

# Step-by-step guidelines for using the Climate explorer for analysis of station data, re-analysis and climate model data

## Examples with precipitation data

(for the IS-ENES3 spring school in Romania, May 2022)

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### Explanation

**Bold**: indicates the section on the web page or in the column at the right

Underlined: click on this/select this option

## Find and analyse station data for precipitation for Cluj-Napoca in Romania

1. Go to <https://climexp.knmi.nl/start.cgi> (use Chrome as a browser)
2. Login through “[log in or register](#)” (just above the map on the home page)
3. Go to [Select a time series](#) and click on [Daily station data](#) in the right column
4. Select the data set that you want to use (we suggest Blended ECA&D for this case), select “precipitation”. Under [Select](#) fill in “Cluj” after “stations with a name containing”
5. Then click on [Get stations](#) lower on the same page. On the page that will appear you will find the following information:

New variable:  of

Threshold:   absolute value

Minimum:  % valid data

First apply:  -day running mean

Missing data:  ignore,  climatology,  trend,  persistence.

[make new set of time series](#)

**Aggregate this set of time series**

Type:

[make time series](#)

[View, upload your time series](#)

**Select a field**

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly CMIP6 scenario runs
- > Monthly CORDEX scenario runs
- > Attribution runs
- > View, upload your field

**Investigate this set of time series spatially**

- > Make a map/export kml

Looking for stations with substring CLUJ

Found 1 stations

CLUJ\_NAPOCA (RO)

coordinates: 46.78N, 23.57E, 410.0m

ECA station code: 222 ([get data](#))

Found 99 years of data in 1923-2021

6. Click on get [data under](#) CLUJ\_NAPOCA (RO) and you will get the following page. If you scroll down you will get some information on mean, percentiles, missing data (1 missing value in 2020, which we will ignore for the rest of this example). Before continuing with the dataset, check available information on homogeneity (see separate paragraph on this in this document)

daily CLUJ NAPOCA precipitation

Retrieving data from [ECA&D v1.1 database](#) ...

If it takes too long you can abort the job here (using the [back] button of the browser does not kill the data extraction job)

rr [mm/day] 24-hr summed precipitation, coordinates: 46.78N, 23.57E, 410.0m; ECA station code: 222 CLUJ NAPOCA RO, ([eps](#), [pdf](#), [metadata](#), [raw data](#), [netcdf](#))

Annual cycles, computed with all data available (Jan-Dec: [eps](#), [pdf](#), [raw data](#)., Jul-Jun: [eps](#), [pdf](#), [raw data](#)).

**Select a field**

- > Daily climate indices
- > Monthly station data
- > Monthly climate indices
- > Annual climate indices
- > View, upload your time series

**Select a field**

- > Daily fields
- > Monthly observations
- > Monthly reanalysis fields
- > Monthly and seasonal historical reconstructions
- > Monthly seasonal hindcasts
- > Monthly CMIP3+ scenario runs
- > Monthly CMIP5 scenario runs
- > Annual CMIP5 extremes
- > Monthly CMIP6 scenario runs
- > Monthly CORDEX scenario runs
- > Attribution runs
- > View, upload your field

## Calculate trends

7. To see whether there is a trend in average annual rainfall, go to [Create a lower resolution time series](#) and select as in the figure below. Then click on [make a new time series](#)

Create a lower resolution time series

New time scale:

New variable:  of CLUJ NAPOCA rr

Threshold:

Minimum:  % valid data

First apply:  -day running mean

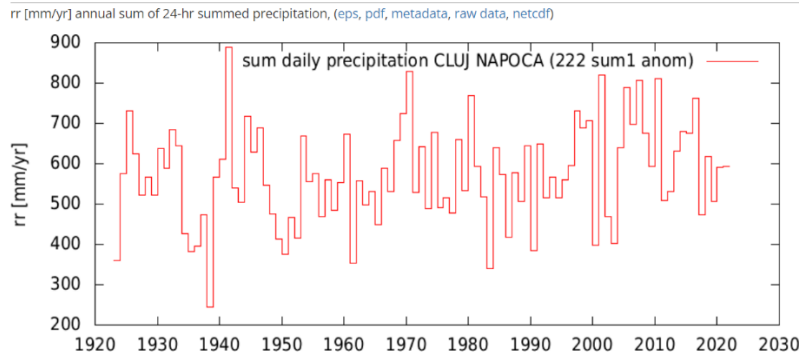
Missing data:  ignore,  climatology,  trend,  persistence.

8. You will get the following figure:

### Time series

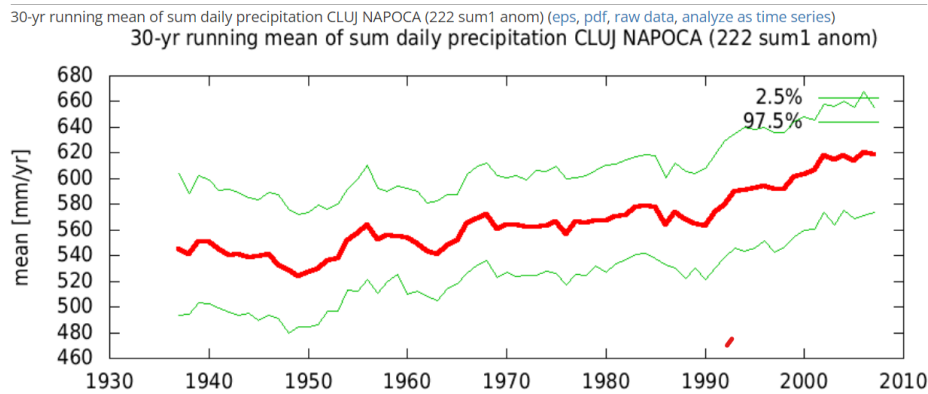
annual CLUJ NAPOCA sum daily precipitation

Retrieving data ...



- Go to [Investigate this time series](#) in the right column and click on [Running mean/s.d./.....](#). In the next screen after “window” fill in 30 (moving 30-year average) and click on [Compute](#).
- You will get, among others, the following information. The average annual rainfall has increased from around 540 mm/y to around 620 mm/y.

Probability that the distribution is a chance fluctuation around a constant		
statistic	value	p-value
minimum	523.87	0.1290
maximum	620.39	0.1593
difference	96.52	0.0471



11. If you go back to step 7 and select seasonal instead of annual (Jan-Dec), you can also investigate the trends in seasonal rainfall amounts. Then, in step 9 you will get a slightly different menu, which now also includes **Starting season**: select the season that you want to investigate (see below). You will see that the largest changes (in mm) can be observed in summer (JJA) and autumn (SON).

Compute running mean, standard deviation, skewness, ...

Running:

Window:  years, with at least  years with data

Starting season:

Season:  over  seasons

Anomalies:  subtract seasonal cycle

Years:  -

Only for:  < sum\_daily\_precipitation <

Apply:  logarithm,  sqrt to sum\_daily\_precipitation CLUJ NAPOCA

Detrend:  detrend everything

Filters:  take year-on-year differences

subtract mean of  previous years

Decorrelation scale:  seasons

## Calculate climatological averages

12. Go back to step 6 where you had the complete time series with daily data
13. Go to **Manipulate this time series**, and indicate that you want only the period 1991-2020 (see below) and click on [select](#)

Manipulate this time series

Select years:  -

Make index:

Filter adjacent days   filter  
cut-off value  days

14. In the next screen go to **Create a lower resolution time series** at the bottom. To calculate the climatological average annual rainfall select [annual \(Jan-Dec\)](#) and [sum](#) and click on [make new time series](#) (to calculate the seasonal averages, select [seasonal](#) after **New time scale**)

Create a lower resolution time series

New time scale:

New variable:  of CLUJ NAPOCA rr

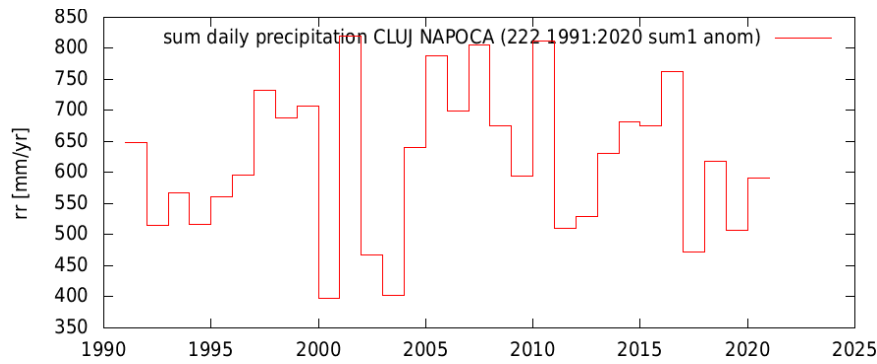
Threshold:

Minimum:  % valid data

First apply: -month running mean

Missing data:  ignore,  climatology,  trend,  persistence.

15. You will get the following graph (among others).



16. Go to [Investigate this time series](#) in the right column and click on [Running mean/s.d./.....](#) In the next screen after “window” fill in 30 (moving 30-year average) and click on [Compute](#).

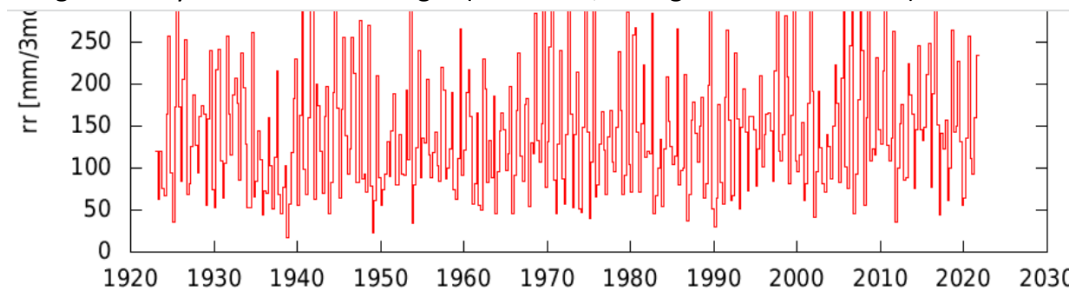
17. You will get, among others, the following information.

Probability that the distribution is a chance fluctuation around a constant		
statistic	value	p-value
minimum	620.36	0.4807
maximum	621.38	0.5009
difference	1.01	0.0013

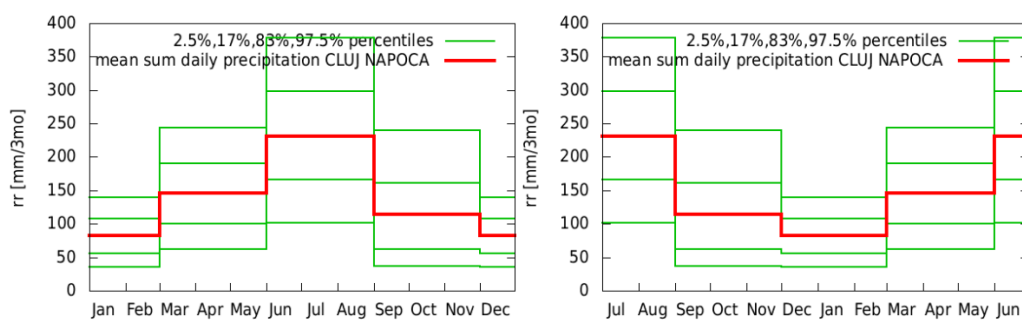
Demanding at least 24 years in a sliding window of 30 years

moment	value	95% CI
mean	620.4	577.3 ... 666.4

18. If you select [seasonal](#) in step 14 and click on [Make new time series](#), in the next screen you will get already the seasonal averages (see below, the figures at the bottom)



Annual cycles, computed with all data available (Jan-Dec: [eps](#), [pdf](#), [raw data](#)., Jul-Jun: [eps](#), [pdf](#), [raw data](#)).



19. If you click on raw data on top of the figure, you can obtain the data behind the figure

```

# Climatology of ./data/bpeca222_sum4_anom.dat
# climexp_url :: https://climexp.knmi.nl/ecaprcp.cgi?WMO=222
# comment :: \n
# contact_email :: eca@knmi.nl
# description :: 222
# elevation :: 410.0 m
# ensemble :: metadata is from ensemble member 0 but data from the full ensemble 0 to 0
# file :: ./data/bpeca222_sum4_anom.dat
# history :: 2022-03-28 12:35:47 ./bin/climatology ./data/bpeca222_sum4_anom.dat\n 2022-03-28 12:35:47 dat2nc ./data/bpeca222_sum4_anom.dat bpeca CLUJ_NAPOCA
./data/bpeca222_sum4_anom.nc\n 2022-03-28 12:35:47 bin/daily2longer data/bpeca222.dat 4 sum add_anom 222_sum4_anom\n 2022-03-28 11:27:36 dat2nc ./data/bpeca222.dat p 222
./data/bpeca222.nc.10979\n 2022-03-28 11:27:34 ./ECADdata/becaprcp 222\n
# institution :: KNMI Climate Explorer and KNMI
# latitude :: 46.78 degrees_north
# license :: Data is strictly for non-commercial research and education only. See http://www.ecad.eu/documents/ECAD_datapolicy.pdf
# longitude :: 23.57 degrees_east
# olderfile :: /data/volume_3/climexp/data/bpeca222.dat
# reference :: Klein Tank et al. (2002) Daily dataset of 20th-century surface air temperature and precipitation series for the European Climate Assessment, Intern. J. Climatol.
22:1441-1453. doi:10.1002/joc.773
# scripturl01 :: http://climexp.knmi.nl/becaprcp.cgi?STATION=CLUJ_NAPOCA&WMO=222&id=$id
# scripturl02 :: http://climexp.knmi.nl/daily2longer.cgi?
EMAIL=$id&NAME=precipitation&NPERYEAR=366&STATION=CLUJ_NAPOCA&TYPE=bpeca&WMO=222&addoption=add_anom&nperyearnew=4&oper=sum&sum=1
# source_url :: http://www.ecad.eu/
# station_code :: 222
# station_country :: RO
# station_metadata :: http://www.ecad.eu/utills/stationdetail.php?stationid=222
# station_name :: CLUJ_NAPOCA
# timestamp :: Mon Oct 4 11:43:16 2021
#2000 + date      mean      2.5%      17%      50%      83%      97.5%
19991201         82.4355    35.0750    55.5650    81.1992    108.103   140.073
20000301         145.599     62.6825    99.8980    144.899    190.270   244.155
20000601          230.528    102.060    166.295    223.098    297.870   378.505
20000901          113.898     36.3250    62.1680    108.400    161.368   239.740
20001201          82.4355    35.0750    55.5650    81.1992    108.103   140.073

```

Calculate the trend in average maximum 1 day precipitation per year and the average for the current climate (1991-2020)

20. Go back to step 6

21. In the next screen go to [Create a lower resolution time series](#) at the bottom. To calculate the average maximum 1 day precipitation per year select [annual \(Jan-Dec\)](#) and [max](#) and click on [make new time series](#)

Create a lower resolution time series

New time scale:

New variable:  of CLUJ\_NAPOCA rr

Threshold:

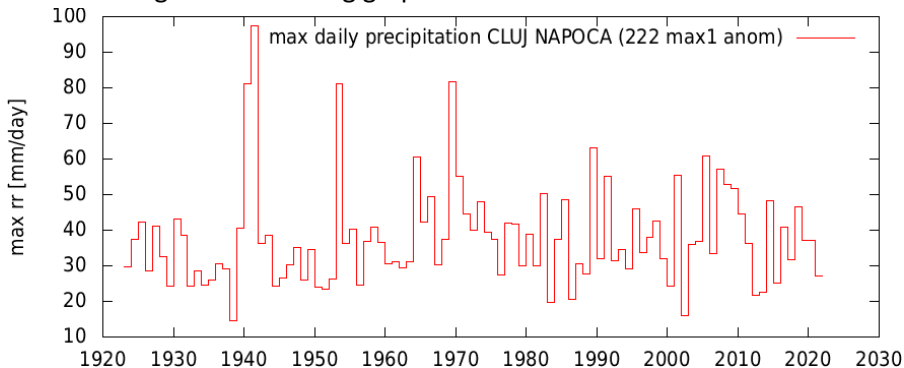
Minimum:  % valid data

First apply:  -day running mean

Missing data:  ignore,  climatology,  trend,  persistence.

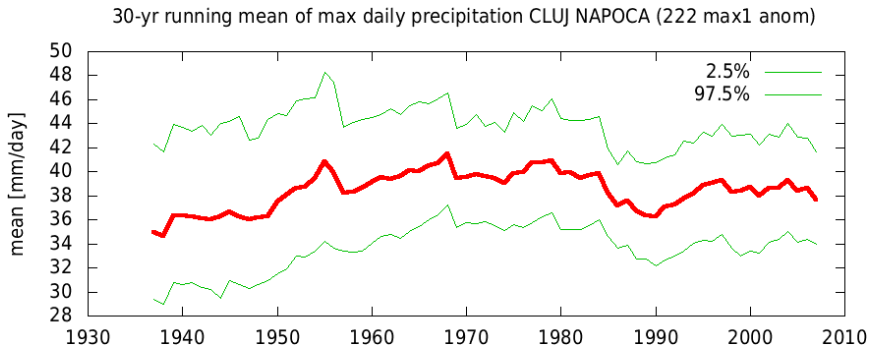
[make new time series](#)

22. You will get the following graph



23. Go to [Investigate this time series](#) in the right column and click on [Running mean/s.d./.....](#) In the next screen after “window” fill in 30 (moving 30-year average) and click on [Compute](#).

24. You will get, among others, the following graph. There doesn't seem to be a clear trend in the maximum annual 1-day precipitation



25. Go back to step 22 where you had the time series with the annual maximum 1-day rainfall
26. Go to [Manipulate this time series](#), and indicate that you want only the period 1991-2020 (see below) and click on [select](#)
27. Go to [Investigate this time series](#) in the right column and click on [Running mean/s.d./.....](#). In the next screen after “window” fill in 30 (moving 30-year average) and click on [Compute](#).
28. You will get, among others, the following information.

Probability that the distribution is a chance fluctuation around a constant		
statistic	value	p-value
minimum	38.60	0.5084
maximum	38.65	0.4806
difference	0.05	0.0013

Demanding at least 24 years in a sliding window of 30 years

moment	value	95% CI
mean	38.60	34.30 ... 42.70

## Download data

29. Go back to the screen in step 6
30. Scroll down to [Manipulate this time series](#), indicate that you want the data for the period [1990 to 2019](#) (the same as available for temperature), and click on [Select](#)
31. On top of the figure in the next screen, you can click on [raw data](#) (just above the figure) and you will get the next screen.

```

# Searching for GHCND series nr ROE00100902
# coordinates: 46.78N, 23.57E, 410.0m; GHCN-D station code: ROE00100902 CLUJ_NAPOCA Romania
# WMO station 15120
# excluding GTS observations
# file :: /data/volume_2/climexp/data/pgdcnROE00100902.dat
# description :: ROE00100902
# institution :: KNMI Climate Explorer and NOAA/NCEI
# source_url :: https://catalog.data.gov/dataset/global-historical-climatology-network-daily-ghcn-daily-version-3
# source_doi :: https://doi.org/10.7289/V5D21VHZ
# contact_email :: ncdc.ghcnd@noaa.gov
# reference :: Matthew J. Menne, Imke Durre, Russell S. Vose, Byron E. Gleason, and Tamara G. Houston, 2012: An Overview of the Global Historical Climatology Network-Daily Database. J. Atmos. Oceanic Technol., 29, 897-910. doi:10.1175/JTECH-D-11-00103.1.
# license :: U.S. Government Work. The non-U.S. data cannot be redistributed within or outside of the U.S. for any commercial activities.
# station_code :: ROE00100902
# station_name :: CLUJ_NAPOCA
# station_country :: Romania
# wmo_code :: 15120
# latitude :: 46.78 degrees_north
# longitude :: 23.57 degrees_east
# elevation :: 410.0 m
# climexp_url :: https://climexp.knmi.nl/gdcnprcp.cgi?WMO=ROE00100902
# scripturl01 :: http://climexp.knmi.nl/gdcnprcp.cgi?STATION=CLUJ_NAPOCA&WMO=ROE00100902&id=$id
# timestamp :: Mon Oct 4 00:15:27 2021
# comment ::
# scripturl02 :: http://climexp.knmi.nl/selectyear.cgi?email=$id&file=pgdcnROE00100902.dat&name=precipitation&station=CLUJ_NAPOCA&type=pgdcn&wmo=ROE00100902&yr1=1990&yr2=2019
# history :: 2022-04-07 12:20:12 bin/selectyear 1990 2019 data/pgdcnROE00100902.dat ROE00100902_1990:2019\n 2022-04-07 12:15:47 dat2nc ./data/pgdcnROE00100902.dat p
ROE00100902 ./data/pgdcnROE00100902.nc.3281024\n 2022-04-07 12:15:46 ./GDNCData/gdcnprcp ROE00100902\n
# PRCP [mm/day] precipitation
19900101 0.000000
19900102 0.000000
19900103 0.600000
19900104 0.000000
19900105 0.000000
19900106 0.000000
19900107 0.000000
19900108 0.100000
19900109 0.000000
19900110 0.000000
19900111 0.000000

```

32. On top you will find metadata and lower in the file you will find the daily data. By clicking on the right side of your mouse to can save this file on your own computer.

## Find and analyse gridded observational data for precipitation for Cluj-Napoca in Romania

1. Go to <https://climexp.knmi.nl/start.cgi> (use Chrome as a browser)
2. Login through “[log in or register](#)” (just above the map on the home page)
3. Go to **Select a field** and click on [Daily fields](#) in the right column
4. On the next page, go to the part under **Observations**

Observations	Tmean	Tmax	Tmin	Prcp	SLP	Glob. Rad.	Elev	
CPC 0.5° global 1979-now				X,X				<a href="#">i</a>
CPC 0.25° CONUS 1948-now				X,X				<a href="#">i</a>
GPCC 1° 1988-now				X,X				<a href="#">i</a>
GPCP v1.3 1° 1997-now				X				<a href="#">i</a>
CMORPH 0.5° 1998-now				X				<a href="#">i</a>
CHIRPS 2.0 Africa 0.25° 1981-now				X				<a href="#">i</a>
KNMI Radar 1km 2009-Feb2019				X				<a href="#">i</a>
GPM IMERG V06 2000-now				0.5°, 0.2°				<a href="#">i</a>
UMD/NCEI 1° OLR 1979-now				X				<a href="#">i</a>
Berkeley 1880-now 1° anomalies	X	X	X					<a href="#">i</a>
Berkeley 1880-now 1° full	X	X	X					<a href="#">i</a>
E-OBS 1920-now 0.25° Europe	X	X	X	X	X	X	X	<a href="#">i</a>

5. We are interested in precipitation, therefore we look here for **prcp**. We are interested in a country in Europe and the gridded dataset with observations with the highest spatial resolution for Europe which has precipitation data is **E-OBS 1920-now 0.25° Europe**. Select the X behind this data set for precipitation.
6. You will get a screen where you can select a region or grid point for further analysis. To compare the information with the station data for Cluj-Napoca, we need the location of this station (Latitude 46:46:00, longitude 23:34:00; location generally given with the metadata; convert to decimal degrees). Click on [Make time series](#)

Get grid points, average area or generate subset

Mask:  [add a mask to the list](#) [i](#)

Latitude:  °N -  °N [i](#)

Longitude:  °E -  °E [i](#)

Boundaries:  [i](#)

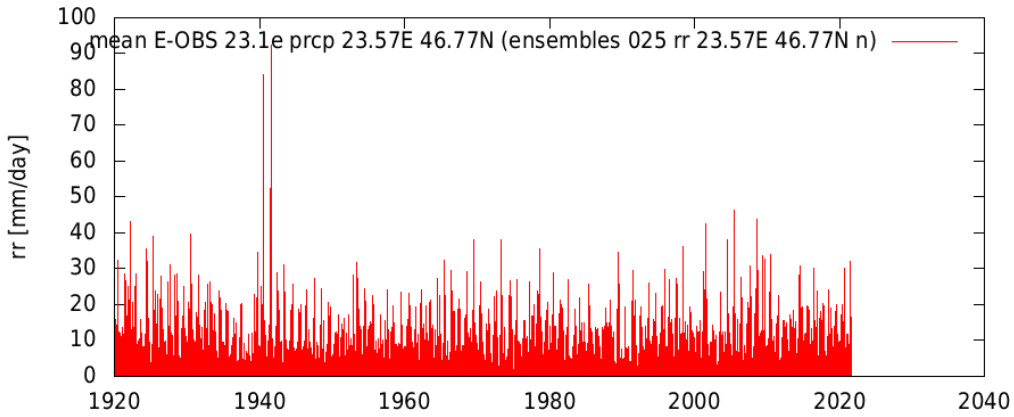
Make:  average  max  min  set of grid points  subset of the field [i](#)

Considering:  everything  land points  sea points [show/hide more](#) [i](#)

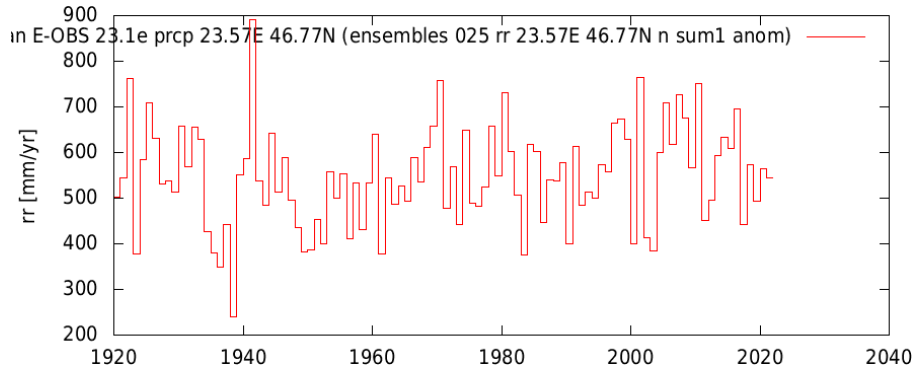
Units:  convert to mm/day  leave in mm/dy [i](#)

[Make time series](#)

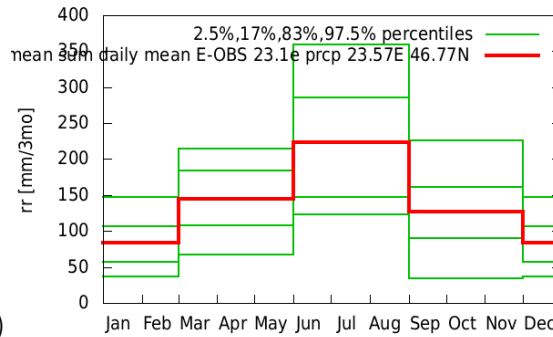
7. This may take some time, but afterwards you will get a screen which starts with “Time series”, and lower on the page will give you among others the following graph



8. With this time series you can do similar analysis as for the station data for Cluj-Napoca (steps 7-32). As you can see in the figure below, the annual rainfall is comparable with the station data and also the distribution over the season.

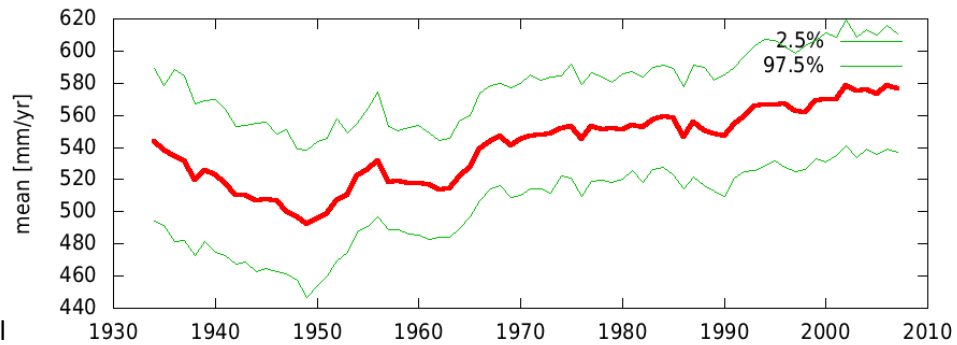


Annual rainfall

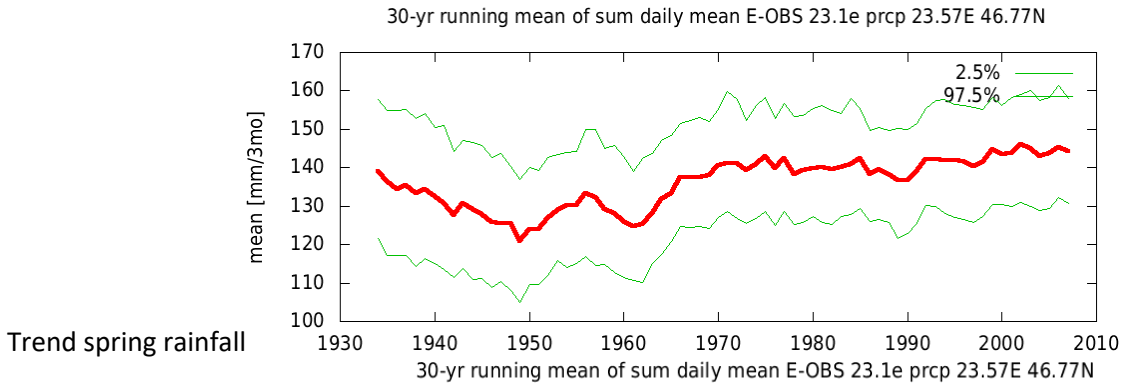


Average rainfall per season (1991-2020)

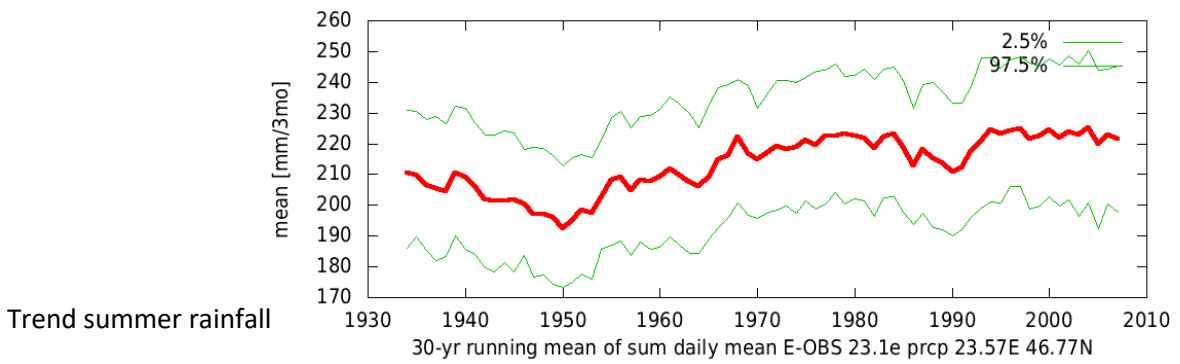
30-yr running mean of sum daily mean E-OBS 23.1e prcp 23.57E 46.77N



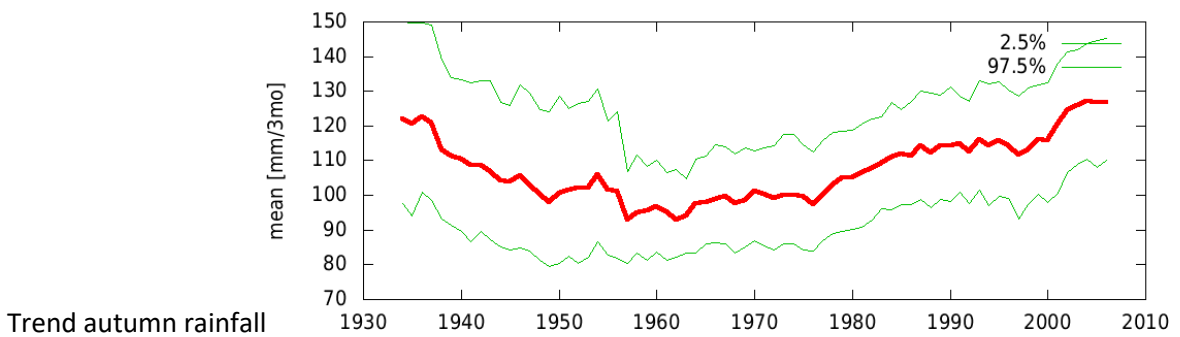
Trend annual rainfall



Trend spring rainfall

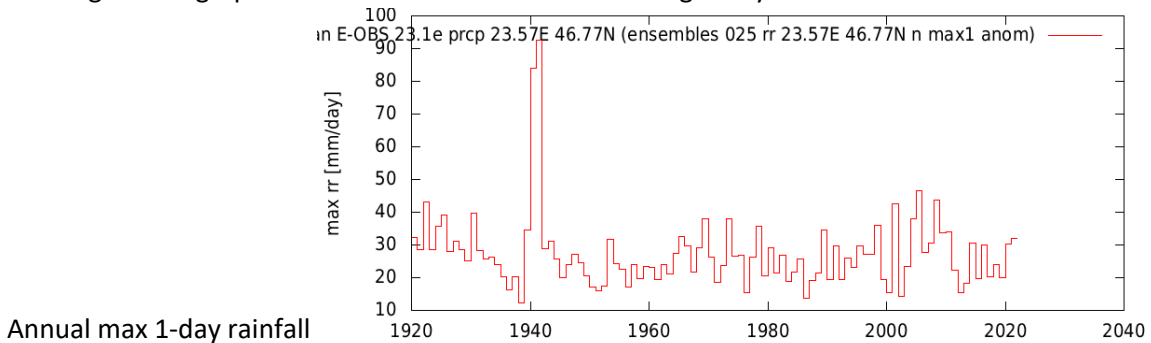


Trend summer rainfall

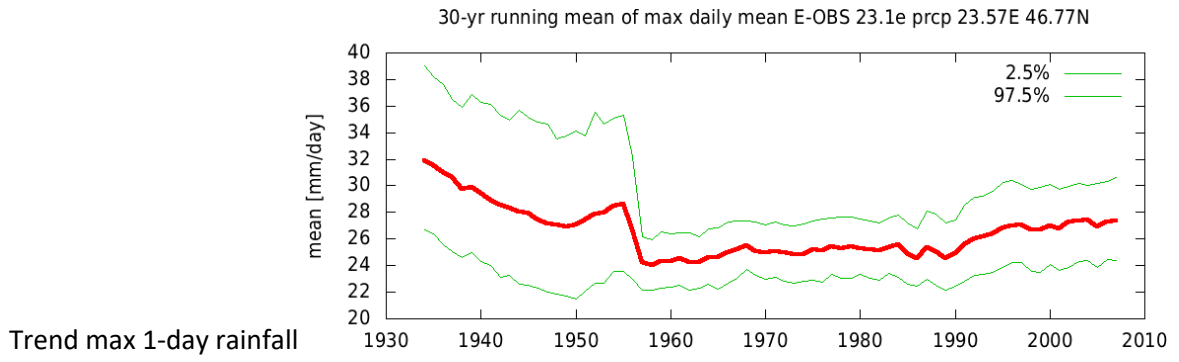


Trend autumn rainfall

Below graphs are shown for the annual maximum 1-day precipitation. When comparing this with the station data, you can see that there are less high extremes, expect for a few around 1940. Gridding of station data may result in smoothing of extremes, especially for rainfall. It is not clear why this did not happen for the 2 extremes around 1940. The 2 extremes around 1940 also result in a strange trend graph. It looks like there is some inhomogeneity in the data.



Annual max 1-day rainfall



## Find and analyse re-analysis data for precipitation for Cluj-Napoca in Romania

1. Go to <https://climexp.knmi.nl/start.cgi> (use Chrome as a browser)
2. Login through “[log in or register](#)” (just above the map on the home page)
3. Go to [Select a field](#) and click on [Daily fields](#) in the right column
4. On the next page, scroll down until you reach the part on [reanalysis](#)

Reanalysis	t2m	prcp	slp	z500	u200	v200	evap	wspd	
NCEP/NCAR 1948-now	X	X	X	X		X			<a href="#">i</a>
ERA5 1950-now 0.5°	X	X	X	X			X	X	<a href="#">i</a>
ERA5 1950-now 0.25° Europe	X	X	X	X			X	X	<a href="#">i</a>
ERA5 1950-now 0.25° Africa	X	X	X	X			X	X	<a href="#">i</a>
ERA5 1950-now 0.25° North America	X	X	X	X			X	X	<a href="#">i</a>
	Tmin	Tmax	Tdew	Twet	sp	t850	pot evap	max wspd	
ERA5 1950-now 0.5°	X	X	X	X	X	X		X	<a href="#">i</a>
ERA5 1950-now 0.25° Europe	X	X	X	X	X	X		X	<a href="#">i</a>
ERA5 1950-now 0.25° Africa	X	X	X	X	X	X		X	<a href="#">i</a>
ERA5 1950-now 0.25° North America	X	X	X	X	X	X		X	<a href="#">i</a>
	t2m	prcp	slp	tmin	tmax	t850	z500	u10,v10	
ERA-20C 1900-2010	X	X	X					X	<a href="#">i</a>
20CR V3 1836-2015	X	X	X	X	X	X	X	X, X	<a href="#">i</a>

5. We are interested in precipitation, therefore we look here for **prcp**. We are interested in a country in Europe and the dataset with the highest spatial resolution for Europe which has precipitation data is **ERA5 1950-now 0.25° Europe**. Select the **X** behind this data set for precipitation.
6. You will get a screen where you can select a region or grid point for further analysis. To compare the information with the station data for Cluj-Napoca, we need the location of this station (Latitude 46:46:00, longitude 23:34:00; location generally given with the metadata; convert to decimal degrees). Click on [Make time series](#)

Get grid points, average area or generate subset

Mask:  [add a mask to the list](#) [i](#)

Latitude:  °N -  °N [i](#)

Longitude:  °E -  °E

Boundaries:

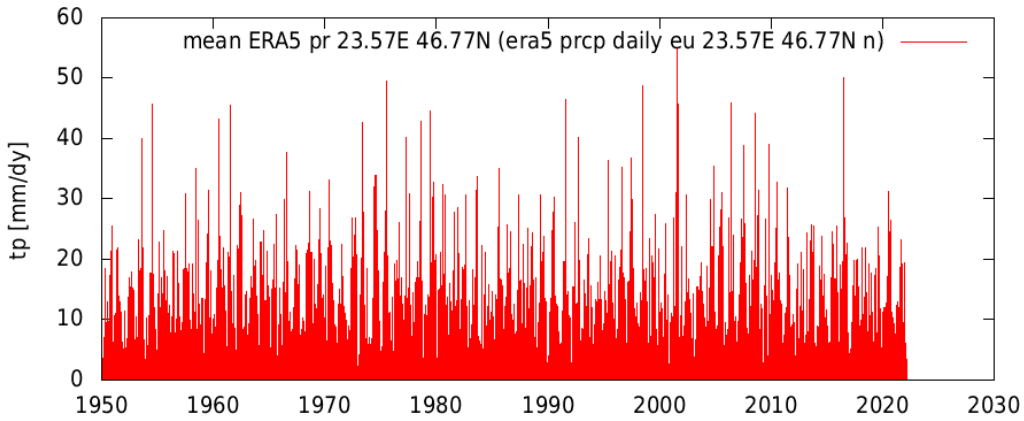
Make:  average  max  min  set of grid points  subset of the field [i](#)

Considering:  everything  land points  sea points [show/hide more](#) [i](#)

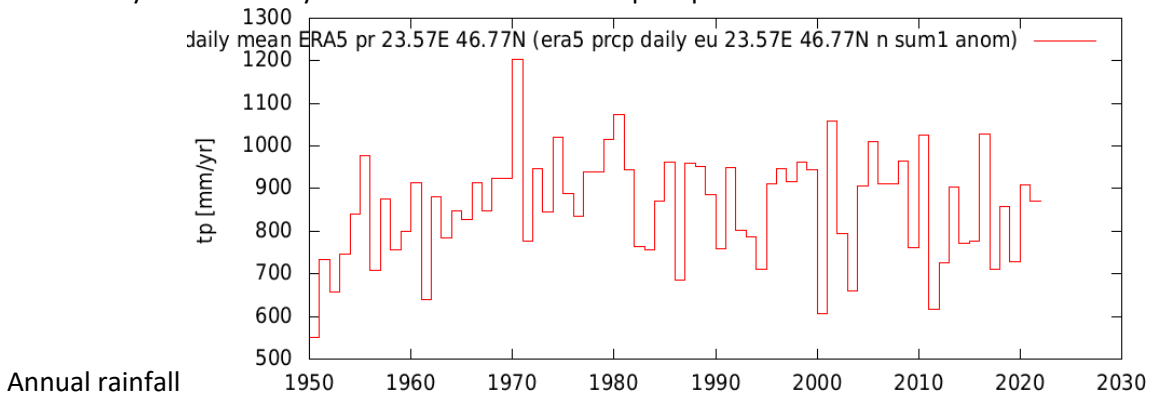
Units:  convert to mm/day  leave in mm/dy [i](#)

Make time series

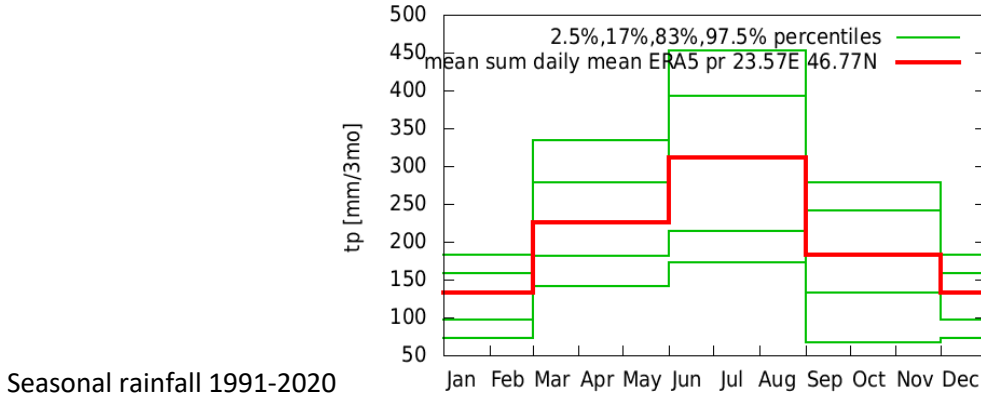
7. This may take some time, but afterwards you will get a screen which starts with “Time series”, and lower on the page will give you among others the following graph



8. With this time series you can do similar analysis as for the station data for Cluj-Napoca (steps 7-32). As you can see in the figure below, the annual rainfall is overestimated in this re-analysis. The distribution though is similar as in the observations (highest in summer, lowest in winter, and in spring somewhat higher than in autumn). It is known that reanalysis is in general better for temperature than for precipitation, since observational data on temperature are used directly in the reanalysis. This is not the case for precipitation.



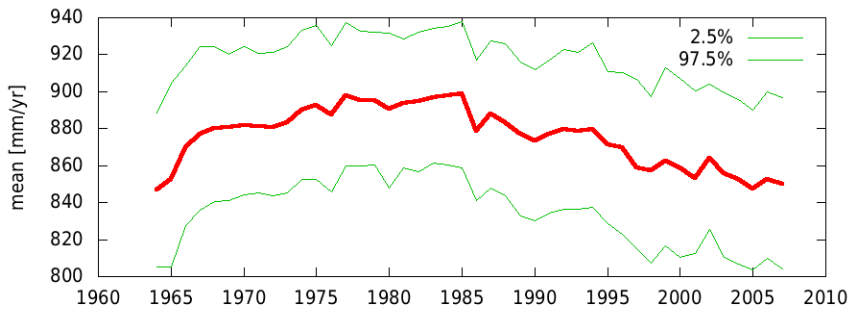
Annual rainfall



Seasonal rainfall 1991-2020

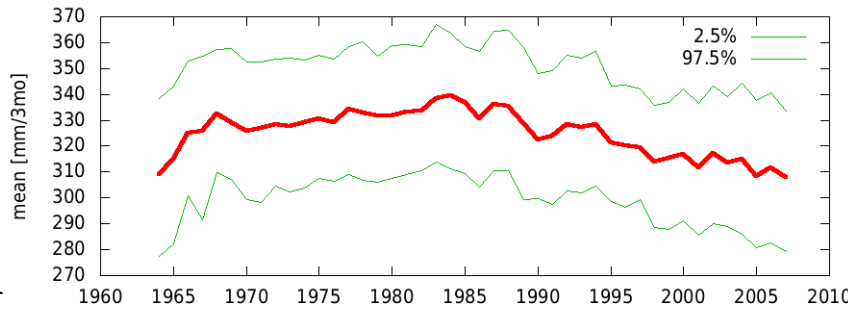
The trend is also not the same as in the observations (clearly less for annual precipitation, no increase in summer precipitation), but for the autumn also an increase is observed as in the observations.

r running mean of sum daily mean ERA5 pr 23.57E 46.77N (era5 prcp daily eu 23.57E 46.77N n sum1 anom)



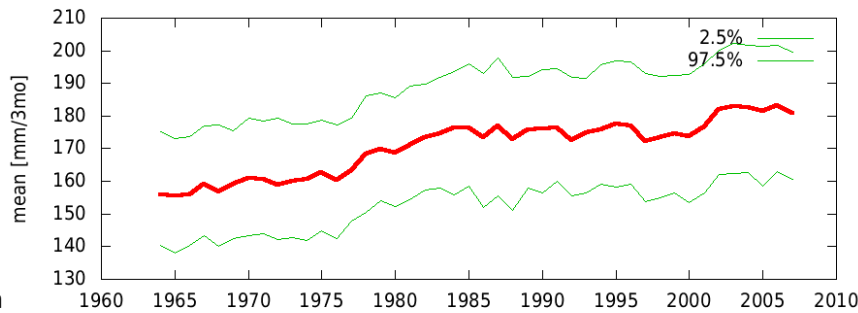
Trend annual

r running mean of sum daily mean ERA5 pr 23.57E 46.77N (era5 prcp daily eu 23.57E 46.77N n sum4 anom)



Trend summer

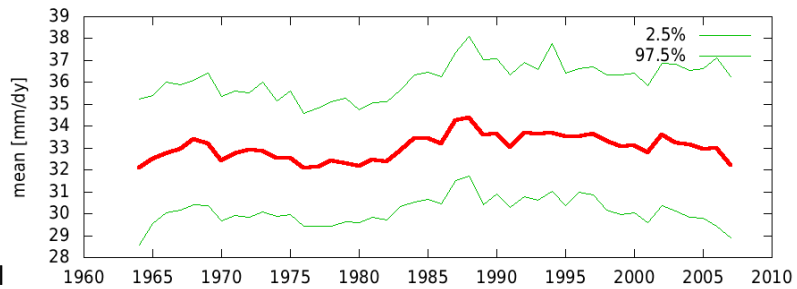
r running mean of sum daily mean ERA5 pr 23.57E 46.77N (era5 prcp daily eu 23.57E 46.77N n sum4 anom)



Trend autumn

The maximum 1-day rainfall does not show a clear trend as in the observations. However, it is slightly lower than in the observations. This is logical, since re-analysis gives area average data and station data give point data. Point data normally give higher values for rainfall.

r running mean of max daily mean ERA5 pr 23.57E 46.77N (era5 prcp daily eu 23.57E 46.77N n max1 anom)



Trend maximum 1-day rainfall

## Find and analyse climate model data for precipitation for Cluj-Napoca in Romania

1. Go to <https://climexp.knmi.nl/start.cgi> (use Chrome as a browser)
2. Login through “[log in or register](#)” (just above the map on the home page)
3. Go to **Select a field** and click on [Daily fields](#) in the right column
4. On the next page, go to the right column and click on [Attribution runs](#)
5. Scroll down to **EC-EARTH 2.3 coupled run** Lower you can also find higher spatial resolution data from the regional climate model RACMO 12 km/EC-EARTH2.3 1950-2100. These are data from the regional climate model RACMO for Europe, run with the global model EC-EARTH at its boundaries. However, data for Romania is just outside the range that is covered in this RCM simulation. Therefore we will use the global climate model EC-EARTH data for this example. We are interested in daily precipitation, therefore we look here for **pr** (here a different abbreviation is used for precipitation!) and **daily** data (16 stands for the number of runs made, an ensemble of 16 members). Select the **X** behind this data set for precipitation. Then click on [Select field](#) at the top of the web page.

RACMO 12km /EC-EARTH2.3 1950-2100	scenario	tas	tas min	tas max	pr		mrso	mrso 1m	mrso 10cm	evap pot	psl
16 daily	RCP8.5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						
16 monthly	RCP8.5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
		<b>RX1day</b>	<b>RX2day</b>	<b>RX3day</b>	<b>RX5day</b>						
16 annual	RCP8.5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						
16 Oct-Mar	RCP8.5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						

6. After some time you will get a screen where you can select a region or grid point for further analysis. To compare the information with the station data for Cluj-Napoca, we need the location of this station (Latitude 46:46:00, longitude 23:34:00; location generally given with the metadata; convert to decimal degrees). Also click on [convert to mm/day](#). Click on [Make time series](#)

Get grid points, average area or generate subset

Mask:  [add a mask to the list](#) [i]

Latitude:  °N -  °N [i]

Longitude:  °E -  °E

Boundaries:

Make:  average  max  min  subset of the field [i]

Considering:  everything  land points  sea points [show/hide more](#) [i]

Units:  convert to mm/day  leave in kg m-2 s-1 [i]

[Make time series](#)

- This may take a considerable time (hour or more), since a lot of data have to be accessed. You will see information on the progress on your screen similar as shown below. Information from the nearest grid point is extracted, but as you can see the grid box that is used is rather large.

Reading day 13865/ 18263 (CPU time 8.9s, wall time 0:00:31)

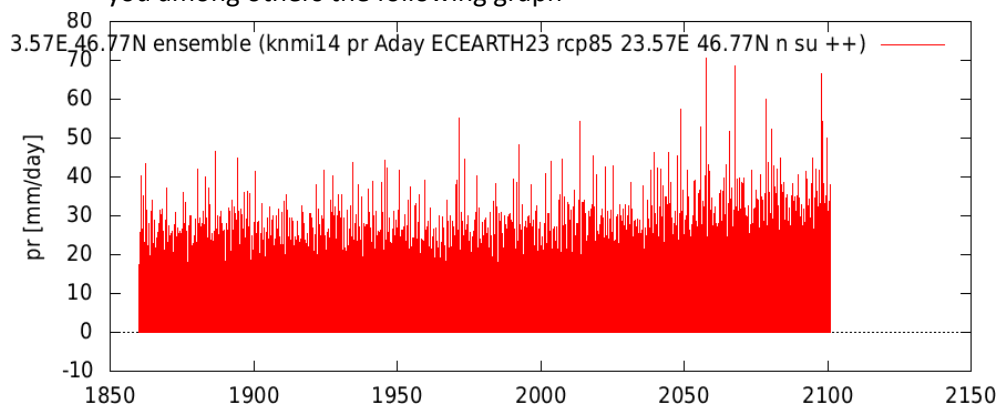
taking grid box region lon= 23.062 24.188, lat= 45.981 47.103

tasmx\_day\_ECEARTH23\_rcp85\_20010101-20501231\_01

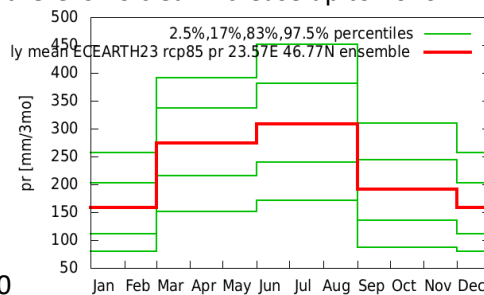
Reading day 15429/ 18262 (CPU time 9.7s, wall time 0:00:31)

taking grid box region lon= 23.062 24.188, lat= 45.981 47.103

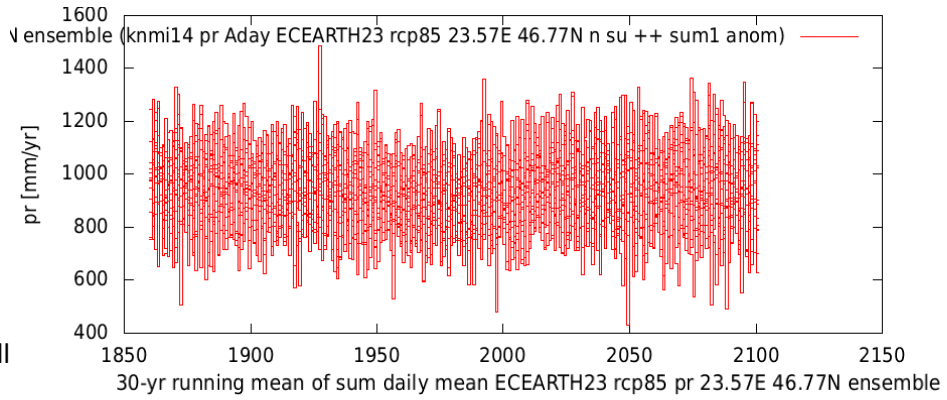
- Afterwards you will get a screen which starts with "Time series", and lower on the page will give you among others the following graph



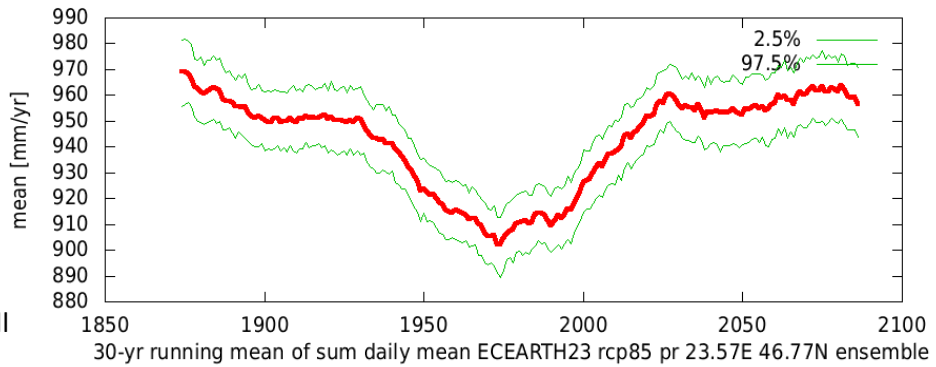
- With this time series you can do similar analysis as for the station data for Cluj-Napoca (steps 7-28). In this case you have data for the period 1860 to 2100 under scenario RCP8.5 (the highest emission scenario). We first look at the annual and seasonal mean rainfall to see how well the model simulates the climate in Cluj Napoca. As you can see in the figure below, the average seasonal rainfall is overestimated (almost 50%), especially in spring (when comparing it to the station data). This underestimation may also be due to the fact that a point is compared with a rather big area with considerable part with mountains. Therefore the estimate for the area as a whole may be less overestimated. In the figure for the trend of annual average rainfall you also see a different trend. In the observations there is a increase all the time, whereas the model shows first shows a decrease in annual rainfall and from about 1970 on an increase again. The trend in annual maximum daily rainfall is increasing in the model data in the historical period, whereas in the observations there is no clear increase up to 2020.



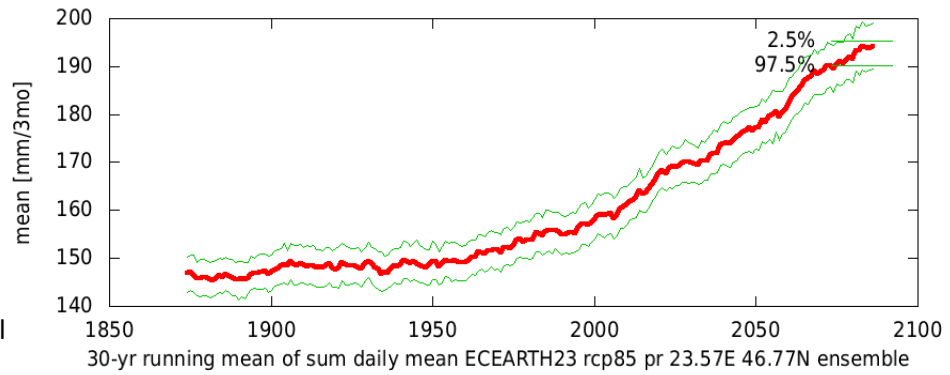
Seasonal avg rainfall sums 1991-2020



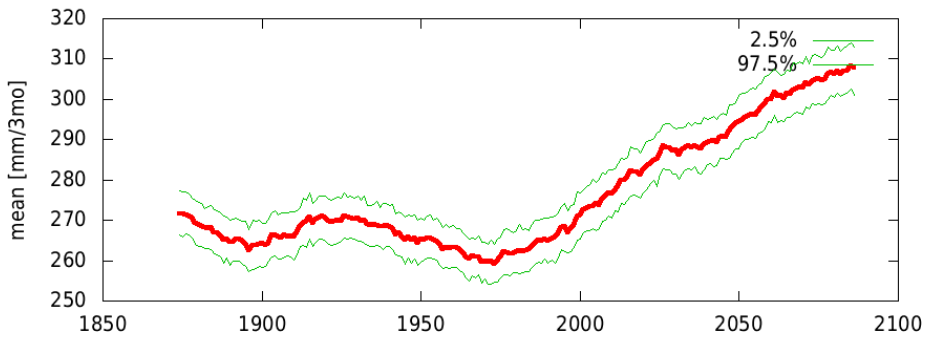
Annual avg rainfall



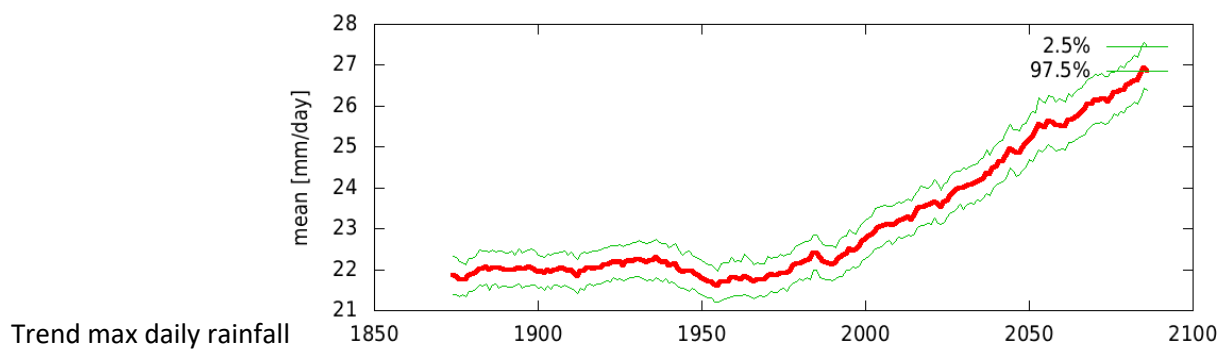
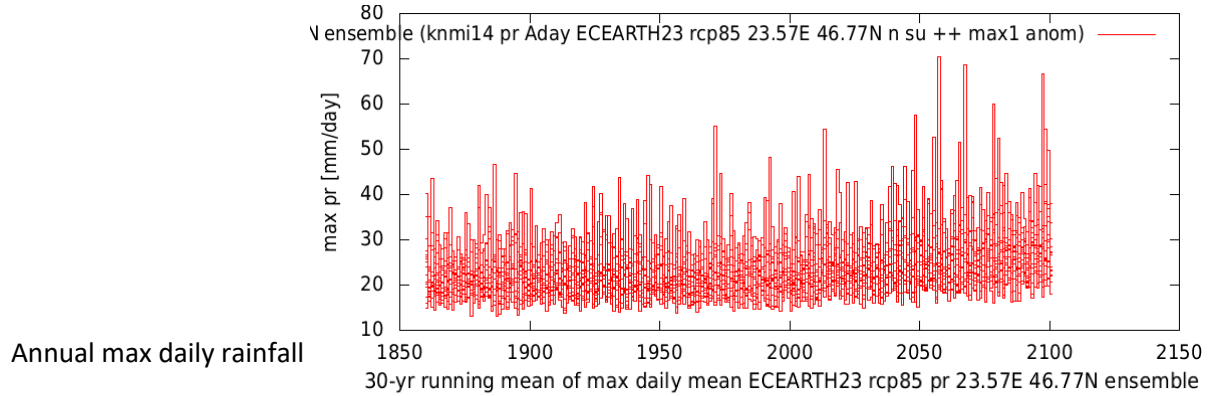
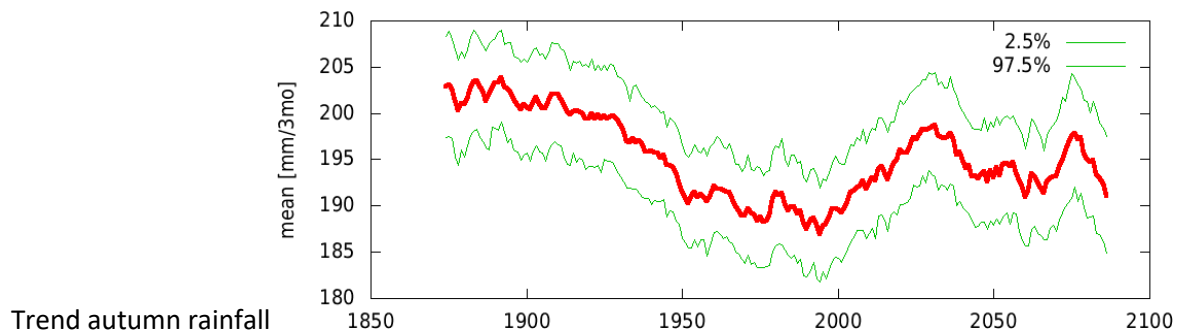
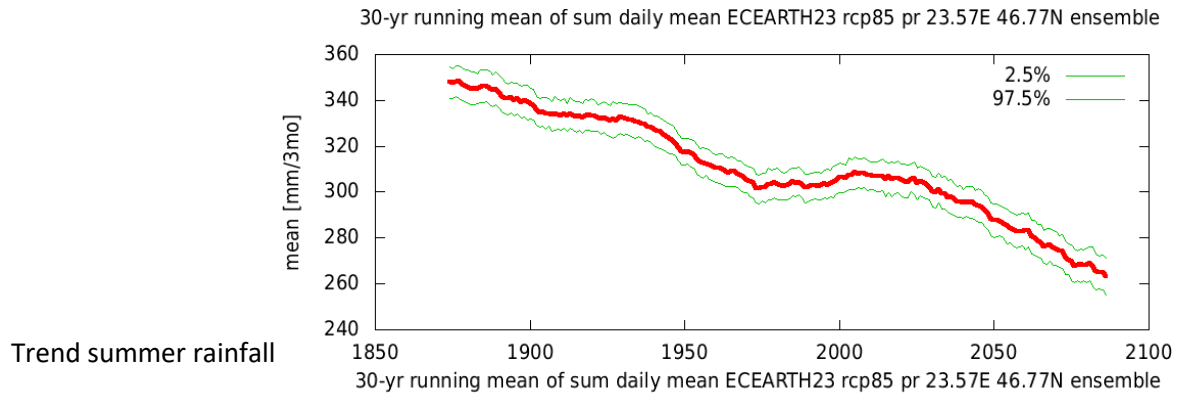
Trend annual rainfall



Trend winter rainfall



Trend spring rainfall



















## Download data

10. To download data, go back to the screen in step 8
11. Scroll down to **Manipulate this time series**, indicate that you want the data for the period [1990 to 2019](#) (the same as available for temperature), and click on [Select](#)

12. On top of the figure in the next screen, you can click on [raw data](#) (just above the figure), and you will get the following screen

## Ensemble members

Time series

number	ascii	netcdf	analyse separately
0			>
1			>
2			>
3			>
4			>
5			>
6			>
7			>

13. Here you can download the data per ensemble member by clicking on the icon behind the ensemble number (the 16 members are numbered here from 0 to 15). Depending on the impact model that you want to use, it may be better to use the ASCII format or the Net-CDF format (standard for spatial + temporal climate data). You can take a direct look at the ASCII data file. On top you will find metadata and lower in the file you will find the daily data in the following format.

```

19900101  0.4988704
19900102  0.6685340
19900103  0.1700269
19900104  0.2084430
19900105  0.3320594
19900106  0.1653135
19900107  0.6319396E-01
19900108  0.5156733E-02
19900109  0.9998232
19900110  0.6874157
19900111  0.9519420E-01
19900112  0.6478438
19900113  2.428894

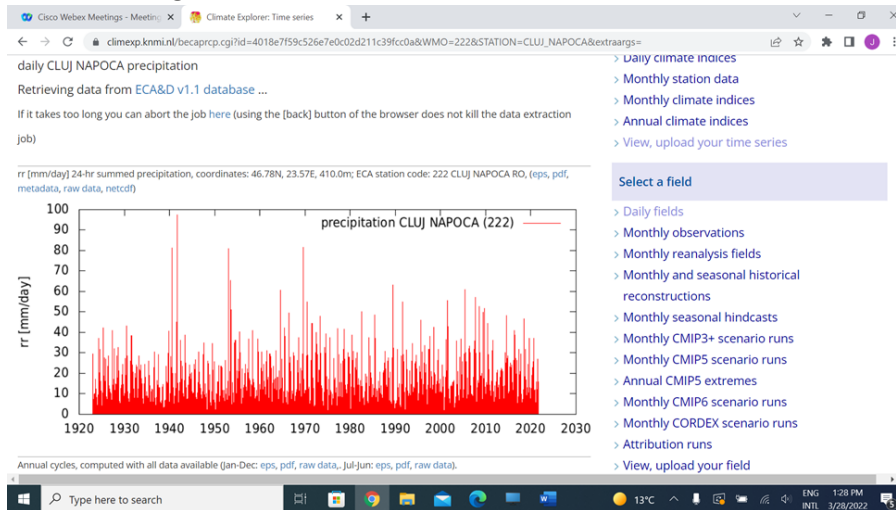
```

(If you take a look at the data, you will see that this climate model run also contains leap years)

14. Save the datafile(s) on your own computer. If you use multiple climate variables, take care that you combine the climate variables from the same ensemble run, since these are consistent with each other at the daily level.

## Check homogeneity of station data

1. Above the first give after selecting a station, you have the possibility to click on [metadata](#) above the first figure



2. If you click on [metadata](#), you will get the following screen

### Metadata

CLUJ\_NAPOCA

References	
Climate Explorer URL	<a href="http://climexp.knmi.nl/becaprcp.cgi?WMO=222&amp;STATION=CLUJ_NAPOCA">climexp.knmi.nl/becaprcp.cgi?WMO=222&amp;STATION=CLUJ_NAPOCA</a>
Climate Explorer filename	data/bpeca222.dat (temporary, will be deleted 3 days after last use)
Variable	
name	rr
units	mm/day
long_name	24-hr summed precipitation
Ascii global metadata	
description	rr [mm/day] 24-hr summed precipitation, coordinates: 46.78N, 23.57E, 410.0m; ECA station code: 222 CLUJ_NAPOCA RO,
institution	KNMI
source_url	<a href="http://www.ecad.eu/">www.ecad.eu/</a>

3. Since we selected this from the blended ECA&D dataset, click on [www.ecad.eu/](http://www.ecad.eu/) for further information
4. You are referred to the ECA&D website. Click on [daily data](#) in the upper part of the screen

The screenshot shows the ECA&D website. At the top, there is a message: 'Some parts of the website are not working properly. We are working on this.' Below this is the ECA&D logo and the text 'European Climate Assessment & Dataset'. At the bottom, there is a navigation bar with links for 'Home', 'FAQ', 'Daily data', 'Indices of extremes', and 'Project info'. Below the navigation bar, there is a 'See also:' section with links to 'KNMI Climate Explorer', 'ICA&D', and 'Copernicus/C35\_311a\_Lot4'.

5. Then go to [custom query \(ASCII\)](#)

<a href="#">Custom query (ASCII)</a>	updated until: Feb 28, 2022
<a href="#">Download predefined subsets (ASCII)</a>	updated until: Feb 28, 2022
<a href="#">Download predefined sets of aggregated indices data (ASCII)</a>	updated until: Feb 28, 2022
<a href="#">E-OBS gridded version of the ECA dataset (netCDF)</a>	updated until: Dec 31, 2020

6. Select the required station and dataset as shown below and click on [Next](#)

Your selection now yields less or equal than 5,000,000 observations. Proceed with the **Next**-button.

Type of series ?	blend	note that synop data are included; see <a href="#">help</a>
Country ?	ROMANIA	1 countries selected
Location ?	CLUJ NAPOCA	1 stations selected
Element ?	Precipitation amount	1 elements selected
<input type="checkbox"/> Additional selection criteria		

7. Select [More details about the series in your selection](#)

**Summary of selection**

This page summarizes your query from the ECA dataset. Click the button to download the data. *More details* gives access to details about the series in your selection.

The exact source of each observation in the **blended** series can be traced back from the first figure of the source ID (SOUID). A source ID starting with 9 indicates synoptical data, whereas 1 indicates participant data.

No changes have been made to the source data from the participants. Only quality codes have been added. More details on the source data are available upon request from [ECA&D Project Team](#).

<b>Country</b>	ROMANIA
<b>Station</b>	Cluj Napoca
<b>Element</b>	Precipitation amount
<b>Period</b>	All available years
<b>Blending</b>	yes

Estimated filesize: **1 Mb**

[Download](#)

**More details about the series in your selection**

If you click on a *station*, available meta data information is shown for that station. Finally, clicking on a *series* provides detailed information about the series.

Country	Station	Element	Begin	End
 ROMANIA	<a href="#">222 CLUJ NAPOCA</a>	<a href="#">RR: Precipitation amount series</a>	1923-01-01	2022-02-28

8. If you click on the element, you will get more information, as shown below.

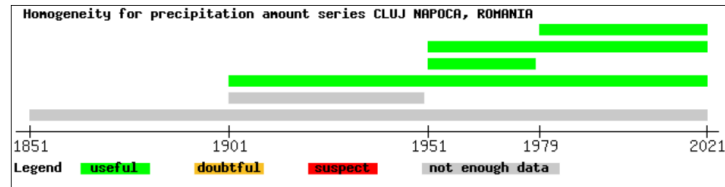
## Detailed information about the selected series and its quality for climate change research

[Close this window](#)

Country	Station	Element
 ROMANIA	222 CLUJ NAPOCA	RR: Precipitation amount series

### Homogeneity test results

The quality for climate change research of each **blended** series was statistically tested. A description of the homogeneity tests that have been applied is given in Project info > [ATBD](#) and in this [helptext](#). The diagram below summarizes the test results for fixed time periods. Only the results for periods with at least 80% data availability are shown.



### Source information

The tables below provide details on the source data that is used to create the **blended** series. The exact source of each observation in the blended series can be traced back from the first figure of the source ID. A source ID starting with 9 indicates synoptical data, whereas 1 indicates participant data. The column "Dheight" is the difference in height (meters) between the main station and the

Source	Par ID	Ele ID	WMO	GSN	Latitude	Longitude	Height	Dheight	Dist	Begin	End
100902 CLUJ NAPOCA, ROMANIA	28	RR4	15120	N	+46:47:00	+23:34:00	410m	0m	0km	19230101	20200930
915120 CLUJ-NAPOCA, ROMANIA	-	RR8	15120		+46:46:00	+23:34:00	411m	1m	2km	19820101	20200229