

# **Big Data Analytics Lab, UMBC**

## **ERA5 Reanalysis Climate Dataset Collection**

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Goal: This document describes the process of the ERA5 reanalysis climate data collection. Here we will download the hourly data for one year from the European Copernicus Climate Data Store for seven variables used for the unsupervised clustering task.

Follow these steps to download the dataset:

Step-1:

Create a new user in the Copernicus Climate Data Store using the following URL. Skip this step if you already have a user in the system.

<https://cds.climate.copernicus.eu/user/register?destination=%2Fcdsapp%23!%2Fhome>

Step-2:

Login to the Copernicus Climate Data Store using your email ID and password through the following URL.

<https://cds.climate.copernicus.eu/user/login?destination=%2Fcdsapp%23!%2Fhome>

### Step-3:

After login click the “**Datasets**” option from the top menu bar. On the dataset page, you will see all the datasets available to download. In the search bar type “**ERA5 hourly data on single**” and click the search button. Then from the search result select the dataset with the title “**ERA5 hourly data on single levels from 1940 to present**”.

The screenshot shows the Copernicus ERA5 dataset search results page. The browser address bar displays the URL: `cds.climate.copernicus.eu/cdsapp#!/search?type=dataset&text=ERA5%20hourly%20data%20on%20single%20levels`. The top navigation bar includes links for Home, Search, **Datasets** (highlighted with a red box), Applications, Your requests, Toolbox, Support, and Live. Below the navigation bar, the search results are displayed. The search bar contains the text "ERA5 hourly data on single" and a search button. The results are sorted by Relevance. The first result is titled "ERA5 hourly data on single levels from 1940 to present" (highlighted with a red box). The description states: "ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 8 decades. Data is available from 1940 onwards. ERA5 replaces the ERA-Interim reanalysis. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. This principle, called data assimilation, is based on the method used ...". The second result is titled "ERA5 hourly data on single levels from 1950 to 1978 (preliminary version)".

### Step-4:

The next page will show the overview of the dataset and the description of all variables included in this dataset. Here click on the “**Download data**” option as shown in the picture.

The screenshot shows the Copernicus ERA5 dataset overview page. The browser address bar displays the URL: `cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels?tab=overview`. The top navigation bar includes links for Home, Search, Datasets, Applications, Your requests, Toolbox, Support, and Live. Below the navigation bar, the dataset title "ERA5 hourly data on single levels from 1940 to present" is displayed. The description states: "ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 8 decades. Data is available from 1940 onwards. ERA5 replaces the ERA-Interim reanalysis. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. This principle, called data assimilation, is based on the method used by numerical weather prediction centres, where every so many hours (12 hours at ECMWF) a previous forecast is combined with newly available observations in an optimal way to produce a new best estimate of the state of the atmosphere, called analysis, from which an updated, improved forecast is issued. Reanalysis works in the same way, but at reduced resolution to allow for the provision of a dataset spanning back several decades. Reanalysis does not have the constraint of issuing timely forecasts, so there is more time to collect observations, and when going further back in time, to allow for the ingestion of improved versions of the original observations, which all benefit the quality of the reanalysis product." The "Download data" button is highlighted with a red box. A world map showing the spatial coverage of the dataset is also visible.

### Step-5:

On this page, we have to choose different options according to our dataset requirements. We have to select **reanalysis** from the product type. Then select the variables as shown in the picture. Here we have selected 7 variables from the “Popular” and “Radiation and heat” subsets. Then select the target “Year”, “Month”, “Day”, “Time”, and “Geographical area”. Select the “NetCDF” from the data format. Finally, **submit** the form after selecting the “Terms of use” option.

The screenshot shows the CDS dataset selection interface. The browser address bar displays the URL: `cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels?tab=form`. The navigation bar includes links for Overview, Download data (highlighted with a red box), Quality assessment, and Documentation. The 'Product type' section has four options: Reanalysis (checked and highlighted with a red box), Ensemble members, Ensemble mean, and Ensemble spread. The 'Variable' section has a 'Popular' dropdown (highlighted with a red box) and a list of variables. The following variables are selected and highlighted with red boxes: 10m u-component of wind, 10m v-component of wind, 2m temperature, Sea surface temperature, and Surface pressure. The 'Radiation and heat' section is expanded, showing additional variables.

Product type

☒ Reanalysis ☐ Ensemble members ☐ Ensemble mean ☐ Ensemble spread

Variable ?

Popular

☒ 10m u-component of wind ☒ 10m v-component of wind

☐ 2m dewpoint temperature ☒ 2m temperature

☐ Mean sea level pressure ☐ Mean wave direction

☐ Mean wave period ☒ Sea surface temperature

☐ Significant height of combined wind waves and swell ☒ Surface pressure

☐ Total precipitation

Temperature and pressure

Wind

Mean rates

Radiation and heat

► Mean rates

▼ Radiation and heat

- |   |  |
|---|--|
| <input type="checkbox"/> Clear-sky direct solar radiation at surface      | <input type="checkbox"/> Downward UV radiation at the surface        |
| <input type="checkbox"/> Forecast logarithm of surface roughness for heat | <input type="checkbox"/> Instantaneous surface sensible heat flux    |
| <input type="checkbox"/> Near IR albedo for diffuse radiation             | <input type="checkbox"/> Near IR albedo for direct radiation         |
| <input checked="" type="checkbox"/> Surface latent heat flux              | <input type="checkbox"/> Surface net solar radiation                 |
| <input type="checkbox"/> Surface net solar radiation, clear sky           | <input type="checkbox"/> Surface net thermal radiation               |
| <input type="checkbox"/> Surface net thermal radiation, clear sky         | <input checked="" type="checkbox"/> Surface sensible heat flux       |
| <input type="checkbox"/> Surface solar radiation downward, clear sky      | <input type="checkbox"/> Surface solar radiation downwards           |
| <input type="checkbox"/> Surface thermal radiation downward, clear sky    | <input type="checkbox"/> Surface thermal radiation downwards         |
| <input type="checkbox"/> TOA incident solar radiation                     | <input type="checkbox"/> Top net solar radiation                     |
| <input type="checkbox"/> Top net solar radiation, clear sky               | <input type="checkbox"/> Top net thermal radiation                   |
| <input type="checkbox"/> Top net thermal radiation, clear sky             | <input type="checkbox"/> Total sky direct solar radiation at surface |
| <input type="checkbox"/> UV visible albedo for diffuse radiation          | <input type="checkbox"/> UV visible albedo for direct radiation      |

Select all Clear all

► Clouds

► Lakes

Year

- |                               |                               |                               |  |                               |                               |
|-------------------------------|-------------------------------|-------------------------------|--|-------------------------------|-------------------------------|
| <input type="checkbox"/> 1940 | <input type="checkbox"/> 1941 | <input type="checkbox"/> 1942 | <input type="checkbox"/> 1943            | <input type="checkbox"/> 1944 | <input type="checkbox"/> 1945 |
| <input type="checkbox"/> 1946 | <input type="checkbox"/> 1947 | <input type="checkbox"/> 1948 | <input type="checkbox"/> 1949            | <input type="checkbox"/> 1950 | <input type="checkbox"/> 1951 |
| <input type="checkbox"/> 1952 | <input type="checkbox"/> 1953 | <input type="checkbox"/> 1954 | <input type="checkbox"/> 1955            | <input type="checkbox"/> 1956 | <input type="checkbox"/> 1957 |
| <input type="checkbox"/> 1958 | <input type="checkbox"/> 1959 | <input type="checkbox"/> 1960 | <input type="checkbox"/> 1961            | <input type="checkbox"/> 1962 | <input type="checkbox"/> 1963 |
| <input type="checkbox"/> 1964 | <input type="checkbox"/> 1965 | <input type="checkbox"/> 1966 | <input type="checkbox"/> 1967            | <input type="checkbox"/> 1968 | <input type="checkbox"/> 1969 |
| <input type="checkbox"/> 1970 | <input type="checkbox"/> 1971 | <input type="checkbox"/> 1972 | <input type="checkbox"/> 1973            | <input type="checkbox"/> 1974 | <input type="checkbox"/> 1975 |
| <input type="checkbox"/> 1976 | <input type="checkbox"/> 1977 | <input type="checkbox"/> 1978 | <input type="checkbox"/> 1979            | <input type="checkbox"/> 1980 | <input type="checkbox"/> 1981 |
| <input type="checkbox"/> 1982 | <input type="checkbox"/> 1983 | <input type="checkbox"/> 1984 | <input type="checkbox"/> 1985            | <input type="checkbox"/> 1986 | <input type="checkbox"/> 1987 |
| <input type="checkbox"/> 1988 | <input type="checkbox"/> 1989 | <input type="checkbox"/> 1990 | <input type="checkbox"/> 1991            | <input type="checkbox"/> 1992 | <input type="checkbox"/> 1993 |
| <input type="checkbox"/> 1994 | <input type="checkbox"/> 1995 | <input type="checkbox"/> 1996 | <input type="checkbox"/> 1997            | <input type="checkbox"/> 1998 | <input type="checkbox"/> 1999 |
| <input type="checkbox"/> 2000 | <input type="checkbox"/> 2001 | <input type="checkbox"/> 2002 | <input type="checkbox"/> 2003            | <input type="checkbox"/> 2004 | <input type="checkbox"/> 2005 |
| <input type="checkbox"/> 2006 | <input type="checkbox"/> 2007 | <input type="checkbox"/> 2008 | <input type="checkbox"/> 2009            | <input type="checkbox"/> 2010 | <input type="checkbox"/> 2011 |
| <input type="checkbox"/> 2012 | <input type="checkbox"/> 2013 | <input type="checkbox"/> 2014 | <input type="checkbox"/> 2015            | <input type="checkbox"/> 2016 | <input type="checkbox"/> 2017 |
| <input type="checkbox"/> 2018 | <input type="checkbox"/> 2019 | <input type="checkbox"/> 2020 | <input checked="" type="checkbox"/> 2021 | <input type="checkbox"/> 2022 | <input type="checkbox"/> 2023 |

Select all Clear all

Month

- |   |  |   |   |  |  |
|---|--|---|---|--|--|
| <input checked="" type="checkbox"/> January | <input checked="" type="checkbox"/> February | <input checked="" type="checkbox"/> March     | <input checked="" type="checkbox"/> April   | <input checked="" type="checkbox"/> May      | <input checked="" type="checkbox"/> June     |
| <input checked="" type="checkbox"/> July    | <input checked="" type="checkbox"/> August   | <input checked="" type="checkbox"/> September | <input checked="" type="checkbox"/> October | <input checked="" type="checkbox"/> November | <input checked="" type="checkbox"/> December |

Clear all

### Day

<input checked="" type="checkbox"/> 01	<input checked="" type="checkbox"/> 02	<input checked="" type="checkbox"/> 03	<input checked="" type="checkbox"/> 04	<input checked="" type="checkbox"/> 05	<input checked="" type="checkbox"/> 06
<input checked="" type="checkbox"/> 07	<input checked="" type="checkbox"/> 08	<input checked="" type="checkbox"/> 09	<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> 11	<input checked="" type="checkbox"/> 12
<input checked="" type="checkbox"/> 13	<input checked="" type="checkbox"/> 14	<input checked="" type="checkbox"/> 15	<input checked="" type="checkbox"/> 16	<input checked="" type="checkbox"/> 17	<input checked="" type="checkbox"/> 18
<input checked="" type="checkbox"/> 19	<input checked="" type="checkbox"/> 20	<input checked="" type="checkbox"/> 21	<input checked="" type="checkbox"/> 22	<input checked="" type="checkbox"/> 23	<input checked="" type="checkbox"/> 24
<input checked="" type="checkbox"/> 25	<input checked="" type="checkbox"/> 26	<input checked="" type="checkbox"/> 27	<input checked="" type="checkbox"/> 28	<input checked="" type="checkbox"/> 29	<input checked="" type="checkbox"/> 30
<input checked="" type="checkbox"/> 31					

[Clear all](#)

### Time ?

<input checked="" type="checkbox"/> 00:00	<input type="checkbox"/> 01:00	<input type="checkbox"/> 02:00	<input type="checkbox"/> 03:00	<input type="checkbox"/> 04:00	<input type="checkbox"/> 05:00
<input type="checkbox"/> 06:00	<input type="checkbox"/> 07:00	<input type="checkbox"/> 08:00	<input type="checkbox"/> 09:00	<input type="checkbox"/> 10:00	<input type="checkbox"/> 11:00
<input type="checkbox"/> 12:00	<input type="checkbox"/> 13:00	<input type="checkbox"/> 14:00	<input type="checkbox"/> 15:00	<input type="checkbox"/> 16:00	<input type="checkbox"/> 17:00
<input type="checkbox"/> 18:00	<input type="checkbox"/> 19:00	<input type="checkbox"/> 20:00	<input type="checkbox"/> 21:00	<input type="checkbox"/> 22:00	<input type="checkbox"/> 23:00

[Select all](#) [Clear all](#)

### Geographical area ?

☐ Whole available region

With this option selected the entire available area will be provided

☒ Sub-region extraction ?

North  
43

West  
-33

East  
-23

South  
33

### Format

☐ GRIB

☒ NetCDF (experimental)

[Clear all](#)

### Terms of use

☒ Licence to use Copernicus Products [View terms](#)

Show API request

Show Toolbox request

Submit Form

## Step-6:

After the successful submission of the form, you will see the request on the next page, and the status will be “**In Process**”. The dataset will be ready for download after 1 to 2 minutes and you will see the green “**Download**” button in the status. You can also view all of your previous data requests from the “**Your requests**” option in the top menu.

[Home](#) [Search](#) [Datasets](#) [Applications](#) [Your requests](#) [Toolbox](#) [Support](#) [Live](#)

### Your requests

To improve our service, we need to hear from you! Please complete [this very short survey](#). Thank you.

[All](#) [Queued](#) [In progress](#) [Failed](#) [Unavailable](#) [Complete](#)

Auto refreshed : 21:26:47 [Delete selected](#)

Product	Submission date	End date	Duration	Size	Status	
▶ ERA5 hourly data on single levels from 1940 to present	2023-06-11 18:27:47	2023-06-11 18:29:20	0:01:32	8.6 MB	<a href="#">Download</a>	<input type="checkbox"/>
▶ ERA5 hourly data on single levels from 1940 to present	2023-06-11 18:21:02	2023-06-11 18:22:54	0:01:51	9.8 MB	<a href="#">Download</a>	<input type="checkbox"/>