Geophysical Research Abstracts
Vol. 21, EGU2019-1573, 2019
EGU General Assembly 2019

Extraction of textural parameters in submarine gravity flow sediments, essential for detection of their complexity.

Joanna Pszonka

Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Krakow, Poland
(joanna.pszonka@gmail.com)

Submarine gravity flows transport volumetrically the most extensive sediments on Earth and thereby constitute there the most significant process for moving sediment. So, understanding of these flows is crucial in order to gather how sediments are redistributed across our planet. Submarine flows can undergo transformations during their depositional events and incorporate different types of flows, from dilute turbidity currents, via intermediate stages to dense debris flows. The directly monitoring of these complexities is extremely difficult, expensive or even impossible due to (i) a flow-occurring in relatively inaccessible locations and (ii) an unpredictability of such phenomena. The depositional record of submarine gravity flows appears very useful in capturing data, including textural characteristics of these deposits, as important indicators for flow hydrodynamics.

The question should be asking in textural studies is whether grain-size and -shape differences through beds are statistically significant. The object of this experiment is to display how to obtain in significant amount size- and shape-grain parameters of submarine gravity flow sediments.

The aim was solved by using the mineral liberation analysis (MLA), an automated measurement system, created to provide quantitative analyses of mineral species. This system is based on a scanning electron microscope (SEM) with an energy dispersive X-ray (EDX) spectrometer and a software: (i) backscattered electron (BSE) image analysis allows to determine grain boundaries and sites for X-ray spectral acquisition, (ii) X-ray spectra allow to classify samples by comparison to a library of reference spectra and (iii) software automates microscope operations and data acquisition.
The experiment was carried out with the Cergowa sandstones (Outer Flysch Carpthians), sediments deposited by surge-type turbidity currents in the more distal localities of the basin, high-density turbidites and hyperpycnal flows fed from a directly connected delta in the proximal part. 22 samples representing different structures of sediments, thereby different types of density flows, were crushed and framework grains were separated to prepare standard petrographic thin sections, coated with carbon.

On average, ca. 180 000 grains were measured for each sample and the time needed to register 8 samples (the standard sample holder accepts 8 thin sections) is 5 – 8 hours. The experiment enabled to obtain the following textural characteristics of submarine gravity flow sediments: (i) size measurements: area, perimeter, max span, length, breadth, diameter and (ii) shape measurements: aspect ratio, angularity, form factor.
Textural differences among analysed samples, representing diverse types of gravity flow were displayed in a comparative study with descriptive statistics: four moment measures (mean, standard deviation, skewness, kurtosis), as well as supplemental median value. Qualitative MLA–findings, such as mineral identification, complete these data.

The MLA provided quantitative analysis regarding textural parameters of submarine sediments, necessary to determine depositional flow types and their transformations. The MLA seems to be one of the most suitable methods to extract data set for textural analysis in a large amount and relatively quick time, so it has great potential to detect and suggest some solving in uncertainty and complexity of the difficult to monitor submarine gravity flows phenomenon.