Geophysical Research Abstracts
Vol. 18, EGU2016-18000, 2016
EGU General Assembly 2016

Frost weathering microstructures on quartz grains as paleoenvironmental indicators in Western Iberia mountain environments (Serra da Estrela, Portugal)

Alexandre Nieuwendam (1), Barbara Woronko (2), and Gonçalo Vieira (1)

(1) Center of Geographical Studies-IGOT, University of Lisbon, Lisbon, Portugal (alexandretn@gmail.com), (2) Faculty of Geology, University of Warsaw, Warsaw, Poland

Cailleux analysis (1942) with modifications from Mycielska-Dowgiallo and Woronko (1998) and scanning electron microscope (SEM) following Mahaney (2002) were performed on quartz grains from vertical slope deposits profiles. Other analyses include granulometric composition.
The degree of weathering (ST) of single grains was determined by identifying frost-weathering microstructures. The frost action index (FAI) is the average value of the ST for a given sample. The FAI value varies between 0 and 3, and the higher the value, the more intensive the frost weathering (Woronko and Hoch, 2011). The effects of frost weathering comprise several microstructures, such as, breakage blocks and conchoidal fractures and scaling. Chemical weathering effects were also seen, like solution pits, solution crevasses and amorphous precipitation.
The values of FAI index of the sediments from the slope deposits vary between 0.6 and 2.05. Samples with a FAI higher than 1.3 indicate that frost weathering occurred for a longer period and was more intense where the dominant microstructures are breakage blocks registered within microdepressions and microfissures. The samples that have a FAI below 1.3, frost weathering was less intense and for a shorter period, with less frequent freeze-thaw cycles and the dominant microstructures are small conchoidal fractures.
The values of the FAI in sediments from the slope deposits reveal changes along the vertical profiles. The maximum value of frost-weathering intensity imprinted on quartz grains were observed in sediments near the base of the slope deposits, and this could be attributed to the effects of seasonal freezing and thawing, as well as to the influence of short term temperature changes. The lower frost-weathering intensity was observed in the near-surface layers probably because they were exposed to frost weathering for a shorter time.

References

Cailleux A. 1942. Les actiones éoliennes périglaciaires en Europe. Mémoires de la Société Géologique de France 41: 1–176.

Mahaney WC. 2002. Atlas of sand grain surface textures and applications. Oxford University Press: Oxford, UK.

Mycielska–Dowgiałło E, Woronko B. 1998. Analiza obtoczenia i zmatowienia powierzchni ziarn kwarcowych frakcji piaszczystej i jej wartość interpretacyjna. Przegląd Geologiczny 46: 1275–1281 (Summary).

Woronko B, Hoch M. 2011. The Development of Frost-weathering Microstructures on Sand-sized Quartz Grains: Examples from Poland and Mongolia. Permafrost and Periglacial Processes 22: 214–227. DOI: 10.1002/ppp.725.