

Two different layers of spaced stratification in the Upper Cretaceous Izumi Group, Bandodani Formation, southwest Japan

*Takumi Nagato¹, Hajime Naruse¹

1. Kyoto University

In coarse-grained sandstones deposited from various processes such as subaqueous sediment gravity flows, pyroclastic flows, hyperconcentrated flows, and tsunamis, the sedimentary structure called the spaced stratification is commonly observed in the basal part of beds. The spaced stratification is composed of multiple inverse graded layers in which grains become coarser upward from the sharp erosional bases. Several studies have proposed hypotheses for the formation process of this characteristic structure based on field observation and flume experiments, but the controversy has not yet been settled as to which hypothesis is correct. Here, based on high-resolution microtextural observations of sandstone samples, we suggest that several different processes may have produced macroscopically similar sedimentary structures.

This study analyzed the spaced stratification in high-resolution using the image segmentation model composed of CNN (Convolutional Neural Network).

This study conducted a field survey to observe features of this sedimentary structure and to take samples from a sandstone bed exhibiting the spaced stratification in Oge island, the northern Tokushima Prefecture, Japan. The Bandodani Formation of the Izumi Group, which is the Upper Cretaceous submarine fan deposit, is distributed in this region. The polished horizontal cross-sections parallel to the paleocurrent direction were produced from the sandstone bed. The cross-sections were photographed using a desktop scanner, and the high-resolution spatial variation in grain size and fabric of the spaced stratification was automatically measured using the CNN-based image segmentation technique.

As a result of the analysis, two types of inverse graded layers were newly identified in the spaced stratification, distinctively different in grain size and fabric characteristics. The inverse graded layer Type A is characterized by an upward tendency to be sorted poorly in grain size and to become a lower concentration of the imbrication angle of the grain long axes. In contrast, Type B is characterized by well-sorted grain size distribution and the high concentration of the imbrication angle of the grain long axes throughout a layer. Thus, this study suggests that several different processes can form the spaced stratification.

Keywords: Spaced stratification, Traction carpet, Turbidite, Image analysis, CNN