Stratigraphic and tectonic implications of detrital U-Pb zircon ages from North Islesboro, western Penobscot Bay, Maine, USA

Douglas N. Reusch[1], Christopher S. Holm-Denoma[2], and John F. Slack[3]

1. Department of Geology, University of Maine at Farmington, Farmington, Maine 04938, USA <reusch@maine.edu>

2. United States Geological Survey, MS 973, Denver Federal Center, Denver, Colorado 80225, USA

3. United States Geological Survey (Emeritus), Farmington, Maine 04938, USA

New U-Pb ages of detrital zircons were determined by laser ablation ICP-MS on three rock samples collected from different parts of North Islesboro, in western Penobscot Bay, Maine. Quartzite from Hutchins Island (44°21.045'N, 68°52.227'W), near deformed marble, minor foliated siliceous schist, and sparse amphibolite, yields abundant detrital zircon U-Pb ages (n = 120) of ca. 2.0 Ga and minor ages of 2.8–2.4 Ga, with a gap at 2.4–2.3 Ga and no grains <1.80 Ga. This age spectrum, unique in the region, permits correlation with the >670 Ma Seven Hundred Acre Island Formation 8–10 km to the south. The quartzite-marble strata are interpreted as a passive-margin sequence. If the depositional age of the quartzite is not appreciably younger than 1.80 Ga, it is a candidate for the oldest rock in the entire Appalachians.

Near Kedears Hill, where deformation is minor (single steep cleavage), the youngest detrital zircon U-Pb age populations in graywacke (44°22.429'N, 68°53.652'W; n = 112) and nearby felsic tuffaceous sedimentary rock (44°22.454'N, 68°53.613'W; n = 70) are Paleozoic. The graywacke is no older than ca. 514 Ma, has abundant Neoproterozoic (683, 626, 577 Ma) and numerous Mesoand Paleoproterozoic grains, and grains of the same ages as in the quartzite. The tuffaceous sedimentary rock is apparently Late Devonian (youngest grains ca. 370 Ma), and has complex zircon rim and core relationships including Ordovician, Silurian, and Cambrian ages as well as a strong Grenvillian (ca. 1160–957 Ma) signal, plus Mesoproterozoic and Archean ages.

In the quartzite, the lack of Mesoproterozoic detrital zircon ages is consistent with sources in both the Amazonian and West African cratons. However, the presence of six zircons having ages of <1.9 Ga argues instead for a West African source, specifically from the Eburnean orogen. Further support for this interpretation comes from the presence of a nearly identical detrital zircon barcode reported for the Taghdout quartzite in the Anti-Atlas Mountains of Morocco. Similar barcodes to that of the quartzite have been documented in fragments of Cadomia, which in the Neoproterozoic were positioned north of the West African craton.

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