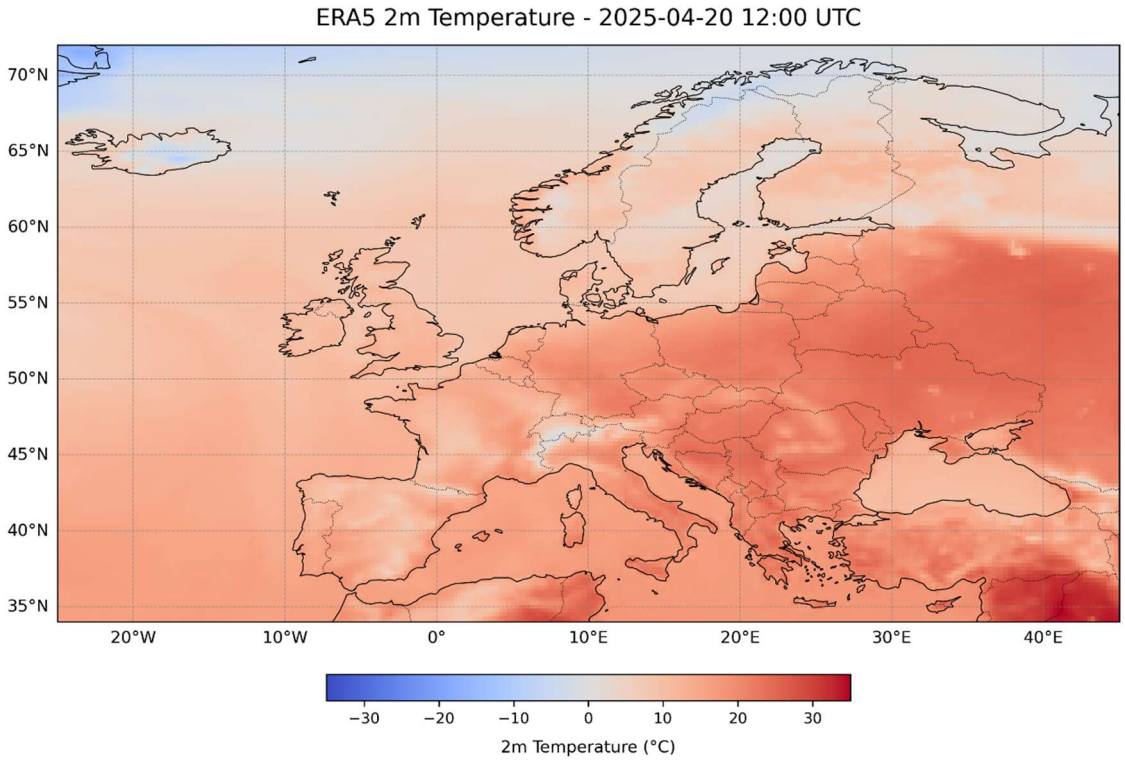
ERA5 Single-Date 2-metre Temperature Map Generator



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1. Introduction

This document is a complete user guide for the *map_era5_t2m_region_plot_single_hourly.py* Python script. This tool allows you to quickly generate 2-metre air temperature (t2m) maps from ERA5 reanalysis NetCDF files.

With this script, you can:

- Select a specific date and time (UTC).
- Define a custom geographic region.
- Save high-resolution maps in PNG and/or PDF formats.

It is ideal for meteorologists, researchers, educators, and students who need to visualize ERA5 data without using complex GIS software.

2. System Requirements

To run the script, you'll need the following:

2.1. Software

- Python 3.7 or newer (tested on Python 3.10+).
- ERA5 NetCDF file containing the t2m variable in Kelvin.

2.2. Python Libraries

Install the required libraries with:

```
pip install xarray matplotlib cartopy netCDF4 numpy
```

Libraries used:

- xarray – Efficient reading/handling of NetCDF datasets.
- matplotlib – Core plotting and visualization library.
- cartopy – Geographic projections, coastlines, borders.
- netCDF4 – Low-level NetCDF file access.
- numpy – Data arrays, numerical operations, date/time handling.

3. How to Use the Script

3.1. User Configuration

Edit the USER CONFIGURATION section at the top of the .py file:

Variable	Description	Example
nc_file	Input NetCDF file name.	"my_era5_t2m_data.nc"
target_datetime	Date/time in "YYYY-MM-DD HH:MM" (UTC).	"2025-04-20 12:00"
output_basename	Prefix for output filenames.	"Europe_t2m"
lat_north, lat_south	Geographic bounding box (latitudes).	55, 35
lon_west, lon_east	Geographic bounding box (longitudes).	-10, 30
color_map	Matplotlib colormap name.	"coolwarm"
dpi	Output image resolution (DPI).	300
save_pdf	Save PDF file (True/False).	True
save_png	Save PNG file (True/False).	True

3.2. Execution

From the command line, in the same folder as the script and NetCDF file:

```
map_era5_t2m_region_plot_single_hourly.py
```

The output maps will be saved in the same folder.

4. Package Contents

- map_era5_t2m_region_plot_single_hourly.py – Main script.
- Eur_ERA5_t2m_20250420.nc – Sample NetCDF file for testing.
- Readme.pdf – This user manual.
- License.txt – Commercial license agreement.

5. Script Output

The script generates one or two files depending on save_pdf and save_png settings. Filename format:

<output_basename>_<date>_<time>UTC.<extension>

Example output:

If output_basename = "Europe_t2m" and target_datetime = "2025-04-20 12:00", the results will be:

Europe_t2m_20250420_12UTC.png

Europe_t2m_20250420_12UTC.pdf

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