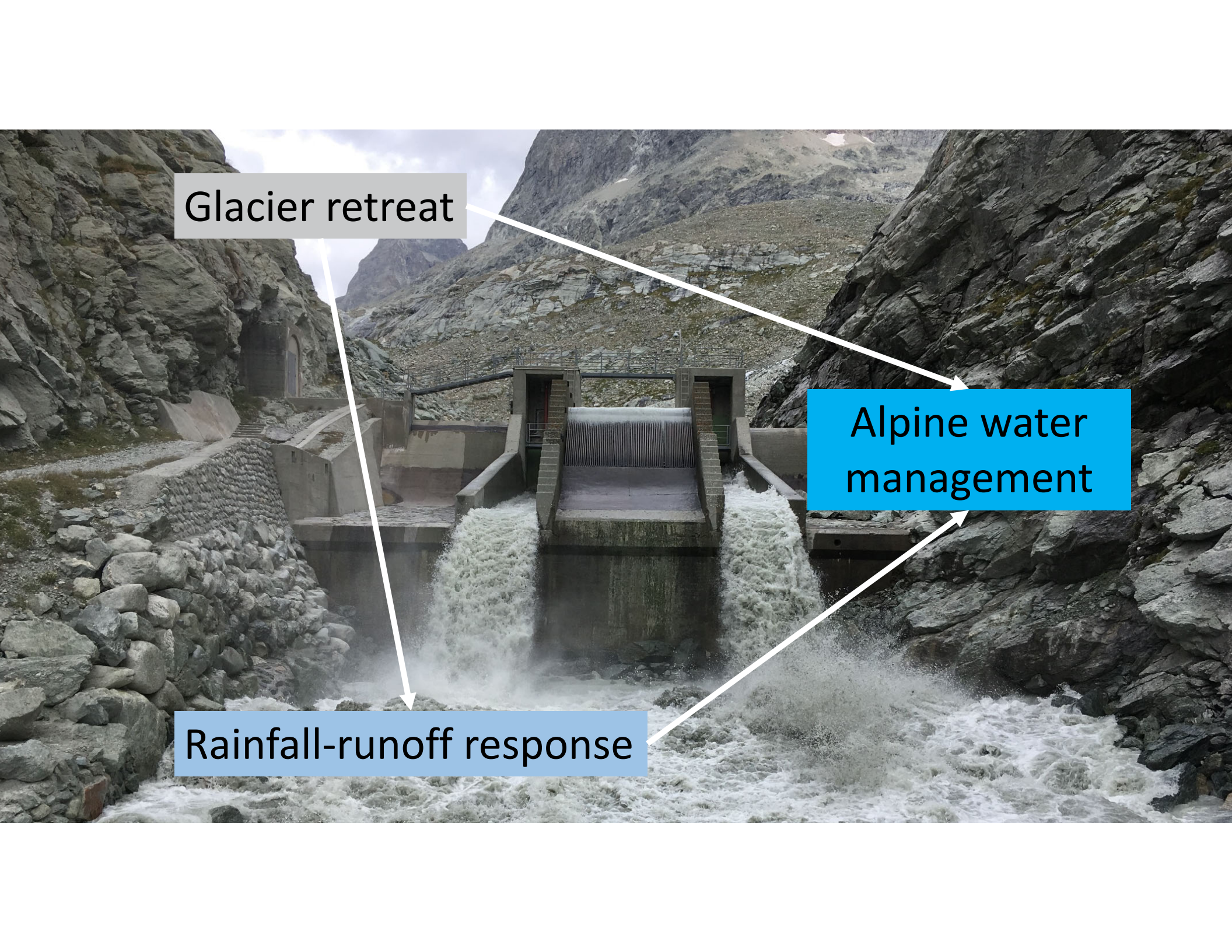


How do glaciers modulate rainfall-runoff response?

Schaefli, B., Binkert, L., Benelli, L., Ceperley, N., Leiser, P., Baumgartner, J., Berger, B., Wyss, K.





Glacier retreat

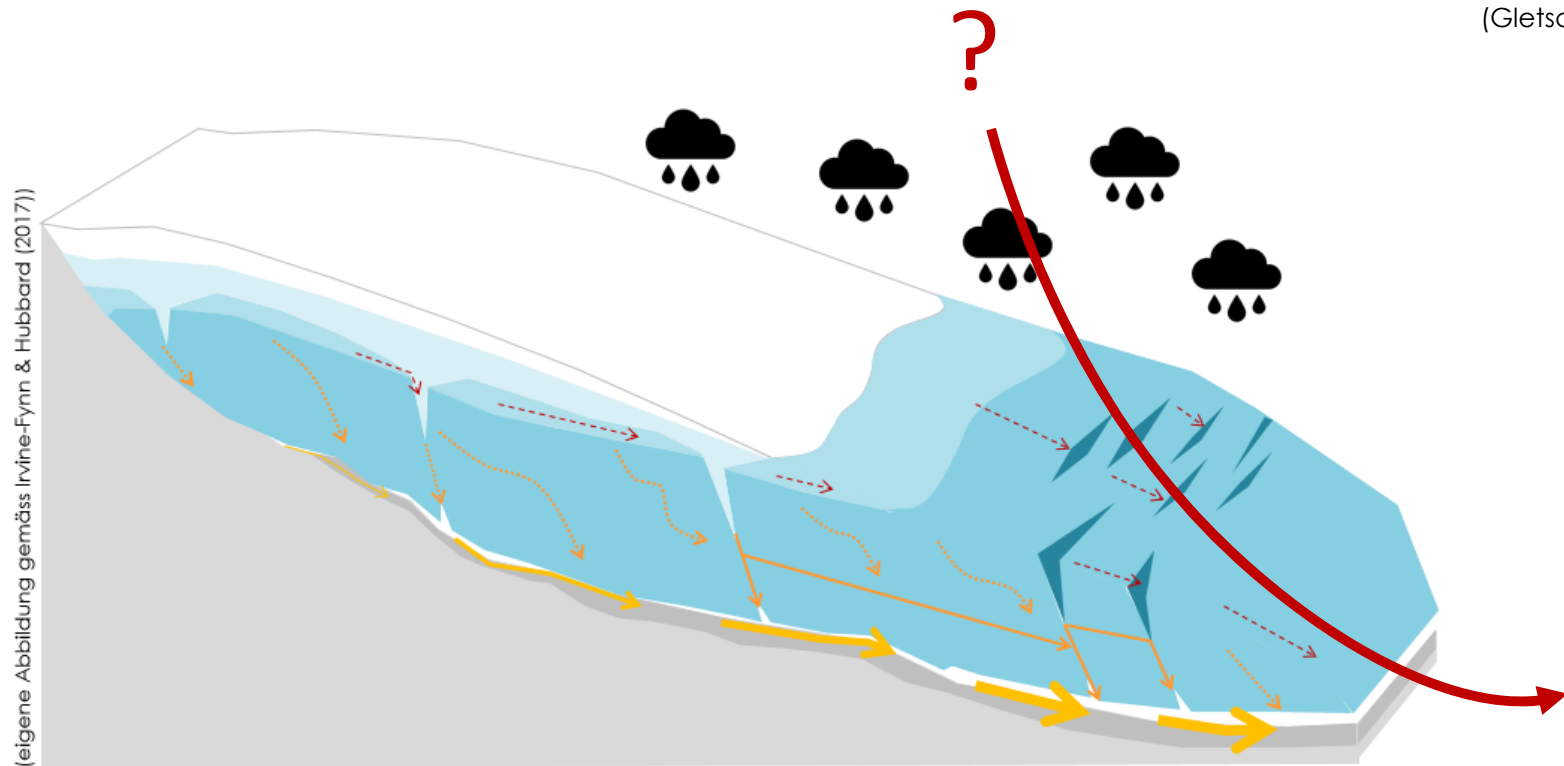
Alpine water
management

Rainfall-runoff response

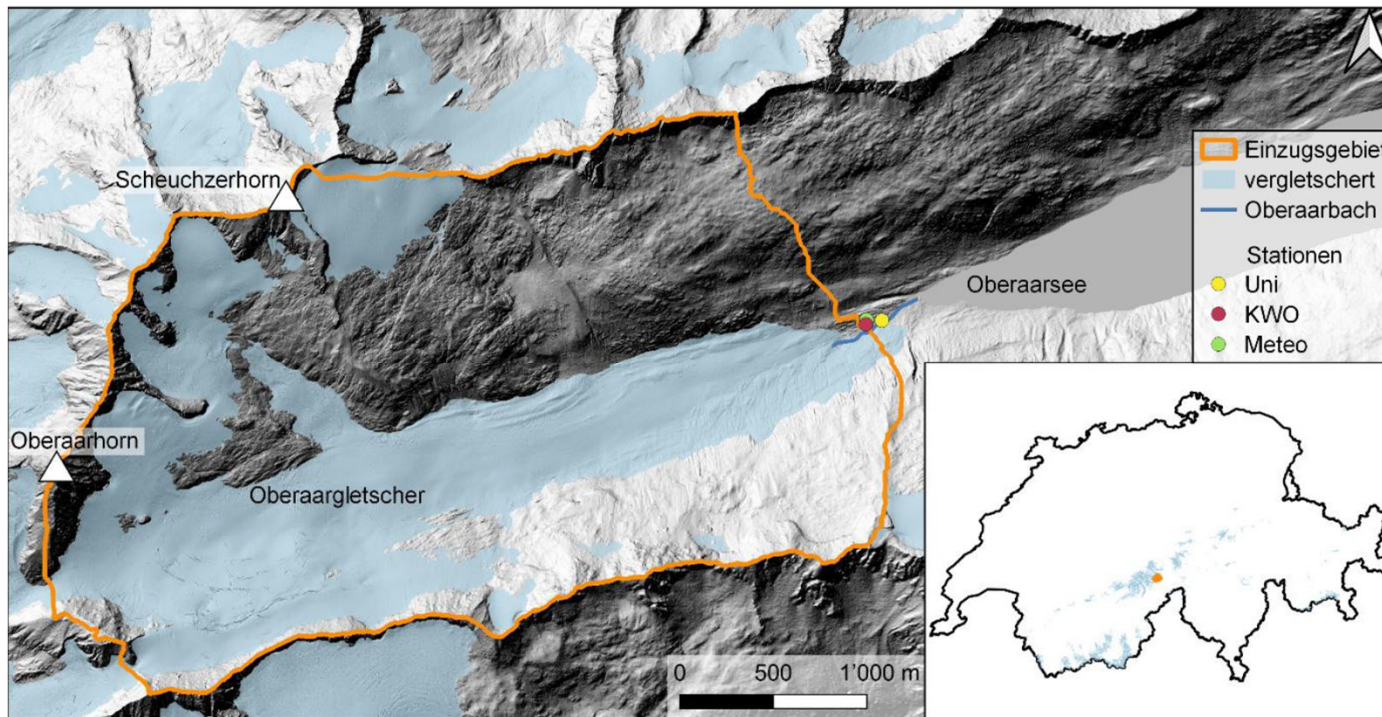
Almost no literature



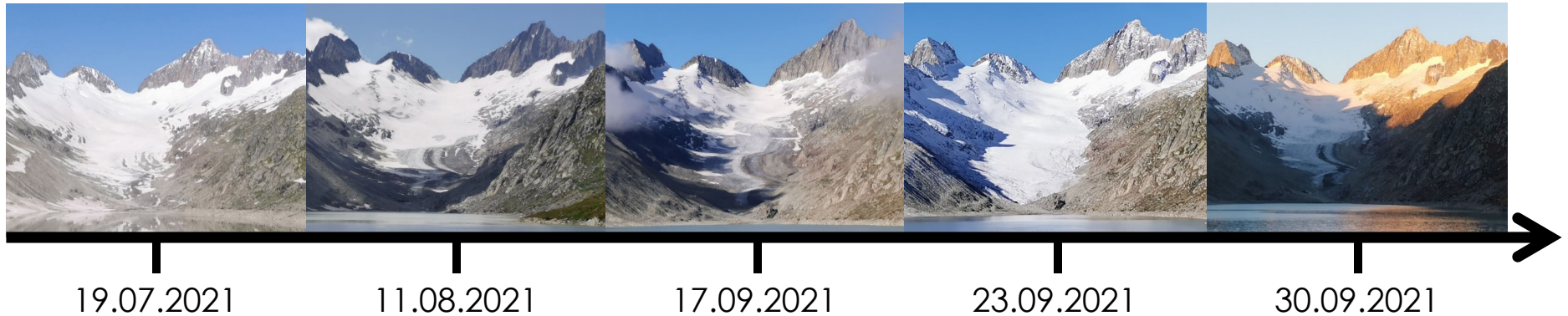
(Gletschertor, 23.09.2021)



(eigene Abbildung gemäss Irvine-Fynn & Hubbard (2017))



Oberaarglacier catch.
9.7 km² , 47% glacier
2'330 m - 3'630 m asl.

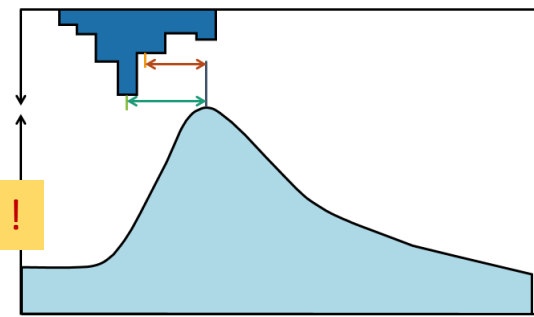


Methods

- Streamflow observations
 - water temperature, electrical conductivity
- Rainfall gauge
- Snow line observations
 - pictures, snow maps
- Isotope sampling
- Lag estimation:
 - Time from rainfall to streamflow event

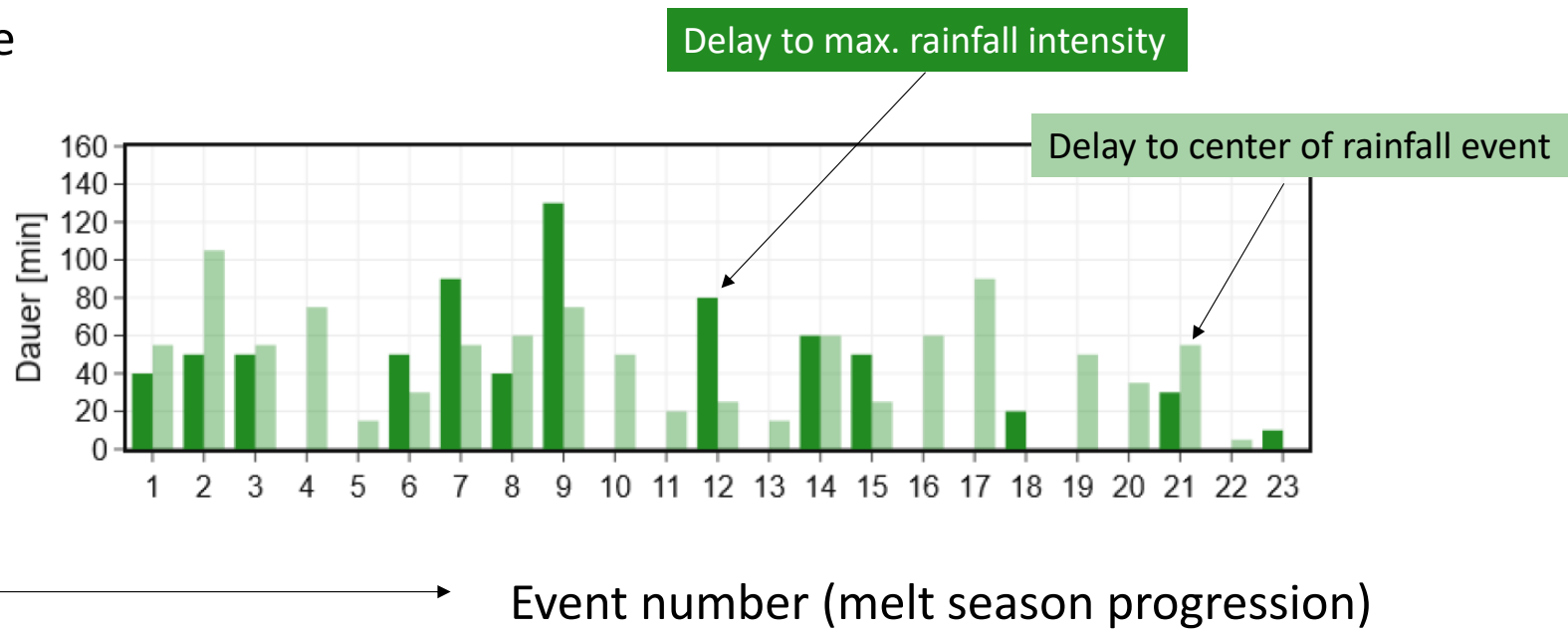


Manual event identification !



Results: temporal evolution of lag time

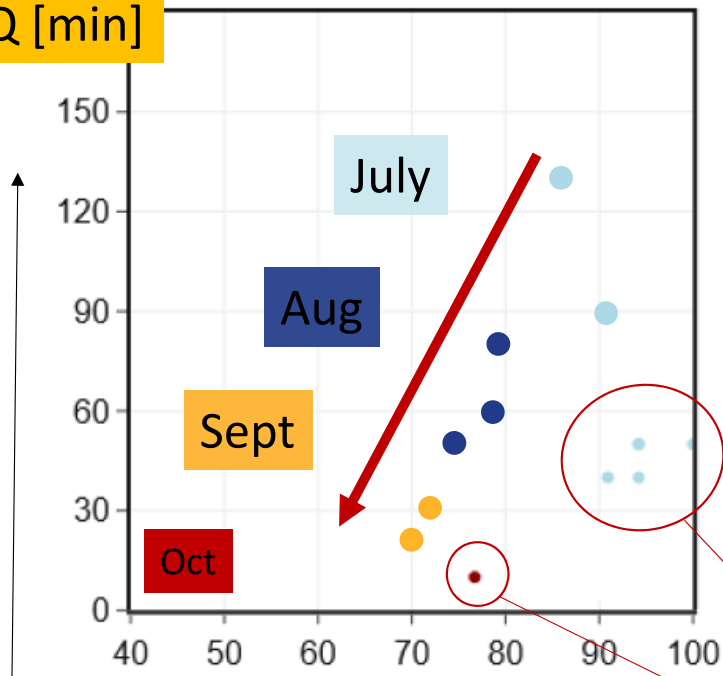
Lag time



Results 2:

Lag response time: 15 min – 130 min

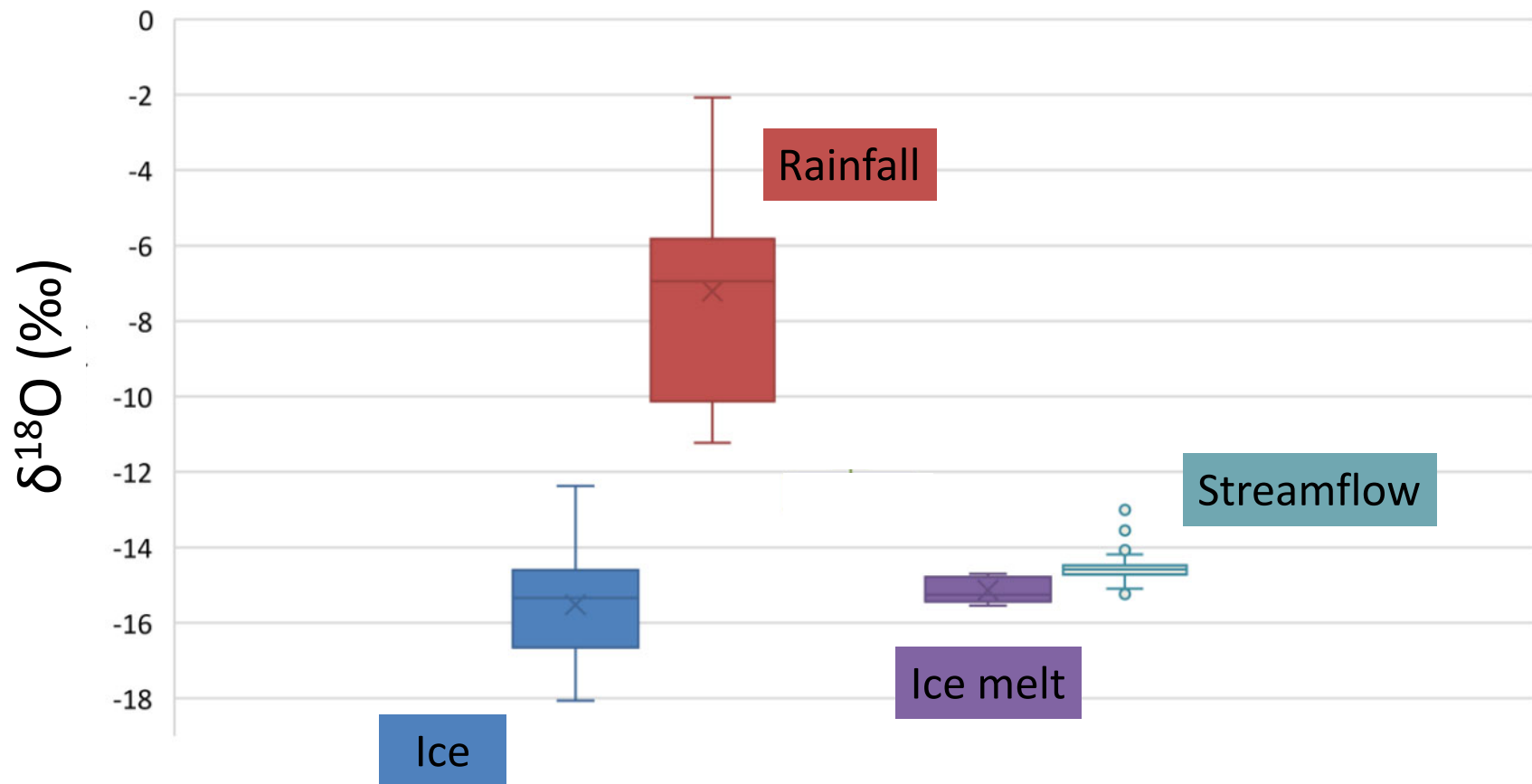
Lag P-Q [min]



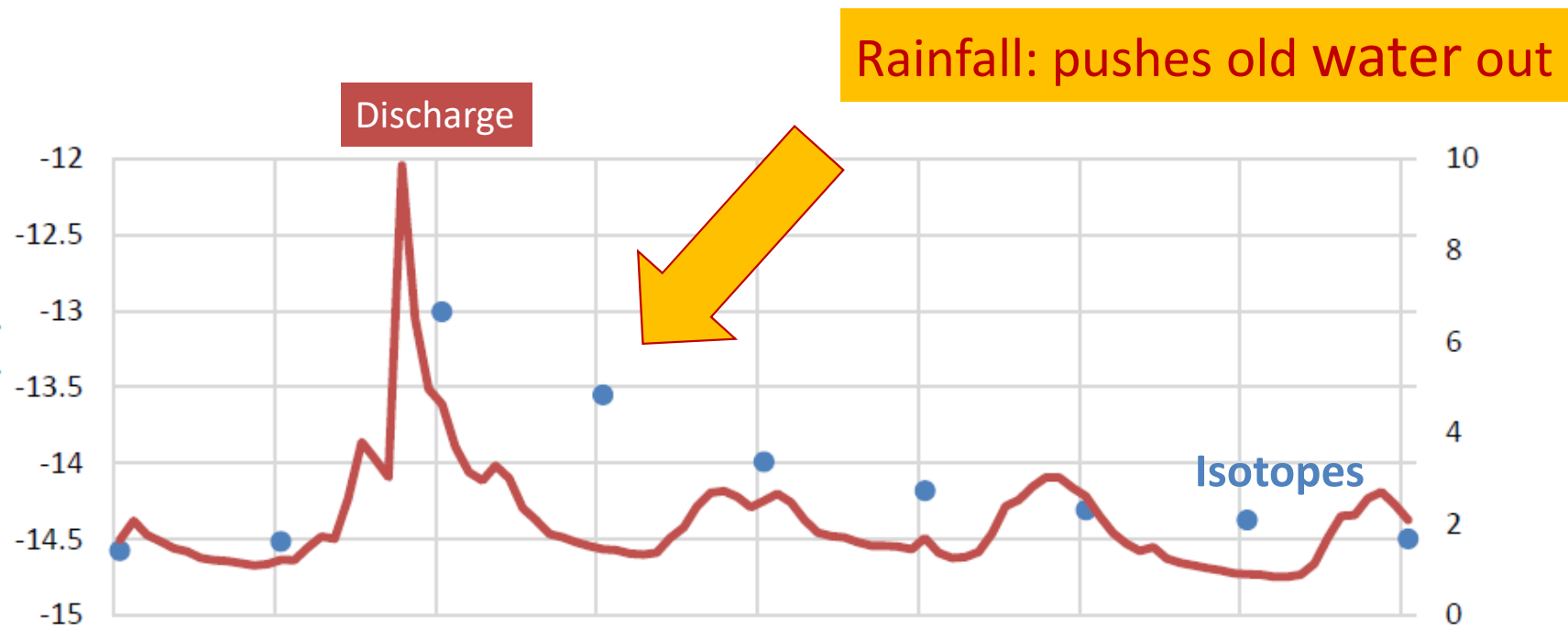
Glacier snow cover

Snowfall: only part of the glacier contributes

Summer rainfall: perfect tracer for flow paths



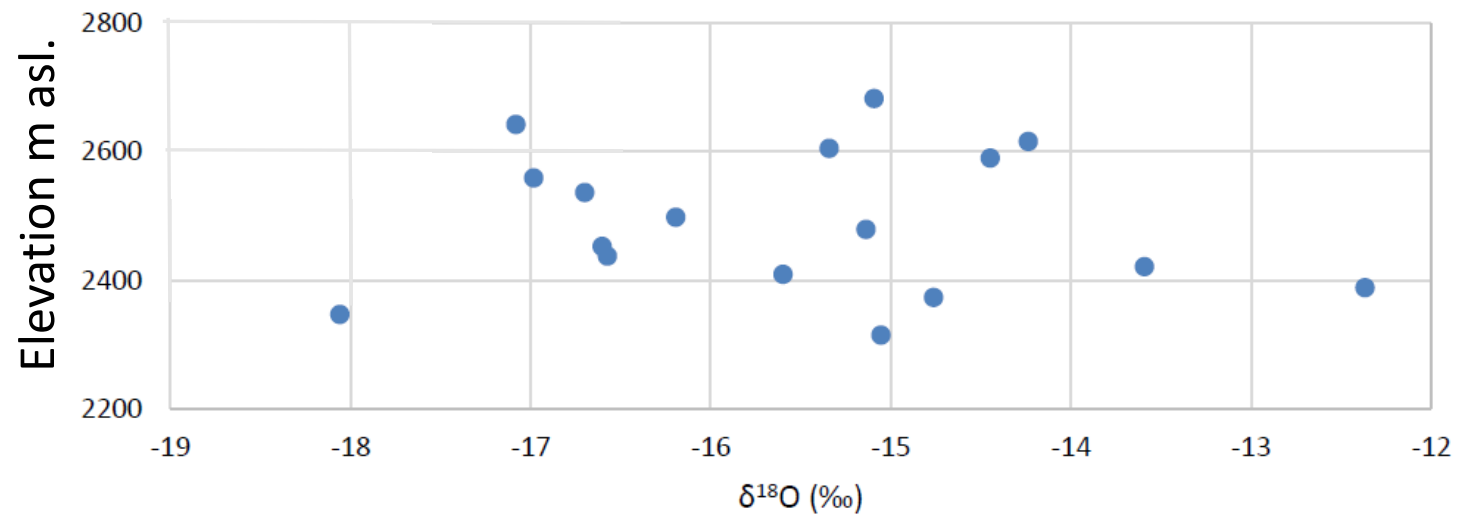
Results 3:



Conclusion

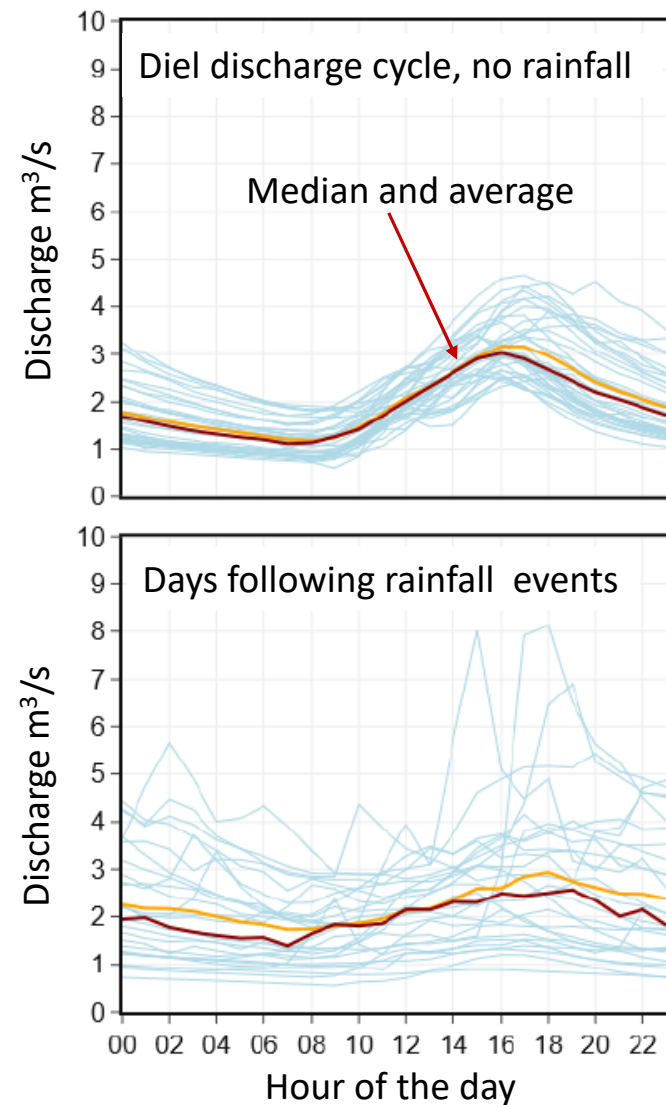
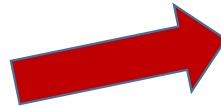
- Response time
= $f(\text{season progression})$
- Limit of the purely data-based approach
 - Equilibrium line modelling !
- Faster response without glaciers

Spatial distribution of ice isotope values



Challenges

- Rainfall quantification
 - In-situ versus radar-based
 - Snowfall events
- Manual discharge event identification



Full isotope time series

