

The evaluation of bioturbation flux based on biogenic stratification using rule based lattice model

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This study aimed to establish a method to estimate the magnitude of the intensity of bioturbation quantitatively from geologic records. First, we employed the percentage area of bioturbation (PAB) as a proxy of the intensity of bioturbation that is measurable in ancient deposits, and examined the relationship between PAB and the actual biological activity by numerical experiments using a rule-based lattice model of bioturbation. In this model, the migration of sediment particles due to bioturbation are determined stochastically. Experiments were conducted by changing the two dimensionless parameters of bioturbation: the dimensionless bioturbation flux and the dimensionless bioturbation length. These dimensionless parameters were arisen from the dimensional analysis of the model parameters. The first parameter can be regarded as the intensity of bioturbation, and the second is related to the size scale of the dominant tracefossil in the assemblage. As a result of the numerical experiments, we obtained a relational function to estimate the bioturbation flux from PAB and the bioturbation length. Both the parameters PAB and the bioturbation length can be measured from the images of sections of sedimentary rocks, and therefore our method to estimate the bioturbation flux is applicable for the ancient depositional successions.

Keywords: Paleo environment, Bioturbation Index, Sedimentary structures