

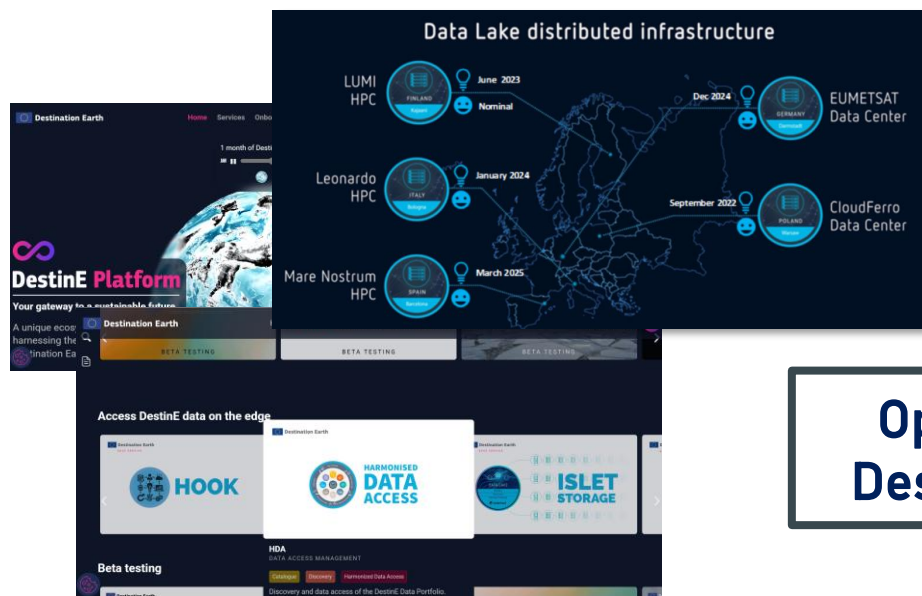
Exploiter les capacités du DestinE Data Lake Harmonised data access service et les Edges services

Danaële Puechmaille & team, EUMETSAT

*Destination Earth Workshop
30-06-2026, Paris*



DestinE (Data Lake) services

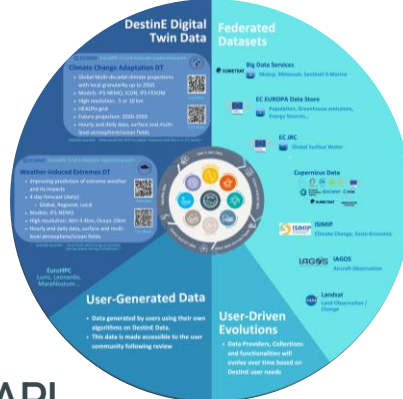


Harmonised Data access

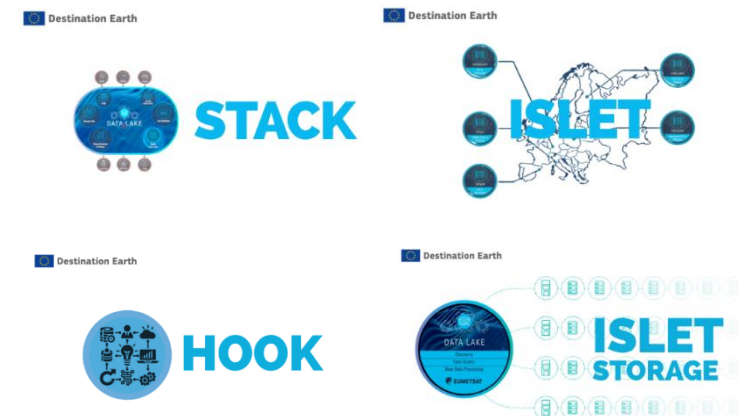


Open to any
DestinE users

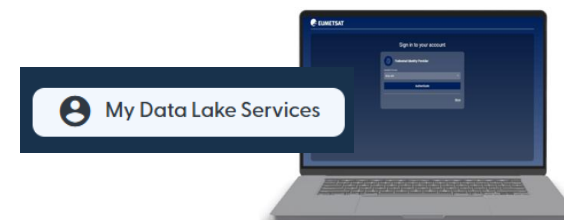
+250
datasets



EDGE Services



On request - Project
assessment *(no cost)*





Harmonised Data Access (HDA) service



Destination Earth



**HARMONISED
DATA
ACCESS**



DestinE Data Portfolio – discover Climate DT datasets

DestinationEarth DataLake - [InPrivate]

https://data.destination-earth.eu/data-portfolio?category%5B0%5D=DestinE...

Data Lake Destination Earth

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DATA PORTFOLIO

The Data Lake Initiative through Harmonized Data Access (HDA) service grants you access to impressive collection of datasets derived from ESA, EUMETSAT, ECMWF as well as from Copernicus, and many other diverse sources, along with new data from the Digital Twins. HDA provides a seamless access to datasets via GULs and APIs, regardless of data type and location.

Search

24 Results

Filters (1)

Category: DestinE Climate DT - Generation 2

clear all filters

Category

- ☐ Atmosphere (24)
- ☐ Climate/Weather (24)
- ☒ DestinE Climate DT - Generation 2 (24)
- ☐ DestinE Data (24)
- ☐ Ice (24)
- ☐ Land (23)
- ☐ Marine (24)
- ☐ Soil (24)
- ☐ Air Quality (0)
- ☐ Biomass/Vegetation (0)
- ☐ Demographic (0)
- ☐ DEMs (0)
- ☐ Fire (0)
- ☐ Imagery (0)
- ☐ Land cover (0)
- ☐ Lightning (0)
- ☐ Other (0)
- ☐ Statistical (0)
- ☐ Temperature (0)
- ☐ User Generated (0)
- ☐ Water (0)
- ☐ Wind (0)

Temporal Extent

start date DD/MM/YYYY

end date DD/MM/YYYY

Provider

- ☐ ECMWF (24)
- ☐ Copernicus
- ☐ Atmosphere
- ☐ Monitoring Service

Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Control Simulation - ICON - Generation-2 - Realization-1

Digital Twins Climate Change Atmosphere Ocean Land Sea Ice Snow Soil

The Climate Change Adaptation Digital Twin provides global climate projections and sector-specific information over multiple decades at high resolution via a unified framework combining advanced Earth system models, impact assessments, and observations. This Generation-2, Realization-1 Collection gives access to 'Control Simulation' data base.

Learn more

Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Control Simulation - IFS-FESOM - Generation-2 - Realization-1

Digital Twins Climate Change Atmosphere Ocean Land Sea Ice Snow Soil

The Climate Change Adaptation Digital Twin provides global climate projections and sector-specific information over multiple decades at high resolution via a unified framework combining advanced Earth system models, impact assessments, and observations. This Generation-2, Realization-1 Collection gives access to 'Control Simulation' data base.

Learn more

Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Control Simulation - IFS-NEMO - Generation-2 - Realization-1

Digital Twins Climate Change Atmosphere Ocean Land Sea Ice Snow Soil

The Climate Change Adaptation Digital Twin provides global climate projections and sector-specific information over multiple decades at high resolution via a unified framework combining advanced Earth system models, impact assessments, and observations. This Generation-2, Realization-1 Collection gives access to 'Control Simulation' data base.

Learn more

Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Historical Simulation - ICON - Generation-1 - Realization-1

Digital Twins Climate Change Atmosphere Ocean Land Sea Ice Snow Soil

The Climate Change Adaptation Digital Twin provides global climate projections and sector-specific information over multiple decades at high resolution via a unified framework combining advanced Earth system models, impact assessments, and observations. This Generation-1, Realization-1 Collection gives access to 'Historical Simulation' data base.

Learn more

DestinationEarth DataLake - [InPrivate]

https://data.destination-earth.eu/climate-dt

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CLIMATE CHANGE ADAPTATION DIGITAL TWIN

The Climate Change Adaptation Digital Twin (Climate DT) is the first ever attempt to produce multi-decadal climate projections operationally. The Climate DT is implemented by Finland's CSC-IT Center for Science who leads a consortium of European excellence centres with partners in six countries.

The Digital Twin on Climate Adaptation, Sebastian

ECMWF

Climate change - Climate change refe...

OVERCOMING CHALLENGES

these challenges, is the concept of data streaming.

Watch on YouTube

Climate change adaptation scenarios

The Climate DT provides multi-decadal global climate simulations with local granularity, including information specific to the sectors most affected by climate change such as renewable energy, urban planning or hydrology. The objective is to produce updated simulations every year or less, compared to the current models, ran only every several years. This enables the inclusion of the latest developments in Earth system science and digital infrastructure. An important innovation of the Climate DT is the data streaming concept, reducing the need for storage of massive data volumes (several decades of km-scale Earth system simulations). Impact-sector applications will be able to run within the digital twin workflow allowing them to obtain the information they need while the simulations are running instead of cherry picking within the stored data.

Learn more

Climate DT Datasets

- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Historical Simulation - ICON - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Historical Simulation - IFS-NEMO - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Control Simulation - IFS-FESOM - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Control Simulation - IFS-NEMO - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Future Projection - ICON - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Future Projection - IFS-FESOM - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Future Projection - IFS-NEMO - Generation-1 - Realization-1
- Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Storyline Simulation Present Climate - IFS-FESOM - Generation-1 - Realization-1

Discover one Climate DT dataset

https://data.destination-earth.eu/data-portfolio/EO.ECMWF.DAT.D1.DT_CLIMATE.G2.PROJECTIONS_SSP3-7.0_ICON.R1

DestinationEarth DataLake - [InPrivate]

→ ↻ 🏠 🔒 https://data.destination-earth.eu/data-portfolio/EO.ECMWF.DAT.D1.DT_CLI... 🔍 📄 ⭐ ⚙️ ⬇️ InPrivate

Data Lake  Destination Earth

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Collection

Climate Change Adaptation Digital Twin (Climate Adaptation DT) - Future Projection - ICON - Generation-2 - Realization-1

Digital Twins

Climate Change

Atmosphere

Ocean

Land

Sea Ice

Snow

Soil

Earth

High Performance Computing

Decision Making

Europe

Meteorology

classdt

datasetclimate-at

generation2

expver0001

streamclimate

type:tc

activityprojections

experimentssp3-7.0

realization1

modeHCON

resolutionstandardhigh

levtypeo2do3dplstcsl

The Climate Change Adaptation Digital Twin provides global climate projections and sector-specific information over multiple decades at high resolution via a unified framework combining advanced Earth system models, impact assessments, and observations. This Generation-2, Realization-1 Collection gives access to 'Future Projection' data based on the 'ICON' model.

ECMWF: producer, processor, licensor

Spatial Extent



© OpenStreetMap contributors.

Temporal Extent

01.01.2015 - 31.12.2049

Instruments

n/a

Constellation

n/a

Processing Level

n/a

Description

The DestinE Digital Twin for Climate Change Adaptation (Climate DT) supports adaptation activities by providing innovative climate information on multi-decadal timescales, globally, at scales at which many impacts of climate change are observed. It combines cutting-edge global Earth-system models, impact-sector applications and observations into a unified framework to provide global climate projections and impact-sector information on multi-decadal timescales (1990 to -2050), at very high spatial resolutions (5 to 10 km).

The Climate DT represents the first ever attempt to operationalise the production of global multi-decadal climate projections, leveraging the world-leading supercomputing facilities of the EuroHPC Joint Undertaking along with some of the leading European climate models. A concise overview of what the Climate DT aims to achieve, and of the different concepts essential for an understanding of the Digital Twin's characteristics, is included in the [Climate DT factsheet](#)

Future Projection

To project how climate will change on a global and local scale in the future, forcing changes according to the Shared Socioeconomic Pathway (SSP) 3-7.0 scenario from ScenarioMIP. The SSP3-7.0 scenario explores a future with a continuous increase in CO2 emissions with no strong mitigation efforts. All DestinE projections carried out so far follow this scenario. In the future, alternative future scenarios will be explored. The projections carried out so far are initialised in 2020 from reanalysis followed by a 5-year ocean spin-up. For the upcoming simulations carried out in phase 2 of DestinE, scenario simulations will extend the historical simulations.

Models

The Climate DT exploits and further evolves a new generation of global storm-resolving and eddy-rich models built through a cooperative model development approach. For more information on models please click [here](#)

Variables

Name:	10 metre U wind component
Dimensions:	lat, lon, time
Type:	Measured values
Description:	This parameter is the eastward component of the 10m wind. It is the horizontal speed of air moving towards the east, at a height of ten metres above the surface of the Earth, in metres per second. Care should be taken when comparing this parameter with observations, because wind observations vary on small space and time scales and are affected by the local terrain, vegetation and buildings that are represented only on average in the ECMWF Integrated Forecasting System. This parameter can be combined with the V component of 10m wind to give the speed and direction of the horizontal 10m wind.
Unit of Values:	m s ⁻¹
Name:	10 metre V wind component
Dimensions:	lat, lon, time
Type:	Measured values
Description:	This parameter is the northward component of the 10m wind. It is the horizontal speed of air moving towards the north, at a height of ten metres above the surface of the Earth, in metres per second. Care should be taken when comparing this parameter with observations, because wind observations vary on small space and time scales and are affected by the local terrain, vegetation and buildings that are represented only on average in the ECMWF Integrated Forecasting System. This parameter can be combined with the U component of 10m wind to give the speed and direction of the horizontal 10m wind.
Unit of Values:	m s ⁻¹
Name:	10 metre wind speed
Dimensions:	lat, lon, time
Type:	Measured values
Description:	This parameter is the horizontal speed of the wind, or movement of air, at a height of ten metres above the surface of the Earth. The units of this parameter are metres per second. Care should be taken when comparing this parameter with observations, because wind observations vary on small space and time scales and are affected by the local terrain, vegetation and buildings that are represented only on average in the ECMWF Integrated Forecasting System. The eastward and northward components of the horizontal wind at 10m are also available as parameters.
Unit of Values:	m s ⁻¹
Name:	2 metre dewpoint temperature
Dimensions:	lat, lon, time
Type:	Measured values
Description:	This parameter is the temperature to which the air, at 2 metres above the surface of the Earth, would have to be cooled for saturation to occur. It is a measure of the humidity of the air. Combined with temperature and pressure, it can be used to calculate the relative humidity. 2m dew point temperature is calculated by interpolating between the lowest model level and the Earth's surface, taking account of the atmospheric conditions. See further information. This parameter has units of kelvin (K). Temperature measured in kelvin can be converted to degrees Celsius (°C) by subtracting 273.15.
Unit of Values:	K

EUM2080759 v1 Draft

 Funded by the European Union

Destination Earth

5

Data Discovery: How & Where

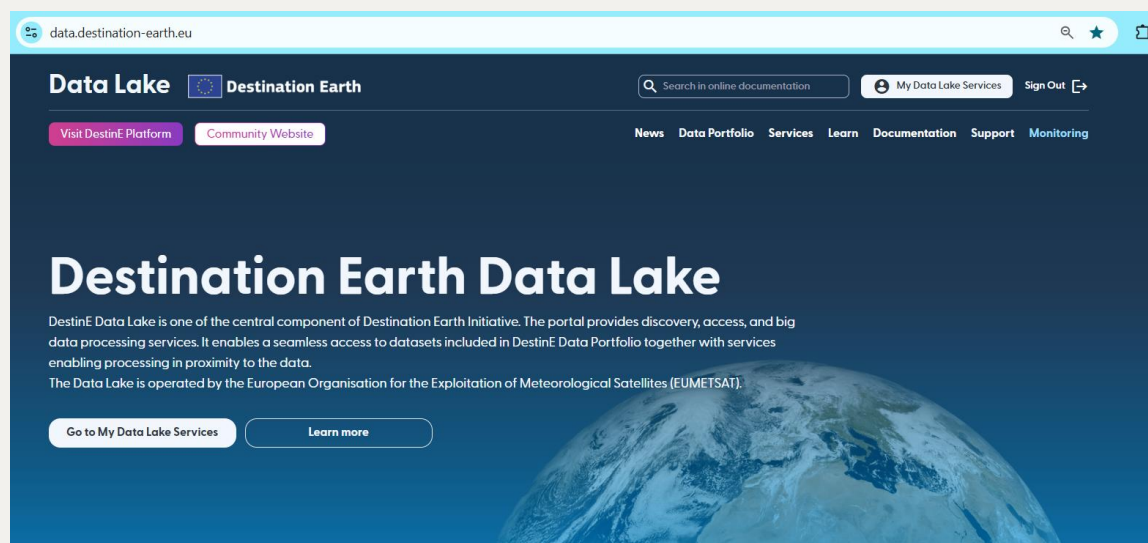
How:

Graphically — via the DEDL web portal - free-text search and advanced filtering capabilities

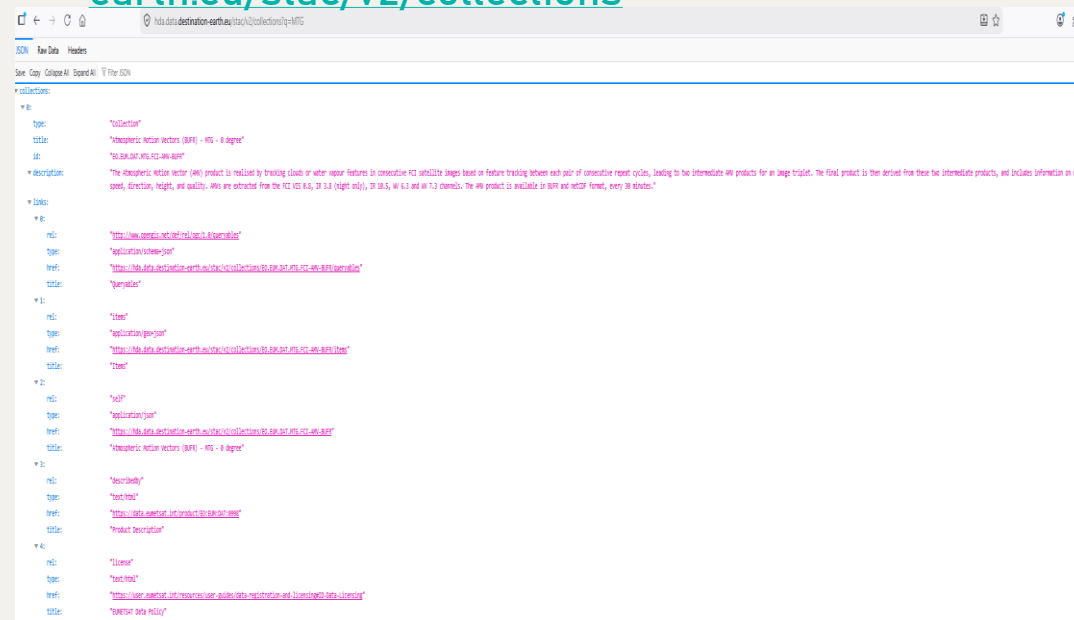
Programmatically — via the DEDL HDA (Harmonized Data Access) APIs

Where:

 DEDL Web Portal: <https://data.destination-earth.eu/data-portfolio>



 HDA-STAC APIs: <https://hda.data.destination-earth.eu/stac/v2/collections>





STAC – A standard interface

- SpatioTemporal Asset Catalog (STAC)
 - [STAC collection specification](#)
 - [STAC Item specification](#)
- v1.1.0
- Dataset discovery filters
 - Free-text search
 - Temporal extent
 - Area of interest
 - CQL filters
- Product search filtering capabilities
 - Temporal extent
 - Area of interest
 - Custom properties per dataset such as cloud cover, etc.
 - Specific id
 - Sort

STAC API STAC API v1.0.0. New version of STAC API for HDA API.

GET	/stac/v2	DEDL STAC capabilities discovery
GET	/stac/v2/conformance	information about specifications that this API conforms to
GET	/stac/v2/queryables	Get the JSON Schema defining the list of variable terms that can be used in CQL2 expres
GET	/stac/v2/collections	The feature collections in the dataset.
GET	/stac/v2/collections/{collectionId}	Describe the feature Collection for the given `collectionId`.
GET	/stac/v2/collections/{collectionId}/queryables	Get the JSON Schema defining the list of variab
GET	/stac/v2/collections/{collectionId}/items	List of items availaible in a given collection
GET	/stac/v2/collections/{collectionId}/items/{itemId}	Fetch a single feature.
GET	/stac/v2/search	Search STAC items with simple filtering.
POST	/stac/v2/search	Search STAC items with full-featured filtering.
POST	/stac/v2/collections/{collectionId}/order	Order data from a collection. Only ECMWF-like dataset



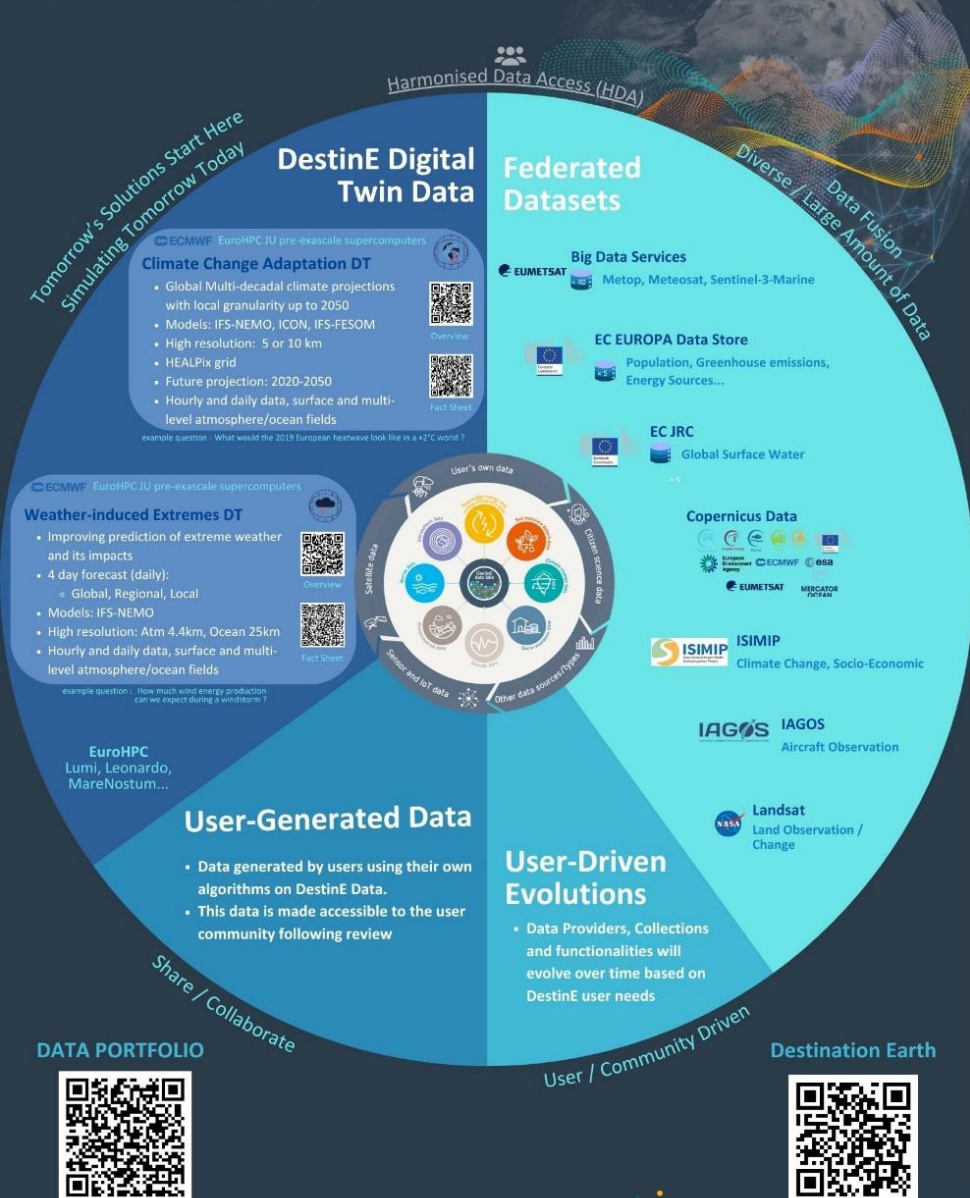
```
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https://hda.data.destination-earth.eu/stac/v2/collections/EO.ECMWF.DAT.D1.DT_... InPrivate
Pretty-print ✓
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  "description": "The DestinE Digital Twin for Climate Change Adaptation (Climate DT) supports adaptation activities by providing innovative climate information on multi-decadal timescales, globally, at scales at which many impacts of climate change are observed. It combines cutting-edge global Earth-system models, impact-sector applications and observations into a unified framework to provide global climate projections and impact-sector information on multi-decadal timescales (1990 to ~2050), at very high spatial resolutions (5 to 10 km).\n\nThe Climate DT represents the first ever attempt to operationalise the production of global multi-decadal climate projections, leveraging the world-leading supercomputing facilities of the EuroHPC Joint Undertaking along with some of the leading European climate models. A concise overview of what the Climate DT aims to achieve, and of the different concepts essential for an understanding of the Digital Twin's characteristics, is included in the [Climate DT factsheet](https://destine.ecmwf.int/wp-content/uploads/2024/06/2024.06.07_Climate-DT-Fact-Sheet_V7-2.pdf)\n\n## Future Projection \n\nTo project how climate will change on a global and local scale in the future, forcing changes according to the Shared Socioeconomic Pathway (SSP) 3-7.0 scenario from ScenarioMIP. The SSP3-7.0 scenario explores a future with a continuous increase in CO2 emissions with no strong mitigation efforts. All DestinE projections carried out so far follow this scenario. In the future, alternative future scenarios will be explored. The projections carried out so far are initialised in 2020 from reanalysis followed by a 5-year ocean spin-up. For the upcoming simulations carried out in phase 2 of DestinE, scenario simulations will extend the historical simulations.\n\n## Models\n\nThe Climate DT exploits and further evolves a new generation of global storm-resolving and eddy-rich models built through a cooperative model development approach. For more information on models please click [here](https://destine.ecmwf.int/climate-change-adaptation-digital-twin-climate-dt/#models)\n\n## Simulations\n\nThe Climate DT team carries out several types of digital twin simulations on the EuroHPC supercomputers. Multi-decadal simulations are produced to cover the recent past (from 1990) and possible future evolutions of the climate up to 2050. See [here](https://destine.ecmwf.int/climate-change-adaptation-digital-twin-climate-dt/#simulations) for more information on Simulations\n\n## Parameters\n\nBelow we see the list of parameters extracted from the 'DestinE Climate DT data portfolio', for more information please refer to the pages [Climate DT Phase2 CLTE Parameters](https://confluence.ecmwf.int/display/DDCZ/DestinE+ClimateDT+Phase+2+clte+Parameters) and [Climate DT Phase2 CLMN Parameters](https://confluence.ecmwf.int/display/DDCZ/DestinE+ClimateDT+Phase+2+clmn+Parameters)",
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```
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Pretty-print ✓
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    ],
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  }
}
```



DestinE Data Portfolio and HDA

Destination Earth Data Portfolio



DestinE service
open to any
DestinE users
Subject to provider
Data policy

Destination Earth



HARMONISED
DATA
ACCESS



1 Credential

1 Harmonised API

STAC



+250 datasets

+ 15 different
providers

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



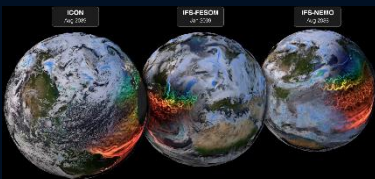
Funded by
the European Union

Destination Earth

Data Lake distributed infrastructure



LUMI
HPC



Leonardo
HPC

Mare Nostrum
HPC



June 2023



January 2024



March 2025

Dec 2024



EUMETSAT
Data Center



September 2022

CloudFerro
Data Center

Totals

Storage (PB):	120
vCPUs:	42680
GPUs:	76
Datasets:	+200





Destination Earth



Destination Earth



Destination Earth

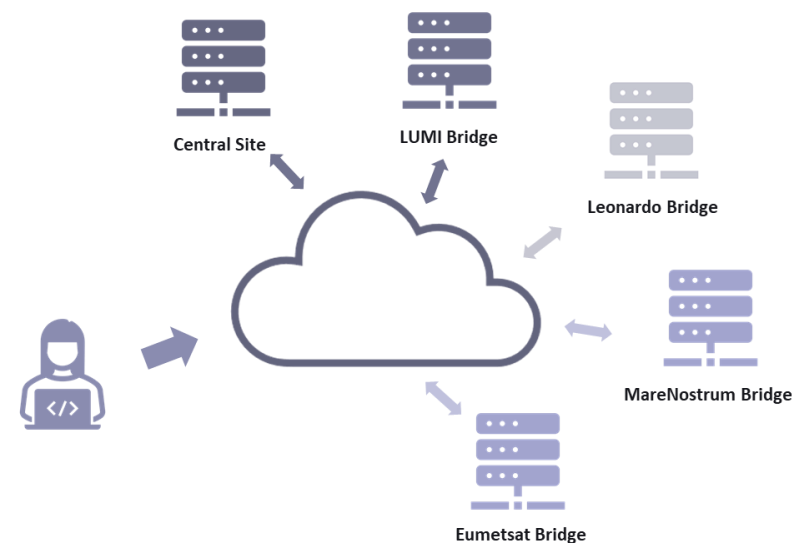


data.destination-earth.eu



**MyDataLake
services**

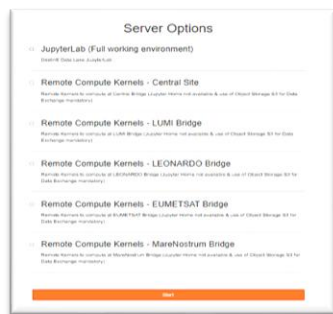
On-demand services
Subject to EC approval



Stack Services are ready-to-use, multitenant data processing solutions, running on the Data Lake, enabling Data Processing Services.



Jupyter Hub & JupyterLab, DEDL instance of JupyterHub, acting as proxy for authenticated user to spawn JupyterLab instances



Jupyter Enterprise Gateway, enables users to launch Jupyter. kernels at the individual data sites of the distributed infrastructure



Dask Gateway, enables users to request Dask clusters on-demand to be used to distribute compute jobs across all federation sites and executing computations next to the data.



STACK : Connecting to JupyterHub: Options

- Choose an Environment for your JupyterLab Instance
- Or a Remote Kernel

JupyterLab (default) DestinE Data Lake JupyterLab

JupyterLab (default) DestinE Data Lake JupyterLab

JupyterLab full DL with GPU DestinE Data Lake JupyterLab for deep learning with GPU support **NEW**

Specify an existing docker image Use a pre-existing docker image from registry.central.data.destination-earth.eu

jupyter.central.data.destination-earth.eu/hub/spawn/a619e269-b4b9-49fc-ae7b-dc1e5fb6fe81

jupyterhub Home Token

Server Options

Local environment

[Copy Permalink](#)

Environment: JupyterLab (default) DestinE Data Lake JupyterLab

Version: newest (2026.05.4) newest release

CPU: Default (role quota) Use the maximum CPU available for your role

RAM: Default (role quota) Use the maximum RAM available for your role

Remote Kernels

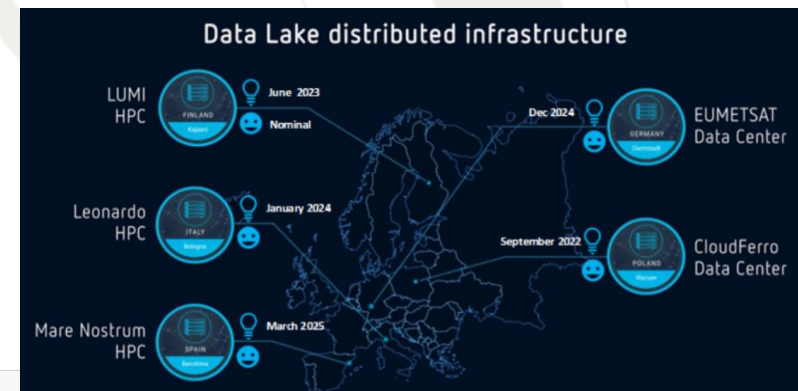
[Copy Permalink](#)

Select a DEDL bridge: Central Site Remote Kernels to compute at Central Bridge (Jupyter Home not avail.)

CPU: Default (role quota) Use the maximum CPU available for your role

RAM: Default (role quota) Use the maximum RAM available for your role

Start

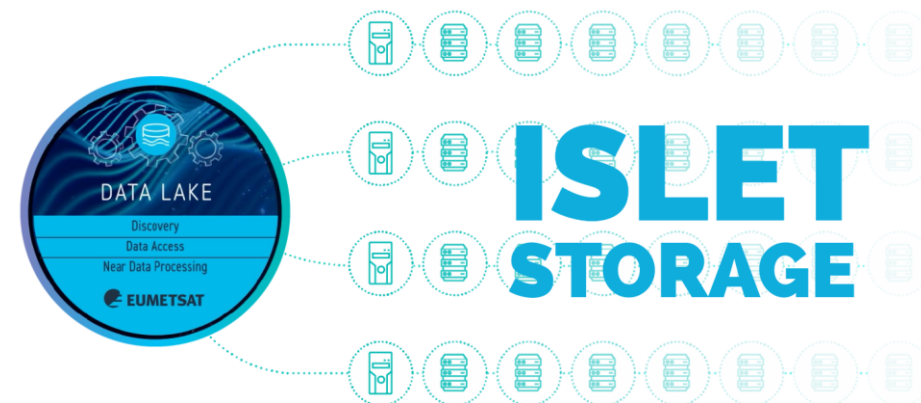




Destination Earth



Destination Earth

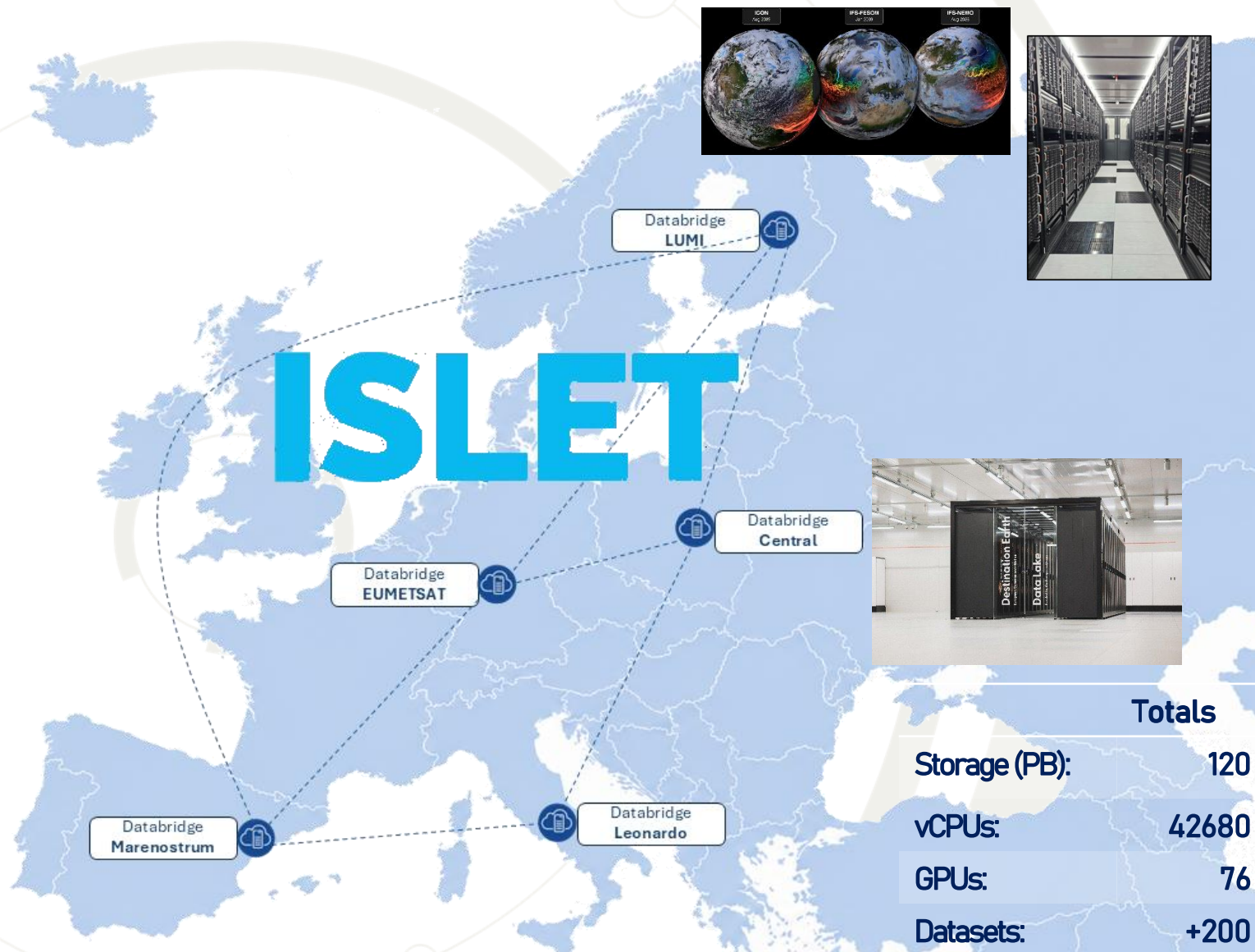




Databridges:

- Central (Poland)
- LUMI (Finland) - HPC
- Leonardo (Italy) - HPC
- Marenostum (Spain) - HPC
- EUMETSAT (Germany)

Based on





ISLET: OpenStack

 Destination Earth



Virtual environment based on the
OpenStack

Preconfigured images

vCPU and GPU

Kubernetes clusters

 Destination Earth

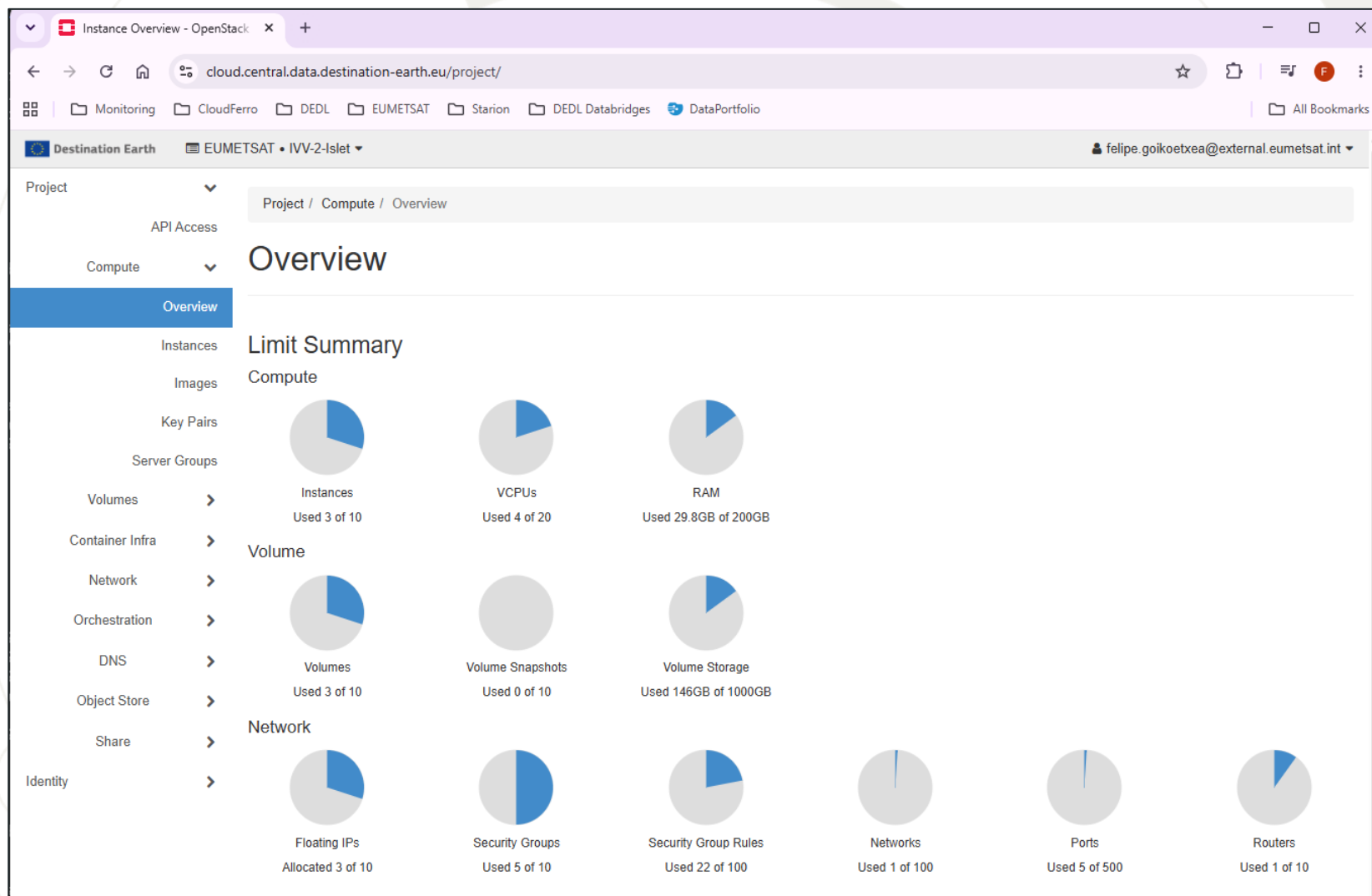


Access to S3 storage

Manage S3 storage



- Horizon Dashboard – Overview

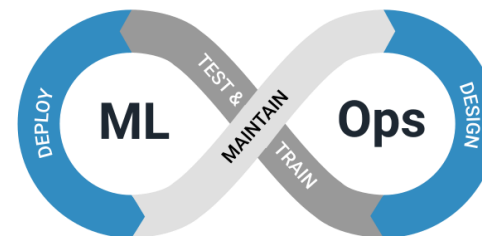




AI/ML enabling new tools

- **MLOps platform – Support AI/ML lifecycle**

- Managed Kubeflow solution that enables scaling training, pipelines and model serving.
- Provides a path from notebooks to reproducible ML workflows.
- Roadmap: Integration with Airflow and mlflow for orchestration, tracking and registry



DEFAIR

Destination Earth
Framework for
preparing AI-Ready Data

- **DEFAIR – Destination Earth Framework for preparing AI-Ready Data**

- Python-based framework that helps defining reusable EO data preparation pipelines.
- Supports processing steps such as filtering, reprojection, collocation, alignment,...
- Enables generation of AI ready outputs in formats such as Zarr, NetCDF and GeoTIFF.
 - Supports reproducible preprocessing for analytics and AI/ML workflows

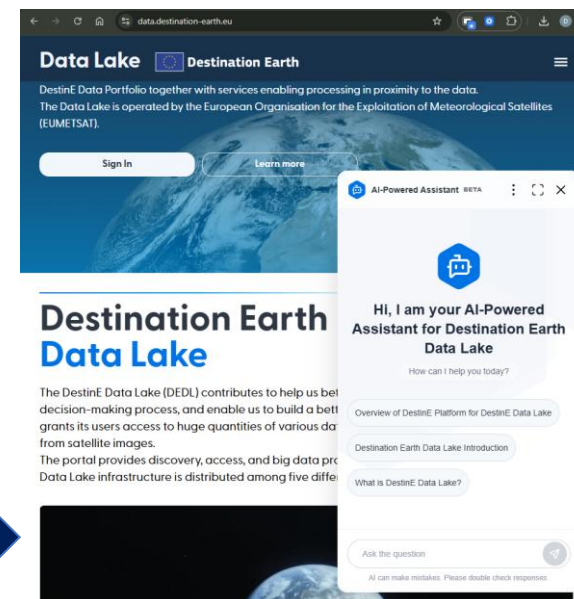
- **DEDL Cube – structured access to multidimensional EO data**

- Transforms diverse EO products into cloud native data cubes
- Enable efficient multidimensional access for time-series and analysis
- Built around open standards: GeoDataCube API, Open EO and Zarr/GeoZarr
- Designed to support AI/ML workflows



- **AI Widget – Guidance for using the DEDL services**

- Helps users navigate DEDL documentation, services and examples
- Uses knowledge from the Data Lake docs, Data Portfolio, use cases and GitHub lab
- Supports users in discovering data, understanding APIs and getting started faster





Applications developed and hosted on DestinE Data Lake, exploiting DT Outputs and/or EUMETSAT satellite observations

- **AI4Clouds:** Enhancement of the short-term forecast of clouds (Predictia & Iberdrola)



- **AIDE:** Enhancement of lower resolution products from MTG satellite (OHB, Royal Meteorological Institute of Belgium and Meteologix AG)



- **AETHER:** Enhancement of Lightning Imager (LI) background resolution from MTG satellite (Thales Services Numeriques and ItaliaMeteo)



- Final delivery: April – June 2026
- Open source: model weights, documentation and source code will be made available to DestinE users

Deep Learning Model Weights

Ready to deploy for
inference





DestinE Data Lake – users projects statistics

DestinE Data Lake

Use Cases Overview*

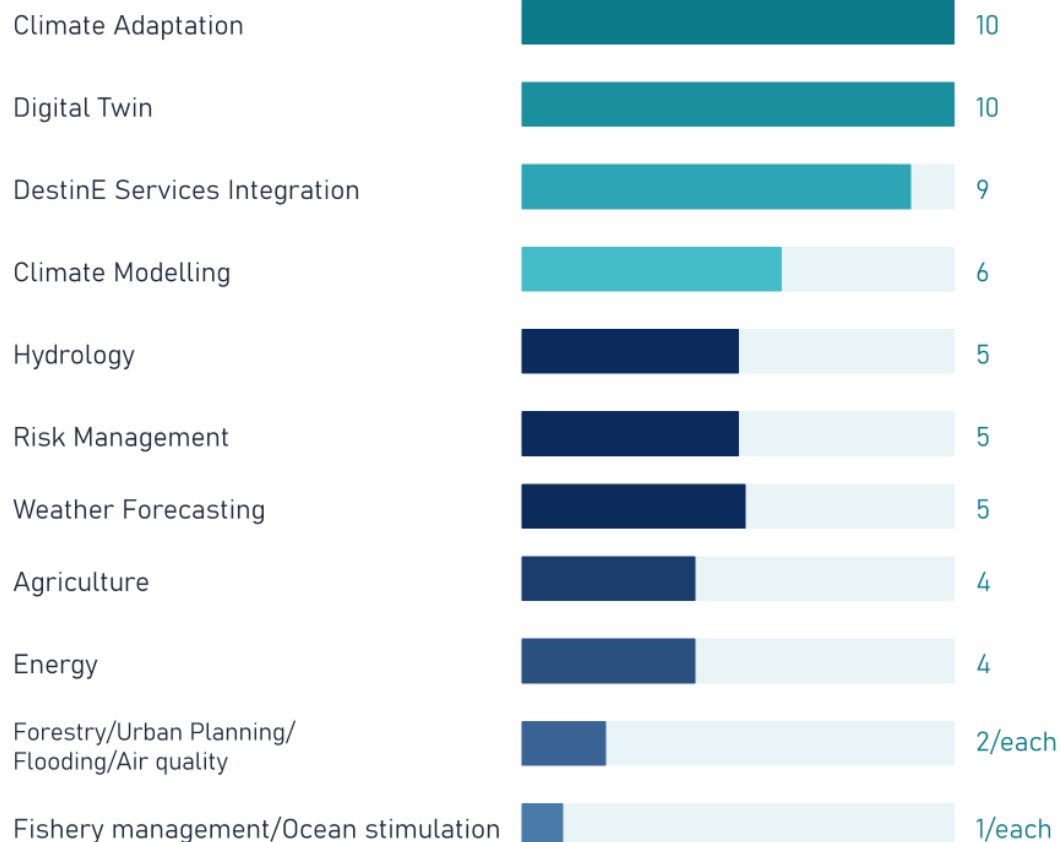
41

on-boarded projects

across 13 countries

*Source: DestinE Data Lake Edge Services
Status Report – May 2026

Projects by Thematic Area (up to 3 per project)

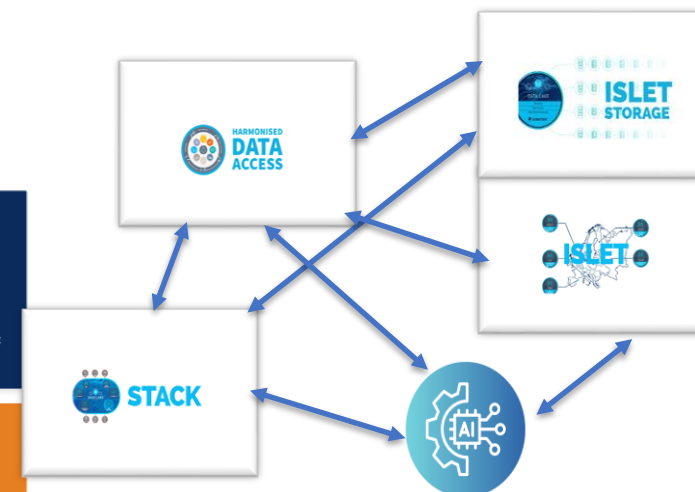


14
DestinE
Contractors + staff

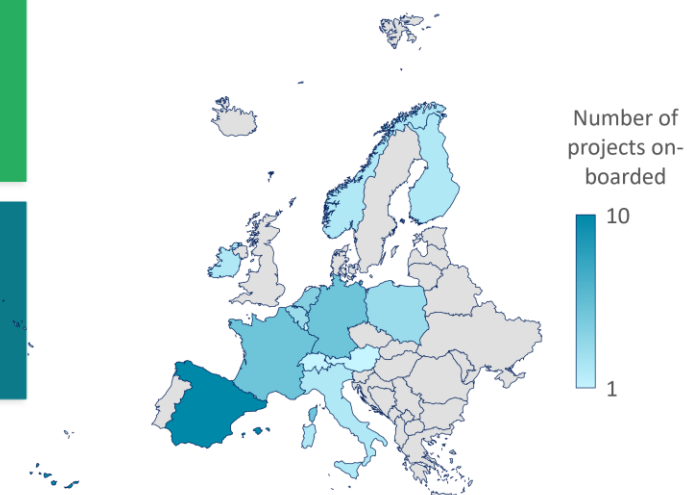
7
SMEs &
Start-ups

5
Public
Authority

15
Academia
& Research



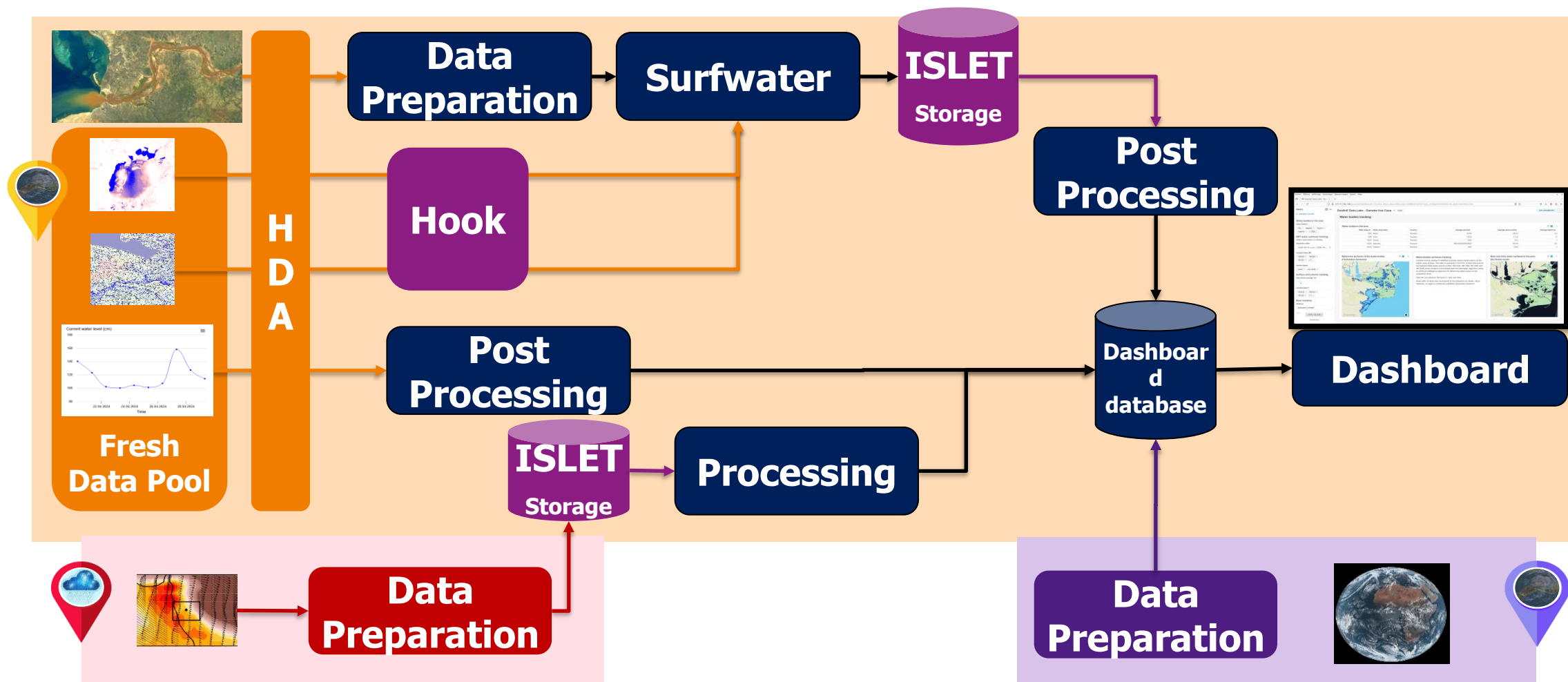
Repartition of projects on-boarded





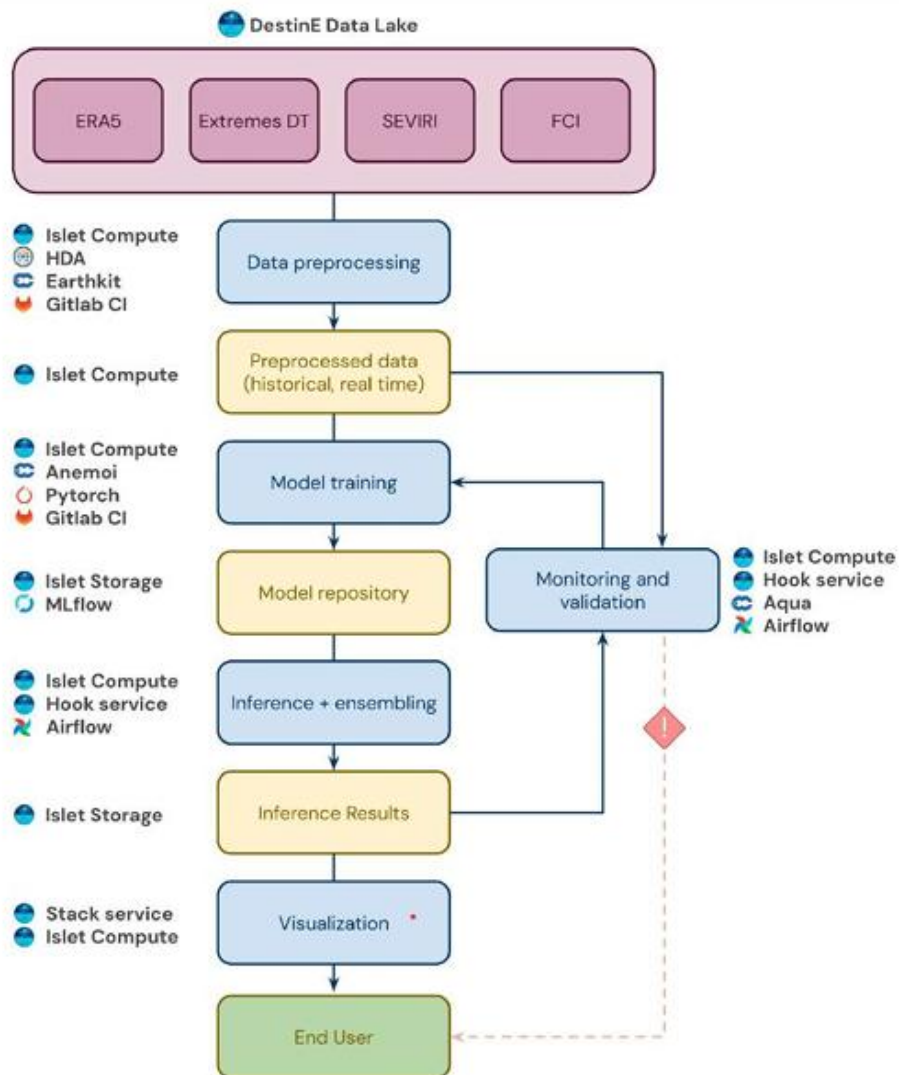
Previously developed demonstrators

Danube Delta reservoir



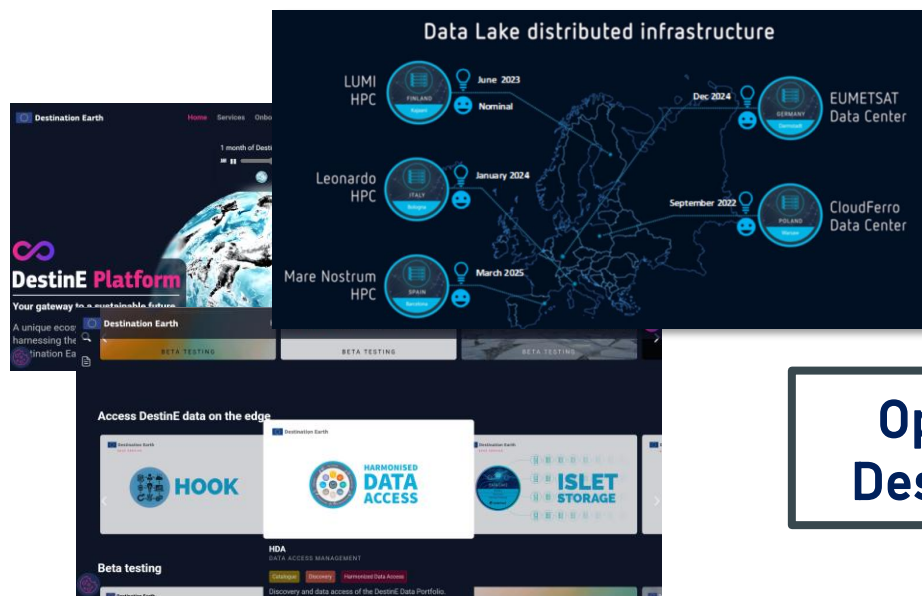


AI4Clouds





DestinE (Data Lake) services

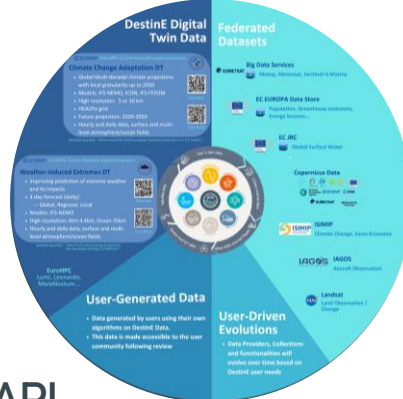


Harmonised Data access

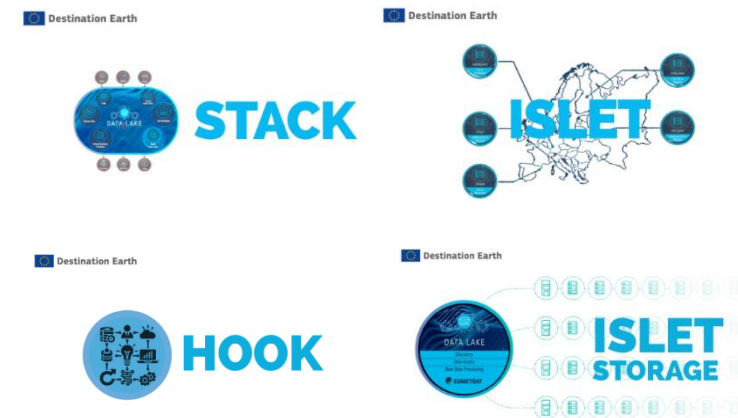


Open to any
DestinE users

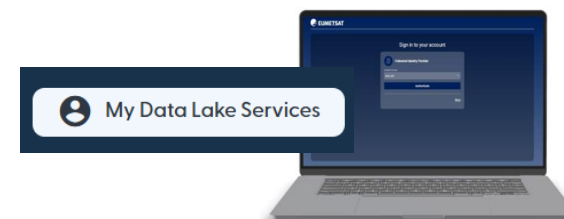
+250
datasets



EDGE Services



On request - Project
assessment *(no cost)*



- Harmonise (standardise) access to data with just one API
- Bringing computation to the data (near data processing), Destination Earth Data Lake is a cloud-native platform for discovering, accessing and exploiting DestinE data (and other data from multiple data spaces) at scale.