Glacial striae from some sites in Croatia: Categorization and variability

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Striae are linear abrasion features on the rock surfaces, which are produced by relative motion of rock particles in contact (Atkins, 2004). Their genesis is reflected in morphology, orientation and relative position on the particle surface. Thus, they can be used as a tool to distinguish glacigenic from other diamictons and fault zones. So far, glacial striae have been found on 25 locations with Pleistocene in NW and SW Croatia. The locations in external Dinarides were described by Marjanac, 2012, whereas those in inland sections around Zagreb are currently under study.

The studied glacial striations can be categorized by morphology (size, curvature and complexity), orientation, grouping and relationship (see Fig 1). The size categories are: **microstriae** (<0,1 mm wide), **normal sized** (0,1-2 mm wide and/or 50 mm long), **large** (10-20 mm wide and/or 50-100 mm long) and **very large** (>10 mm wide and/or >100 mm long). The curvature categories are: **straight**, **curved** and **very curved** whereas the complexity categories are: **simple**, **grooved** and **complex**. The orientation of striae is observed relative to clast long axis and can be **(sub)parallel**, **oblique** and **perpendicular**. The grouping categories are: **single**, **chaotic/noise**, **parallel** and **grouped**. The mutual relationship of striae can be described as **spaced**, **in contact**, **superimposed** and **radial**.

The relationship of development of striae on clast lithology, size and shape is studied on clasts from 25 localitites in Dinarides, both External and Internal. The striations are well developed on calcerous clastics (Jelar breccia and Promina conglomerates) and limestones, but are less developed on dolomites and quite poor on sandstones. Their development potential is smaller in softer lithologies and that also applies to weathered magmatic and metamorfic rocks. The clast size shows no apparent relationship to abundance of striae but there is dependance of their sizes, where larger clasts by the rule harbour larger striae. Sphericity is also not in apparent relationship to abundance of striae while higher roundness normally supports more striations. Striations were found on most bullet shaped clasts.

Conclusion

The studied glacial striae are easy to distinguish from tectonic and antropogenic striae, although not always readily apparent to the untrained eye. Unlike tectonical striae (which are generally uniform, parallel, and developed on only one or on (sub)parallel clast faces) and antropogenic striae (which are shallow, often unweathered, with serrated edges due to small exerted pressure), glacial striae are variable in morfology, orientation, grouping and relationship. Their overlapping and divergent relationship documents rotation of clasts, and their number documents the abundance of hard objects within the moving mass of debris under heavy load of the overlaying ice. Recognition of glacial striae is crucial in correct interpretation of the genesis of glacigenic diamictons.

References

Atkins, C.B. 2004: Photographic atlas of striations from selected glacial and non-glacial environments. Antarctic Data Series No: 28, Antarctic Research Centre, 45 pp.

Marjanac, Lj. 2012: Pleistocene glacial and periglacial sediments of Kvarner, Northern Dalmatia and Southern Velebit Mt. - evidence of Dinaric glaciation. Doctoral thesis, University of Zagreb, 276 pp.