Foraminiferal thamatocoenosis as a tracer of the sorting process in the coastal surf zone

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Microplastic wastes (<5 mm in size) in marine environments might seriously affect on marine ecosystem. Recently, a noteworthy case has been reported that microplastic fragments were included in an agglutinated shell of foraminifera, a unicellular microorganism of Protista (Tsuchiya et al., 2019; Tsuchiya and Nomaki, 2019). This case arrises a serious fear of ecologic pollution because such microorganism shows generally high productivity and plays an important primary consumer of the ecologic system. It has been suggested that secondary microplastic grains might be generated from macro-size plastic wastes by fragmentation process affected by both ultraviolet light and wave energies. However, the physical processes of fracturing, sorting and accumulating microplastics such as included in foraminiferal shells has been still unknown. The purpose of the present talk is to propose a model that braking wave at the surf zone of the pocket beach plays an important role for generating and sorting the microfragments of plastic wastes.

We have studied the bottom sediments of the well-known singing sand beach Kotogahama since 2013. According to the results, the distribution of singing sand corresponds to the surf zone (0--8 m in depth) owing to the repeated sorting process driven by braking wave. Focussing on the foraminiferal shells in the sand grain, the assemblage is dominated by rock-reef species transported from neighboring rocky areas. The foraminiferal content shows significant deviation pattern from coast to offshore areas. It clearly indicates that foraminiferal shell might be a good tracer for coastal sorting process of bottom sediments. In previous studies, fluorescent particles have been frequently used for such tracer of beach process. However, using fluorescent particles should not be desirable for future studies because the material might induce further microplastic contamination to the coastal region. We would like to clarify the detailed coastal process generating microplastic particles using foraminiferal shells as a tracer of coastal sorting process.

Keywords: microplastic wastes, foraminifera, surf zone