DRAWBACK OF SUNBURN BASALT – CASE STUDY FROM THE BORSKA SKALKA

L. Nováková[1], P. Schnabl[2], P. Navabpour[3], Z. Skácelová[4], Š. Kdýr[2], G. Nikolopoulos[5]
[1]Institute of Rock Structure and Mechanics, The Czech Academy of Sciences, V Holešovičkách 41, CZ-12809 Prague 8, Czech Republic, email: lucie.novakova@irsm.cas.cz; [2]Geological Institute, The Czech Academy of Sciences, Rozvojová 269, CZ-16000 Prague 6, Czech Republic; [3]Institute of Geosciences, Friedrich Schiller University of Jena, Burgweg 11, D-07749 Jena, Germany; [4]Czech Geological Survey, Erbenova 348, CZ-79001 Jeseník, Czech Republic; [5]Department of Geology, University of Patras, GR-26500 Patras, Greece

Introduction: The presence of sunburns is a common feature in alkaline basaltic rocks. Despite their frequent occurrence, works that have studied the origin and implications of sunburn presence are still scarce and controversial [1]. The evidence of sunburn in basaltic rocks works best by identification of white or grey spots and cracks on the rock surface [2]. The locality of the Borska skalka (479 m a.s.l.) near Nový Bor town, Czech Republic (N50.774193, E14.544955) was chosen to demonstrate the influence of sunburn basalts to both field and laboratory measurements. The small ball-like decay of the basaltoid rocks, which markedly highlights the weathering, is also called "sonnenbrand". It is a primarily acquired texture, which is well documented on the outline. The intensity of the disability increases towards the subsoil and is accompanied by a change in the separation from the column to the irregular block [3]. [4] described the connection of sunburn origin with late magmatic processes and non-uniform crystallization of analcite and nepheline from the residual melt. The manifestation of the sunburn symptoms ("spots" and capillary cracks) is caused by physical weathering.

Methodology: A 32 m long profile was prepared along with a dominant rock tower. Magnetic field was measured along the profile using three axis fluxgate magnetometer. The magnetic susceptibility was examined directly in the field by kappa-meter SM20. The field dependence of magnetic susceptibility was investigated using susceptibility meter KLF1. Remanent magnetisation was measured by spinner magnetometer JR6. The isothermal remanent magnetization was acquired by MMPM10 pulse magnetizer. The parameter "Rem" was calculated as a percentage of original magnetization, where 100% is defined as saturated isothermal remanent magnetisation acquired at 2T.

Results: The outcrop is composed of massive basalt, with a sunburn area. The area in the proximity of the altered zone shows deviation in the magnetic field. The rotation of the azimuth was approximately 100°, the magnetic inclination changed more than 40° and the intensity of magnetic field (H) increased twice (Fig. 1). The magnetic susceptibility measured directly on the rock wall show no difference in the amount of magnetic minerals. Laboratory measurement of the field dependent magnetic susceptibility proved that main carriers of magnetisation are titanomagnetites (or similar spinelids).

However, the remanent magnetisation measured on two specimens shows vast differences in natural remanent magnetisation. The sample at the massive part had magnetisation 4.1 A/m, while the sunburn part had 59.9A/m. The corresponding parameters "Rem" are 1% and 14.4% respectively.

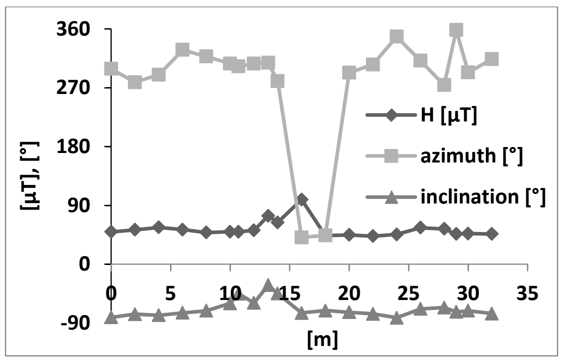

Fig. 1 Graph of the measured data along the profile at the Borska skalka.

Discussion: The sunburn area has higher porosity than the massive parts and almost permanently content some moisture. The moisture in the rock increases electric conductivity, which predisposes this area as lightning strike conductor. It causes the increase in magnetisation of the rock (and distorts the magnetic field in the surrounding area) while the massive basalt with high resistivity is not affected by the lightning strikes.

Summary: The parts affected by sunburn might affect not only field measurements using the classical geological compass, but also some laboratory magnetic parameters.

References: [1] Gisbert G. et al. (2016). *IX Congr. Geol. Esp., Geo-Temas 16 (1)***,** 455-458. [2] Weiher B. et al. (2007). *16. Tagung für Inggeol. Forum „Junge Inggeol.*" 1-9. [3] Cajz V. (2002) GRR in 2001, 25, 24-25. [4] Zagozdzon P.P. (2003) Geolines 188-193.

Acknowledgement: This work has been supported by IRSM CAS, v.v.i. (AVOZ30460519), GLI CAS, v.v.i. (RVO67985831), and DFG (grant n. NA1165/2-1).