Introduction to the BtB portal and the EO-based data application

This step-by-step guide will take you through the basic functionality within the portal and the EO data application.

Objective: Learn how to navigate the EO-based data app providing tools to analyse view and download data. Learn how satellite-based data could be used for water resources management providing near real time and spatially distributed information.
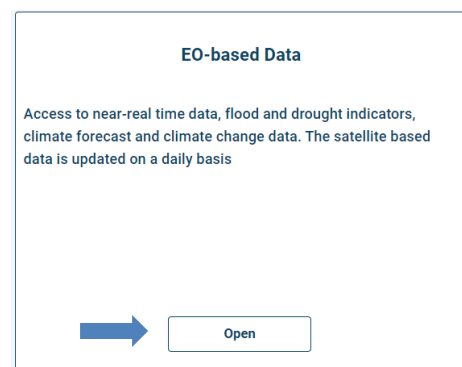
1 Open the EO-based data app

Open the portal through

https://beyondtheboundary.waterdss.com/

Note there is no need to log in access is public to all users.

The EO data app is accessible from the BtB portal - click on the 'Open' button seen to the right.

Next press the >> button and select Asia ⇨ Karnataka.

EO-based Data

Access to near-real time data, flood and drought indicators, climate forecast and climate change data. The satellite based data is updated on a daily basis

Open

2 Overview of the main functionality

This part of the guide will provide you with an overview of the main functionality. See the figure on the next page for details.
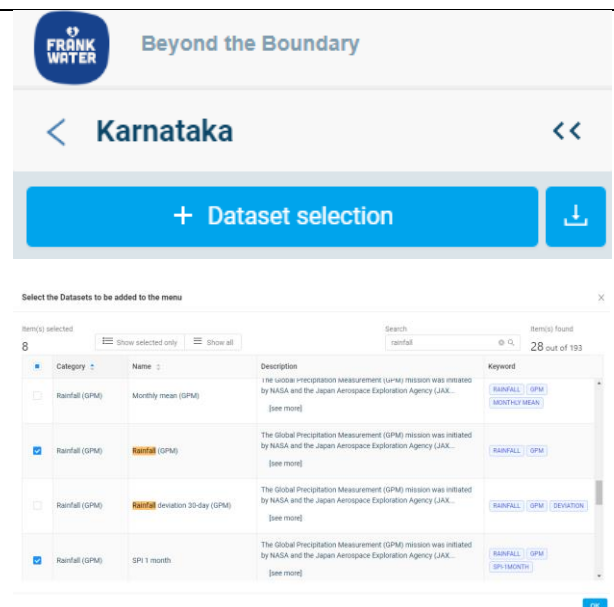
Available data

- Click on "Dataset selection" on the left in the view to open the dialog listing all the available data types.
- Go through the data types and select by ticking the boxes on each dataset row, those that could be of use for your work.

Note that clicking on the "OK" button will make the selected data available for viewing and download.

Download area information

Click on [↓] to download shapefiles for the domain of the study area.

Beyond the Boundary

< Karnataka <<

+ Dataset selection   [↓]

Select the Datasets to be added to the menu

	Category	Name	Description	Keyword
☐	Rainfall (GPM)	Monthly mean (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Administration (JAX... [see more]	RAINFALL GPM MONTHLY MEAN
☑	Rainfall (GPM)	Rainfall (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Administration (JAX... [see more]	RAINFALL GPM
☐	Rainfall (GPM)	Rainfall deviation 30-day (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Administration (JAX... [see more]	RAINFALL GPM DEVIATION
☑	Rainfall (GPM)	SPI 1 month	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Administration (JAX... [see more]	RAINFALL GPM SPI-1MONTH

Basic functionality within the EO-based Data application

2.1 Basic data functionality

View the data

- From the dataset selection dialog, write 'rainfall' on the Search box. Go through the list of items found and select 'Rainfall (GPM)'

Search

Enter text here

Select the Datasets to be added to the menu ✕

Item(s) selected
1   ☰ Show selected only   ☰ Show all

Search
rainfall ⊗ 🔍

Item(s) found
28 out of 193

☑	Category ⬍	Name ⬍	Description	Keyword
☐	Rainfall (GPM)	Monthly mean (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Exploration Agency (JAX... [see more]	RAINFALL GPM MONTHLY MEAN
☑	Rainfall (GPM)	Rainfall (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Exploration Agency (JAX... [see more]	RAINFALL GPM
☐	Rainfall (GPM)	Rainfall deviation 30-day (GPM)	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Exploration Agency (JAX... [see more]	RAINFALL GPM DEVIATION
☐	Rainfall (GPM)	SPI 1 month	The Global Precipitation Measurement (GPM) mission was initiated by NASA and the Japan Aerospace Exploration Agency (JAX... [see more]	RAINFALL GPM SPI-1MONTH

OK

Note that the data is now shown in the left panel. Click on top of the name of the dataset to display it on the map view.

It will appear showing the last available time step.

< Karnataka   <<

+ Dataset selection   ⤓

∨ Rainfall (GPM)

Rainfall (GPM) ⬅   ✕ ⓘ

- Look at other time steps by clicking on the timeline at the bottom, or by typing the date in the date box.

Note the legend to the right showing the data values for the different colours in the legend palette.

Download raster data

To download a raster data set:
- Click ⤓ Download to open the

download menu.

- Select "Raster file" and specify the time period.
- Press "Get raster file" to generate the .netcdf file (zip file).
- A zip file with the NETCDF data will appear including the size of the file
- Click to download the compressed data.

Please note: some data types might be very large if a long time period is selected. All raster data are downloaded as netcdf files.

- Download the GPM data for the last month available (2023-01-01 to 2023-01-31).
- You would view the data using a GIS software (such as QGIS) or other freeware tools (Panoply NASA tool).
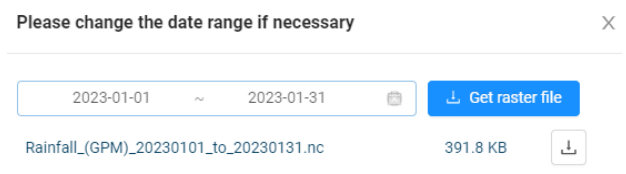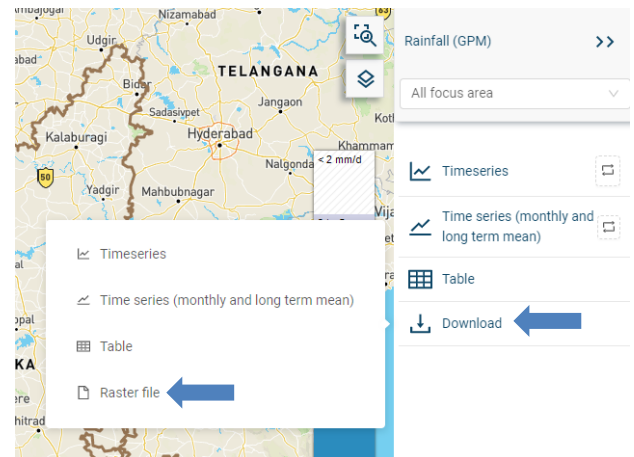
2.2 Basic time series functionality

This part of the guide will illustrate the different options for visualising and downloading time series data. When the user selects a dataset the associated tools for the specific data type will be enabled in the view menu. Please note that the list of tools depends on the selected dataset type.

Time series (areas)

The time series could be plotted on a few different spatial scales:

- All focus area: Area weighted time series for the whole area
- Area: Area weighted time series for predefined areas
- Subarea layer: Area weighted time series for a selected sub-area
- Stations: Time series for predefined shapefile of point locations
- User location: Values for a user specified location
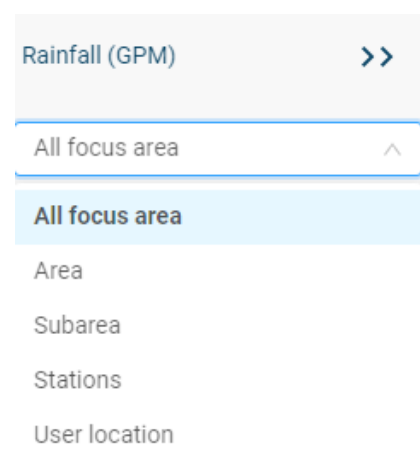
To extract a time series at a user location click on the map to define it and the system will retrieve the data for this location.
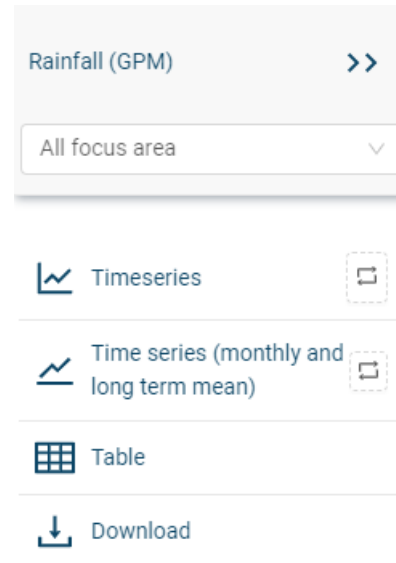
Time series (tools)

There are three options for viewing time series. The available tools operate based on the selected spatial level:

- Time series: area weighted time series
- Time series (monthly): Monthly accumulated time series
- Table: statistical data for the data type

Note: the area weighted time series is calculated by calculating the overlap between the area (polygon) and the satellite raster data using the formula (fraction is the fraction of a data cell within the area.):

$$Weighted\ TS = \frac{\sum value * fraction}{Sum\ fractions}$$

Time series

This part of the guide demonstrates how time series information could be retrieved for the different data types. Try to explore the options for showing and downloading time series data:

- Select the GPM rainfall data.
- Select the Time series tool for "All focus area".
- Try the different zoom options (ask for advice if needed).
- Download the data and open the csv file in Excel or a text editor.
- Do the same steps but use the tool called "Time series (monthly and longterm mean)".
- Note that the monthly time series also contains a time series representing the long term average.
- Download and open the csv file in Excel or a text editor.

2.3 Table tool

Here the table tool is introduced showing different statistical information of the data. The table tool is available only for some data. The purpose of the tool is to display different types of statistical information. The type of information will depend on the specific tool.

- Try to select "Subarea", click on the empty white box for the drop-down list of taluks in Karnataka
- Select Anekal
- Click on the Table tool and observe the results
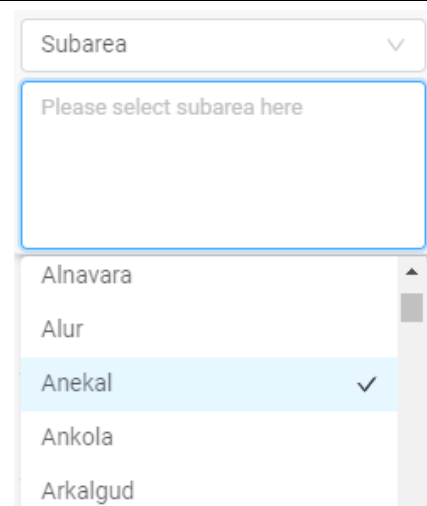
- Try downloading the file and open it in Excel or a text editor.

Rainfall (GPM) - Subarea   ✕

Time	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.	Min.	Max.
2018	1.5	28.2	65.4	39.1	259.5	55.5	17.9	71.2	140.7	96.4	13.6	8.5	66.5	1.5	259.5
2019	0.0	5.9	1.4	59.6	166.0	47.5	23.5	137.1	103.9	153.0	19.3	12.2	60.8	0.0	166.0
2020	2.1	5.3	18.5	166.6	97.1	113.5	177.5	111.1	154.5	147.9	99.1	20.7	92.8	2.1	177.5
2021	32.8	3.6	1.4	131.7	81.9	73.6	148.8	80.9	112.4	212.1	222.0	0.2	91.8	0.2	222.0
2022	0.1	1.3	25.7	101.9	335.4	191.1	160.0	281.0	131.9	167.2	104.1	188.6	140.7	0.1	335.4
Avg.	3.5	3.8	31.7	119.5	174.1	71.1	83.2	121.0	148.0	194.2	54.7	17.9	0	0	0
Max.	32.8	28.2	159.3	281.3	335.4	191.1	193.7	281.0	288.5	593.7	222.0	188.6	0	0	0
Min.	0.0	0.0	0.4	8.5	16.6	17.7	17.9	25.8	16.3	6.7	3.4	0.2	0	0	0

2.4 Advanced plotting options

Here, advanced plotting options in the form of "Envelope plot" and "Column chart" are demonstrated.

Envelope plot

The envelope tool will be available for all data types consisting of several members (or ensembles) as this plot type is a way to simplify the presentations of many members.

The envelope plot consists of 3 lines, 25 and 75 percentile and median:

- Median: The median of all members at all time steps
- 25 percentile: Shows the value which 25% of the members are below
- 75 percentile: Shows the value which only 25% of the members are above

The three lines are often used to represent the most likely outcome of a data type consisting of many members.

Historical ensemble (GPM)   >>

Subarea   ⌄

Anekal ✕

~ Timeseries

~ Time series (monthly and long term mean)

▄ Envelope plot

↓ Download

Envelope plot

- Select the "Historical ensemble (GPM)" (you will have to click "Dataset selection" and add the

data type from the GPM data).

- Start by plotting a Time series (Monthly) – notice that the data type consist of a number of members.
- Plot the Envelope plot.

Discuss if you understand the envelope plot and if you are able to see the connection with the monthly data. Ask if there are any questions.
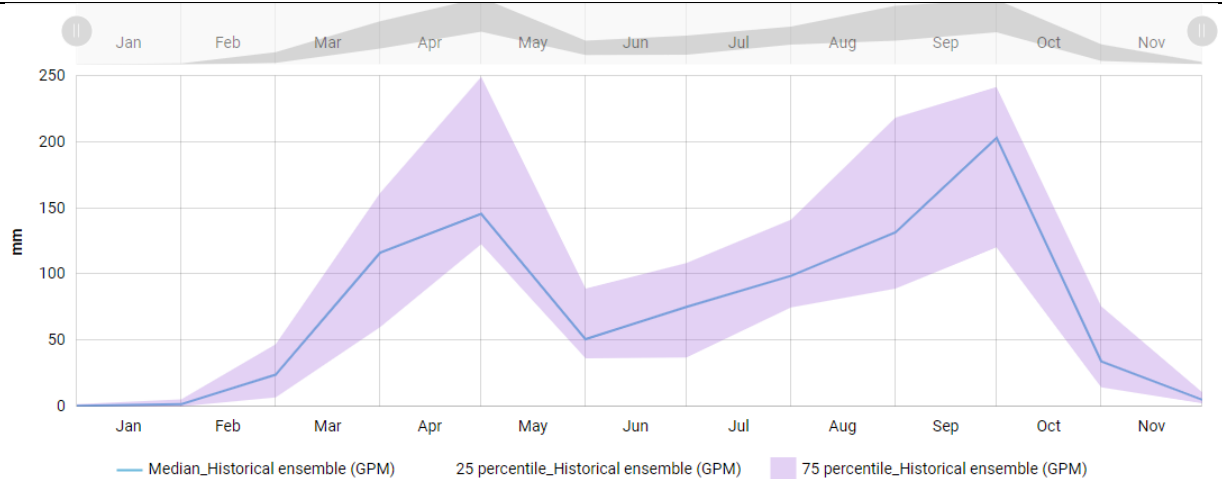

Column chart

The column chart is a plot type only available for indices as it represents the area covered by a specific index category at a specific time.

Column chart

- Go to the 'Dataset selection' again, find and add to your map SPI 1 month dataset based on GPM data
  - SPI = Standardised Precipitation Index
  - The SPI is an index used to evaluate the rainfall as it represents the cumulative probability of a given **rainfall** event.
  - The SPI values are linked with a number of categories, e.g. SPI values below -2 correspond to extremely dry situations.
- Plot the column chart for Anekal.

Note: The column chart shows how much percentage of an area is represented by a specific SPI category, in other words, what percentage of the total area falls under certain conditions at a given period.

This plot could be used to identify periods with a large coverage of very dry or very wet rainfall conditions. Ask if you would like more information on this plot type.

SPI 1 month - All focus area
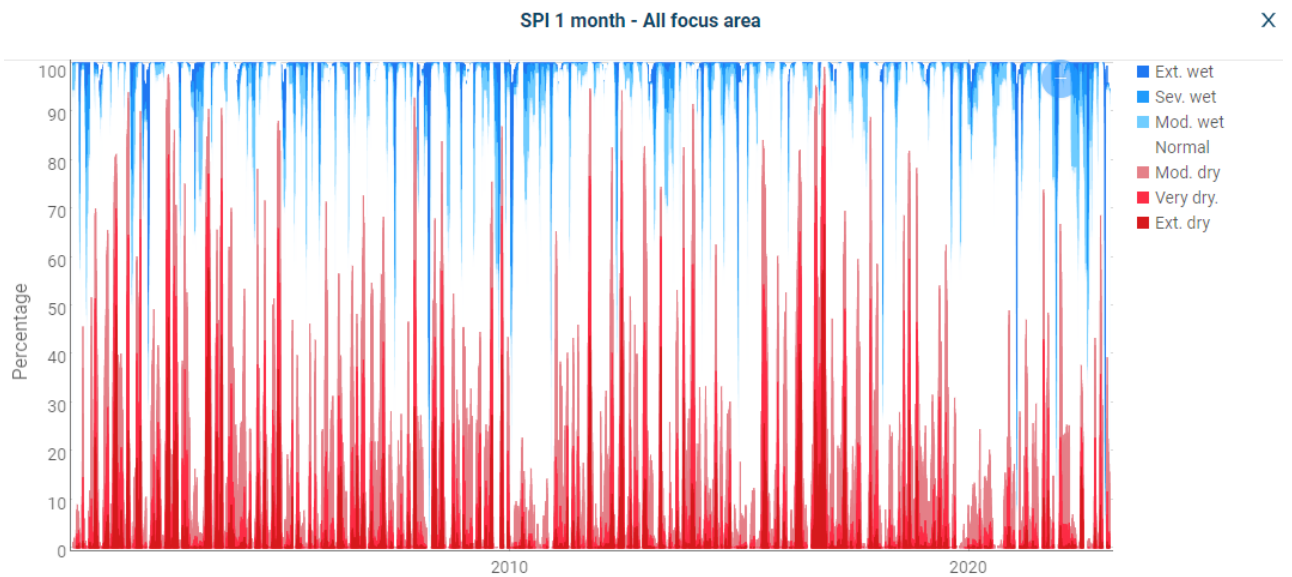
2.5 Station based data types

Finally, in this section of the guide some station-based data types are examined and how to access the data demonstrated.

Select and plot data

Station data means that the data is connected to a location on the ground.

- Click on "Dataset selection"
- Select the following data types:
  - Rainfall GHCN: rainfall data
  - JASON: lake and reservoir level
  - River discharge: river flow

Look at the help text for more information on these data types. Select one of them from the left panel. This will display the stations in the map view.

To view time series for the available stations, select a station by clicking on the map or by selecting it from the list under "Features" on the right panel.

- Click "Time series" to view the data.
- Try to download the data.

Discuss how this type of data might be used in your work.