

Earthkit introduction

ECMWF, Forecasts & Services Department, Development
Section



Introducing



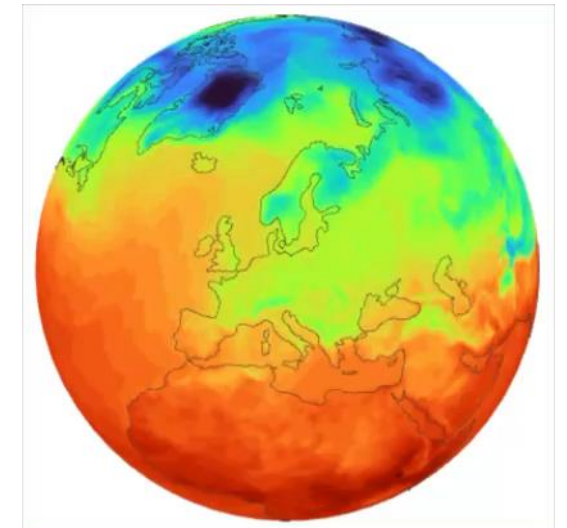
Earthkit

- New set of high-level scalable, interoperable, focused Python components
- Suitable for use by our **operational services** and directly by **researchers / analysts**
- Designed with Machine Learning / GPU / In-memory computations as *first-class citizens*
- Designed with diskless data access in mind
- Reduce boilerplate code
- *Earthkit is already in operational use at ECMWF; version 1.0 was released in June 2026*



Open Development

- Highly collaborative both inside and outside ECMWF
- All code is on GitHub, fully embracing Open Development



Introducing earthkit

Interoperable with essential
Python packages



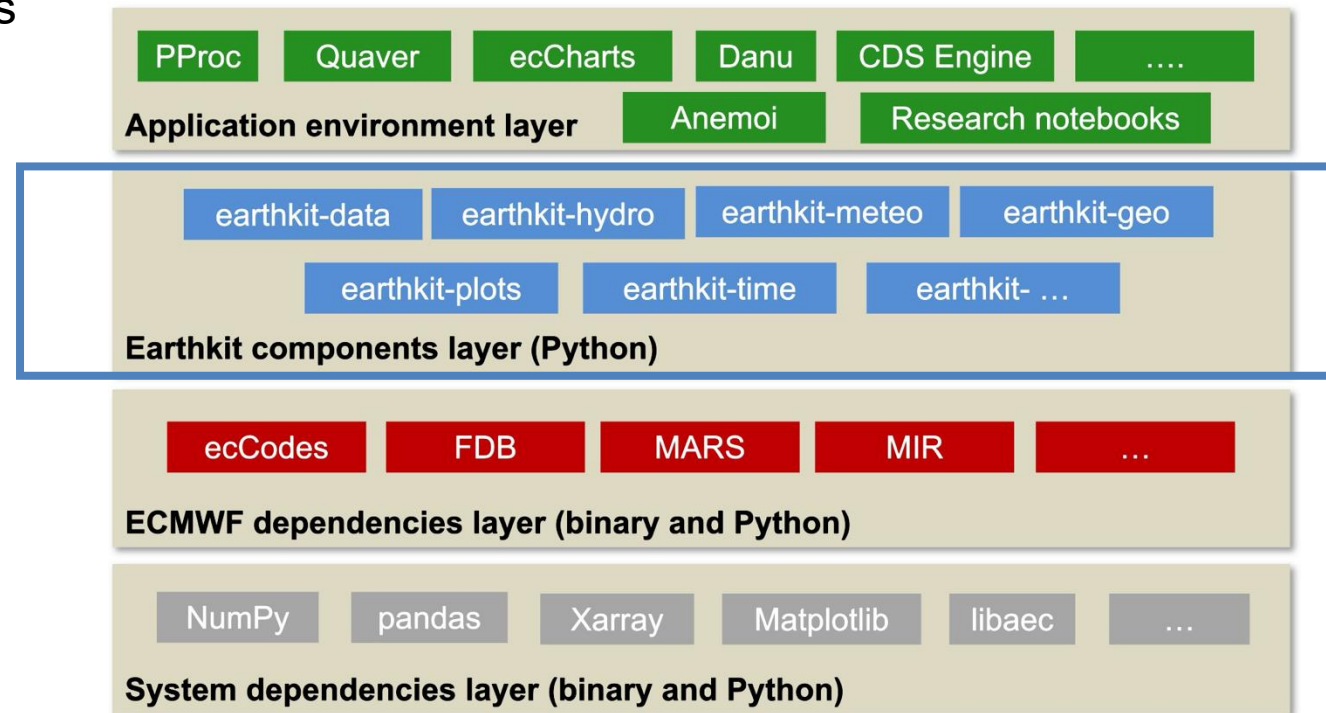
Integration with a wide range
of data formats



Introducing Earthkit

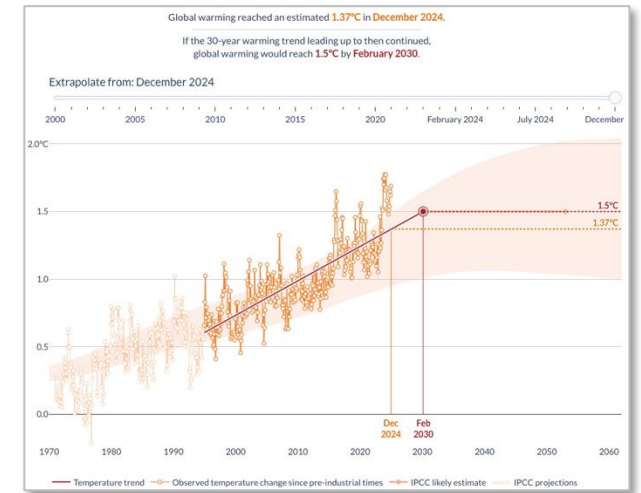


- Part of the modernization of the ECMWF software stack
- Earthkit will replace Magics and Metview in terms of processing and plotting
- EarthStudio, a long-term project, will replace Metview's user interface and ecCharts



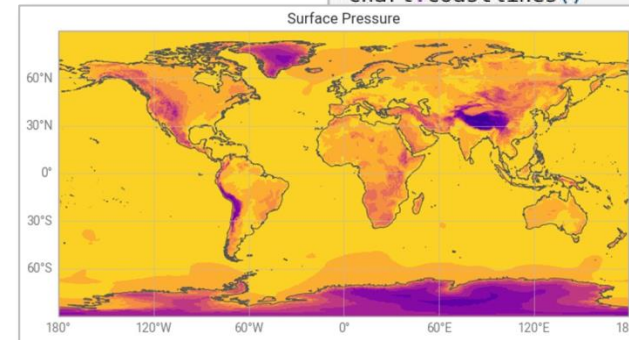
Example usages today

- The Anemoi machine learning framework (data handling and plotting)
- ECMWF's post-processing suite (data and time handling, thermodynamic computations)
- Forecast-in-a-box (data handling, workflows, plotting)
- ecCharts (data handling)
- Recommended way to retrieve and visualise Destination Earth Digital Twin data via polytope
- Copernicus web applications, e.g. C3S Global Temperature Trend Monitor; on-the-fly aggregation of daily statistics; recommended way to access and process CDS datasets



```
chart = earthkit.plots.Map(extent=[-180, 180, -90, 90])
chart.plot(
    data[0]
)

chart.title("Surface Pressure")
chart.coastlines()
```



Earthkit and its components



This course will introduce:



earthkit
data



earthkit
geo



earthkit
hydro



earthkit
workflows



earthkit

<https://earthkit.ecmwf.int/>



earthkit
plots



earthkit
meteo



earthkit
time



earthkit
utils



earthkit
transforms



Installation



- The Earthkit Python components are on PyPi
 - Can be installed with `pip install earthkit-data`; `pip install earthkit-plots` etc
 - We make use of optional components, e.g. `pip install 'earthkit-data[geotiff,mars]'` (or `[all]`)
 - All packages can be installed in one go with `pip install earthkit`
- Earthkit's binary dependencies are also on PyPi
 - We have a fairly new system of distributing binary Python packages
 - e.g.
 - `pip install eccodes` gives you the Python interface
 - `pip install eccodeslib` gives you the binary library
 - Earthkit will ensure that the proper dependencies are installed, but some may come as optional components
 - It is possible to use binaries (e.g. `ecCodes`, `MIR`, ...) from elsewhere – see the `findlibs` readme
 - <https://github.com/ecmwf/findlibs>

Earthkit technical setup for training

Earthkit 1.0 training

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Setup environment

- You should be able to try the examples in this course either on a MacOS or Linux machine/laptop or from a Jupyterhub session on ECMWF's HPC "ATOS"
- Get the training repo (we assume you will put it into \$HOME/training but it's up to you – on ATOS it's best to ensure it's close to \$HOME)
- ```
mkdir $HOME/training
cd $HOME/training
git clone git@github.com:ecmwf-training/2026-earthkit-training.git #OR
git clone https://github.com/ecmwf-training/2026-earthkit-training.git
cd 2026-earthkit-training
```
- Follow the setup instructions in README.md (repeated on these slides)



# Setup environment

- **Local machine that is not ATOS:**
- Create a virtualenv:

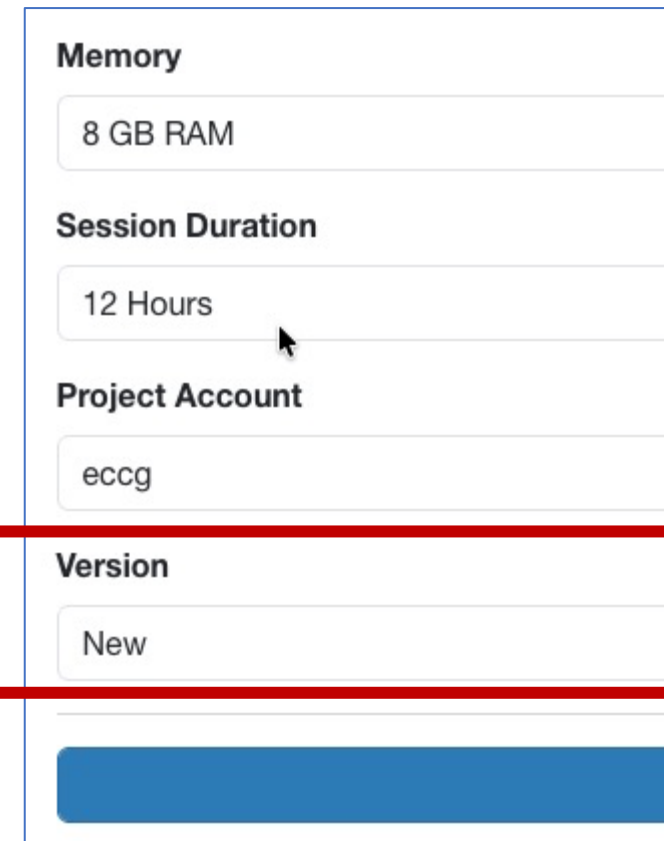
```
python3 -m venv ./earthkit-venv
source ./earthkit-venv/bin/activate
pip3 install -r ./requirements.txt
```

- Launch jupyter:
- `jupyter lab`

- From Jupyter, navigate to
  - `$HOME/training/2026-earthkit-training/content`

- **JupyterHub/ATOS**

- Go to <https://jupyterhub.ecmwf.int/>
- Choose **"Version : New"** on the config page



The screenshot shows a configuration page for JupyterHub. It has four sections: 'Memory' with a dropdown set to '8 GB RAM', 'Session Duration' with a dropdown set to '12 Hours', 'Project Account' with a dropdown set to 'eccg', and 'Version' with a dropdown set to 'New'. The 'Version' section is highlighted with a red rectangular border. Below these sections is a large blue button.

