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Silicified seafloor contribution to TTG formation: insights from zircon O and Si isotopes

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Supplementary Information

The Supplementary Information includes:

- Geological setting and samples
- Analytical methods (Sample preparation, Cathodoluminescence imaging, SIMS analysis of zircon oxygen isotope compositions, LA-ICP-MS measurements of zircon silicon isotope compositions, laser-fluorination analysis of bulk-rock O isotope composition, XRF analysis of bulk-rock major element composition)
- Numerical modelling (Thermodynamic phase equilibrium modelling, modelling melt's O and Si isotope composition, Calculation of the O and Si isotopic composition of theoretical magmatic zircons)
- Tables S-1 to S-5
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Geological setting and samples

The Barberton Granitoid-Greenstone Terrain (BGGT) in South Africa exposes a succession of supracrustal rocks known as the Barberton Greenstone Belt (BGB) and a series of surrounding granitoids (Byerly *et al.*, 2019; Lowe and Byerly, 2007; Moyen *et al.*, 2019) (**Fig. S-1**). The supracrustal successions constituting the BGB are subdivided into three different groups, namely the 3.53-3.30 Ga Onverwacht Group, 3.28-3.25 Ga Fig Tree Group and ~3.2 Ga Moodies Group. The oldest Onverwacht Group of the BGB comprises meta-volcanic rocks (generally ultramafic to mafic but occasionally felsic) that are generally overlain by sedimentary layers encompassing pyroclastites, detritic and orthochemical metasediments. The sedimentary layers and the top of lava flows are generally silicified in the Onverwacht Group due to low-temperature hydrothermalism near the Paleoarchean seafloor (Hofmann and Harris, 2008).

The BGB is surrounded by four different generations of Paleoarchean to Mesoarchean granitoids (Moyen *et al.*, 2019; Moyen *et al.*, 2021). The first generation of granitoids is represented by the 3.51 Ga Steynsdorp tonalite-trondhjemite-granodiorite (TTG) pluton which crops out in the southwestern part of the BGGT. The second generation emplaced at ~3.45 Ga includes the Theespruit and Stolzburg TTG plutons that crop out in the south of the BGGT. The third granitoid generation is represented by 3.28-3.22 Ga TTG bodies which include the Kaap Valley and Nelshoogte plutons both appearing in the east of the BGGT. Finally, the last granitoid generation of the BGGT is represented by large ~3.1 Ga granodiorite-monzonite-syenogranite (GMS) plutons which comprise the Boesmanskop, Heerenveen, Mpuluzi, Pig's Peak and Nelspruit intrusions.

For the present study, we have collected and analysed eleven samples of the Barberton TTGs (**Fig. S-1**). The samples originated from the ~3.45 Ga Stolzburg pluton (n=2, SK-SLZ01 and SK-SLZ02), the ~3.45 Ga Theespruit pluton (n=1, SK-THP03), the 3.22 Ga Nelshoogte pluton (n=4, SK-NL01, SK-NL02, SK-NL03 and SK-NL04) and the ~3.22 Ga Kaap Valley pluton (n=4, SK-KV01, SK-KV02, SK-KV03 and SK-KV04). Our samples, therefore, represent two different generations of Paleoarchean felsic magmatic events in the BGGT (i.e. the ~3.45 and the 3.22 Ga events). In addition, our sample set is also representative of the lithological heterogeneity of the Barberton TTG plutons which range from tonalitic to trondhjemitic compositions (**Table S-1** and **Fig. S-2**).

Analytical methods

Sample preparation

Centimetre-thick slabs of individual hand-specimen samples were cut using a diamond saw and used for powder preparation at Stellenbosch University and zircon separation at Laboratoire Magmas et Volcans (Clermont Auvergne University). A tungsten carbide jaw crusher and an agate mill were successively used to prepare the fine rock powders. For zircon separation, selected rock slabs were firstly crushed and sieved to separate minerals of different sizes. Subsequently, a Frantz magnetic separator was used to eliminate magnetic minerals, and was followed by flotation in a dense liquid (bromoform, density = 2.89) to isolate the fraction of dense minerals, including zircon. Zircon was finally hand-picked under a binocular microscope and mounted in epoxy, which was then polished to flatness and carefully cut using a diamond wire saw into smaller portions carrying relevant zircons. These portions of the epoxy mount were pressed into an indium mount along with polished specimens of 91500 zircon standard at the University of Lausanne. The replacement of as much epoxy as possible by indium before analyses was important for minimising signal perturbations due to epoxy degassing during secondary ion mass spectrometry analyses. Interferometric analyses of the prepared indium mount demonstrated that the elevation gradient at its surface did not exceed 5 micrometres.

Cathodoluminescence imaging

Cathodoluminescence (CL) images of the mounted zircons were acquired at Laboratoire Magmas et Volcans using Jeol JSM-5910LV scanning electron microscope to select the most preserved areas of the mounted zircons for isotopic analyses. These images were acquired at an accelerating voltage of 15 kV. The CL images of analysed zircon areas typically featured oscillatory or sector zoning that are characteristic of igneous zircons (**Fig. S-2**). We purposely avoided, as much as possible, cracks, patchy domains, weathered/altered domains and visible metamorphic overgrowths/recrystallized zones so as to retrieve the most pristine isotopic signal for meaningful interpretations.

SIMS analysis of zircon oxygen isotope compositions

The oxygen isotope compositions of zircons grains separated from eight different samples were measured at the University of Lausanne by secondary ion mass spectrometry (SIMS) using the 1280 Swiss-SIMS instrument. Depending on the number of separated zircons, 1 to 15 zircon grains per sample and up to two spots per grain were analysed. The analyses were conducted with a ~15 µm spot using a 10 kv Cs^+ primary beam and a 2 nA current. After introduction into the spectrometer through a slit of ~122 micrometres, the $^{16}O^-$ and $^{18}O^-$ secondary ion beams passed through an exit slit 1 towards the respective off-axis L'2 (with a 10^{10} ohm resister) and H1 Faraday cups (with a 10^{11} ohm resister) in multi-collection mode. This analytical setting resulted in a mass resolving power of ~2400 on ^{18}O detector. Individual analyses lasted 3.5 minutes including the duration of pre-analysis sputtering, automatic centering of the secondary ion beams and 20 cycles of counting, each of which lasted 5 seconds. Oxygen isotope compositions are expressed in delta notation representing a permil deviation of the analysed $^{18}O/^{16}O$ ratio from that of VSMOW ($\delta^{18}O=1000*(^{18}O/^{16}O)_{sample}/(^{18}O/^{16}OV)_{SMOW}-1000$). Repeated analyses of 91500 zircon standard ($\delta^{18}O$ = +9.9 ± 0.3 ‰) (Wiedenbeck *et al.*, 2004) mounted in the same indium mount as our zircon crystals were used to control the stability of the signal over the analytical session, to correct for instrumental mass fractionation, and to evaluate the reproducibility of the analyses. The 91500 zircon standard measurements allowed estimating an external reproducibility of 0.4 ‰ (2 SD; n=29) (**Table S-2**).

LA-MC-ICP-MS measurements of zircon silicon isotope compositions

The silicon isotope composition of zircons was analysed at Laboratoire Magmas et Volcans by laser-ablation multi-collection inductively coupled plasma mass spectrometry (LA-MC-ICP-MS), using a Resonetics Resolution M-50E and a Thermo Scientific Neptune Plus MC-ICP-MS. Up to 7 zircon grains per sample and 2 spots per grain were measured for Si isotope compositions. These measurements followed the procedure previously published by Guitreau *et al.* (2020). Briefly, an excimer laser characterised by a wavelength of 193 nm and an energy of 2-5 mJ was used to ablate zircon crystals with a 40 µm spots. The generated particles were carried into the mass spectrometer through a He gas flow at a rate of ~0.65 L/min. Counting operated in static multi-collection mode and the external L3 and H3 Faraday cups served for counting ^{28}Si and ^{30}Si ions respectively, whereas the ^{29}Si ions were counted on the central C cup. Individual analyses comprised 20 seconds of background measurement followed by ~70 seconds of analyses during which 70 different counting cycles were performed. Silicon isotope compositions are expressed in delta notation representing a permil deviation of the analysed $^{30}Si/^{28}Si$ ratio from that of NBS28 standards ($\delta^{30}Si=1000*(^{30}Si/^{28}Si)_{sample}/(^{30}Si/^{28}Si)_{NBS28}-1000$). Measurements of unknowns were bracketed by analyses of 91500 zircon standard that was used as an external reference for standard bracketing. Repeated analyses of Mud-Tank ($\delta^{30}Si$ = -0.36 ± 0.34 ‰, 2 SD, n=12) and MUN-4 ($\delta^{30}Si$ = -1.84 ± 0.33 ‰, 2 SD, n=12) used as secondary zircon standards gave results consistent with those of the literature (Mud-Tank $\delta^{30}Si$ = -0.34 ± 0.03 ‰, Trail *et al.*, 2018; MUN-4 $\delta^{30}Si$ = -2.05 ± 0.30 ‰, Guitreau *et al.*, 2020) (**Table S-3**).

Laser-fluorination analysis of bulk-rock O isotope composition

The bulk-rock O isotope compositions of 2 tonalitic and 4 trondhjemitic samples were measured at the University of Lausanne by laser-fluorination mass spectrometry using a MAT253 instrument. These data were analysed jointly with the bulk-quartz O isotope composition reported in Kitoga *et al.* (2024), with an external reproducibility of 0.2 ‰ (2 SD) estimated based on repeated analyses of LS1 quartz standard ($\delta^{18}O$ = 18.1 ‰) throughout the analytical session.

XRF analysis of bulk-rock major element composition

Major element compositions were analysed at Stellenbosch University using a PAN analytical Axios Wavelength Dispersive x-ray fluorescence (XRF) spectrometer. Homogeneous discs, representative of each sample, on which these measurements were performed, had been prepared by mixing 0.5 g of powder with 5 g of flux (32.8 % $LiBO_2$ + 66.7 % $Li_2B_4O_7$ + 0.5 % LiI) and fusing the mixture at 1000 ° C in an automatic Claisse M4 Gas Fusion instrument. Several reference materials (BE-N, JB-1, BHVO-A, JG-1, HUSG-1 and WITS-G) were analysed repetitively along with the samples and returned an external reproducibility (2 SD) that was lower than 0.7 wt. % for SiO_2 and Al_2O_3, and 0.1 wt. % for all the other major oxides (see here https://commons.datacite.org/doi.org/10.25519/qxr1-9y88 the dataset including reference material analyses). The reference materials further allowed estimating an accuracy of ± 5 % (2 SD) for the reported major element compositions. The volatile content or loss on ignition (LOI) was measured gravimetrically after keeping small portions of rock powders in a muffle furnace at 1000° C for a duration of 30 minutes.

Numerical modelling

To explain the origin of Si and O isotopic compositions measured in bulk TTG and zircon samples, we have simulated the composition of felsic melts formed by partial melting of an average unaltered basalt and an average silicified basalt. We further calculated the Si and O isotope composition of zircons that would crystallise from these felsic melts. Three different tasks were achieved during this numerical simulation:

- Thermodynamic determination of the nature and proportion of mineral phases as well as the proportion and composition of the melt existing at different P-T conditions (results shown in **Fig. S-5** and **Fig. S-6**)
- Calculation of the O and Si isotopic compositions of the generated melt (based on liquid/solid partitioning of O and Si isotopes);
- Estimation of the O and Si isotopic composition of zircons precipitated from the melt based on melt/zircon partitioning of O and Si isotopes.

Thermodynamic phase equilibrium modelling

We used the Perple_X software incorporating the thermodynamic database and solution models of Holland *et al.* (2018) and Holland & Powell (2011) to model the evolution of an average silicified or an average unaltered mafic source in closed system within the temperature and pressure ranges of 550 to 1020 °C and 0.5 to 1.7 GPa. Ten different oxides were considered in this thermodynamic model, namely Na_2O, CaO, K_2O, FeO, MgO, Al_2O_3, SiO_2, H_2O, TiO_2 and O_2 (NCKFMASHTO). The thermodynamic models for solid solutions considered in the model are Melt(HGPH), St(W), Ctd(W), Ep(HP11), Fsp(C1), Gt(HGP), Opx(HGP), Cpx(HGP), Crd(HGP), Bi(HGP), Mica(W), cAmph(G), IlHm(A) and Sp(HGP). The majority of these solution models were defined empirically and experimentally for relatively mafic systems, and their use for reliably simulating the evolution of a system displaying the composition of an average silicified basalt remains questionable. However, in the absence of experimental data on a silica-rich thermodynamic system, we consider that these solution models are applicable for any compositional case including for the average silicified basalt, as previously done for a pelitic source (Mayne *et al.*, 2019).

The major element compositions considered by our model for the average silicified and for the average unaltered mafic sources were calculated from previously analysed compositions of such rocks in the 3.5-3.2 Ga Onverwacht Group (Lahaye *et al.*, 1995; Furnes *et al.*, 2012; Puchtel *et al.*, 2013; Schneider *et al.*, 2018) and are given in **Table S-4**. For the silicified mafic source, we considered the major element compositions of silicified basalts published by Hofmann and Harris (2008) for eight different sections of silicified mafic lithologies and our own data acquired for five other sections to calculate the major element composition of the average silicified basalts (accessible here https://commons.datacite.org/doi.org/10.25519/qxr1-9y88). The composition of each silicified rock was weighted with its volumetric representativeness to avoid compositional bias due to the over-representation of highly silicified basalts ($SiO_2 > 85$ wt. %) in the existing data set. The compositions of equilibrated liquids and abundance of phases equilibrated at different P-T conditions (along the 600 °C/GPa, 700 °C/GPa, 800 °C/GPa and 900 °C/GPa geotherms) are illustrated in **Fig. S-5** and **Fig. S-6**.

Modelling the O and Si isotopic compositions of the melts

The melt compositions and the proportion of co-existing mineral phases provided by the thermodynamic simulation were subsequently used to calculate the $\delta^{18}O$ and the $\delta^{30}Si$ of the melt along the four different P-T paths considered (i.e.

600 °C/GPa, 700 °C/GPa, 800 °C/GPa and 900 °C/GPa). This was done by considering the total isotopic composition of the closed system (i.e. the initial isotopic composition of starting materials), and the mineral/liquid fractionation of O and Si isotopes. For the starting average unaltered basalt composition, we considered a $\delta^{18}O$ and a $\delta^{30}Si$ composition of +5.6 ‰ and -0.29 ‰, respectively, which are typically representative of unaltered mantle-derived mafic to ultramafic rocks (Pack *et al.*, 2016; Savage *et al.*, 2010). For the silicified basalts, an average $\delta^{18}O$ value of +13 to +16 ‰ and an average $\delta^{30}Si$ of ~ +0.55 ‰ were calculated from the bulk-rock analyses published in the literature (Abraham *et al.*, 2011; de Wit & Furnes, 2016; Hofmann & Harris, 2008) for silicified lithologies from the Onverwacht. Most values of mineral/melt fractionation of O isotopes ($\Delta^{18}O_{mineral/melt}$) are for granitic systems and were calculated from the composition of bulk-rock samples and minerals published previously (Shieh and Schwarcz, 1974; Faure and Harris, 1991; Valley *et al.*, 1994; Lackey *et al.*, 2008; Fourie and Harris, 2011), whereas $\Delta^{30}Si_{mineral/melt}$ values were mainly calculated based on the dataset of Murphy *et al.* (2024). The value of $\Delta^{18}O_{pyroxene/melt}$ is not available in the compiled database and was therefore set to -0.5 ‰ based on the thermodynamic models of Bindeman *et al.* (2005) and Bucholz *et al.* (2017). Although $\Delta^{18}O_{mineral/melt}$ and $\Delta^{30}Si_{mineral/melt}$ should vary with thermodynamic conditions (i.e. P-T-X), we have fixed them to constant values provided in **Table S-4**. These values apply best for TTG melts as already argued by André *et al.* (2022) because they are based on isotopic analyses in natural migmatitic or granitic systems.

Considering the above parameters, the isotopic composition of the generated melt was calculated using a simple formula of Rayleigh distillation (André *et al.*, 2022):

$$\delta^{x}A_{ZRC} = \delta^{x}A_{0} + 1000 \times (\alpha - 1) \times lnF$$

Where x is the mass number (30 or 18), A is an element (Si or O), F is the melting degree of the volume of melt in the system (at a considered P-T condition), $(\delta^{x}A)_0$ is the initial isotopic composition of the starting lithology (i.e. an average unaltered or silicified basalt) and α is an average coefficient of solid/liquid isotopic fractionation. Note that α is an average fractionation coefficient calculated as follows:

$$\alpha = \frac{\frac{\sum \Delta^{x}A_{mineral/melt} \times wt.\%_{mineral}}{\sum wt.\%_{mineral}}}{1000} + 1$$

Calculation of the O and Si isotopic composition of theoretical magmatic zircon

After calculating the O and Si isotopic composition of the melt produced at each P-T condition, we used empirically determined laws expressing $\delta^{18}O_{zircon}$ and $\delta^{30}Si_{zircon}$ as a function of melt compositions and system temperatures to estimate the isotopic composition of zircons that would have crystallised from the calculated melts. We used the following empirical laws respectively proposed by Lackey *et al.* (2008) and Guitreau *et al.* (2022) to calculate $\delta^{18}O_{zircon}$ and $\delta^{30}Si_{zircon}$ values:

$$\delta^{18}O_{zircon} = \delta^{18}O_{melt} - (0.0612 \times SiO_2 - 2.5)$$

and,

$$\delta^{30}Si_{zircon} = \delta^{30}Si_{melt} - (0.0054 \times \frac{10^6}{T^2} \times SiO_2)$$

where T is in Kelvin and SiO_2 represents the SiO_2 concentration in the liquid expressed in wt.%. Although zircon can precipitate at different temperatures and melt compositions during the evolution of a felsic melt, we simplified our calculation by considering that the average zircon precipitated at a temperature that was 50 °C lower than the initial melt temperature and that the composition of the melt remained unchanged until zircon crystallised. This might introduce a slight difference between the isotopic composition of zircon obtained in our model and the one that actually occurred in natural TTG systems, where zircon possibly precipitated continuously from a cooling and compositionally evolving melt. However, such differences are certainly comprised within analytical precision with which we typically measure the O and Si isotopic composition of natural zircons (i.e. 2 SD values <0.4 ‰). We therefore consider that our modelled zircon composition likely reflects (within error) that of zircons that could have precipitated from felsic melts produced by melting of either an average silicified basalt or an average unaltered basalt.

Supplementary Tables

Table S-1 Summary of O isotope, Si isotope and major element analyses (overleaf) in the BGGT TTG samples

Sample	TTG body	Type	Latitude	Longitude	$\delta^{18}O_{wr}$	$\delta^{18}O_{zrc}$	2SD	$\delta^{30}Si_{zrc}$	2SD	$\Delta^{18}O_{WR-Zrc}$
SK-KV01	Kaap Valley	Tonalite	-25.7702833	31.0655950		+5.7	0.4	-0.21	0.36	
SK-KV02	Kaap Valley	Trondhjemite	-25.8325333	30.8160167	+7.9					
SK-KV03	Kaap Valley	Trondhjemite	-25.8440667	30.8508000		+5.6	0.3	-0.33	0.28	
SK-KV04	Kaap Valley	Trondhjemite	-25.7178167	30.8422667		+5.4	0.3	-0.29	0.22	
SK-NL01	Nelshoogte	Trondhjemite	-25.8916833	30.6225500	+8.1					
SK-NL02	Nelshoogte	Trondhjemite	-25.8741333	30.6992333		+5.2	0.1	-0.57	0.50	
SK-NL03	Nelshoogte	Trondhjemite	-25.8153500	30.6447333		+5.8	1.0	-0.33	0.40	
SK-NL04	Nelshoogte	Tonalite	-25.7791000	30.6592667	+7.2	+5.6	0.8	-0.27	0.33	1.7
SK-THP03	Theespruit	Trondhjemite	-26.0559667	30.8503833	+7.4	+5.9	1.0	-0.37	0.49	1.5
SK-SLZ01	Stolzburg	Trondhjemite	-25.9079667	31.0906000	+6.9	+4.8	0.5	-0.60	0.50	2.1
SK-SLZ02	Stolzburg	Tonalite	-26.0247333	30.7619833	+7.2					

Table S-1 *Continued*

Sample	SiO_2	TiO_2	Al_2O_3	MgO	CaO	K_2O	Na_2O	Fe_2O_3	L.O.I.	Total
SK-KV01	63.6	0.5	15.3	3.0	4.8	1.3	4.3	5.2	1.9	99.9
SK-KV02	67.1	0.4	15.6	1.8	3.8	1.2	4.9	3.8	1.2	99.8
SK-KV03	67.3	0.5	15.1	2.0	3.6	1.1	4.9	4.2	1.6	100.2
SK-KV04	70.2	0.3	15.6	1.3	3.3	1.4	5.2	2.9	0.6	100.7
SK-NL01	72.8	0.3	15.1	0.6	2.9	1.1	4.9	2.3	0.7	100.6
SK-NL02	73.5	0.2	14.4	0.5	2.3	1.8	4.7	2.1	0.7	100.3
SK-NL03	70.0	0.4	15.2	1.3	3.3	1.0	4.8	3.2	1.1	100.3
SK-NL04	58.2	0.9	13.9	6.6	5.6	1.1	3.5	8.6	2.0	100.3
SK-THP03	72.2	0.3	15.0	1.0	2.5	1.4	5.4	2.3	0.6	100.6
SK-SLZ01	72.4	0.2	15.3	0.4	2.1	1.9	5.6	1.7	0.5	100.0
SK-SLZ02	60.1	1.0	18.4	2.2	5.2	1.6	5.7	4.8	1.4	100.4

Table S-2 SIMS analyses of O isotope compositions in Barberton TTG zircons and in 91500 standard zircon. $\delta^{18}O$, IMF and 2Se values are expressed in ‰.

Sample #	Ipr (nA)	$^{18}O/^{16}O$ H'2/L'2	16O/Coeff L'2	yield	$\delta^{18}O$raw	2se	IMF	**Corrected $\delta^{18}O$**	2se
91500_2	1.96E+00	2.03E-03	2.09E+09	1.07E+09	11.77	0.10	1.91	**10.09**	0.10
91500_3	1.96E+00	2.03E-03	2.08E+09	1.06E+09	11.84	0.12	1.98	**10.16**	0.12
91500_5	1.96E+00	2.03E-03	2.08E+09	1.07E+09	11.72	0.13	1.86	**10.04**	0.13
91500_6	1.95E+00	2.03E-03	2.08E+09	1.07E+09	11.54	0.10	1.68	**9.86**	0.10
91500_8	1.95E+00	2.03E-03	2.09E+09	1.07E+09	11.34	0.10	1.48	**9.66**	0.10
91500_9	1.95E+00	2.03E-03	2.08E+09	1.07E+09	11.46	0.12	1.60	**9.78**	0.12
91500_10	1.95E+00	2.03E-03	2.08E+09	1.07E+09	11.53	0.12	1.67	**9.85**	0.12
91500_11	1.94E+00	2.03E-03	2.08E+09	1.07E+09	11.41	0.12	1.55	**9.73**	0.12
91500_12	1.94E+00	2.03E-03	2.07E+09	1.07E+09	11.16	0.10	1.30	**9.48**	0.10
91500_14	1.94E+00	2.03E-03	2.07E+09	1.07E+09	11.53	0.12	1.67	**9.85**	0.12
91500_15	1.94E+00	2.03E-03	2.07E+09	1.07E+09	11.48	0.12	1.62	**9.80**	0.12
THP03-01_1	1.93E+00	2.02E-03	2.00E+09	1.03E+09	7.56	0.18		**5.86**	0.18
THP03-01_2	1.93E+00	2.02E-03	1.97E+09	1.02E+09	8.77	0.27		**7.08**	0.27
THP03-02_1	1.93E+00	2.02E-03	2.00E+09	1.03E+09	8.10	0.21		**6.40**	0.21
THP03-02_2	1.93E+00	2.03E-03	1.91E+09	9.91E+08	11.61	0.15		**9.91**	0.15
THP03-03_1	1.93E+00	2.02E-03	2.01E+09	1.04E+09	8.04	0.23		**6.34**	0.23
THP03-03_2	1.93E+00	2.02E-03	2.00E+09	1.04E+09	7.39	0.13		**5.69**	0.13
THP03-04_1	1.93E+00	2.02E-03	2.00E+09	1.04E+09	7.94	0.21		**6.24**	0.21
THP03-04_2	1.92E+00	2.02E-03	1.95E+09	1.01E+09	9.20	0.23		**7.50**	0.23
THP03-05_1	1.92E+00	2.02E-03	2.01E+09	1.04E+09	7.66	0.19		**5.96**	0.19
THP03-06_1	1.93E+00	2.02E-03	2.02E+09	1.05E+09	7.07	0.12		**5.38**	0.12
THP03-06_2	1.93E+00	2.02E-03	2.01E+09	1.04E+09	7.22	0.17		**5.53**	0.17
THP03-07_1	1.92E+00	2.02E-03	1.95E+09	1.01E+09	9.30	0.18		**7.60**	0.18
THP03-08_1	1.92E+00	2.02E-03	2.01E+09	1.04E+09	7.11	0.13		**5.41**	0.13
THP03-08_2	1.92E+00	2.02E-03	1.96E+09	1.02E+09	8.32	0.16		**6.63**	0.16
THP03-09_1	1.92E+00	2.02E-03	2.02E+09	1.05E+09	7.06	0.10		**5.37**	0.10
THP03-09_2	1.92E+00	2.02E-03	2.00E+09	1.04E+09	8.05	0.24		**6.36**	0.24
91500_17	1.92E+00	2.03E-03	2.04E+09	1.06E+09	11.86	0.12	2.00	**10.18**	0.12
THP03-10_1	1.92E+00	2.02E-03	1.99E+09	1.04E+09	8.00	0.20		**6.30**	0.20

Sample #	Ipr (nA)	$^{18}O/^{16}O$ H'2/L'2	16O/Coeff L'2	yield	δ18Oraw	2se	IMF	**Corrected δ18O**	2se
THP03-10_2	1.92E+00	2.02E-03	1.99E+09	1.04E+09	7.21	0.13		**5.52**	0.13
THP03-11_1	1.92E+00	2.02E-03	1.99E+09	1.04E+09	8.38	0.18		**6.68**	0.18
THP03-11_2	1.92E+00	2.02E-03	1.96E+09	1.02E+09	9.16	0.14		**7.47**	0.14
THP03-13_1	1.92E+00	2.02E-03	2.01E+09	1.05E+09	7.05	0.13		**5.35**	0.13
NL03-01_1	1.92E+00	2.02E-03	2.01E+09	1.05E+09	7.07	0.12		**5.37**	0.12
NL03-01_2	1.92E+00	2.02E-03	2.00E+09	1.04E+09	9.24	0.18		**7.55**	0.18
NL03-02_1	1.92E+00	2.02E-03	1.99E+09	1.04E+09	7.44	0.17		**5.74**	0.17
91500_18	1.92E+00	2.03E-03	2.05E+09	1.07E+09	11.84	0.12	1.98	**10.16**	0.12
NL03-03_1	1.92E+00	2.02E-03	1.99E+09	1.04E+09	7.78	0.13		**6.09**	0.13
NL03-03_2	1.92E+00	2.02E-03	1.98E+09	1.03E+09	7.62	0.18		**5.92**	0.18
NL03-04_1	1.92E+00	2.02E-03	1.99E+09	1.04E+09	7.74	0.17		**6.05**	0.17
NL03-05_1	1.92E+00	2.02E-03	1.94E+09	1.01E+09	6.10	0.17		**4.40**	0.17
NL03-05_2	1.91E+00	2.02E-03	1.99E+09	1.04E+09	7.56	0.16		**5.87**	0.16
NL03-06_1	1.91E+00	2.02E-03	1.99E+09	1.04E+09	7.26	0.15		**5.56**	0.15
NL03-06_2	1.91E+00	2.02E-03	2.00E+09	1.05E+09	7.09	0.11		**5.39**	0.11
NL03-07_1	1.91E+00	2.02E-03	1.95E+09	1.02E+09	8.89	0.57		**7.20**	0.57
91500_19	1.91E+00	2.03E-03	2.03E+09	1.06E+09	11.49	0.10	1.63	**9.81**	0.10
NL03-10_1	1.91E+00	2.02E-03	1.99E+09	1.05E+09	7.34	0.13		**5.64**	0.13
NL03-10_2	1.90E+00	2.02E-03	1.97E+09	1.04E+09	7.71	0.14		**6.01**	0.14
NL03-11_1	1.90E+00	2.02E-03	1.97E+09	1.04E+09	7.28	0.13		**5.58**	0.13
NL03-12_1	1.90E+00	2.02E-03	1.96E+09	1.03E+09	8.10	0.18		**6.40**	0.18
NL03-12_2	1.90E+00	2.02E-03	1.97E+09	1.04E+09	7.49	0.14		**5.80**	0.14
NL03-15_1	1.90E+00	2.02E-03	1.98E+09	1.04E+09	7.06	0.13		**5.36**	0.13
NL03-15_2	1.90E+00	2.02E-03	1.98E+09	1.04E+09	6.99	0.10		**5.29**	0.10
NL03-17_1	1.90E+00	2.02E-03	1.99E+09	1.05E+09	7.16	0.11		**5.47**	0.11
91500_20	1.90E+00	2.03E-03	2.00E+09	1.05E+09	11.73	0.10	1.87	**10.05**	0.10
NL03-17_2	1.90E+00	2.02E-03	1.89E+09	9.92E+08	6.75	0.17		**5.05**	0.17
NL03-19_1	1.90E+00	2.02E-03	1.96E+09	1.03E+09	8.33	0.14		**6.63**	0.14
NL03-20_1	1.90E+00	2.02E-03	1.95E+09	1.03E+09	8.38	0.24		**6.68**	0.24
NL03-23_1	1.90E+00	2.02E-03	1.93E+09	1.02E+09	8.49	0.18		**6.79**	0.18
NL03-24_1	1.90E+00	2.02E-03	1.96E+09	1.03E+09	6.93	0.13		**5.23**	0.13
NL03-25_1	1.90E+00	2.02E-03	1.95E+09	1.03E+09	7.38	0.11		**5.68**	0.11
NL03-26_1	1.90E+00	2.02E-03	1.95E+09	1.03E+09	7.55	0.10		**5.85**	0.10
NL03-27_1	1.89E+00	2.02E-03	1.96E+09	1.04E+09	6.96	0.13		**5.27**	0.13
91500_21	1.89E+00	2.03E-03	2.00E+09	1.06E+09	11.66	0.11	1.80	**9.98**	0.11
91500_24	1.88E+00	2.03E-03	2.01E+09	1.07E+09	11.37	0.16	1.51	**9.69**	0.16
NL04-01_1	1.88E+00	2.02E-03	1.94E+09	1.03E+09	6.53	0.11		**4.84**	0.11
NL04-01_2	1.88E+00	2.02E-03	1.89E+09	1.01E+09	8.41	0.17		**6.72**	0.17
NL04-02_1	1.87E+00	2.02E-03	1.94E+09	1.04E+09	7.66	0.11		**5.97**	0.11
NL04-02_2	1.87E+00	2.02E-03	1.93E+09	1.03E+09	7.60	0.14		**5.90**	0.14
NL04-03_1	1.87E+00	2.02E-03	1.94E+09	1.04E+09	6.58	0.10		**4.88**	0.10
NL04-03_2	1.87E+00	2.02E-03	1.92E+09	1.03E+09	6.78	0.16		**5.08**	0.16
NL04-04_1	1.87E+00	2.02E-03	1.94E+09	1.04E+09	6.83	0.13		**5.13**	0.13
NL04-04_2	1.87E+00	2.02E-03	1.94E+09	1.04E+09	6.63	0.12		**4.94**	0.12
NL04-05_1	1.87E+00	2.02E-03	1.94E+09	1.04E+09	7.54	0.12		**5.84**	0.12
NL04-05_2	1.86E+00	2.02E-03	1.94E+09	1.04E+09	7.56	0.16		**5.87**	0.16
91500_25	1.86E+00	2.03E-03	1.99E+09	1.07E+09	11.39	0.15	1.53	**9.71**	0.15
NL04-07_1	1.86E+00	2.02E-03	1.92E+09	1.03E+09	8.04	0.22		**6.35**	0.22
NL04-07_2	1.86E+00	2.03E-03	1.94E+09	1.04E+09	9.68	0.30		**7.99**	0.30
NL04-08_1	1.86E+00	2.02E-03	1.92E+09	1.03E+09	7.04	0.12		**5.34**	0.12
NL04-08_2	1.86E+00	2.02E-03	1.94E+09	1.04E+09	7.41	0.16		**5.71**	0.16
NL04-09_1	1.85E+00	2.02E-03	1.93E+09	1.04E+09	7.31	0.12		**5.61**	0.12
NL04-10_1	1.85E+00	2.02E-03	1.92E+09	1.04E+09	7.02	0.14		**5.32**	0.14
NL04-11_1	1.85E+00	2.02E-03	1.92E+09	1.04E+09	6.93	0.12		**5.24**	0.12

Sample #	Ipr (nA)	$^{18}O/^{16}O$ H'2/L'2	16O/Coeff L'2	yield	$\delta^{18}O$raw	2se	IMF	Corrected $\delta^{18}O$	2se
NL04-11_2	1.85E+00	2.02E-03	1.92E+09	1.04E+09	7.14	0.15		**5.44**	0.15
NL04-12_1	1.85E+00	2.02E-03	1.93E+09	1.04E+09	7.37	0.13		**5.68**	0.13
NL04-13_1	1.85E+00	2.02E-03	1.95E+09	1.06E+09	7.09	0.10		**5.40**	0.10
91500_26	1.85E+00	2.03E-03	1.98E+09	1.07E+09	11.38	0.11	1.52	**9.70**	0.11
NL04-13_2	1.85E+00	2.02E-03	1.94E+09	1.05E+09	6.80	0.12		**5.11**	0.12
NL04-19_1	1.85E+00	2.02E-03	1.94E+09	1.05E+09	7.34	0.11		**5.64**	0.11
NL04-19_2	1.85E+00	2.02E-03	1.93E+09	1.05E+09	7.36	0.13		**5.66**	0.13
NL04-21_1	1.85E+00	2.02E-03	1.91E+09	1.04E+09	7.24	0.15		**5.54**	0.15
NL04-21_2	1.85E+00	2.02E-03	1.91E+09	1.04E+09	7.92	0.13		**6.22**	0.13
NL04-22_1	1.84E+00	2.02E-03	1.92E+09	1.04E+09	7.22	0.10		**5.53**	0.10
NL04-22_2	1.84E+00	2.02E-03	1.91E+09	1.04E+09	7.79	0.15		**6.09**	0.15
NL04-24_1	1.84E+00	2.02E-03	1.85E+09	1.00E+09	6.71	0.26		**5.01**	0.26
NL02-02_1	1.84E+00	2.02E-03	1.93E+09	1.05E+09	6.90	0.11		**5.20**	0.11
NL02-02_2	1.84E+00	2.02E-03	1.92E+09	1.04E+09	6.83	0.14		**5.13**	0.14
91500_27	1.84E+00	2.03E-03	1.98E+09	1.08E+09	11.34	0.16	1.48	**9.66**	0.16
KV04-01_1	1.84E+00	2.02E-03	1.92E+09	1.05E+09	7.32	0.10		**5.63**	0.10
KV04-01_2	1.84E+00	2.02E-03	1.90E+09	1.04E+09	7.19	0.10		**5.49**	0.10
KV04-02_1	1.84E+00	2.02E-03	1.91E+09	1.04E+09	7.21	0.13		**5.51**	0.13
KV04-02_2	1.84E+00	2.02E-03	1.92E+09	1.04E+09	6.95	0.12		**5.26**	0.12
KV04-03_1	1.83E+00	2.02E-03	1.89E+09	1.03E+09	6.97	0.12		**5.27**	0.12
KV04-03_2	1.83E+00	2.02E-03	1.90E+09	1.04E+09	7.19	0.11		**5.49**	0.11
KV01-03_1	1.83E+00	2.02E-03	1.93E+09	1.05E+09	7.20	0.10		**5.50**	0.10
KV01-04_1	1.83E+00	2.02E-03	1.93E+09	1.05E+09	7.31	0.14		**5.61**	0.14
KV01-04_2	1.83E+00	2.02E-03	1.93E+09	1.05E+09	8.03	0.15		**6.33**	0.15
KV01-05_1	1.83E+00	2.02E-03	1.93E+09	1.06E+09	7.33	0.11		**5.63**	0.11
91500_28	1.83E+00	2.03E-03	1.97E+09	1.08E+09	11.27	0.11	1.41	**9.59**	0.11
KV01-05_2	1.82E+00	2.02E-03	1.92E+09	1.05E+09	7.60	0.10		**5.91**	0.10
KV01-06_1	1.82E+00	2.02E-03	1.91E+09	1.05E+09	7.30	0.13		**5.60**	0.13
KV01-06_2	1.82E+00	2.02E-03	1.94E+09	1.07E+09	7.69	0.45		**6.00**	0.45
KV01-07_1	1.82E+00	2.02E-03	1.92E+09	1.05E+09	7.25	0.13		**5.55**	0.13
KV01-07_2	1.82E+00	2.02E-03	1.92E+09	1.05E+09	7.21	0.11		**5.52**	0.11
KV01-08_1	1.82E+00	2.02E-03	1.90E+09	1.04E+09	7.28	0.13		**5.58**	0.13
KV01-10_1	1.82E+00	2.02E-03	1.92E+09	1.05E+09	7.48	0.15		**5.78**	0.15
KV01-10_2	1.82E+00	2.02E-03	1.91E+09	1.05E+09	7.31	0.12		**5.62**	0.12
KV01-11_1	1.82E+00	2.02E-03	1.91E+09	1.05E+09	7.25	0.12		**5.55**	0.12
KV01-12_1	1.82E+00	2.02E-03	1.90E+09	1.05E+09	7.26	0.12		**5.56**	0.12
91500_29	1.82E+00	2.03E-03	1.94E+09	1.07E+09	11.48	0.12	1.62	**9.80**	0.12
KV01-12_2	1.82E+00	2.02E-03	1.89E+09	1.04E+09	7.62	0.12		**5.92**	0.12
91500_31	1.81E+00	2.03E-03	1.91E+09	1.06E+09	11.76	0.10	1.90	**10.08**	0.10
91500_32	1.81E+00	2.03E-03	1.91E+09	1.05E+09	11.67	0.14	1.81	**9.99**	0.14
KV01-14_2	1.81E+00	2.02E-03	1.78E+09	9.86E+08	6.78	0.23		**5.06**	0.23
KV01-16_1	1.80E+00	2.02E-03	1.89E+09	1.05E+09	7.27	0.10		**5.55**	0.10
KV01-16_2	1.80E+00	2.02E-03	1.87E+09	1.04E+09	7.50	0.12		**5.79**	0.12
KV01-24_1	1.80E+00	2.02E-03	1.87E+09	1.04E+09	7.57	0.11		**5.85**	0.11
KV01-24_2	1.80E+00	2.02E-03	1.86E+09	1.03E+09	7.35	0.12		**5.63**	0.12
KV03-01_1	1.80E+00	2.02E-03	1.89E+09	1.05E+09	7.46	0.11		**5.74**	0.11
KV03-01_2	1.80E+00	2.02E-03	1.90E+09	1.05E+09	7.07	0.13		**5.36**	0.13
91500_33	1.80E+00	2.03E-03	1.92E+09	1.07E+09	11.51	0.14	1.65	**9.83**	0.14
KV03-02_1	1.80E+00	2.02E-03	1.88E+09	1.05E+09	7.26	0.11		**5.54**	0.11
KV03-02_2	1.80E+00	2.02E-03	1.88E+09	1.05E+09	7.28	0.11		**5.57**	0.11
KV03-03_1	1.80E+00	2.02E-03	1.89E+09	1.05E+09	7.33	0.15		**5.62**	0.15
KV03-03_2	1.80E+00	2.02E-03	1.90E+09	1.06E+09	7.33	0.12		**5.62**	0.12
KV03-05_1	1.80E+00	2.02E-03	1.89E+09	1.05E+09	7.33	0.12		**5.62**	0.12
KV03-05_2	1.79E+00	2.02E-03	1.90E+09	1.06E+09	7.38	0.12		**5.66**	0.12

Sample #	Ipr (nA)	$^{18}O/^{16}O$ H'2/L'2	16O/Coeff L'2	yield	$\delta^{18}O$raw	2se	IMF	Corrected $\delta^{18}O$	2se
KV03-06_1	1.79E+00	2.02E-03	1.90E+09	1.06E+09	7.23	0.13		**5.51**	0.13
KV03-06_2	1.79E+00	2.02E-03	1.90E+09	1.06E+09	7.37	0.10		**5.65**	0.10
KV03-07_1	1.79E+00	2.02E-03	1.89E+09	1.05E+09	7.31	0.12		**5.59**	0.12
KV03-08_1	1.79E+00	2.02E-03	1.89E+09	1.06E+09	7.33	0.12		**5.61**	0.12
91500_34	1.79E+00	2.03E-03	1.90E+09	1.06E+09	11.57	0.10	1.71	**9.89**	0.10
KV03-09_1	1.79E+00	2.02E-03	1.86E+09	1.04E+09	8.06	0.22		**6.34**	0.22
KV03-10_1	1.79E+00	2.02E-03	1.88E+09	1.05E+09	7.11	0.14		**5.39**	0.14
KV03-11_1	1.79E+00	2.02E-03	1.87E+09	1.04E+09	7.32	0.10		**5.60**	0.10
KV03-14_1	1.78E+00	2.02E-03	1.88E+09	1.05E+09	7.45	0.14		**5.73**	0.14
KV03-14_2	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.13	0.14		**5.42**	0.14
KV03-15_1	1.78E+00	2.02E-03	1.84E+09	1.03E+09	6.87	0.17		**5.15**	0.17
KV03-16_1	1.78E+00	2.02E-03	1.87E+09	1.05E+09	7.38	0.13		**5.66**	0.13
KV03-17_1	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.21	0.10		**5.50**	0.10
KV03-17_2	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.20	0.12		**5.48**	0.12
KV03-18_1	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.02	0.12		**5.30**	0.12
91500_35	1.78E+00	2.03E-03	1.89E+09	1.07E+09	11.61	0.10	1.75	**9.93**	0.10
KV03-18_2	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.70	0.18		**5.98**	0.18
KV03-21_1	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.46	0.10		**5.74**	0.10
KV03-21_2	1.78E+00	2.02E-03	1.86E+09	1.05E+09	7.15	0.14		**5.44**	0.14
SLZ01-01_1	1.77E+00	2.02E-03	1.85E+09	1.04E+09	6.81	0.20		**5.09**	0.20
SLZ01-01_2	1.77E+00	2.02E-03	1.86E+09	1.05E+09	6.70	0.12		**4.98**	0.12
SLZ01-02_1	1.77E+00	2.02E-03	1.87E+09	1.05E+09	6.85	0.12		**5.13**	0.12
SLZ01-02_2	1.77E+00	2.02E-03	1.84E+09	1.04E+09	6.09	0.12		**4.37**	0.12
SLZ01-03_1	1.77E+00	2.02E-03	1.85E+09	1.05E+09	6.50	0.14		**4.78**	0.14
SLZ01-03_2	1.77E+00	2.02E-03	1.85E+09	1.05E+09	6.57	0.14		**4.85**	0.14
SLZ01-05_1	1.77E+00	2.02E-03	1.87E+09	1.06E+09	6.10	0.13		**4.38**	0.13
91500_36	1.77E+00	2.03E-03	1.87E+09	1.06E+09	11.45	0.13	1.59	**9.77**	0.13
SLZ01-05_2	1.77E+00	2.02E-03	1.86E+09	1.05E+09	6.67	0.16		**4.95**	0.16
SLZ01-06_1	1.77E+00	2.02E-03	1.85E+09	1.05E+09	6.56	0.12		**4.84**	0.12
SLZ01-06_2	1.77E+00	2.02E-03	1.85E+09	1.05E+09	6.23	0.10		**4.51**	0.10
SLZ01-08_1	1.76E+00	2.02E-03	1.85E+09	1.05E+09	6.49	0.10		**4.77**	0.10
SLZ01-08_2	1.76E+00	2.02E-03	1.86E+09	1.05E+09	6.52	0.13		**4.80**	0.13
SLZ01-10_1	1.76E+00	2.01E-03	1.84E+09	1.04E+09	2.83	0.19		**1.12**	0.19
SLZ01-14_1	1.76E+00	2.02E-03	1.84E+09	1.04E+09	6.38	0.15		**4.66**	0.15
SLZ01-15_1	1.76E+00	2.02E-03	1.85E+09	1.05E+09	6.52	0.15		**4.80**	0.15
SLZ01-15_2	1.76E+00	2.02E-03	1.84E+09	1.05E+09	6.86	0.11		**5.14**	0.11
SLZ01-16_1	1.76E+00	2.02E-03	1.84E+09	1.05E+09	6.66	0.12			0.12
91500_37	1.76E+00	2.03E-03	1.86E+09	1.06E+09	11.46	0.14	1.60	**9.78**	0.14
SLZ01-16_2	1.76E+00	2.02E-03	1.83E+09	1.04E+09	6.85	0.14		**5.13**	0.14
SLZ01-18_1	1.76E+00	2.02E-03	1.83E+09	1.04E+09	6.33	0.12		**4.61**	0.12
SLZ01-18_2	1.76E+00	2.02E-03	1.84E+09	1.05E+09	5.07	0.14		**3.36**	0.14
SLZ01-21_1	1.75E+00	2.02E-03	1.84E+09	1.05E+09	5.77	0.17		**4.05**	0.17
SLZ01-21_2	1.75E+00	2.02E-03	1.83E+09	1.04E+09	5.02	0.16		**3.31**	0.16
Average 91500								**9.86±0.36 (2SD)**	

Grey lines are standard analyses. In red are data that were excluded due to significant shift from the magmatic value measured in other grains. These data are based on spots located in fractured zones (see images on Figure S-2). The shift from isotopic compositions obtained from non-fractured spots is likely due to alteration of analysed zircon areas, which is not discussed in this manuscript.

Table S-3 LA-MC-ICP-MS analysis of Si isotope compositions in zircon. Errors, δ^{29}Si, and δ^{30}Si values are expressed in ‰.

Name	δ^{29}Si	2 σ	**δ^{30}Si**	**2 σ**	^{28}Si (V)	^{27}Al/^{28}Si	δ^{30}Si' from δ^{29}Si	2 σ
Natural zircons								
SLZ01-01b	-0.30	0.11	**-0.53**	**0.30**	6.39	0.0009	-0.57	0.11
SLZ01-01a	-0.35	0.11	**-0.56**	**0.34**	5.95	0.0011	-0.67	0.11
SLZ01-02b	-0.50	0.12	**-0.85**	**0.15**	5.93	0.0022	-0.96	0.12
SLZ01-02a	-0.37	0.12	**-0.41**	**0.20**	5.55	0.0029	-0.72	0.12
SLZ01-03b	-0.31	0.11	**-0.75**	**0.15**	5.17	0.0026	-0.59	0.11
SLZ01-03a	-0.18	0.13	**-0.39**	**0.20**	5.32	0.0086	-0.35	0.13
SLZ01-05b	-0.26	0.12	**-0.70**	**0.23**	5.51	0.0014	-0.50	0.12
SLZ01-05a	-0.37	0.15	**-0.76**	**0.14**	4.15	0.0000	-0.71	0.15
SLZ01-06b	-0.27	0.14	**-0.63**	**0.23**	4.10	0.0024	-0.51	0.14
SLZ01-06a	-0.23	0.13	**-0.59**	**0.37**	5.38	0.0032	-0.45	0.13
SLZ01-08b	-0.37	0.14	**-0.12**	**0.21**	5.05	0.0034	-0.72	0.14
SLZ01-08a	-0.59	0.13	**-0.53**	**0.25**	4.83	0.0132	-1.15	0.13
SLZ01-10	-0.54	0.21	**-1.07**	**0.39**	4.48	0.0160	-1.05	0.21
SLZ01-14	-0.39	0.12	**-1.00**	**0.36**	5.30	0.0031	-0.76	0.12
SLZ01-15	-0.42	0.13	**-0.41**	**0.16**	4.79	0.0017	-0.80	0.13
SLZ01-18b	-0.34	0.14	**-0.34**	**0.19**	4.54	0.0018	-0.65	0.14
Average SLZ01			**-0.55**	**0.39**				
KV03-01a	-0.27	0.11	**-0.43**	**0.22**	5.96	0.0000	-0.53	0.11
KV03-02	-0.23	0.12	**-0.32**	**0.20**	5.28	0.0001	-0.43	0.12
KV03-03	-0.32	0.14	**-0.04**	**0.25**	5.18	0.0000	-0.61	0.14
KV03-05a	-0.31	0.11	**-0.46**	**0.20**	5.90	0.0000	-0.59	0.11
KV03-06	-0.07	0.17	**-0.37**	**0.24**	6.30	0.0000	-0.13	0.17
KV03-07	-0.15	0.12	**-0.40**	**0.22**	5.17	0.0001	-0.28	0.12
KV03-08	-0.29	0.11	**-0.30**	**0.21**	5.83	0.0000	-0.56	0.11
Average KV03			**-0.33**	**0.28**				
NL02bout	-0.34	0.11	**-0.39**	**0.35**	5.68	0.0014	-0.66	0.11
NL02coeur	-0.29	0.12	**-0.75**	**0.40**	5.83	0.0791	-0.57	0.12
Average NL02			**-0.39**	**0.35**				
KV04-01a	-0.24	0.11	**-0.13**	**0.42**	5.89	0.0001	-0.46	0.11
KV04-01b	-0.49	0.13	**-0.25**	**0.42**	6.44	0.0003	-0.94	0.13
KV04-02a	-0.29	0.12	**-0.24**	**0.32**	5.78	0.0030	-0.55	0.12
KV04-02b	-0.52	0.11	**-0.25**	**0.25**	5.86	0.0087	-1.00	0.11
KV04-3a	-0.26	0.12	**-0.42**	**0.41**	5.61	0.0013	-0.50	0.12
KV04-03b	-0.19	0.12	**-0.42**	**0.39**	5.79	0.0021	-0.37	0.12
Average KV04			**-0.29**	**0.22**				
KV01-03	-0.38	0.12	**-0.39**	**0.44**	5.43	0.0012	-0.73	0.12
KV01-04b	-0.16	0.12	**-0.22**	**0.22**	5.91	0.0000	-0.30	0.12
KV01-04a	-0.23	0.16	**-0.05**	**0.36**	5.93	0.0001	-0.43	0.16
KV01-05a	-0.08	0.12	**0.00**	**0.28**	5.43	0.0000	-0.16	0.12
KV01-06a	-0.22	0.13	**-0.29**	**0.34**	5.37	0.0000	-0.43	0.13
KV01-07	-0.20	0.11	**-0.06**	**0.37**	5.45	0.0001	-0.38	0.11
KV01-14	-0.19	0.12	**-0.46**	**0.25**	5.39	0.0000	-0.37	0.12

Name	δ^{29}Si	2 σ	**δ^{30}Si**	**2 σ**	^{28}Si (V)	^{27}Al/^{28}Si	δ^{30}Si' from δ^{29}Si	2 σ
Average KV01			**-0.17**	**0.31**				
NL04-1b	-0.29	0.12	**-0.25**	**0.31**	5.32	0.0011	-0.56	0.12
NL04-01a	-0.36	0.12	**-0.58**	**0.29**	5.08	0.0007	-0.69	0.12
NL04-2b	-0.30	0.11	**-0.31**	**0.23**	5.37	0.0002	-0.58	0.11
NL04-3	-0.16	0.12	**-0.06**	**0.35**	5.17	0.0000	-0.30	0.12
NL04-4a	-0.17	0.13	**-0.30**	**0.39**	5.62	0.0001	-0.32	0.13
NL04-5b	-0.16	0.13	**-0.16**	**0.33**	5.61	0.0002	-0.31	0.13
NL04-7a	-0.29	0.12	**-0.23**	**0.46**	5.63	0.0000	-0.55	0.12
Average NL04			**-0.27**	**0.15**				
THP03-5	-0.36	0.14	**-0.79**	**0.39**	5.57	0.0004	-0.70	0.14
THP03-06a	-0.18	0.14	**-0.30**	**0.47**	5.56	0.0000	-0.34	0.14
THP03-07	-0.31	0.15	**-0.34**	**0.55**	4.98	0.0016	-0.59	0.15
THP03-08a	-0.20	0.12	**-0.19**	**0.49**	5.53	0.0003	-0.39	0.12
THP03-9b	-0.22	0.12	**-0.21**	**0.53**	5.41	0.0006	-0.43	0.12
Average THP03			**-0.37**	**0.49**				
NL03-02b	-0.19	0.13	**-0.39**	**0.46**	5.49	0.0039	-0.36	0.13
NL03-04	-0.28	0.14	**-0.19**	**0.42**	5.64	0.0001	-0.54	0.14
NL03-05 (entre a-b)	-0.33	0.18	**-0.28**	**0.49**	5.84	0.0009	-0.63	0.18
NL03-6b	-0.60	0.13	**-0.14**	**0.50**	5.57	0.0001	-1.15	0.13
NL03-12	-0.50	0.19	**-0.64**	**0.56**	5.27	0.0068	-0.97	0.19
Average NL03			**-0.33**	**0.40**				
Standards								
Seq1-MudTank1	-0.05	0.11	**-0.21**	**0.19**	6.38	0.0000	-0.11	0.11
seq1-MudTank-2	-0.10	0.11	**-0.39**	**0.17**	4.82	0.0000	-0.19	0.11
seq2-MudTank-1	-0.26	0.12	**-0.21**	**0.14**	5.43	0.0000	-0.51	0.12
seq2-MudTank-2	-0.23	0.12	**-0.47**	**0.21**	5.11	0.0000	-0.44	0.12
seq2-MudTank-3	-0.19	0.13	**-0.32**	**0.17**	4.97	0.0000	-0.37	0.13
seq3-MudTank-1	-0.25	0.12	**-0.36**	**0.17**	5.60	0.0000	-0.47	0.12
seq3-MudTank-2	-0.11	0.11	**-0.60**	**0.23**	5.53	-0.0076	-0.21	0.11
Seq4_MudTank1	-0.03	0.12	**-0.44**	**0.28**	5.51	0.0000	-0.05	0.12
seq4-MudTank-2	-0.20	0.12	**-0.59**	**0.27**	5.30	0.0000	-0.39	0.12
seq4-MudTank-3	-0.32	0.12	**-0.28**	**0.31**	5.24	0.0000	-0.62	0.12
seq4-MudTank-4	-0.26	0.13	**-0.50**	**0.25**	4.93	0.0000	-0.51	0.13
seq5-MudTank-1	-0.17	0.12	**-0.30**	**0.66**	5.22	0.0000	-0.33	0.12
Seq5-MudTank-2	-0.18	0.13	**-0.58**	**0.47**	5.25	0.0000	-0.36	0.13
Average MudTank	**-0.18**	**0.18**	-0.40	0.28				
Seq1-MUN1	-0.93	0.10	**-2.27**	**0.28**	6.36	0.0003	-1.80	0.10
seq1-MUN2	-0.90	0.11	**-2.01**	**0.21**	5.01	0.0003	-1.74	0.11
seq-2-MUN-1	-1.10	0.12	**-2.48**	**0.15**	5.62	0.0004	-2.12	0.12
seq2-MUN-2	-0.96	0.13	**-1.85**	**0.19**	4.47	0.0004	-1.85	0.13
seq2-MUN-3	-0.95	0.13	**-2.09**	**0.18**	5.20	0.0003	-1.83	0.13
seq3-MUN-1	-0.93	0.11	**-1.68**	**0.21**	5.84	0.0001	-1.79	0.11
seq3-MUN-2	-0.99	0.13	**-1.94**	**0.24**	5.63	0.0001	-1.91	0.13
Seq4-MUN-1	-0.74	0.12	**-1.80**	**0.29**	5.68	0.0002	-1.43	0.12
seq4-MUN-2	-0.92	0.12	**-1.61**	**0.50**	5.48	0.0003	-1.78	0.12
seq4-MUN-3	-1.00	0.12	**-1.62**	**0.30**	5.28	0.0003	-1.94	0.12
seq4-MUN-4	-0.99	0.13	**-1.95**	**0.28**	4.92	0.0003	-1.91	0.13
seq5-MUN-1	-1.02	0.12	**-2.07**	**0.72**	5.41	0.0004	-1.97	0.12
seq5-MUN-2	-1.00	0.11	**-2.10**	**0.39**	5.33	0.0004	-1.93	0.11

Name	$\delta^{29}Si$	2 σ	**$\delta^{30}Si$**	**2 σ**	^{28}Si (V)	$^{27}Al/^{28}Si$	$\delta^{30}Si'$ from $\delta^{29}Si$	2 σ
Average MUN	**-0.96**	**0.16**	**-1.96**	**0.50**				
seq1-91500-2	-0.27	0.11	**-0.48**	**0.17**	6.67	0.0003	-0.49	0.11
Seq1-91500-3	-0.32	0.10	**-0.56**	**0.32**	6.46	0.0002	-0.57	0.10
seq1-91500-4	-0.13	0.11	**-0.20**	**0.30**	6.18	0.0003	-0.23	0.11
seq1-91500-5	-0.25	0.12	**-0.53**	**0.31**	6.01	0.0004	-0.44	0.12
seq1-91500-6	-0.17	0.12	**-0.20**	**0.17**	5.79	0.0002	-0.30	0.12
seq1-91500-7	-0.19	0.12	**-0.35**	**0.17**	5.50	0.0003	-0.36	0.12
seq1-91500-8	-0.19	0.11	**-0.38**	**0.16**	5.22	0.0003	-0.36	0.11
seq1-91500-9	-0.21	0.11	**-0.25**	**0.15**	5.09	0.0002	-0.41	0.11
seq2-91500-2	-0.13	0.12	**-0.29**	**0.15**	5.62	0.0003	-0.24	0.12
seq2-91500-3	-0.31	0.11	**-0.55**	**0.18**	5.73	0.0003	-0.60	0.11
seq2-91500-4	-0.17	0.11	**-0.12**	**0.17**	5.65	0.0006	-0.34	0.11
seq1-91500-5	-0.21	0.11	**-0.54**	**0.17**	5.55	0.0002	-0.41	0.11
seq2-91500-6	-0.20	0.13	**-0.30**	**0.18**	5.54	0.0003	-0.39	0.13
seq2-91500-7	-0.17	0.13	**-0.17**	**0.18**	5.54	0.0003	-0.32	0.13
Seq2-91500-8	-0.26	0.13	**-0.58**	**0.21**	5.50	0.0002	-0.50	0.13
seq-291500-9	-0.13	0.12	**-0.14**	**0.18**	5.46	0.0002	-0.25	0.12
seq2-91500-10	-0.26	0.12	**-0.54**	**0.22**	5.40	0.0001	-0.50	0.12
seq2-91500-11	-0.16	0.13	**-0.48**	**0.22**	5.41	0.0002	-0.32	0.13
seq2-91500-12	-0.24	0.13	**-0.32**	**0.39**	5.37	0.0002	-0.45	0.13
seq2-91500-13	-0.15	0.13	**-0.24**	**0.37**	5.43	0.0002	-0.30	0.13
seq2-91500-14	-0.25	0.12	**-0.36**	**0.36**	5.41	0.0004	-0.49	0.12
seq2-91500-15	-0.13	0.12	**-0.36**	**0.15**	5.32	0.0006	-0.26	0.12
seq2-91500-16	-0.25	0.12	**-0.56**	**0.16**	5.24	0.0002	-0.49	0.12
seq2-91500-17	-0.25	0.12	**-0.32**	**0.18**	5.26	0.0004	-0.48	0.12
seq3-91500-2	-0.25	0.12	**-0.27**	**0.21**	5.93	0.0004	-0.44	0.12
seq3-91500-3	-0.17	0.11	**-0.14**	**0.21**	5.94	0.0002	-0.30	0.11
seq3-91500-4	-0.18	0.12	**-0.45**	**0.19**	5.98	0.0003	-0.33	0.12
seq3-91500-5	-0.26	0.12	**-0.37**	**0.15**	5.97	0.0004	-0.47	0.12
seq3-91500-6	-0.09	0.12	**-0.45**	**0.18**	5.81	0.0003	-0.16	0.12
seq3-91500-7	-0.25	0.12	**-0.34**	**0.22**	5.86	0.0002	-0.48	0.12
seq3-91500-8	-0.28	0.11	**-0.42**	**0.24**	5.90	0.0003	-0.54	0.11
seq3-91500-9	-0.12	0.11	**-0.22**	**0.24**	5.92	-0.0068	-0.23	0.11
seq3-91500-10	-0.25	0.12	**-0.46**	**0.25**	5.84	-0.0069	-0.47	0.12
seq3-91500-11	-0.20	0.12	**-0.19**	**0.23**	5.80	-0.0070	-0.38	0.12
seq4-91500-2	-0.28	0.12	**-0.56**	**0.31**	5.81	0.0003	-0.50	0.12
seq4-91500-3	-0.20	0.12	**-0.26**	**0.33**	5.81	0.0003	-0.36	0.12
seq4-91500-4	-0.19	0.11	**-0.19**	**0.41**	5.78	0.0003	-0.33	0.11
seq4-91500-5	-0.21	0.11	**-0.45**	**0.41**	5.74	0.0002	-0.37	0.11
seq4-91500-6	-0.14	0.12	**-0.40**	**0.38**	5.67	0.0003	-0.26	0.12
seq4-91500-7	-0.23	0.12	**-0.31**	**0.29**	5.77	0.0001	-0.44	0.12
seq4-91500-8	-0.19	0.12	**-0.50**	**0.27**	5.63	0.0003	-0.37	0.12
seq4-91500-9	-0.19	0.11	**-0.39**	**0.26**	5.60	0.0002	-0.36	0.11
seq4-91500-10	-0.22	0.11	**-0.16**	**0.41**	5.74	0.0002	-0.42	0.11
seq4-91500-11	-0.23	0.12	**-0.38**	**0.41**	5.67	0.0002	-0.44	0.12
seq4-91500-12	-0.21	0.12	**-0.54**	**0.48**	5.66	0.0001	-0.41	0.12
seq4-91500-13	-0.18	0.12	**-0.22**	**0.37**	5.57	0.0002	-0.34	0.12
seq4-91500-14	-0.18	0.12	**-0.26**	**0.35**	5.57	0.0006	-0.34	0.12
seq4-91500-15	-0.20	0.12	**-0.56**	**0.25**	5.55	0.0004	-0.39	0.12
seq4-91500-16	-0.23	0.12	**-0.25**	**0.27**	5.55	0.0002	-0.45	0.12
seq4-91500-17	-0.18	0.12	**-0.36**	**0.27**	5.51	0.0003	-0.35	0.12
seq4-91500-18	-0.19	0.13	**-0.41**	**0.27**	5.52	0.0003	-0.38	0.13
seq4-91500-19	-0.22	0.13	**-0.36**	**0.28**	5.51	0.0003	-0.42	0.13
seq4-91500-20	-0.15	0.12	**-0.33**	**0.29**	5.52	0.0002	-0.28	0.12

Name	$\delta^{29}Si$	2 σ	**$\delta^{30}Si$**	**2 σ**	^{28}Si (V)	$^{27}Al/^{28}Si$	$\delta^{30}Si'$ from $\delta^{29}Si$	2 σ
sea4-91500-21	-0.22	0.12	**-0.33**	**0.28**	5.50	0.0002	-0.42	0.12
seq4-91500-22	-0.20	0.11	**-0.30**	**0.27**	5.42	0.0003	-0.38	0.11
seq4-91500-23	-0.29	0.11	**-0.35**	**0.26**	5.38	0.0002	-0.55	0.11
seq4-91500-24	-0.14	0.11	**-0.40**	**0.27**	5.39	0.0003	-0.27	0.11
seq4-91500-25	-0.12	0.12	**-0.41**	**0.26**	5.32	0.0003	-0.23	0.12
seq4-91500-26	-0.27	0.12	**-0.18**	**0.25**	5.20	0.0002	-0.51	0.12
seq4-91500-27	-0.19	0.12	**-0.49**	**0.25**	5.21	0.0002	-0.36	0.12
seq5-91500-2	-0.23	0.13	**-0.28**	**0.38**	5.46	0.0003	-0.41	0.13
seq5-91500-3	-0.13	0.13	**-0.13**	**0.31**	5.52	0.0006	-0.23	0.13
seq5-91500-4	-0.29	0.13	**-0.65**	**0.31**	5.60	0.0003	-0.52	0.13
seq91500-5	-0.18	0.12	**-0.34**	**0.38**	5.55	0.0003	-0.33	0.12
seq5-91500-6	-0.15	0.13	**-0.36**	**0.43**	5.47	0.0003	-0.27	0.13
seq5-91500-7	-0.16	0.14	**-0.45**	**0.46**	5.42	0.0003	-0.30	0.14
seq5-91500-8	-0.32	0.14	**-0.23**	**0.45**	5.43	0.0003	-0.62	0.14
seq5-91500-9	-0.09	0.13	**-0.25**	**0.48**	5.58	0.0003	-0.18	0.13
seq5-91500-10	-0.30	0.12	**-0.55**	**0.38**	5.45	0.0002	-0.59	0.12
seq5-91500-11	-0.10	0.11	**-0.39**	**0.45**	5.65	0.0004	-0.19	0.11
seq5-91500-12	-0.24	0.12	**-0.33**	**0.49**	5.45	0.0003	-0.46	0.12
seq5-91500-13	-0.20	0.12	**-0.30**	**0.53**	5.47	0.0003	-0.39	0.12
seq5-91500-14	-0.26	0.14	**-0.25**	**0.45**	5.41	0.0004	-0.51	0.14
seq5-91500-15	-0.15	0.14	**-0.45**	**0.41**	5.39	0.0003	-0.29	0.14
seq5-91500-16	-0.22	0.14	**-0.35**	**0.46**	5.39	0.0003	-0.43	0.14
seq5-91500-17	-0.13	0.12	**-0.32**	**0.50**	5.43	0.0003	-0.25	0.12
seq5-91500-18	-0.24	0.11	**-0.40**	**0.43**	5.33	0.0002	-0.46	0.11
Average 91500	**-0.20**	**0.11**	**-0.36**	**0.25**				

In red are data that were excluded due to significant shift from the magmatic value measured in other grains. These data are based on spots located in fractured zones (see images on Figure S-2). The shift from isotopic compositions obtained from non-fractured spots is likely due to alteration of analysed zircon areas, which is not discussed in this manuscript.

Table S-4 Parameters used in the thermodynamic model

Starting source compositions (wt.% and ‰)		
Lithology	Silicified basalt*	Unaltered basalt**
SiO_2	74.24	51.27
TiO_2	0.83	0.88
Fe_2O_3	7.82	11.98
FeO	7.03	10.78
Al_2O_3	7.15	12.37
MgO	2.44	9.54
CaO	1.44	7.85
Na_2O	0.42	2.60
K_2O	2.05	0.30
H_2O	3.10	4.59
O_2	0.18	0.18
$\delta^{18}O$	+10 to +15 ‰	+5.6 ‰
$\delta^{30}Si$	+0.55 ‰	-0.29 ‰

Mineral-melt fractionation coefficients***		
Phase	$\Delta^{30}Si_{mineral\text{-}melt}$	$\Delta^{18}O_{mineral\text{-}melt}$
Quartz	+0.04	+1.8
Plagioclase	-0.08	-0.1
Alkali feldspar		-0.1
Amphibole	-0.38	-2.9
Biotite		-4.0
Pyroxene	-0.33	-0.5
Garnet	-0.47	-2.8
magnetite		-7.1

*The major compositions of silicified basaltic source from the Barberton Greenstone Belt are based on published dataset of (Hofmann and Harris, 2008) complemented by our own dataset (accessible here https://commons.datacite.org/doi.org/10.25519/qxr1-9y88). The considered O and Si isotopic composition of this source are based on previously published compositions of silicified lavas from the Onverwacht Group (Hofmann and Harris, 2008; Abraham *et al.*, 2011; Kitoga *et al.*, 2024).

**The major element compositions of unaltered basalts used in our model were calculated based on previously published representative compositions of Barberton (Onverwacht) mafic rocks (Lahaye *et al.*, 1995; Furnes *et al., 2012;* Puchtel *et al.,* 2013*;* Schneider *et al.,* 2019*)*. The O and Si isotope compositions of unaltered basalts are considered identical to typical fresh mantle-derived lavas(Savage *et al.*, 2010; Pack and Herwartz, 2014;).

***Mineral melt fractionation coefficients of Si isotopes ($\Delta^{30}Si_{mineral\text{-}melt}$) were calculated based on Si isotope compositions of different phases in an Archean granulite (Murphy *et al.*, 2024). Mineral-melt fractionations ($\Delta^{18}O_{mineral\text{-}melt}$) of O isotopes were based on a compilation of different phase composition in magmatic systems (Shieh and Schwarcz, 1974; Faure and Harris, 1991; Lackey et al., 2008; Valley *et al.*, 1994; Fourie and Harris, 2011;). The pyroxene-liquid fractionation of O isotopes was taken from (Bindeman *et al.*, 2005) and is consistent with values obtained by numerical calculations of (Bucholz *et al.*, 2017)

Table S-5 References for O and Si isotopic compositions of magmatic zircons older than 3.0 Ga compiled from the literature and represented by density curves in Figure 3.

O isotope compositions of Pre-3.0 Ga magmatic zircons	Si isotope compositions of Pre-3.0 Ga magmatic zircons
• Bell *et al.*, 2011; • Bell and Harrison, 2013; • **Chowdhury *et al.*, 2021, 2023;** • Hiess *et al.*, 2011; • **Lei *et al.*, 2023;** • Roberts & Santosh, 2018; • Smithies *et al.*, 2021; • **Trail *et al.*, 2018;** • Valley *et al.*, 2005; • Vezinet *et al.*, 2018, 2019; • Wang *et al.*, 2022; • Zeh *et al.*, 2014	• **Chowdhury *et al.*, 2021, 2023;** • Guitreau *et al.*, 2022; • **Lei *et al.*, 2023;** • **Trail *et al.*, 2018**

In bold are papers that reported both O and Si isotopic compositions of zircon.

Supplementary Figures

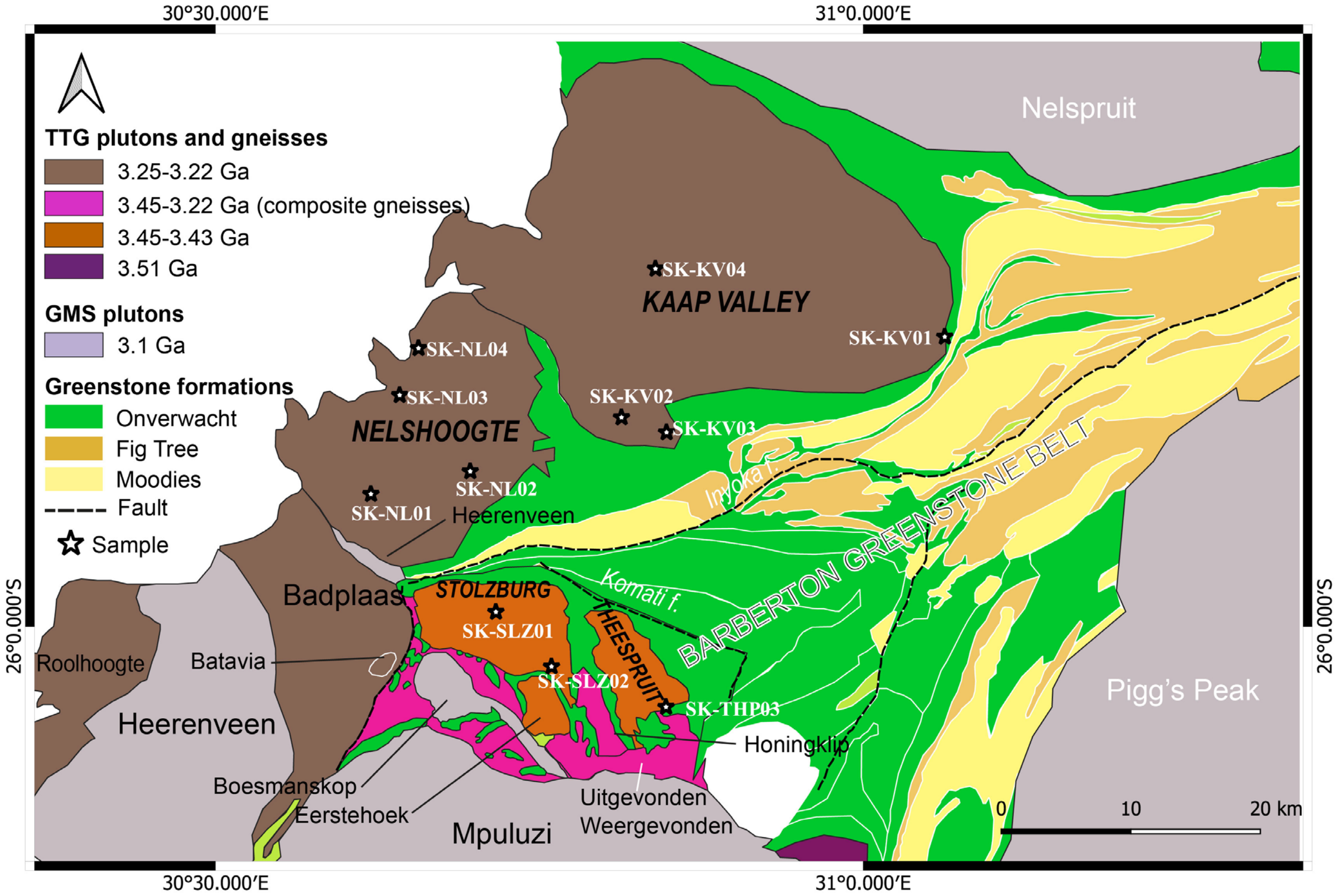


Figure S-1 Simplified geological map of the Barberton Granitoid-Greenstone Terrain. The location of outcrops from which the eleven samples analysed in this study were collected is represented with stars. The names of plutons for which isotopic compositions are discussed in this study are written in upper case and among these, the names of plutons for which we produced new data are in capital letter. The unmapped white body near Steynsdorp represents a younger granitoid. Abbreviations: TTG = tonalite-trondhjemite-granodiorite series and GMS = Granite-Monzonite-Syenite series.

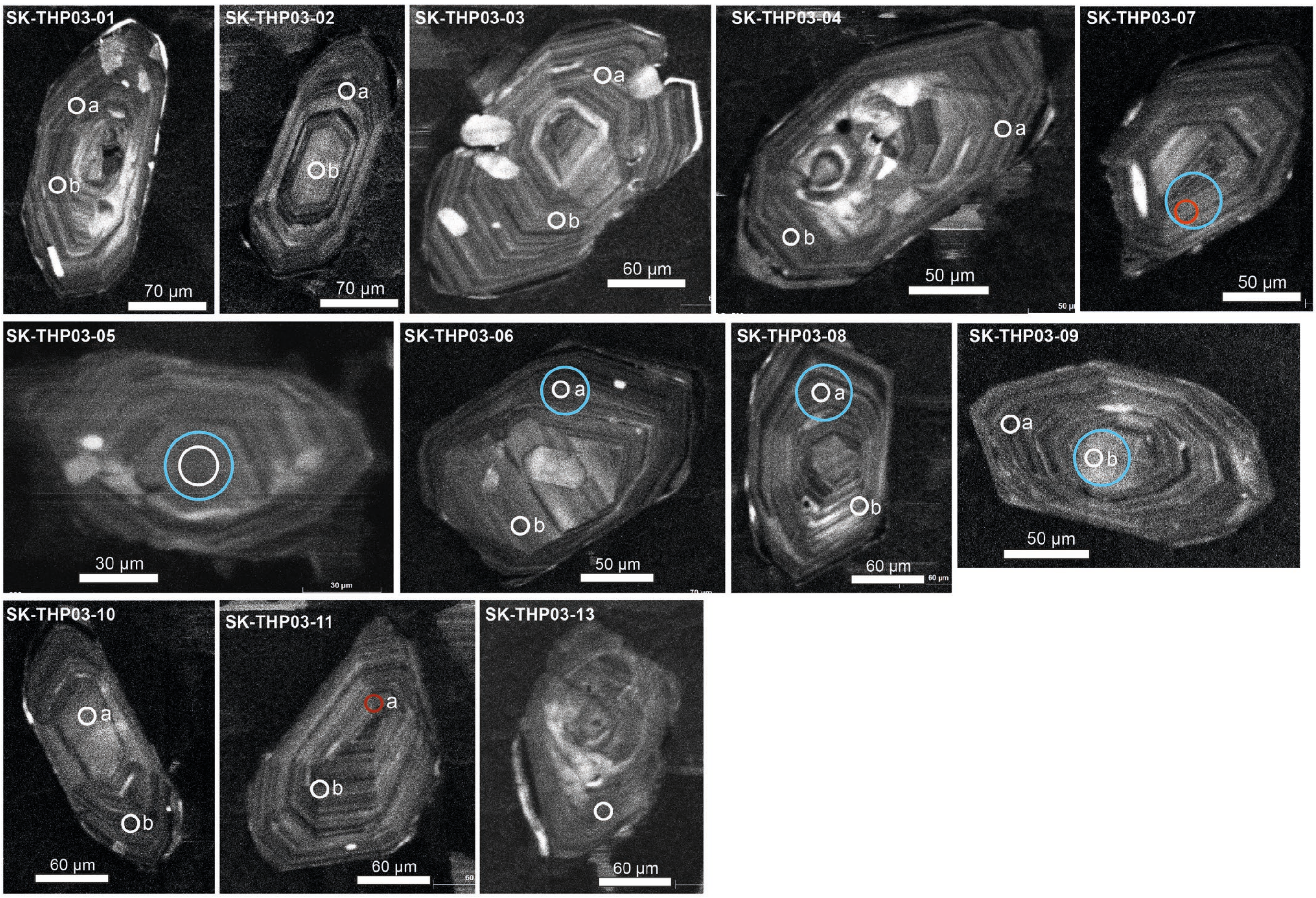


Figure S-2 Cathodoluminescence images of all analysed zircons. White circles show O isotope analysis spots (with those excluded in red), and blue circles show Si isotope analysis spots. Most analysed crystals show simple and fine oscilatory zoning, which is a typical feature of magmatic zircon crystals (e.g., Corfu *et al.*, 2003). Limited metamorphic recrystallisation and/or metasomatic alteration textures were observed, and avoided for analyses, as well as inclusions.

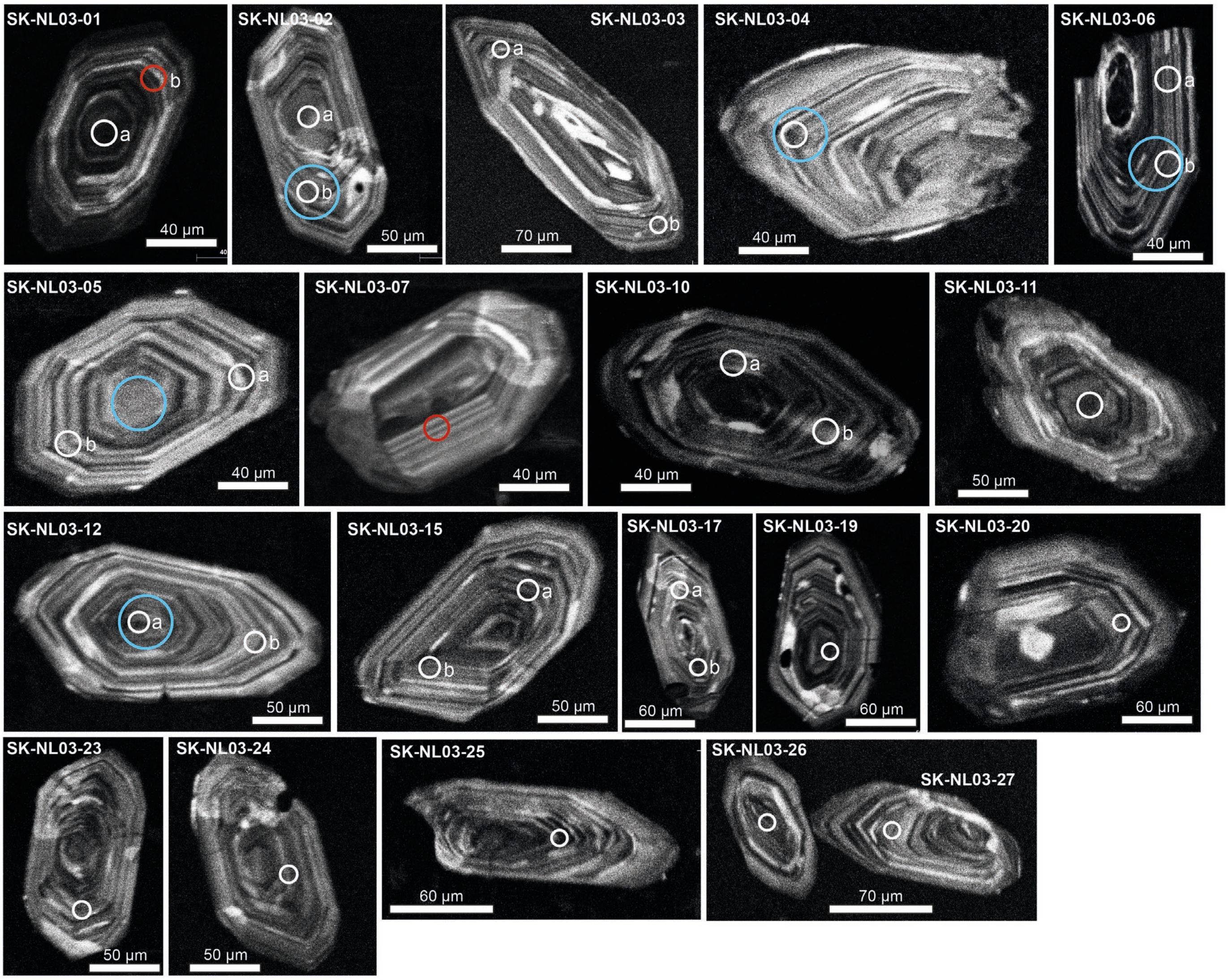
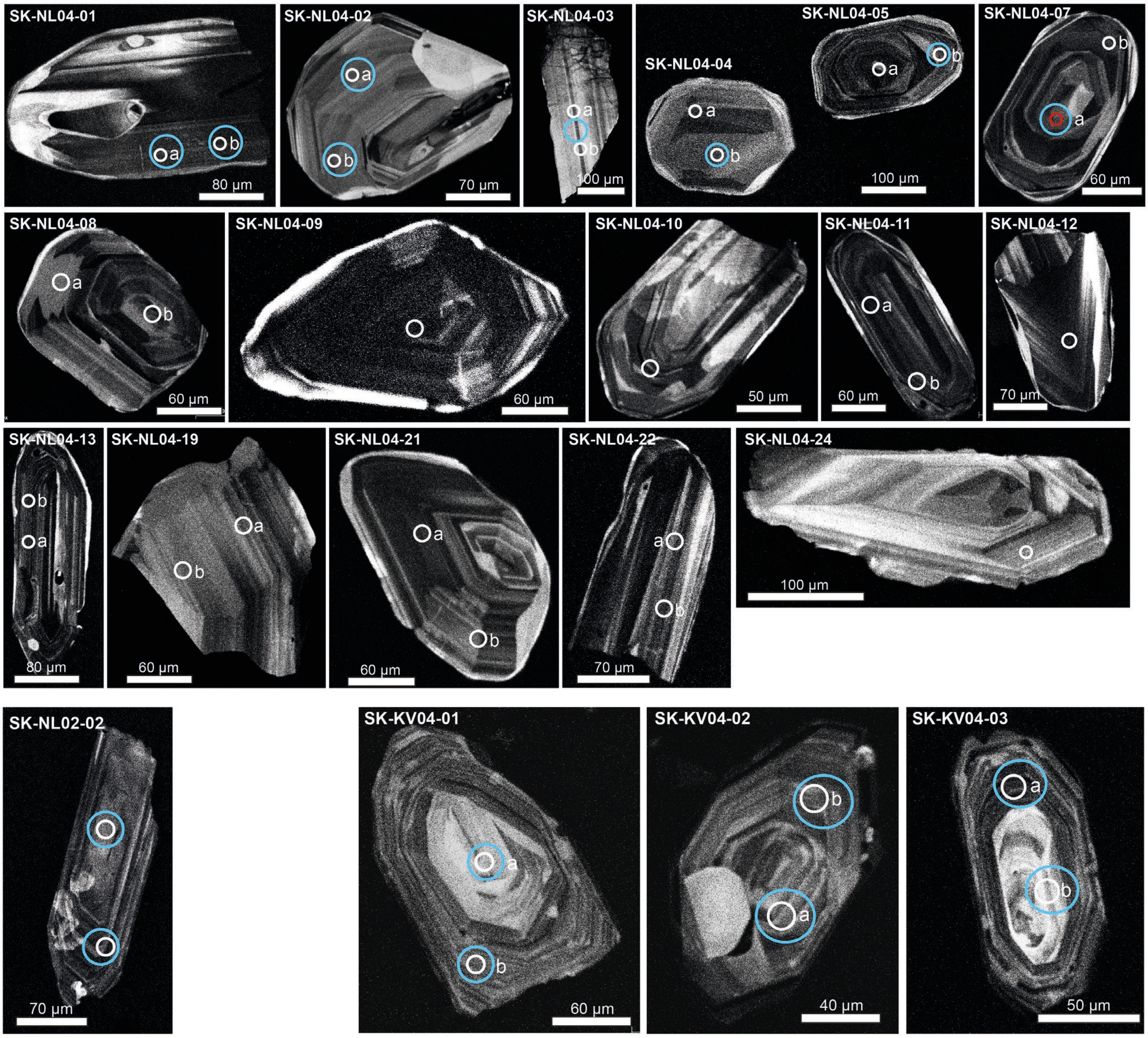


Figure S-2 (continued)



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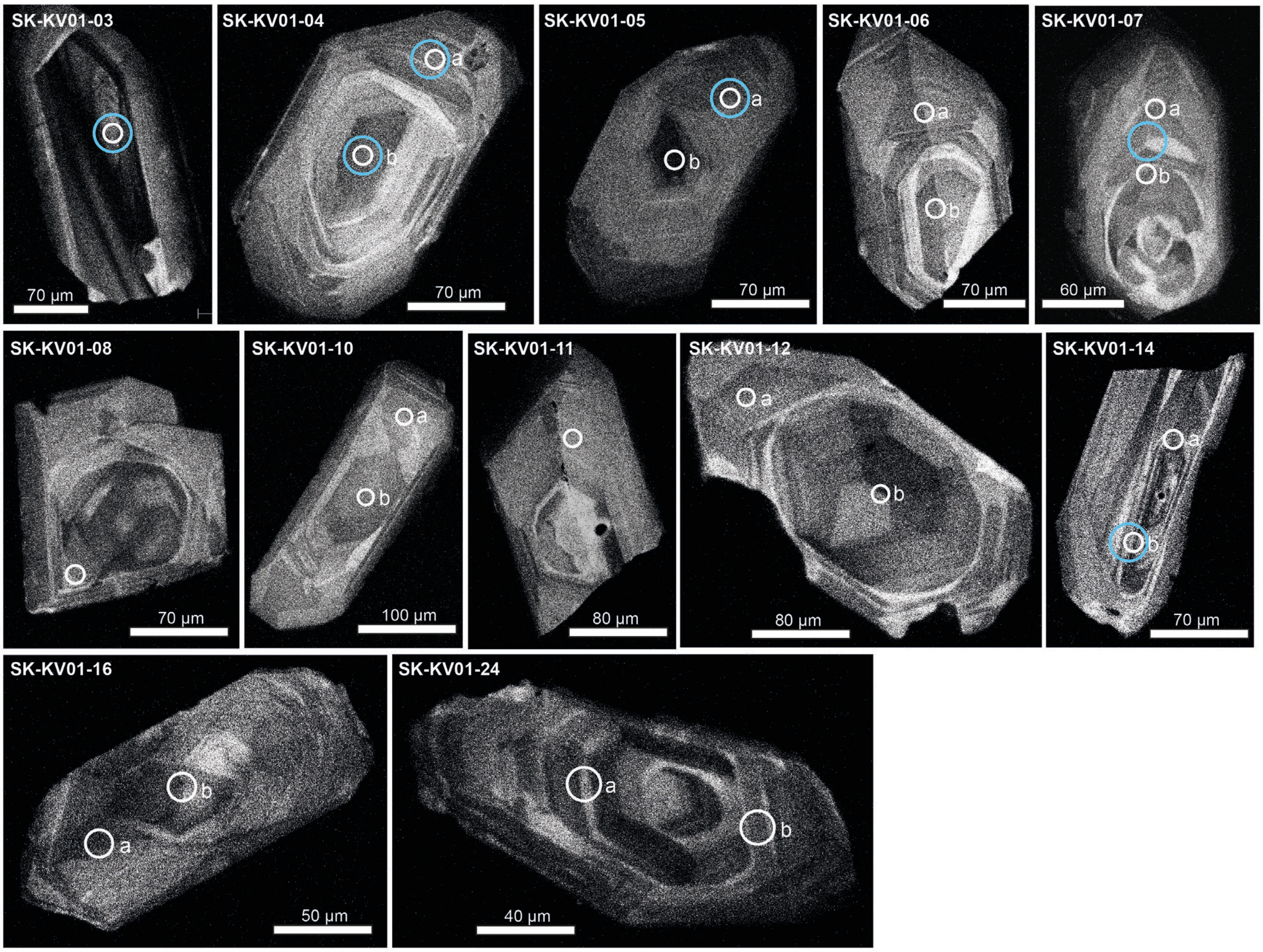

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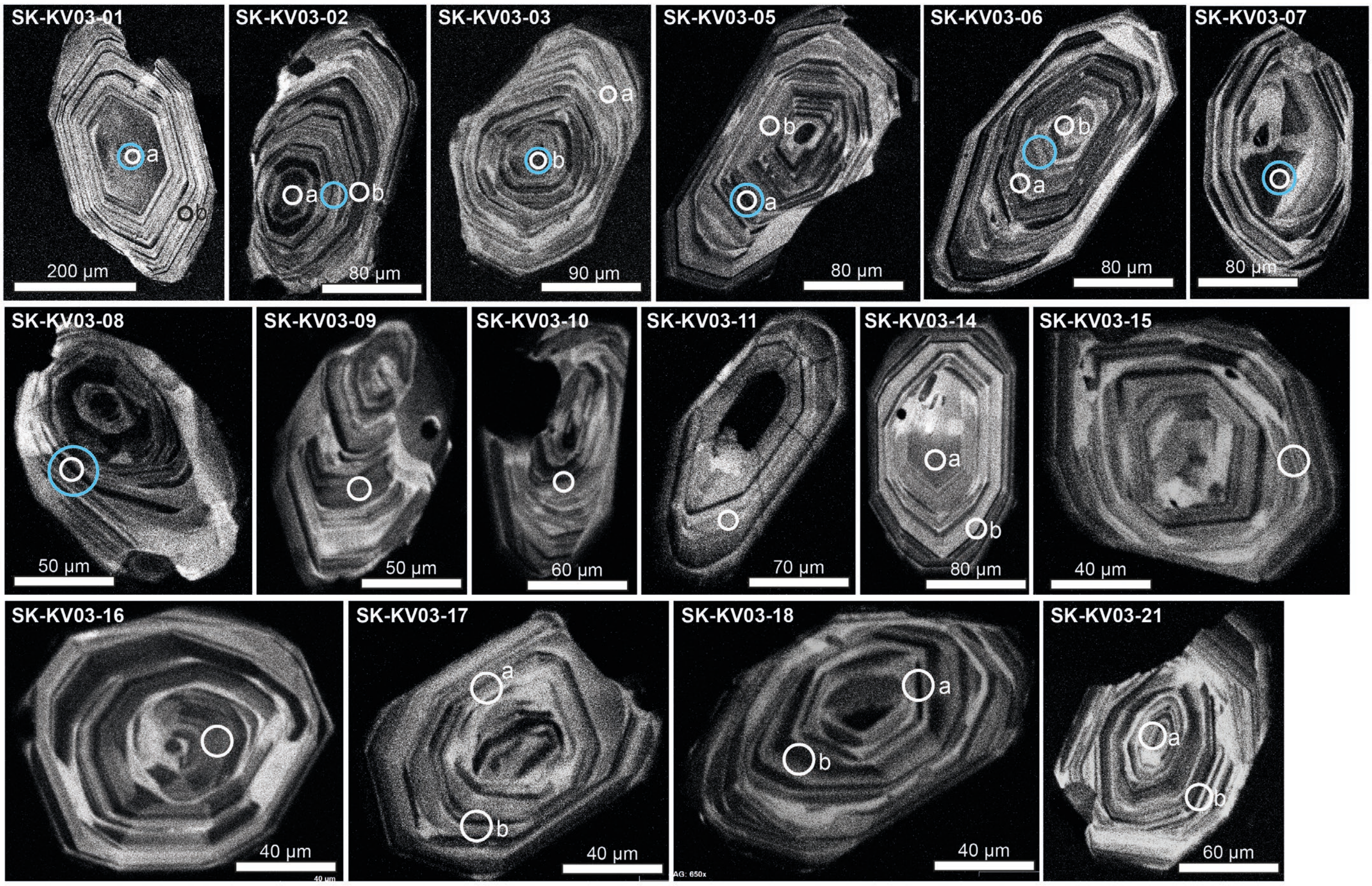

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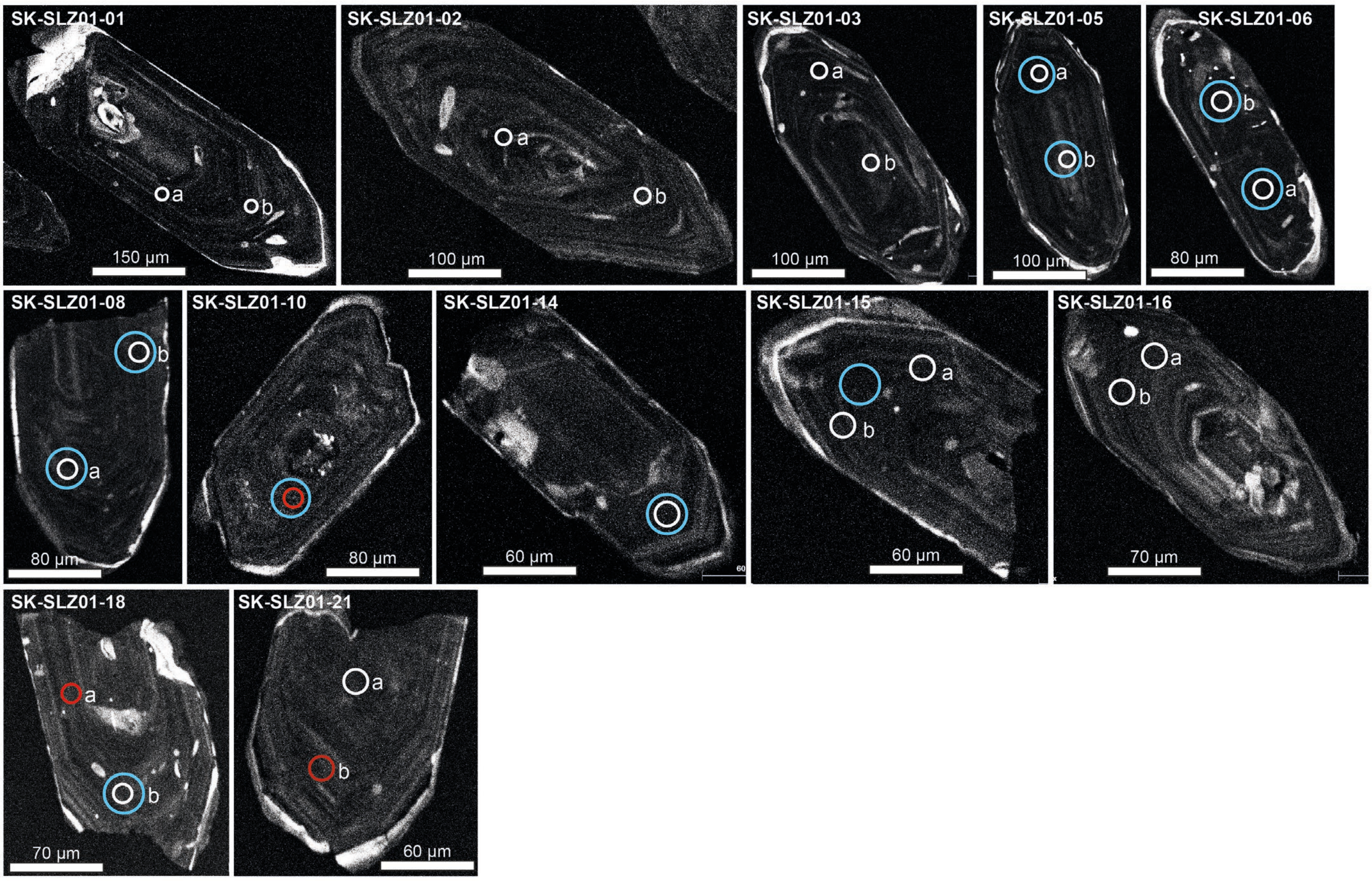

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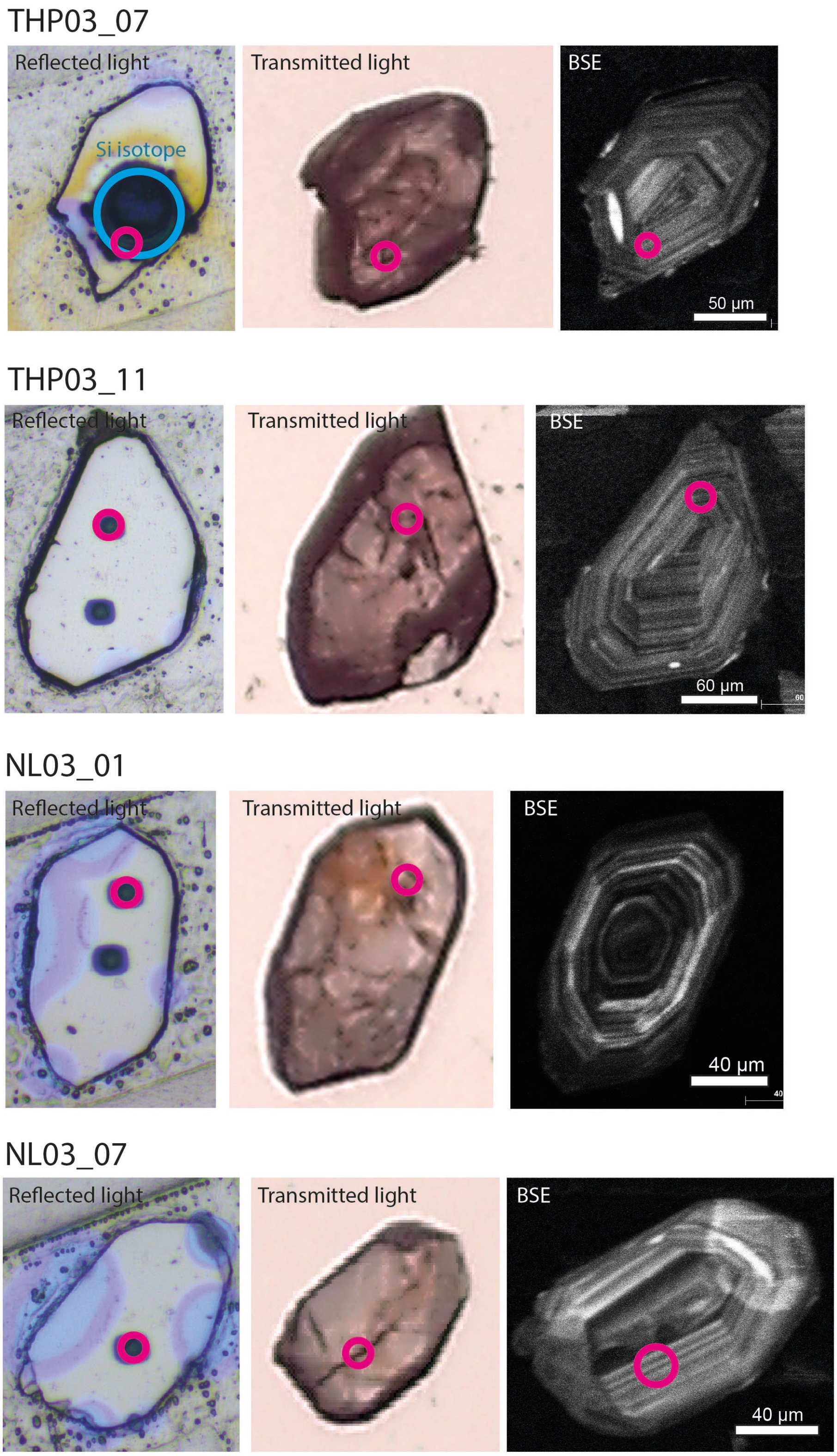

Figure S-3 Reflected and transmitted light, as well as cathodoluminescence (CL) images of zircon crystals for which some O isotope analyses were discarded (reddish pink spots) due to likely alteration and/or weathering. All of these data were acquired in seemingly simple and pristine igneous domains, as judging from CL and reflected light images, but transmitted light images revealed that these measurements were actually done on top of major cracks or tiny fracture networks located underneath crystal surfaces. We, consequently, interpreted measured O isotope signatures as no longer primary and, instead, most likely attesting to isotope exchange that was achieved through fluid circulation through cracks and very dark (radiation-damaged) domains as already documented by several detailed studies (e.g., Pidgeon *et al*., 2017, 2019; Liebmann *et al.*, 2021; Zakharov *et al.*, 2025). The zircon crystal SLZ01-10 is quite revealing of such issues. In fact, it exhibits very dark and faint zoning with tiny bright flakes in CL, altogether pointing to important radiation damage accumulation that is a pre-requisite for effective zircon alteration (e.g., Corfu *et al.*, 2003; Pidgeon *et al.*, 2017; Guitreau *et al.*, 2018; Guitreau and Flahaut, 2019). This crystal is probably the most weathered among those discarded as argued by its CL texture but more specifically by its O and Si isotope compositions that are the lowest measured (+1.12 ‰ and -1.07 ‰, respectively). These signatures comply with those expected for low-temperature weathering, as notably noted by Pidgeon *et al.* (2017) for O isotopes and Guitreau *et al.* (2022) for Si isotopes, which partly accounts for isotope data variability in very old crystals.

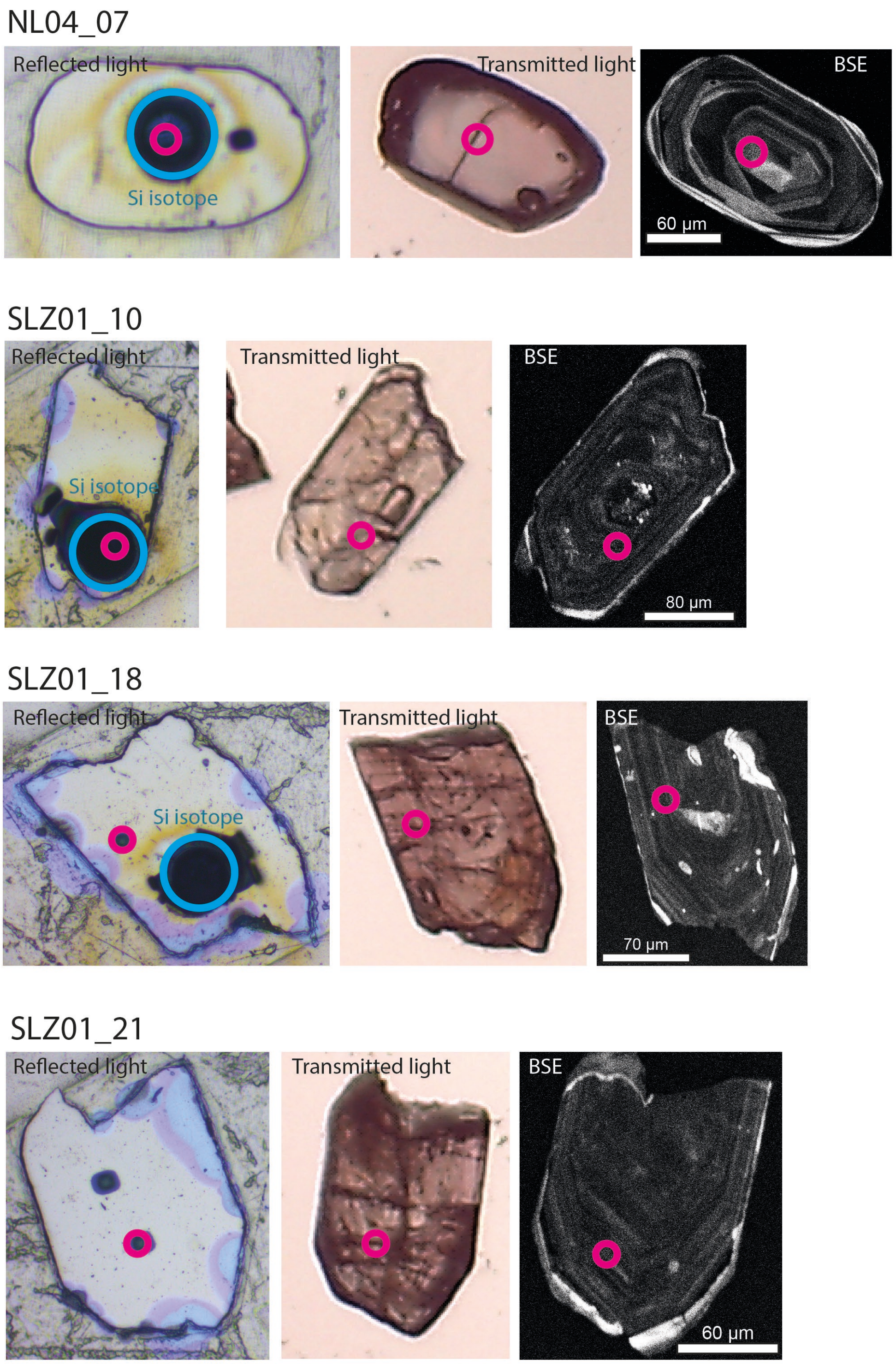

Figure S-3 (continued)

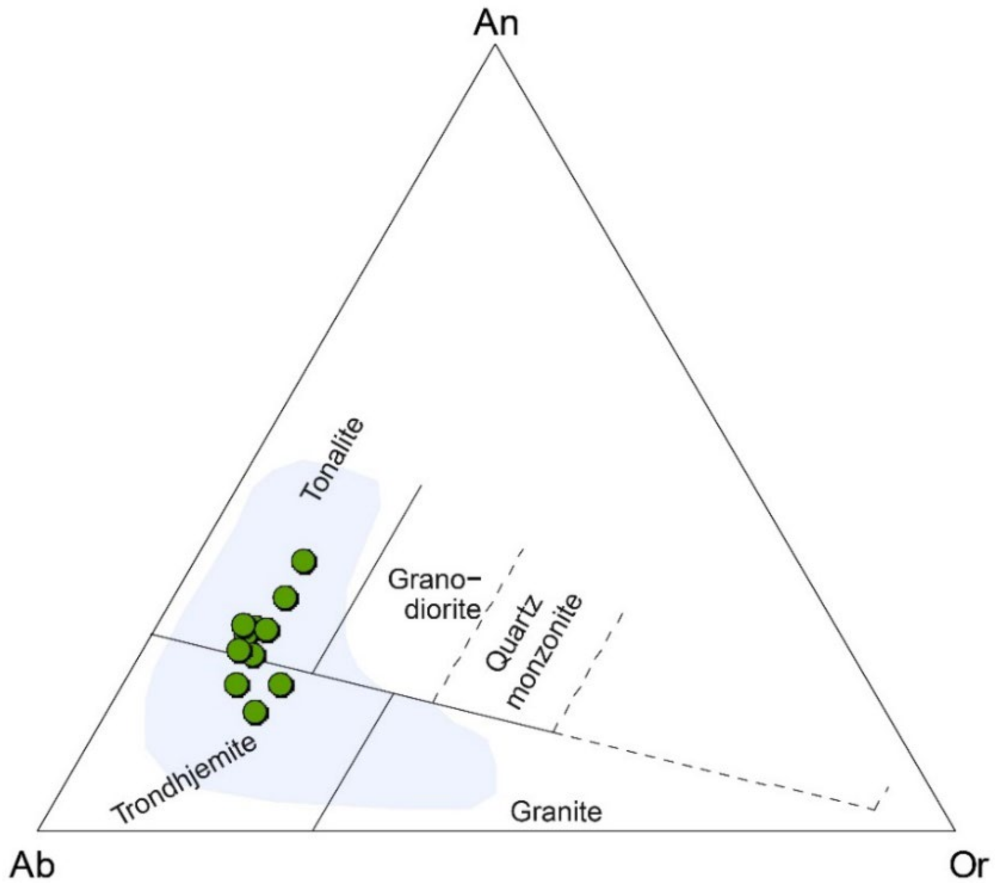

Figure S-4 Classification of the analysed Barberton TTG samples (green circles) in the An-Ab-Or diagram. The bluish field is the field of published Barberton TTG compositions (Moyen *et al.*, 2019).

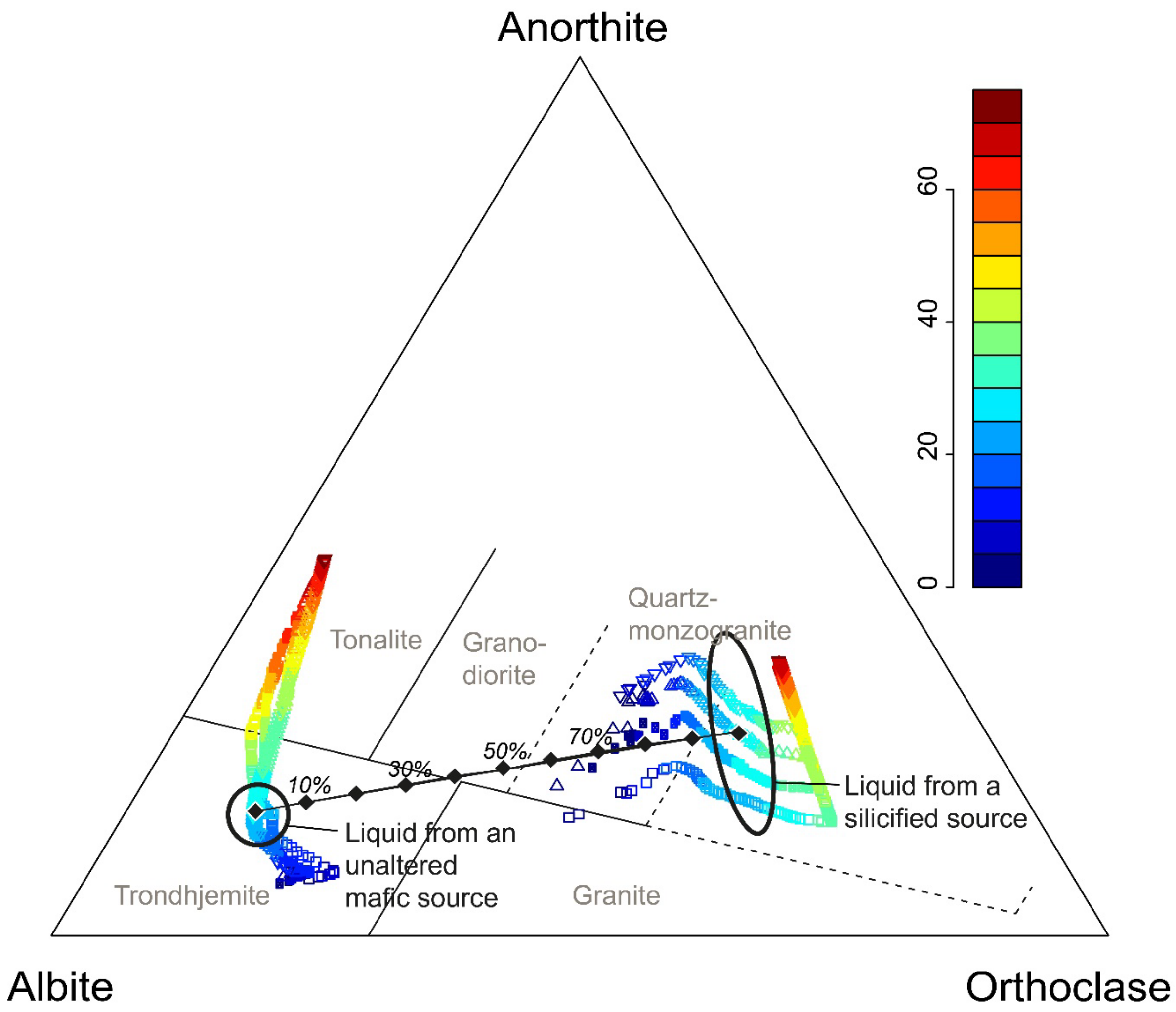

Figure S-5 Modelled liquid compositions presented in an An-Ab-Or diagram. The colour coding reflects the liquid proportion in wt. %. Black circle/ellipse represents melting conditions where a primary TTG liquid is produced. The black line shows compositions of melts obtained by mixing the liquids generated by an unaltered mafic source with those generated by a silicified seafloor source. Note the mixed liquid can contain up to 30 % of melt generated by a silicified source and still remain in the natural TTG field.

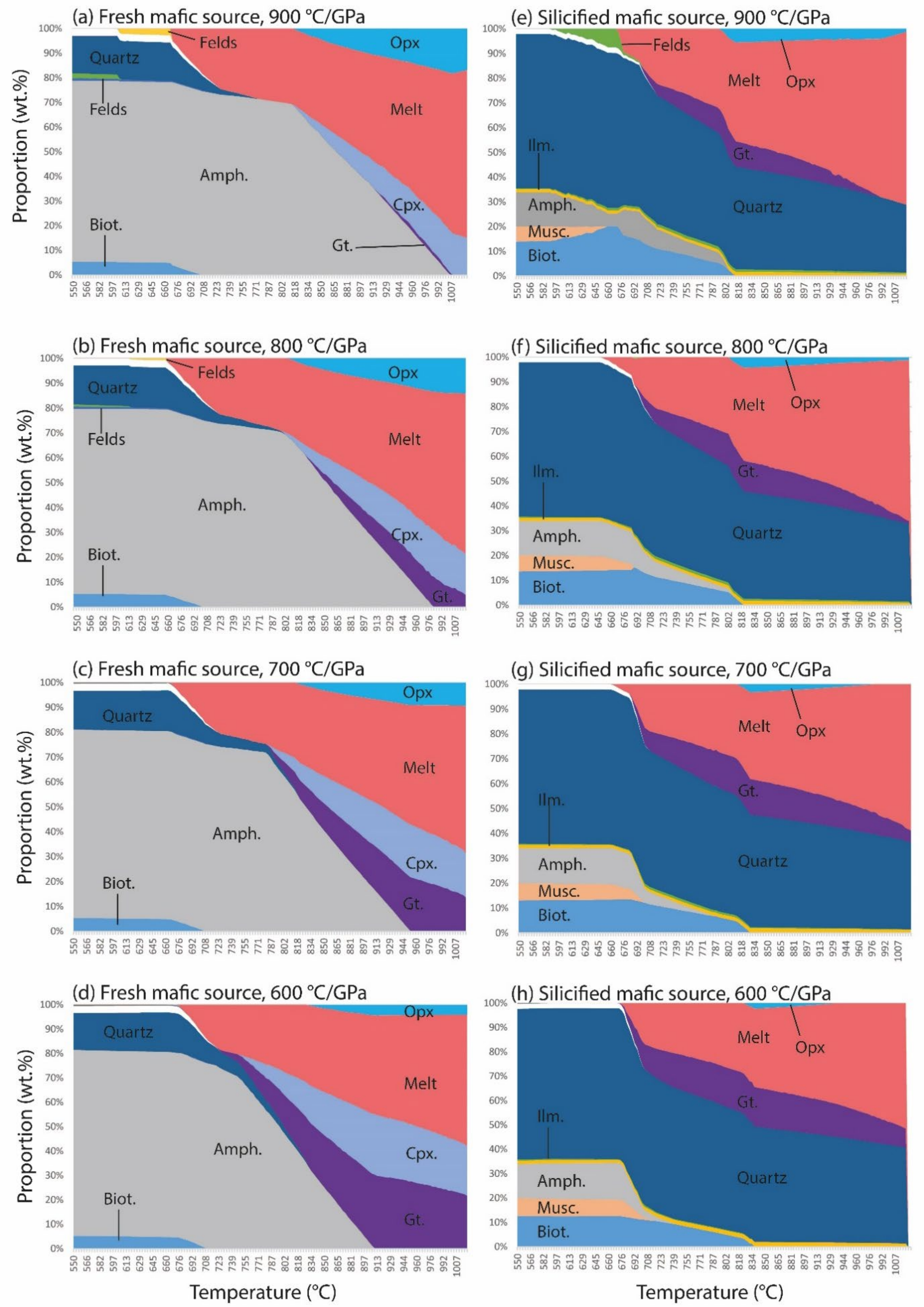

Figure S-6 Proportions of mineral phases equilibrating with the liquid at different temperatures along four different geotherms (600 °C/GPa, 700 °C/GPa, 800 °C/GPa and 900 °C/GPa). (a), (b), (c) and (d) reflect an average fresh mafic source whereas (e), (f), (g) and (h) are based on an average silicified mafic source.

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