

Expanding provenance constraints on Ross Embayment till to assess LGM input of ice from the WAIS

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Sand petrography of till from Reedy Glacier and till from the base of Whillans and Kamb ice streams in West Antarctica revealed similar mineral and rock types indicating that sediment fill in the West Antarctic basin beneath the Whillans and Kamb Ice Streams was eroded from the southern Transantarctic Mountains. However the Reedy glacier samples contain higher proportions of feldspar and less quartz than the WAIS samples. When compared to the Ross Sea samples, the central Ross Sea till composition aligns more closely with Reedy Glacier samples than West Antarctic samples (Kramer, 2008) suggesting the mixing line of East and West Antarctic ice at 180° in the central Ross Sea (from Licht et al., 2005) may represent the maximum extent of the WAIS in the Ross Sea during the LGM. Further work is needed to determine whether a signature of West Antarctic rocks can be identified in the sub-ice stream tills.

We have expanded our till provenance studies in the Ross Embayment to include U-Th-Pb detrital zircon age distributions as an additional fingerprinting tool. In a preliminary study, three replicate samples collected from the Lonewolf Nunatak at the head of Byrd Glacier are dominated by ages that fall between 564-583 Ma with a few older groups (i.e., 1000 Ma and 2730 Ma) common to at least two of the three samples. However, no ages are reported younger than about 450 Ma (Palmer, 2008). Several samples were analyzed from the Ross Sea floor to try to identify whether that zircon age distribution signature could be traced downstream. The zircon age distribution at site ELT27-14 in the west-central Ross Sea is statistically similar at the 95% confidence interval using the K-S test (Palmer 2008). A core from the east-central Ross Sea (east of 180°), NBP-07-39, shows a very different zircon age distribution, with a zircon age population is dominated by grains of 100Ma. Rocks of this age have never been identified in East Antarctica and suggest a West Antarctic source. Therefore, this major difference in age populations between these two sites is interpreted to represent a boundary between the East and West Antarctic ice sheets. To further test this observation from the detrital zircon data, we will compare the U-Th-Pb detrital zircon fingerprint of samples collected from beneath West Antarctic ice streams and till from additional samples from the East Antarctic plateau to LGM-age till from across the Ross Sea floor.