# Temporal size change of the middle Miocene planktonic foraminiferal species *Paragloborotalia siakensis* (LeRoy)

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The extinction of Miocene planktonic foraminiferal species *Paragloborotalia siakensis* (LeRoy) defines the uppermost boundary of planktonic foraminiferal Zone N.14 (Blow, 1969). Many workers have examined the taxonomy of the morphospecies, however it has still been controversy. Bolli and Saunders (1982) proposed that *Globorotalia siakensis* (= *P. siakensis* of this study) should be a junior synonym for *Groborotalia mayeri* Cushman. The geologic time scale of Berggren et al. (1995) is also based on this taxonomic criterion, and the extinction of "*Neogloboquadrina mayeri*" was used for his zonal boundary. Zachariasse and Sudijono (2012) conducted morphological analyses using a scanning electron microscope (SEM) for *P. siakensis* collected near the type locality. They also examined holotypes of both species and concluded that *P. siakensis* could be distinguished from *G. mayeri* by its suture and surface structure. Okada and Hayashi (2013) carried out taxonomical examinations for *P. siakensis* obtained from IODP Site U1338 in the eastern equatorial Pacific, which is located in the central part of the distribution area. Through their SEM analysis, most specimens could be correlated with the holotype of *P. siakensis* with few exceptions. In addition, their diagrams of morphological analyses indicate that holotypes of *P. siakensis* and *G. mayeri* should be contained within the same morphological space of the specimens from Site U1338. They also reported the size distribution pattern of *P. saikensis* from approximately 15 to 11 Ma and pointed out that the size distribution pattern would have a good potential for global correlation and needs more study. The purpose of this study is to refine the temporal size distribution of *P. siakensis* and to establish global correlation based on the size distribution pattern of the species.
We conducted size measuring of this species at Site U1338 from approximately 16 to 11 Ma. At the same time, we performed X-ray microcomputed tomography (XMCT) analyses and thin section observations at selected horizons. Seventy-five samples at an interval of approximately 0.05 Ma from the site were used for this study. These samples had been already examined for planktonic foraminiferal assemblage (Hayashi et al. 2012). Then, total 6895 specimens of *P. siakensis* were measured in maximum diameter. The size distribution was discussed with respect to previous geochemical and paleontological data. In the next step, we are examining the size distribution at the Site U1337 near the Site U1338. And some three-dimensional images of specimens collected from characteristic horizons were acquired by XMCT. The CT images enable us to visualize the inner structure such as the form of chambers, ontogenetic growth pattern, and density distribution in each test. Based on CT images, we can estimate the three-dimensional morphologic comparison, degree of maturation and obesity of each test. For mineralogical approaches, thin sections of foraminiferal tests were observed by a polarization microscope. In a result, we detected twice giantisms and twice dwarfings in the size distribution pattern. The cycle of size change was approximately 2 Ma. One of the dwarfing events could be correlated with Mi3 event (Miller et al., 1991). Therefore, this dwarfing event could be caused by cooling of sea surface water. According to 3D profiles of foraminiferal chambers, tests of relatively small specimens were composed of both high and low CT value layers. In contrast, the larger tests were generally composed of a pair of low CT value layers. Considering previous CT studies, we assume that the difference in the inner layers might reflect the growth the rate for each individual: pair of low CT value layers might mean relatively rapid growth rate.

 

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