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Paper No. 166-2

Presentation Time: 1:50 PM

**TRACE ELEMENTS IN SUBFOSSIL *ADAMUSSIUM COLBECKI*: EVIDENCE OF PAST MULTIANNUAL SEA ICE IN COASTAL MCMURDO SOUND, ANTARCTICA**

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Sea ice controls primary production and disturbance in coastal Antarctica; alteration of sea-ice persistence changes the structure of benthic ecosystems. Sea ice either melts annually or persists for multiple years, and proxies are needed to understand sea-ice dynamics prior to satellite data. Trace element (TEs) proxies in valves of the Antarctic scallop *Adamussium colbecki* can record sea-ice state. Our previous work on modern specimens shows strong Mn/Ca cycles, lower Pb/Ca concentrations, and stronger wavelet coherence between TEs and the distance between subannual growth lines called striae (interstrial increments, ISIs) in scallops that lived under annual sea ice compared with scallops under multiannual sea ice. Here, we extend TE analysis to subfossil valves to understand past sea-ice conditions. A recent study reconstructing seawater temperature using *A. colbecki* subfossils indicates warmer seawater temperatures 2000–5000 ybp near our study area, thus we expect to see annual sea ice-like TEs in our subfossils.

Subfossil scallops were collected from terraces above two sites in western McMurdo Sound (Ross Sea) located ~30 km apart: currently, Explorers Cove (EC) has multiannual sea ice and Bay of Sails (BOS) has annual sea ice. One subfossil from each site was sampled for TEs linked to ice melt, metabolism, and primary productivity, and diagenesis with an LA-ICP-MS at Union College. Samples were taken between striae along the central growth axis of lower (right) valves from umbo to margin. Distances between striae were measured along the central margin (FIJI). Cycles, means (95% CIs) and wavelet coherence between TEs and ISIs (CNLTtsa) were compared to modern valves from the same sites.

TEs indicate that the EC subfossil was diagenetically altered, but the BOS subfossil lacked Mn/Ca cycles, had higher mean Pb/Ca, and had weak wavelet coherence between TEs and ISIs compared with modern annual sea ice scallops. Therefore, the currently annual sea-ice site may have had multiannual sea ice in the past, despite warmer seawater temperatures during the Holocene. This unexpected result highlights the need for high-spatial resolution sea-ice proxies. Antarctica's highly regional sea-ice variability may have extended through the Holocene, and proxies like *A. colbecki* will help clarify local conditions.

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