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Phytoplankton assemblages and lipid biomarkers indicate sea-surface warming and sea-ice decline in the Ross Sea during Marine Isotope sub-Stage 5e

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The Marine Isotope sub-Stage 5e ($\sim$ 125 – 119 kyrs BP), the last interglacial period before the present, is believed to have been globally warmer ($\sim$ 2°C) than today. Studying this time interval might therefore provide insights into near future climate state given the ongoing climate change and global temperature increase. Of particular interest are the expected changes in polar ice cover. One important aspect of the cryosphere is sea-ice, which influences albedo, deep and surface water currents, and phytoplankton production, and thus affects the global climate system. To investigate whether changes in sea-ice cover occurred in the Southern Ocean close to Antarctica during Marine Isotope sub-Stage 5e dinoflagellate and diatom assemblages have been analyzed in core AS05-10, drilled in the continental slope off the Drygalski basin (Ross Sea) at a water depth of 2377 m. The core was drilled within the frame of the PNRA 2009/A2.01 project, an Italian project with a multidisciplinary approach, and covers the interval from Present to Marine Isotope Stage (MIS) 7. The core stratigraphy is based on diatom bioevents and on the climate cyclicity provided by the variations of the diatom assemblages.
For this study we focused on the interval from MIS7 to MIS5. A strong reduction of sea-ice-loving diatom taxa with respect to open water-loving diatom taxa is observed during MIS5. In general the production of phytoplankton increases at the base of MIS5 and then slowly decreases. Dinoflagellate cysts, particularly heterotrophic species, are abundant during MIS5e only. The sea surface temperature reconstruction based on the TEX86L, a proxy based on lipid biomarkers produced by Thaumarcheota, shows a 4°C temperature increase from MIS6 to MIS5e. A slightly smaller temperature increase is observed at the onset of MIS7, but this stage is barren of heterotrophic dinoflagellates. All proxies together seem to indicate that the retreat of the summer sea-ice in the Ross Sea during MIS5e was likely greater than that during MIS7.