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Ice shelves along the Western Antarctic Peninsula during the Little Ice Age: observations from the LARISSA project in Barilari Bay, Graham Land

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Barilari Bay, west Antarctic Peninsula, lies 12 nautical miles northwest from ice-core site Beta on the Bruce Plateau, which is an area of regionally high snow accumulation rates and ice velocity. This area has experienced recent rapid regional warming (Vaughan, 2003), and aerially-documented ice shelf disintegration since the 1940's . A 133cm Kasten core (KC54) was collected aboard the Nathaniel B. Palmer in 2010 (NBP1001), allowing for the investigation of whether the inner fjord of Barilari Bay has experienced fluctuations in glacial dynamics throughout Marine Isotope Stage 2e to present, or if the recent observations are unique to the last century. KC-54 was collected in the tributary region of the Weir and Lawrie glaciers. Multibeam bathymetric mapping delineated that the core was collected landward of a prominent grounding zone wedge, in a zone of paleo-ice streaming, indicated by mega-scale glacial lineations. The glacial stratigraphy has been established based on a multi-proxy data-set, including: grain size; preserved total organic carbon; δ13C; diatom abundance and assemblages; physical properties including magnetic susceptibility and porosity; and geophysical data. The lower-most unit is a homogeneous, poorly-sorted, diamicton with low porosity and no diatoms. Unconformably overlying the basal unit is a laminated mud with low diatom abundance. This unit grades upwards into a zone of abundant ice rafted debris. The top unit is a finely laminated, diatom-rich mud. The facies change from glacial till to sandy-silt to laminated, diatomaceous sediments from the NPB1001 KC54 documents a transition from sub-glacial to sub-ice shelf to open marine conditions in the inner fjord of Barilari Bay. The chronology of this change was determined using radiocarbon and 210Pb radio-isotope dating. The cyclicity of sediment flux to the basin was examined through x-ray analysis of laminations deposited above the diamicton. This helps to constrain the controlling factor in depositional behavior in inner Barilari Bay during the Late Holocene. The general retreat history of the bay may be related to post-Little Ice Age warming, which has been documented from other marine records along the western Antarctic Peninsula. This work stems from a NSF summer program related to the LARISSA (LARsen Ice Shelf System, Antarctica) project, through the International Antarctic Institute and Hamilton College.