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Visual clustering of ocean sediment grains using a combination of unsupervised machine learning methods.

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Quantitative, granulometric and classification-based distribution of oceanic sediment grains are important indicators in paleo-reconstruction of the characteristics of marine waters. Currently, the classification of grains is performed visually by an expert on a limited subset of a sediment sample using a binocular microscope. It is a highly time-consuming process in which geological expertise is required of the observer. In this study, we propose a method to automate and accelerate this kind of work using a combination of machine learning algorithms. We photograph sediment samples prepared for examination using a digital optical microscope. We then apply a clustering algorithm including classical and neural machine learning techniques. An experienced marine geologist then identifies the resulting clusters. Our method significantly reduces the time consumption of the expert. We demonstrate that the proposed method is able to divide sediment grains into homogeneous groups suitable for further accurate classification. This will allow further evaluation of important characteristics (paleoindicators), such as the ratio of biogenic carbonate grains and terrigenous grains, as well as the ratio of whole shells and shell fragments. The clustering results obtained using our algorithm may be used to train a more accurate classification algorithm.

Agreement to place

Participants agree to post their abstracts and presentations online at the workshop website. All materials will be placed in the form in which they were provided by the authors

Primary authors: GOLIKOV, Viktor; KRINITSKIY, Mikhail (Shirshov Institute of Oceanology, Russian Academy of Sciences); BORISOV, Dmitrii (Shirshov Institute of Oceanology, Russian Academy of Sciences)

Presenter: GOLIKOV, Viktor

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