Provenance of Early Cambrian Passive Margin Sediments: Clues From Detrital Zircons in the Poughquag Quartzite and Potsdam Sandstones

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Upstate New York hosts a sequence of Cambrian to Ordovician sedimentary rocks deposited on the shelf of the Iapetus Ocean on the passive margin of Laurentia. These form the basal units of Paleozoic cover, representing the initiation of a major marine transgression as part of the Sauk sequence and unconformably overly Precambrian (Grenville) basement.

These sedimentary units are frequently mapped and correlated as time-equivalent units, although it has been suggested that deposition may have began slightly earlier in the north and east regions of Lake Champlain and Western Vermont. Although correlated as large-lithostratigraphic units, McLennan et al. (2001) suggested that the sediments may not have the same source. This is surprising for passive margin sediments, which are generally thought to have a high portion of multi-generation sediments.

Here, we present a provenance study of laser ablation ICP-MS U-Pb ages of zircons from the Potsdam Sandstone and the Poughquag Quartzite. We analyzed hundreds of grains from each sample set whereas previous studies only measured <100 zircons (Gaudette et al., 1981; McClennan et al., 2001; Montario and Garver, 2009). More extensive sampling allows us to discuss subtleties in sources that could are not captured by smaller sample sizes.

Initial results suggest that the source of sediments becomes increasingly older and more complex up section. Poughquag quartzite samples from just above the Great Unconformity have a single-source provenance of zircon ages of 900-1000 Ma. Slightly up section, zircons show a bimodal source, with primary source of 1000 – 1100 Ma and a secondary source of 2.1-2.2 Ma. The Potsdam sandstone (stratigraphically higher than the base of the Poughquag has a complex provenance with source ages of Grenville ages (900-1400 Ma), 1.7-1.8 Ga, 2.1-2.2, and 2.5-2.7 Ga.

References: Gaudette et al., (1981). EPSL 54, 248-260; McLennan et al., (2001). J. Sed. Res. 71, 305-317; Montario and Garver (2009). J. Geology, 117, 595-614; Sloss, L. (1963). GSA Bulletin 74, 93-113