U-PB DETRITAL ZIRCON GEOCHRONOLOGY OF A CAMBRIAN–LATE PROTEROZOIC QUARTZITE IN THE NORTHERN FAIRBANKS MINING DISTRICT, CIRCLE QUADRANGLE, ALASKA

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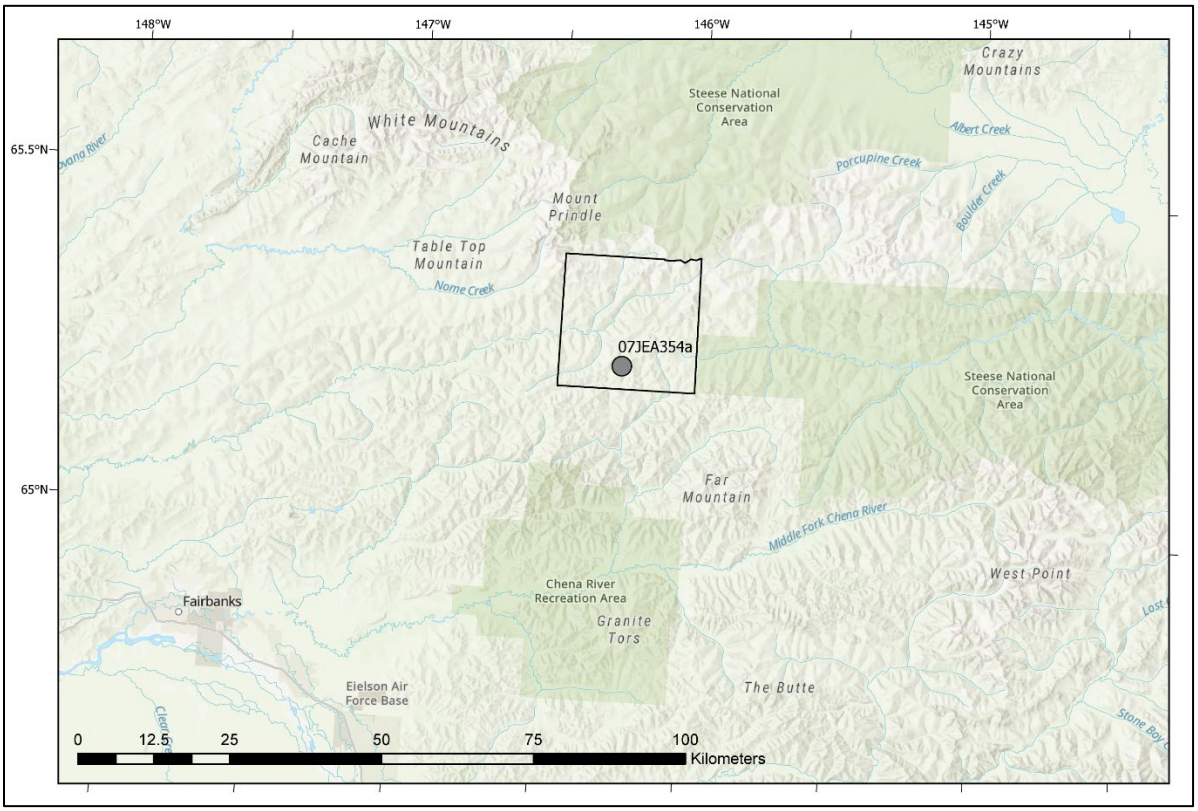
Raw Data File 2025-16



Location map for sample 07JEA354a selected for detrital zircon geochronology. The polygon outlined in black represents the boundary of the bedrock geologic map of the northern Fairbanks mining district, Circle Quadrangle, Alaska (Athey and others, 2022).

This report has not been reviewed for technical content or for conformity to the editorial standards of DGGS.

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U-PB DETRITAL ZIRCON GEOCHRONOLOGY OF A CAMBRIAN–LATE PROTEROZOIC QUARTZITE IN THE NORTHERN FAIRBANKS MINING DISTRICT, CIRCLE QUADRANGLE, ALASKA

J. Wesley Buchanan[1], Rainer J. Newberry[1], and Jennifer E. Athey[1]

INTRODUCTION

This dataset contains uranium-lead (U-Pb) geochronologic single spot zircon data, analyzed using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). The detrital zircon (DZ) data come from a metamorphic rock from the Alaska Division of Geological & Geophysical Surveys' (DGGS) geologic mapping project in the northern Fairbanks mining district, covering parts of the Circle A-4, A-5, B-4, and B-5 quadrangles, Alaska (Athey and others, 2022). Sample 07JEA354a was collected by the DGGS Mineral Resources Section during a detailed geologic mapping campaign in June 2007. In addition to analytical data compiled in the geologic map for this area (Athey and others, 2022), other DGGS publications supporting geologic mapping in the northern Fairbanks mining district include geophysical data (Burns and others, 2019), geochemical data (Athey and others, 2008), and $^{40}Ar/^{39}Ar$ data (Layer and others, 2025). Isotopic, elemental, and age data associated with this report are available at https://doi.org/10.14509/31685.

The northern Fairbanks mining district map area lies within the Yukon-Tanana Uplands in rocks that we interpret to correlate with the Cambrian to Late Proterozoic Fairbanks schist (Newberry and others, 1996) and the Wickersham Grit unit (Foster and others, 1983; Weber and others, 1988, 1992). These rocks are intruded by several phases of plutonism, of which two occur in the map area: Tertiary and Cretaceous plugs, dikes, and sills with differing characteristic geochemical signatures (Athey and others, 2022). The Cretaceous intrusions are regionally associated with placer- and lode-gold mines and occurrences (Newberry and others, 1995). The age data in this report, when combined with other regional DZ data, will help to build a more robust detrital zircon record in the Yukon-Tanana Uplands.

SAMPLE COLLECTION AND DESCRIPTION

The sample selected for detrital zircon analysis, 07JEA354a, was collected from a surface outcrop on Mount Ryan in the northern Circle A-5 Quadrangle (65.24289 / -146.25024, NAD27 datum). Sample location coordinates were obtained using recreational-grade GPS units, with a typical reported accuracy of about 10 meters. The sample was collected from the quartzite- and grit-bearing quartzite unit (CZq, from Athey and others, 2022) in the southern portion of the project map area. It is a schistose quartz-rich metagrit with 5 percent feldspar and quartz grit up to 1.5–2 mm in diameter, and 95 percent quartz schist matrix with ~0.1–0.7 mm diameter grains. Coarser grains are 80 percent anhedral quartz with moderate to strong undulose extinction and 20 percent subhedral alkali feldspar. The

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matrix is 80 percent anhedral quartz, 7 percent subhedral alkali feldspar, 3 percent subhedral plagioclase (some twinned, ~An_{20}), 6 percent biotite, and 4 percent muscovite. Mica grains generally display parallel alignment. Based on the presence of plagioclase and garnet in adjacent rocks within the same package, sample 07JEA354a has experienced lower amphibolite-facies metamorphic conditions.

METHODS

This report includes single-grain zircon data generated by Apatite to Zircon, Inc. (A2Z), in 2008. The sample was crushed, sieved, and zircon were isolated using standard gravimetric and magnetic mineral-separation techniques. Zircon from sample 07JEA354a were mounted in epoxide resin, polished, and immersed in 5.5N HNO_3 for 20 seconds at 21°C to remove any surface lead contamination. Zircon analysis spots were selected using transmitted light microscopy to avoid inclusions, cracks, and (or) other internal features that might generate invalid results. Detailed procedures can be found in Donelick and others (2005).

LA-ICP-MS data were collected with an Agilent 7700x quadrapole mass spectrometer using high purity argon as the plasma gas. Grains were targeted and ablated using a New Wave YP213 213 nm solid state laser ablation system with a 20-µm-diameter laser spot size, 5 Hz laser firing rate, and ultra-high-purity helium as the carrier gas. Isotopes measured included: ^{202}Hg, $^{204}(Hg + Pb)$, ^{206}Pb, ^{207}Pb, ^{208}Pb, ^{232}Th, ^{235}U, and ^{238}U. Common Pb was corrected for using the methods of Stacey and Kramers (1975). Ages and common Pb ratios were determined iteratively using a pre-set, session-wide minimum common Pb age value. Data were standardized using the natural zircon standards FC-1 (Paces and Miller, 1993) and Temora 2 (Black and others, 2004). Uranium decay constants and the $^{238}U/^{235}U$ isotopic ratio reported in Steiger and Jäger (1977) were used in this study. Detailed methodology can be found in Bradley and others (2009).

AGE DISCUSSION

Zircon from sample 07JEA354a are well behaved and have few discordance issues. Ninety-nine out of 105 zircon grains have less than 10 percent discordance and are included in all plots (fig. 1). All grains analyzed are listed in the accompanying data table. Isotopic data were plotted using IsoplotR version 6.5, using the methods described by Vermeesch (2018). Zircon grains are predominantly Proterozoic (peak at ~1.8 Ga), with about a third of the grains being Archean (peak at ~2.7 Ga). Thirteen zircon grains are Mesoproterozoic with a youngest grain age of 1,002.94±131.18 Ma. The detrital zircon record of sample 07JEA354a is consistent with similar Cambrian aged rocks in and around the field area.

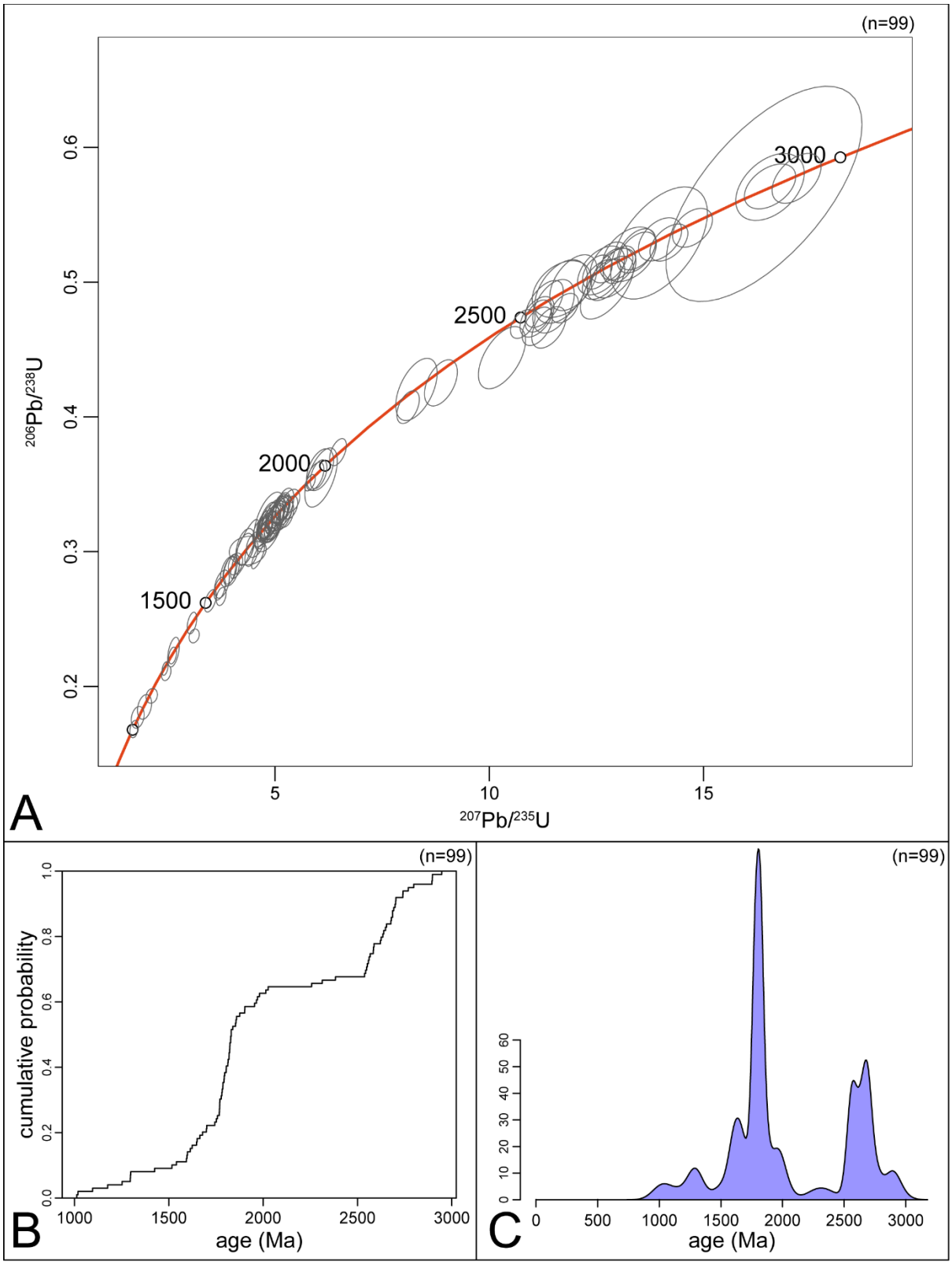

Figure 1. Age-related plots for sample 07JEA354a. **A.** Wetherill concordia diagram. **B.** Cumulative age distribution (CAD) diagram. **C.** Kernel density estimate (KDE).

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