# U-Pb AGE OF MINERALIZED FELDSPAR PORPHYRY SILLS AT THE LOUISE LAKE Cu-Mo-Au-As DEPOSIT, SMITHERS MAP AREA, WEST-CENTRAL BRITISH COLUMBIA (NTS 93L)

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## INTRODUCTION

The Louise Lake porphyry deposit is located about 35 kilometres west of Smithers, in the Hazelton Mountains of west-central British Columbia in Smithers map area 93L/13E (MINFILE 093L 079). Work at the property since its discovery in 1968 has identified a drill indicated resource of about 50,000,000 tonnes containing 0.3 per cent copper and 0.31 grams gold per tonne (Global Mineral and Chemical Limited report, 1995). Cu-Mo-Au-As mineralization at the Louise Lake deposit is related to a swarm of feldspar porphyry sills which intrude Lower Cretaceous sedimentary rocks. In this report we present new U-Pb data and an interpreted crystallization age for a sample of one of these mineralized sills, which constrain the maximum age of mineralization at the Louise Lake deposit. We present a synopsis of the regional setting and local geology of the Louise Lake deposit followed by U-Pb data, an interpreted age and implications of this age. The U-Pb age reported herein was determined at the Geochronology Laboratory of the Department of Earth and Ocean Sciences at the University of British Columbia. The reader is referred to a review of the Louise Lake deposit (Hanson and Klassen, 1995) for information relating to its exploration history and for detailed descriptions of mineralization and alteration.

## REGIONAL GEOLOGY

The Louise Lake deposit lies near the western margin of the Intermontane morphogeologic belt, within the Stikine accreted terrane (Wheeler and McFeely, 1991). The deposit is in the western part of the east-west trending Skeena Arch, a regional structural culmination which separates the middle Mesozoic Bowser and Nechako basins (Figure 1). Mesozoic strata underlying the Skeena Arch are divisible into several volcanic and/or siliciclastic assemblages separated by unconformities. In ascending order the units are: Upper Triassic arc volcanics of the Takla Group; Lower to Middle Jurassic arc volcanic and clastic sedimentary strata of the Hazelton Group; wackes, fine grained sedimentary rocks and tuffs of the Middle Jurassic Ashman Formation, part of the Bowser Lake Group; Lower Cretaceous, mainly Albian sedimentary rocks and subordinate basalt flows of the Skeena Group; and, volcanic rocks of the the Upper Cretaceous Brian Boru Formation (Carter and Kirkham, 1969).

Several distinct suites of plutonic rocks also occur in the area. The Early to Middle Jurassic Topley intrusions invade Hazelton Group and older strata (Wheeler and McFeely, 1991; Wanless et al., 1974). Numerous small- and medium-sized, high-level stocks of the Late Cretaceous Bulkley intrusions and the Eocene Nanika intrusions have also been recognized in the region (MacIntyre, 1985). The Coast Plutonic Complex lie directly west of the Louise Lake area in the eastern Coast Belt.

Rocks of the Skeena Arch are variably folded and faulted. Takla, Hazelton and Skeena strata have undergone open to tight folding while Late Cretaceous and younger rocks are only gently warped. The region is cut by steep, generally north to northwest-trending faults.

## GEOLOGY OF THE LOUISE LAKE DEPOSIT

The Louise Lake deposit is located near the headwaters of Coal Creek, at an elevation of about 1000 metres (Figure 2). Hazelton Group volcanic and Skeena Group sedimentary rocks, which underlie much of the property, are separated by the east-northeast-trending, steeply dipping Coal Creek lineament. Skeena Group conglomerate, sandstone and argillite, which occur north of the Coal Creek lineament, have been intruded by a swarm of quartz monzoritic feldspar porphyry sills which are altered and mineralized at Louise Lake. Prior to the present study

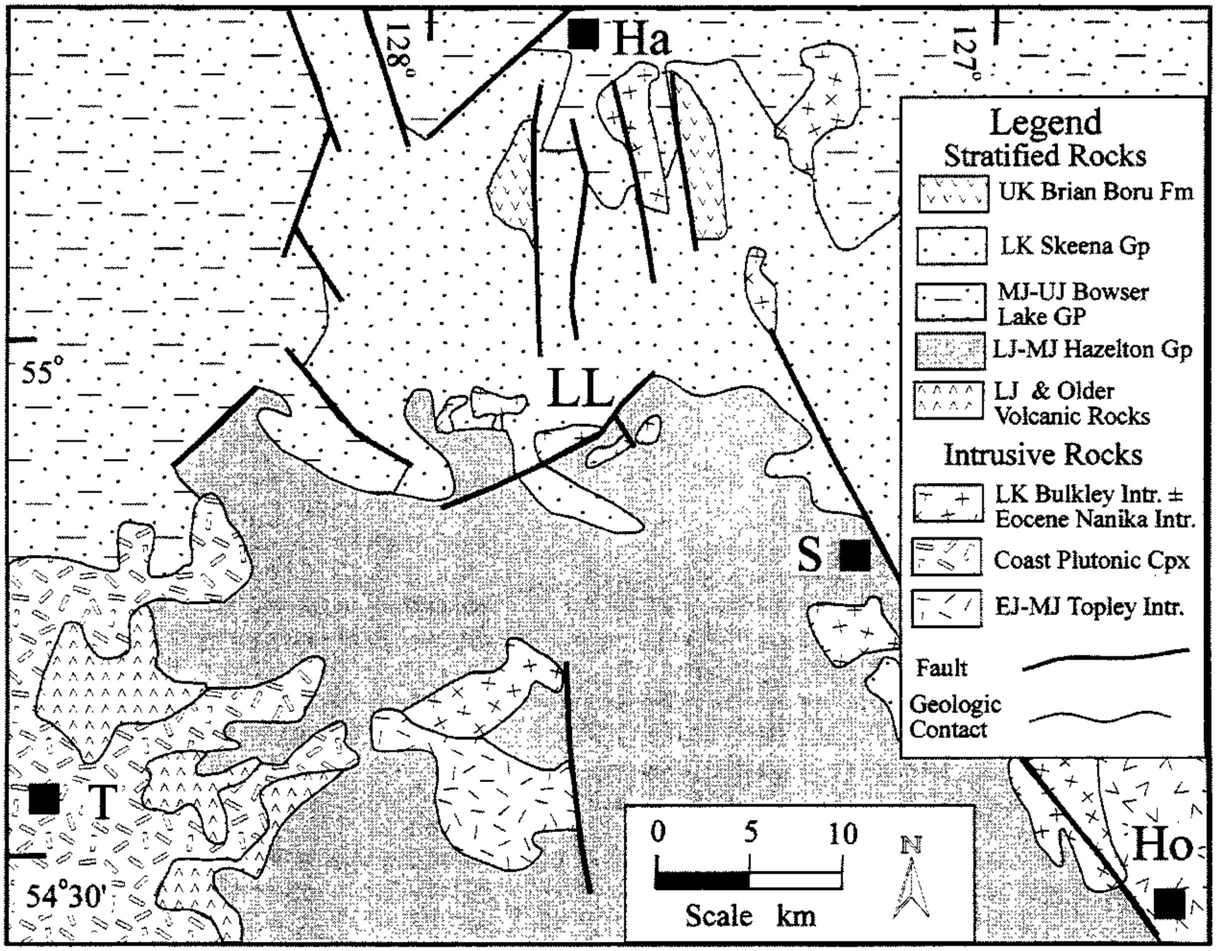


Figure 1. Regional geological map of the western Skeena Arch and vicinity, modified from Hanson and Klassen (1995) and Wheeler and McFeely (1991). Abbreviations: Ha: Hazelton; Ho: Houston; LL: Louise Lake deposit; S: Smithers; T: Terrace.

these sills were undated and were assigned, on the basis of lithology, to the Eocene Nanika intrusions. Postmineral feldspar porphyry dikes cut mineralized sills on the property.

Three distinct alteration zones have been recognized at the Louise Lake deposit. A core zone of strongly silicified and sericitized rocks with intense quartz-pyrite stockworks is mantled by a medial clay and quartz-sericite zone with some quartz-pyrite veining. This is, in turn, surrounded by a peripheral kaolinite zone characterized by modest quartz-pyrite veining. In addition to pyrite, sulfide minerals recognized at the deposit include chalcopyrite and molybdenite, with minor amounts of stibnite, sphalerite, chalcocite, bornite and tennantite; enargite is said to be present in trace amounts (N.C. Carter, personal communication, 1995). Gold appears to be associated with tennantite (Hanson and Klassen, 1995).

## U-Pb GEOCHRONOLOGY

New U-Pb zircon data and an interpreted crystallization age for the Louise Lake feldspar porphyry sills are given in this report. Zircons grains were selected for analysis on the basis of their magnetic susceptibility, clarity, colour, grain size and morphology. In general only high quality, crack- and inclusion-free grains were chosen. All fractions were air abraded (Krogh, 1982) to remove about 10-20 volume percent of the outer part of each grain. Complete U-Pb analytical procedures employed at the University of British Columbia Geochronology Laboratory are reported in Mortensen *et al.* (1995). U-Pb data are shown on a concordia diagram on Figure 3 and listed in Table 1.

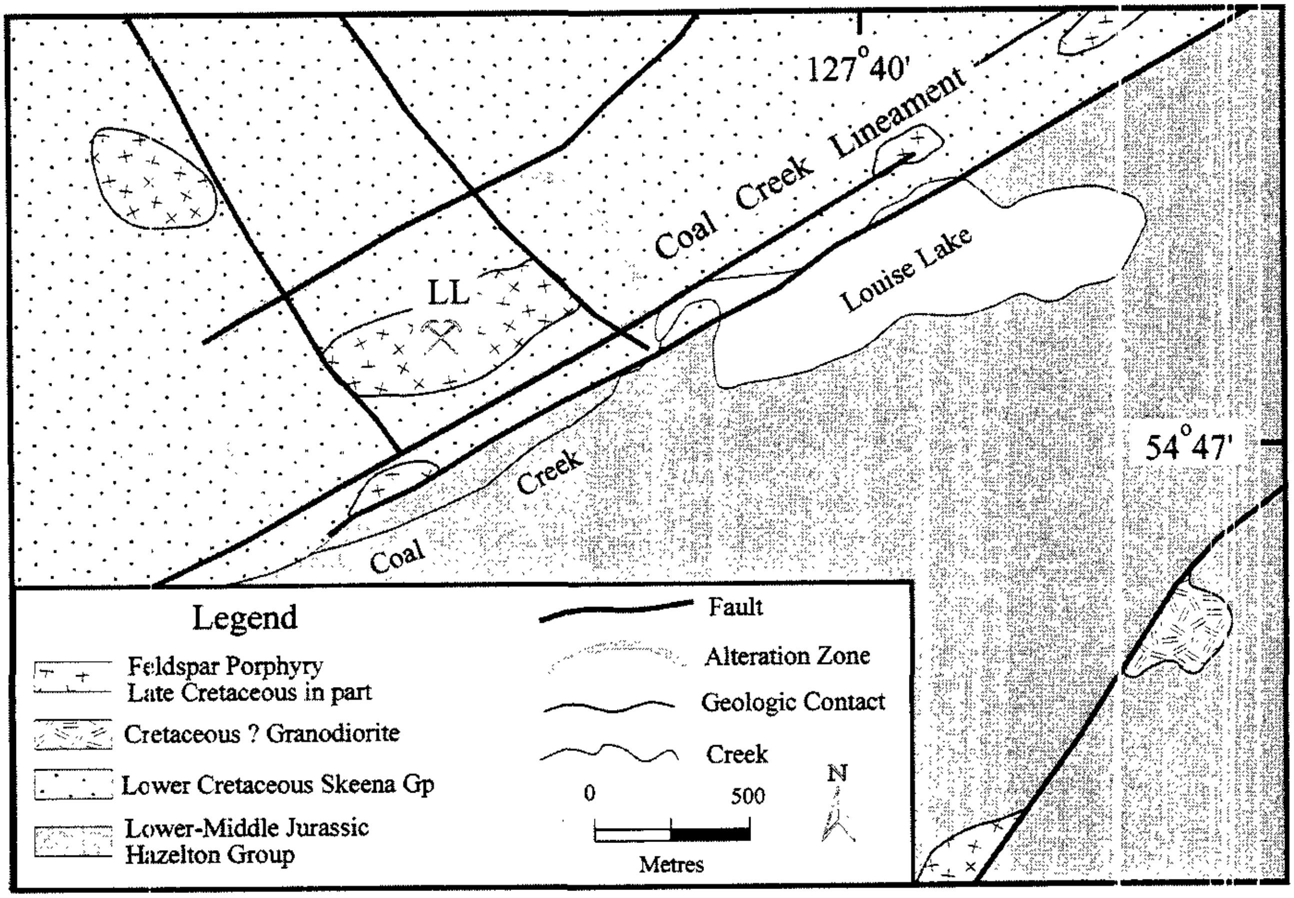


Figure 2. Map of the Louise Lake deposit after Hanson and Klassen (1995). LL denotes location of the Louise Lake deposit.

## *LOUISE LAKE PORPHYRY SILL: DDH-LL18*

A sample of altered and mineralized feldspar porphyry sill was collected for geochronology from drill core during the 1995 field season. The dated sample contained about 15% euhedral to subhedral clay-altered feldspar phenocrysts in a fine-grained matrix of feldspar, sericite, kaolinite and quartz.

This sample yielded abundant, high quality, pale pink, stubby to rarely elongate, prismatic zircon. Three analysed fractions intersect concordia between about 85.5 Ma and 88.0 Ma, and indicate a Late Cretaceous crystallization age. Fraction B has the highest degree of concordance and is thought to provide the best age for this rock, while Fractions A and C appear to have undergone minor Pb loss. An interpreted crystallization age of 87.5 +4.9/-2.0 Ma is based on the $^{206}Pb/^{238}U$ age of fraction B, with conservatively estimated precisions. These errors are derived from the entire overlap of all ellipses with the concordia curve (minimum age) and the weighted $^{207}Pb/^{206}Pb$ age and associated precision of all fractions (maximum age).

A Late Cretaceous crystallization age of 87.5 +4.9/-2.0 Ma for the Louise Lake feldspar porphyry indicates that this intrusive unit is related to the Bulkley intrusions, and not the Nanika intrusions, as previously inferred. This age is several million years older than the reported age range for the Bulkley intrusions, which is based mainly on K-Ar cooling data (Carter, 1974; 1981).

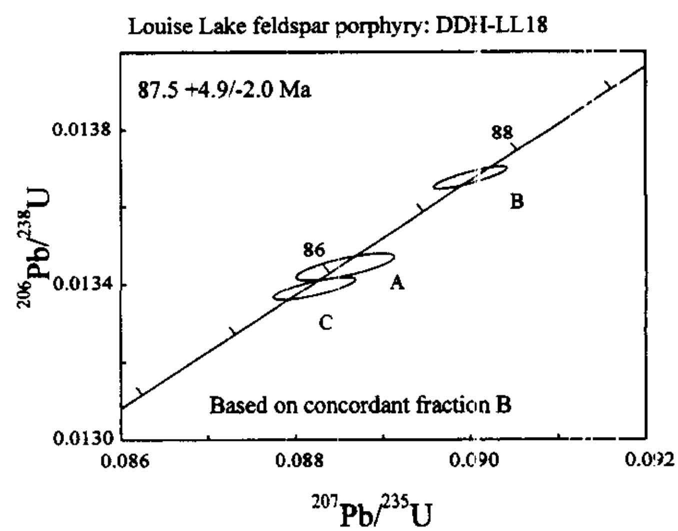


Figure 3. Concordia diagram for the Louise Lake feldspar porphyry (Sample DDH-LL18). Ellipses are plotted at the 2σ level of precision. See text for discussion.

**TABLE 1. U-Pb ANALYTICAL DATA FOR THE LOUISE LAKE PORPHYRY**

| Fraction[1] | Wt | $U^2$ | Pb*[3] | $^{206}Pb$[4] | Pb[5] | $^{208}Pb$[6] | Isotopic ratios (1σ,%)[7] | | | Apparent ages (2σ,Ma)[7] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg | ppm | ppm | $^{204}Pb$ | pg | % | $^{206}Pb/^{238}U$ | $^{207}Pb/^{235}U$ | $^{207}Pb/^{206}Pb$ | $^{206}Pb/^{238}U$ | $^{207}Pb/^{206}Pb$ |
| DDH-LL18: Louise Lake Feldspar Porphyry sill | | | | | | | | | | | |
| A cc,N2,p | 0.091 | 457 | 6 | 1414 | 25 | 7.2 | 0.01344(0.13) | 0.0886(0.32) | 0.04777(0.24) | 86.1(0.2) | 88.1(11.4) |
| B c,N2,p | 0.125 | 501 | 7 | 2575 | 21 | 7.5 | 0.01367(0.11) | 0.0900(0.23) | 0.04774(0.15) | 87.5(0.2) | 86.4(7.3) |
| C m,N2,p | 0.112 | 541 | 7 | 2263 | 23 | 7.7 | 0.01339(0.11) | 0.0882(0.27) | 0.04778(0.19) | 85.7(0.2) | 88.4(9.2) |

Notes: Analytical techniques are listed in Mortensen *et al.* (1995).

[1] Upper case letter = fraction identifier; All zircon fractions air abraded; Grain size, intermediate dimension: cc= >134μm, c= >134 μm and >104μm, m= <104μm and >74μm, f= <74μm; Magnetic codes:Franz magnetic separator sideslope at which grains are nonmagnetic (N) or Magnetic (M); e.g., N1 = nonmagnetic at 1°; Field strength for all fractions = 1.8A; Front slope for all fractions = 20°; Grain character codes: b = broken fragments, e = elongate, eq = equant, p = prismatic, s = stubby, t = tabular, ti = tips.

[2] U blank correction of 1-3pg ± 20%; U fractionation corrections were measured for each run with a double $^{233}U$-$^{235}U$ spike (about 0.005/amu).

[3] Radiogenic Pb

[4] Measured ratio corrected for spike and Pb fractionation of 0.0043/amu ± 20% (Daly collector) and 0.0012/amu ± 7% and laboratory blank Pb of 10pg ± 20%. Laboratory blank Pb concentrations and isotopic compositions based on total procedural blanks analysed throughout the duration of this study.

[5] Total common Pb in analysis based on blank isotopic composition

[6] Radiogenic Pb

[7] Corrected for blank Pb, U and common Pb. Common Pb corrections based on Stacey Kramers model (Stacey and Kramers, 1975) at the age of the rock or the $^{207}Pb/^{206}Pb$ age of the fraction.

## DISCUSSION

Based on the Late Cretaceous U-Pb age determined in this study, the Louise Lake porphyry deposit appears to be associated with the lithologically similar Bulkley intrusions, a plutonic suite responsible for numerous porphyry deposits in west-central British Columbia (Carter, 1974; 1976; 1981; Christopher and Carter, 1976; MacIntyre, 1976; 1985). The crystallization age of 87.5 +4.9/-2.0 Ma for the Louise Lake feldspar porphyry is considered to be a maximum age for alteration and mineralization at the Louise Lake deposit, which is hosted within and adjacent to this intrusion. Although this age does not directly constrain the timing of mineralization, the high-level nature of this intrusion and the associated Louise Lake deposit (Hanson and Klassen, 1995) strongly suggests that it underwent rapid cooling, and that late hydrothermal activity associated with mineralization did not significantly post-date primary igneous cyrstallization.

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