

Snow petrel stomach oil deposits ("Antarctic mumiyo") as archives for the environmental history of terrestrial East Antarctica

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Snow petrels (*Pagodroma nivea*) are endemic to Antarctica. Their feeding grounds are located within the pack ice or open waters of the Southern Ocean. They feed on fish, krill and squid with changing proportions depending on sea ice conditions. The birds breed in un-glaciated areas along the coast but also on inland nunataks and mountain ranges up to 440 km from the coast. Their nests are sheltered in rock cavities, which are defended by the petrels against potential intruders (e.g., competitors and Skuas) by ejecting proventricular stomach oil. The stomach oil accumulates and fossilizes around the breeding sites, thus forming centimetre to decimetre thick deposits of so-called Antarctic mumiyo.

The distribution, age, and composition of the mumiyo deposits provide information concerning the environmental history at the breeding sites and potentially also on the sea-ice conditions of the adjacent ocean. The paleoenvironmental information concerns the position of marine and lacustrine shorelines, and the extent of glaciers or the ice sheet, since the nests only occur on dry and un-glaciated grounds. Information on the sea-ice history may be provided by biogeochemical proxies to be measured on the mumiyo, however, these proxies still need to be tested.

First radiocarbon-dating of mumiyo deposits from mountain ranges in Dronning Maud Land was carried out by Hiller et al. (1995). The results indicated snow petrel occupation during the last glacial, however, with some question marks arising from poor temporal resolution due to the employment of conventional ¹⁴C dating only. Here, we present first combined ¹⁴C AMS, biomarker and inorganic geochemical data that were obtained on mumiyo deposits from Petermann Range, Dronning Maud Land. The mumiyo shows a finely laminated internal structure. ¹⁴C ages indicate a consistent age-depth relation spanning from 17 ka to > 58 ka. These data confirm the existence of un-glaciated areas during the Last Glacial Maximum (LGM), as assumed by Hiller et al. (1995), and extend the archive far into Marine Isotope Stage (MIS) 3, which is poorly understood in coastal Antarctica. The biomarker and inorganic composition characterizes the material and has some potential to establish proxies for the environmental conditions at the surface of the adjacent Southern Ocean.

Keywords: Mumiyo deposits, Dronning Maud Land, environmental history

References

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