Supplementary figures and tables to: ***A revised map of volcanic units in the Oman ophiolite: insights into the architecture of an oceanic proto-arc volcanic sequence***
Belgrano et al. (2019) *Solid Earth*

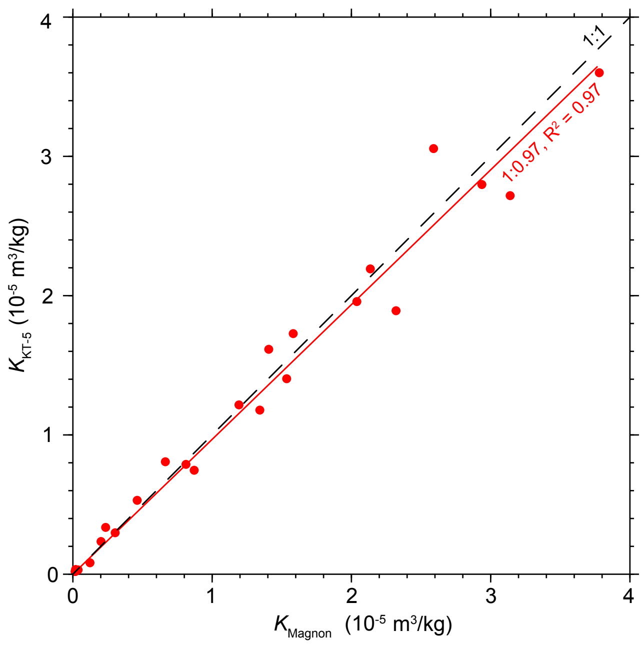


Figure S1. Magnetic susceptibility measured by an Exploranium™ KT-5 handheld kappameter and a desktop Magnon™ kappameter for the same samples. Linear regression through data (red line) indicates reasonable comparability between datasets.

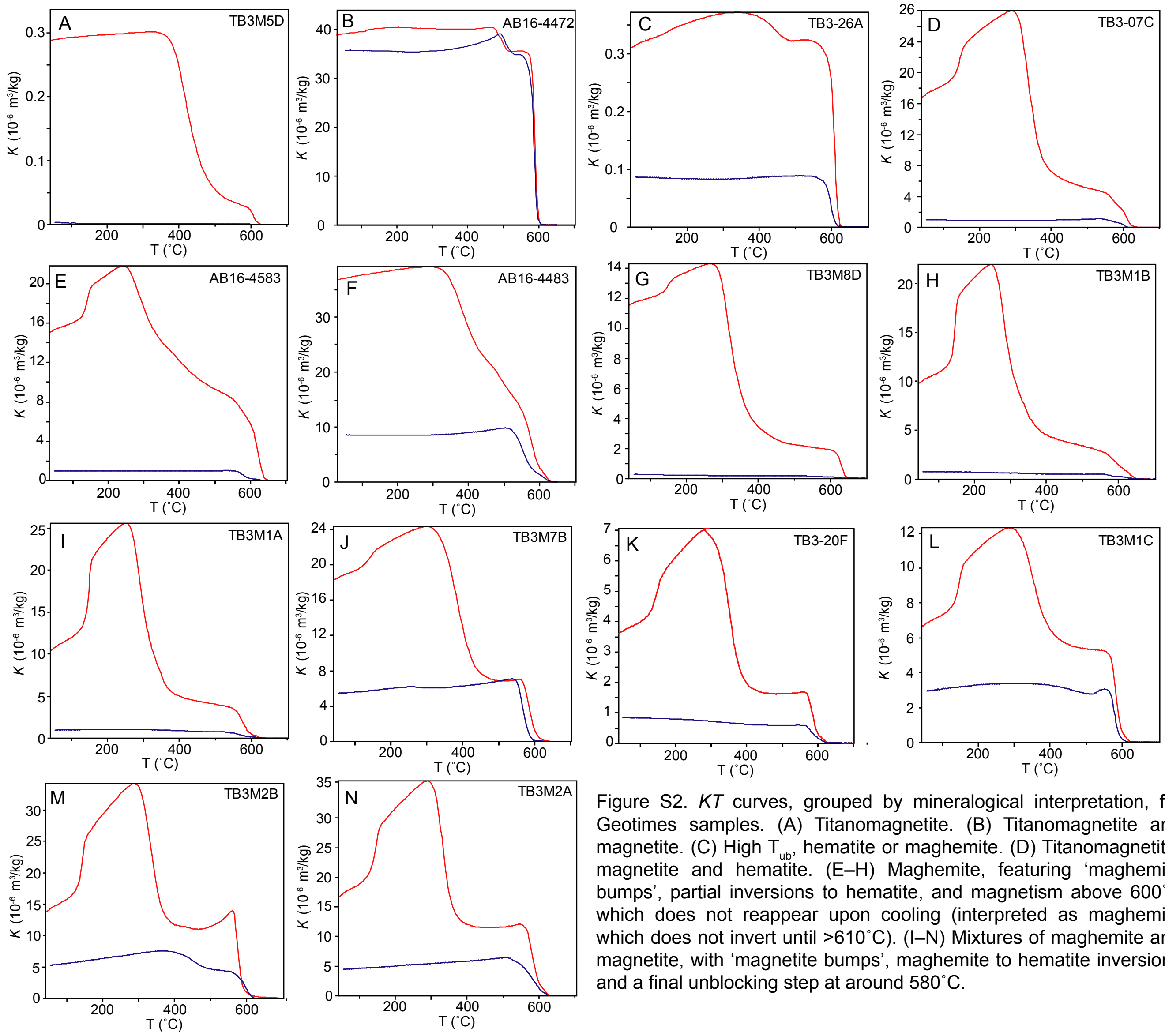
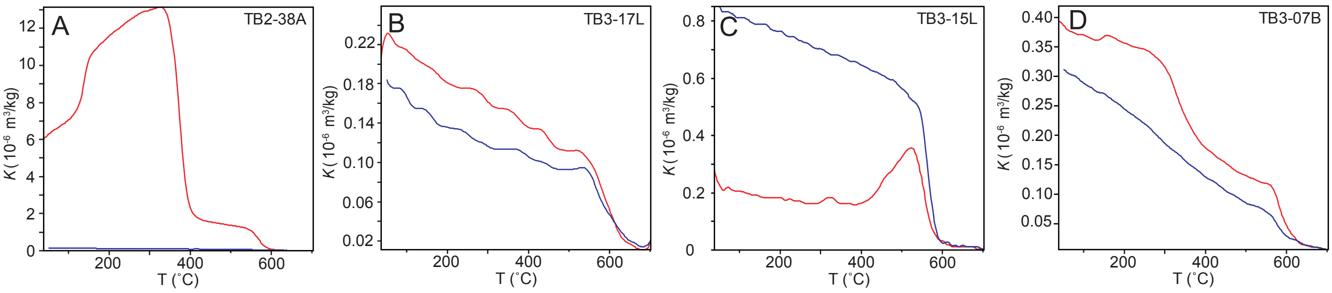


Figure S2. *KT* curves, grouped by mineralogical interpretation, for Geotimes samples. (A) Titanomagnetite. (B) Titanomagnetite and magnetite. (C) High T_{ub}, hematite or maghemite. (D) Titanomagnetite, magnetite and hematite. (E–H) Maghemite, featuring 'maghemite bumps', partial inversions to hematite, and magnetism above 600˚C which does not reappear upon cooling (interpreted as maghemite which does not invert until >610˚C). (I–N) Mixtures of maghemite and magnetite, with 'magnetite bumps', maghemite to hematite inversions and a final unblocking step at around 580˚C.



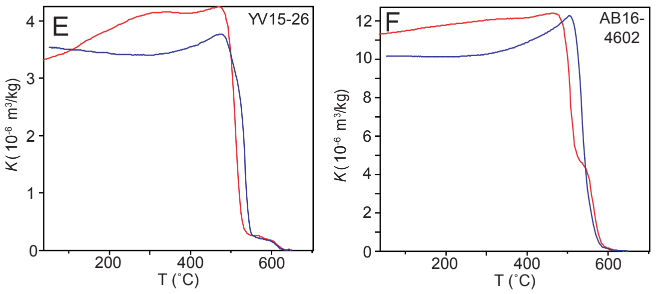
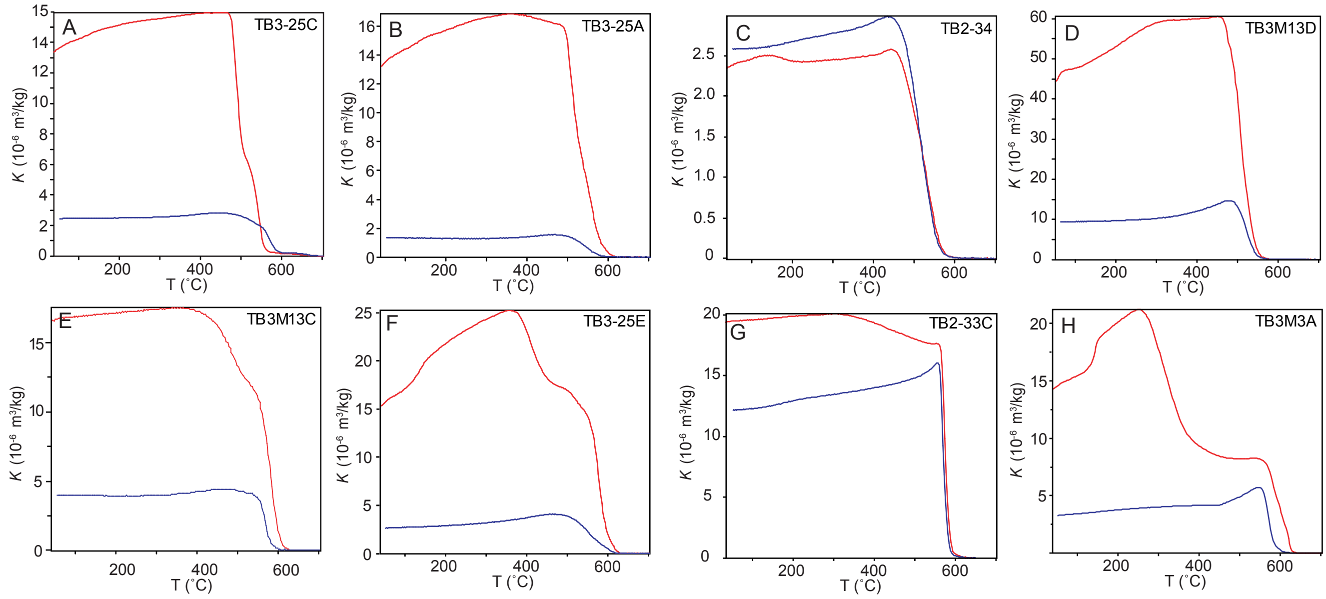


Figure S3. *K*T curves, grouped by mineralogical interpretation, for Lasail samples. (A) Maghemite and magnetite. (B) Noisy data due to very weak ferromagnetism: trace magnetite and hematite. (C) Weak ferromagnetism, well-defined Hopkinson peak and magnetite unblocking at 580˚C, significant magnetite produced above 600˚C seen in cooling curve. (D) Weak ferromagnetism, faint maghemite inversion and magnetite unblocking at 580˚C (E) Single titanomagnetite unblocking at ~515˚C. (F) Two titanomagnetite unblocking steps at 510˚C and 560˚C.



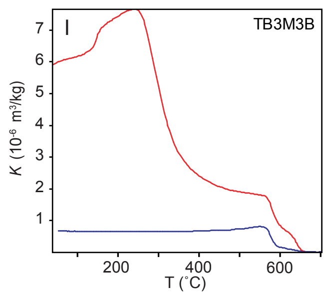


Figure S4. *K*T curves, grouped by mineralogical interpretation, for Tholeiitic Alley samples. (A–D) Titanomagnetite unblocking temperatures between 500–560˚C. (E) Titanomagnetite unblocking at 510˚C and magnetite/maghemite unblocking at 580–590˚C. (F) Maghemite 'bump' and inversion and magnetite/maghemite unblocking at 580–590˚C. (G) Single magnetite unblocking at 576˚C (H) Maghemite 'bump', inversion and high unblocking temperature at ~600–620˚C. (I) Maghemite 'bump' and inversion, magnetite unblocking at 580˚C and maghemite unblocking at ~640˚C.

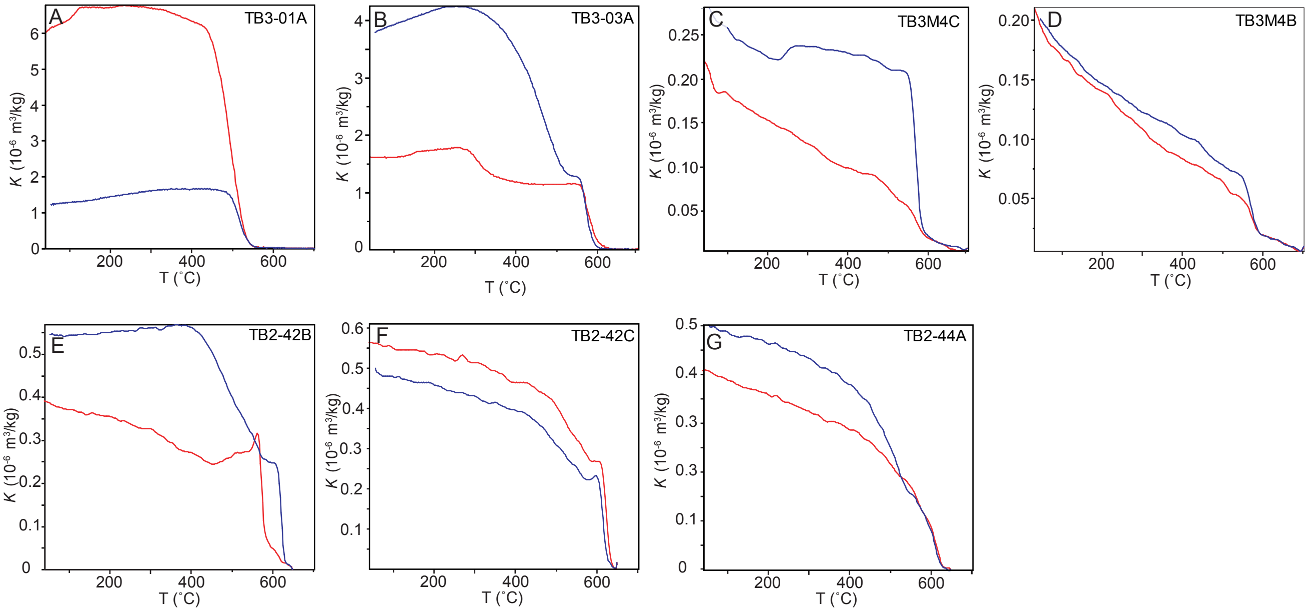


Figure S5. *K*T curves, grouped by mineralogical interpretation, for Boninitic Alley samples. (A) Titanomagnetite unblocking temperatures between 510˚C. (B) Slight maghemite 'bump' and inversion and magnetite unblocking at 580˚C. (C–E) Noisy, mostly paramagnetic signal with magnetite unblocking at 580˚C and some artificial magnetite production above 600˚C (F) Noisy, slightly paramagnetic signal with maghemite/hematite unblocking at ~630˚C (G) Mostly paramagnetic signal with a gradual drop in *K* between 500–630˚C (titanomagnetite, magnetite, maghemite/hematite)

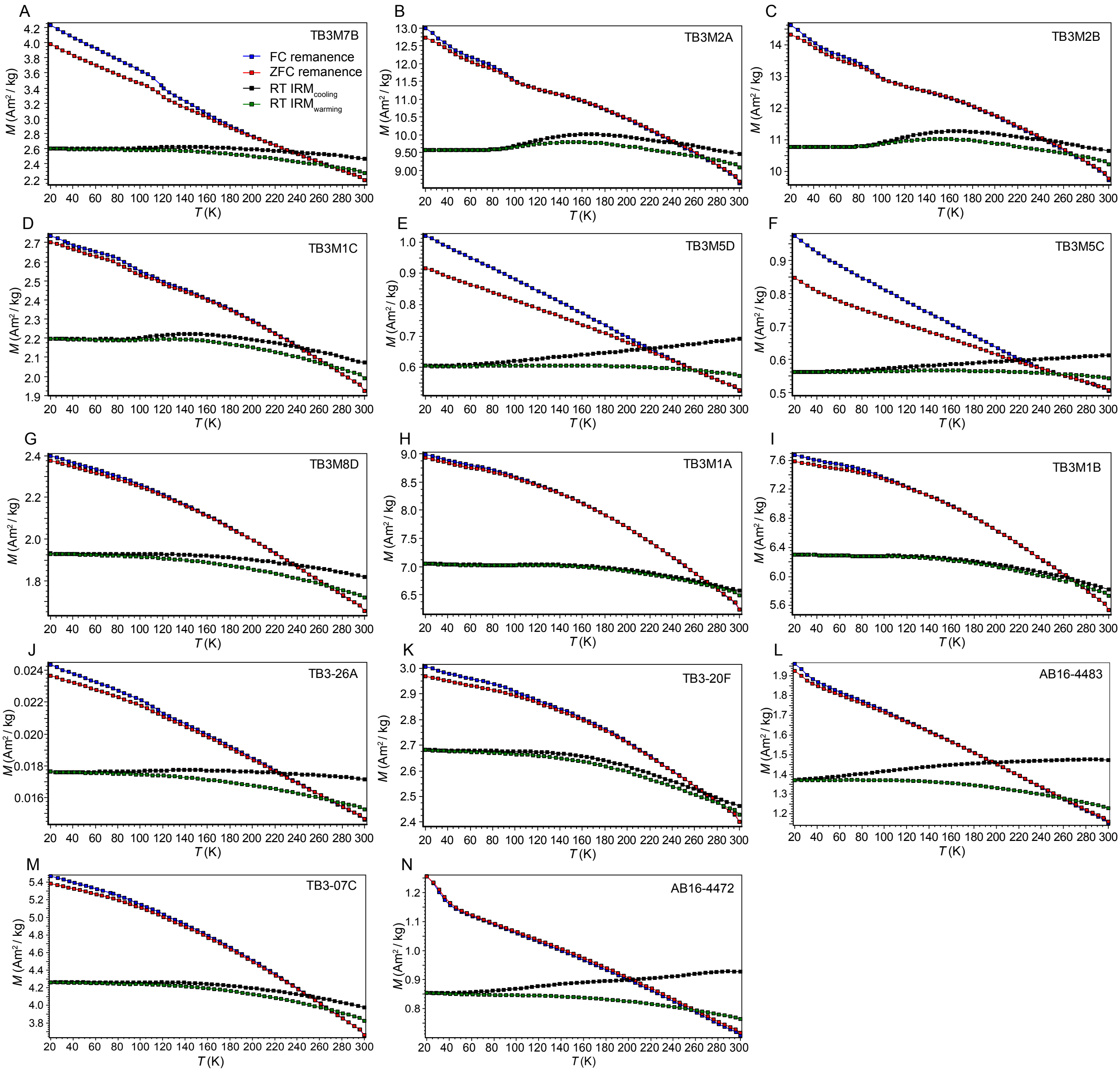


Figure S6. Low-temperature FC and ZFC remanences and RT-IRM during cooling and warming, grouped by mineralogical interpretation, for Geotimes samples. (A–D): Geotimes with a weak Verwey transition at 100–120 K, indicating trace- or partially oxidized presence of stoichiometric magnetite. (E–N) Geotimes without a detectable Verwey transition due to oxidation or Ti substitution in magnetite, or a Besnus transition (30–35 K) suggesting an absence of monoclinic pyrrhotite.

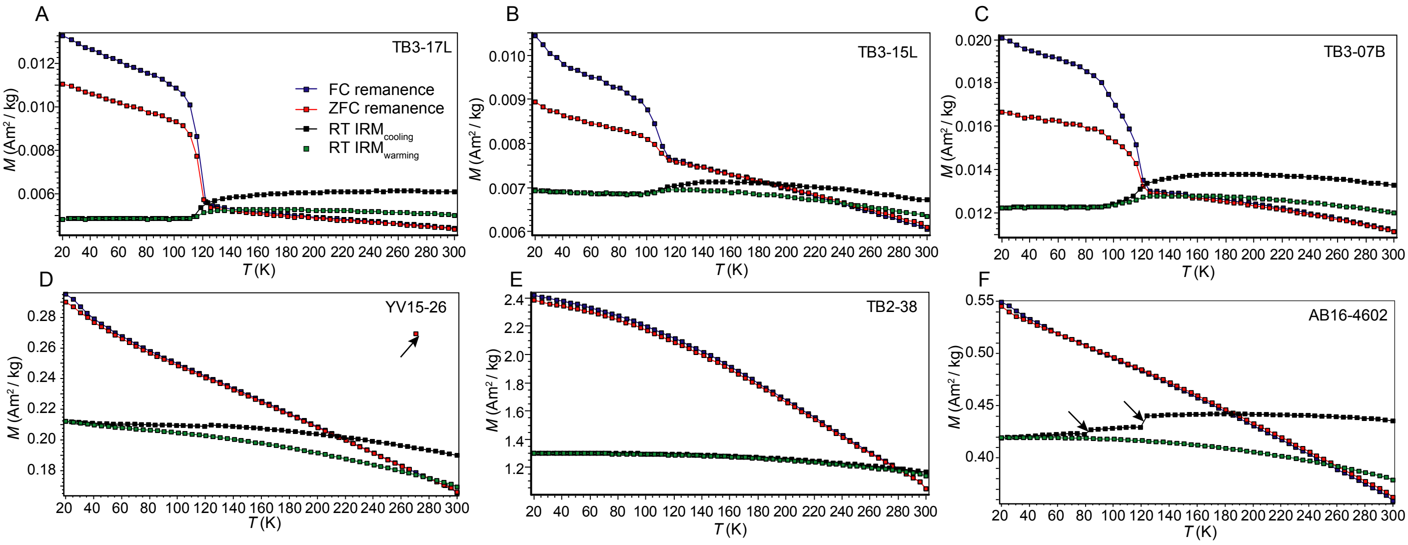


Figure S7. Low-temperature FC and ZFC remanences and RT-IRM during cooling and warming, grouped by mineralogical interpretation, for Lasail samples. (A–C): Lasail samples with a Verwey transition at 100–120 K, indicating the presence of stoichiometric magnetite. (D–F) Lasail without a detectable Verwey transition, either due to oxidation or Ti substitution in magnetite. Arrows point to outliers and artefacts likely introduced by movement of the sample during measurement

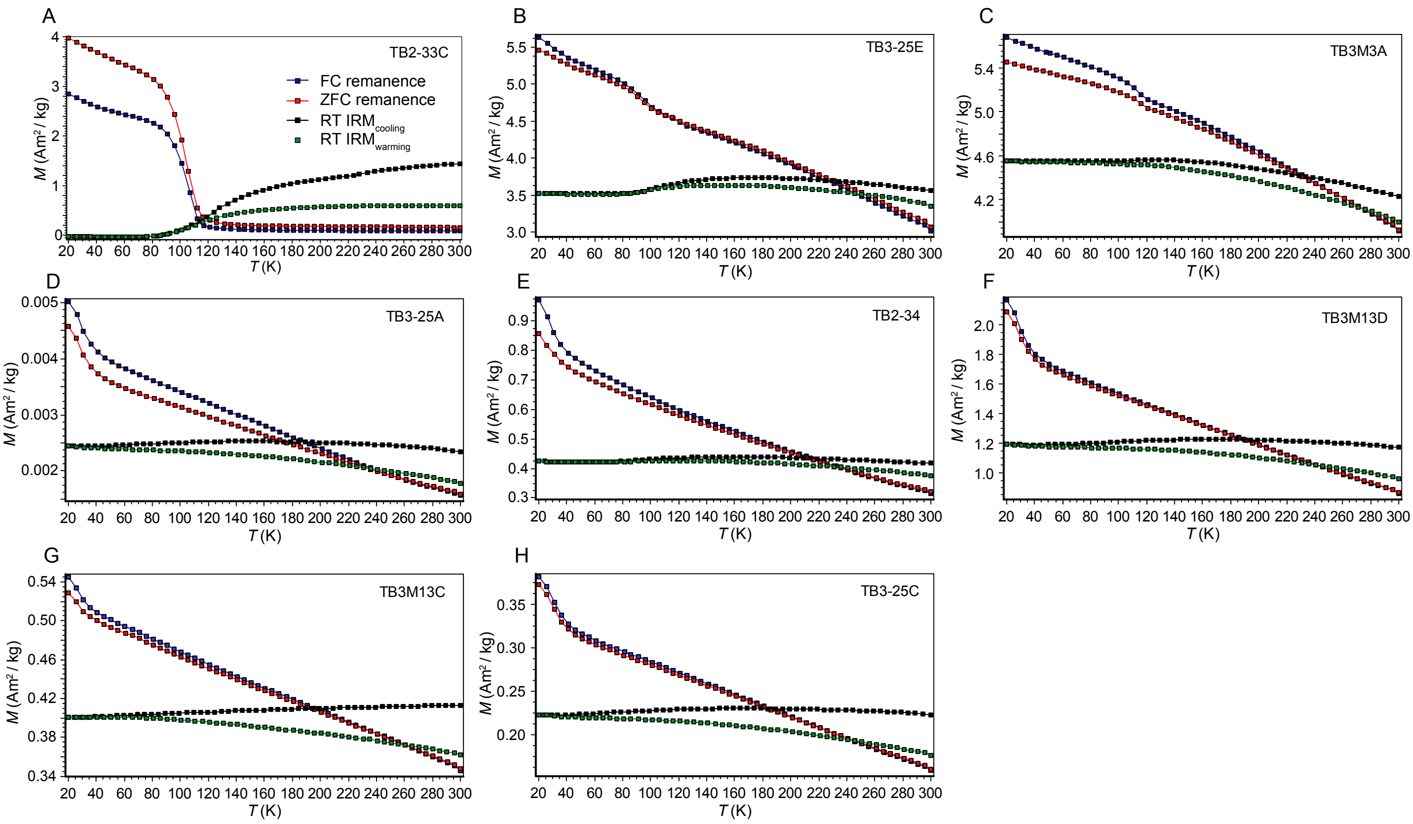
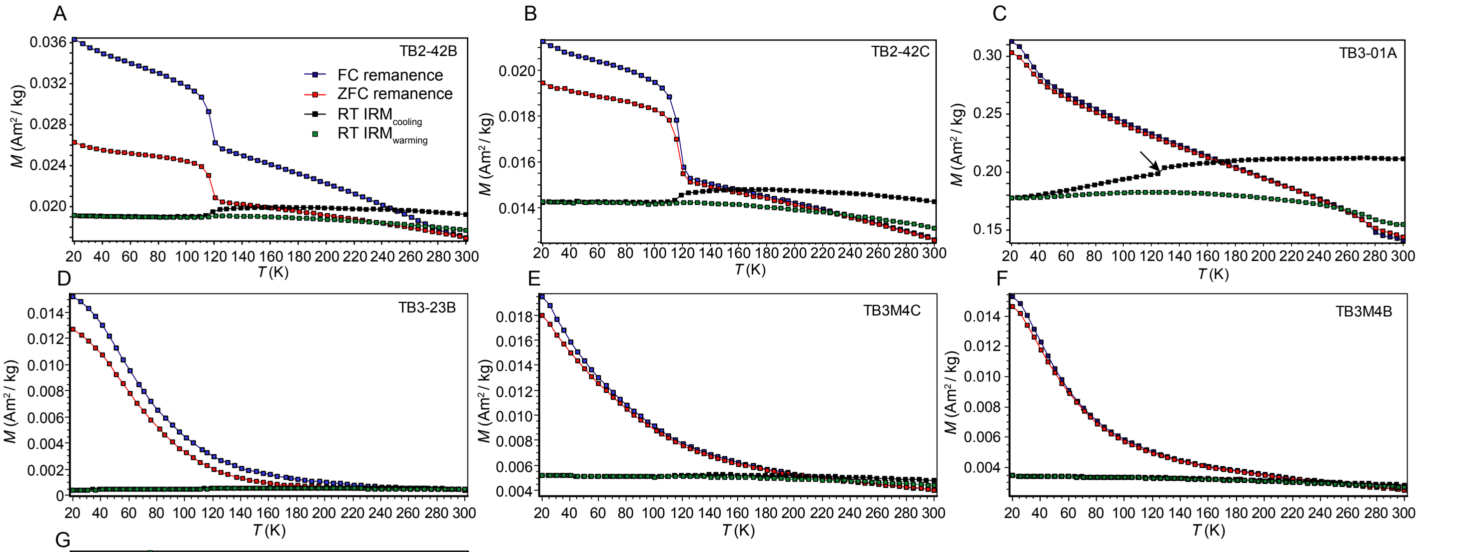


Figure S8. Low-temperature FC and ZFC remanences and RT-IRM during cooling and warming, grouped by mineralogical interpretation, for Tholeiitic Alley samples. (A–C): Tholeiitic Alley with a Verwey transition at 100–120 K, indicating the presence of stoichiometric magnetite. (D–H) Tholeiitic Alley samples without a detectable Verwey transition, either due to oxidation or Ti substitution in magnetite.



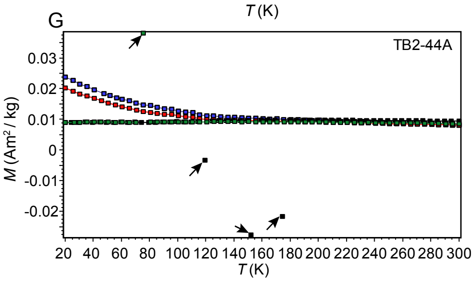


Figure S9. Low-temperature FC and ZFC remanences and RT-IRM during cooling and warming, grouped by mineralogical interpretation, for Boninitic Alley samples. (A–B): Boninitic Alley with a Verwey transition at 100–120 K, indicating the presence of stoichiometric magnetite. (C–G) Boninitic Alley samples, weakly magnetic and without a detectable Verwey transition, either due to oxidation or Ti substitution in magnetite. Arrows point to outliers and artefacts likely introduced by movement of the sample during measurement

Table S1: Volcanic unit assignments of samples indicated by field observations and diagrams in Fig. 5 of text.

Sample	Field character	Zr vs. Ti	Ti vs. V	Y vs. Cr	Zr vs. Zr/Y	Cpx Mg# vs. Ti	Assigned Lava Unit
LD10-145/6	–	bA	–	La/bA	La/bA	–	**bA**
LD10-146/4	–	bA	La/bA	La/bA	La/tA	–	**bA**
SG14-28	La/bA	bA	bA	La/bA	bA/La	–	**bA**
SG14-29	La/bA	bA	bA	La/bA	bA	–	**bA**
SP18-B7	tA	La/tA/bA	bA	La/bA	La/tA	–	**bA**
SP18-D2	tA/bA	bA	bA	bA	bA	–	**bA**
TB2-19A	bA	La/tA/bA	La/bA	bA	La/tA/bA	–	**bA**
TB4-09B	bA	La/tA/bA	La/bA	bA/La	La/bA	–	**bA**
TB4-10A	La/bA	bA	bA	bA	bA	–	**bA**
TB4-10B	tA/bA	bA	bA	La/A/bA	bA	–	**bA**
TB4-17I	bA	bA	bA	bA	bA	–	**bA**
TB4-18H	La/bA	La/tA/bA	bA	La/bA	La/bA	–	**bA**
TB4-19G	bA	bA	bA	bA	La/bA	–	**bA**
TB4-23A	tA	bA	bA	La/bA	La/bA	–	**bA**
AB16-4613	La/bA	La/tA/bA	bA	La/tA/bA	bA	La/tA/bA	**bA**
TB2-27A	La/bA	bA	bA	bA	La/bA	–	**bA**
TB2-42A	La/bA	La/bA	bA	bA/La	La/bA	bA	**bA**
TB2-45b	tA/bA	La/tA/bA	bA	bA/La/A	La/tA/bA	tA/bA	**bA**
TB4-05D	La/bA	bA	bA	bA/La	bA	–	**bA**
AB16-4550	La/bA	bA	bA	La/bA	La/bA	–	**bA**
TB2-21A	tA/bA	La/tA/bA	bA	bA/La	bA	–	**bA**
TB2-42b	La/bA	bA	bA	bA/La	bA	bA	**bA**
TB2-42c	La/bA	bA	bA	bA/La	La/bA	bA	**bA**
TB2-44A	La/bA	bA	bA	bA/La	bA	bA	**bA**
TB3-01A	tA/bA	bA	bA	bA	bA	bA	**bA**
TB3-03A	–	La/tA/bA	bA	bA/La/A	La/tA/bA	–	**bA**
TB3-19C	bA	La/tA/bA	bA	bA/La	La/bA	–	**bA**
TB3-23B	bA	bA	bA	bA	bA	–	**bA**
LD10-146/1	–	bA	–	bA	bA	La/bA	**bA**
RaM-005	La/tA/bA	La/bA	La/bA	bA/La	bA	–	**dL**
TB2-40d	La/bA	La/bA	bA	bA/La	bA	La	**dL**
TB5-27A	La	bA	bA	bA	bA	–	**dL**
LD10-1251	tA	fA	–	–	Gt/tA	tA	**fA**
SP18-A8	tA	fA	–	–	Gt/tA	–	**fA**
TB3-13B	–	fA	–	–	Gt/tA	–	**fA**
TB2-32A	Gt	fA	–	–	Gt/tA	–	**fA**
TB2-34A	tA	fA	–	–	Gt/tA	–	**fA**
TB3-25A	Gt	fA	–	–	Gt/tA	–	**fA**
TB3-25C	tA	fA	–	–	Gt/tA	–	**fA**
TB3-25E	Gt/tA	fA	–	–	Gt/tA	–	**fA**
TB3-06A	Gt/tA	fG	Gt	–	Gt	–	**fG**
TB3-10D	Gt/tA	fG	–	–	Gt	–	**fG**
TB4-06B	Gt	fG	Gt	Gt	Gt	–	**fG**
TB4-23C	fA	fG	–	–	Gt	–	**fG**
TB2-50c	–	fG	Gt	–	Gt	–	**fG**
RaM-004	Gt/tA	Gt	Gt	Gt	Gt/La/tA	–	**Gt**
SG13-36A	Gt	Gt/La/tA	Gt/La/tA	Gt/tA	Gt/La/tA	–	**Gt**
SG14-44	Gt	Gt/La/tA	Gt/tA	Gt	Gt/tA	–	**Gt**
SG14-57	Gt	Gt	Gt	Gt	Gt	–	**Gt**
SP18-A1	Gt	Gt/tA	Gt/La/tA	–	Gt/La/tA	–	**Gt**
SP18-A3	Gt/tA	Gt	Gt	–	Gt	–	**Gt**
SP18-B3	Gt	Gt	Gt	Gt	Gt/tA	–	**Gt**
SP18-B5	Gt	Gt	Gt	–	Gt	–	**Gt**
SP18-C5p	Gt	Gt	Gt	–	Gt	–	**Gt**
SP18-D11	Gt/tA	Gt	Gt	Gt	Gt/tA	–	**Gt**
SP18-D9	Gt/tA	Gt	Gt	Gt	Gt	–	**Gt**
TB3-05B	Gt	Gt	Gt	Gt	Gt/La/tA	–	**Gt**

Table S1 continued.

Sample	Field character	Zr vs. Ti	Ti vs. V	Y vs. Cr	Zr vs. Zr/Y	Cpx Mg# vs. Ti	Assigned Lava Unit
TB3-05C	–	Gt	Gt	Gt	Gt/tA	–	**Gt**
TB3-05D	Gt	Gt	Gt	Gt	Gt/La	–	**Gt**
TB3-07A2	tA	Gt	Gt	–	Gt/La	–	**Gt**
TB3-08A	La	Gt/tA	Gt	Gt	Gt/La/tA	–	**Gt**
TB3-11F	tA	Gt	Gt	Gt	Gt/La	–	**Gt**
TB3-14B	Gt	Gt/La/tA	Gt	–	Gt/La	–	**Gt**
TB4-17C	tA/bA	Gt/La/tA	Gt/La	Gt	Gt/La/tA	–	**Gt**
TB4-18F	Gt/tA	La/tA	Gt/La/tA	Gt	La/tA	–	**Gt**
TB4-19C	Gt/tA	Gt	Gt	Gt/A	Gt/La	–	**Gt**
WF-007	–	Gt/La/tA	–	Gt	Gt/La/tA	–	**Gt**
WF-009	Gt	Gt/tA	Gt	Gt	Gt/La/tA	–	**Gt**
YV15-04	Gt/tA	Gt/tA	Gt/tA	–	Gt/tA	–	**Gt**
YV15-15	Gt	Gt	Gt	–	Gt	Gt	**Gt**
AB16-4511	–	Gt/tA	Gt	Gt/tA	Gt/La/tA	Gt	**Gt**
AB16-4512	–	La/tA	Gt/La/tA	Gt	La/tA	–	**Gt**
AB16-4521	Gt	Gt/La/tA	Gt	Gt	Gt/La/tA	Gt	**Gt**
AB16-4571	–	Gt	Gt	Gt	Gt/La	Gt	**Gt**
AB16-4592	Gt/La	Gt	Gt	Gt	Gt/La/tA	Gt	**Gt**
AB16-4593	Gt	Gt	Gt	Gt	Gt/La	–	**Gt**
AB16-4671	Gt	Gt	Gt	–	Gt/La	–	**Gt**
LD10-1204	Gt	Gt	Gt	–	Gt/A	–	**Gt**
LD10-1231	tA	Gt	Gt	Gt	Gt/La	Gt	**Gt**
LD10-1241	tA	Gt	Gt	–	Gt/La	–	**Gt**
TB2-32b	–	Gt	Gt	Gt	Gt	–	**Gt**
TB2-39c	La	Gt	Gt	–	Gt/tA	Gt/tA	**Gt**
TB2-45c	Gt	Gt	Gt	–	Gt/tA	Gt	**Gt**
TB4-06C	Gt	Gt	Gt	–	Gt	–	**Gt**
TB4-15B	Gt	Gt	Gt	Gt	Gt	–	**Gt**
TB4-18B	Gt/tA	Gt	Gt	–	Gt	–	**Gt**
TB4-20C	Gt/tA	Gt/tA	Gt	–	Gt/tA	–	**Gt**
TB4-20N	Gt	Gt	Gt	Gt	Gt/tA	–	**Gt**
AB16-4472	Gt	Gt	Gt	–	Gt/tA	Gt	**Gt**
AB16-4483	Gt	Gt	Gt	–	Gt/tA	Gt	**Gt**
AB16-4492	–	Gt	Gt	Gt	Gt/tLa	–	**Gt**
AB16-4583	Gt	Gt/tA	Gt	Gt	Gt/La/tA	–	**Gt**
TB2-40b	–	Gt/La/tA	Gt	Gt	La/tA	Gt	**Gt**
TB3-20C	Gt/tA	Gt/A	Gt	Gt	Gt/La/tA	–	**Gt**
TB3-20D	Gt	Gt/A	Gt/La	Gt	La/tA	–	**Gt**
TB3-20I	Gt/tA	Gt	Gt	Gt	Gt	–	**Gt**
TB3-26A	Gt	Gt	Gt	–	Gt/La/tA	–	**Gt**
TB3M8D	Gt/La	Gt/La/tA	Gt/tA	Gt/A	Gt/La/tA	–	**Gt**
TB5-43	Gt/tA	Gt	Gt	–	Gt/tA	–	**Gt**
SW16-23	–	Gt/La/tA	Gt/La/tA	–	Gt/La/tA	–	**Gt–La**
YV15-02	Gt/tA	Gt/tA	Gt	La/tA	Gt/La/tA	–	**Gt–La**
TB2-39b	La	La/tA	Gt/La/tA	Gt/La/tA	La/tA	Gt/La	**Gt–La**
TB2-40	Gt/tA	La/tA	Gt/La	Gt/La/tA	La/tA	–	**Gt–La**
YV15-14	–	Gt/La/tA	Gt/La/tA	Gt	Gt/La/tA	La	**Gt–La**
TB4-17F	La/bA/tA	La/tA	La/tA	La/bA	La/tA/bA		**La**
RaM-002	La	La/tA	La/tA	La/tA	La/tA	–	**La**
TB3-08B	La	La/tA	La/tA	La/tA/bA	La/tA/bA	La	**La**
TB3-19B	La	Gt/La/tA	La/tA	La/tA	La/tA	La	**La**
TB4-10D	La/bA	Gt/La/tA	Gt/La	Gt/A/La	La/tA	–	**La**
YV15-08	La/bA	Gt/La/tA	La/tA	Gt/A/La	Gt/La/tA	La	**La**
YV15-17	–	La/tA	–	La/tA	Gt/La/tA	–	**La**
YV15-22	La	La/tA	La/tA	La/tA	La/tA	–	**La**
AB16-4601	La	La/tA	La/tA	La	La/tA	–	**La**
LD10-1211	La	La/tA	La/tA	La/tA	La/tA	La	**La**

Table S1 continued.

Sample	Field character	Zr vs. Ti	Ti vs. V	Y vs. Cr	Zr vs. Zr/Y	Cpx Mg# vs. Ti	Assigned Lava Unit
TB2-33A	–	La/tA	La/tA	La/tA	La/tA	La/bA	**La**
TB2-35c	La	Gt/La/tA	La/tA	La/tA	Gt/La/tA	La	**La**
TB2-39A	La	La/tA	La/tA	La/tA	La/tA	La	**La**
AB16-4602	La	La/tA	La/tA	Gt/La/tA	La/tA	La	**La**
LD10-1221	La	La/tA	–	La/tA	La/tA	La	**La**
TB2-38	–	La/tA	La/tA	La/tA	La/tA	La	**La**
TB3-15L	La	La/tA	La/tA	Gt/La/tA	La/tA	La	**La**
TB3-17L	La	La/tA/bA	La/bA	La/tA/bA	La/tA/bA	La	**La**
YV15-26	La	La/tA	La/tA	La/tA	La/tA	La	**La**
TB3-09B	La	Gt/La/tA	La/tA	La/tA	La/tA	–	**La**
SP18-A9	tA/bA	La/tA	La/tA	La/tA	La/tA	bA	**T-A**
WR-004	La/bA	T-A	–	La/tA	La/tA	–	**T-A**
TB4-19A	tA/bA	La/tA/bA	La/tA/bA	La/bA	La/tA/bA	–	**T-A**
TB3-15C	tA/bA	T-A	–	La/tA/bA	La/tA	–	**T-A**
SP18-B9	tA	La/tA	tA	Gt/tA	tA	–	**tA**
SP18-C13	tA	La/tA	La/tA	Gt/La/tA	La/tA	–	**tA**
SP18-C16	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
SP18-C7	tA	Gt/La/tA	La/tA	–	Gt/La/tA	–	**tA**
SP18-C8	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
SP18-D3	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
SP18-D5	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
TB3-10A	tA	La/tA	tA	tA	La/bA	–	**tA**
TB3-10C	Gt/tA	Gt/La/tA	tA	–	La/tA	–	**tA**
TB3-13C	tA	Gt/La/tA	tA	tA	La/tA	–	**tA**
TB3-20G	Gt/tA	La/tA	Gt/La/tA	Gt/La/tA	La/tA	–	**tA**
TB3-23A	tA/bA	Gt/La/tA	Gt/La/tA	La/tA	La/tA	–	**tA**
TB3-25I	tA/bA	La/tA	–	La/tA/bA	La/tA	–	**tA**
TB3-25J	Gt/tA	Gt/La/tA	Gt/La/tA	Gt/tA	La/tA	–	**tA**
TB4-07F	tA	La/tA	La/tA	La/tA	La/tA/bA	–	**tA**
TB4-12C	tA	La/tA	La/tA	Gt/tA	tA	–	**tA**
TB4-15I	Gt/tA	La/tA	La/tA	–	La/tA	–	**tA**
TB4-15J	tA	La/tA	tA	–	La/tA	–	**tA**
TB4-17G	tA/bA	tA	La/tA	tA	La/tA	–	**tA**
TB4-19A	tA/bA	La/tA/bA	La/tA/bA	La/bA	La/tA/bA	–	**tA**
TB4-19F	tA/bA	La/tA/bA	La/tA	tA	La/tA	–	**tA**
TB4-19K	Gt/tA	tA	tA	–	La/tA	–	**tA**
YV15-03	tA	Gt/tA	tA	–	La/tA	–	**tA**
YV15-21	tA	La/tA	La/tA	Gt/tA	tA	–	**tA**
YV15-23	Gt/tA	La/tA	tA	–	La/tA	–	**tA**
YV15-24	tA	La/tA	La/tA	Gt/tA	Gt/La/tA	–	**tA**
AB16-4611	La	La/tA	tA	–	La/tA	tA	**tA**
TB2-32c	Gt/tA	La/tA	tA	–	La/tA	–	**tA**
TB2-33b	tA	La/tA	La/tA	tA	La/tA	tA	**tA**
TB2-35	Gt/tA	La/tA	La/tA	–	La/tA	–	**tA**
TB2-35b	tA	La/tA	tA/La	–	La/tA	–	**tA**
TB2-35d	Gt	Gt/tA	tA	–	Gt/tA	–	**tA**
TB2-41c	La/tA	Gt/tA	tA	–	La/tA	–	**tA**
TB2-46A	tA	Gt/tA	tA	–	Gt/La/tA	–	**tA**
TB2-50d	Gt/tA	La/tA	La/tA	La/tA	La/tA	tA	**tA**
TB4-17B	tA	La/tA	La/tA/bA	tA	La/tA/bA	–	**tA**
TB4-17J	tA	Gt/La/tA	Gt/La/tA	–	Gt/La/tA	–	**tA**
YV15-13	Gt/tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
TB2-31A	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
TB2-31B	tA	La/tA	La/tA	La/tA	La/tA	–	**tA**
TB2-31C	–	La/tA	tA	–	La/tA	–	**tA**
TB2-33C	tA	La/tA	tA	–	La/tA	–	**tA**
TB2-33D	tA	La/tA	La/tA	tA	La/tA	–	**tA**

Table S1 continued.

Sample	Field character	Ti vs. Zr	Ti vs. V	Cr vs. Y	Zr vs. Zr/Y	Cpx Mg# vs. Ti	Assigned Lava Unit
TB2-34D	tA	tA	La/tA	–	Gt/tA	tA	**tA**
TB2-38B	Gt/tA	Gt/tA	tA	–	La/tA	–	**tA**
TB2-41A	–	Gt/tA	tA	–	Gt/A	–	**tA**
TB3-03D	–	La/tA	La/tA	–	La/tA/bA	tA	**tA**
TB3-14C	tA/bA	La/tA	La/tA	La/tA	tA/bA	–	**tA**
TB3-14E	tA/bA	Gt/La/tA	La/tA	Gt/La/tA	La/tA	–	**tA**
TB3-14F	tA	La/tA	La/tA	La/tA	tA	–	**tA**
TB3-25G	Gt/tA	La/tA	Gt/La/tA	Gt/La/tA	La/tA	–	**tA**
TB5-36	tA/bA	La/tA	La/tA	La/tA	Gt/La/tA	–	**tA**
Dykes & Sills							
SP18-B7	–	La/tA/bA	bA	La/bA	La/tA	–	**bA**
TB5-22A	–	bA	bA	bA	bA	–	**bA**
TB5-22B	–	bA	bA	La/bA	bA	–	**bA**
TB2-43C	–	La/tA	La/tA	–	La/tA	tA/bA	**tA**
TB2-44D	–	La/tA	tA	–	La/tA	tA	**tA**
TB2-45A	–	La/tA	La/tA	–	La/tA	–	**tA**
TB3-19A	–	La/tA	tA	–	La/tA	tA	**tA**
TB3-25H	tA/bA	La/tA	tA	–	La/tA	–	**tA**
TB4-20L	tA/bA	La/tA	La/tA	–	La/tA	–	**tA**

* Lava unit codes: Gt = Geotimes; fG = Felsic Geotimes; La = Lasail, dL = Depleted Lasail; Gt–La = Transitional Geotimes–Lasail; tA = Tholeiitic Alley; fA = Felsic Alley; T-A = Transitional Alley; bA = Boninitic Alley

(–) = Ambiguous or unclear field characteristics, below detection limit, or not measured

Table S2. List of previously published sample locations and unit assignments used for mapping

Reference	Sample	UTM mE	UTM mN	Sample Type[1]	Previous assignment[2]	Assigned lava unit
Belgrano & Diamond (2019)	TB3-03D	430912	2746032	MF	tA	tA
Belgrano & Diamond (2019)	TB3-07C	432314	2737598	PL	Gt	Gt
Kusano et al. (2017)	OM16-113	441682	2687375	GL	LV2	tA
Kusano et al. (2017)	OM17-59C	450762	2696028	GL	LV2	tA
Kusano et al. (2017)	OM17-59D	450762	2696028	GL	LV2	tA
Kusano et al. (2017)	OM16-73B	436731	2738816	GL	LV2	**T-A***
Kusano et al. (2017)	12SH12	455376	2667404	GL	LV2	**T-A***
Kusano et al. (2017)	12SH13	455376	2667404	GL	LV2	**bA***
Kusano et al. (2017)	OM17-62A	450352	2694376	GL	UV2	bA
Kusano et al. (2017)	OM17-62D	450352	2694376	GL	UV2	bA
Kusano et al. (2017)	OM17-62E	450352	2694376	GL	UV2	bA
Kusano et al. (2017)	OM17-63C-1	450158	2694211	GL	UV2	bA
Kusano et al. (2017)	OM17-63C-2	450158	2694211	GL	UV2	bA
Kusano et al. (2017)	OM16-84A	438714	2725582	GL	UV2	bA
Kusano et al. (2017)	OM14-2C	448130	2691007	GL	UV2	bA
Kusano et al. (2017)	OM16-46C	448118	2691017	GL	UV2	bA
Kusano et al. (2017)	OM17-28C	454484	2671056	GL	UV2	bA
Kusano et al. (2017)	OM17-80A	450349	2691829	GL	UV2	bA
Kusano et al. (2017)	OM17-97B-2	438091	2718062	GL	UV2	bA
Kusano et al. (2017)	OM17-67AB	449937	2692255	GL	V1	GT-F
Kusano et al. (2017)	OM17-67B	449937	2692255	GL	V1	GT-F
Gilgen et al. (2016)[#]	WF-006	444615	2716836	PF	La	**dL***
Gilgen et al. (2016)[#]	SG14-08	432248	2741531	PF	La	**dL***
Gilgen et al. (2016)[#]	RaM-010	437328	2730669	PF	La	**dL***
Gilgen et al. (2016)[#]	SG14-21	438651	2700428	PF	Gt	Gt
Gilgen et al. (2016)[#]	AB16-4584	430229	2743811	PF	Gt	GT
Gilgen et al. (2016)[#]	WF-008	443215	2716157	PF	Gt	GT
Gilgen et al. (2016)[#]	SG14-20	438875	2700434	PF	La	La
Gilgen et al. (2016)[#]	RN-002	436006	2725401	PF	La	La
Gilgen et al. (2016)[#]	RN-005	435566	2725434	PF	La	La
Gilgen et al. (2014)	Lasail HW	442869	2684460	P	tA	tA
Gilgen et al. (2014)	Mandoos FW	437167	2733153	P	tA	tA
Gilgen et al. (2014)	Mandoos HW	437250	2733100	MF	tA	tA
Gilgen et al. (2014)	Zuha HW	452374	2675737	MF	tA	tA
Gilgen et al. (2014)	Maqail HW	453453	2661446	P	tA	tA
Gilgen et al. (2014)	Shinas FW	437885	2740740	P	tA	tA
Gilgen et al. (2014)	Shinas HW	437850	2740810	P	tA	**T-A***
Gilgen et al. (2014)	Safwa FW	436049	2716175	P	bA	bA
Gilgen et al. (2014)	Safwa HW	436075	2716125	P	bA	bA
Gilgen et al. (2014)	Aarja FW	440159	2692927	F	bA	bA
Gilgen et al. (2014)	Daris 3A-5 FW	534120	2614195	P	bA	bA
Gilgen et al. (2014)	Al Bishara FW	453181	2618560	PF–DC	bA	bA
Gilgen et al. (2014)	Al Bishara FW	453181	2618560	PF–DC	bA	bA
Gilgen et al. (2014)	Rakah FW	457543	2618830	PF–DC	bA	bA
Gilgen et al. (2014)	Rakah HW	457543	2618830	PF–DC	bA	bA
Gilgen et al. (2014)	Aarja HW	440365	2692871	MF	bA	bA
Gilgen et al. (2014)	Rakah HW	457309	2618809	P	bA	bA
Gilgen et al. (2014)	Rakah FW	457394	2618752	P	bA	bA
Gilgen et al. (2014)	Aswad HW	431625	2749825	P	Gt	Gt
Gilgen et al. (2014)	Hatta M. HW	432806	2739967	MF	Gt	Gt
Gilgen et al. (2014)	Hatta E. HW	433022	2739625	MF	Gt	Gt
Gilgen et al. (2014)	Hatta E. FW	433019	2739652	P	Gt	Gt

Table S2 continued.

Reference	Sample	UTM mE	UTM mN	Sample Type[1]	Previous assignment[2]	Assigned lava unit
Gilgen et al. (2014)	Hatta S. FW	432867	2739325	P	Gt	Gt
Gilgen et al. (2014)	Zuha FW	452055	2675476	PF–DC	Gt	Gt
Gilgen et al. (2014)	Lasail FW	442372	2684648	F	Gt	Gt
Gilgen et al. (2014)	Hatta M. FW	432766	2740199	P	Gt	Gt
Gilgen et al. (2014)	Hatta M. HW	432766	2740199	P	Gt	Gt
Gilgen et al. (2014)	Zuha FW	452315	2675699	P	Gt	Gt
Gilgen et al. (2014)	Aswad FW	431625	2749825	MF	Gt	Gt
Gilgen et al. (2014)	Kaznah FW	436181	2754981	DC	Gt	fG
Gilgen et al. (2014)	Mahab FW	468745	2656161	P	Gt	fG
Gilgen et al. (2014)	Maqail FW	453428	2661425	P	Gt	fG
Gilgen et al. (2014)	Ghuzayn 1 FW	498884	2634728	MF	Gt	fG
Gilgen et al. (2014)	Daris E. FW	543365	2609170	PF–DC	Gt	fG
Gilgen et al. (2014)	Mahab 4 FW	468760	2656345	PF–DC	Gt	fG
Gilgen et al. (2014)	Ghuzayn 3 HW	496843	2635783	PF–DC	La	La
Gilgen et al. (2014)	Ghuzayn 3 FW	496843	2635783	PF–DC	La	La
Gilgen et al. (2014)	Khaznah HW	436181	2754981	DC	La	La
Gilgen et al. (2014)	Mahab 4 HW	468838	2656250	P	La	La
Gilgen et al. (2014)	Ghuzayn 1 HW	498766	2635411	MF	La	La
Gilgen et al. (2014)	Mahab 4 HW	468760	2656345	PF–DC	La	La
MacLeod et al. (2013)	99OC109	602429	2517609	–	V1	Gt
MacLeod et al. (2013)	89OC130	500500	2635300	–	V1	Gt
MacLeod et al. (2013)	89OC132	500400	2635400	–	V1	Gt
MacLeod et al. (2013)	89OC126	500800	2634900	–	V1	Gt
MacLeod et al. (2013)	89OC134	500400	2635400	–	V1	Gt
MacLeod et al. (2013)	99OC199	510600	2626500	–	V1	Gt
MacLeod et al. (2013)	97OC132	435800	2721000	–	V1	Gt
MacLeod et al. (2013)	89OC125	500800	2634900	–	V1	Gt
MacLeod et al. (2013)	89OC131	500600	2635100	–	V1	Gt
MacLeod et al. (2013)	99OC165	452219	2666303	–	V1	Gt
MacLeod et al. (2013)	97OC134	435400	2721600	–	V1	Gt
MacLeod et al. (2013)	89OC120	501300	2634600	–	V1	Gt
MacLeod et al. (2013)	97OC136	435100	2722000	–	V1	Gt
MacLeod et al. (2013)	89OC121	501300	2634600	–	V1	Gt
MacLeod et al. (2013)	99OC163	451452	2666564	–	V1	Gt
MacLeod et al. (2013)	89OC119	501300	2634600	–	V1	Gt
MacLeod et al. (2013)	89OC118	501300	2634600	–	V1	Gt
MacLeod et al. (2013)	89OC117	501400	2634600	–	V1	Gt
MacLeod et al. (2013)	89OC114	501700	2634300	–	V1	Gt
MacLeod et al. (2013)	89OC115	501700	2634300	–	V1	Gt
MacLeod et al. (2013)	89OC116	501600	2634400	–	V1	Gt

All coordinates converted to UTM Zone 40 North (in meters)

[#]Note: Gilgen et al. (2016) sample locations originally erroneously reported in UTM 'Fahud' projection, coordinates are corrected to WGS 84/UTM 40 N here.

[1]Sample type codes: PF = Pillow flow; MF = Massive flow; GL = volcanic glass; PF–DC = Pillow flow from drill core

[2]Lava unit codes: V1= Volcanic Unit 1 (Geotimes); LV2 = Lower Volcanic Unit 2 (Tholeiitic Alley); UV2 = Upper Volcaninc Unit 2 (Boninitic Alley); Gt = Geotimes; fG = Felsic Geotimes; La = Lasail, dL = Depleted Lasail; tA = Tholeiitic Alley; fA = Felsic Alley; T-A = Transitional Alley; bA = Boninitic Alley

***Samples** assigned to a different unit in this study than originally reported.

Table S3. XRF measurements of basalt standards

	BCR-2G[1] (basaltic glass)			BRP-1[2] (basalt whole-rock)		
	Reference value	Measured value	Measured/ Reference	Reference value	Measured value	Measured/ Reference
	(wt%)	*(wt%)*	*(%)*	*(wt%)*	*(wt%)*	*(%)*
SiO_2	54.1	53.95	**-0.28**	50.39	50.36	**-0.06**
TiO_2	2.26	2.25	**-0.44**	3.81	3.83	**0.52**
Al_2O_3	13.5	13.44	**-0.44**	12.40	12.38	**-0.16**
Fe_2O_3	13.8	13.75	**-0.36**	15.59	15.48	**-0.71**
MnO	0.196	0.2	**2.04**	0.214	0.22	**2.8**
MgO	3.59	3.57	**-0.56**	3.94	3.89	**-1.27**
CaO	7.12	7.1	**-0.28**	7.95	7.94	**-0.13**
Na_2O	3.16	3.15	**-0.32**	2.71	2.7	**-0.37**
K_2O	1.79	1.78	**-0.56**	1.52	1.54	**1.32**
P_2O_5	0.35	0.36	**2.86**	0.63	0.64	**1.59**
LOI[4]	–	–	–	0.50	0.47	**-6**
Sum of major elements + LOI		99.55			99.45	
	(μg/g)	*(μg/g)*	*(%)*	*(μg/g)*	*(μg/g)*	*(%)*
Ba	683	684	**0.15**	555	555	**0.07**
Cr	18	11.4	**-36.67**	12.4	1.7	**-86.29**
Cu	19	19.5	**2.63**	160	157	**-1.75**
Ni	17	15	**-11.76**	23.4	18	**-23.08**
Sc	33	32.3	**-2.12**	28.5	26.4	**-7.37**
Sr	346	333	**-3.76**	492	497	**0.93**
V	416	408	**-1.92**	391	394	**0.84**
Y	37	37	**0**	42.0	43.8	**4.29**
Zn	127	128	**0.79**	142	159	**11.69**
Zr	188	182	**-3.19**	310	309	**-0.35**

1. BCR-2G basalt glass standard, reference values from GeoReM v. 18, 01/2015 (Jochum et al., 2005), total Fe calculated as Fe2O3

2. BRP-1, Powdered basalt standard, reference values from Cotta and Enzweiler (2008), total Fe calculated as Fe2O3

3. LLD = lower limit of detection

4. LOI = loss on ignition, after heating in air at 1050°C for 2 hrs

Table S4. LA–ICP–MS measurements of basalt and komatiitic standards.

		BRP-1[1]					OKUM[2]					BCR-2G[3]				
		Reference		Measured values			Reference		*Measured values*			Reference		Measured values		
Element	*Isotope*	R.V.[4]	*95% C.I.*	Mean (n=18)	*1σ*	Measured/ Reference	R.V.	*95% C.I.*	Mean (n=6)	*1σ*	Measured/ Reference	R.V.	±	Mean (n=4)	*1σ*	Measured/ Reference
		(μg/g)	*(%)*	*(μg/g)*	*(%)*	*(%)*	*(μg/g)*	*(%)*	*(μg/g)*	*(%)*	*(%)*	*(μg/g)*	*(%)*	*(μg/g)*	*(%)*	*(%)*
Li	*Li7*	7.16	*N.R*	6.54	*2.7*	**-8.7**	4.4	*6.8*	4.15	*6.7*	**-5.7**	9	*11.1*	9.26	*1.4*	**2.9**
Be	*Be9*	1.82	*N.R*	2.02	*9*	**11.0**	0.065	*6.2*	0.111	*44.3*	**70.8**	2.3	*17.4*	2.58	*7.8*	**12.2**
B	*B11*	N.R	*N.R*	2.88	*2.3*	**-**	N.R	*N.R*	6.75	*4.2*	**-**	*6*	*16.7*	4.41	*6.6*	**-26.6**
Sc	*Sc45*	28.7	*2.8*	30.3	*1.4*	**5.4**	27.9	*5.4*	29.8	*0.6*	**6.8**	33	*6.1*	35.7	*1.1*	**8.2**
V	*V51*	394	*1.8*	408	*3.1*	**3.6**	168	*1.8*	171	*0.4*	**1.9**	425	*4.2*	445	*1.6*	**4.7**
Cr	*Cr53*	12.5	*8.1*	12.9	*7.5*	**3.1**	2460	*1.3*	2411	*1.2*	**-2.0**	17	*11.8*	17.0	*4.6*	**0.0**
Co	*Co59*	37.8	*3.7*	36.8	*2.4*	**-2.7**	88.9	*1.7*	88.8	*0.4*	**-0.1**	38	*5.3*	38.4	*0.6*	**1.1**
Ni	*Ni62*	23.6	*3.8*	22.3	*4.7*	**-5.5**	886	*1.1*	859	*1.1*	**-3.0**	13	*15.4*	12.6	*5.3*	**-3.1**
Cu	*Cu65*	161	*1.9*	150	*4.5*	**-7.0**	43.5	*2.8*	45.0	*4.1*	**3.4**	21	*23.8*	17.6	*1.8*	**-16.2**
Zn	*Zn66*	143	*1.4*	117	*2.8*	**-18.3**	61.2	*3.1*	55.2	*1.6*	**-9.8**	125	*4*	149	*0.7*	**19.2**
Ga	*Ga71*	25	*2.4*	22.6	*1.7*	**-9.6**	8.79	*1.8*	8.29	*1.8*	**-5.7**	23	*4.3*	21.4	*1.1*	**-7.0**
Ge	*Ge73*	1.71	*N.R*	3.00	*6.1*	**75.4**	N.R	*N.R*	1.02	*11.4*	**-**	1.5	*6.7*	1.80	*5.9*	**20.0**
As	*As75*	N.R	*N.R*	0.403	*7.1*	**-**	N.R	*N.R*	0.203	*72.8*	**-**	N.R	*N.R*	0.58	*3.4*	**-**
Rb	*Rb85*	35.7	*2.8*	32.3	*1.8*	**-9.5**	0.96	*6.3*	0.867	*1.6*	**-9.7**	47	*1.1*	45.4	*0.2*	**-3.4**
Sr	*Sr88*	496	*1.2*	503	*1.5*	**1.4**	16.1	*6.2*	15.9	*1.1*	**-1.2**	342	*1.2*	337	*1.1*	**-1.5**
Y	*Y89*	42.4	*2.4*	40.8	*1.8*	**-3.7**	9.08	*3.2*	9.03	*1.6*	**-0.6**	35	*8.6*	35.3	*1.2*	**0.9**
Zr	*Zr90*	313	*1.6*	312	*1.9*	**-0.2**	17	*8.2*	17.3	*8.8*	**1.8**	184	*8.2*	185	*1.1*	**0.5**
Nb	*Nb93*	29.4	*3.1*	28.7	*1.5*	**-2.2**	0.37	*16.2*	0.349	*2.1*	**-5.7**	12.5	*8*	11.8	*0.3*	**-5.6**
Mo	*Mo95*	1.51	*N.R*	1.40	*5.2*	**-7.3**	N.R	*N.R*	0.237	*21.1*	**-**	270	*11.1*	262	*1.2*	**-3.0**
In	*In115*	0.13	*N.R*	0.11	*7.4*	**-15.4**	N.R	*N.R*	0.029	*9.3*	**-**	0.11	*18.2*	0.090	*6.0*	**-18.2**
Cs	*Cs133*	0.37	*5.4*	0.34	*2.8*	**-8.1**	0.184	*1.6*	0.176	*7.1*	**-4.3**	1.16	*6*	1.14	*1.9*	**-1.7**
Ba	*Ba137*	560	*1.3*	537.66	*1.5*	**-3.9**	6.2	*8.1*	5.78	*2.1*	**-6.8**	683	*1*	668	*0.5*	**-2.2**
La	*La139*	43	*2.3*	41.6	*1.3*	**-3.2**	0.412	*4.1*	0.424	*3.7*	**2.9**	24.7	*1.2*	25.2	*1.2*	**2.0**
Ce	*Ce140*	94.1	*1.3*	92.4	*1.3*	**-1.8**	1.27	*2.4*	1.27	*2.8*	**0.0**	53.3	*0.9*	53.4	*0.8*	**0.2**
Pr	*Pr141*	12.4	*1.6*	11.7	*1.2*	**-5.6**	0.235	*3.4*	0.225	*3.3*	**-4.3**	6.7	*6*	6.60	*1.8*	**-1.5**
Nd	*Nd146*	52.3	*1.7*	51.6	*1.6*	**-1.4**	1.494	*1.3*	1.45	*2.8*	**-2.9**	28.9	*1*	29.0	*1.3*	**0.3**
Sm	*Sm147*	11.3	*1.8*	11.1	*2.1*	**-1.8**	0.715	*1.5*	0.686	*5.7*	**-4.1**	6.59	*1.1*	6.69	*2.0*	**1.5**
Eu	*Eu151*	3.45	*2.3*	3.40	*2*	**-1.4**	0.3	*2.3*	0.283	*4.1*	**-5.7**	1.97	*1*	2.00	*1.9*	**1.5**
Gd	*Gd157*	10.5	*2.9*	10.4	*2.8*	**-0.9**	1.17	*6.0*	1.17	*4.6*	**0.0**	6.71	*1*	6.98	*2.8*	**4.0**
Tb	*Tb159*	1.53	*3.3*	1.40	*2.1*	**-8.5**	0.229	*4.4*	0.218	*2.8*	**-4.8**	1.02	*7.8*	1.01	*2.5*	**-1.0**
Dy	*Dy161*	8.57	*3.5*	8.23	*1.8*	**-4.0**	1.61	*2.5*	1.54	*3.3*	**-4.3**	6.44	*0.9*	6.46	*1.9*	**0.3**
Ho	*Ho165*	1.63	*3.7*	1.55	*2.1*	**-4.9**	0.355	*2.5*	0.339	*1.6*	**-4.5**	1.27	*6.3*	1.29	*1.9*	**1.6**
Er	*Er167*	4.24	*2.4*	4.25	*2.4*	**0.2**	1.041	*1.3*	1.04	*2.9*	**-0.1**	3.7	*1.1*	3.92	*4.4*	**5.9**
Tm	*Tm169*	0.57	*3.5*	0.528	*3.1*	**-7.4**	0.155	*3.9*	0.137	*3.2*	**-11.6**	0.51	*7.8*	0.50	*5.1*	**-1.4**
Yb	*Yb173*	3.51	*2.6*	3.44	*2.1*	**-2.0**	1.009	*2.3*	0.977	*2.2*	**-3.2**	3.39	*0.9*	3.50	*1.4*	**3.2**
Lu	*Lu175*	0.5	*4.0*	0.483	*2.7*	**-3.4**	0.148	*3.4*	0.145	*3*	**-2.0**	0.5	*1*	0.516	*3.0*	**2.6**
Hf	*Hf178*	8.07	*2.5*	7.66	*2.5*	**-5.1**	0.551	*4.2*	0.515	*5.3*	**-6.5**	4.84	*5.8*	4.99	*2.0*	**3.1**
Ta	*Ta181*	1.98	*4.1*	1.70	*1.6*	**-14.1**	0.026	*14.4*	0.0193	*9.9*	**-26.9**	0.78	*7.7*	0.713	*3.0*	**-8.6**
Pb	*Pb208*	5.55	*5.5*	5.06	*2.7*	**-8.8**	0.26	*7.7*	0.213	*8*	**-18.1**	11	*9.1*	11.0	*1.7*	**-0.3**
Th	*Th232*	4	*2.5*	3.69	*1.6*	**-7.8**	0.031	*12.9*	0.0274	*4.9*	**-11.6**	5.9	*5.1*	5.60	*1.3*	**-5.1**
U	*U238*	0.83	*3.7*	0.805	*2.1*	**-3.0**	0.012	*41.7*	0.0104	*18.3*	**-13.1**	1.69	*7.1*	1.73	*1.5*	**2.4**

Note: LA-ICP-MS standard measurements previously reported in Belgrano & Diamond (2019): samples were measured together.

R.V.= Reference Value; N.R. = no reference value; N.M. = not measured

1. BRP-1 basalt standard prepared as powder pellet, reference values from Cotta and Enzweiler (2008), total Fe calculated as Fe2O3

2. OKUM komatiite standard prepared as a powder pellet, reference values from Kane et al. (2007), total Fe calculated as Fe2O3

3. BCR-2G basaltic glass standard directly measured, reference values from GeoReM v. 18, 01/2015 (Jochum et al., 2005), total Fe calculated FeO