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MONITORING ISOTOPIC SIGNATURE IN HEADWATERS TO TRACE ENVIRONMENTAL CHANGES: AN EXAMPLE IN THE ITALIAN ALPS

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Glaciers are shrinking

due to climate change worldwide, especially in the European Alps

Theoretical models suggest that only 4%–13% of the 2003 European Alps ice area will survive in 2100 [3,4].

In the Southern Alps small glaciers (area <1 km^2) are expected to disappear within the next few decades [5,6].

Glacier-fed streams induce variation in the physical, chemical and biological features of freshwater ecosystems [11,12].

Small glaciers, due to their very rapid reaction time, are particularly suitable for the assessment and monitoring of climate change impacts [7,8]

The combined use of dissolved ions (SO_4^{3-} and Si), and water stable isotopes (δ^2H -$\delta^{18}O$) can be useful in distinguishing between snow, ice, and groundwater sources in headwaters and monitor the occurring environmental changes.

We present the results of our investigations in high-altitude streams in the Italian Alps during the ablation season, in early and late summer 2018

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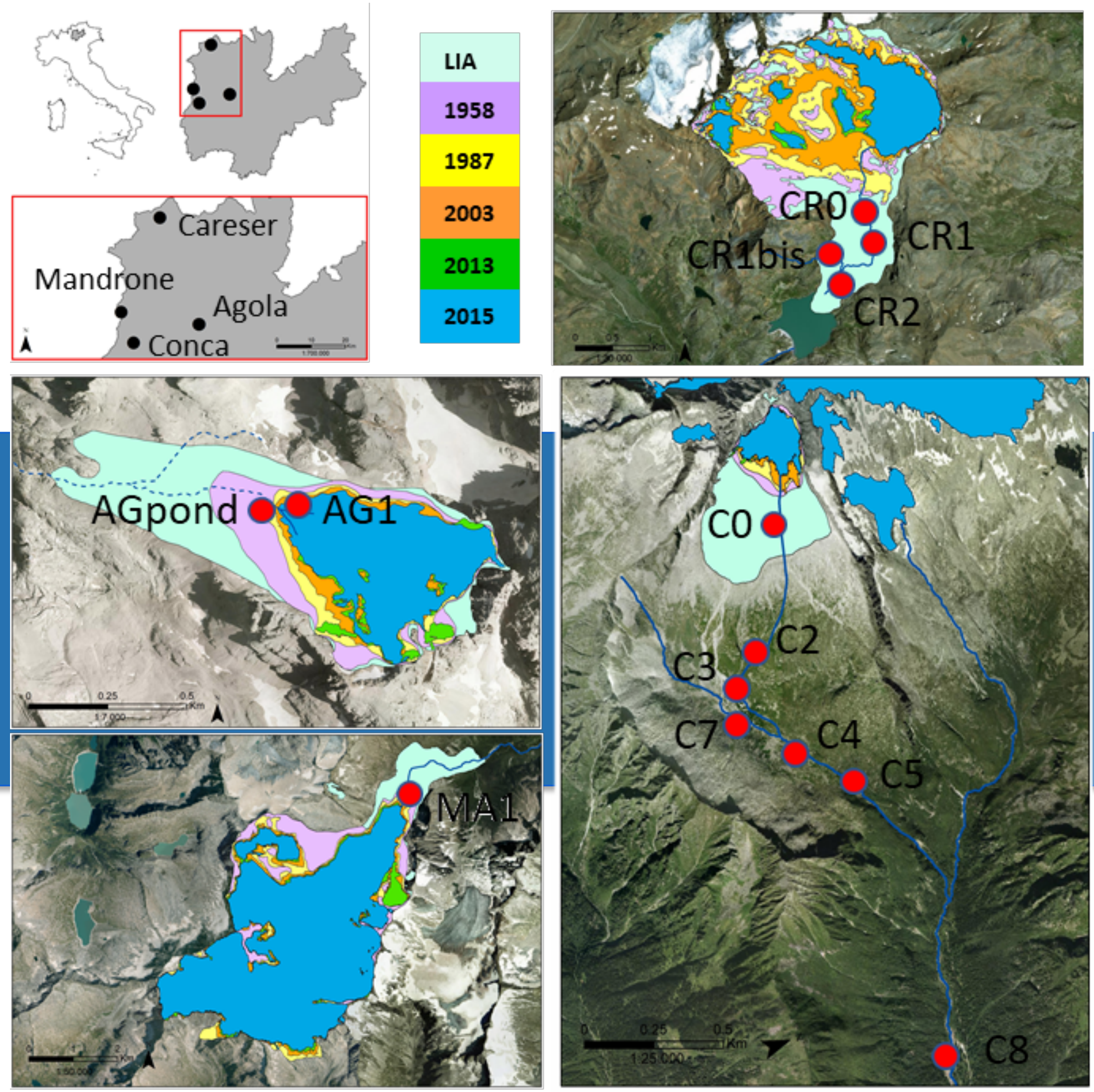
Study Area

46°N, 10°E
Trentino Province

13 study sites were selected on six streams:
- Conca and Conca tributary,
- Careser and Careser tributary,
- Agola,
- Mandrone



Area: Conca = 0.14 km^2, Agola = 0.19 km^2, Careser = 1.39 km^2, Mandrone = 10.14 km^2

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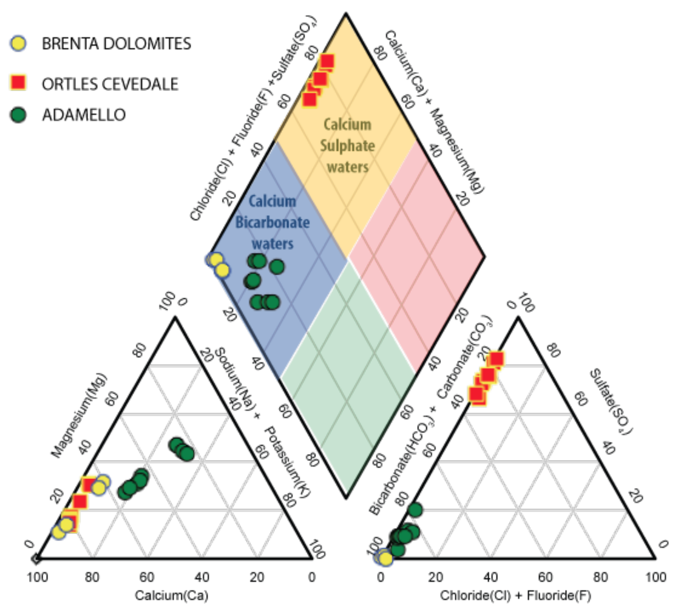
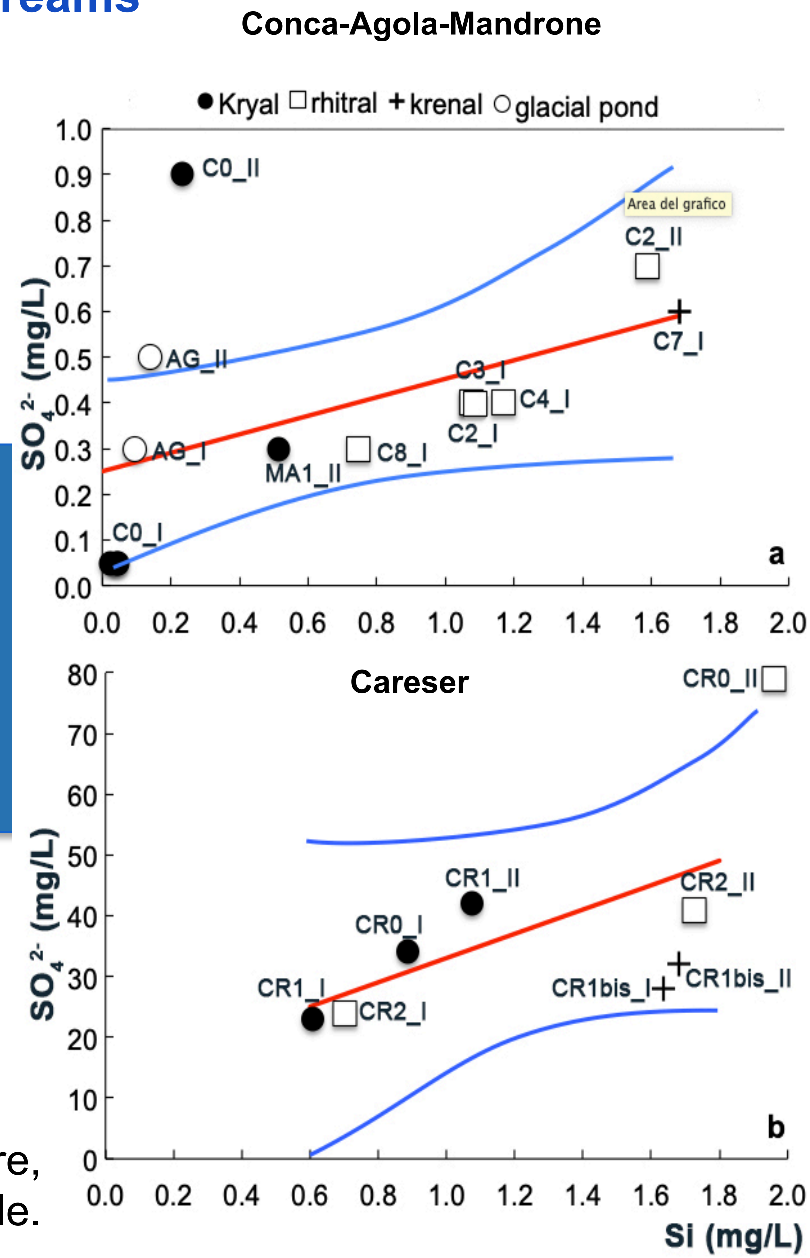
Geochemical characteristics of glacier streams



Differences in the hydrochemical facies for the three mountain groups characterized by different lithologies



Kryal - black circle, Rhithral - white square, Krenal - black cross, Glacial pond - white circle.

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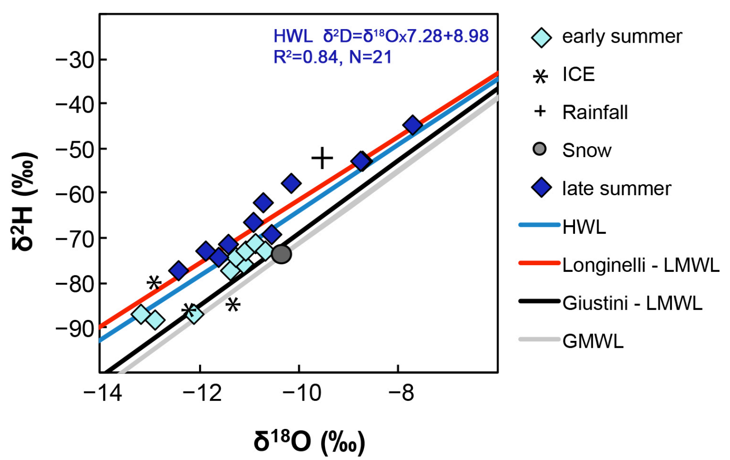
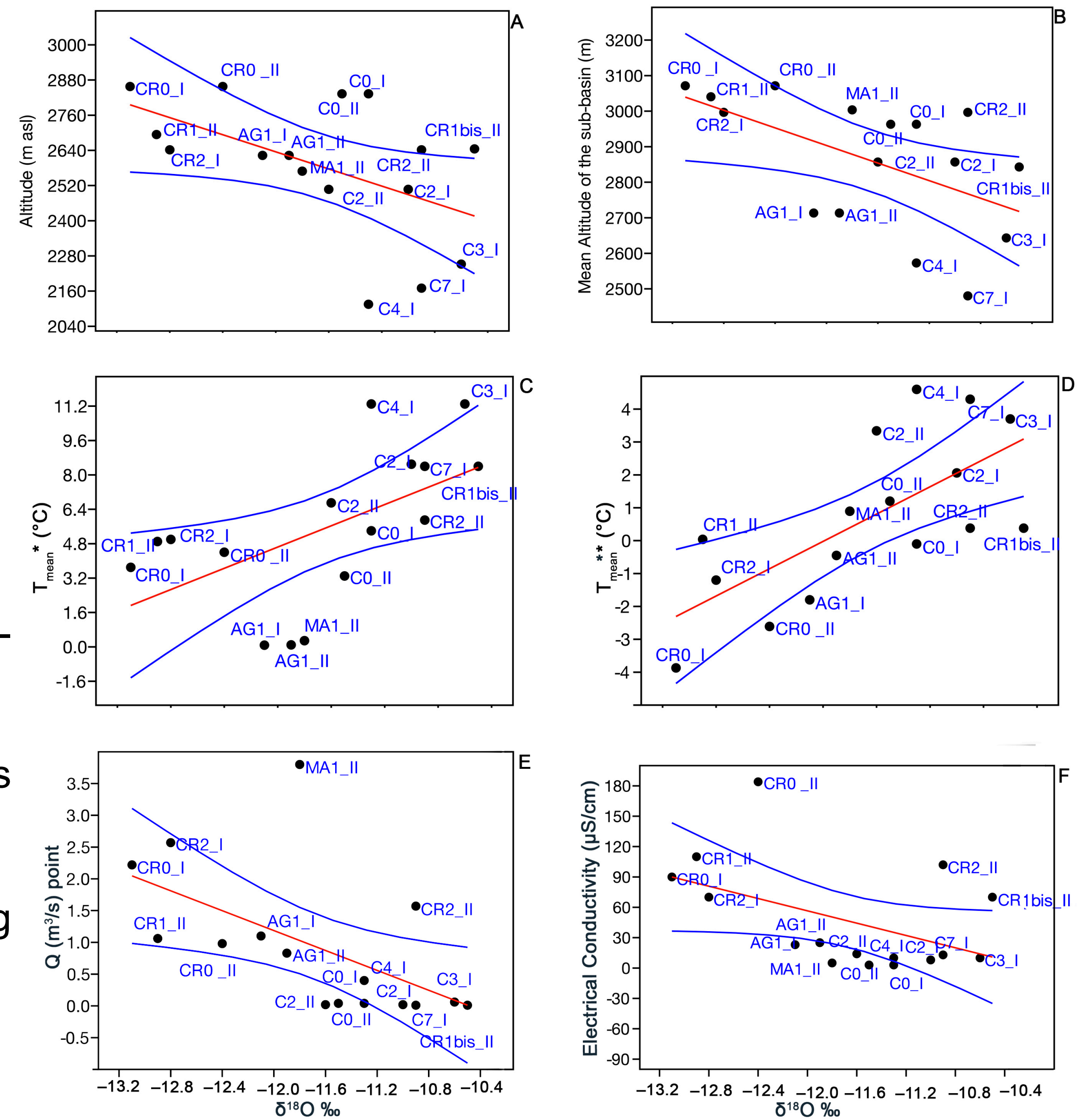


A) $\delta^{18}O$ vs. sampling altitude
B) $\delta^{18}O$ vs. mean altitude of the sub-basin;
C) $\delta^{18}O$ vs. water T_{mean}
(T water measured for three weeks before sampling)
D) $\delta^{18}O$ vs. air T_{mean}
(T air from January to the sampling period)
E) $\delta^{18}O$ vs. discharge
F) $\delta^{18}O$ vs. electrical conductivity.



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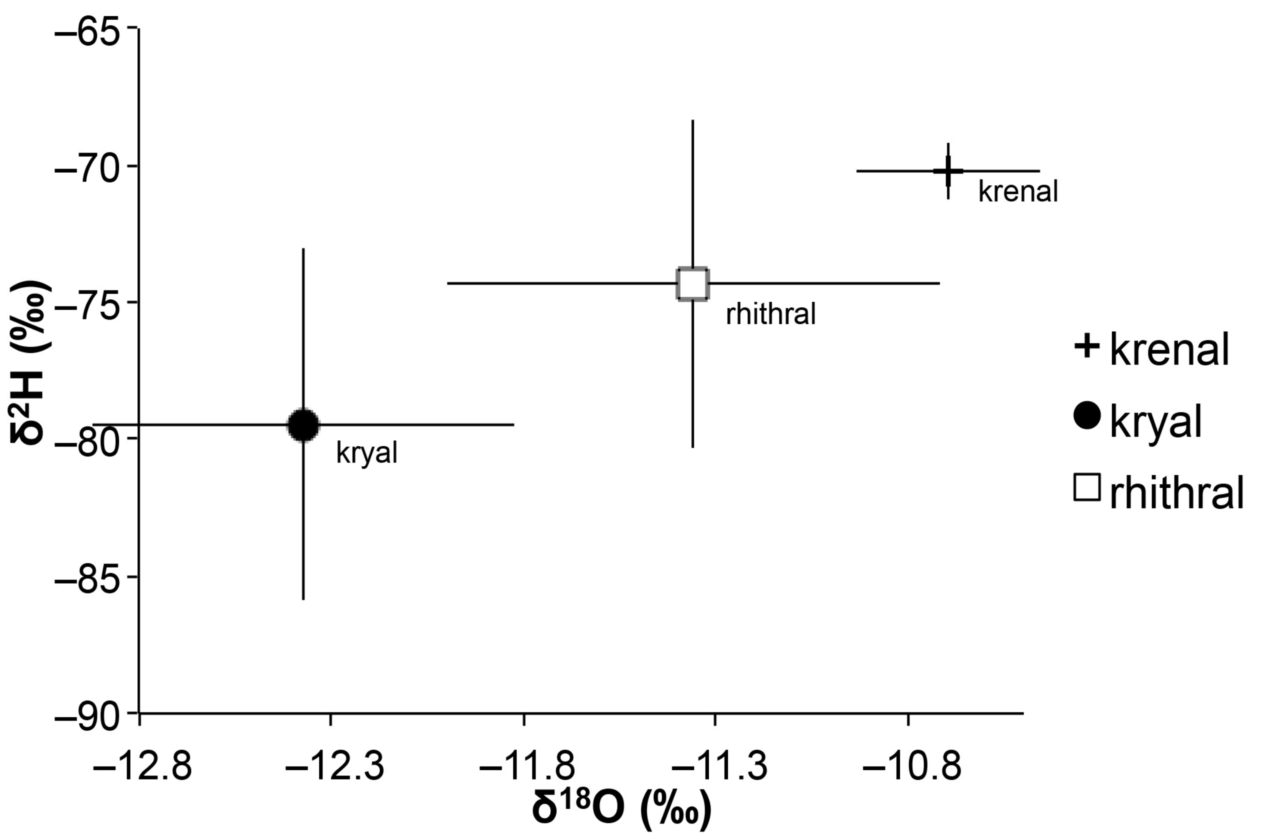

Isotopic composition of stream waters categorized as kryal (close to the glacier snout), rhitral and krenal.

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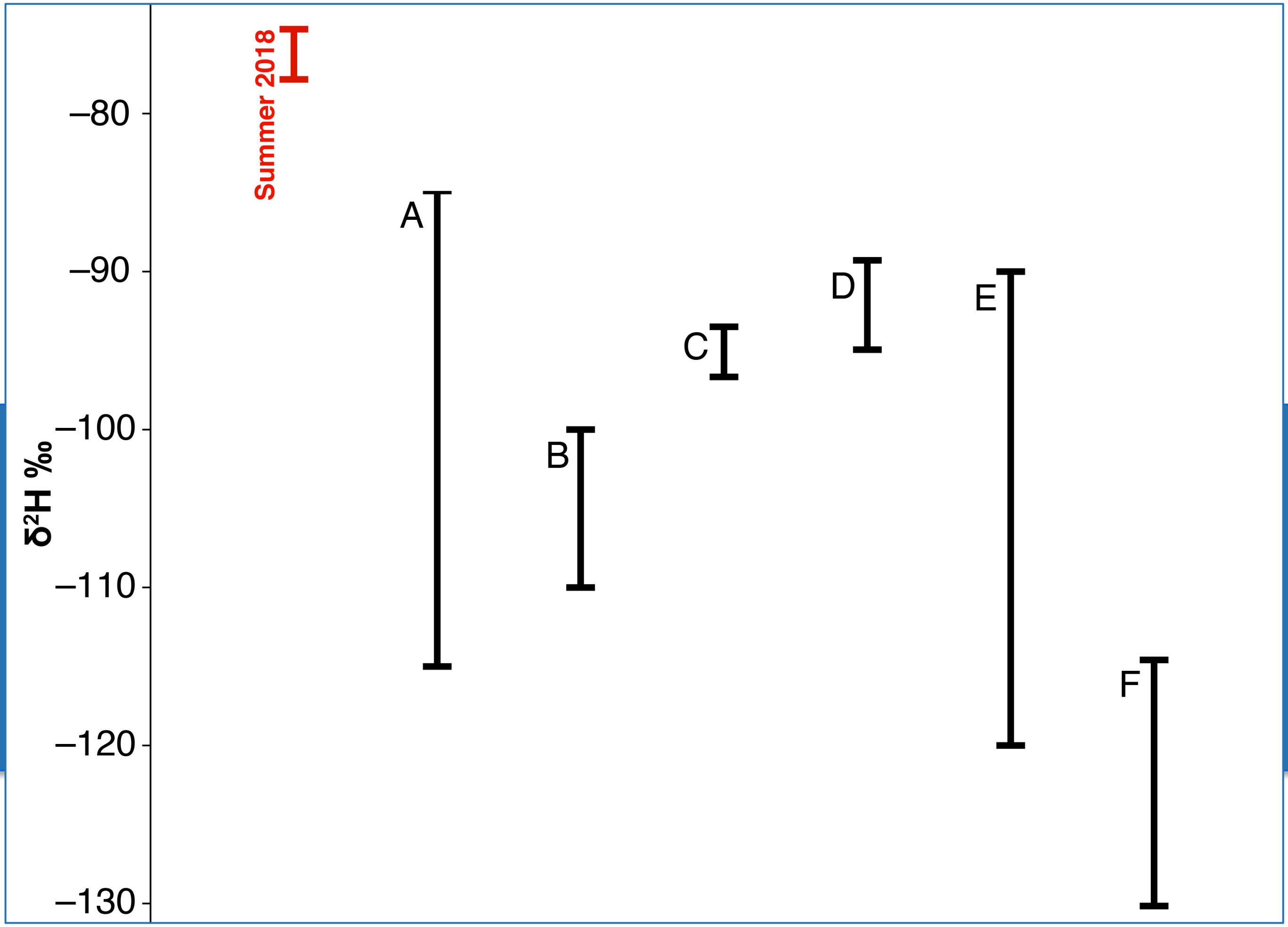

δ^2H range of alpine periglacial waters in the summer of 2018 described in this study, compared with alpine stream waters from other glacial areas reported in previous studies: A, B, D, E = Italian Dolimites surface waters, C = Adige river source waters, F = Swiss surface waters

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water

MDPI

Article

Headwaters' Isotopic Signature as a Tracer of Stream Origins and Climatic Anomalies: Evidence from the Italian Alps in Summer 2018

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