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Process-oriented streamflow characterization in mountain rivers of semiarid areas: Sierra Nevada, Spain

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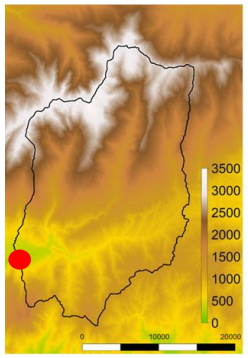
Objective

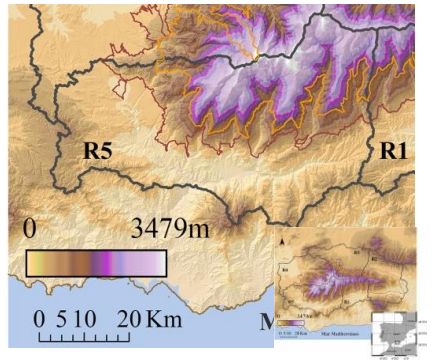
Assessment of **different baseflow separation** methods in mountain rivers of semiarid areas, in the **Sierra Nevada** area, in **southern Spain**, in the framework of a process-oriented approach for identifying the major sources/sinks of water.

The results only will provide a better understanding of baseflow separation in snowfed rivers in semiarid regions, but also assess hydrograph analysis in a **process-oriented approach**.

Study Site & Methodology

Sierra Nevada Mountain Range

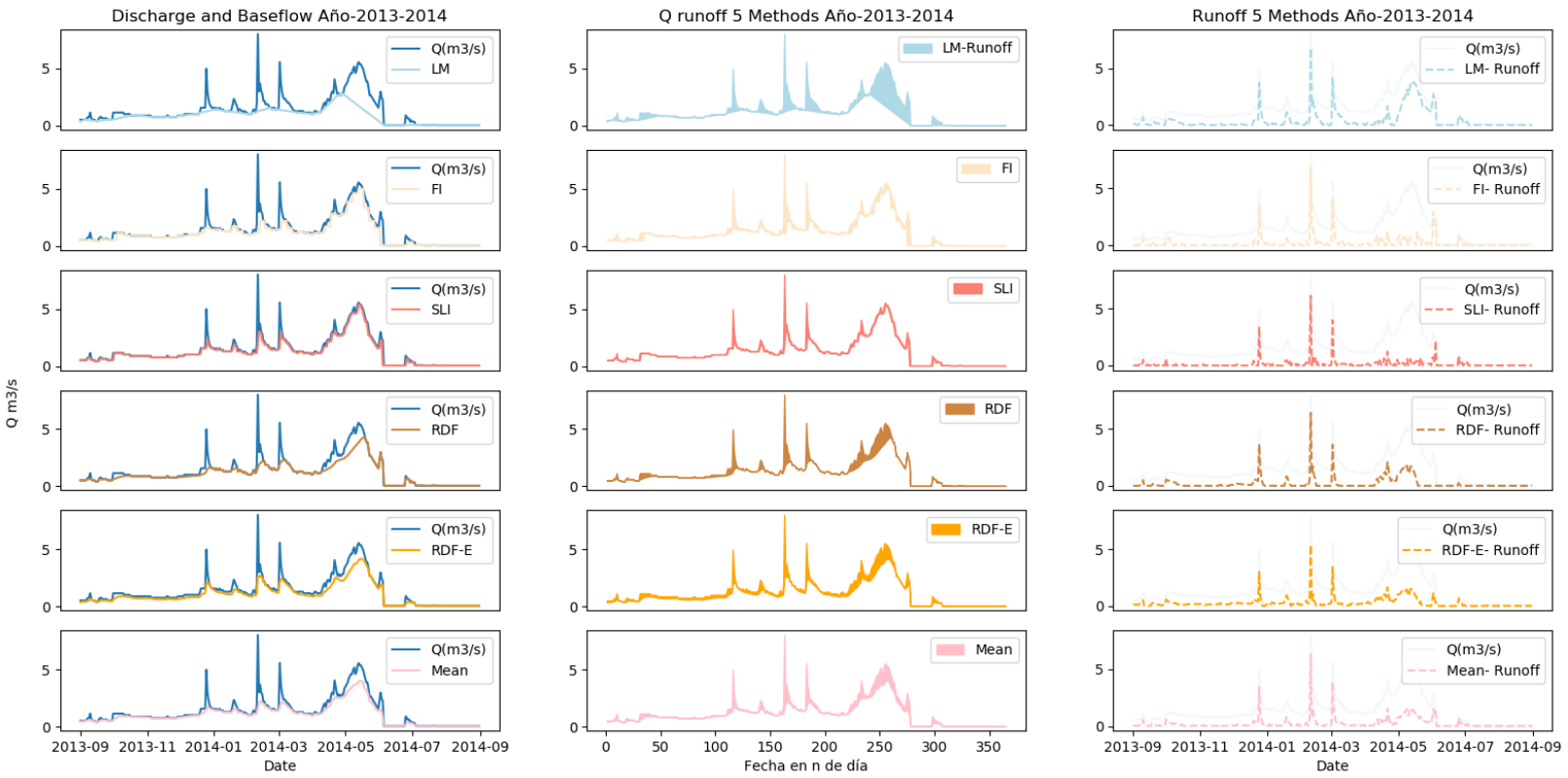




	Area (km2)	Pmm	Snow	Tmean	Height (m)
Guadalfeo Basin– R5	*1058*	*660*	*109.3*	*13.14*	*1418.5*
Orgiva Basin	530.15	745	109	12.5	1645.5 Gauge station 500 aprox

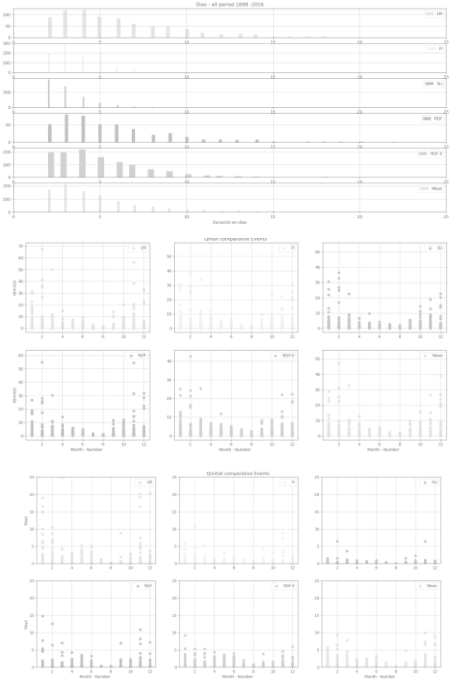
Data Analysis → **Base Flow Analysis: HydroOffice** → **Hydrological variable influence on Discharge** → **Event Separation**

Results:**Base Flow separation methods**



5 Methods applied:

- Local minimum
- Fixed Interval
- Sliding Interval
- BFLOW filter - RDF
- Eckhardt filte - RDFE



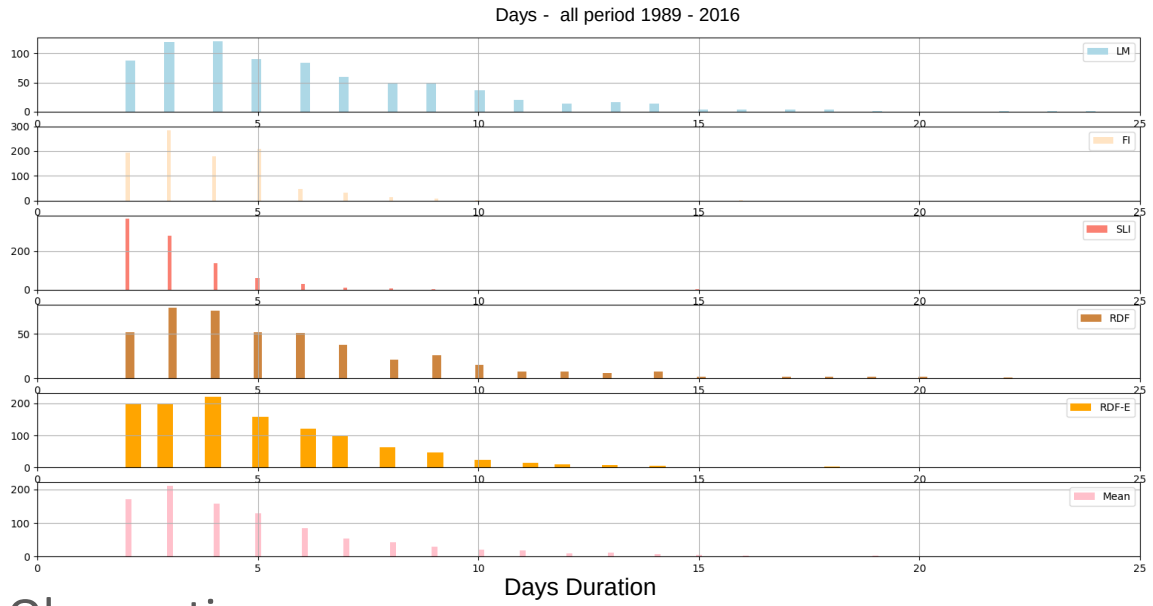
Base Flow calculation + Runoff for each method + Final runoff response

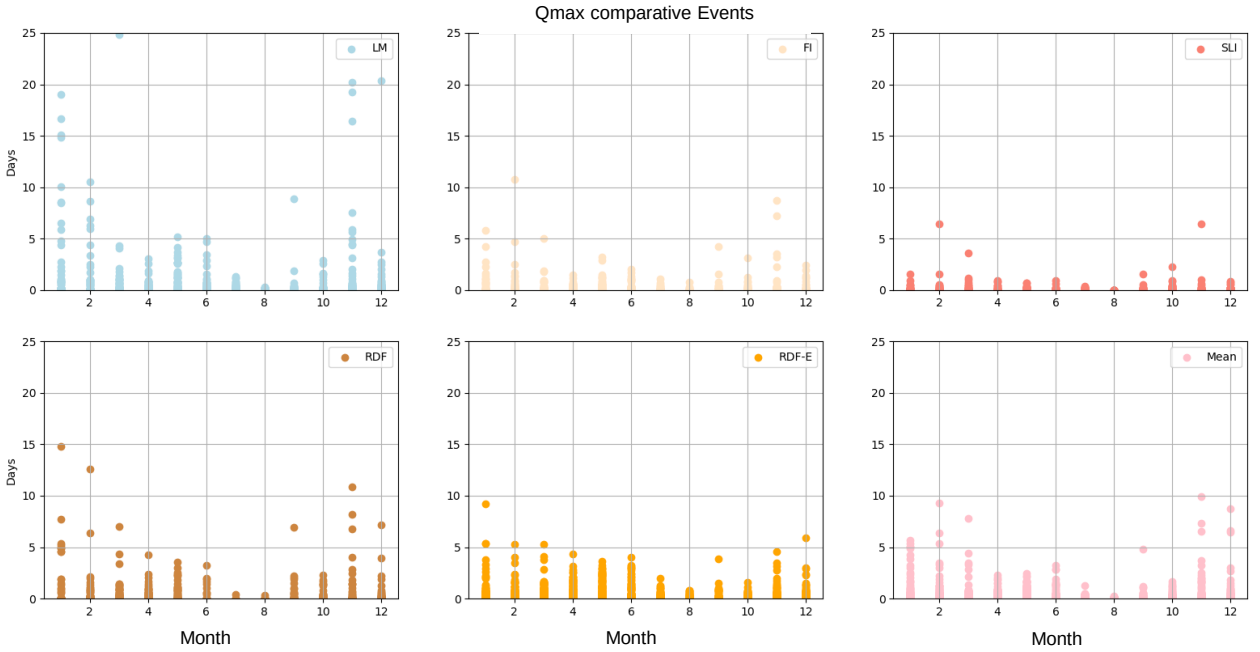
HydroOffice Tool

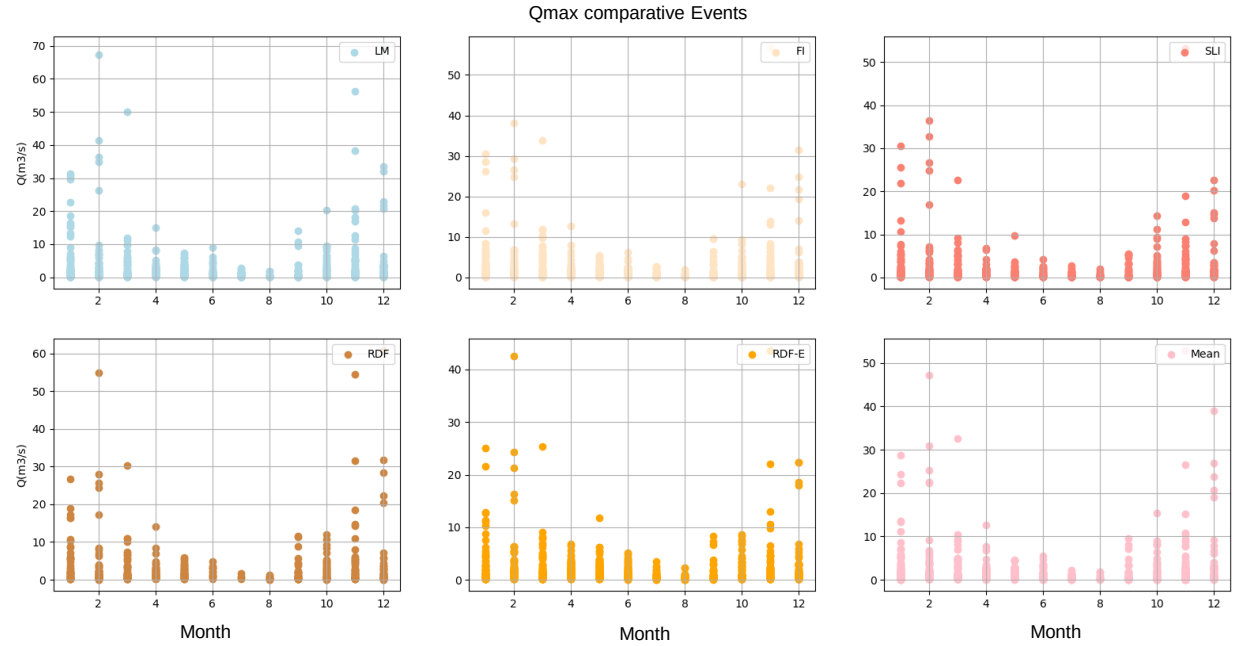
Area coloread
= Qdischarge - Bflow

Ploting
the final runoff

Results:**Base Flow separation methods**



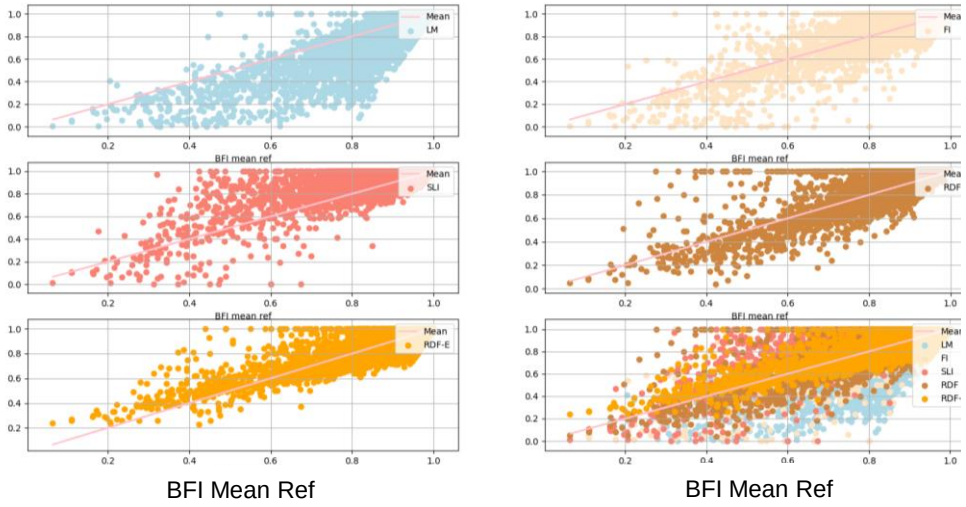


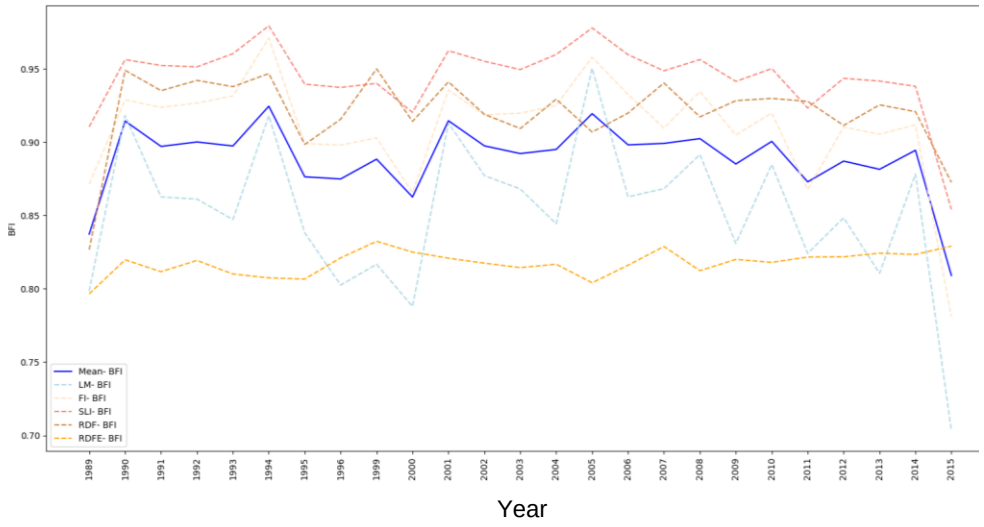


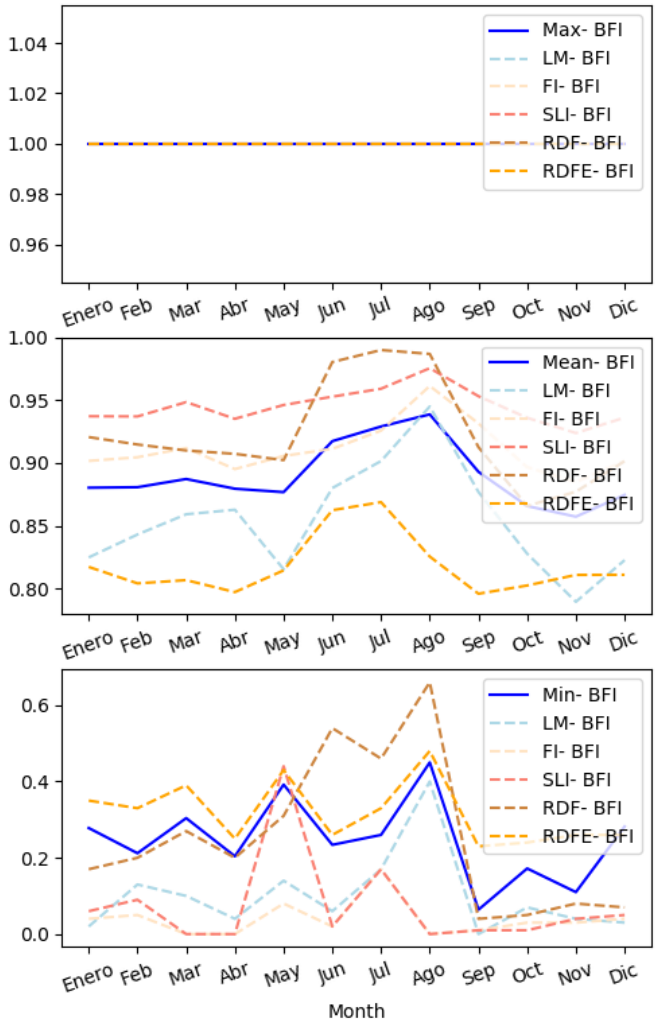
Observations:

- In terms of **days duration**, all methods provide similar events
- In terms of **Qinitial** of the event, LM and FI provide higher max values of Q
- In terms of **Qmax** of the event, LM and FI provide higher max values of Q
- Month with **higher Q** values – Jan, Feb, Dec
- Month with **lower Q** values – Jul, Ags
- **Max value** of runoff – 30<Q<70 depending method

Results:**BFI**

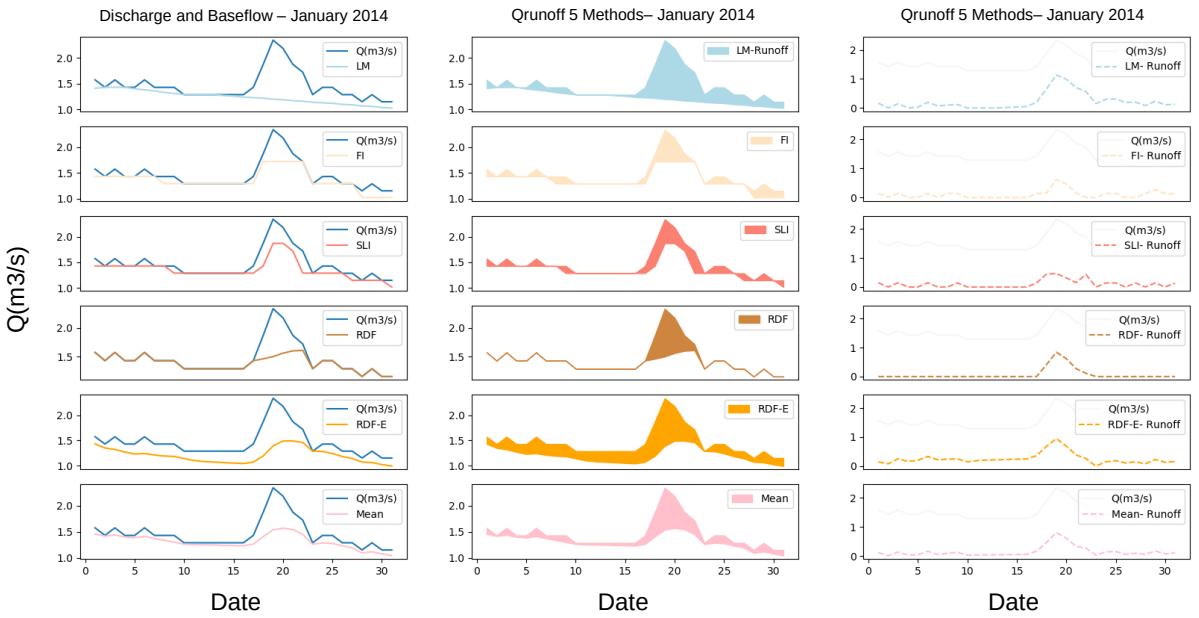


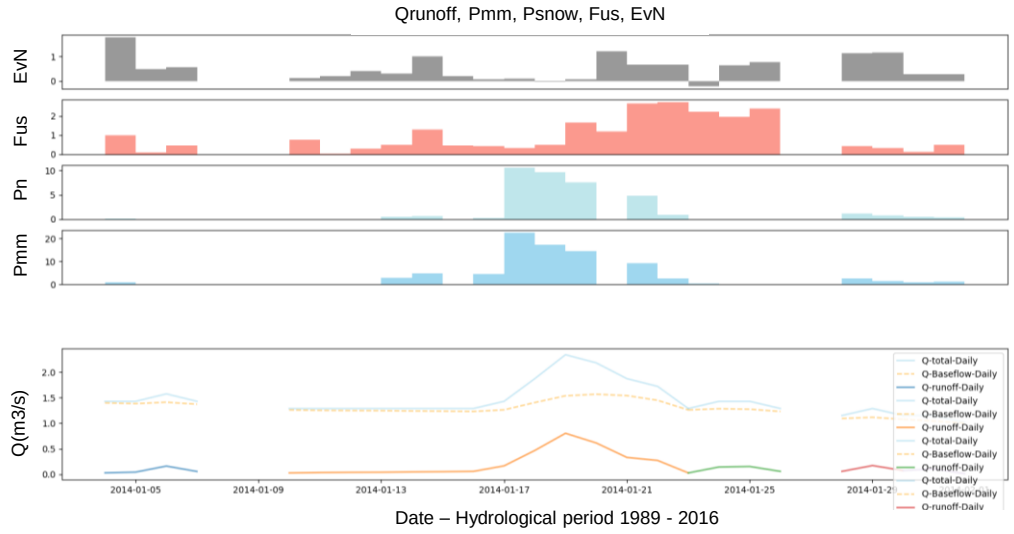




- BFI máx =1 means at some point all the discharge equals to baseflow
- BFI >0.9 summer months
- 1 – BFI = water running that does not come from baseflow = Pmm or Fusion
- Melting months appear to have
- At the annual scale, BFI in all methods do not have less value 0.8

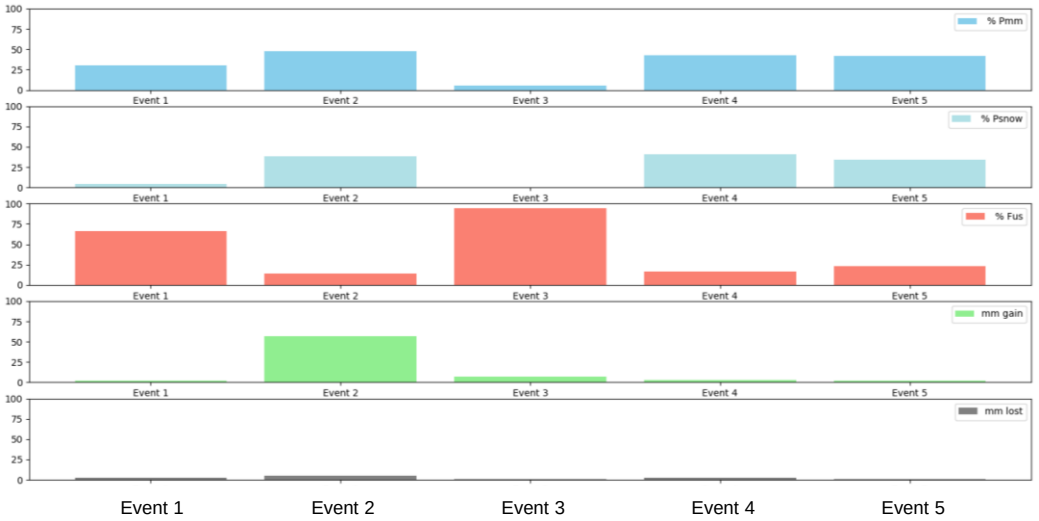
Results: **Process-oriented approach.**





Example of a **process-oriented approach analysis using the mean value of 5 methods:**

- Fusion plays a key role in the runoff generation together with rain precipitation
- A clear classification in term of event driver seems to appear
- An event driver classification will provide a better understanding of how climate change is affecting runoff generation in snow areas in the Mediterranean area (semi-arid climate)



Next Research Steps

1 – Analysis of event drivers at different temporal scales.

When these events are finally analyzed, we will be able to understand in a better way the relationship between snow dynamics and the impact on streamflow

2 - When these processes are clear, we could be able to apply this learning process to future scenarios since the approach was a process oriented one.

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DFH Dinámica Fluvial e Hidrología

THANK YOU VERY MUCH!

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