

生痕化石の観察に基づく細粒碎屑岩の圧密の推定

Estimating the degree of compactional thinning of fine-grained clastic rock based on ichnological observation

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This study proposed the empirical relationship between the degree of compactional thinning and geochemical composition for fully consolidated fine-grained clastic rocks. New data were provided by sedimentological, ichnological, and geochemical analyses of the mudrock samples from the Eocene Naharigawa Formation, Muroto-Hanto Group, Kochi Prefecture, Japan. Based on these analyses, the degree of compaction of the Naharigawa mudstones as a percentage of shortening (C_{ms}) was calculated as 83.01 %. To quantitatively estimate the empirical relationship, the C_{ms} values for various fine-grained clastic rocks, whose geochemical compositions are available by previous studies, were further calculated and compiled. As a result of the compilation, a significant and strong negative correlation between the C_{ms} values and CaO abundances ($r = -0.75$; $p < 0.05$) was recognized. Furthermore, the C_{ms} values show negative correlation between Ca concentrations normalized to terrigenous material (CaO/Al_2O_3 , CaO/TiO_2) that are considered as proxies for relative contribution of non-terrigenous (i.e. biogenic) carbonates, although the recognized correlations are not statistically significant. These lines of evidence strongly suggest that the degree of physical compaction of fine-grained clastic sediments is affected by carbonate contents. Although the obtained relationship may hold only for fully consolidated fine-grained clastic rocks of the Paleogene or older ages, it is very helpful for quantitatively estimating the degree of compactional thinning for any fine-grained clastic rock-dominated succession, as long as the major element composition of the sediments is determined. Furthermore, a geological example of application of the proposed empirical relationship to consolidated mudstone-dominated succession is also discussed.

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