Flood Separation Tool - Step by Step guide

Step 1: Enable macros

When you open a file that has macros, the yellow message bar appears with a shield icon and the Enable Content button. If you know the macro, or macros, are from a reliable source, on the Message Bar, click Enable Content.

Step 2: Paste data

The file opens at the "**Homepage**" tab, there are three columns for continuous data. Column A and Column B are mandatory. Column C is optional (for a third variable – e.g. water quality parameters such as a concentration, temperature, or conductivity)

Make sure the data is treated for major gaps and that all inputs are in numeric format. Minor gaps in column B (streamflow), will be filled with a simple linear interpolation algorithm.

Step 3: Define the baseflow level (upper limit)

The baseflow upper level can be estimated graphically from the Discharge as a function of Time plot. Use the graphical tools to format the vertical axis's maximum value, for better visibility, to approximate the baseflow upper limit. It can also be approximated using the flow duration curve or observation histogram, the baseflow dominates in duration and number of observations.

Step 3: Define the smallest peak

This tool extracts events from the highest to the defined smallest peak. Below the smallest peak parameter, the algorithm will stop checking for any more floods. For instance, this parameter can limit the extraction to events with peaks above 100 m^3/s. The smallest peak can also be approximated graphically, and it can be set equal to the baseflow level, at the risk of extracting non-flood events. However, these can be easily found (generated graphs) and deleted from the "**Events**" tab (see **Step 6** for more details).

Step 4: Rising and falling limb calibration

The algorithm starts the definition of the events from the peak descends towards baseflow. When the difference between two consecutive measurements is smaller than the flattening criterion, below the relative or the upper limit of baseflow, the event separation stops, marking the start and end of the event.

During a flood event, baseflow is relative to the flood peak. Accordingly, different events have different baseflow levels. The relative baseflow indicates which discharge percentile of the flood corresponds to the baseflow. By default, the relative baseflow level is optional it is deactivated (value = 0%).

Step 5: Automated separation

When all parameters are defined, data is in place, click on proceed to initiate the event separation. The process may take a while to complete depending on your system configuration. (The tool was tested, using a 10-year, 15-minute resolution dataset, on a Ryzen 3 3100 CPU, with an execution time of ~20 to 60 seconds).

Step 6: Validation

Graphs for validation are generated during automatic separation, check the directory of this tool in the "**graphs**" folder to assess the obtained events. The start and end of each event are listed in the "**Events**" tab. You can choose which events to keep and which events to delete from extraction. If you wish to delete an event, delete the "**yes**" in the "**keep**" column.

If no manual correction is required, click on "**Mark events**" then "**Extract events**". Otherwise, click on "**Mark events**" and go to **step 7**. Otherwise, go to **step 8**.

Step 7: Manual correction

The manual correction allows three operations:

- Adjust the start and end of events.
- Separate multipeak events into single peak events
- Include more events manually

In the **Input data** tab, events' start, end, and ID are marked. Use search tools "ctrl + F" and events IDs to navigate to events.

- To adjust the start or the end of the event, change the position of the "Start" and "End" or "Start/End".
- To separate a multipeak event, add "Start/End" near the separation point in the designated column.
- To include an event manually position the "Start" and "End" at the start and end points of the event in the designated column.

NOTE: "Start", "End", and "Star/End" are case sensitive and the filling is done without quotation marks.

Once the manual correction is performed. Click on "**Extract events**".

Step 8: output events

The extracted flood events can be found in the "**Output**" tab.