

# Reconstructing past Antarctic ice flow paths using detrital zircon provenance

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Detrital zircons were extracted from East Antarctica (EA), West Antarctica (WA) and Ross Sea tills (Fig. 1). U-Pb age distributions from 1,465 zircons provide new information on the subglacial geology of Antarctica, as well as assisting in the reconstruction of Last Glacial Maximum (LGM) ice flow paths. Statistical analyses using the Kolmogorov-Smirnov (K-S test) reveal that EA and WA age distributions are distinct at a P-value  $<0.05$ . This makes it possible to trace the unique signatures from EA and WA into the Ross Sea.

WA ice streams, Kamb, Bindshadler, and Whillans, all contain Ross age (550-500 Ma) and Grenville age (1100-1000 Ma) populations. Kamb and Bindshadler contain a young zircon age population  $\sim 100$  Ma, whereas Whillans Ice Streams is missing the  $\sim 100$  Ma age populations, but contains a  $\sim 230$  Ma age population.

All samples collected at the head and middle of major EA outlet glaciers contain grains whose age of formation is consistent with the Ross Orogeny and all samples showed small age populations scattered throughout the Proterozoic. The most noteworthy peaks occur from the Permian through the Triassic. EA outlet glacier samples, Beardmore Glacier (BG), Davis Nunatak (DN), Bates Nunatak (BN), and Cloudmaker (CM) (all where Beacon Group rocks have been mapped) match age populations from previously dated Beacon samples of  $\sim 240$ - $270$  Ma (Elliot and Fanning, 2008). This suggests that the signature from the Beacon Supergroup may be identifiable. These outlet samples are a representation of material being transported into the TAM. The fingerprint of each outlet glacier will be altered as it crosses the TAM, resulting in the addition of Ross age material. Three anomalously young zircons ( $19.4 \pm 0.9$ ,  $25 \pm 0.9$  and  $23.1 \pm 0.5$ ) were found at the head of the Scott Glacier from Mt. Howe (MH).

All of the Ross Sea samples contain age populations consistent with the Ross Orogeny, however the samples show spatial variability in the age distribution of the Mesozoic grains. The Central Eastern and Eastern Ross Sea has a  $\sim 100$  Ma population which is consistent with the age populations seen at Kamb and Bindshadler Ice Streams. This suggests that the ice flow of the West Antarctic Ice Sheet (WAIS) was confined to the region during the Last Glacial Maximum (LGM).

## References:

Elliot and Fanning, 2008, Detrital zircons from upper Permian and lower Triassic Victoria Group sandstones, Shaketon Glacier region, Antarctica: Evidence for multiple sources along the Gondwana plate margin, *Gondwana Research*, v. 13, pgs. 259-274.