Parameter identification of mathematical models based on three dimensional information of planktic foraminiferal shell structure obtained by Microfocus X-ray CT

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Morphological variations in microfossils like foraminifers and radiolarians might have the meaning of various functions for their evolution and adaptation in the geological history. In order to quantitatively understand such morphological variations, it is important to parameterize the morphological features in microfossils. We obtained precise morphology of a modern planktic foraminifera Globigerinoides ruber (d'Orbigny) using Micro-Xray Computed Tomography (Micro-XCT) technique, and developed numerical approximate models to validate the parameterization by experimental rules used the sequentially connected spheres. Our approximate spherical model clarified that several parameters including radius ratio, distances of geometric centers in each chambers are almost constant, and others such as revolving angle between adjacent chambers are gradually transformed associated with growth of G. ruber, It indicates that previous numerical model could not interpret whole morphology of this species. The coupling of mathematical model and Micro-XCT technique has the great potential to realize various forms of microfossils and understand its functional morphology.

Keywords: Microfocus X-ray CT, Mathematical Model, functional morphology, Planktic foraminifera

