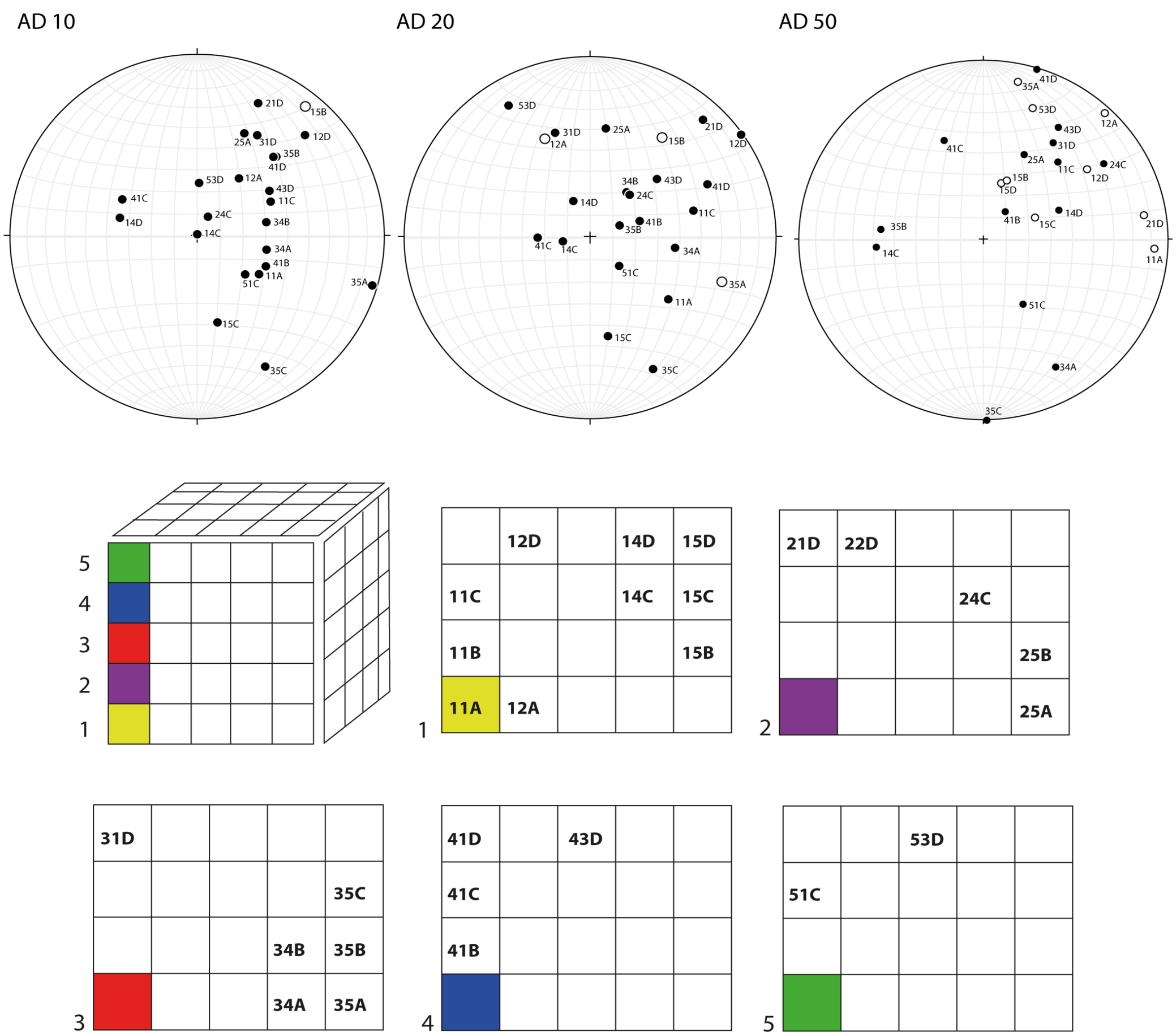
Magnetic structure and paleointensity from the rock that experienced impact during the Santa Fe Crater formation, R. Kavkova[1,2], G. Kletetschka[1,2,3], [1]Institute of Geology, Academy of Sciences of the Czech Republic, Czech Republic, [2]Faculty of Science, Charles University, Czech Republic, [3]Department of Geology and Geophysics, University of Alaska Fairbanks, USA, (Kletetschka@gmail.com).

Great effort was put forward to get new information about paleomagnetic fields that can be recorded in samples' Natural Remanent Magnetiztion (NRM). Elaborated methods were designed to get value of paleofield by analyzing NRM without heating [1]. Rock samples, in general, have NRMs that depend on magnetic minerals, their grain size, aspect ratio, strain and temperature [2, 3]. In crustal rocks two major processes record paleomagnetic information. Process 1 is a cooling the magnetic grain of constant volume through the blocking temperature when fluctuation of the magnetic moments within magnetic minerals of the rock starts interacting with the external magnetic field (if present). Process 2 is when magnetic grain is growing chemically through the blocking volume of homogeneously distributed magnetic dipoles within the mineral and when this mineral volume starts interacting with the external field (if present) at fixed temperature. The acquired magnetizations by process one and two are called thermal remanent magnetization (TRM) and chemical remanent magnetization (CRM), respectively. Both of these processes contribute to overall paleofield recording capability with the similar efficiency [4].

Methods for paleofield estimates rely on laboratory manipulation of samples by giving them artificial TRM and compare them with the magnetization originally found. This manipulation, however, results in irreversible heat-induced alteration [5, 6].

Fig. 1: Samples' magnetic orientation during de-



magnetization by 10, 20, 50 mT along with the sub-gragmentation map.

Normalization method uses multiple empirical sample measurements without heating above room temperature and defines saturation magnetization as a proxy to estimate paleofield. This method depends on a constant determined from a large dataset of magnetic measurements. Such paleofield estimate is believed to fall at least within an order of magnitude to the approximating paleofield [2,3].

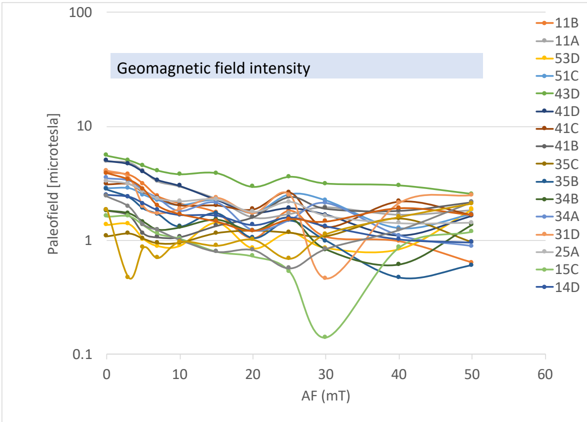


Fig. 2: Demagnetization by impact reduces paleointensity down to microtesla level.

In this work we inviestigate a new method that does not involve heating and capture the amount of magnetic informaton in the samples collected from Santa Fe impact structure. We used the following logic.

Santa Fe shock structure is evidenced by large shattercone structure left in the rock units in the Santa fe, New Mexico area. We discovered that the rock collected today shows signs of impact demagnetization in terms of scattered paleodirections (Fig.1), and reduced paleointensity by more than order of magnitude (Fig. 2). While the resulting directions were less scattered when demagnetized by low magnetic field (10 mT) the scattering increased when demagnetized with 20 mT and 50 mT field (Fig 1). This indicates that demagnetization by impact influenced the grains with the highest magnetic coercivity. Our data not only confirms that impact has taken place but also show for the first time how much intensity is lost due to impact and that the impact modified also the high coecivity fraction.

Acknowledgments: We thank Petr Pruner, Petr Schnabl for use of magnetic laboratory in Průhonice, Czech Republic. This work was supported by GACR 17-05935S, and grant RVO 67985831.

References: [1] Weiss B. P. and Tikoo S. M. (2014) *Science 346*, 1198- [2] Kletetschka G. et al. (2004) *EPSL 226*, 521-528. [3] Kletetschka G. and Wieczorek M. A. (2017) PEPI 272, 44-49. [4] Kletetschka G. et al. (2002) *Tectonophysics 347*, 167-177.