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Greenhouse to Icehouse Antarctic paleoclimate and ice history from George V Land and Adélie Land shelf sediments

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Along the George V and Adélie Land (GVAL) shelf of Antarctica, shallowly-buried sediments recovered during the IODP Expedition 318 record Antarctica's climate and ice history from the lush forests of the Eocene greenhouse to the dynamic ice sheet margins of the Neogene. Over these times, Antarctica and the Southern Ocean have played a central role in controlling sea level, deep-water formation, ocean circulation, and exchange of carbon dioxide with the atmosphere. Yet there are currently very few direct records of Antarctic climate and ice conditions from close to the continent. On the GVAL shelf, short piston cores and dredges have recovered Cretaceous and Eocene sediment at the sea bed. In 2010, IODP Expedition 318 shelf sites recovered earliest Oligocene and early Pliocene diamicts, giving direct records of ice advances across the shelf at these times, and confirming that target sediments are accessible at shallow burial depths. However, ice and drilling conditions from the JOIDES Resolution were challenging and prevented the recovery of the targeted full sections. We present a new proposal to investigate Oligocene to Pliocene ice sheet dynamics by targeting downlap surfaces outcropping near the seafloor to date and characterize major episodes of ice sheet advance and retreat. These direct records of ice extent on the shelf can be set in the context of Southern Ocean records of temperature, ice-rafted debris (IRD) and latitudinal fluctuations of the opal belt, and hence we can relate ice behavior to paleoclimate conditions. The ice and climate history of the GVAL margin can provide warm-world scenarios to help understand ice sheet instability in analogous future warm climates.