

20-2 - LINKING MDA ESTIMATES, PLUTON EMPLACEMENT AND DEFORMATION IN THE NORTH SLOPE SUBSURFACE, ALASKA, WITH LA- ICPMS AND CA-TIMS: IMPLICATIONS FOR DEVONIAN OROGENESIS IN THE BROOKS RANGE



Sunday, 15 October 2023



8:30 AM - 8:45 AM



320 (3, David L Lawrence Convention Center)

Abstract

The timing of Paleozoic contractional deformation in the North Slope subterrane, Alaska, is constrained by analyses of seismic data and two key wells. Folded clastic strata in the Topagoruk #1, constrained by plant fossils to Early–Middle Devonian age, are unconformably overlain by a thin, flat-lying clastic section of uncertain age. Two detrital zircon aliquots from a composite sample of the Devonian rocks in the 10,385–10,503 ft interval analyzed by U/Pb LA-ICPMS at UC Santa Barbara and the Arizona LaserChron Center yielded young peaks at ca. 430–420 Ma with younger grains ($n=6/352$) trailing down to ca. 410–380 Ma. Discordant analyses with dates as young as ca. 180 Ma reflect regionally observed Pb-loss. The best estimate for an MDA (maximum depositional age) is the youngest age peak at ca. 420 Ma. Six young grains analyzed by CA-TIMS at Boise State University gave dates between 419.07 ± 0.29 Ma and 415.83 ± 0.29 Ma (2σ), providing a youngest grain MDA estimate of 416 Ma for the unit. Importantly, there is little difference in the MDA estimated from CA-TIMS and carefully filtered LA-ICPMS data, indicating that establishing the U/Pb systematics coupled with appropriate filtering of data to avoid the effects of regional Pb-loss events is a necessary step for establishing meaningful MDA estimates.

Felsic plutonic rocks in the East Teshekpuk #1 cut folded Devonian units and are unconformably overlain by carbonate strata of the Lisburne Group, constrained by biostratigraphy to Late Mississippian in age. LA-ICPMS analysis of igneous zircon from plutonic rocks penetrated in the 10,625–10,664 ft interval defines a Pb-loss profile extending from the weighted mean peak age of 369 ± 4 Ma (2σ , systematic; MSWD = 1.6; $n=20/60$) down to ca. 340 Ma. Discordant analyses extend the Pb-loss profile to ca. 170 Ma. CA-TIMS analysis of 7 grains also shows the effect of Pb-loss. The oldest 3 overlapping dates give a weighted mean emplacement age of 367.51 ± 0.51 Ma (2σ , systematic) with the remaining analyses trailing down to 365.77 ± 0.26 Ma (2σ). The new MDA and intrusive ages from subsurface units of the North Slope suggest the timing of the onset of deformation was between ca. 416–367 Ma, consistent with regional relationships in the North Slope subterrane. Seismic interpretation indicates that deformation likely

persisted into the Mississippian.

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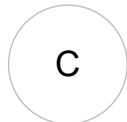
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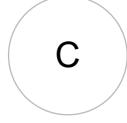
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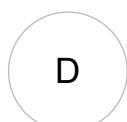
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