



ESA CCI permafrost time series maps as Essential Climate Variable (ECV) products, primarily derived from satellite measurements and visualized within the AWI O2A (Observation to Analysis and Archive) framework.



The European Space Agency (ESA) Climate Change Initiative (CCI) is a global monitoring program which aims to provide long-term satellite-based products to serve the climate modelling and climate user community. Building on GlobPermafrost (2016-2019), **Permafrost_cci** data products are elaborated during Phase 1 CCI+ (2018-2021) and continued during Phase 2 of CCI+ (2022-2026).

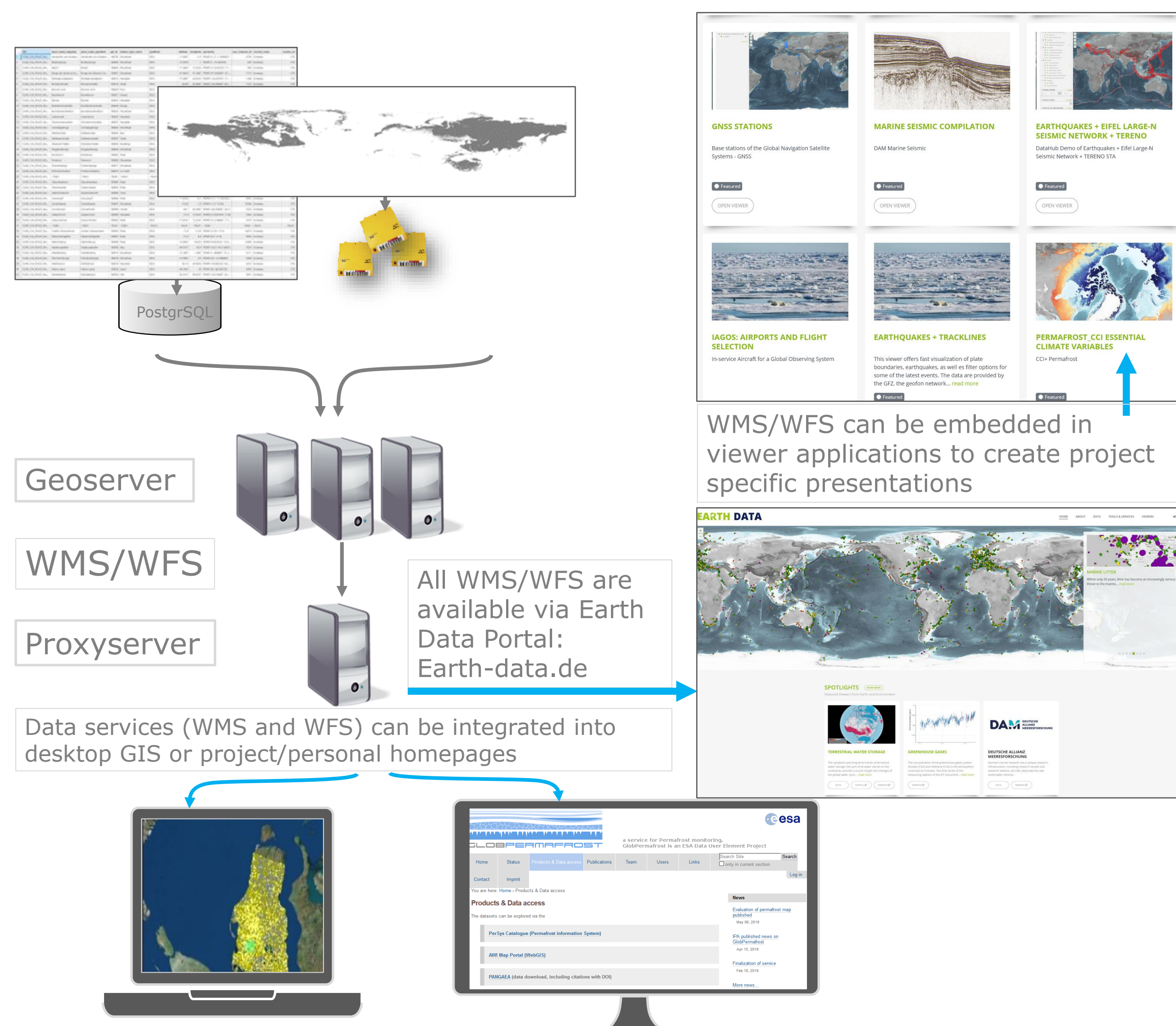
Permafrost_cci timeseries products from 1997 to 2023 in 1km resolution are:

- Permafrost Temperature
- Active Layer Thickness
- Permafrost Fraction

ESA Circumpolar Landcover (Additional product service)

Earth-data.de is a frontend and point of access to data viewers that show data published as digital data services based and realised upon GIS (Geographical Information Systems)-based geodata infrastructure at AWI. GIS server technology enables the digital publication and therefore visualization of multidisciplinary project data in the World Wide Web. **Permafrost_cci timeseries** datasets have been published as WebGIS services relying on OGC-standardized Web Mapping Services (WMS) and Web Feature Services (WFS). **Permafrost_cci timeseries** WMS are embedded in a JavaScript GIS viewer application based on a leaflet library. All services are interoperable and can be integrated into various desktop GIS applications.

O2A Infrastructure Framework



Permafrost_cci timeseries Viewer Functionalities

The screenshot shows the Earth Data viewer interface with several callouts:

- Information panel:** Switch here for details about: the project, its coordination and partners, or Help.
- Data Layers Panel:** Shows the data layers that are available > select to display.
- Projection button:** Change view: Polar or World.
- PopUp window:** Shows individual information per pixel (value), Information about the data layer, Access to the data source.
- Abstract Panel:** Detailed information on the individual data layer as well as information about the citation and access to the data.
- Time Slider Tool:** Filter data products by time.
- Baselayers List:** Select an appropriate basemap.
- Legend Panel:** Decipher the colour codes and get information about the unit.

Permafrost_cci Data Products

The figure displays three screenshots of the Permafrost_cci Data Products viewer:

- Ground Temperature per Depth (GTD) [°C]:** Surface, 1, 2, 5, 10m Depth. Yearly, Yearly Mean, Yearly Std.
- Permafrost Occurrence Probability in Fraction (PFR) [%]:** Yearly, Yearly Mean, Yearly Std.
- Active Layer Thickness (ALT) [m]:** Yearly, Yearly Mean, Yearly Std.

additional product service:

- Permafrost Circumpolar Landcover
- Global Terrestrial Network for Permafrost (GTN-P) permafrost temperature mean annual ground temperature compilation (depths 0 to 10 m)
- Interact Research Stations

Data access:

Permafrost_cci timeseries: Westermann et al. (2024): Permafrost_cci: Permafrost v4 data product <http://catalogue.ceda.ac.uk/uuid/7479606004d9465bad9>

Permafrost_cci Circumpolar Landcover: Bartsch et al. (2024): <https://doi.org/10.5281/zenodo.14235736>

Global Terrestrial Network for Permafrost (GTN-P) permafrost temperature mean annual ground temperature compilation (depths 0 to 10 m) for assessment of Permafrost_cci products <https://doi.pangaea.de/10.1594/PANGAEA.972992>

The ESA GlobPermafrost final product data set is published under doi:10.1594/PANGAEA.780111

