Image classification with unconventionally applied GIS methods in the fault related rocks from the Western Tatra Mts. grain size distribution: preliminary results

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Analysis of a grain size distribution and grain shapes in the fault-related rocks is a relevant tool in a reconstruction of a mechanisms and conditions leading to a development of these rocks (e.g., Heilbronner & Keulen, 2006; Berger et al., 2011). A data can be obtained from a thin sections: manually (like in Kania, 2014) or using an image analysis procedure. A YAGBSE imagery was used and an image classification methods derived from the remote sensing and GIS methodology were applied (see e.g., Tarquini & Favalli, 2009) to improve grain sized distribution data on the Western Tatra Mts. fault rocks. Such an extended method allowed to get definitely better data sample to performing statistical analyses.

The analyses were proceeded in 5 samples taken in typical for the Western Tatra Mts. crystalline core cataclasites from the Długi Upłaz–Wołowiec area, as well as one protomylonite from the Wołowiec massif. The characteristic feature of this region is abundance of a sub-horizontal brittle-ductile shear zones, composed of a shearing-related rocks: cataclasites and mylonites. The protholites are so called leucogranites and Rohače-type granodiorites. The following procedure was applied: (1) YAGBSE SEM imaging, (2) noise reduction, (3) determining training areas for a maximum likelihood classification, (4) maximum likelihood classification, (5) generalization of the raster, (6) vectorization, (7) data selection, the quartz grains were taken into consideration,) statistical analyses. In some stages decision steps with visual evaluation of the results were included. The ArcGIS software was applied to perform a crucial steps – supervised image classification.

The results of the grain size determination are shown on the Figure 1. The area and perimeter of the grains have generally unimodal distribution with right-side skewness, resembling the gamma distribution in most cases. The unique rocks have different kurtosis, stronger for the rocks of more advanced cataclasis.

The range of a variation in size parameters is narrowest for the mylonite. In the cataclasites, narrow range of the variation occur in the smaller grain dominated rocks.

The method applied here with additional shape indicators seems to be a powerful tool in quantitative analysis and interpretation of the fault rocks textural features.

References:

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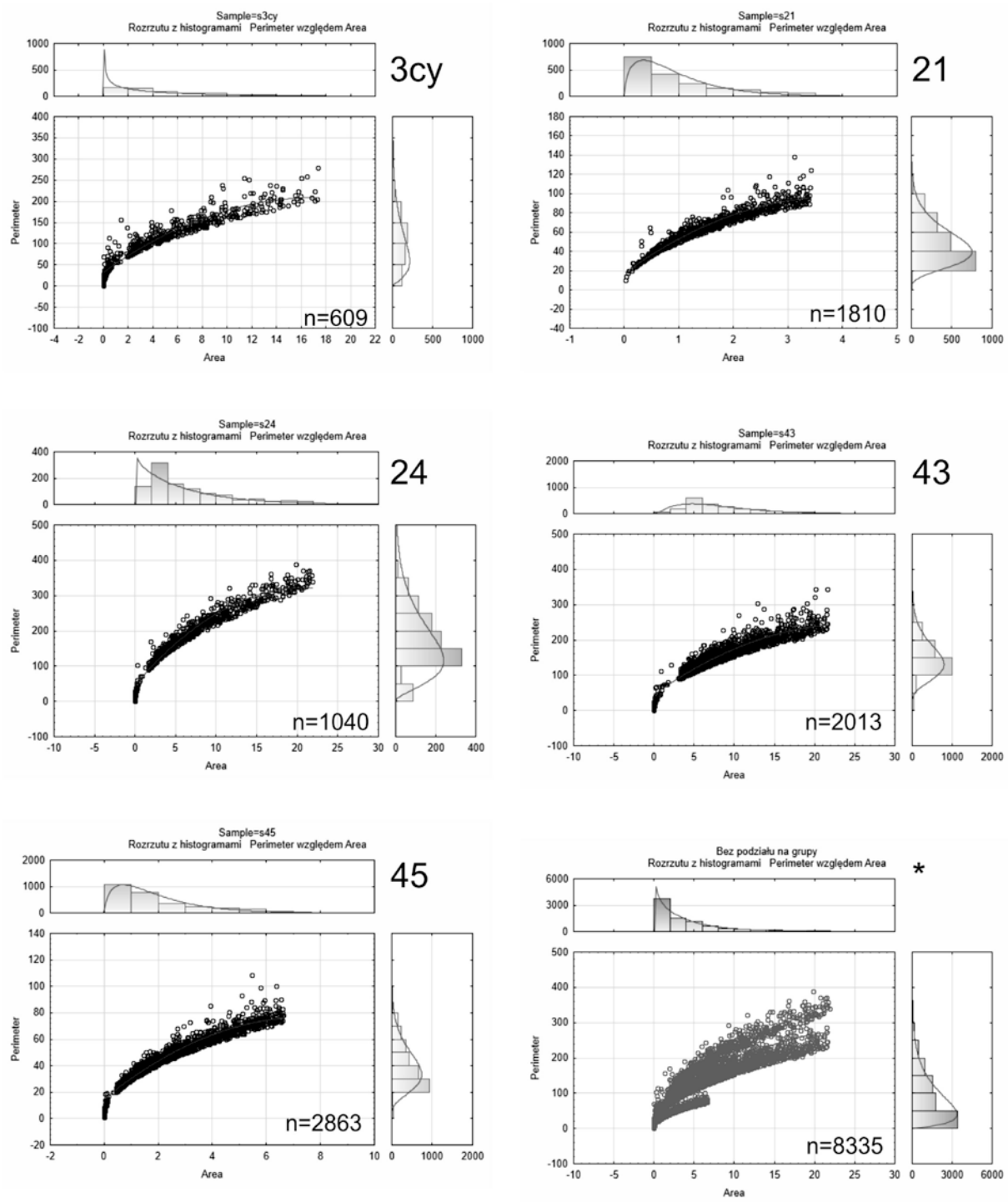

Figure 1: Grain size distribution: histograms of an area (upper, μm2), a perimeter (left, μm); perimeter (Y axis) vs. area (X axis) scatter plot. The last plot–aggregated data of all of the samples.