Glacial History of Ferrero Bay (eastern Pine Island Bay): A polar comparison to Antarctic Peninsula fjords

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Ongoing research in the Antarctic Peninsula (AP) indicates that glacial response to Holocene climate events differed in timing and magnitude throughout the region, likely due to local forcings on glacial stability (e.g. oceanography, orography, drainage basin size and elevation). Primary sites include restricted bays and fjords that yield high-resolution marine sediment records and have been analyzed for sedimentary, geochemical, and microfaunal assemblage proxies. These are compared with onshore records, including ice cores, lake studies, and exposure ages of erratics. Ferrero Bay, located in eastern outer Pine Island Bay (PIB), provides a key end member for our understanding of glacial response to climate events. It is the largest and southernmost bay to be included in the study, lies within a truly polar climate setting, and encloses Cosgrove Ice Shelf within the inner bay, which is restricted by King and Canisteo peninsulas.

Three Kasten cores and high-resolution multi-beam swath bathymetry data were collected from Ferrero Bay during the Oden Southern Ocean 2009-2010 cruise. The base of KC-15 yielded two radiocarbon ages which provide a minimum age of ice sheet retreat of 10,736 ± 219 cal yr BP at 1.3 mbsf, indicating low accumulation rates during the Holocene. Mean grain size decreases up-section from clayey sand (winnowed proximal glacimarine facies) to sandy clay (sub ice shelf facies) during deglaciation of outer PIB (Kirshner, et al., 2012). Variation from facies described in outer PIB is expected, as Ferrero Bay lies within a more restricted setting. Total organic carbon and nitrogen increase steadily, suggesting an increase in productivity as Ferrero Bay opened, with greatest productivity during the most recent open water phase. Diatom total abundance also increases, and the assemblage is dominated by sea-ice related taxa. Ongoing diatom assemblage analysis on KC-15 helps delineate changing environments during the Holocene, including recognition of ice shelf vs. sea-ice vs. open water facies, and other variables such as water temperature and nutrient availability. The combined results show a progressive change from more severe polar conditions during early deglaciation of the bay to the current setting and indicates relatively little response to Holocene climate events, such as the mid-Holocene warm interval, compared to more northern bays and fjords.