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Structural analysis of a Miocene ignimbrite quarry (Tar, Hungary) by Drone (UAV) 3D photogrammetry modelling.

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The abandoned “Fehérkő bánya” ignimbrite quarry in Tar (NE Hungary) was considered as the type locality of the Early Miocene “Middle Rhyolite Tuff Horizon”, but later this was revised due to its lithological composition which is similar to younger (Middle Miocene - Langhian) ignimbrites (Harangi et al. 2005). The paleomagnetic directions do not show significant rotation compared with the present North (Márton et al. 2007).
The quarry has rectangular shaped vertical walls reaching 40 m heights. This geometry makes it extremely difficult to collect measurements on the rock surface. However, using a camera drone, and more than 500 photos taken, a 3D photogrammetry model was created using PhotoScan software. The model was rectified using GPS-surveyed field control points. It has a precision and resolution of a few cm-s which makes it usable for pattern tracking via modeling tools such as Leapfrog Geo: a powerful tool to extract, classify and analyze structural elements from photogrammetry models (Szentpeteri et al. 2016). Structural extraction uses the photo patterns and the 3D geometry to define geological structures in the virtual space by digitizing 3D lines. The structural analysis – completed with field measurement – revealed a multi-phase deformation based on the following observations:
1) A swarm of NW and SE dipping small-medium sized fractures and normal faults are the dominant features. Some of the steeper faults show slickensides referring to sinistral oblique normal faulting. These structures – if considered as one phase – refer to an extension ranging from WNW-ESE to NW-SE direction. Similarly to the main fault of the Zagyva-valley, which is located a few km to the West, the footwall is mostly the SE block.
2) A few W-E striking faults are also present – regarding its subordinate occurrence, it is considered as a possible, but unsure deformation phase.
3) Small subhorizontal fractures showing a slight dipping trend to the SW are probably due to decompression which occurred after the exhumation of the faulted rock body. The slight dipping can be explained with a less than 10 degree tilt towards the SW.
The observed structural phenomena correspond with the Serravallian and Tortonian deformation events detected in similar geological formations in the nearby region (Petrik et al. 2016). This work is the first demonstration of drone 3D photogrammetry used for structural analysis in Hungary.

Harangi, Sz., et al. (2005). Correlation and petrogenesis of silicic pyroclastic rocks in the Northern Pannonian Basin, Eastern-Central Europe: In situ trace element data of glass shards and mineral chemical constraints. Journal of Volcanology and Geothermal Research, 143(4), 237-257.

Márton, E., et al. (2007). Paleomagnetic correlation of Miocene pyroclastics of the Bükk Mts and their forelands. Central European Geology, 50(1), 47-57.

Petrik, A., et al. (2016). Cenozoic structural evolution of the southwestern Bükk Mts. and the southern part of the Darnó Deformation Belt (NE Hungary). Geologica Carpathica, 67, 83-104.

Szentpéteri, K., et al. (2016). Drones (UAVs) in mining and Exploration. An application example: Pit Mapping and Geological Modelling. MGEI 8th Annual Convention 2016.