Data Repository item 2001043

Analytical Methods

Ar/Ar analysis

For $^{40}$Ar/$^{39}$Ar analysis at the University of Alaska in Fairbanks, phengite separated from the samples were wrapped in aluminum foil and arranged in two levels, labeled top and bottom, within aluminum cans of 2.5 cm diameter and 4.5 centimeter height. Three samples of hornblende (MMhb1, Samson and Alexander, 1987) with an age of 513.9 Ma (Lanphere et al., 1990) included on each level with each set of unknowns to monitor the neutron flux. The samples were irradiated for 4 MWh in position 5c of the uranium enriched research reactor of McMaster University in Hamilton, Ontario, Canada. Upon their return from the reactor, the samples and monitors were loaded into holes, which are two millimeter in diameter in a copper tray, which was then loaded in an ultra-high vacuum extraction line. The monitors and samples were fused using a 6-watt argon-ion laser. Argon purification was achieved using a liquid nitrogen cold trap and a SAES Zr-Al getter at 400 °C. The samples were then analyzed in a VG-3600 mass spectrometer at the Geophysical Institute of the University of Alaska using the single-crystal step-heating technique (York et al., 1981; Layer et al., 1987; Layer, 2000). The argon isotopes measured were corrected for system blank, mass discrimination, as well as calcium, potassium and chlorine interference reactions following procedures outlined in McDougall and Harrison (1988). The weighted mean of the results obtained on the monitor samples was used on the ensuing calculations for their corresponding set of samples. All ages were calculated using the constants of Steiger and Jäger (1977). The data are listed in Table A.

Rb/Sr analysis

The whole rock sample was crushed to sand grain size using a roller mill. Part of this homogeneous whole rock material was powdered for analyses. The majority was subjected
to heavy liquid and magnetic separation in order to concentrate the phengites. Further
purification of the mica flakes was achieved by slight smooth morturing in an achate
morture filled with p.a. alcohol. Two fractions of mica were separated according to their
grain size, a coarse one >100 µm and a fine grained fraction <100 µm. Final control of the
mica was performed under the binocular. The phengites were leached in 2.5n HCl for 2
hours to remove all impurities such as carbonate. The residual phengites were dissolved in
concentrated HF-HNO₃. The whole rock sample was dissolved in 2.5n HCl and in a second
step in HF-HNO₃, complete dissolution was achieved. Whole rock and phengite solutions and
the leachates were splitted. One part was spiked with a mixed ⁸⁴Sr-⁸⁵Rb spike for determining
the concentration, the other was used for the measurement of the Sr isotopic composition.

Isotope ratios of Sr and the concentrations Rb and Sr were analyzed using a Finnigan
MAT261 mass spectrometers. The methods are described in Reischmann and Anthes (1996).
Errors for isotope ratios and age calculations are quoted to the 2-σ level. Regressions were
calculated with the program of Ludwig (1999), that is based on York (1969) and the decay
constants of Steiger and Jäger (1975). The data are listed in Table B.

**Phengite composition**

Figure A1 shows element distribution maps for Na, Mg, K and Si of phengites from the
Kerketas nappe on Samos Island, which have been selected for age dating. (A) Phengite
from sample Sa97-85. (B) Phengite from sample Sa97-113. Note homogeneity of phengites.
Table C lists the microprobe data.

**REFERENCES CITED**

Lanphere, M.A., Dalrymple, G.B., Fleck, R.J., and Pringle, M.S., 1990, Intercalibration of
mineral standards for K-Ar and ⁴⁰Ar/³⁹Ar age measurements: EOS, Transactions of the
American Geophysical Union, v. 71, p. 1658.


### TABLE A. $^{40}$Ar/$^{39}$Ar PHENGITE DATA

<table>
<thead>
<tr>
<th>Sample</th>
<th>Ca/K ratio</th>
<th>Integrated age (Ma)</th>
<th>Isochron age (Ma)</th>
<th>Initial $^{40}$Ar/$^{36}$Ar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sa97-85</td>
<td>0.02</td>
<td>23.4 ± 0.4</td>
<td>23.8 ± 0.6</td>
<td>297 ± 41</td>
</tr>
<tr>
<td>Sa97-85B</td>
<td>1.08</td>
<td>26.6 ± 1.0</td>
<td>25.2 ± 3.2</td>
<td>565 ± 249</td>
</tr>
<tr>
<td>Sa97-85F</td>
<td>0.11</td>
<td>22.1 ± 0.4</td>
<td>22.8 ± 1.0</td>
<td>287 ± 147</td>
</tr>
<tr>
<td>Sa97-113</td>
<td>0.44</td>
<td>24.8 ± 0.8</td>
<td>24.7 ± 1.6</td>
<td>321 ± 48</td>
</tr>
</tbody>
</table>

Note: Errors are quoted to the 2 $\sigma$ level.

### TABLE B. Rb/Sr PHENGITE DATA

<table>
<thead>
<tr>
<th>Sample</th>
<th>Rb (ppm)</th>
<th>Sr (ppm)</th>
<th>$^{87}$Rb/$^{86}$Sr</th>
<th>$^{87}$Sr/$^{86}$Sr</th>
<th>2 $\sigma$</th>
<th>Sr$_i$ (21 Ma)</th>
<th>$\varepsilon$Sr$_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phengite  &gt;100 $\mu$m</td>
<td>281.93</td>
<td>2.93</td>
<td>280.667980</td>
<td>0.792224</td>
<td>0.000022</td>
<td>0.708516</td>
<td>54.52</td>
</tr>
<tr>
<td>Phengite  &lt;100 $\mu$m</td>
<td>347.43</td>
<td>3.77</td>
<td>268.785224</td>
<td>0.789360</td>
<td>0.000024</td>
<td>0.709196</td>
<td>64.16</td>
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<tr>
<td>Whole rock</td>
<td>13.41</td>
<td>34.40</td>
<td>1.127990</td>
<td>0.709910</td>
<td>0.000018</td>
<td>0.709574</td>
<td>69.52</td>
</tr>
<tr>
<td>Leachate &gt;100 $\mu$m</td>
<td>12.28</td>
<td>59.93</td>
<td>0.592960</td>
<td>0.709193</td>
<td>0.000020</td>
<td>0.709016</td>
<td>61.61</td>
</tr>
<tr>
<td>Leachate &lt;100 $\mu$m</td>
<td>13.03</td>
<td>66.83</td>
<td>0.564020</td>
<td>0.709106</td>
<td>0.000015</td>
<td>0.708938</td>
<td>60.50</td>
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</tbody>
</table>