

Long term size changes of the Middle Miocene planktonic foraminifera in the eastern equatorial Pacific

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Body size is a key morphological attribute which has fundamental and significance information. For paleobiologic study based on fossil records, classification depends mainly on morphology of hard tissue. Previous studies noted that the temporal reduction in dominant size was observed in several fossil records when the taxon faced mass extinction or strong biostress.

This phenomenon was termed as “Lilliput effect” and appears to be ubiquitous to extinction events and occurs not only within unicellular and multicellular but also terrestrial and marine organisms, therefore it has a potential to make clear what the relationship between organism response and environmental fluctuation.

Then, a size analysis to investigate the phenomenon requires a lot of individuals of single taxon, therefore microfossil characterized by rich and successive abundance is more valid material than macrofossil. Particularly, planktonic foraminifera shows accretion growth by adding new chamber on its penultimate chamber, therefore the size well reflects the ontogenic pattern.

The core samples we used in this study were drilled at the Integrated Ocean Drilling Program (IODP) Sites U1337 and U1338 consisting of the Pacific Equatorial Age Transect (PEAT) project, which was planned in order to obtain the Cenozoic successive geologic record. The stratigraphic interval of approximately 400 million years in Middle Miocene (15–11 Ma) was used for this study. This interval includes the transition from the relatively warm face (MCO: Miocene Climatic Optimum) to the colder mode with the expansion of the Eastern Antarctica Ice Sheet (EAIE: 13.8 Ma).

Keywords: Planktonic Foraminifera, Size, Giantism, Middle Miocene Climatic Optimum, Eastern Antarctic Ice-sheet Expansion

Long term diameter changing

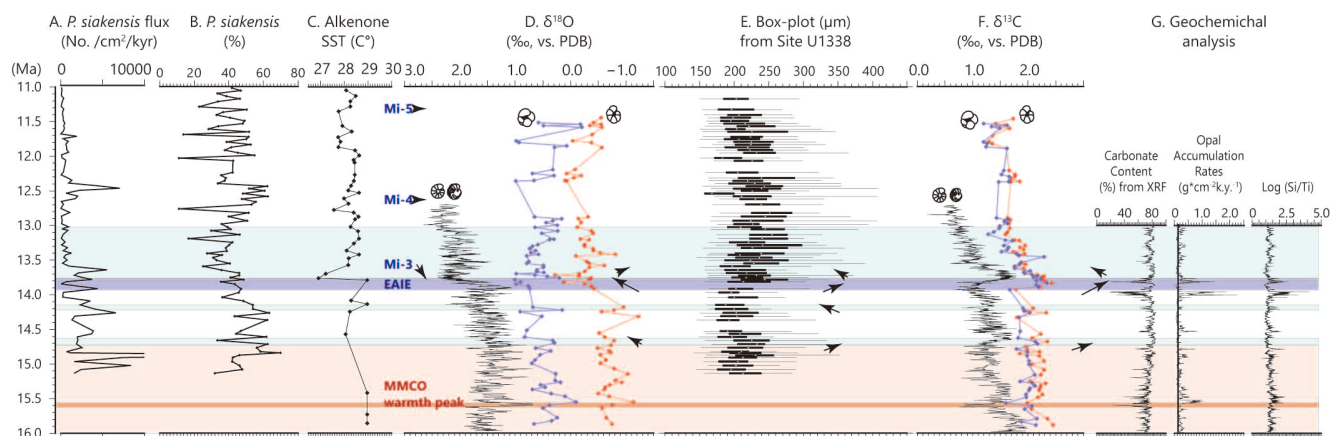


Fig.1 Temporal size changes are plotted with other previous data. A: Flux of *P. siakensis* at Site U1338 (Hayashi et al., 2013). B: Relative abundance of *P. siakensis* at Site U1338 (Hayashi et al., 2013). C: Alkenone SST data at Site U1338 (Rousselle et al., 2013). D: Stable oxygen isotope data. The black line represents benthic foraminiferal data at Site U1338 (Holbourn et al., 2014). The red line represents data for *P. siakensis* and the blue line does data for *Dentoglobigerina venezuelana* at Site U1337 (Matsui et al., 2017). E: Diameter of *P. siakensis* at Site U1338. F: Stable carbon isotope data. The color of each line is same as D. G: Geochemical data (Holbourn et al., 2014; Lyle et al., 2012).