Ice sheet history in the southern part of the Soya Coast, East Antarctica revealed by glacial landforms and surface exposure dating

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Geological constraint on the Antarctic ice sheet history since the Last Glacial Maximum (LGM) is important to understand the mechanism of the ice sheet fluctuation and its contribution to the global sea-level rise. Recent study have reported retreat ages of the ice sheet in Skarvsnes, southern part of the Soya Coast, East Antarctica based on surface exposure dating (SED) (Yamane et al. 2011). However, the retreat processes of the ice sheet remain unclear, because reported ages are only from four locations and insufficient geomorphological consideration. Here, we report the ice sheet history based on detailed description of the glacial landforms and newly obtained SED data from various altitudes and different distances from the current ice sheet margin in the southern part of the Soya Coast (Skarvsnes, Skallen, and Telen), East Antarctica. Samples from 29 glacial erratics and 3 bedrock surfaces were analyzed for SED. The ages of erratics from Skarvsnes are predominantly in the range 6–9 ka for samples collected from 50–400 m asl, whereas bedrock yielded older ages which has 1.4 and 2.1 ka. On the other hand, the ages from Skallen are predominantly in the range 6–8 ka, the ages of the bedrock and erratic are the almost same. From our results, we infer that the ice sheet experienced rapid retreat over the early-mid Holocene (6–9 ka) short interval at least 400 m thickness.

The difference in exposure ages derived from bedrock and erratic from the same location is thought to be caused by inheritance acquired during ice-free periods prior to the last deglaciation. These difference ages between bedrock and erratic are consistent with glacial-geomorphological observations. Streamlined bedforms that support the interpretation of subglacial meltwater erosion can be confirmed all of the southern part of the Soya Coast, additionally, small erosional marks (s-forms) well develop and superimposed on the streamlined bedforms in the Skallen (Sawagaki and Hirakawa. 1997) and also Telen. It is considered that the bedrock of Skallen and Telen is sufficiently eroded so as not inheritance the nuclide acquired during ice-free periods.

Our results for early-mid Holocene retreat indicate possibly caused by inflow circumpolar deep water to the submarine valley in the Lützow-Holm Bay. In order to promote to discuss between ocean and ice sheet interactions, detail bathymetry and marine sediments in the Lützow-Holm Bay will be even more needed.

References

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