# Conodonts and detrital zircons from Triassic and Jurassic rocks above the Salmon River unconformity, Thompson Plateau, south-central British Columbia

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**Abstract**

In the Salmon River valley, 50 km SE of Kamloops, an unconformity separates schists of the Chapperon Group from less deformed limestones and siliciclastic rocks. The unconformity was first documented in the 1950s, limestones above the unconformity were dated as Late Triassic in the 1970s, and the Salmon River locale was considered to be a prime example of a Permo-Triassic unconformity recognized at numerous localities throughout south-central British Columbia. The area was mapped in 2016, and the rocks above the unconformity, extending several km west from their base in the Salmon River valley, were mapped as a single Triassic unit (the Salmon River succession) of predominantly siliciclastic rocks with some limestones at the base. Samples collected from the limestones during this mapping yielded conodonts that confirm a Late Triassic age for rocks immediately above the unconformity with the Chapperon Group. However, LA-ICP-MS U-Pb detrital zircon analysis of two sandstone samples indicate that the Salmon River succession is not a single Triassic unit. Detrital zircons from a sample near the base of the siliciclastic rocks yielded a maximum depositional age of ca. 183 Ma, and a sample collected 4.5 km to the west also yielded Early Jurassic zircons. These data show that most of the Salmon River succession is Jurassic, and that a more extensive sub-Jurassic unconformity merges with the sub-Triassic unconformity. The Salmon River succession is tentatively correlated with the Hall Formation (Early Jurassic, Toarcian) of the Rossland Group. The geological relationships documented along the Salmon River exemplify relationships in a large part of southeastern Quesnel terrane, where Paleozoic rocks are unconformably overlain by Middle to Late Triassic sedimentary rocks, and also by Early Jurassic volcanic and sedimentary rocks of the Rossland Group.

**Keywords:** Salmon River succession, conodonts, detrital zircons, U-Pb, LA-ICP-MS, Quesnel terrane, Triassic unconformity, Jurassic unconformity

## 1. Introduction

Jones (1959) identified an unconformity along a segment of the Salmon River, 50 km SE of Kamloops (Figs. 1, 2) that separated undated schists of the Chapperon Group from an overlying package of less-deformed limestones and siliciclastic sedimentary rocks that he assigned to the Cache Creek Group (Carboniferous-Permian). The rocks above the unconformity were later assigned a Triassic age, following the extraction of Late Triassic conodonts from limestone a few 10s of m above the unconformity (Campbell and Okulitch, 1973; Okulitch and Cameron, 1976), and the Salmon River locality was cited as one example of a Permo-Triassic unconformity that could be recognized at numerous localities throughout south-central British Columbia (Read and Okulitch, 1977).

The unconformity was revisited by Schiarizza (2017) during mapping focussed on the Nicola Group to the west (Fig. 2). This mapping included rocks above the unconformity in a single Triassic unit. This unit, referred to as the Salmon River

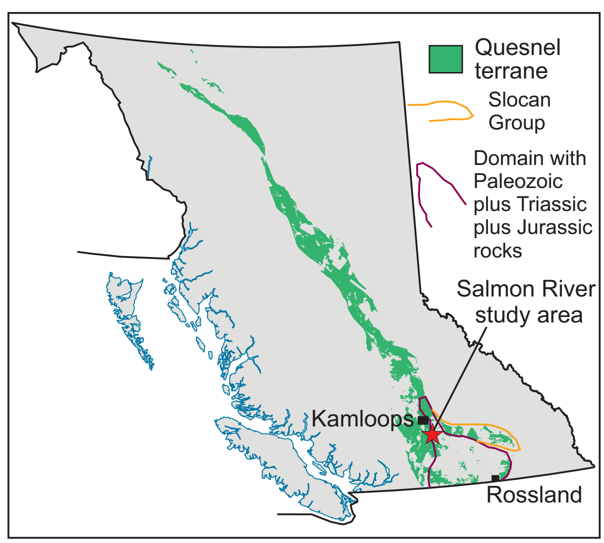


**Fig. 1.** Location of the Salmon River study area and distribution of Quesnel terrane in British Columbia.

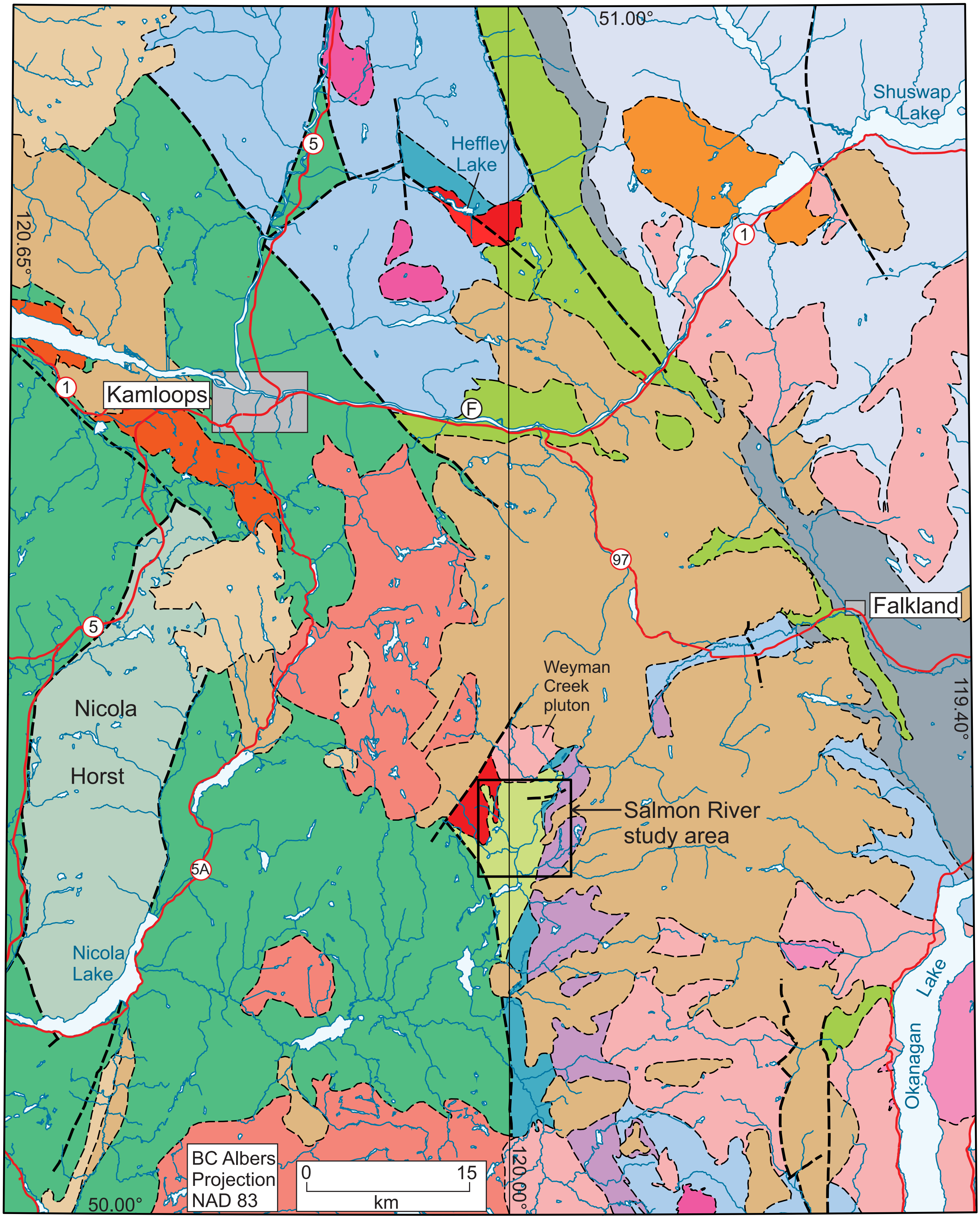


**Fig. 2.** Simplified geology of the eastern Ashcroft (92I) and western Vernon (82L) map areas, showing location of the Salmon River study area. Geology mainly after Monger and McMillan (1989) and Thompson et al. (2006).


**Fig. 2.** Continued. Legend.

succession, was inferred to extend several km west from the Salmon River where it was juxtaposed with the Nicola Group across a very poorly constrained contact. Herein we present new conodont data from samples collected as part of this mapping that confirm a Late Triassic age for limestones immediately above the unconformity with subjacent Chapperon Group rocks. We also present new U-Pb zircon detrital ages from overlying siliciclastic rocks using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). The detrital zircon data show that the Salmon River succession is not a single Late Triassic unit as considered by Schiarizza (2017), but that most of the unit is Jurassic, implying that a more extensive sub-Jurassic unconformity merges with the sub-Triassic unconformity.

## 2. Setting

The Salmon River study area is on the Thompson Plateau (Holland, 1976), about 50 km southeast of Kamloops, in the traditional territories of the Nlaka'pamux, Syilx, and Secwepemc First Nations (Fig. 1). It is in a belt of Paleozoic rocks, locally overlain by Mesozoic rocks and partially covered by Eocene volcanic rocks, that forms the eastern part of Quesnel terrane at this latitude (Fig. 2). This belt is flanked to the west by the Triassic-Jurassic arc complex, which is the most characteristic element of Quesnel terrane, here represented by volcanic and sedimentary rocks of the Nicola Group (Middle to Late Triassic) and associated suites of Late Triassic and Early Jurassic alkaline and calc-alkaline intrusions (Monger and McMillan, 1989). East of the Paleozoic Quesnel belt are mainly Devonian to Carboniferous assemblages of pericratonic metasedimentary, metavolcanic, and metaplutonic rocks, overlain by Late Triassic slates, siltstones, quartzites, and limestones of the Slocan Group (Thompson et al., 2006).

The Paleozoic rocks of Quesnel terrane in this region are assigned to the Harper Ranch Group and the Chapperon Group (Fig. 2). The Harper Ranch Group is predominant and, in its type area, east-northeast of Kamloops, includes Late Devonian and Mississippian arc-derived volcaniclastic rocks, and Late Mississippian and early Permian limestones (Beatty et al., 2006). Rocks assigned to the group farther south, west and northwest of Okanagan Lake are mainly early Permian, and include limestones, siltstones, argillites, slates, sandstones, and mafic volcanic rocks (Okulitch, 1979; Nixon and Carbno, 2001; Thompson et al., 2006). The Chapperon Group, first named and described by Jones (1959), forms a series of inliers that extend almost 50 km in the southwestern part of the Paleozoic Quesnel belt (Fig. 2). It includes biotite-quartz schists and phyllites, chert, quartzites, chlorite schists derived from mafic volcanic rocks, limestones, and serpentine-talc-magnesite schists derived from an ultramafic protolith (Jones, 1959; Thompson et al., 2006; Schiarizza, 2017). These rocks are undated, but the group is considered pre-Permian because, at the south end of the belt, it is overlain by Permian conglomerate that is included in the Harper Ranch Group (Read and Okulitch, 1977; Thompson et al., 2006).

Mesozoic rocks that overlie the Paleozoic rocks of Quesnel terrane are mainly Early Jurassic, but Triassic rocks, mainly limestones and siltstones, occur locally (Fig. 2). The predominant Early Jurassic unit is a succession of pyroxene basalts and breccias, intercalated with conglomerates, siltstones, and sandstones, that is best exposed east and northeast of Kamloops. These rocks had previously been included in the Nicola Group (Triassic), but are now assigned to the Lions Head succession of the Rossland Group (Jurassic) following Beatty et al. (2006), who discovered Early Jurassic (Sinemurian) fossils near the base of the succession, about 20 km east of Kamloops (Fig. 2). Jurassic sedimentary rocks of the Salmon River succession are spatially separate, lithologically distinct, and younger than the Lions Head succession, but may also be part of the Rossland Group.

## 3. Mesozoic rocks above the Salmon River unconformity

Jones (1959) assigned the rocks above the unconformity to the Cache Creek Group (Carboniferous-Permian). Preto (1964) confirmed the unconformable relationship between the Chapperon Group and overlying rocks recognized by Jones (1959), and suggested that the younger rocks might be either Cache Creek Group or Nicola Group. Campbell and Okulitch (1973) and Okulitch and Cameron (1976) reported Late Triassic conodonts from rocks above the unconformity, and subsequent workers inferred that this Late Triassic age applied both to the basal part of the succession and to siliciclastic rocks extending several km to the west. Okulitch (1979) assigned rocks above the unconformity to the Nicola Group, Daughtry and Thompson (2004a) included them in the Slocan Group, and Schiarizza (2017) referred to them as the Salmon River succession.

Conodont and detrital zircon age data presented below show that the Salmon River succession of Schiarizza (2017) comprises two separate units: a Triassic limestone unit of small aerial extent, and a Jurassic unit of mainly sandstones and siltstones that includes most of the Salmon River succession of Schiarizza (2017), as well as some rocks farther east that had been included in the Nicola Group. The Triassic rocks are referred to herein as the 'limestone unit'. The term 'Salmon River succession' is retained, but redefined to include only the Jurassic siliciclastic rocks.

### 3.1. Limestone unit (Triassic)

The limestone unit is exposed along the Salmon River as a local lens intervening between Chapperon Group rocks to the east and Jurassic conglomerates at the base of the Salmon River succession to the west (Fig. 3). The predominant rock types are medium to dark grey platy to flaggy micritic limestone, pebbly limestone, and thin- to medium-bedded, locally cross-stratified calcarenite (Figs. 4, 5). The pebbly limestones contain tabular intraformational limestone clasts and granules and small pebbles of chert, quartz, and quartz tectonite in a weakly to moderately foliated micritic limestone matrix. The calcarenites contain minor chert, quartz, and quartz-rich lithic grains in addition to predominantly carbonate grains. The unit also includes calcareous shales, typically as thin beds intercalated with calcarenite and, at one locality, a thin layer of green-grey faintly laminated chert.

### 3.2. Salmon River succession (Jurassic)

The Salmon River succession, as redefined herein, comprises Jurassic siliciclastic rocks that unconformably overlie both the Chapperon Group and the locally intervening limestone unit. The succession extends 5 to 7 km westward from its base near the Salmon River, where it is juxtaposed with the Nicola Group across an unexposed and poorly constrained contact. Detrital zircons provide Early Jurassic maximum depositional ages at two localities, one very near the base of the succession and one near the western limit of its exposure (see below).

The predominant rock types are sandstone and siltstone. Conglomerates locally form the base of the succession, and

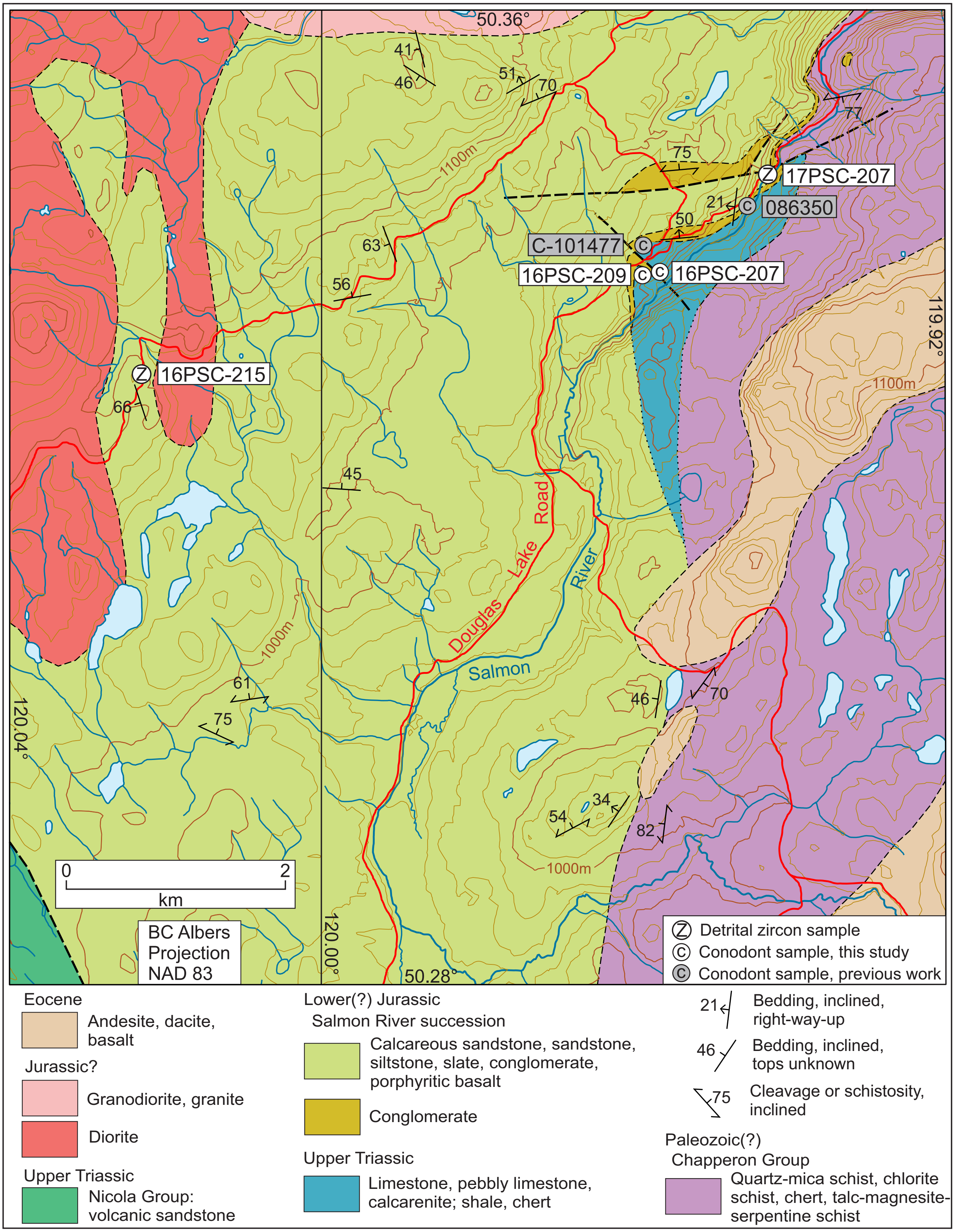


**Fig. 3.** Geology of the Salmon River study area showing locations of conodont and detrital zircon sample sites. Geology after Preto (1964), Read and Okulitch (1977), Daughtry and Thompson (2004a), and Schiarizza (2017).

**Fig. 4.** Limestone unit, pebbly limestone at conodont sample site 16PSC-207. Sample was collected from a narrow limestone lens such as in lower right of photo.

**Fig. 5.** Limestone unit, micritic limestone with 20 cm cross-stratified calcarenite bed, at conodont sample site 16PSC-209. Sample was collected from limestone beneath calcarenite bed.

occur elsewhere as medium to thick beds intercalated with finer grained rocks. A unit of plagioclase-hornblende-pyroxene-phyric basalt, possibly a sill, was identified at one location in the lower part of the unit, but volcanic rocks are otherwise absent. The conglomerate ranges from a few m to several 10s of m thick and rests above the Triassic limestone unit or the Chapperon Group. It is poorly stratified and polymictic, containing angular to subrounded clasts (mainly <1-5 cm, but locally to ~20 cm) in a fine-grained carbonate-cemented sandstone matrix. The clasts include chert, limestone, fine-grained quartzite, quartz phyllite, green volcanic or volcaniclastic rock, dark grey siliceous argillite, and vein quartz. Many of the clasts resemble rocks in the underlying Chapperon Group, from which they were probably derived; limestone clasts were likely derived, at least in part, from the subjacent limestone unit, as indicated by Triassic conodonts extracted from the clasts (see below).

Above the basal conglomerate, and directly above the Chapperon Group in the south, where the basal conglomerates are missing, is a section, several 100 m thick, of mainly brown-weathered carbonate-cemented sandstone. In this section, intervals of thin-bedded, fine- to medium-grained sandstone are punctuated by medium to thick beds of medium-to coarse-grained sandstone, and less common pebble conglomerate (Fig. 6). The thin sandstone beds locally display convolute lamination, cross stratification, graded bedding, and load casts, and are typically intercalated with thin beds or laminae of dark grey siltstone. The medium to thick sandstone beds locally display normal grading, and may have laminated tops. The sandstones and pebble conglomerates contain detrital grains of feldspar, fine-grained lithic fragments, chert, and quartz.

Outcrop in the western two-thirds of the Salmon River belt is sparse, and the succession is represented by scattered exposures of mainly dark grey siltstone, brown-weathered carbonate-cemented sandstone with quartz, feldspar and chert grains, and grey to green sandstone with mainly feldspar and volcanic-lithic grains (Fig. 7).

## 4. Conodont biochronology

Here we present fauna and age assignments, as determined by M.J. Orchard, for conodonts extracted from two samples collected from the limestone unit in 2016. We also present revised reports on two previous collections: one (GSC curation number 086350) that first documented Triassic rocks in the area; and the other (GSC curation number C-101477) from limestone cobbles within the basal conglomerate of the Salmon River succession. All collections are small and fragmentary, and some conodont elements are deformed. The Colour Alteration Index (CAI) is 5, implying post-depositional temperatures of 300°+ C. Though poorly preserved, the conodont elements show no corrosion that might imply reworking.

**Fig. 6.** Lower part of Salmon River succession, interbedded calcite-cemented sandstone, small-pebble conglomerate, and calcareous siltstone; detrital zircon sample site 17PSC-207.

**Fig. 7.** Parallel-stratified sandstone, Salmon River succession; detrital zircon sample site 16PSC-215.

### 4.1. Sample 16PSC-207 (GSC curation number V-012668), limestone unit

Sample 16PSC-207 was collected 130 m northwest of the Salmon River (289618E, 5580456N, UTM Zone 11, NAD83), about 1600 m southwest of the east-northeast trending fault that marks the north termination of the limestone unit (Fig. 3). It is from an exposure of pebbly limestone with a few narrow fine-grained limestone lenses (Fig. 4), which is at the top of a set of limestone and calcarenite outcrops that extends part way down to the river. The sample was collected from a fine-grained limestone lens about 4 cm wide and 30 cm long. It yielded two incomplete specimens of *Quadralella*, which ranges within the Carnian stage. Preserved features support assignment to *Quadralella* cf. *Q. angulata* (Mazza, Cau, and Rigo), but incomplete preservation precludes certainty as to substage. The age is Late Triassic, late? Carnian.

### 4.2. Sample 16PSC-209 (GSC curation number V-012669), limestone unit

Sample 16PSC-209 was collected from an isolated outcrop (289459E, 5580437N, UTM Zone 11, NAD83) 160 m west-southwest from sample site 16PSC-207 (Fig. 3). The exposure consists of dark grey fine-grained limestone intercalated with calcarenite beds 1-20 cm thick (Fig. 5). The calcarenite beds are locally boudinaged or folded about west-plunging folds with north-dipping axial surfaces that are parallel to a weak cleavage within the limestones. The sample came from a fine-grained, weakly-cleaved limestone unit, and yielded a conodont collection consisting of: *Ancyrogondolella* cf. *tozeri* (Orchard) (1 specimen); *A*. sp. indet. (5 specimens); *Mockina* cf. *postera* (Kozur & Mostler) (1 specimen); *Norigondolella* sp. indet. (1 specimen); S2 ramiform elements (2 specimens). The age is Late Triassic, early middle Norian.

### 4.3. GSC curation number 086350, limestone unit

Triassic conodonts from the Salmon River area were first described by Okulitch and Cameron (1976). They reported a small collection that included *Epigondolella primitia* Mosher, and *Metapolygnathus polygnathiformis* (Budurov and Stefanov), for which they suggested a late Carnian age. The sample (GSC curation number 086350) was collected from an exposure of limestone and limy conglomerate along or near the Douglas Lake road, plotted on Fig. 3 from the location shown by Daughtry and Thompson (2004a). Re-examination of the fauna from this location provides the following revision: *Primatella*? sp. indet. (1 specimen); *Quadralella* cf. *deflecta* (1 specimen); *Q*. sp. indet. (2 specimens). The age is Late Triassic, late Carnian, as originally proposed by Okulitch and Cameron (1976).

### 4.4. GSC curation number C-101477, limestone clasts in basal Salmon River succession conglomerate

Conodonts were extracted from a sample submitted by R.I. Thomson during the Geological Survey of Canada's Ancient Pacific Margin NATMAP program (Thompson et al., 2006). The sample was from limestone clasts in the basal conglomerate of the Salmon River succession, collected about 275 m northwest of sample 16PSC-207, which is from the Triassic limestone unit. This conodont collection comprises a few indeterminate neogondolellin specimens that support an age within the range of Middle-Late Triassic, Ladinian-Norian (Orchard, 2000; Daughtry and Thompson, 2004a). A re-assessment of this small collection has additionally identified a possible specimen of *Quadralella*, which suggests a Carnian age for at least one of the clasts. The fauna is revised as: *Neogondolella*? sp. indet. (3 specimens); *Quadralella*? sp. indet. (1 specimen); ramiform elements (2 specimens).

## 5. Detrital zircon geochronology

We collected two sandstone samples from the Salmon River succession for U-Pb detrital zircon analysis. Sample preparation and analytical work (LA-ICP-MS) was conducted at the Pacific Centre for Isotopic and Geochemical Research (PCIGR), the Department of Earth, Ocean and Atmospheric Sciences, the University of British Columbia.

### 5.1. Analytical procedures

Following mineral separation by standard procedures, zircons were handpicked in alcohol and mounted in epoxy, along with reference materials. Grain mounts were then wet ground with carbide abrasive paper and polished with diamond paste. Next, cathodoluminescence (CL) imaging was carried out on a Philips XL-30 scanning electron microscope (SEM) equipped with a Bruker Quanta 200 energy-dispersion X-ray microanalysis system at the Electron Microbeam/X-Ray Diffraction Facility (EMXDF). An operating voltage of 15 kV was used, with a spot diameter of 6 µm and peak count time of 30 seconds. After removal of the carbon coat the grain mount surface was washed with mild soap and rinsed with high-purity water. Prior to analysis the grain mount surface was cleaned with 3 N $HNO_3$ acid and again rinsed with high-purity water to remove any surficial Pb contamination that could interfere with the early portions of the spot analyses.

Analyses were conducted using a Resonetics RESOlution M-50-LR, which contains a Class I laser device equipped with a UV excimer laser source (Coherent COMPex Pro 110, 193 nm, pulse width of 4 ns) and a two-volume cell designed and developed by Laurin Technic Pty. Ltd. (Australia). This sample chamber allowed the investigation of several grain mounts in one analytical session. The laser path was fluxed by $N_2$ to ensure better stability. Ablation was carried out in a cell with a volume of approximately 20 $cm^3$ and a He gas stream that ensured better signal stability and lower U-Pb fractionation (Eggins et al., 1998). The laser cell was connected via a Teflon squid to an Agilent 7700x quadrupole ICP-MS housed at PCIGR. A pre-ablation shot was used to ensure that the spot area on grain surface was free of contamination. Samples and reference materials were analyzed for 36 isotopes, including Pb ($^{204}Pb$, $^{206}Pb$, $^{207}Pb$, $^{208}Pb$), $^{232}Th$, and U ($^{235}U$, $^{238}U$) with a dwell time of 0.02 seconds for each isotope. Pb/U and Pb/Pb ratios were determined on the same spots along with trace element concentrations. The settings for the laser were: spot size of 34 μm with a total ablation time of 30 seconds, frequency of 5 Hz, fluence of 5 J/$cm^2$, power of 7.8 mJ after attenuation, pit depths of approximately 15 μm, He flow rate of 800 mL/min, $N_2$ flow rate of 2 mL/min, and a carrier gas (Ar) flow rate of 0.57 L/min.

Reference materials were analyzed throughout the sequence to allow for drift correction and to characterize downhole fractionation for Pb/U and Pb/Pb isotopic ratios. For U-Pb analyses, natural zircon reference materials were used, including Plešovice (Sláma et al., 2008) or 91500 (Wiedenbeck et al., 1995, 2004) as the internal reference material, and both Temora2 (Black et al., 2004) and Plešovice and/or 91500 as monitoring reference materials; the zircon reference materials were placed between the unknowns. Raw data were reduced using the Iolite 3.4 extension (Paton et al., 2011) for Igor Pro™ yielding U/Pb ages, and their respective uncertainties. Final interpretation and plotting of the analytical results employed the ISOPLOT software of Ludwig (2003).

### 5.2. Sample 17PSC-207, basal Salmon River succession

Sample 17PSC-207 was collected from an outcrop along the Douglas Lake road (290640E, 5581299N, UTM Zone 11, NAD 83) about 30 m northwest of the Salmon River (Fig. 3). Exposed here is a well-bedded succession, dipping gently to the west, of calcite-cemented sandstones and small-pebble conglomerates, interbedded with calcareous siltstones (Fig. 6). These rocks are near the base of the Salmon River succession, less than 10 m above the basal conglomerate. The sample comes from a bed of very calcareous coarse-grained sandstone with detrital grains of plagioclase, monocrystalline quartz, polycrystalline quartz, chert, fine-grained quartz tectonite, and feldspathic volcanic rock.

Seventy-eight detrital zircon grains were analyzed from sample 17PSC-207 (Table 1, Fig. 8). Most (n=61) have Mesozoic $^{206}Pb/^{238}U$ ages, 6 grains are Paleozoic (503 to 323.7 Ma) and 11 grains are Paleoproterozoic (2452 to 1693 Ma). With the exception of 1 grain (233.1 Ma), the Mesozoic grains (n=60) form a tight cluster ranging from 215 to 178.3 Ma, forming a strong peak at 202 Ma on the probability density curve. More than half these grains (n=31) are Early Jurassic (201 to 178.3 Ma), and about half of these (n=14) range from 188.3 to 178.3 Ma, accounting for a secondary peak at ca. 183 Ma on the probability density curve. Lacking the analytical numbers for a statistically rigorous precise age (see Pullen et al., 2014; Coutts et al., 2019), we consider that 183 Ma is a reasonable estimate of the maximum depositional age and that it demonstrates the Salmon River succession is Jurassic.

### 5.3. Sample 16PSC-215, upper(?) part of Salmon River succession

Sample 16PSC-215 was collected from an isolated outcrop along the Monte-Glimpse Forest Service road (711864E, 5579575N, UTM Zone 10, NAD 83), about 4 km west of the Salmon River, in the poorly exposed western part of the Salmon River succession (Fig. 3). The outcrop is mainly green, massive to laminated, fine- to medium-grained sandstone (Fig. 7), but also includes a narrow interval of medium to dark grey laminated siltstone. The sample is medium-grained sandstone consisting mainly of plagioclase grains, accompanied by feldspathic lithic grains, hornblende, and mafic mineral or lithic grains altered to actinolite and epidote.

A small population of 17 detrital zircon grains were analyzed from sample 16PSC-215 (Table 2, Fig. 9). One of these has a $^{206}Pb/^{238}U$ age of 304.5 Ma, and the others (n=16) form a cluster ranging from 189 to 211.4 Ma, with a peak at 206 Ma on the probability density curve. This cluster is markedly similar to the main population of grains from sample 17PSC-207. The youngest grains (189 Ma, 189.7 Ma, 189.9 Ma, 194 Ma) contribute to a secondary peak at ca. 190 Ma, providing an estimate of the maximum depositional age. Again, although lacking the statistical rigour of large zircon sample numbers, this peak indicates that the Salmon River succession is Jurassic.

## 6. Discussion

### 6.1. Triassic rocks

Exposed along strike to the south is a belt of rocks that may be related to the limestone unit of the Salmon River study area (Fig. 2). Although mapped as Harper Ranch Group by Daughtry and Thompson (2004b), these rocks are Triassic, at least in part, because they contain Early-Middle Triassic conodonts (Thompson et al., 2006). Rocks that may correlate with the Triassic limestone unit also occur at Heffley Lake, 25 km northeast of Kamloops (Fig. 2). This unit is predominantly siltstone and argillite, but includes a limestone body that has yielded Carnian conodonts (Friedman et al., 2002). On a more regional scale, the Triassic limestone unit is part of an assemblage of Middle and Late Triassic rocks that unconformably overlie Paleozoic rocks of Quesnel terrane at scattered localities south and southeast of the Salmon River

**Table 1.** Zircon U-Pb laser ablation analytical data for sample 17PSC-207, Salmon River succession.

| **Sample no.** | **Isotopic Ratios** | | | | | | | **Isotopic Ages** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis ID | $^{207}Pb/^{235}U$ | 2σ (abs) | $^{206}Pb/^{238}U$ | 2σ (abs) | ρ | $^{207}Pb/^{206}Pb$ | 2σ (abs) | $^{207}Pb/^{235}U$ | 2σ (Ma) | $^{206}Pb/^{238}U$ | 2σ (Ma) | $^{207}Pb/^{206}Pb$ | 2σ (Ma) |
| X17PSC_207_b1 | 0.171 | 0.026 | 0.02824 | 0.00077 | 0.0252 | 0.0498 | 0.0075 | 160 | 22 | 179.5 | 4.8 | 130 | 300 |
| X17PSC_207_b2 | 7.63 | 0.27 | 0.4037 | 0.0049 | 0.2664 | 0.1456 | 0.0038 | 2183 | 31 | 2186 | 23 | 2287 | 45 |
| X17PSC_207_b3 | 0.21 | 0.053 | 0.033 | 0.0019 | 0.0189 | 0.051 | 0.013 | 196 | 47 | 209 | 12 | 0 | 440 |
| X17PSC_207_b4 | 0.543 | 0.066 | 0.0762 | 0.0023 | 0.1076 | 0.0554 | 0.0066 | 432 | 42 | 473 | 14 | 310 | 240 |
| X17PSC_207_b5 | 0.197 | 0.052 | 0.031 | 0.0016 | 0.2907 | 0.048 | 0.012 | 173 | 43 | 197 | 10 | -140 | 430 |
| X17PSC_207_b6 | 0.173 | 0.026 | 0.0308 | 0.0013 | 0.0272 | 0.0504 | 0.0077 | 160 | 23 | 195.8 | 8.1 | 130 | 320 |
| X17PSC_207_b7 | 5.13 | 0.28 | 0.3335 | 0.0075 | 0.0975 | 0.119 | 0.006 | 1831 | 48 | 1855 | 36 | 1911 | 97 |
| X17PSC_207_b8 | 0.267 | 0.048 | 0.0331 | 0.0015 | 0.0537 | 0.064 | 0.012 | 234 | 37 | 209.8 | 9.6 | 430 | 350 |
| X17PSC_207_b10 | 4.37 | 0.17 | 0.3004 | 0.0082 | 0.4526 | 0.1214 | 0.0047 | 1706 | 32 | 1693 | 40 | 1971 | 71 |
| X17PSC_207_b11 | 0.21 | 0.03 | 0.0296 | 0.00086 | 0.1562 | 0.0574 | 0.009 | 196 | 27 | 188 | 5.4 | 300 | 290 |
| X17PSC_207_b12 | 0.235 | 0.033 | 0.0331 | 0.0011 | 0.3469 | 0.0544 | 0.0073 | 211 | 27 | 209.8 | 6.7 | 250 | 270 |
| X17PSC_207_b13 | 0.148 | 0.026 | 0.0301 | 0.0012 | 0.0805 | 0.0479 | 0.0088 | 138 | 23 | 191.4 | 7.7 | -10 | 330 |
| X17PSC_207_b14 | 0.169 | 0.025 | 0.02856 | 0.00062 | 0.273 | 0.0527 | 0.0075 | 156 | 22 | 181.5 | 3.9 | 200 | 290 |
| X17PSC_207_b15 | 0.183 | 0.036 | 0.0297 | 0.0011 | 0.0146 | 0.055 | 0.011 | 168 | 30 | 188.6 | 6.6 | 220 | 380 |
| X17PSC_207_b16 | 0.194 | 0.067 | 0.0333 | 0.0028 | 0.1035 | 0.045 | 0.016 | 172 | 57 | 211 | 17 | -240 | 580 |
| X17PSC_207_b17 | 0.176 | 0.024 | 0.02882 | 0.00091 | 0.0021 | 0.0556 | 0.0073 | 162 | 20 | 183.1 | 5.7 | 290 | 270 |
| X17PSC_207_b18 | 0.186 | 0.02 | 0.0304 | 0.00087 | 0.0442 | 0.0482 | 0.0056 | 172 | 18 | 193 | 5.5 | 100 | 240 |
| X17PSC_207_b19 | 0.189 | 0.033 | 0.02912 | 0.00092 | 0.0849 | 0.0587 | 0.0097 | 179 | 30 | 185 | 5.7 | 410 | 320 |
| X17PSC_207_b20 | 0.215 | 0.027 | 0.0316 | 0.0012 | 0.0344 | 0.0536 | 0.0069 | 195 | 22 | 200.5 | 7.4 | 230 | 260 |
| X17PSC_207_b21 | 0.211 | 0.034 | 0.0319 | 0.0011 | 0.2791 | 0.0536 | 0.0088 | 198 | 30 | 202.3 | 6.9 | 170 | 300 |
| X17PSC_207_b22 | 0.24 | 0.036 | 0.0317 | 0.0012 | 0.1021 | 0.0602 | 0.0096 | 214 | 29 | 201.4 | 7.6 | 390 | 320 |
| X17PSC_207_b23 | 0.213 | 0.038 | 0.0296 | 0.0014 | 0.045 | 0.057 | 0.011 | 191 | 31 | 188.3 | 9 | 220 | 350 |
| X17PSC_207_b24 | 4.92 | 0.33 | 0.3178 | 0.0074 | 0.1835 | 0.1202 | 0.0074 | 1791 | 57 | 1778 | 36 | 1910 | 120 |
| X17PSC_207_b25 | 0.461 | 0.045 | 0.0659 | 0.0021 | 0.2862 | 0.0614 | 0.0067 | 381 | 31 | 411 | 13 | 550 | 220 |
| X17PSC_207_b26 | 0.211 | 0.026 | 0.03014 | 0.00082 | 0.1364 | 0.0528 | 0.0062 | 192 | 22 | 191.4 | 5.2 | 270 | 250 |
| X17PSC_207_b27 | 4.36 | 0.19 | 0.3093 | 0.006 | 0.3135 | 0.1097 | 0.0047 | 1699 | 36 | 1737 | 29 | 1773 | 78 |
| X17PSC_207_b28 | 0.174 | 0.034 | 0.0285 | 0.0017 | 0.0794 | 0.051 | 0.01 | 161 | 29 | 181 | 11 | 170 | 400 |
| X17PSC_207_b29 | 0.216 | 0.03 | 0.03184 | 0.00097 | 0.1009 | 0.0528 | 0.0073 | 196 | 24 | 202 | 6.1 | 180 | 260 |
| X17PSC_207_b30 | 0.214 | 0.032 | 0.031 | 0.0013 | 0.1602 | 0.0544 | 0.0082 | 201 | 30 | 196.5 | 8.4 | 280 | 320 |
| X17PSC_207_b31 | 0.211 | 0.033 | 0.0317 | 0.0013 | 0.051 | 0.0524 | 0.0084 | 190 | 28 | 200.9 | 8.1 | 160 | 310 |
| X17PSC_207_b32 | 0.164 | 0.014 | 0.02887 | 0.00093 | 0.132 | 0.0519 | 0.0047 | 153 | 13 | 183.4 | 5.8 | 220 | 190 |
| X17PSC_207_b33 | 0.345 | 0.052 | 0.0326 | 0.0011 | 0.162 | 0.085 | 0.015 | 293 | 38 | 206.7 | 6.8 | 980 | 320 |
| X17PSC_207_b34 | 0.214 | 0.031 | 0.0309 | 0.0013 | 0.1477 | 0.0549 | 0.0082 | 193 | 26 | 196.4 | 8 | 260 | 300 |
| X17PSC_207_b35 | 0.249 | 0.027 | 0.03682 | 0.00088 | 0.2664 | 0.0548 | 0.0066 | 224 | 21 | 233.1 | 5.5 | 280 | 220 |
| X17PSC_207_b37 | 10.29 | 0.33 | 0.4631 | 0.0065 | 0.1709 | 0.1731 | 0.0052 | 2457 | 31 | 2452 | 29 | 2578 | 52 |
| X17PSC_207_b38 | 0.566 | 0.08 | 0.0736 | 0.0026 | 0.1528 | 0.0608 | 0.009 | 442 | 51 | 458 | 16 | 420 | 290 |
| X17PSC_207_b39 | 0.223 | 0.025 | 0.03154 | 0.00087 | 0.0647 | 0.0559 | 0.0068 | 202 | 20 | 200.2 | 5.5 | 310 | 230 |
| X17PSC_207_b40 | 0.167 | 0.024 | 0.02805 | 0.00081 | 0.1239 | 0.0544 | 0.0076 | 155 | 21 | 178.3 | 5.1 | 230 | 280 |
| X17PSC_207_b41 | 4.67 | 0.29 | 0.3186 | 0.0086 | 0.3997 | 0.1159 | 0.0069 | 1761 | 56 | 1782 | 42 | 1850 | 110 |
| X17PSC_207_b42 | 0.194 | 0.034 | 0.03089 | 0.0009 | 0.3047 | 0.0484 | 0.0077 | 176 | 28 | 196.1 | 5.6 | 0 | 290 |
| X17PSC_207_b43 | 0.232 | 0.024 | 0.03191 | 0.00083 | 0.245 | 0.0596 | 0.0073 | 215 | 21 | 202.4 | 5.2 | 440 | 240 |
| X17PSC_207_b44 | 0.191 | 0.037 | 0.0329 | 0.0013 | 0.0796 | 0.0457 | 0.0091 | 181 | 33 | 208.9 | 7.9 | -80 | 340 |
| X17PSC_207_b45 | 0.22 | 0.034 | 0.0315 | 0.0012 | 0.0653 | 0.0554 | 0.0087 | 198 | 28 | 199.6 | 7.4 | 250 | 300 |
| X17PSC_207_b46 | 0.206 | 0.027 | 0.0317 | 0.0011 | 0.0233 | 0.0516 | 0.0071 | 188 | 23 | 200.9 | 6.6 | 150 | 270 |
| X17PSC_207_b47 | 0.198 | 0.031 | 0.0317 | 0.0011 | 0.121 | 0.0491 | 0.008 | 180 | 26 | 201.3 | 6.9 | 20 | 290 |
| X17PSC_207_b48 | 0.231 | 0.041 | 0.032 | 0.0014 | 0.1083 | 0.058 | 0.011 | 205 | 34 | 203.3 | 9 | 260 | 380 |
| X17PSC_207_c1 | 0.231 | 0.03 | 0.03299 | 0.00095 | 0.0241 | 0.0471 | 0.0051 | 208 | 24 | 209.2 | 5.9 | 10 | 210 |
| X17PSC_207_c2 | 0.208 | 0.029 | 0.03133 | 0.00097 | 0.217 | 0.0454 | 0.0054 | 189 | 23 | 198.8 | 6.1 | -60 | 230 |
| X17PSC_207_c3 | 6.23 | 0.32 | 0.3633 | 0.007 | 0.0019 | 0.119 | 0.0048 | 1999 | 46 | 2005 | 30 | 1923 | 73 |
| X17PSC_207_c4 | 5.59 | 0.42 | 0.3385 | 0.0059 | 0.0521 | 0.1141 | 0.0049 | 1895 | 64 | 1879 | 29 | 1845 | 79 |
| X17PSC_207_c5 | 0.27 | 0.037 | 0.03344 | 0.00096 | 0.287 | 0.0574 | 0.0075 | 238 | 29 | 212 | 6 | 350 | 270 |
| X17PSC_207_c6 | 0.238 | 0.032 | 0.02935 | 0.00096 | 0.1573 | 0.0466 | 0.006 | 216 | 26 | 186.5 | 6 | 10 | 260 |
| X17PSC_207_c7 | 0.303 | 0.044 | 0.0317 | 0.0016 | 0.5856 | 0.0528 | 0.0067 | 265 | 35 | 201 | 10 | 260 | 260 |
| X17PSC_207_c8 | 5.83 | 0.46 | 0.3473 | 0.0091 | 0.0286 | 0.1183 | 0.0064 | 1928 | 69 | 1920 | 43 | 1900 | 100 |
| X17PSC_207_c9 | 0.219 | 0.024 | 0.03184 | 0.00095 | 0.131 | 0.0524 | 0.0043 | 199 | 20 | 202 | 5.9 | 250 | 170 |
| X17PSC_207_c10 | 0.219 | 0.027 | 0.031 | 0.001 | 0.2082 | 0.0523 | 0.007 | 199 | 22 | 196.6 | 6.5 | 170 | 250 |
| X17PSC_207_c11 | 0.507 | 0.092 | 0.078 | 0.0029 | 0.2015 | 0.0471 | 0.0098 | 421 | 71 | 484 | 17 | -70 | 350 |
| X17PSC_207_c12 | 0.236 | 0.034 | 0.0322 | 0.001 | 0.0593 | 0.0566 | 0.0085 | 211 | 28 | 204 | 6.2 | 290 | 300 |
| X17PSC_207_c13 | 0.618 | 0.077 | 0.0811 | 0.002 | 0.045 | 0.0555 | 0.0062 | 477 | 47 | 503 | 12 | 320 | 220 |

**Table 1.** Continued.

| Sample no. | Isotopic Ratios | | | | | | | Isotopic Ages | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis ID | $^{207}Pb/^{235}U$ | 2σ (abs) | $^{206}Pb/^{238}U$ | 2σ (abs) | ρ | $^{207}Pb/^{206}Pb$ | 2σ (abs) | $^{207}Pb/^{235}U$ | 2σ (Ma) | $^{206}Pb/^{238}U$ | 2σ (Ma) | $^{207}Pb/^{206}Pb$ | 2σ (Ma) |
| X17PSC_207_c14 | 0.241 | 0.028 | 0.03186 | 0.00096 | 0.1957 | 0.0561 | 0.0061 | 217 | 23 | 202.2 | 6 | 350 | 220 |
| X17PSC_207_c15 | 0.4 | 0.037 | 0.0515 | 0.0013 | 0.0265 | 0.0573 | 0.0046 | 338 | 27 | 323.7 | 8.1 | 430 | 170 |
| X17PSC_207_c16 | 0.209 | 0.025 | 0.0338 | 0.001 | 0.0942 | 0.0494 | 0.007 | 191 | 21 | 214.3 | 6.4 | 70 | 270 |
| X17PSC_207_c17 | 0.205 | 0.021 | 0.0329 | 0.0012 | 0.0248 | 0.0484 | 0.0056 | 193 | 20 | 208.5 | 7.4 | 110 | 250 |
| X17PSC_207_c19 | 0.23 | 0.03 | 0.032 | 0.0011 | 0.0607 | 0.0547 | 0.0065 | 207 | 24 | 203.3 | 7.2 | 290 | 250 |
| X17PSC_207_c20 | 0.209 | 0.029 | 0.0317 | 0.0013 | 0.1018 | 0.05 | 0.0065 | 190 | 24 | 201.2 | 8.4 | 170 | 280 |
| X17PSC_207_c21 | 0.264 | 0.053 | 0.0286 | 0.0011 | 0.0172 | 0.0472 | 0.0093 | 238 | 44 | 181.9 | 6.9 | -40 | 340 |
| X17PSC_207_c22 | 0.225 | 0.046 | 0.0328 | 0.0017 | 0.0459 | 0.053 | 0.011 | 199 | 38 | 208 | 10 | 110 | 380 |
| X17PSC_207_c23 | 0.241 | 0.027 | 0.0288 | 0.0013 | 0.0786 | 0.0546 | 0.0076 | 218 | 22 | 183 | 8.3 | 320 | 290 |
| X17PSC_207_c24 | 0.253 | 0.05 | 0.0339 | 0.0016 | 0.1814 | 0.059 | 0.012 | 221 | 41 | 215 | 10 | 290 | 430 |
| X17PSC_207_c25 | 0.22 | 0.031 | 0.0317 | 0.0011 | 0.1787 | 0.0525 | 0.0063 | 199 | 25 | 201 | 6.7 | 250 | 250 |
| X17PSC_207_c26 | 0.206 | 0.052 | 0.0294 | 0.0014 | 0.0622 | 0.047 | 0.013 | 187 | 44 | 186.6 | 8.6 | -20 | 520 |
| X17PSC_207_c27 | 0.198 | 0.025 | 0.0317 | 0.0011 | 0.1426 | 0.05 | 0.0064 | 181 | 21 | 201.4 | 6.8 | 150 | 250 |
| X17PSC_207_c28 | 0.265 | 0.047 | 0.0323 | 0.0016 | 0.0987 | 0.066 | 0.011 | 232 | 37 | 205 | 10 | 540 | 360 |
| X17PSC_207_c29 | 0.209 | 0.038 | 0.0329 | 0.0015 | 0.0309 | 0.0503 | 0.008 | 188 | 31 | 208.8 | 9.4 | 80 | 300 |
| X17PSC_207_c30 | 5.41 | 0.29 | 0.3335 | 0.0078 | 0.0223 | 0.128 | 0.0061 | 1876 | 45 | 1854 | 38 | 2048 | 82 |
| X17PSC_207_c31 | 0.254 | 0.049 | 0.0318 | 0.0013 | 7E-06 | 0.063 | 0.011 | 222 | 39 | 201.7 | 8.1 | 440 | 360 |
| X17PSC_207_c33 | 0.249 | 0.03 | 0.03226 | 0.00075 | 0.0923 | 0.0604 | 0.0067 | 223 | 24 | 204.7 | 4.7 | 490 | 240 |
| X17PSC_207_c34 | 0.266 | 0.045 | 0.0331 | 0.0014 | 0.3718 | 0.063 | 0.01 | 234 | 35 | 209.8 | 8.9 | 480 | 310 |

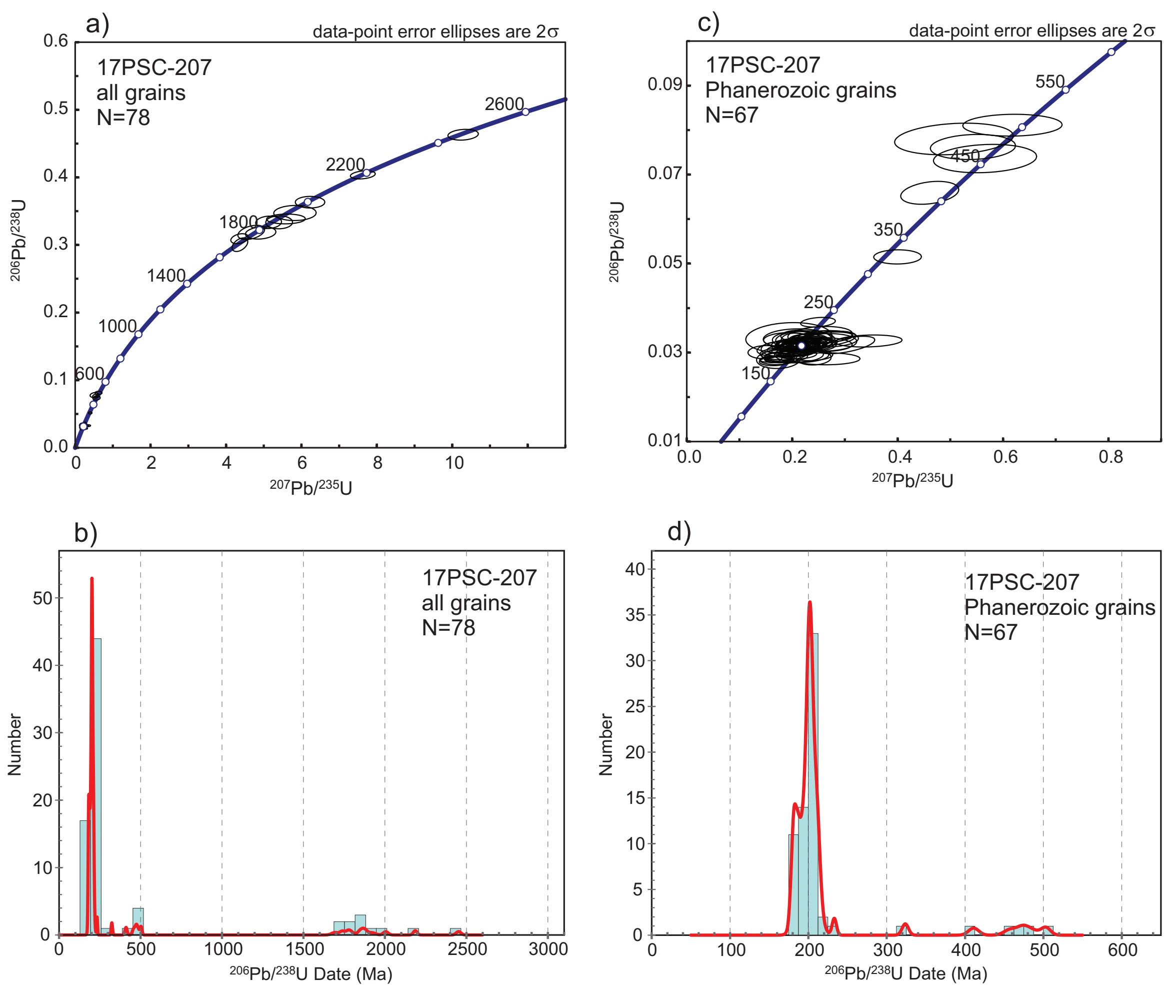


**Fig. 8.** U-Pb data for detrital zircons from Salmon River succession sandstone sample 17PSC-207. **a)** Concordia plot of all grains. **b)** Histogram of all grains and superimposed probability density curve. **c)** Concordia plot of Phanerozoic grains. **d)** Histogram of Phanerozoic grains with superimposed probability density curve.

**Table 2.** Zircon U-Pb laser ablation analytical data for sample 16PSC-215, Salmon River succession.

| Sample no. | Isotopic Ratios | | | | | | | Isotopic Ages | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis ID | $^{207}Pb/^{235}U$ | 2σ (abs) | $^{206}Pb/^{238}U$ | 2σ (abs) | ρ | $^{207}Pb/^{206}Pb$ | 2σ (abs) | $^{207}Pb/^{235}U$ | 2σ (Ma) | $^{206}Pb/^{238}U$ | 2σ (Ma) | $^{207}Pb/^{206}Pb$ | 2σ (Ma) |
| X16PSC_215_3 | 0.204 | 0.038 | 0.0312 | 0.0011 | 0.0287 | 0.0503 | 0.01 | 184 | 32 | 197.9 | 6.9 | 20 | 370 |
| X16PSC_215_4 | 0.215 | 0.025 | 0.03075 | 0.00078 | 0.3225 | 0.052 | 0.0067 | 196 | 21 | 195.2 | 4.9 | 180 | 250 |
| X16PSC_215_5 | 0.224 | 0.027 | 0.0326 | 0.00092 | 0.3921 | 0.0505 | 0.0062 | 204 | 24 | 206.8 | 5.7 | 240 | 270 |
| X16PSC_215_7 | 0.308 | 0.047 | 0.0484 | 0.0012 | 0.218 | 0.0471 | 0.0072 | 274 | 36 | 304.5 | 7.5 | 90 | 310 |
| X16PSC_215_12 | 0.23 | 0.029 | 0.03172 | 0.00068 | 0.2968 | 0.0543 | 0.0069 | 215 | 24 | 201.3 | 4.3 | 310 | 260 |
| X16PSC_215_13 | 0.233 | 0.077 | 0.0298 | 0.0021 | 0.0402 | 0.05 | 0.019 | 204 | 63 | 189 | 13 | 180 | 650 |
| X16PSC_215_14 | 0.24 | 0.041 | 0.03335 | 0.00078 | 0.2014 | 0.0526 | 0.0085 | 217 | 31 | 211.4 | 4.9 | 300 | 270 |
| X16PSC_215_17 | 0.227 | 0.027 | 0.03252 | 0.00054 | 0.0014 | 0.0514 | 0.0061 | 206 | 22 | 206.3 | 3.4 | 220 | 240 |
| X16PSC_215_24 | 0.228 | 0.098 | 0.032 | 0.0013 | 0.4768 | 0.0522 | 0.017 | 207 | 64 | 203 | 8.1 | 330 | 380 |
| X16PSC_215_25 | 0.214 | 0.014 | 0.03189 | 0.00058 | 0.1868 | 0.0484 | 0.0034 | 198 | 12 | 202.4 | 3.6 | 130 | 160 |
| X16PSC_215_28 | 0.204 | 0.032 | 0.0299 | 0.00084 | 0.1591 | 0.051 | 0.0083 | 192 | 29 | 189.9 | 5.3 | 150 | 340 |
| X16PSC_215_31 | 0.22 | 0.014 | 0.03272 | 0.00065 | 0.0314 | 0.0491 | 0.0035 | 201 | 12 | 207.5 | 4.1 | 170 | 160 |
| X16PSC_215_32 | 0.22 | 0.017 | 0.03324 | 0.00061 | 0.0226 | 0.0487 | 0.0039 | 203 | 14 | 210.8 | 3.8 | 120 | 180 |
| X16PSC_215_33 | 0.203 | 0.041 | 0.0306 | 0.0016 | 0.0796 | 0.053 | 0.0099 | 185 | 35 | 194 | 10 | 150 | 390 |
| X16PSC_215_39 | 0.209 | 0.04 | 0.0315 | 0.0012 | 0.0275 | 0.0489 | 0.0098 | 188 | 34 | 199.8 | 7.5 | 50 | 390 |
| X16PSC_215_41 | 0.23 | 0.017 | 0.03254 | 0.00042 | 0.2826 | 0.0508 | 0.0037 | 211 | 15 | 206.4 | 2.6 | 230 | 170 |
| X16PSC_215_45 | 0.2 | 0.019 | 0.02987 | 0.00065 | 0.3635 | 0.0483 | 0.0044 | 184 | 16 | 189.7 | 4 | 90 | 190 |

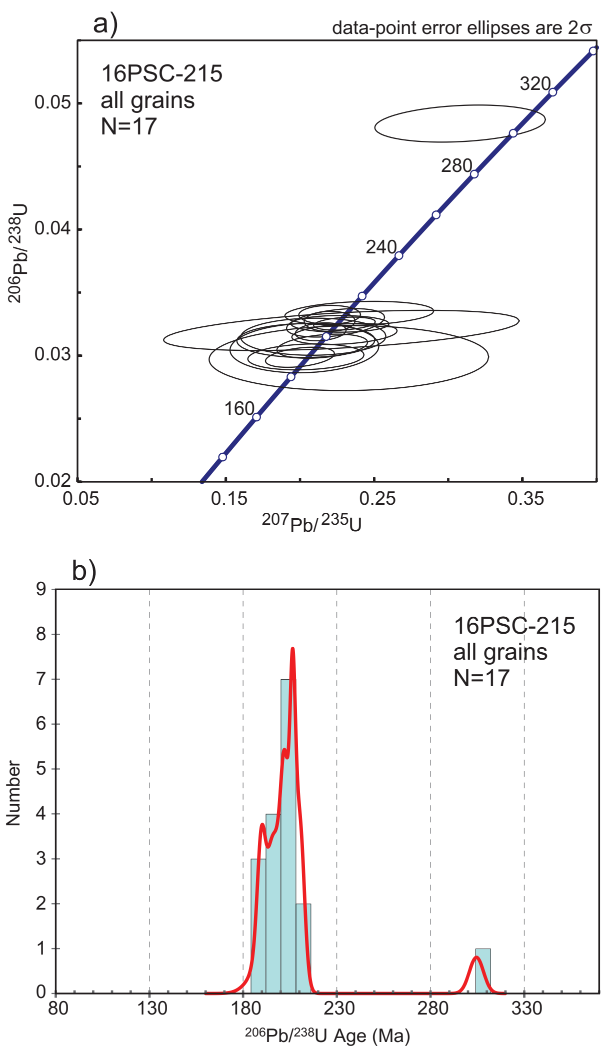


**Fig. 9.** U-Pb data for detrital zircons from Salmon River succession sandstone sample 16PSC-215. **a)** Concordia plot of all grains. **b)** Histogram of all grains and superimposed probability density curve.

area. These include Late Triassic rocks, mainly limestone, chert breccia, sandstone and shale, that unconformably overlie the Old Tom and Shoemaker formations near Olalla, 120 km south of the Salmon River area (Bostock, 1941; Read and Okulitch, 1977); Late Triassic limestone and siltstone of the French Mine, Hedley, Chuchuwayha, and Stemwinder formations near Hedley, 20 km west of the Olalla Triassic rocks (Ray and Dawson, 1994); and the Brooklyn Formation (Middle Triassic, mainly chert breccia, conglomerate, limestone, greenstone) that sits unconformably above the Knob Hill and Atwood groups in the Greenwood-Grand Forks area, 170 km southeast of the Salmon River area (Fyles, 1990).

### 6.2. Jurassic rocks

The Salmon River succession comprises siliciclastic rocks that unconformably overlie the Chapperon Group and the Triassic limestone unit. The best age constraint comes from detrital zircons extracted from sample 17PSC-207, indicating a maximum depositional age of ca.183 Ma (Early Jurassic, near the Pliensbachian/Toarcian boundary). The Salmon River succession is cut to the north by granodiorite of the Weyman Creek pluton (Fig. 2; Daughtry and Thompson, 2004a), which is undated but included in the Middle to Late Jurassic Okanagan plutonic suite (Thompson et al., 2006). If this assignment is correct, the Salmon River succession is no younger than Middle Jurassic.

Siliciclastic rocks that might correlate with the Salmon River succession are in the Ashcroft Formation, an assemblage of Early and Middle Jurassic sandstones, conglomerates, and shales that unconformably overlie Late Triassic volcanic and plutonic rocks in the western part of Nicola belt (Travers, 1978; Monger and McMillan, 1989). A more compelling correlation is with the Hall Formation, which forms the upper part of the Rossland Group in its type area, 220 km southeast of the Salmon River study area (Fig. 1; Höy and Dunne, 1997). This correlation is based on a strong lithologic similarity, and a good match between the age of the Hall Formation (Toarcian) and the maximum depositional age established for the Salmon River succession. Most importantly, the Salmon River succession is close to a slightly older volcano-sedimentary succession (Lions Head succession, Fig. 2; Beatty et al., 2006) that is correlated with the older (Sinemurian) parts of the Rossland Group (Archibald and Elise formations), which underlie the Hall Formation in the type area of the group (Höy and Dunne, 1997).

Detrital zircons from the Salmon River succession do not identify a unique source area. The predominant Late Triassic-Early Jurassic grains could have been provided by the upper part of the Nicola Group (Late Triassic) and associated Late Triassic to Early Jurassic intrusions (Monger and McMillan, 1989; Schiarizza et al., 2013; Mihalynuk and Diakow, 2020), but the Early Jurassic component of this population could also have been provided by older parts of the Rossland Group and associated intrusions (Höy and Dunne, 1997; Beatty et al., 2006). Paleoproterozoic grains from sample 17PSC-207 (n=11, 1693 to 2452 Ma) were probably derived from the North American craton, recycled through pericratonic and continental margin sedimentary rocks, and perhaps again through Paleozoic rocks of Quesnel terrane (Mortensen et al., 2017).

### 6.3. Geologic domains of southern Quesnel terrane

Quesnel terrane is predominantly a Mesozoic arc complex, represented in southern British Columbia by volcanic and volcaniclastic rocks of the Nicola Group (Middle to Late Triassic) and associated Late Triassic and Early Jurassic intrusions. However, the terrane, as defined in the 1980s, also includes Paleozoic and Mesozoic rocks east of this arc complex (Monger et al., 1991). The Salmon River area is part of a geologic domain that forms the eastern part of Quesnel terrane in southern British Columbia (Fig. 1). This domain contains most of the Paleozoic rocks that have been included in Quesnel terrane, as well as Middle to Late Triassic sedimentary successions that unconformably overlie the Paleozoic rocks, and Early Jurassic volcanic-sedimentary successions (the Rossland Group and correlatives) that overlie the Paleozoic and Triassic rocks. The boundaries and coherent Mesozoic stratigraphy of this domain have not been fully appreciated because many Triassic rocks in the western part were previously included in the Nicola Group, and the full extent of the Jurassic rocks has become apparent only recently (Beatty et al., 2006; this study). The geologic history implied by relationships within the domain includes pre-Middle Triassic amalgamation of disparate Paleozoic assemblages (Okanagan and Harper Ranch subterranes of Monger et al., 1991); deposition of Middle to Late Triassic rocks unconformably above the Paleozoic rocks; uplift and erosion followed by deposition of Early Jurassic arc-like volcanic and sedimentary rocks (Rossland Group and correlatives).

To the north of the Paleozoic domain, Quesnel terrane is represented by Triassic siliciclastic rocks of the Slocan Group (Fig. 1), which were deposited mainly above pericratonic assemblages of the North American margin (Klepacki and Wheeler, 1985; Thompson et al., 2006). Volcanic rocks correlated with the Rossland Group occur locally above the Slocan Group (Thompson et al., 2006), linking the Paleozoic domain to the Slocan domain by at least the Early Jurassic. Older ties are more tenuous, because the Slocan Group is, for the most part, lithologically distinct from the Triassic rocks of the Paleozoic domain and although the Slocan Group is locally in contact with the Harper Ranch Group (Thompson et al., 2006), these contacts are not demonstrably depositional. However, if the Slocan Group and the Triassic rocks of the Paleozoic domain are linked, they would represent a stratigraphic overlap across pericratonic assemblages of the North American margin and the Paleozoic rocks of Quesnel terrane.

The Middle Triassic to Early Jurassic arc complex that forms most of Quesnel terrane is markedly distinct from the domains to the east, as exemplified by the contrasting Triassic rocks of the Nicola Group (volcanic and volcaniclastic), Slocan Group (slate, siltstone and quartz sandstone), and the Paleozoic domain (limestone and siltstone). However, Nicola rocks mapped 130 to 150 km north-northwest of the Salmon River area show some tentative links, including local exposures of Early Permian rocks, correlated with the Harper Ranch Group, in the central part of the Nicola belt, and a substantial unit of thin-bedded siltstone and quartzose siltstone (Middle to Late Triassic, Meridian Lake succession) that is lithologically similar to the Slocan Group, but is intercalated with coarse-grained volcaniclastic strata of the Nicola Group (Schiarizza et al., 2013; Schiarizza, 2019). These occurrences suggest that the basement to the Nicola Group correlates, at least in part, to rocks in the Paleozoic domain, and that the Slocan Group interfingers with Nicola rocks, as also suggested by Unterschutz et al. (2002).

## 7. Conclusions

Mesozoic rocks that rest unconformably above the Chapperon Group, previously considered a single Triassic unit, are now known to comprise two different units: a restricted limestone unit with Triassic conodonts; and a more extensive belt of Jurassic siliciclastic rocks (the Salmon River succession) that is tentatively correlated with the Hall Formation (Early Jurassic, Toarcian) of the Rossland Group. The geologic relationships documented near the Salmon River exemplify those in a large geologic domain that forms the eastern part of Quesnel terrane in southern British Columbia (Fig. 1). This domain comprises most of the Paleozoic rocks that have been included in Quesnel terrane, as well as Middle to Late Triassic sedimentary successions that unconformably overlie the Paleozoic rocks, and Early Jurassic volcanic-sedimentary successions (the Rossland Group and correlatives) that overlie the Paleozoic and Triassic rocks.

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