PROVENANCE EVOLUTION DURING ASSEMBLY OF THE ACADIAN/NEOACADIAN OROGEN: DETRITAL ZIRCON DATA FROM THE DEVONIAN OF NEW YORK

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Upper Hamilton and younger bedrock

Marcellus subgroup outcrop belt

modified after Steven Schimmrich hudsonvalleygeologist.blogspot.com
Stratigraphic distribution of samples

Oneonta Formation

West
- Jamestown
- Bradford
- Genesee River
- Tioga River
- Chemung River

East
- Delaware River
- Catskill Mountains
- Hudson Valley

- Conneaut Group
- Canadaway Group
- Java and West Falls groups
- Sonyea Group
- Genesee Group
- Hamilton Group
- Tully Fm.
- Onondaga Fm.
- Tristates Group
- Helderberg Group

- Sil. Shawangunk Fm.

Legend:
- Terrestrial to brackish red & green shales, sandstones and conglomerates
- Shallow marine gray shales, siltstones and sandstones
- Basinal dark gray to black shales
- Shallow marine limestones, some cherty
(Many thanks to Mark Pecha, Dominque Geisler, and other staff at the Laserchron Center)
Chenango Member, Skaneateles Formation, Hamilton Group, Colgate Quarry

Probability-density

n – 100 to 300 grains
Figure 1. Generalized map depicting major tectonic and geochronological subdivisions in the USA. The Grenville Province is shown in medium gray and its exposed portions are indicated by heavy outlines. Abbreviations: AD = Adirondack Mountains, (from Tectonic Evolution of the Adirondack Mountains and Grenville Orogen Inliers within the USA, McLelland, et al, 2013)
Zircon plots

**Shawangunk Formation** (depositional age ~ 420 Ma)

- **Trans-Hudson/Penokean Granite-rhyolite**
- **Yavapi/Mazatzal**
- **Grenville**
- **Appalachian**
- **Peri-Gondwana**
- **Iapetus Rifting**
- **Superior**

$n=95$
Oneonta Formation –

Terrestrial facies extend west into central New York State

Upper Givetian - Lower Frasnian sequence
sandstone petrology

Upper Slide Mountain – feldspathic

Walton - lithic

Oneonta - lithic

upper Hamilton Group – lithic

Shawangunk and Oriskany quartz arenite
Zircon populations from middle to upper Lower Devonian (Pragian and Emsian Stages) strata are dominated by Grenville (ca. 1400-1000 Ma) and older grains, derived largely from older Paleozoic clastic rocks that were originally sourced from the Laurentian craton.

Lower Middle Devonian (Eifelian to lowest Givetian) siliciclastics, including the Marcellus subgroup, are dominated by Laurentian sources, with younger Grenville (Ottawan, ca. 1080-1020 Ma) zircons most abundant.

Upper Middle Devonian (Givetian) clastics are dominated by Grenville zircons, but include larger ca. 470-420 Ma populations from igneous and metamorphic sources within the Appalachian Orogen.

Lower Upper Devonian (Frasnian) strata contain zircon suites signaling new source terranes including Neoproterozoic ‘peri-Gondwana’ (ca. 950-540 Ma) source rocks.

Zircon populations from the lower Frasnian Oneonta Formation document an abrupt shift to a provenance with much greater abundance of Neoproterozoic age materials, likely derived from newly-exposed Avalonian/peri-Gondwanan sources.

The later Frasnian strata (Slide Mountain Formation) contain relatively fewer Neoproterozoic zircons, and increased contributions from Paleozoic igneous and metamorphic sources.

Biostratigraphic/age control in terrestrial facies is less than ideal. Next steps: marine units that are better-constrained.