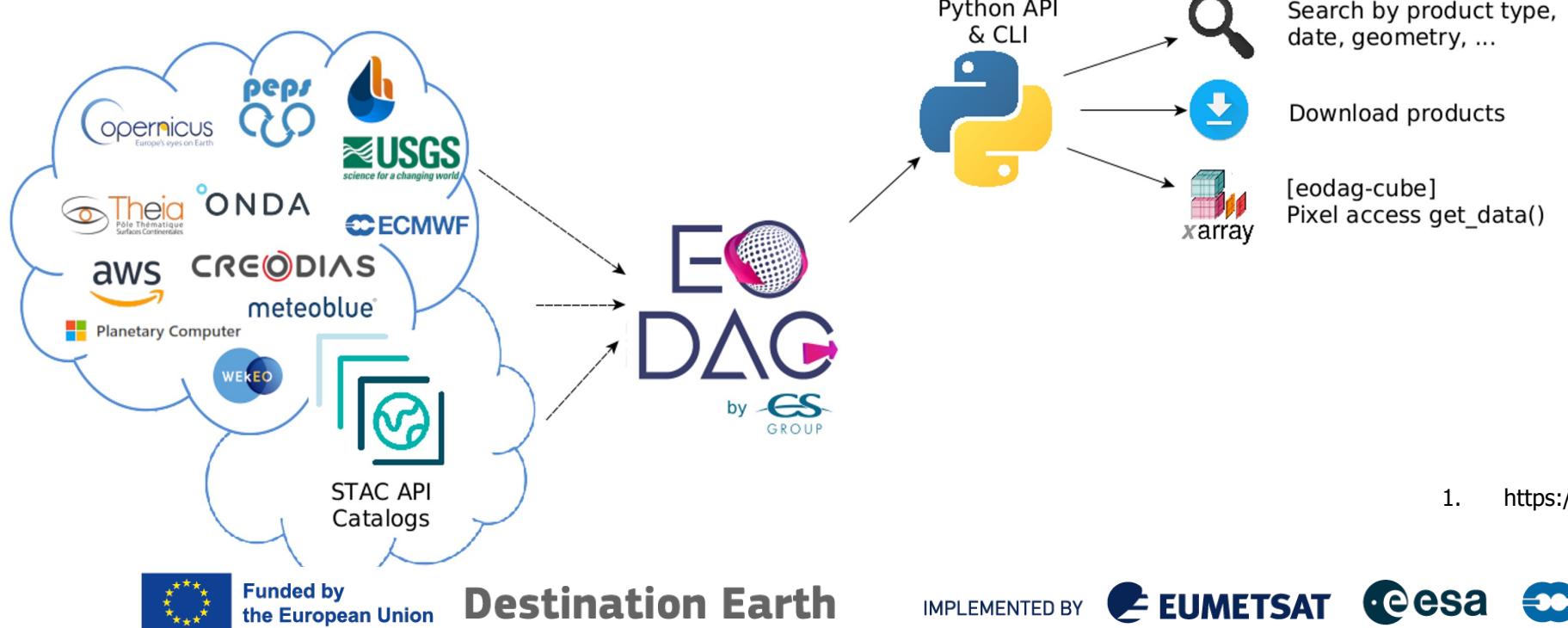
- Chosen collection: EO.ECMWF.DAT.CAMS_SOLAR_RADIATION_TIMESERIES
- Fetch queryables
- Selected filters:
 - sky_type: clear
 - time_reference: true_solar_time
 - format: csv
- Properties fetched successfully.
- Applicable filters table:

Description	Type	enum	value
sky_type	string	clear, observed_cloud	clear
time_reference	string	true_solar_time, universal_time	true_solar_time
format	string	csv, netcdf	csv

```
{  
  "$schema": "https://json-schema.org/draft/2019-09/schema",  
  "$id": "http://localhost:8088/collections/DT_CLIMATE_ADAPTATION/queryables",  
  "type": "object",  
  "title": "Queryables for DestinE Data Lake STAC API",  
  "description": "Queryable names for the DestinE Data Lake STAC API Item Search",  
  "properties": {  
    "ecmwf:type": {  
      "const": "fc",  
      "default": "fc",  
      "title": "type"  
    },  
    "ecmwf:model": {  
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      "default": "IFS-NEMO",  
      "title": "model"  
    },  
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      "title": "resolution",  
      "type": "string"  
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```

Privileged access with EODAG¹

- Command line tool
- Plugin-oriented Python framework
- Available on Github (Apache 2.0)
- Extensions (eodag cube, JupyterLab...)
- Each data provider is a plugin
 - Ease to extend with tutorials and documentation



Privileged access with EODAG – Usage examples



- **Python**

```
from eodag import EODataAccessGateway

dag = EODataAccessGateway()

search_results, total_count = dag.search(
    productType="S2 MSI L1C",
    start="2021-03-01", end="2021-03-31",
    geom={"lonmin": 1, "latmin": 43, "lonmax": 2, "latmax": 44}
)
product_paths = dag.download_all(search_results)
```

- **CLI**

```
eodag search --productType S2 MSI L1C --box 1 43 2 44 --start 2021-03-01 --end 2021-03-31
eodag download --search-results search_results.geojson
```

Privileged access with EODAG - labextension



PRODUCTS SEARCH

Product type: S2_MSI_L1C

Date range: 01/08/2023 to 10/08/2023

Max cloud cover: 75%

Additional Parameters: tileIdentifier: 31TCJ

Preview Results | Generate Code

Search results

Start time	End time	Cloud cover	Actions	Metadata
2023-08-08T10:46:29.024Z	2023-08-08T10:46:29.024Z	0 %	🔍	Platform serial identifier: S2B Instrument: MSI Product type: S2MSI1C Processing level: LEVEL10 Sensor mode: INS-NOBS Start time from ascending node: 2023-08-08T10:46:29.024Z Completion time from ascending node: 2023-08-08T10:46:29.024Z
2023-08-06T10:56:21.024Z	2023-08-06T10:56:21.024Z	21 %	🔍	
2023-08-05T10:36:29.024Z	2023-08-05T10:36:29.024Z	27 %	🔍	
2023-08-03T10:46:31.024Z	2023-08-03T10:46:31.024Z	35 %	🔍	
Generate code				

```
[1]: from eodag import EODataAccessGateway, setup_logging
setup_logging(1) # 0: nothing, 1: only progress bars, 2: INFO, 3: DEBUG

dag = EODataAccessGateway()
geometry = "POLYGON ((1.054688 47.631835, -2.548828 43.576146, 0.439453 40.642858, 5.712891 44.083376, 1.054688 47.631835))"
search_results, total_count = dag.search(
    productType="S2_MSI_L1C",
    geom=geometry,
    start="2023-08-01",
    end="2023-08-10",
    cloudCover=75,
    **{
        "tileIdentifier": "31TCJ",
    }
)

[*]: path = dag.download(search_results[1])
S2A_MSIL1C_20230806T105621_N0509_R094_T31TCJ_20230806T144314: 38% 12.3M/32.0M [00:22<00:31, 624kB/s]
```

Native integration with all STAC tools

- STAC browser¹
- The python library PySTAC²
- QGIS STAC API Browser³

Catalogues 151 | Toutes | Liste | Ordre croissant | Ordre décroissant | Filtrer les catalogues par titre, description ou mots-clés | Sélectionner des mots clés

The screenshot shows a grid of dataset cards from a STAC browser. The cards include:

- EUMETSAT AMSU-A Level 1B - Metop - Global**: The Advanced Microwave Sounding Unit-A (AMSU-A) is a 15-channel microwave radiometer that is used for measuring global atmospheric... 01/03/2008 0:00:00 UTC jusqu'à présent
- CAMS reanalysis monthly mean of total column carbon monoxide**: CAMS reanalysis monthly mean of total column carbon monoxide 01/01/2003 0:00:00 UTC – 31/12/2022 23:59:59 UTC
- Glacier Distribution**: Worldwide distribution of glacier outlines associated with individual glacier parameter including hypsometry. The inset figures show a close up of the outlines of the Rhone glacier in Switzerland and the corresponding hypsometry.
- Global ocean low and mid trophic levels biomass content hindcast**: The Low and Mid-Trophic Levels (LMTL) reanalysis for global ocean is produced at CLS on behalf of Global Ocean Marine Forecasting Center. It... 01/01/1998 0:00:00 UTC – 31/12/2022 0:00:00 UTC
- MHS Level 1B - Metop - Global**: The Microwave Humidity Sour channel instrument used to pr retrieval of surface temperatur 23/03/2009 0:00:00 UTC j
- Global Horizontal Irradiation**: Global Horizontal Irradiation 01/01/2000 0:00:00 UTC – 31/12/2000 23:59:00 UTC
- CAMS solar radiation time-series**: The CAMS solar radiation services provide historical values (2004 to present) of global (GHI), direct (BHI) and diffuse (DHI) solar irradiation, as... 01/02/2004 0:00:00 UTC jusqu'à présent
- Glaciers elevation and mass change data from 1850 to present from the Fluctuations of Glaciers Database**: This dataset provides in situ and remote derived glacier changes from individual glaciers globally. The dataset represents the latest... 01/01/1850 0:00:00 UTC – 31/12/2019 0:00:00 UTC
- GLOBAL OCEAN MEAN DYNAMIC TOPOGRAPHY**: Mean Dynamic Topography that combines the global CNES-CLS-2022 MDT, the Black Sea CMEMS2020 MDT and the Med Sea CMEMS2020... 01/01/2003 0:00:00 UTC
- Multi Observation Global Temperature Salinity He Current and**: You can find here the Multi OI Ocean ARMOR3D L4 analysis i reprocessing. It consists of 3D 01/01/1993 0:00:00 UTC – 05/
- Atmospheric Carbon Dioxide (CO₂) from Satellites**: Atmospheric Carbon Dioxide (CO₂) from Satellites 01/01/2003 0:00:00 UTC – 31/12/2019 0:00:00 UTC
- Global Ocean Monthly Mean Sea Surface**: Global Ocean Monthly Mean Sea Surface 01/01/1993 0:00:00 UTC – 05/

1. <https://github.com/radiantearth/stac-browser>
2. <https://github.com/stac-utils/pystac>
3. <https://github.com/stac-utils/qgis-stac-plugin>

<https://radiantearth.github.io/stac-browser/#/external/hda.data.destination-earth.eu/stac>



Key takeaways

- Interface between users and the DestinE Data Lake portfolio
- Harmonized data access API
- Federation of providers
- STAC compliant
- EODAG library, CLI and JupyterLab extension



Thank you!

Q&A

aubin.lambare@cs-soprasteria.com



API



<https://hda.data.destination-earth.eu>

Web portal



<https://hda.data.destination-earth.eu/ui>

Python tutorials



<https://github.com/destination-earth/DestinE-DataLake-Lab>

Documentation



<https://destine-data-lake-docs.data.destination-earth.eu>



a Sopra Steria company