### Table S1. Electron microprobe analyses of biotite

#### Sample KK15-4A

<table>
<thead>
<tr>
<th>Analyses</th>
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<tbody>
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<td>TiO₂</td>
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</tr>
<tr>
<td>Al₂O₃</td>
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<tr>
<td>FeO</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>Na₂O</td>
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<tr>
<td>F</td>
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<tr>
<td>Cl</td>
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<tr>
<td>Cr₂O₃</td>
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#### Normalized to 22 oxygens

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<td>Al³⁺</td>
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<tr>
<td>Cl</td>
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<tr>
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<tr>
<td>Al total</td>
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<td>Fe/Fe+Mg</td>
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<tr>
<td>Vol [cm³/mol]</td>
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</tr>
<tr>
<td>Density [g/cm³]</td>
<td>3.10</td>
</tr>
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</table>

- **a** OH calculated assuming full site occupancy
- **b** Calculations made in excel spreadsheet published at http://www.open.ac.uk/earth-research/tindle/AGT/AGT_Home_2010/Microprobe-2.html (access April 2017)
- **c** Volume (cm³/mol) for biotite was calculated according to following equation of Parry and Downey (1982): V(biotite) = 150.6 – 3.214 [Mg/(Mg+total Fe+Ti+Mn)];
- **d** Density from Robie and Bethke (1962), calculated assuming linear proportions between end-members annite - phlogopite
Table S1. Electron microprobe analyses of biotite

<table>
<thead>
<tr>
<th>Sample</th>
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<th>wt%</th>
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<td>K₂O</td>
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<tr>
<td>Cl</td>
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<td>0.00</td>
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<tr>
<td>Cr₂O₃</td>
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Normalized to 22 oxygens

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<th>wt%</th>
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<td>Si</td>
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<tr>
<td>Cl</td>
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<td>Fe/Fe+Mg</td>
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<tr>
<td>Vol[cm³/mol]</td>
<td>149.44</td>
<td>149.39</td>
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<tr>
<td>Density[g/cm³]</td>
<td>3.11</td>
<td>3.10</td>
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</table>

aOH calculated assuming full site occupancy. bCalculations made in excel spreadsheet published at http://www.open.ac.uk/earth-research/tindle/AGT/AGT_Home_2010/Microprobe-2.html (access April 2017)

Molar volume (cm³/mol) for biotite was calculated according to following equation of Parry and Downey (1982): V(biotite) = 150.6 – 3.214 [Mg/(Mg+total Fe+Ti+Mn)]; cDensity from Robie and Bethke (1962), calculated assuming linear proportions between end-members annite - phlogopite.
Table S1. Electron microprobe analyses of biotite

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<td>SiO₂</td>
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<tr>
<td>CrO₂</td>
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<td>O=Cl</td>
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<tr>
<td>Total</td>
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Listed elements normalized to 22 oxygens:

| Si     | 5.367 | 5.410 |
| Al³⁺   | 2.633 | 2.590 |
| Al⁶⁺   | 0.702 | 0.738 |
| Ti     | 0.379 | 0.383 |
| Cr     | 0.000 | 0.000 |
| Fe     | 2.730 | 2.642 |
| Mn     | 0.029 | 0.024 |
| Mg     | 1.758 | 1.780 |
| Ca     | 0.003 | 0.000 |
| Na     | 0.032 | 0.028 |
| K      | 1.942 | 1.926 |
| OH⁻    | 4.000 | 4.000 |
| F      | 0.000 | 0.000 |
| Cl     | 0.000 | 0.000 |
| TOTAL  | 19.57 | 19.52 |
| Al total | 3.33  | 3.33  |
| Fe/Fe+Mg | 0.61  | 0.60  |
| VO³⁻ [cm³/mol] | 149.45 | 149.42 |
| Density [g/cm³] | 3.11  | 3.10  |

Notes:
- *OH calculated assuming full site occupancy
- Molar volume (cm³/mol) for biotite was calculated according to following equation of Parry and Downey (1982): \( V(\text{biotite}) = 150.6 - 3.214 \times \frac{\text{Mg}}{\text{Mg+total Fe+Ti+Mn}} \);
- Density from Robie and Bethke (1962), calculated assuming linear proportions between end-members annite - phlogopite.
Table S2. Electron microprobe analyses of chlorite

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<td>SiO₂</td>
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<td>0.03</td>
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<td>Cl</td>
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<tr>
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<td>85.79</td>
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</table>

Reformatted oxide percentages based on 28 oxygens (with Fe⁴⁺/Fe³⁺ and OH calculated assuming full site occupancy):

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<tr>
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<th>Map area 3</th>
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<tbody>
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<td>SiO₂</td>
<td>25.93</td>
<td>25.85</td>
<td>25.18</td>
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<td>0.12</td>
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<tr>
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<td>-</td>
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<td>FeO</td>
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<tr>
<td>MgO</td>
<td>11.56</td>
<td>11.33</td>
<td>11.46</td>
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<tr>
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<td>0.03</td>
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<td>0.01</td>
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<tr>
<td>Total</td>
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(Continued)
Table S2. Continued

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<th>Map area 3</th>
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<td></td>
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<tr>
<td>Normalized to 28 oxygens&lt;sup&gt;ab&lt;/sup&gt;</td>
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<td>Density&lt;sup&gt;d&lt;/sup&gt; [g/cm&lt;sup&gt;3&lt;/sup&gt;]</td>
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<sup>a</sup>Fe<sup>2+</sup>/Fe<sup>3+</sup> and OH calculated assuming full site occupancy  
<sup>b</sup>Calculations made in excel spreadsheet published at http://www.open.ac.uk/earth-research/tindle/AGT/AGT_Home_2010/Microprobe-2.html (access April 2017)  
<sup>c</sup>Molar volume (cm<sup>3</sup>/mol) for chlorite was calculated according to following equation of Parry and Downey (1982): V(chlorite) = 213.3 – 4.909 [Mg/(Mg+total Fe+Ti+Mn)]  
<sup>d</sup>density from http://webmineral.com database (access April 2017) for chamosite (brunsvigite).
<table>
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<th>Supplementary Material</th>
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<tr>
<td></td>
<td>Fe</td>
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Table S2. Electron microprobe analyses of chlorite (wt%) with Fe<sup>2+</sup>/Fe<sup>3+</sup> ratio calculated assuming Fe<sup>2+</sup> in the octahedral site (Supplementary Material).
Table S3. Electron microprobe analyses of K-feldspar

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<th>KK15-4C</th>
<th>KK15-4C</th>
<th>KK15-4C</th>
<th>KK15-4C</th>
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<td>100.86</td>
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Normalized to 8 oxygens

| Si          | 3.001   | 3.011   | 2.989   | 3.032   | 2.989   | 2.999   | 2.999   | 3.032   | 2.999   | 2.999   | 2.999   |
| Ti          | 0.003   | 0.001   | 0.001   | 0.002   | 0.002   | 0.001   | 0.000   | 0.001   | 0.000   | 0.000   | 0.000   |
| Al          | 0.996   | 0.998   | 1.005   | 0.989   | 0.997   | 1.054   | 0.997   | 0.966   | 0.996   | 0.996   | 0.996   |
| Fe          | 0.013   | 0.007   | 0.009   | 0.013   | 0.011   | 0.011   | 0.011   | 0.008   | 0.009   | 0.026   | 0.016   |
| Mn          | 0.000   | 0.001   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.001   | 0.000   | 0.000   |
| Mg          | 0.001   | 0.000   | 0.002   | 0.001   | 0.002   | 0.014   | 0.001   | 0.001   | 0.018   | 0.000   |         |
| Ca          | 0.000   | 0.000   | 0.000   | 0.000   | 0.001   | 0.018   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   |
| Na          | 0.023   | 0.021   | 0.021   | 0.013   | 0.048   | 0.095   | 0.024   | 0.023   | 0.012   | 0.010   |         |
| K           | 0.922   | 0.924   | 0.961   | 0.938   | 0.938   | 0.823   | 0.969   | 0.924   | 0.953   | 0.951   |         |
| Cr          | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   |
| F            | 0.004   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.001   |
| Cl           | 0.001   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.000   | 0.001   | 0.000   |
| Total        | 4.971   | 4.960   | 4.991   | 4.971   | 5.001   | 4.971   | 4.971   | 5.001   | 4.961   | 5.001   | 4.981   |


Density [g/cm³] 2.55 2.55 2.55 2.55 2.55 2.55 2.55 2.55 2.55 2.55 2.55

Volume and density from Robie and Bethke (1962) for orthoclase
Table S4. Electron microprobe analyses of plagioclase

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<tr>
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<td>FeO</td>
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<td>MnO</td>
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<tr>
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<tr>
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<td>Normalized to 8 oxygens</td>
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<tr>
<td>Density[b/g/cm³]</td>
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*Volume and density from Robie and Bethke (1962), calculated assuming linear proportions between end-members albite - anorthite

b \(X_{ab} = \frac{Na}{Na+Ca}\)
Table S5. Electron microprobe analyses of titanite, rutile and garnet

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<th>Phase</th>
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<th>Rutile</th>
<th>Garnet</th>
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<td></td>
<td>rim</td>
<td>core</td>
<td>rim</td>
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<tr>
<td></td>
<td></td>
<td>wt%</td>
<td></td>
<td>wt%</td>
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Note: The EMP analyses used to calculate the average were outside the Map area 2 and 3 to avoid those from the same mineral grain. See Table S1 and S2.

Table S6. The average composition of biotite and chlorite from EMP point analyses used to produce Fig. 8

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Note: The EMP analyses used to calculate the average were outside of the Map area 2 and 3 to avoid those from the same mineral grain. See Table S1 and S2.

Volume and density from Robie and Bethke (1962)

See Table S5. Electron microprobe analyses of titanite, rutile and garnet.
Figure S1. Photograph of the hand sample (KK15-4A) with three studied zones - from the most altered (A) to the one furthest away from the joint (C).