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亜北極・北極 Emiliania huxleyi のココリス形態の培養温度に対する応答
Subarctic and Arctic Emiliania huxleyi coccolith morphological responses to the growth temperatures

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Coccolithophore is a key calcified phytoplankton for biogeoscience because of their specific products such as calcified scales, coccolith, and unsaturated ketones, alkenone. As a biomaker, the chemical compositions of alkenones are often used to estimate paleo ocean temperatures and to identify the changes of the marine environments (e.g., Harada et al., 2012). In particular, the polar region is an important area to recognize the changes of the global environments and the sea-ice melting is known to be accelerated by the global warming. MIRAI subarctic expeditions have been continued to investigate the subarctic to Arctic environment and concurrently the culture experiments of marine organisms including coccolithophores have been performed to predict the future changes of marine ecosystem. In this study, two Emiliania huxleyi strains, MR57N and MR70N, isolated by MIRAI subarctic expedition in 2010 were cultured at the different temperatures (5, 10, 15 and 20?C) and salinities (25, 32, and 35 per mill) and investigated from the viewpoint of the coccolith morphology. As the results, these strains showed the similar growth properties that the growth rate increased with raising the temperature. According to SEM observations and the image analyses, the size (length of distal shield: LDS) and the numbers of distal shield elements of the coccolith decreased with raising the temperature. The central area of the coccoliths was also changed from grill structures to completely calcified structures. Moreover, the cell size of E. huxleyi decreased with raising the temperature. Thus, the subarctic and Arctic E. huxleyi stains showed the correlations between cell sizes and coccolith morphometic parameters with variable central area morphology depending on the growth temperatures. For the salinity experiments, there is almost no variation on the growth properties and a little variation on the morphometrical parameters. These results imply that the subarctic and arctic E. huxleyi strains can maintain enough to grow in the temperature range between 5 to 20?C and the salinity range between 25 to 35 per mill, suggesting that these strains can ideally survive under the warmer and/or the less salinity environments. The coccolith morphologies and the parameters vary in response to the growth temperature but not to the salinity. This relationship was applied to the natural plankton samples reported by Bollmann et al. (2009) and the part of their data was correlated with sea water temperatures but the data shallower than 15 m depth was not. This may imply the importance of the light intensity and the further culture experiments with the different light intensity are required.

Harada et al. (2012) Global Biogeochemical Cycles 26, GB2036.
Bollmann et al. (2009) EPSL 284, 320.