

Using KNMI radar data for catchment hydrology

Claudia Brauer, Hydrology and Environmental Hydraulics Group, Wageningen University

This readme gives instructions on how to download some KNMI datasets, extract a certain area and preprocess them to time series for studies in (catchment) hydrology.

1. Determine which dataset you need

All public radar datasets are published on the KNMI Data Platform. The file [overview radar products KNMI.xlsx](#) lists the different products, with main specifications, references to background information and recommendations for certain applications.

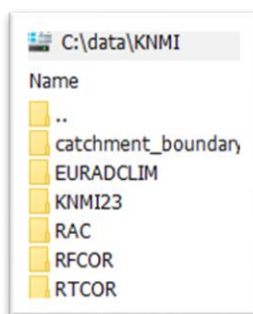
Specific examples below are made for the following commonly used products:

- **IRC RTCOR**: for real-time applications.
- **IRC RFCOR**: for offline studies after 2018. (For 2018-2022 it's not known whether RAC or IRC RFCOR is better.)
- **RAC**: for offline studies (starting) before 2018.
- **EURADCLIM**: for studies (partly) outside the Netherlands.
- **KNMI'23** climate scenarios (not radar but model output).

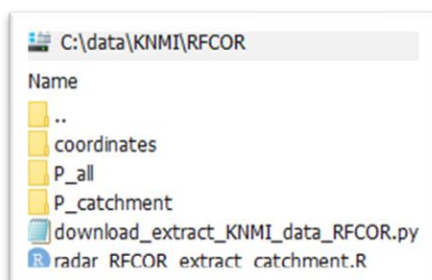
2. File structure

Make one folder for each dataset you want. If you download the zip file, the file structure is already included. Pick a location with enough storage space (for example: the IRC data need 55 GB for each year of data) and with a simple path. Add a folder for the catchment boundary (see Section 4).

For example:



In the folder for each dataset are the following files and subfolders:



In Section 3 you will put the h5 or nc files with data from the whole country in the folder [P_all](#), using the python script. In Section 4 you will use the R script, spatial information about the pixel locations

and catchment boundary to extract the pixels (locations stored in [coordinates](#) subfolder) and data belonging to those locations (stored in [P_catchment](#) subfolder). For EURADCLIM, the coordinates are provided in a separate zip folder. Extract this file and paste it in the [EURADCLIM/coordinates](#) subfolder.

3. Downloading data

For most datasets (see the overview excel file for exceptions), you need to download data from the KNMI Data Platform through an API, using an API key. If you only want to download data once or a few times, you can use the anonymous API key published on <https://developer.dataplatform.knmi.nl/open-data-api#token>.

The anonymous key has an expiration date, so you may have to update it. The key looks something like this:

```
eyJvcmcilOil1ZTU1NGUxOTI3NGE5NjAwMDEyYTNiYjEiLCJpZCI6ImE1OGI5NGZmMDY5NDRhZDNhZjFkMDBBmNDBmNTQyNjBkliwiaCI6Im11cm11cjEyOCJ9
```

Use the python script [download_extract_KNMI_data_....py](#) to download the data. Install a python editor (for example Spyder) first if needed. Specify which dataset and which period with the API key. It may be necessary to download the data into in a folder with a simple path (e.g. no spaces).

If the loop for downloading stops often, it may be because it's too much for the anonymous API key. You can request a personal key (easy and free) through the link above > click [API catalogue](#) > under [Open Data API](#), click [Request an API key](#). You may have to make an account first.

For EURADCLIM, the files are combined per year in a zip file available from the [Preview](#) page on the KNMI Data Platform, so no API download is needed. Extract the zip file in the [P_all](#) folder.

4. Extracting catchment

Use the R script [radar_..._extract_catchment.R](#) to extract a certain area from the radar dataset following the steps below.

Put a shape file (at least three files with the same name and extensions .dbf, .shp and .shx together) of the catchment boundary in the folder [catchment_boundary](#). The default is a shapefile in Rijksdriehoekskoordinates (RD), which for some datasets is reprojected to lat-lon in the script. Instead of cutting out a catchment area, you can cut out a rectangle. The entire country is within 3.3-7.5 degrees east and 50.7 and 53.6 degrees north. This option is commented in the script.

Specify which period you want in the R script. R reads the h5 or nc files one by one, extracts the pixels inside the catchment and stores those values in a dataframe. Note that this can take quite some time: for example 1 hour for 1 year of IRC data. The result is four .dat files: 5-minute and hourly rainfall sums of each pixel and 5-minute and hourly catchment average rainfall sums. These four files are stored in the [P_catchment](#) folder. The size of a file with one year of 5-min sums per pixel for a catchment of 100 km² (so 100 pixels) is about 50 MB. Locations and IDs from the extracted pixels and a map are saved in the [coordinates](#) folder.

Please check if the values match other observations. You can for example download hourly data from a nearby automatic weather station or daily data from a manual raingauge from www.knmi.nl/klimatologie.