Detrital zircon geochronology of the northern Mackenzie region: Proterozoic is the key to the Cretaceous

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Summary

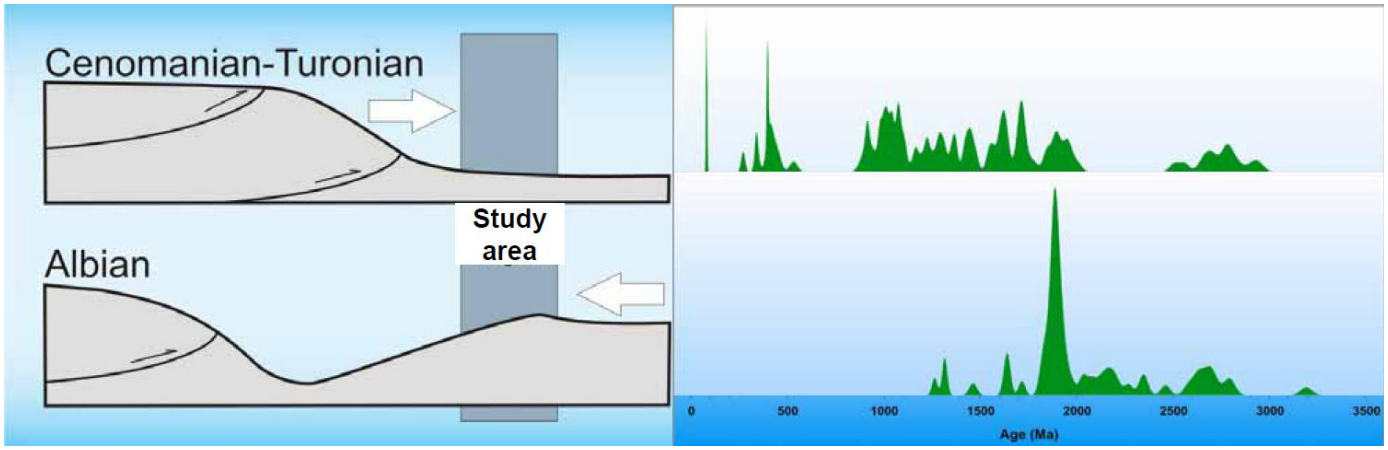
Detrital zircon age spectra from Lower Cretaceous sandstones have age peaks at approximately 1.8 Ga and 2.6 Ga. That signature is typical of sources at the heart of Laurentia. Upper Cretaceous sandstones yield detrital zircon age spectra that have Grenville-age peaks, as well as Devonian and Cretaceous peaks. What do those data mean?

Detrital zircon ages from Mesoproterozoic, Neoproterozoic, and Cambrian strata provide context regarding the provenance of Hudsonian and Grenvillian detrital zircon. There are dramatic differences in the detrital zircon signatures of Cambrian strata west and east of Norman Wells that are attributed to Proterozoic source distribution and lateral compartmentalization within the Cambrian depositional system (Hadlari et al., in press).

Devonian and Mississippian sandstones yield detrital zircon that reflect Laurentian basement, include exotic 500-700 Ma ages, and also contain Ordovician-Devonian ages (Lemieux et al., 2011). Those sandstones were likely sources for Devonian-aged detrital zircon within Cretaceous strata and so the distribution of Devonian clastics, as preserved prior to Cretaceous deposition, define those source areas.

Finally, for sources of Cretaceous aged detrital zircon we consider both reworking of Cretaceous volcaniclastics and Cretaceous granitoids found within the Mackenzie Mountains. A subaerial exposure surface and angular unconformity at the base of the Cenomanian Slater River Formation provide evidence for erosion of Lower Cretaceous strata. We postulate that shortening and uplift resulted in erosion of any Cretaceous volcanic rocks, and possibly plutons, in the present day Mackenzie Mountains and that those sediments were then transported from west to east as the proto-mountain belt and foredeep migrated eastward.

Figure 1: Cartoon section of depositional setting of Lower and Upper Cretaceous strata in the northern Mackenzie Valley and the corresponding detrital zircon age spectra.



References

Hadlari, T., Davis, W.G., Dewing, K., Heaman, L.M., Lemieux, Y., Ootes, L., Pratt, B.R., and Pyle, L.J., In press, Two detrital zircon signatures for the Cambrian passive margin of Laurentia highlighted by new U-Pb results from Northwest Territories, Canada: GSA Bulletin.

Lemieux, Y., Hadlari, T., and Simonetti, A., 2011, Detrital zircon geochronology and provenance of Devono-Mississippian strata in the northern Canadian Cordilleran miogeocline: Canadian Journal of Earth Sciences, 48, p. 515-541.