

Detrital Zircon LA-ICPMS Geochronology of Western Arctic Alaska Basin Sedimentary Rocks

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ABSTRACT

New U-Pb detrital zircon ages were determined by laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) for several quartz-rich horizons from cores and cuttings from boreholes in western Arctic Alaska. Preliminary results are presented here for reservoir rocks in the Chukchi Sea (Klondike well) and western National Petroleum Reserve Alaska. The samples are from middle Paleozoic basement and the Middle Mississippian to Upper Jurassic-Lower Cretaceous Ellesmerian and Beaufortian mega-sequences. Detrital zircon U-Pb age populations from several samples, including the borehole in the Chukchi Sea, are remarkably similar and span the Mesoarchean to Devonian. Age populations include major peaks between ~500-390 Ma, a broad spread of ages between ~1900-950 Ma, and a minor peak between ~2800-2400 Ma. The observed western Arctic Alaska Precambrian zircon age population patterns are largely consistent with detrital zircon lineages from Neoproterozoic to early Paleozoic sedimentary rocks of the northwestern Laurentian passive margin; specifically these detrital zircon age spectra are similar to hybrid or mixed populations of cratonal and marginal sequences (e.g., Adams argillite, Lane and Gehrels, 2014). In addition, the overall detrital zircon age population signatures of Arctic Alaska samples are remarkably similar to rocks of the Devonian clastic wedge in Arctic Canada and the Yukon (Gottlieb et al., 2014 and references therein). Our preliminary results imply a consistent Laurentian and Ellesmerian/Caledonian sourcing of zircons and widespread, well mixed, sedimentary dispersal in post-Mississippian Ellesmerian and Rift (Beaufortian) Sequence marine rocks. Similarity between detrital zircon age populations from the Late Permian(?) Kavik Sandstone in the Klondike well to other Laurentia-sourced Arctic Alaska samples suggests that areas west of the Hanna Trough axis in the Chukchi Sea contain Laurentia-derived sediments of the Devonian clastic wedge, and the part of the Chukchi basin may have similar reservoir rocks to those in the North Slope of Alaska. Triassic strata in westernmost Arctic Alaska contain <300 Ma zircon which is postulated to have been derived syndepositionally from eastern Arctic Russia (e.g. Miller et al., 2006, 2010). The absence of zircon younger than ~380 Ma in the Kavik Sandstone samples has implications on the reconstruction of the Arctic Alaska-Chukotka microplate. Western Arctic Alaska and the Hanna Basin trough axis palinspastically restores to the Sverdrup basin using a simple rotation model during the opening of the Amerasia basin. The Klondike borehole is opposite to the North Slope subterranean along the Hanna Basin trough axis but apparently doesn't contain <380 Ma zircon; it shows that the Hanna Trough axis may not have been the physical barrier to sediment derived from eastern Arctic Russia during the Triassic. Gottlieb et al., 2014, *Geosphere*, v. 10, p. 1366-1384. Lane and Gehrels, 2014, *GSA Bulletin*, v. 126, p. 398-414. Miller et al., 2006, *Tectonic*, v. 25, TC3013. Miller et al., 2010, *AAPG Bulletin*, v. 94, p. 665-692.