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Intense pedogenic development and large carbon contents in soils above the Pleistocene trimline (NW Italian Alps)

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Most of the Alpine range was influenced by glacier movement or by intense erosive processes during Pleistocene glacial periods, which erased previously existing soils and landforms. Thus, most of the soils in the Alps began developing since at least the end of the Last Glacial Maximum (LGM). However, some surfaces located above the trimline (the upper limit reached by valley and cirque glaciers) still retain "old" morphologies and can be considered paleosurfaces, often covered by fossil or active periglacial features.

After having found very well developed Umbrisols hidden inside blockfields at 3030 m a.s.l. on the Stolenberg Plateau, Monte Rosa Massif – NW Italian Alps (Pintaldi et al. 2021a, 2021b, 2022), we explored other relict cryogenic landforms located above the Pleistocene trimline, such as blockfields and blockstreams, observing the soils hidden below the surface stone layers.

In most cases, we found extremely well-developed soils, such as Podzols with extremely thick E horizons or Umbrisols with A-Bh horizons up to more than 1-m thick. One of the most important properties was the large organic carbon content, up to 10-13% in soils located inside barren blockstreams and blockfields presently devoid of vegetation, at elevations between 1000 and 2950 m a.s.l..

The age of this organic matter is likely very old. For instance, inside the blockfield on the Stolenberg Plateau (3030 m a.s.l.), the organic matter was up to 22 ka old, corresponding to the early retreat glacial phase after the LGM. The age and nature of the organic matter in the other soils is still being analyzed, and it will be able to give important information on past environmental condition in understudied high-elevation areas in the Alps.

References

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