

# Application of the Earth Mover's distance (EMD) for a quantitative comparison of SPO data from the rigid particle rotation model and the columnar mineral grain in metamorphic rock

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Shape preferred orientation (SPO) is widely used in the deformation analysis of rock. As the evaluation of the distribution pattern is generally performed by qualitative comparison, it is difficult to evaluate a lot of distribution patterns systematically. In order to solve such difficulties, in this study, we introduce the Earth Mover's distance (EMD) as the scale of similarity in the distribution pattern of SPO. The EMD calculates the similarity between the distributions on the basis of the distance that is obtained by the transport problem. In this presentation, we demonstrate the similarity between two types of the SPO data, both of which are collected by the numerical simulation based on the rigid particle rotation model and the measurement of columnar tourmaline grains embedded within an individual metachert spacemen. SPO data of columnar grains is collected by the measurement of the direction of the long axis, the length of long axis and width of the 3136 and 1577 columnar tourmaline grains, respectively. The similarity between SPO data was represented on the value of the EMD, and then we estimated the strain, degree of non-coaxiality and Flinn parameter as indexes to constrain the development of SPO pattern of columnar grains under ductile deformation. Our analysis showed that the smallest EMD is obtained from the simulation data calculated by setting the strain to 1-2, the degree of non-coaxiality to 75°-90°, and the Flinn parameter to 1-3. This result suggests that the analysed sample would be deformed under the pure shear condition.

Keywords: shape preferred orientation, Earth Mover's distance, the rigid particle rotation model