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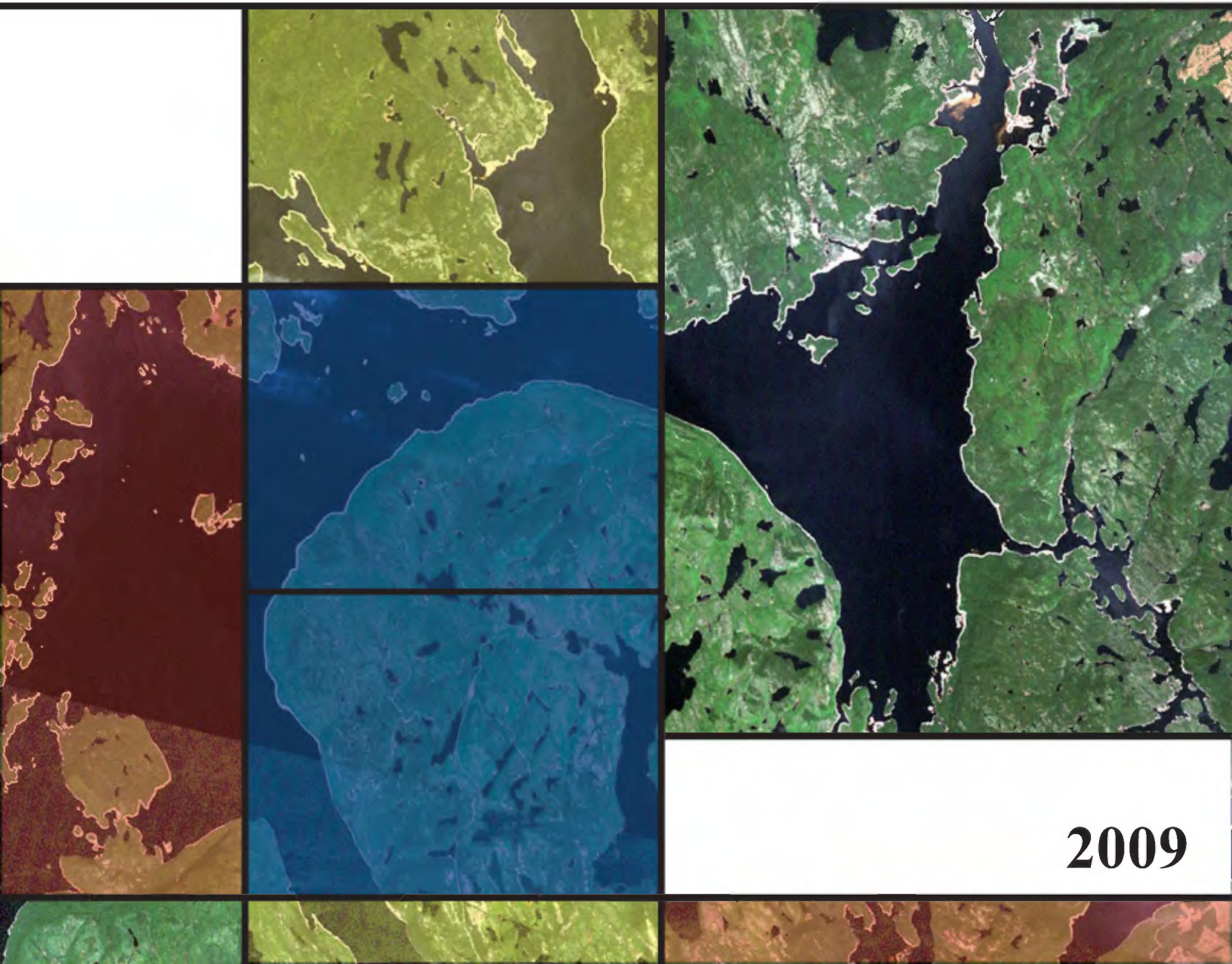
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Report on U-Pb geochronology for the Pipmuacan Reservoir region

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INTRODUCTION

This report of U-Pb zircon isotopic data accompanies the geological synthesis of the region of the Pipmuacan Reservoir (NTS 22E) by Hébert *et al.* (2009). The geological synthesis of this region, dominated by plutons and orthogneisses, uses precise ages to outline an igneous geochronological framework for the region, which is extended to the Grenville Province of Quebec. Ages reported in the synthesis were either previously published or are new and documented here. Geochronology samples for this report were selected by Claude Hébert to constrain age relationships underpinning geological mapping in the Pipmuacan Reservoir region. Contextual map locations are shown in the geological synthesis.

For each sample, this technical report 1) describes analytical techniques and data reduction procedures used, citing references with further information, 2) presents tables of U-Pb isotopic data that also give UTM coordinates, 3) displays isotopic ratios and uncertainties in concordia diagrams 4) interprets these data and 5) assigns U-Pb zircon ages with analytical uncertainties. Technical information is thereby made available for reassessment in case of questions concerning conflicting radiometric ages or geological relationships.

METHODOLOGY

U-Pb SHRIMP microbeam analysis

Zircons were separated using standard techniques of disc mill crushing and heavy mineral separation using a Wilfley shaking table, methylene iodide heavy liquid and a Frantz isodynamic magnetic separator. Representative grains (>100 μ) were selected from the non-magnetic separate at a sideslope of 10° and operating 1.8A current. Approximately 150 randomly selected zircon grains were mounted in a 2.5 cm epoxy disk (#IP206) along with fragments of GSC SHRIMP zircon standard 6266.

SHRIMP (sensitive high resolution ion microprobe) analysis (Compston, 1982) was employed as its high spatial resolution was needed to resolve ages of igneous cores and metamorphic overgrowths from one of the samples. Details of analytical procedures using the SHRIMP II ion microprobe at the Geological Survey of Canada (GSC) are available in Stern (1997), and Stern and Amelin (2003). Following grinding and polishing, zircon cross sections were imaged using a Secondary Electron Microscope (SEM) in backscattered electron or cathodoluminescence mode. Images were used to guide the primary beam to optimum spots for analysis. Selected spots were sputtered using a mass-filtered O⁻ primary beam operating in Kohler mode. Primary beam currents ranged from 2-6 nA, gener-

ating elliptical pits 20 microns in maximum diameter. Pits were <1 micron deep after completion of six scans. The 1 σ external errors of ²⁰⁶Pb/²³⁸U ratios reported in the data table incorporate a ± 1.9 % error in calibrating the standard zircon (see Stern and Amelin, 2003). No fractionation correction was applied to the Pb-isotope data; common Pb correction utilized the Pb composition of the surface blank (Stern, 1997). Plotting and statistical analysis of data were performed using the Excel program and protocols of Ludwig (2003). Uncertainties for final ages are reported at the 95 percent confidence level. Data from SHRIMP are presented in figure 1a and b, and tables 1 and 3.

U-Pb - ID_TIMS analysis

Zircons were separated using standard techniques described above. Crystals free of cracks, alteration and cores were selected from the least magnetic, often diamagnetic, fraction on the Frantz isodynamic separator. To minimize effects of peripheral lead loss or to remove metamorphic rims, all zircon fractions were mechanically abraded until crystals assumed a well-rounded shape (Krogh, 1982).

The highest precision for U-Pb zircon analyses can be obtained for uniform zircons using techniques first established by Krogh (1973). Isotope dilution and thermal ionisation mass spectrometry (ID_TIMS) for measuring U-Pb isotopes at the Geological Survey of Canada were summarized by Parrish *et al.* (1987). With the exception of three analyses, all were conducted on multigrain fractions. Mass spectrometric data reduction and numerical procedures of propagation of analytical uncertainties in the calculation of isotopic ratios and ages follow Roddick (1987). Isotopic data are presented in table 2 and ratios are plotted in figure 2. Regression calculations follow York (1969). Because only 3 to 6 fractions were analysed per sample, age uncertainties are given at the 2 sigma (σ) confidence level.

RESULTS

SHRIMP analysis

SAMPLE CH_00_17 - Orthogneiss mangéritique du Complexe gneissique de Rouvray

Zircons are subhedral rounded prisms with length to breadth ratios (L/B) that range from 1 to 4. SEM backscatter images of crystal sections show well-zoned 'igneous' cores and rounded mantles that show no zoning or vague zoning. Mantles range from thin rims to volumetrically predominant overgrowths. In many prismatic crystals, thin marginal rims widen to prominent terminal overgrowths.

Twenty-four concordant analyses (table 1) show a bimodal age distribution on a concordia plot (figure 1a) and histogram (figure 1b; 20 Ma bin width). This distribution is interpreted

in terms of an older, igneous age for cores with regular, prismatic zoning and a younger, metamorphic age for weakly zoned rims. A cumulative frequency diagram (figure 1b) shows a large spread of the older $^{207}\text{Pb}/^{206}\text{Pb}$ age population ($n=19$) but a tight cluster of 5 younger ages. The oldest of these 5 analyses consists of an atypical, diffuse, asymmetric overgrowth along the side of a prismatic core, which has high U and low Th/U. The best age for the younger event is, therefore, obtained from a weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ age of the 4 youngest ages, which is 1046 ± 19 Ma (MSWD = 0.20). This age is interpreted as the age of metamorphism.

The 19, older $^{207}\text{Pb}/^{206}\text{Pb}$ ages show a spread from 1466 Ma to 1266 Ma. This distribution is interpreted in terms of metamorphic resetting of Pb isotopic systems in igneous zircons. The probability density distribution shows peaks at 1464 Ma and 1382 Ma, of which the younger peak is the larger. Hence, the possibility needs to be considered that the younger age peak is close to the age of the igneous precursor. Although this interpretation cannot be discarded the internal morphology shows regular igneous zoning for cores regardless of their age. There is also no evidence for distinct cores within the igneous cores. The data is, therefore interpreted in terms of a single precursor igneous event and a single metamorphic resetting. Regression of all analyses yields upper and lower intercept ages of 1494 ± 37 Ma and 1077 ± 46 Ma and a mean square of weighted deviates (MSWD) of 1.14. As the lower intercept age is nominally older than the age of metamorphism, another regression was applied that anchors the 19, older analyses to the 1046 ± 19 Ma metamorphic age. This regression yields an upper intercept age of 1484 ± 30 Ma (MSWD = 1.2), which is interpreted as the time of igneous crystallization.

SAMPLE of garnet paragneiss from Séquence supracrustale de Saint-Yves

Among nineteen zircons that were analysed, eighteen were found to be related with metamorphic events. The only one igneous zircon gave an age of 1371 ± 13 Ma (table 3). It is clear that more geochronological studies have to be made on this supracrustal sequence, but for the moment this is the best age approximation available.

ID_TIMS analyses

SAMPLE CH_00_06 - Granite de De Mun

Zircons are clear, colourless and subhedral, elongate ($L/B = 5 - 10$). There are some fluid inclusions in negative crystals, but no fractures or visible cores. Some prismatic crystals tend to be platy (fraction A)

Four zircon analyses are 1.5 - 2.1 percent discordant and aligned along a discordia, with fraction A of platy zircons the most discordant (figure 2a, table 2). Regression yields upper and lower intercept ages of $1383 +30/-17$ Ma

and $1007 +93/-102$ Ma (MSWD = 1.04) that are interpreted as igneous crystallization and metamorphic disturbance, respectively.

SAMPLE Heb_Charnockite_01 - Charnockite de Patrick Ouest

Zircons are clear and colourless prisms with no visible cores or fractures and a few opaque inclusions. There is a wide range of L/B ($2 - 10$).

Four zircon analyses are tightly clustered (figure 2b, table 2), with one concordant and three 0.39 – 0.50 percent discordant. A weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ age of 1143.5 ± 1.2 Ma (MSWD = 2.6) is interpreted as the time of igneous crystallization.

SAMPLE CH_02_1256 - Anorthosite de Vanel

Zircons are clear, colourless and anhedral. There are no visible inclusions, fractures or cores. Three analyses were done on single grains (D, E, F) and three on multigrain fractions (A, B, C).

All six analyses are arrayed along the concordia with $^{207}\text{Pb}/^{206}\text{Pb}$ ages ranging from 1081 Ma to 1049 Ma (figure 2c, table 2). This spread is interpreted in terms of an older igneous zircon U-Pb system disturbed by recrystallization and Pb loss during metamorphism. The two oldest analyses are in close agreement at 0.55 percent and 0.65 percent discordant. Not only do they correspond to single grain analyses, they have the highest U concentrations of 542 ppm and 442 ppm. The weighted average $^{207}\text{Pb}/^{206}\text{Pb}$ age for the two analyses is 1080 ± 2 Ma (MSWD = 0.23) is assigned to the age of igneous crystallization.

SAMPLE CH_00_09 - Monzonite d'Étienne

Zircons are clear, pale brown, somewhat irregular prisms ($L/B = 3 - 5$). There are some inclusions but no fractures or visible cores.

Four analyses are tightly clustered near the concordia and are concordant to 0.38 percent discordant. A weighted average $^{207}\text{Pb}/^{206}\text{Pb}$ age of 1059.1 ± 1.4 Ma (MSWD = 2.14) is assigned to the age of igneous crystallization (figure 2d, table 2).

SAMPLE CH_00_14 - Granite de La Carpe

Zircons are subhedral prisms ($L/B = 3 - 4$) and slightly rounded tips. Crystals are clear and very pale brown. Inclusions are present but not fractures or cores.

Four analyses are clustered along the concordia. The oldest fraction D is interpreted to have a small component of inherited radiogenic Pb. The weighted average $^{207}\text{Pb}/^{206}\text{Pb}$ age of 1028 ± 2 Ma (MSWD = 1.23) for the remaining 3 analyses is assigned to the time of igneous crystallization (figure 2e, table 2).

SAMPLE Heb_Psukè_01 - Granite de Psukè

Zircons are clear, colourless subhedral to euhedral prisms (L/B = 2 – 6). There are no visible cores but there are some opaque inclusions.

Of four analyses, three are concordant and one negatively discordant. Concordant fraction Z6 is interpreted to have a small inherited component. The weighted average $^{207}\text{Pb}/^{206}\text{Pb}$ age for the remaining 3 analyses of 1024.2 ± 2.4 Ma (MSWD = 0.10) is assigned to the time of igneous crystallization (figure 2f, table 2).

SAMPLE CH_00_08 - Granite porphyroïde de Menton

Crystals are clear, pale brown and prismatic. Prisms are euhedral to subhedral (L/B = 4 – 1). Tips can be slightly rounded. There are few inclusions, nor fractures and no visible cores.

Three analyses cluster on the concordia and two are discordant. The weighted average $^{207}\text{Pb}/^{206}\text{Pb}$ age of 1019.6 ± 1.5 (MSWD = 1.5) for the three concordant analyses is assigned to the time of igneous crystallization (figure 2g, table 2).

SAMPLE Heb_Margane_01 - Monzonite de Margane

Zircons are prismatic (L/B = 1 – 4) and range from subhedral to wedge shaped to anhedral. Grains are clear to partially cloudy. There are no visible cores.

Three analyses plot along the concordia. Data point Z4 is interpreted in terms of a small component of inherited radiogenic Pb. The $^{206}\text{Pb}/^{238}\text{U}$ ages of the two remaining analyses are in good agreement. Their weighted average of 1018.4 ± 2.4 (MSWD = 0.01) is assigned to the time of igneous crystallization (figure 2h, table 2).

SAMPLE CH_00_08 - Granite de Touladi

Zircons are clear, pale yellow, stubby prismatic (L/B = 2), subhedral to euhedral. There are a few clear inclusions and fractures, but no visible cores.

Of four clustered analyses, two are concordant and two slight negatively discordant. One analysis yields an older age, which is interpreted in terms of a significant component of inherited radiogenic Pb. The $^{206}\text{Pb}/^{238}\text{U}$ ages for the four clustered analyses are in good agreement, yielding a weighted average of 987.4 ± 1.8 Ma (MSWD = 0.2). This age is attributed to the time of igneous crystallization (figure 2i, table 2).

SAMPLE CH_00_03 - Mangérite de Strike

Zircons are colourless, prismatic and subhedral (L/B = 3 – 6). Not all the prisms are parallel sided, showing that there may have been some pre-existing crystal interference during zircon growth. There are no visible cores.

Five analyses are concordant and clustered with overlapping uncertainty envelopes (figure 2j, table 2). Nevertheless, two analyses (Z3 and Z4) may comprise a small component of older radiogenic Pb. The remaining 3 analyses yield a ‘concordia’ age (Ludwig, 2003) of 1073.4 ± 1.5 Ma (MSWD = 0.064), which is attributed to the time of igneous crystallization.

SAMPLE CH_00_01 - Monzonite de Pamouscachiou

Zircons are colourless, prismatic and subhedral (L/B = 4-6). Again, not all prisms are parallel sided. There are no visible cores.

Three analyses are concordant and clustered, yielding a ‘concordia’ age of 1069.1 ± 1.5 Ma (MSWD = 0.0004). This age is attributed to the time of igneous crystallization (figure 2k, table 2).

ACKNOWLEDGEMENTS

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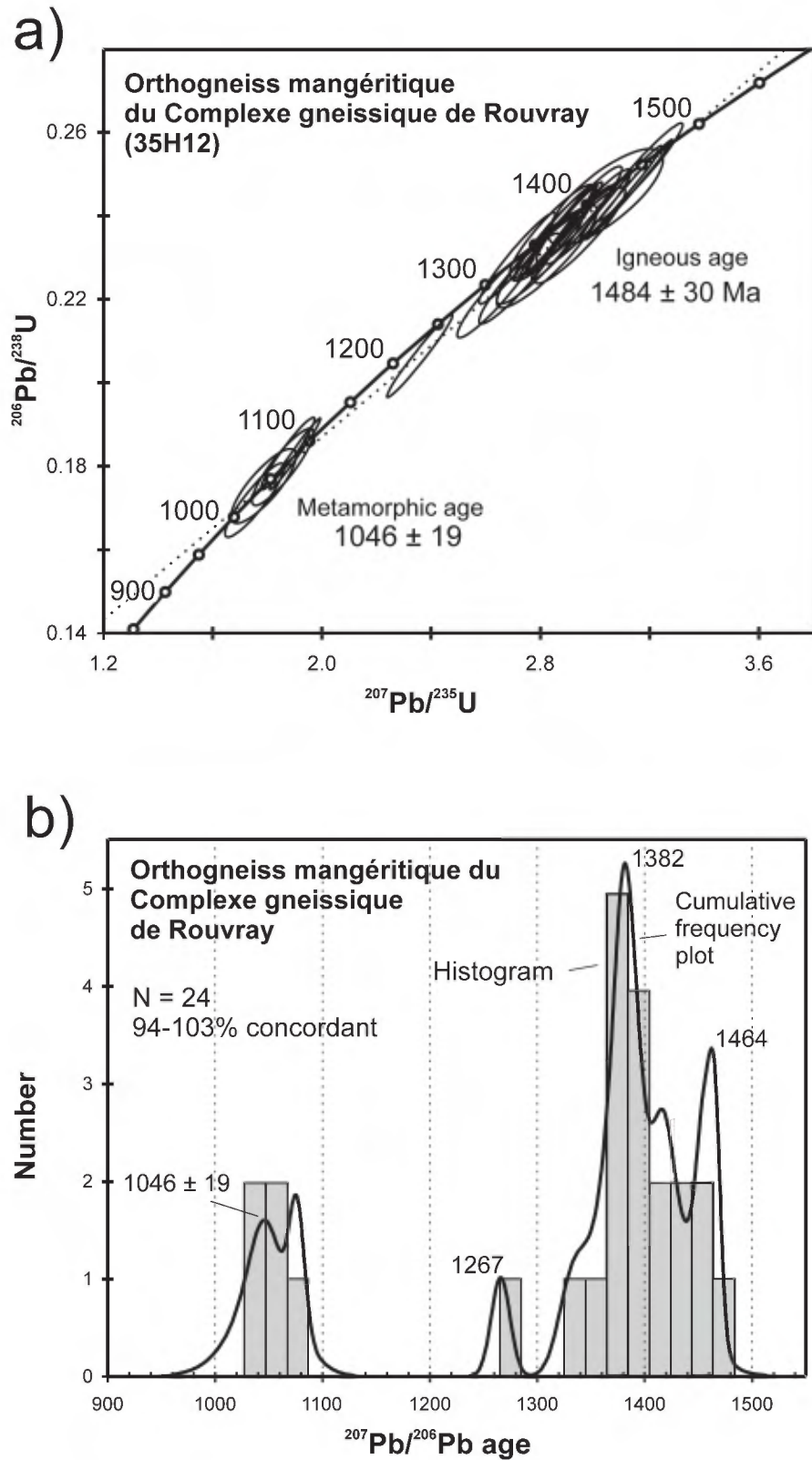


FIGURE 1 - U-Pb SHRIMP isotopic data for zircons from sample CH_00_17: a) Concordia diagram showing isotopic ratios with 2σ uncertainties; b) Histogram and cumulative frequency curve for $^{207}\text{Pb}/^{206}\text{Pb}$ ages.

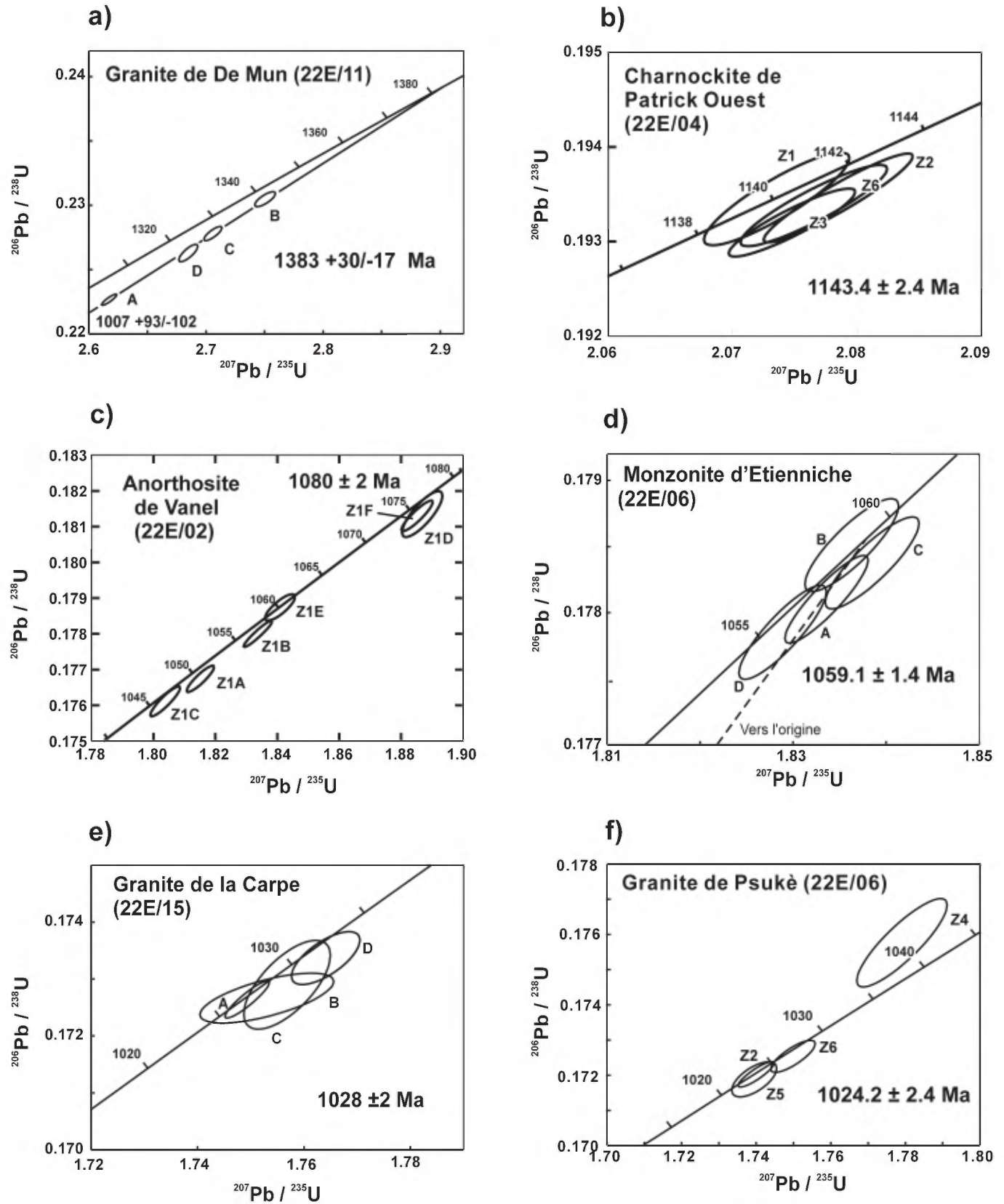


FIGURE 2 - U-Pb ID-TIMS isotopic ratios zircons with 2σ uncertainties from seven igneous units plotted on concordia diagrams for: a) Sample CH_00_06, b) Sample Heb_Charnockite_01, c) Sample CH_02_1256, d) Sample CH_00_09, e) Sample CH_00_14.

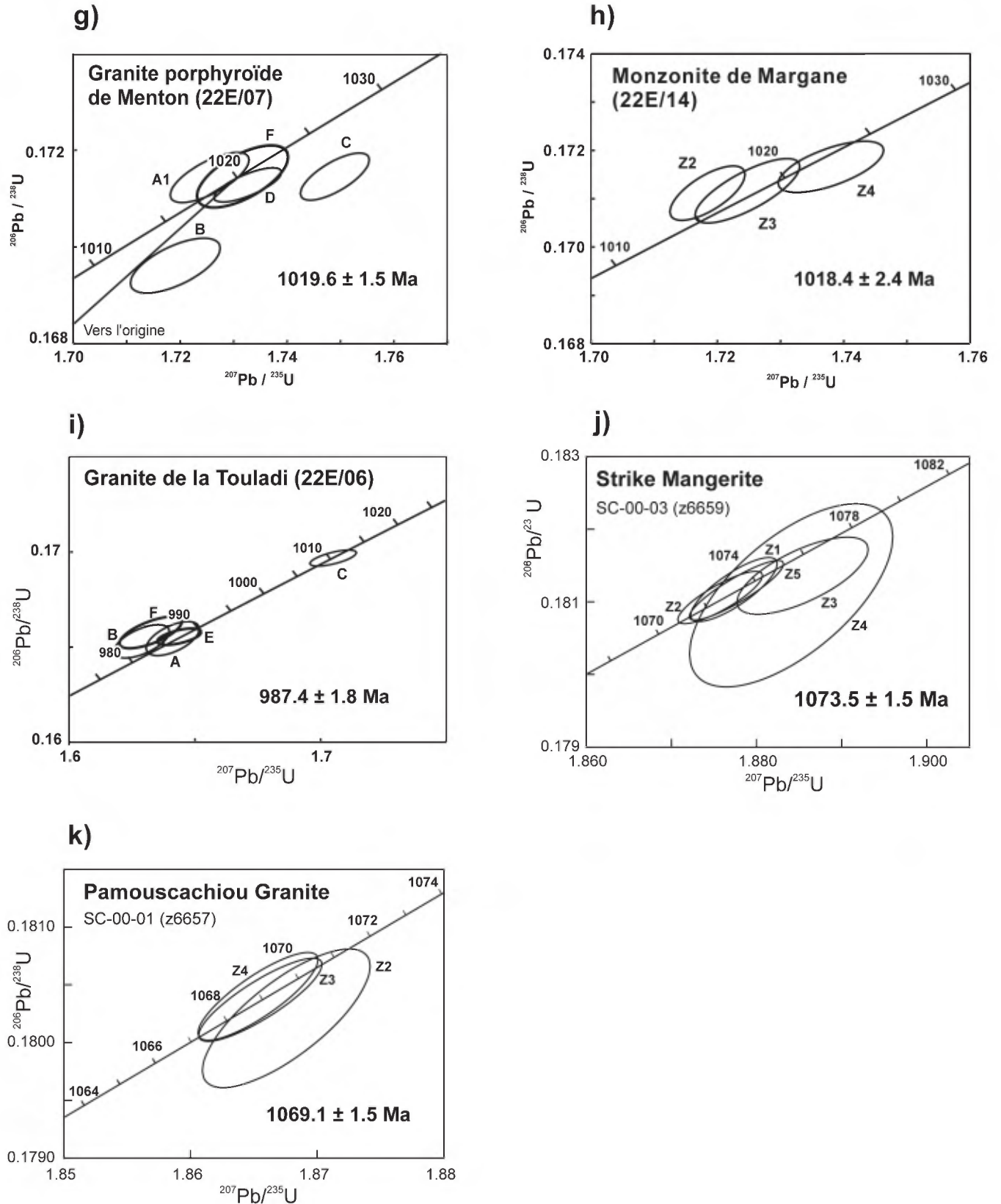


FIGURE 2 (continued) - U-Pb ID-TIMS isotopic ratios zircons with 2σ uncertainties from seven igneous units plotted on concordia diagrams for: **g)** Sample CH_00_08, **h)** Sample Heb_Margane_01, **i)** Sample CH_00_08, **j)** Sample CH_00_03, **k)** Sample CH_00_01. Fractional ages cited in the text are rounded to the nearest integer, whereas uncertainties are rounded upwards.

Table 1 - U-Pb SHRIMP zircon isotopic data

| Lab# | U (ppm) | Th (ppm) | Th/U | Pb (ppm) | ²⁰⁴ Pb (ppb) | ²⁰⁶ Pb (ppb) | $\pm 1\sigma$ | f_{206} | ²⁰⁸ Pb | $\pm 1\sigma$ | ²⁰⁷ Pb | ²³⁸ U | Age (Ma) | | | | Disc. (%) | | | | | |
|--|---------|----------|------|----------|-------------------------|-------------------------|---------------|-----------|-------------------|---------------|-------------------|------------------|-------------------|---------------|-------------------|---------------|-----------|-------------------|---------------|-------------------|---------------|------|
| | | | | | | | | | | | | | ²⁰⁶ Pb | $\pm 1\sigma$ | ²⁰⁷ Pb | $\pm 1\sigma$ | | ²⁰⁶ Pb | $\pm 1\sigma$ | ²⁰⁷ Pb | $\pm 1\sigma$ | |
| CH_00_17; z6625 - Orthogneiss mangérienne du Complexe gneissique de Rouvray (NTS 22E7, UTM 368655E, 5469236N) | | | | | | | | | | | | | | | | | | | | | | |
| 6625-23.1 | 109 | 42 | 0.40 | 19 | 6 | 3,45E-04 | 5,60E-05 | 0,0060 | 0,1086 | 0,0027 | 1,774 | 0,050 | 0,1745 | 0,0037 | 0,0738 | 0,0012 | 1037 | 20 | 1035 | 33 | 100,2 | -0,2 |
| 6625-12.1 | 141 | 98 | 0.72 | 27 | 3 | 1,21E-04 | 2,82E-05 | 0,0021 | 0,2144 | 0,0048 | 1,745 | 0,044 | 0,1711 | 0,0037 | 0,0740 | 0,0008 | 1018 | 20 | 1040 | 23 | 97,9 | 2,1 |
| 6625-2.1 | 282 | 135 | 0.49 | 54 | 3 | 5,96E-05 | 1,37E-05 | 0,0010 | 0,1465 | 0,0018 | 1,864 | 0,040 | 0,1823 | 0,0036 | 0,0742 | 0,0005 | 1079 | 19 | 1046 | 13 | 103,2 | -3,2 |
| 6625-10.1 | 174 | 202 | 1.20 | 39 | 3 | 1,22E-04 | 2,70E-05 | 0,0021 | 0,3665 | 0,0036 | 1,845 | 0,047 | 0,1791 | 0,0038 | 0,0747 | 0,0009 | 1062 | 21 | 1061 | 24 | 100,1 | -0,1 |
| 6625-4.1 | 656 | 4 | 0.01 | 111 | 2 | 1,91E-05 | 1,19E-05 | 0,0003 | 0,0020 | 0,0005 | 1,891 | 0,038 | 0,1822 | 0,0035 | 0,0753 | 0,0003 | 1079 | 19 | 1076 | 7 | 100,3 | -0,3 |
| 6625-9.1 | 249 | 146 | 0.61 | 56 | 2 | 4,10E-05 | 1,53E-05 | 0,0007 | 0,1824 | 0,0010 | 2,353 | 0,049 | 0,2060 | 0,0041 | 0,0829 | 0,0004 | 1207 | 22 | 1266 | 9 | 95,4 | 4,6 |
| 6625-5.1 | 753 | 182 | 0.25 | 173 | 2 | 1,58E-05 | 1,25E-05 | 0,0003 | 0,0766 | 0,0009 | 2,713 | 0,058 | 0,2296 | 0,0045 | 0,0857 | 0,0006 | 1333 | 23 | 1331 | 12 | 100,1 | -0,1 |
| 6625-14.1 | 200 | 120 | 0.62 | 48 | 5 | 1,33E-04 | 2,74E-05 | 0,0023 | 0,1840 | 0,0033 | 2,635 | 0,058 | 0,2211 | 0,0044 | 0,0865 | 0,0007 | 1287 | 23 | 1348 | 15 | 95,5 | 4,5 |
| 6625-17.1 | 247 | 126 | 0.53 | 62 | 5 | 1,03E-04 | 5,13E-05 | 0,0018 | 0,1536 | 0,0026 | 2,841 | 0,065 | 0,2362 | 0,0046 | 0,0872 | 0,0008 | 1367 | 24 | 1366 | 18 | 100,1 | -0,1 |
| 6625-22.1 | 217 | 87 | 0.41 | 53 | 4 | 9,94E-05 | 2,76E-05 | 0,0017 | 0,1232 | 0,0014 | 2,847 | 0,061 | 0,2357 | 0,0047 | 0,0876 | 0,0005 | 1364 | 25 | 1374 | 10 | 99,3 | 0,7 |
| 6625-20.1 | 154 | 59 | 0.40 | 36 | 3 | 9,44E-05 | 2,79E-05 | 0,0016 | 0,1174 | 0,0028 | 2,721 | 0,061 | 0,2248 | 0,0045 | 0,0878 | 0,0007 | 1307 | 24 | 1378 | 15 | 94,8 | 5,2 |
| 6625-7.1 | 396 | 165 | 0.43 | 98 | 3 | 3,66E-05 | 8,00E-06 | 0,0006 | 0,1281 | 0,0009 | 2,863 | 0,057 | 0,2364 | 0,0046 | 0,0879 | 0,0003 | 1368 | 24 | 1380 | 7 | 99,1 | 0,9 |
| 6625-11.1 | 206 | 117 | 0.59 | 53 | 4 | 9,50E-05 | 3,86E-05 | 0,0017 | 0,1760 | 0,0017 | 2,853 | 0,063 | 0,2355 | 0,0046 | 0,0879 | 0,0007 | 1363 | 24 | 1380 | 15 | 98,8 | 1,2 |
| 6625-24.1 | 192 | 95 | 0.51 | 47 | 4 | 9,50E-05 | 2,98E-05 | 0,0017 | 0,1567 | 0,0015 | 2,797 | 0,065 | 0,2299 | 0,0046 | 0,0883 | 0,0009 | 1334 | 24 | 1388 | 19 | 96,1 | 3,9 |
| 6625-8.1 | 247 | 137 | 0.57 | 64 | 3 | 6,11E-05 | 1,21E-05 | 0,0011 | 0,1719 | 0,0009 | 2,883 | 0,058 | 0,2369 | 0,0046 | 0,0883 | 0,0004 | 1370 | 24 | 1388 | 8 | 98,7 | 1,3 |
| 6625-15.1 | 296 | 105 | 0.37 | 73 | 3 | 5,41E-05 | 8,21E-06 | 0,0009 | 0,1085 | 0,0016 | 2,938 | 0,064 | 0,2403 | 0,0048 | 0,0887 | 0,0006 | 1388 | 25 | 1397 | 14 | 99,4 | 0,6 |
| 6625-6.1 | 158 | 71 | 0.47 | 38 | 3 | 9,04E-05 | 2,69E-05 | 0,0016 | 0,1407 | 0,0018 | 2,821 | 0,074 | 0,2301 | 0,0051 | 0,0890 | 0,0011 | 1335 | 27 | 1403 | 23 | 95,1 | 4,9 |
| 6625-21.1 | 430 | 345 | 0.83 | 117 | 5 | 5,77E-05 | 2,52E-05 | 0,0010 | 0,2501 | 0,0022 | 2,914 | 0,061 | 0,2358 | 0,0046 | 0,0896 | 0,0004 | 1365 | 24 | 1417 | 9 | 96,3 | 3,7 |
| 6625-3.1 | 184 | 75 | 0.42 | 46 | 3 | 7,53E-05 | 2,02E-05 | 0,0013 | 0,1251 | 0,0013 | 2,972 | 0,064 | 0,2398 | 0,0047 | 0,0899 | 0,0006 | 1386 | 25 | 1424 | 13 | 97,3 | 2,7 |
| 6625-13.1 | 109 | 54 | 0.51 | 28 | 5 | 2,03E-04 | 8,00E-05 | 0,0035 | 0,1543 | 0,0035 | 3,039 | 0,086 | 0,2445 | 0,0048 | 0,0901 | 0,0016 | 1410 | 25 | 1428 | 35 | 98,7 | 1,3 |
| 6625-19.1 | 188 | 72 | 0.39 | 46 | 3 | 8,82E-05 | 2,62E-05 | 0,0015 | 0,1173 | 0,0014 | 2,942 | 0,068 | 0,2351 | 0,0047 | 0,0908 | 0,0008 | 1361 | 25 | 1441 | 17 | 94,4 | 5,6 |
| 6625-1.1 | 242 | 79 | 0.34 | 62 | 1 | 1,82E-05 | 1,45E-05 | 0,0003 | 0,0995 | 0,0008 | 3,157 | 0,066 | 0,2505 | 0,0049 | 0,0914 | 0,0005 | 1441 | 25 | 1456 | 11 | 99 | 1 |
| 6625-18.1 | 268 | 89 | 0.34 | 68 | 4 | 6,71E-05 | 1,41E-05 | 0,0012 | 0,1023 | 0,0014 | 3,091 | 0,062 | 0,2451 | 0,0048 | 0,0915 | 0,0003 | 1413 | 25 | 1456 | 7 | 97,1 | 2,9 |
| 6625-16.1 | 359 | 109 | 0.31 | 90 | 2 | 2,70E-05 | 9,32E-06 | 0,0005 | 0,0948 | 0,0011 | 3,122 | 0,064 | 0,2464 | 0,0049 | 0,0919 | 0,0003 | 1420 | 26 | 1466 | 5 | 96,9 | 3,1 |

NOTES

* = GSC sample lab number followed by - number of zircon grain followed by number of spot analysis

Uncertainty reported at one sigma and calculated by the numerical propagation of all known errors (Stern, 1997)

 f_{206} = refers to mole fraction of ²⁰⁶Pb corresponding to common Pb; common Pb corrections follow (Stern, 1997)Discordance relative to origin = $100 * ((207/206 \text{ age} - 206/238 \text{ age}) / (207/206 \text{ age}))$ Calibration standard 6266; U = 910 ppm; Age = 559 Ma; ²⁰⁶Pb/²³⁸U = 0.09059Error in ²⁰⁶Pb/²³⁸U calibration 1.9%

Th/U calibration: F = 0.03900*UO + 0.85600

TABLE 2 - U-Pb ID-TIMS zircon isotopic data

| Sample | Concentrations | | | | Isotopic ratios | | | | | | Ages (Ma) | | Disc ⁸ |
|---|-----------------------|--------------------|-------|-----------------|-----------------|--------------------------------|--------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------|
| | Fraction ¹ | Poids ² | U | Pb ³ | Pb ⁴ | ²⁰⁶ Pb ⁵ | 208Pb ⁶ | ²⁰⁷ Pb ⁶ | ²⁰⁶ Pb ⁶ | ²⁰⁷ Pb ⁶ | ²⁰⁶ Pb ⁶ | ²⁰⁷ Pb ⁷ | |
| | | (mg) | (ppm) | (ppm) | (pg) | ²⁰⁴ Pb | 206Pb | ²³⁵ U | ²³⁸ U | ²⁰⁶ Pb | ²³⁸ U | ²⁰⁶ Pb | |
| CH_00_06; z6557 - Granite de De Mun (NTS 22E/11; UTM 348533E, 5490450N) | | | | | | | | | | | | | |
| A (10), N0.5, 170*70 | 27 | 184 | 41 | 11 | 6171 | 0,08 | 2.617 ±0.12 | 0.2227 ±0.10 | 0.08525 ±0.06 | 1296 ±2 | 1321 ±2 | 2,12 | |
| B (8), N0.5, 300*70 | 19 | 40 | 10 | 7 | 1599 | 0,12 | 2.750 ±0.16 | 0.2305 ±0.13 | 0.08655 ±0.10 | 1337 ±3 | 1351 ±4 | 1,12 | |
| C (9), N0.5, 300*60 | 27 | 72 | 17 | 10 | 2798 | 0,1 | 2.706 ±0.14 | 0.2278 ±0.12 | 0.08615 ±0.08 | 1323 ±3 | 1342 ±3 | 1,53 | |
| D (30), N0, 150*50 | 9 | 97 | 23 | 3 | 4493 | 0,11 | 2.685 ±0.15 | 0.2263 ±0.15 | 0.08605 ±0.10 | 1315 ±4 | 1339 ±4 | 2,01 | |
| Heb-Charnockite-01; z7248 - Charnockite de Patrick Ouest (NTS 22E/04; UTM 302232E, 5450141N) | | | | | | | | | | | | | |
| Z1 (5) N0, 200*70 | 43 | 50 | 10 | 4 | 6773 | 0,1128 | 2.074 ±0.14 | 0.1935 ±0.13 | 0.07774 ±0.07 | 1140 ±3 | 1140 ±3 | 0,02 | |
| Z2 (8) N0, 200*80 | 49 | 86 | 17 | 9 | 5416 | 0,1054 | 2.078 ±0.14 | 0.1935 ±0.12 | 0.07792 ±0.05 | 1140 ±3 | 1145 ±2 | 0,45 | |
| Z3 (8) N0, 200*80 | 44 | 105 | 21 | 12 | 4692 | 0,1084 | 2.075 ±0.12 | 0.1932 ±0.09 | 0.07789 ±0.06 | 1139 ±2 | 1144 ±2 | 0,5 | |
| Z6 (8) N0, 250*100 | 53 | 91 | 18 | 3 | 17288 | 0,11 | 2.077 ±0.14 | 0.1934 ±0.11 | 0.07788 ±0.06 | 1140 ±2 | 1144 ±3 | 0,39 | |
| CH_02_1256; z7557 - Anorthosite de Vanel (NTS 22E/02; UTM 386383E, 5450208N) | | | | | | | | | | | | | |
| Z1A (9), N0, 180*140 | 40 | 284 | 54 | 6 | 22558 | 0,18 | 1.815 ±0.12 | 0.1767 ±0.10 | 0.07449 ±0.05 | 1049 ±2 | 1055 ±2 | 0,56 | |
| Z1B (8), N0, 180*140 | 40 | 407 | 77 | 4 | 45881 | 0,15 | 1.834 ±0.13 | 0.1780 ±0.10 | 0.07472 ±0.04 | 1056 ±2 | 1061 ±2 | 0,5 | |
| Z1C (8), N0, 180*140 | 35 | 233 | 43 | 3 | 30814 | 0,16 | 1.804 ±0.13 | 0.1761 ±0.12 | 0.07429 ±0.06 | 1046 ±2 | 1049 ±2 | 0,37 | |
| Z1D (1), N0, 210*210 | 7 | 442 | 82 | 4 | 9671 | 0,12 | 1.887 ±0.17 | 0.1813 ±0.18 | 0.07546 ±0.11 | 1074 ±4 | 1081 ±4 | 0,65 | |
| Z1E (1), N0, 250*200 | 9 | 141 | 27 | 1 | 4378 | 0,19 | 1.841 ±0.13 | 0.1787 ±0.10 | 0.07470 ±0.08 | 1060 ±2 | 1060 ±3 | 0,02 | |
| Z1F (1), N0, 250*200 | 9 | 542 | 102 | 2 | 15558 | 0,13 | 1.885 ±0.13 | 0.1813 ±0.12 | 0.07541 ±0.06 | 1074 ±2 | 1080 ±2 | 0,55 | |
| CH_00_09; z6560 - Monzonite d'Étienniche (NTS 22E/06 UTM 334168E, 5482198N) | | | | | | | | | | | | | |
| A (9), N0, 160*70 | 49 | 52 | 10 | 6 | 4556 | 0,22 | 1.834 ±0.12 | 0.1781 ±0.09 | 0.07467 ±0.06 | 1057 ±2 | 1060 ±2 | 0,3 | |
| B (8), N0, 160*70 | 44 | 53 | 11 | 9 | 2826 | 0,22 | 1.836 ±0.14 | 0.1785 ±0.10 | 0.07461 ±0.08 | 1059 ±2 | 1058 ±3 | -0,1 | |
| C (4), N0, 200*80 | 45 | 53 | 11 | 10 | 2785 | 0,22 | 1.838 ±0.14 | 0.1784 ±0.10 | 0.07475 ±0.07 | 1058 ±2 | 1062 ±3 | 0,38 | |
| D (5), N0, 200*80 | 48 | 52 | 10 | 7 | 3717 | 0,22 | 1.829 ±0.13 | 0.1779 ±0.10 | 0.07458 ±0.07 | 1055 ±2 | 1057 ±3 | 0,2 | |
| CH_00_14; z6562 - Granite de La Carpe (NTS 22E/15; UTM 362326E, 5513439N) | | | | | | | | | | | | | |
| A (3), N0, 140*120 | 69 | 32 | 6 | 2 | 10247 | 0,15 | 1.749 ±0.12 | 0.1726 ±0.10 | 0.07349 ±0.05 | 1027 ±2 | 1028 ±2 | 0,09 | |
| B (4), N0, 140*120 | 49 | 40 | 7 | 49 | 447 | 0,19 | 1.753 ±0.36 | 0.1727 ±0.13 | 0.07363 ±0.29 | 1027 ±2 | 1032 ±12 | 0,49 | |
| C (3), N0, 200*100 | 26 | 45 | 9 | 4 | 2921 | 0,22 | 1.757 ±0.23 | 0.1729 ±0.23 | 0.07369 ±0.19 | 1028 ±4 | 1033 ±8 | 0,53 | |
| D (4), N0, 200*100 | 24 | 36 | 7 | 4 | 2100 | 0,27 | 1.764 ±0.18 | 0.1734 ±0.13 | 0.07380 ±0.13 | 1031 ±3 | 1036 ±5 | 0,56 | |
| Heb_Psuke_01; z7247 - Granite de Psukè (NTS 22E/06; UTM 347751E, 5472361N) | | | | | | | | | | | | | |
| Z2 (2) N0, 300*80 | 36 | 64 | 11 | 8 | 2974 | 0,1348 | 1.740 ±0.14 | 0.1720 ±0.11 | 0.07336 ±0.07 | 1023 ±2 | 1024 ±3 | 0,06 | |
| Z4 (5) N0, 200*70 | 30 | 41 | 8 | 5 | 2626 | 0,1653 | 1.779 ±0.34 | 0.1758 ±0.36 | 0.07341 ±0.19 | 1044 ±7 | 1025 ±8 | -1,95 | |
| Z5 (5) N0, 200*60 | 27 | 29 | 5 | 3 | 2546 | 0,1526 | 1.739 ±0.17 | 0.1719 ±0.14 | 0.07340 ±0.14 | 1023 ±3 | 1025 ±6 | 0,26 | |
| Z6 (4) N0, 200*90 | 41 | 27 | 5 | 2 | 5098 | 0,1357 | 1.750 ±0.17 | 0.1725 ±0.13 | 0.07356 ±0.10 | 1026 ±3 | 1029 ±4 | 0,34 | |
| CH_00_08; z6559 - Granite porphyroïde de Menton (NTS 22E/07; UTM 383512E, 5466011N) | | | | | | | | | | | | | |
| A1 (3), N0, 200*80 | 20 | 28 | 6 | 6 | 1014 | 0,34 | 1.726 ±0.21 | 0.1714 ±0.15 | 0.07300 ±0.15 | 1020 ±3 | 1014 ±6 | -0,66 | |
| B (10), N0, 120*60 | 26 | 20 | 4 | 6 | 884 | 0,35 | 1.719 ±0.24 | 0.1696 ±0.17 | 0.07351 ±0.19 | 1010 ±3 | 1028 ±8 | 1,89 | |
| C (8), N0, 220*170 | 27 | 25 | 5 | 4 | 1673 | 0,36 | 1.749 ±0.18 | 0.1715 ±0.14 | 0.07398 ±0.13 | 1020 ±3 | 1041 ±5 | 2,16 | |
| D (10), N1, 200*60 | 54 | 23 | 5 | 7 | 1810 | 0,37 | 1.733 ±0.18 | 0.1713 ±0.10 | 0.07337 ±0.13 | 1019 ±2 | 1024 ±5 | 0,52 | |
| F (8), N0, 200*60 | 24 | 19 | 4 | 5 | 926 | 0,39 | 1.732 ±0.25 | 0.1715 ±0.19 | 0.07324 ±0.20 | 1020 ±4 | 1021 ±8 | 0,05 | |
| Heb_Margane_01; z7246 - Monzonite de Margane (NTS 22E6; 329163E; 5463180N) | | | | | | | | | | | | | |
| Z2 (2) N0, 300*80 | 26 | 33 | 7 | 5 | 1930 | 0,39 | 1.718 ±0.17 | 0.1711 ±0.16 | 0.07283 ±0.13 | 1018 ±3 | 1009 ±5 | -0,96 | |
| Z3 (6) N0, 150*80 | 38 | 21 | 4 | 3 | 1884 | 0,3 | 1.725 ±0.24 | 0.1712 ±0.19 | 0.07308 ±0.16 | 1019 ±4 | 1016 ±6 | -0,25 | |
| Z4 (6) N0, 180*70 | 37 | 21 | 4 | 10 | 858 | 0,28 | 1.738 ±0.24 | 0.1717 ±0.15 | 0.07343 ±0.18 | 1021 ±3 | 1026 ±7 | 0,48 | |

TABLE 2 (continued) - U-Pb ID-TIMS zircon isotopic data

| Sample Fraction1 | Concentrations | | | | Isotopic ratios | | | | | | Ages (Ma) | | Disc ⁸ |
|---|--------------------|-------|-----------------|-----------------|--------------------------------|--------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------|-------------------|
| | Poids ² | U | Pb ³ | Pb ⁴ | ²⁰⁸ Pb ⁵ | 208Pb ⁶ | ²⁰⁷ Pb ⁶ | ²⁰⁶ Pb ⁶ | ²⁰⁷ Pb ⁶ | ²⁰⁶ Pb ⁶ | ²⁰⁷ Pb ⁷ | | |
| | (mg) | (ppm) | (ppm) | (pg) | ²⁰⁴ Pb | 206Pb | ²³⁵ U | ²³⁸ U | ²⁰⁶ Pb | ²³⁸ U | ²⁰⁶ Pb | | |
| CH_00_10; z6561 - Granite de Touladi (NTS 22E14; UTM 353535E, 5531241M) | | | | | | | | | | | | | |
| A (3) N3, 150*100 | 12 | 67 | 13 | 7 | 1223 | 0,25 | 1.641 ±0.32 | 0.1654 ±0.27 | 0.07194 ±0.28 | 987 ±5 | 984 ±11 | -0,29 | |
| B (14) N3, 80*50 | 7 | 51 | 10 | 5 | 794 | 0,26 | 1.629 ±0.34 | 0.1653 ±0.26 | 0.07147 ±0.28 | 986 ±5 | 971 ±11 | -1,72 | |
| C (5) N3, 170*90 | 19 | 83 | 16 | 27 | 651 | 0,22 | 1.705 ±0.27 | 0.1697 ±0.12 | 0.07288 ±0.21 | 1010 ±2 | 1011 ±8 | 0,02 | |
| E (6) N3, 130*80 | 11 | 78 | 15 | 8 | 1135 | 0,24 | 1.644 ±0.27 | 0.1655 ±0.13 | 0.07202 ±0.22 | 988 ±3 | 987 ±9 | -0,1 | |
| F (10) N3, 90*50 | 5 | 96 | 18 | 10 | 547 | 0,26 | 1.633 ±0.38 | 0.1658 ±0.25 | 0.07143 ±0.28 | 989 ±5 | 970 ±11 | -2,1 | |
| CH_00_03; z6659 - Mangérite de Strike (NTS 22E6; UTM 350306E, 5461489M) | | | | | | | | | | | | | |
| Z1 (8) N0, 170*75 | 21 | 78 | 16 | 4 | 4269 | 0,23 | 1.877 ±0.14 | 0.1812 ±0.12 | 0.07516 ±0.08 | 1073.3 ±2.4 | 1073 ±3 | -0,07 | |
| Z2 (8) N0, 155*70 | 18 | 63 | 13 | 4 | 3094 | 0,27 | 1.876 ±0.13 | 0.1811 ±0.10 | 0.07513 ±0.07 | 1072.8 ±2.0 | 1072 ±3 | -0,07 | |
| Z3 (7) N0, 170*60 | 13 | 32 | 7 | 3 | 1357 | 0,27 | 1.885 ±0.20 | 0.1814 ±0.15 | 0.07540 ±0.15 | 1074.4 ±2.9 | 1079 ±6 | 0,48 | |
| Z4 (9) N0, 95*55 | 7 | 38 | 8 | 3 | 1128 | 0,22 | 1.884 ±0.32 | 0.1811 ±0.35 | 0.07546 ±0.28 | 1072.9 ±6.9 | 1081 ±11 | 0,78 | |
| Z5 (19) N0, 130*60 | 25 | 72 | 15 | 7 | 3003 | 0,28 | 1.878 ±0.15 | 0.1812 ±0.11 | 0.07517 ±0.07 | 1073.3 ±2.2 | 1073 ±3 | -0,03 | |
| CH_00_01; z6657 - Monzonite de Pamouscachiou (NTS 22E7; UTM 357658E, 5466336M) | | | | | | | | | | | | | |
| 2 (17) N0, 125*40 | 18 | 68 | 13 | 6 | 2251 | 0,18 | 1.868 ±0.18 | 0.1802 ±0.17 | 0.07516 ±0.12 | 1068.1 ±3.3 | 1073 ±5 | 0,48 | |
| 3 (7) N0, 220*70 | 33 | 58 | 12 | 7 | 2911 | 0,21 | 1.866 ±0.13 | 0.1804 ±0.10 | 0.07501 ±0.07 | 1069.0 ±2.0 | 1069 ±3 | -0,01 | |
| 4 (8) N0, 180*60 | 25 | 79 | 16 | 5 | 4624 | 0,2 | 1.865 ±0.13 | 0.1804 ±0.11 | 0.07499 ±0.07 | 1069.2 ±2.1 | 1068 ±3 | -0,09 | |

NOTES

1 = Fraction identification is followed by: number of grains analysed (in brackets); non-magnetic in degrees sideslope on a Frantz magnetic separator operating at 1.8 Amps; and average length * breadth of crystals in microns.

2 = 2σ error on weight = ± 1 µg

3 = radiogenic Pb

4 = measured ratio corrected for spike and Pb fractionation of 0.09 ± 0.03 percent per atomic mass unit

5 = total common Pb on analysis corrected for fractionation and spike

6 = corrected for blank Pb and U, common Pb, errors quoted are one sigma in percent, procedural blank values for this study ranged from 0.1- 0.2 pg U and 2-4 pg Pb for zircon analyses and 1-2 pg U

7 = age, errors quoted are 2σ in Ma

8 = discordance in percent along a discordia to origin

z = GSC sample lab number

UTM - Zone 19; NAD27

TABLE 3 - Garnet paragneiss from Séquence supracrustale de Saint-Yves. Isotopic data U-Pb on zircons (SHRIMP: Sensitive High-Resolution Ionization Microprobe)

| Sample number and spot number analyzed in the zircon | U (ppm) | Th (ppm) | Th/U | Pb (ppm) | ²⁰⁴ Pb (ppb) | ²⁰⁴ Pb | ²⁰⁴ Pb | ±1σ | f ²⁰⁶ | ²⁰⁶ Pb | ±1σ | ²⁰⁷ Pb | ±1σ | Age (Ma) | | Conc. (%) | | | | | |
|--|---------|----------|-------|----------|-------------------------|-------------------|-------------------|---------|------------------|-------------------|---------|-------------------|---------|-------------------|-----------------------|-----------|------|----|------|-----|-------|
| | | | | | | | | | | | | | | ²⁰⁶ Pb | ²⁰⁷ Pb ±1σ | | | | | | |
| 7245-29.1 | 47 | 40.4 | 0.879 | 9 | 2 | 0.00029906 | 0.00019049 | 0.00518 | 0.26421 | 0.0086 | 1.71377 | 0.09611 | 0.1676 | 0.00246 | 0.07416 | 0.00388 | 999 | 14 | 1046 | 109 | 95.5 |
| 7245-66.1 | 32 | 27.9 | 0.893 | 7 | 0 | 0.00005607 | 0.00021618 | 0.00097 | 0.29835 | 0.01143 | 1.79258 | 0.11312 | 0.17117 | 0.00265 | 0.07595 | 0.0045 | 1019 | 15 | 1094 | 124 | 93.1 |
| 7245-4.1 | 1046 | 2.4 | 0.002 | 167 | 2 | 0.00001257 | 0.00000542 | 0.00022 | 0.00049 | 0.00022 | 1.77973 | 0.02247 | 0.17279 | 0.00181 | 0.0747 | 0.00044 | 1027 | 10 | 1061 | 12 | 96.9 |
| 7245-51.1 | 118 | 0.5 | 0.005 | 19 | 2 | 0.00009973 | 0.00005602 | 0.00173 | 0.00041 | 0.0021 | 1.88272 | 0.04808 | 0.177 | 0.00302 | 0.07715 | 0.00131 | 1051 | 17 | 1125 | 34 | 93.4 |
| 7245-24.1 | 193 | 2.9 | 0.015 | 32 | 1 | 0.00004355 | 0.0000294 | 0.00075 | 0.00478 | 0.00113 | 1.79194 | 0.08285 | 0.17771 | 0.00722 | 0.07313 | 0.00128 | 1054 | 40 | 1018 | 36 | 103.6 |
| 7245-3.1 | 104 | 0.4 | 0.003 | 17 | 1 | 0.00008792 | 0.00005594 | 0.00152 | 0.00036 | 0.00215 | 1.86452 | 0.05351 | 0.17786 | 0.00247 | 0.07603 | 0.00178 | 1055 | 14 | 1096 | 48 | 96.3 |
| 7245-9.1 | 123 | 84.3 | 0.706 | 24 | 3 | 0.00014604 | 0.00005088 | 0.00253 | 0.20858 | 0.00365 | 1.82801 | 0.04709 | 0.17816 | 0.00318 | 0.07442 | 0.00123 | 1057 | 17 | 1053 | 34 | 100.4 |
| 7245-50.1 | 223 | 1.0 | 0.004 | 37 | 0 | 0.00000482 | 0.00004511 | 0.00008 | 0.00304 | 0.00169 | 1.87238 | 0.03313 | 0.17886 | 0.00217 | 0.07592 | 0.00087 | 1061 | 12 | 1093 | 23 | 97 |
| 7245-15.1 | 139 | 96.9 | 0.718 | 28 | 2 | 0.00009326 | 0.00003963 | 0.00162 | 0.21882 | 0.0026 | 1.83189 | 0.0327 | 0.17894 | 0.00208 | 0.07425 | 0.0009 | 1061 | 11 | 1048 | 25 | 101.2 |
| 7245-32.1 | 120 | 0.4 | 0.003 | 20 | 1 | 0.00005482 | 0.00004861 | 0.00095 | 0.00235 | 0.00184 | 1.88825 | 0.04061 | 0.17909 | 0.00239 | 0.07647 | 0.00117 | 1062 | 13 | 1107 | 31 | 95.9 |
| 7245-31.1 | 1119 | 4.4 | 0.004 | 188 | 3 | 0.00001752 | 0.00001656 | 0.0003 | 0.0011 | 0.00062 | 1.91545 | 0.03405 | 0.18133 | 0.00206 | 0.07661 | 0.00095 | 1074 | 11 | 1111 | 25 | 96.7 |
| 7245-19.1 | 76 | 0.4 | 0.005 | 13 | 2 | 0.00018382 | 0.00014227 | 0.00319 | 0.00125 | 0.00531 | 1.8868 | 0.069 | 0.18173 | 0.00288 | 0.0753 | 0.00234 | 1076 | 16 | 1077 | 64 | 100 |
| 7245-82.1 | 122 | 0.3 | 0.002 | 20 | 2 | 0.00011561 | 0.00006068 | 0.002 | -0.00052 | 0.00227 | 1.91356 | 0.04954 | 0.18178 | 0.00238 | 0.07635 | 0.00158 | 1077 | 13 | 1104 | 42 | 97.5 |
| 7245-67.1 | 107 | 0.2 | 0.002 | 18 | 2 | 0.00011297 | 0.00006492 | 0.00196 | 0.00057 | 0.00251 | 1.86384 | 0.04217 | 0.18184 | 0.00231 | 0.07434 | 0.00128 | 1077 | 13 | 1051 | 35 | 102.5 |
| 7245-43.1 | 246 | 2.7 | 0.011 | 42 | 1 | 0.0000318 | 0.00004043 | 0.00055 | 0.00362 | 0.00152 | 1.92114 | 0.03284 | 0.18204 | 0.00215 | 0.07654 | 0.00084 | 1078 | 12 | 1109 | 22 | 97.2 |
| 7245-18.1 | 2238 | 6.6 | 0.003 | 384 | 2 | 0.00000575 | 0.00000462 | 0.0001 | 0.00088 | 0.00018 | 1.95494 | 0.03118 | 0.18552 | 0.00188 | 0.07642 | 0.00085 | 1097 | 10 | 1106 | 22 | 99.2 |
| 7245-2.1 | 28 | 116.9 | 4.351 | 11 | 1 | 0.00015179 | 0.00020168 | 0.00263 | 1.30373 | 0.02155 | 1.98821 | 0.10334 | 0.18555 | 0.00348 | 0.07771 | 0.00359 | 1097 | 19 | 1140 | 95 | 96.3 |
| 7245-3.2 | 2382 | 42.2 | 0.018 | 411 | 2 | 0.00000487 | 0.00000273 | 0.00008 | 0.00573 | 0.00017 | 1.93782 | 0.05027 | 0.18561 | 0.00336 | 0.07572 | 0.00125 | 1098 | 18 | 1088 | 33 | 100.9 |
| 7245-48.1 | 327 | 165.5 | 0.522 | 81 | 1 | 0.00001 | 0.00001 | 0.00017 | 0.15967 | 0.0015 | 2.76671 | 0.04149 | 0.22938 | 0.0029 | 0.08748 | 0.00058 | 1331 | 15 | 1371 | 13 | 97.1 |

NOTES

Sample number (Ex: 7245) and spot number analyzed in the zircon (Ex: 29.1)

Uncertainties are reported at 1σ and are calculated by numerical propagation of all known sources of error (Stern, 1987). f²⁰⁶ refers to mole fraction of total ²⁰⁶Pb that is due to common Pb; data are common Pb

Data are common-Pb corrected using the 204 method, as described by Stern (1997). Conc. = 100 x (²⁰⁶Pb/²³⁸U age)/(²⁰⁷Pb/²³⁵Pb age)