Palynomorph assemblage in sedimentary rocks of the Mesoproterozoic Qaanaaq Formation from northwestern Greenland.

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The evolutions of cyanobacteria and eukaryotic algae have been thought to be promoted by expansion of shallow ocean environment under long-term climatic warming by volcanic activity during the Mesoproterozoic, which is reconstructed by the analyses of sedimentary rocks deposited the delta-submarine fan system formed during the Grenville orogeny (Taira, 2007). Molecular biological researches supported that the pronounced promotion of eukaryote evolution was possibly occurred during the Mesoproterozoic (Philippe and Adoutte, 1998). In paleontological studies of the Mesoproterozoic fossils, organic microfossils such as acritarchs were used as strong indicators for reconstructing the marine organisms. The acritarchs is one of organic microfossils (palynomorphs) that are insoluble by acid and alkali treatments, and cannot be assigned to known group of organisms while they are thought to be cysts and sporangia of eukaryotic organisms. Morphology of the acritarchs became various and complicated after the Phanerozoic, especially during the Paleozoic, so that the acritarch fossils were used for paleontological and paleoenvironmental reconstructions after the Paleozoic. However, there are few studies for evolutional history and paleoecology including the biological response against environmental changes of the acritarchs during the Precambrian. In the present study, we performed the morphological observation of the acritarch fossils in the Mesoproterozoic sediments from northwestern Greenland to identify and examine their species (kinds) and to reconstruct the paleoecology of the marine organism during the Mesoproterozoic.

The samples used were greyish shales of the Qaanaaq Formation belonging to the Dundas Group, collected from the Thule Basin in northwestern Greenland during July-August 2018 and 2019. These expeditions were supported by MEXT (Japanese Ministry of Education, Culture, Sports, Science and Technology) through Arctic Challenge for Sustainability (ArCS) the Arctic region research project. The kerogens were separated by HCl and HF treatments of the sediments, and observed under a fluorescent light microscope.
We could identify 8 kinds of acritarchs such as *Leiosphaeridia* sp., *Synsphaeridium* sp., *Satka* sp., *Navifusa majensi*, *Simia* sp., *Lophosphaeridium* sp., *Schizofusa* sp., *Tasmanites* sp. and filamental microfossils. *Leiosphaeridia* sp. is the most abundant in all horizons of the Qaanaaq Formation in our study, and their diameters tend to increase upwards of the horizons. The *Leiosphaeridia* sp. fossils include several species and cannot distinguish with the broken and isolated colonial cells because their cells have simple structure (Samuelsson et al., 1999). From this fact, the increasing of the fossil sizes observed in our study was presumably affected by the mixture and shift of the several species morphologically identified as *Leiosphaeridia*. *Synsphaeridium* sp. and *Satka* sp. are distinctive features in the aggregates of cellular structures (colonial species), and the relative abundances of these two acritarchs in all assemblage tend to increase in total acritarchs assemblages in the upper horizons. These results indicate that such acritarchs were important for increasing cell size of the eukaryotic algae, and moreover, these evolved to multicellular organisms.

Keywords: Acritarchs, Mesoproterozoic, Palynomorph, Greenland

