Kimberlites as Geochemical Probes of Earth’s Mantle

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Supplement for Figure Caption Data sources and Video Animation

FIGURE 1: The data sources for the various rock types plotted are:

**Kimberlites n = 143**
- Lac de Gras kimberlites, uncontaminated, n=76: Kjarsgaard et al. (2009)
- Somerset Island kimberlites, n=18: Kjarsgaard unpublished data
- Kimberley cluster kimberlites, n=25: le Roex et al. (2003) uncontaminated samples
- Undachnaya East: Kamenetsky et al, n=24. (2012) including all samples with Na2O < 5 wt.%

**Orangeites (former Group 2 kimberlites) n = 141:**
- Bellsbank (n=32), Newlands (n=15), Pneil, Sover North (n=28) & Barkly West & Finsch area (n=5): Tainton (1992) & Becker & le Roex (2006)
- Swartruggens (n=11) & Star (17): Coe et al. (2008)
- Jonkerwater (n=1), New Elands (n=1), Roberts Victor (n=1), Middlewater (n=1), Sanddrift (n=1), Slypsteen (n=1) Brandewynsikul (n=2), Eendekuil, Markt: Becker & le Roex (2006) & Mitchell (1995)

**Olivine lamproites n = 167:**
- Australia, Ellendale field, n=133: Jaques et al. (1986)
- Australia, Argyle, E. Kimberley province, n=11: Jaques et al. (1986)
- Aldan shield, n=8: Davies et al. (2006)
- Sover North, Barkly West/Finsch area, n=15: Tainton (1992)
- Prairies Creek, n=1: K. Fraser (1987)

**Ultramafic lamprophyres n = 48:**
- Torngat Mountains, Canada: Tappe et al. (2008)
- Sarfartoq, Greenland: Tappe et al. (2011)

**Average for estimates of kimberlite melt compositions: n = 3**
- Kjarsgaard et al. (2009), Soltys et al. (2018) and Howarth & Buttner (2019).

et al. (2001), Irvine et al. (2003), Kopylova et al. (1999), Simon et al. (2007), Pearson et al. (2004), Wittig et al. (2008)

FIGURE 3: Data “pristine” or “uncontaminated” Kimberlites from the Lac de Gras (Canada) and Kimberley (South Africa) clusters (Tappe et al. 2013 and le Roex et al. 2003) as well as from the Udachnaya East kimberlite in Siberia (Kamenetsky et al. 2014, excluding serpentinised samples). Data sources for uncontaminated hypabyssal South African orangeites are summarized in Mitchell (1995) and from Coe et al. (2008) and Becker & le Roex (2008). Data sources for olivine lamproites from western Australia, Prairie Creek and Leucite Hills (both in USA) are: Jacques et al. (1986), Fraser & Hawkesworth (1992), Fraser (1987). Data for ultramafic lamprophyres (mainly Sarfartoq, Greenland and Torngat Mountains, Quebec, Canada) are from Tappe et al. (2008) and Tappe et al. (2011) and references therein.


FIGURE 5 3-D Animation: 3-D animation of Hf, Nd, Sr isotope compositions illustrating the relations between kimberlites, orangeites and lamproites with MORB and selected OIB. Data sources are the same as those documented in Fig 5 of the main paper. Key: Turquoise = kimberlites; yellow = orangeites; white = lamproites; red = MORB; purple = selected EMII OIB; orange = selected EM I OIB.

FIGURE 6: Data sources from Araujo et al. (2001) and Pearson et al. (2008). Parameters for mixing lines plotted on figure:

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<tr>
<th>Mixing Scenario</th>
<th>Perid + Kimberlite Os ppb</th>
<th>Perid + Kimberlite Gamma Os</th>
<th>Crust Os ppb</th>
<th>Crust Gamma Os</th>
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<tr>
<td>Kim + perid + crust 1</td>
<td>1.58</td>
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<td>0.03</td>
<td>10002</td>
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<td>crust contaminating kim-perid mix</td>
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<tr>
<td>Kim + perid + crust 2</td>
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<table>
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<th>Peridotite Gamma Os</th>
<th>Kimerlite Os ppb</th>
<th>Kimerlite Gamma Os</th>
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<tbody>
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<td>Kimb_peridotites</td>
<td>4.1 ppb</td>
<td>-14.17</td>
<td>0.5</td>
<td>10.23</td>
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<tr>
<td>lithosphere mixing with kimberlite</td>
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</tr>
</tbody>
</table>
Kimmerlite + Sulfide 1
metasomatic sulfide into kimberlite
Sulphide Os ppb 40.3
Sulphide Gamma Os 920.8
Kimmerlite Os ppb 0.5
Kimmerlite Gamma Os 0

Kimmerlite + Sulfide 2
metasomatic sulfide into kimberlite
mixed with peridot
Sulphide Os ppb 40.3
Sulphide Gamma Os 920.8
Kimmerlite Os ppb 1.5
Kimmerlite Gamma Os -9.44

Supplementary References (in addition to those occurring in the main text):


