BaseFlow Separation using Hydrograph-py

Area of Focus - Alutuma (Station)

In this study, the Alutuma catchment, a sub-basin of the Brahmani river basin in Odisha, was selected as the study area. The total catchment area is **1332** km2 , with a perimeter of 270.40 km. It lies between east longitude 85 20′ to 86° 45′ and north latitude 20° 50′ to 21° 20′.

Alutuma is a small Village/hamlet in Harichandanpur Tehsil in Kendujhar District of Odisha State, India. It is located 75 KM towards South from District head quarters Kendujhar. 27 KM from Harichandanpur. 114 KM from State capital Bhubaneswar.

Name	Alutuma
Basin	BRAHMANI AND BAITARANI
State	ODISHA
Station Type	Telemetric
Lat, Long	20.9308, 85.5192
Zero Of Gauge (m)	44
Max Level (m)	48.480 (22 Jul 2018)

Min Level (m)	45.480 (30 May 2018)
Max Discharge (cumecs)	384.220 (22 Sep 2018)
Min Discharge (cumecs)	0.800 (30 May 2018)
Avg Discharge (cumecs)	38.384

Library Used - Hydrograph-py

Hydrograph-py is a hydrological Python package that provides some tools for:

- Separation of flow time-series into peak flow and baseflow.
- Filtering of peak flow events given a minimum event duration.
- Calculation of peak event volumes.
- Calculation of maximum annual peak flow and maximum annual peak event volume.
- Extreme value analysis using GEV fitting and plotting functions.

Streamflow separation in this package is based on the principle introduced by. They separated the hydrograph into “quickflow” and “delayed flow” components by arbitrarily projecting a line of constant slope from the beginning of any stream rise until it intersected the falling side of the hydrograph.

Function used - sepBaseflow()

The sepBaseflow function separates a time-series into baseflow and peakflow. Fills missing flow records by interpolation. The input and output for this function are shown below.

```
def sepBaseflow(x, dt, A, k=0.000546, dt_max=None, tp_min=None):

Input, A = 1332 Km2
       dt = 60, for hourly interpolation update
       dt_max = Only interpolate over maximum number of consecutive NaN defined
       over time period dt_max in hours.
       tp_min = Minimum duration of runoff peak in hours to be selected as being
       a peak.
```

```
Returns:

     dt [hour]: Time difference in hours between two records.
     Total runoff [m^3 s^-1]: Recorded flow in cumecs for that timestamp.
     Total runoff interp. [m^3 s^-1]: Interpolated recorded flow in cumecs.
     Baseflow [m^3 s^-1]: Calculated baseflow in cumecs for that timestamp.
     Peakflow [m^3 s^-1]: Calculated peakflow in cumecs for that timestamp.
     Peak nr.: Peak number in sequence.
```

Peakflow starts: Timestamp when peakflow starts (moment when runoff peak exceeds baseflow).
Peakflow ends: Timestamp when peakflow ends (moment when runoff peak itersects again with baseflow).
Flow volume [m^3]: Volume of the flow between two time-steps (total volume; i.e. baseflow + peakflow).
Max flow [m^3 s^-1]: Maximum flow of peak flow event.
Date max. flow: Timestamp of maximum flow of peak flow event.
Tp [hour]: Time to peak.

Result

Flow Data used - **Daily River Points information from 01-May-2018 to 31-Oct-2018**

Code to Separate Baseflow – **Click Here**

Separated Baseflow and Peakflow Data - **Click Here**

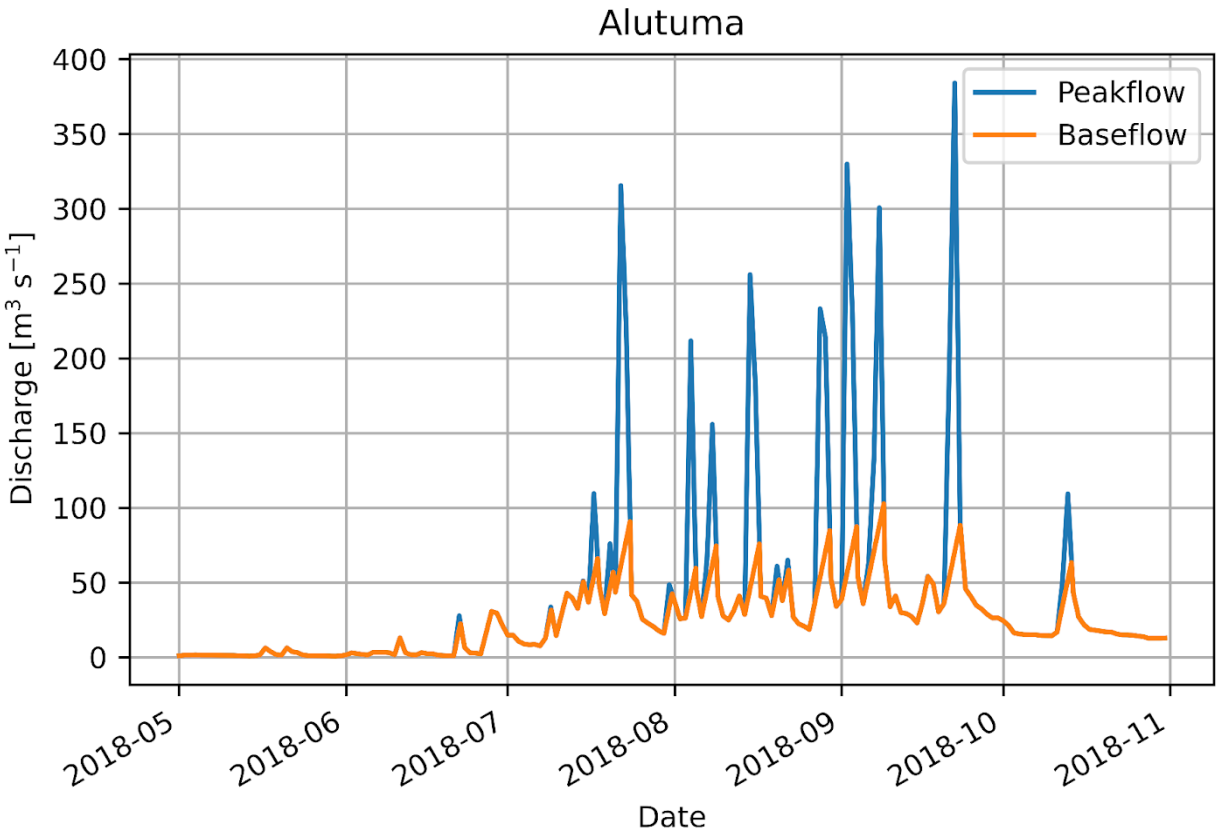

Fig. Hydrograph showing Separated Baseflow and Peakflow

References

1. Daily River Points information, India Water Resources Information System, https://indiawris.gov.in/wris/#/RiverMonitoring. Accessed 29 Sep 2022.
2. Hydrograph-py, https://hydrograph-py.readthedocs.io/en/latest/index.html. Accessed 29 Sep 2022.