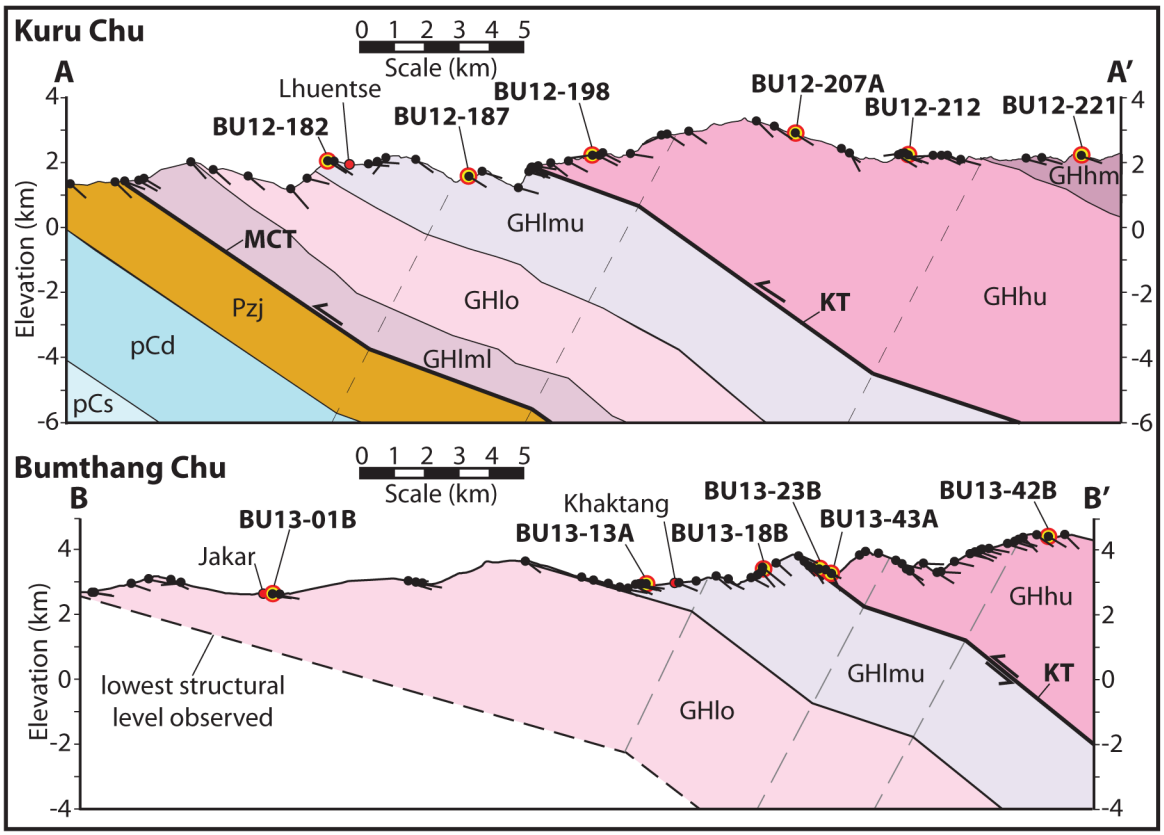
eastern Bhutan: implications for emplacement models

K.S. Agustsson, S.M. Gordon, S.P. Long, G.G.E. Seward, K. Zeiger, M. Penfold

Fig. S1. Cross-sections of the Kuru Chu and Bumthang Chu transects. The apparanet dip of tectonic foliation at each measured outcrop is projected onto the cross-section. Adjacent dip domains, defined by areas of common apparent dip, are separated by kink axes that bisect the interlimb angle (e.g. Suppe, 1983). Structural thickness (foliation-normal distance) above and below the MCT and KT were estimated fromthe cross-sections. Subsurface geometry of Lesser Himalayan rocks on the Kuru Chu cross-section is taken from Long *et al.* (2011b). See Fig. 2 for guide to map units.



Pressure–temperature–structural distance relationships within Greater Himalayan rocks in eastern Bhutan: implications for emplacement models

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Table S1. Mineralogy used to calculate Average *P–T* estimates.[a]

Sample	T (ºC) Holdaway (2000)	Activity $a(H_2O)$	T (ºC)	1σ (°C)	P (kbar)	1σ (kbar)	Al_2SiO_2 type	Garnet[b] Fe	Mn	Mg	Ca	Fe#	Bt Fe#	Pl X_{An}[c]	Ms Fe#	St Fe#	Mineral locations Bt[d]	Pl	Ms	St
BU13-01B_G1		1.00	759	29	9.4	1.3	Ky	0.74	0.07	0.16	0.03	0.82	0.51	0.13	0.40		Matrix rim	Matrix rim	Matrix rim	
		0.60	679	25	8.9	1.2														
BU13-01B_G2	671	1.00	759	30	9.1	1.3	Ky	0.74	0.05	0.18	0.03	0.80	0.51	0.13	0.42		Matrix rim	Matrix rim	Matrix rim	
		0.60	679	26	8.6	1.2														
BU13-01B_G3		1.00	740	28	9.0	1.2	Ky	0.73	0.07	0.16	0.03	0.82	0.50	0.13	0.41		Matrix rim	Matrix rim	Matrix inner rim	
		0.60	662	24	8.5	1.1														
BU12-182_G2		1.00	778	31	9.6	1.3	Ky	0.78	0.04	0.15	0.03	0.84	0.57	0.13	0.46		Matrix rim	Matrix rim	Matrix rim	
	660	0.50	671	25	9.0	1.1														
BU12-182_G6		1.00	760	29	9.5	1.3	Ky	0.78	0.04	0.16	0.02	0.83	0.56	0.11	0.46		Matrix rim	Matrix rim	Matrix rim	
		0.50	659	26	9.2	1.3														
BU12-187_G1		1.00	748	30	8.3	1.3	Ky	0.74	0.10	0.14	0.02	0.84	0.61	0.10	0.48		Matrix rim	Matrix rim	Matrix rim	
		0.75	705	28	8.2	1.3														
BU12-187_G2	704	1.00	763	37	8.2	1.4	Ky	0.74	0.09	0.15	0.02	0.84	0.62	0.13	0.48		Matrix rim	Matrix rim	Matrix rim	
		0.75	719	32	8.1	1.3														
BU12-187_G3		1.00	742	29	8.4	1.3	Ky	0.74	0.09	0.14	0.02	0.84	0.59	0.12	0.48		Matrix rim	Matrix rim	Matrix rim	
		0.75	699	27	8.2	1.2														
BU13-13A_G1		1.00	730	33	8.4	1.2	Sil	0.78	0.03	0.13	0.07	0.86	0.53	0.24	0.52		Matrix rim	Matrix rim	Inclusion rim	
	614	0.40	609	26	7.4	1.1														
BU13-13A_G3		1.00	729	33	8.4	1.2	Sil	0.76	0.03	0.14	0.07	0.85	0.53	0.23	0.58		Matrix rim	Matrix rim	Adjacent inner rim	
		0.40	608	26	7.4	1.1														
BU12-198_G1		1.00	756	40	6.9	1.2	Sil	0.77	0.10	0.10	0.04	0.88	0.66	0.18	0.56		Matrix inner	Matrix rim	Matrix inner rim	
		0.60	684	35	6.5	1.1														
BU12-198_G2	676	1.00	753	39	6.9	1.2	Sil	0.77	0.09	0.10	0.03	0.88	0.64	0.19	0.53		Matrix inner	Matrix inner	Matrix inner rim	
		0.60	682	34	6.5	1.1														
BU12-198_G3		1.00	746	39	6.8	1.1	Sil	0.77	0.09	0.11	0.04	0.88	0.67	0.22	0.52		Matrix inner	Matrix inner	Matrix inner rim	
		0.60	674	34	6.4	1.1														
BU13-18B_G1		1.00	674	23	7.0	1.0	Sil	0.83	0.02	0.11	0.04	0.88	0.58	0.19	0.50	0.85	Matrix rim	Matrix rim	Matrix rim	Matrix rim
	615	0.50	610	20	7.0	1.0														
BU13-18B_G4		1.00	665	23	6.6	1.0	Sil	0.82	0.02	0.11	0.05	0.89	0.58	0.20	0.51	0.85	Matrix rim	Matrix rim	Matrix rim	Matrix inner rim
		0.50	600	20	6.5	0.9														
BU13-23B_G1		1.00	739	30	8.5	0.7	Ky & Sil	0.73	0.09	0.15	0.03	0.83	0.52	0.26	0.43		Matrix rim	Matrix rim	Matrix rim	
	645	0.60	650	26	6.7	0.6														
BU13-23B_G5		1.00	735	29	8.4	0.6	Ky & Sil	0.71	0.11	0.13	0.05	0.84	0.52	0.25	0.42		Matrix rim	Matrix rim	Matrix rim	
		0.60	646	24	6.6	0.5														
BU13-43A_G1		1.00	702	131	9.0	2.3	Sil	0.65	0.11	0.17	0.08	0.80	0.47	0.32			Matrix rim	Matrix rim		
BU13-43A_G3	679	1.00	715	135	8.5	2.3	Sil	0.66	0.11	0.16	0.07	0.80	0.49	0.32			Matrix rim	Matrix rim		
BU13-43A_G6		1.00	716	135	9.0	2.3	Sil	0.65	0.11	0.16	0.07	0.80	0.48	0.32			Matrix rim	Matrix rim		
BU12-207A_G1		1.00	747	42	6.1	1.2	Sil	0.65	0.21	0.10	0.04	0.86	0.59	0.24	0.66		Matrix rim	Matrix rim	Matrix rim	
		0.60	678	37	5.8	1.1														
BU12-207A_G4	661	1.00	718	38	6.0	1.1	Sil	0.65	0.21	0.10	0.04	0.86	0.57	0.24	0.67		Matrix rim	Matrix rim	Matrix rim	
		0.60	653	33	5.7	1.1														
BU12-207A_G5		1.00	730	39	5.9	1.1	Sil	0.64	0.22	0.10	0.04	0.86	0.58	0.24	0.67		Matrix rim	Matrix rim	Matrix rim	
		0.60	664	34	5.7	1.1														
BU13-42B_G1		1.00	784	78	9.4	1.0	–	0.55	0.05	0.10	0.30	0.84	0.54	0.46			Matrix rim	Matrix inner rim		
		0.20	687	80	7.9	1.1														
BU13-42B_G2	665	1.00	779	81	9.4	1.1	–	0.55	0.05	0.10	0.30	0.85	0.53	0.47			Matrix inner	Matrix rim		
		0.20	684	81	7.9	1.1														
BU13-42B_G4		1.00	770	79	9.6	1.1	–	0.55	0.05	0.10	0.29	0.84	0.56	0.44			Matrix inner	Matrix inner rim		
		0.20	679	81	8.1	1.2														
BU12-212B_G1		1.00	770	32	7.6	1.3	Sil	0.91	0.01	0.07	0.02	0.93	0.76	0.06	0.73		Adjacent dis	Matrix rim	Matrix rim	
		0.40	647	24	7.1	1.1														
BU12-212B_G2		1.00	760	40	7.4	1.6	Sil	0.90	0.01	0.07	0.02	0.92	0.78	0.04	0.69		Adjacent dis	Matrix inner	Matrix rim	
	639	0.40	634	29	6.7	1.4														
BU12-212B_G4		1.00	780	32	8	1.3	Sil	0.90	0.01	0.07	0.02	0.93	0.78	0.05	0.70		Adjacent dis	Matrix rim	Matrix rim	
		0.40	650	24	7.2	1.1														
BU12-212B_G5		1.00	783	33	7.9	1.3	Sil	0.89	0.01	0.08	0.02	0.92	0.78	0.11	0.70		Adjacent dis	Matrix inner	Matrix rim	
		0.40	653	24	7.1	1.1														
BU12-221_G1		1.00	773	43	6.0	1.1	Sil	0.68	0.18	0.09	0.04	0.88	0.67	0.24	0.71		Matrix rim	Matrix rim	Matrix inner rim	
		0.60	705	39	5.7	1.0														
BU12-221_G2	699	1.00	774	45	5.8	1.1	Sil	0.68	0.20	0.08	0.04	0.89	0.67	0.23	0.70		Matrix rim	Matrix rim	Matrix rim	
		0.60	705	40	5.5	1.0														
BU12-221_G4		1.00	783	47	6.4	1.2	Sil	0.68	0.19	0.09	0.04	0.88	0.67	0.26	0.69		Matrix rim	Matrix rim	Matrix rim	
		0.60	716	48	6.2	1.3														

[a]Notes for calculations same as Table 2.

[b]Fe = Fe/(Fe+Mn+Mg+Ca); Mn = Mn/(Fe+Mn+Mg+Ca); Mg = Mg/(Fe+Mn+Mg+Ca); Ca = Ca/(Fe+Mn+Mg+Ca); Fe# = Fe/(Fe+Mg)

[c]X_{An} = Ca/(Ca+Na+K)

[d]Adjacent distal rim indicates an analysis from the matrix side of a biotite grain that is adjacent to garnet.

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Table S2. Representative electron-microprobe compositional analyses.

Sample	**BU13-01B**				**BU12-182**				**BU12-187**				**BU13-13A**		
Mineral	Garnet	Biotite	Plagioclase	Muscovite	Garnet	Biotite	Plagioclase	Muscovite	Garnet	Biotite	Plagioclase	Muscovite	Garnet	Biotite	Plagioclase
Location	near-rim[b]	Matrix rim	Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim
SiO_2	37.20	35.53	63.90	45.45	36.11	35.48	64.87	47.52	36.47	34.85	66.24	47.50	36.87	35.66	61.45
Al_2O_3	21.43	18.92	22.58	34.88	21.52	18.93	21.70	35.26	21.54	18.55	21.82	35.81	21.48	19.17	23.90
TiO_2	0.01	2.79	0.01	0.78	0.02	2.47	0.01	0.66	0.01	2.64	bdl	0.66	0.00	1.71	0.03
FeO*	33.41	18.11	0.07	1.33	34.91	19.93	bdl	1.36	33.15	21.27	0.03	1.20	35.54	19.34	0.06
Cr_2O_3	0.01	0.02	0.00	0.03	0.00	0.00	bdl	0.00	0.02	0.03	0.01	0.00	0.03	0.00	0.01
MnO	2.14	0.09	0.01	0.02	1.74	0.09	bdl	bdl	4.35	0.20	0.01	0.01	1.14	0.07	bdl
MgO	4.68	9.67	bdl	1.05	3.92	8.82	bdl	0.88	3.58	7.63	bdl	0.72	3.26	9.67	bdl
CaO	1.02	0.02	2.89	0.00	0.68	bdl	2.33	bdl	0.76	bdl	2.14	0.00	2.58	0.01	4.98
Na_2O	0.00	0.27	10.21	1.09	0.03	0.34	10.51	1.01	0.02	0.15	10.39	1.01	0.01	0.25	8.79
K_2O	bdl	8.59	0.09	9.36	0.02	8.82	0.05	9.73	0.00	9.36	0.16	9.76	0.00	8.34	0.10
Total	99.90	94.01	99.74	93.99	98.94	94.90	99.47	96.43	99.89	94.68	100.81	96.67	100.90	94.21	99.32
Cations p	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens	22 oxygens	8 oxygens
Si	2.97	5.42	2.83	3.06	2.94	5.42	2.87	3.11	2.94	5.40	2.89	3.10	2.95	5.45	2.74
Al	2.02	3.40	1.18	2.77	2.06	3.41	1.13	2.72	2.05	3.39	1.12	2.75	2.02	3.45	1.26
Ti	0.00	0.32	0.00	0.04	0.00	0.28	0.00	0.03	0.00	0.31	bdl	0.03	0.00	0.20	0.00
Fe	2.23	2.31	0.00	0.07	2.37	2.55	bdl	0.07	2.24	2.76	0.00	0.07	2.38	2.47	0.00
Cr	0.00	0.00	0.00	0.00	bdl	0.00	bdl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	0.14	0.01	0.00	0.00	0.12	0.01	bdl	bdl	0.30	0.03	0.00	0.00	0.08	0.01	bdl
Mg	0.56	2.20	bdl	0.11	0.47	2.01	bdl	0.09	0.43	1.76	bdl	0.07	0.39	2.20	bdl
Ca	0.09	0.00	0.14	0.00	0.06	bdl	0.11	bdl	0.07	0.00	0.10	0.00	0.22	0.00	0.24
Na	0.00	0.08	0.88	0.14	0.00	0.10	0.90	0.13	0.00	0.05	0.88	0.13	0.00	0.07	0.76
K	bdl	1.67	0.00	0.80	0.00	1.72	0.00	0.81	0.00	1.85	0.01	0.81	0.00	1.62	0.01
Total	8.02	15.43	5.02	6.99	8.03	15.50	5.02	6.97	8.03	15.54	5.00	6.96	8.04	15.48	5.01
X_{Fe}[a]	0.74	--	--	--	0.78	--	--	--	0.74	--	--	--	0.78	--	--
X_{Mn}	0.05	--	--	--	0.04	--	--	--	0.10	--	--	--	0.03	--	--
X_{Mg}	0.18	--	--	--	0.16	--	--	--	0.14	--	--	--	0.13	--	--
X_{Ca}	0.03	--	--	--	0.02	--	--	--	0.02	--	--	--	0.07	--	--
Fe#	0.80	0.51	--	0.42	0.83	0.56	--	0.46	0.84	0.61	--	0.48	0.86	0.53	--
Mg#	0.20	0.49	--	0.58	0.17	0.44	--	0.54	0.16	0.39	--	0.52	0.14	0.47	--
X_{An}	--	--	0.13	--	--	--	0.11	--	--	--	0.10	--	--	--	0.24

[a] X_{Fe} = Fe/(Fe+Mn+Mg+Ca); X_{Mn} = Mn/(Fe+Mn+Mg+Ca); X_{Mg} = Mg/(Fe+Mn+Mg+Ca); X_{Ca} = Ca/(Fe+Mn+Mg+Ca); Fe# = Fe/(Fe+Mg); Mg# = Mg/(Fe+Mg); X_{Ca} = Ca/(Ca+Na+K).

[b] bdl: below detection limit.

[c] Adjacent distal rim indicates an analysis from the rim furthest from the adjacent garnet.

	BU12-198				BU13-18B					BU13-23B				BU13-43A
Muscovite	Garnet	Biotite	Plagioclase	Muscovite	Garnet	Biotite	Plagioclase	Muscovite	Staurolite	Garnet	Biotite	Plagioclase	Muscovite	Garnet
Inclusion rim	near-rim	Matrix inner rim	Matrix rim	Matrix inner rim	near-rim	Matrix rim	Matrix rim	Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim	Matrix rim	near-rim
46.51	36.73	33.57	63.70	44.69	36.61	34.93	62.64	46.73	27.32	36.79	35.74	61.22	46.08	37.40
36.15	21.28	18.79	23.40	36.18	21.43	20.15	23.18	35.78	53.97	21.42	19.47	24.34	35.43	21.65
0.73	0.00	2.83	0.02	0.51	0.00	2.21	bdl	0.54	0.59	0.01	2.42	bdl	0.64	bdl
1.17	34.35	22.89	0.01	1.27	37.31	20.05	bdl	1.06	14.79	33.53	18.27	0.00	1.04	30.09
0.00	0.00	0.03	0.00	0.02	bdl	0.00	0.04	0.00	0.03	0.02	0.00	0.03	0.00	0.02
0.02	4.22	0.32	0.01	bdl	0.84	0.02	bdl	bdl	0.08	4.00	0.13	bdl	0.01	5.09
0.59	2.56	6.60	bdl	0.57	2.90	8.00	0.01	0.57	1.51	3.95	9.62	0.00	0.76	4.22
0.02	1.30	bdl	3.73	0.00	1.46	bdl	4.10	0.00	bdl	1.09	0.00	5.39	bdl	2.41
1.39	0.01	0.14	9.56	0.61	0.02	0.29	9.33	1.22	0.00	0.01	0.24	8.53	0.83	0.01
8.08	0.01	9.42	0.14	10.63	bdl	8.40	0.05	9.13	0.01	bdl	8.83	0.15	9.77	0.01
94.66	100.47	94.59	100.58	94.47	100.57	94.05	99.35	95.04	98.31	100.82	94.73	99.66	94.54	100.89
11 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	48 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens
3.07	2.97	5.27	2.80	3.01	2.95	5.37	2.79	3.09	7.91	2.94	5.42	2.73	3.08	2.96
2.82	2.03	3.48	1.21	2.87	2.04	3.65	1.22	2.79	18.43	2.02	3.48	1.28	2.79	2.02
0.04	0.00	0.33	0.00	0.03	0.00	0.26	bdl	0.03	0.13	0.00	0.28	bdl	0.03	bdl
0.06	2.32	3.01	0.00	0.07	2.51	2.58	bdl	0.06	3.58	2.24	2.32	0.00	0.06	1.99
0.00	0.00	0.00	0.00	0.00	bdl	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
0.00	0.29	0.04	0.00	bdl	0.06	0.00	bdl	bdl	0.02	0.27	0.02	bdl	0.00	0.34
0.06	0.31	1.54	bdl	0.06	0.35	1.83	0.00	0.06	0.65	0.47	2.17	0.00	0.08	0.50
0.00	0.11	bdl	0.18	0.00	0.13	bdl	0.20	0.00	bdl	0.09	0.00	0.26	bdl	0.20
0.18	0.00	0.04	0.81	0.08	0.00	0.09	0.80	0.16	0.00	0.00	0.07	0.74	0.11	0.00
0.68	0.00	1.89	0.01	0.91	bdl	1.65	0.00	0.77	0.01	bdl	1.71	0.01	0.83	0.00
6.91	8.02	15.62	5.01	7.03	8.04	15.42	5.01	6.95	30.74	8.05	15.46	5.01	6.97	8.03
--	0.77	--	--	--	0.83	--	--	--	--	0.73	--	--	--	0.66
--	0.10	--	--	--	0.02	--	--	--	--	0.09	--	--	--	0.11
--	0.10	--	--	--	0.11	--	--	--	--	0.15	--	--	--	0.16
--	0.04	--	--	--	0.04	--	--	--	--	0.03	--	--	--	0.07
0.52	0.88	0.66	--	0.56	0.88	0.58	--	0.51	0.85	0.83	0.52	--	0.43	0.80
0.48	0.12	0.34	--	0.44	0.12	0.42	--	0.49	0.15	0.17	0.48	--	0.57	0.20
--	--	--	0.18	--	--	--	0.19	--	--	--	--	0.26	--	--

		BU12-207A				BU13-42B					BU12-212B		
Biotite	Plagioclase	Garnet	Biotite	Plagioclase	Muscovite	Garnet	Biotite	Plagioclase	Amphibole	Ilmenite	Garnet	Biotite	Plagioclase
Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim	Matrix rim	near-rim	Matrix inner rim	Matrix rim	Matrix inner rim	Matrix inner rim	near-rim	Adjacent distal rim[c]	Matrix rim
35.20	59.30	36.86	34.66	61.41	44.20	37.79	35.37	55.17	40.67	bdl	35.76	34.21	66.30
19.32	25.93	21.22	19.83	24.46	35.22	21.22	15.59	28.34	14.22	0.02	21.12	19.32	20.84
1.80	0.01	bdl	2.31	0.01	0.53	0.08	3.58	0.01	1.33	51.61	0.00	3.45	0.01
17.76	0.05	29.02	19.69	0.08	2.05	25.40	20.06	0.02	18.82	44.57	39.53	24.40	0.50
0.09	bdl	0.02	0.04	0.01	0.04	bdl	0.00	0.00	bdl	0.01	0.02	0.09	0.02
0.17	0.02	9.63	0.29	0.01	0.01	2.51	0.20	0.01	0.39	1.98	0.43	bdl	bdl
10.40	bdl	2.64	8.15	bdl	0.58	2.49	9.82	bdl	7.64	0.18	1.71	4.35	0.01
0.02	6.71	1.27	0.00	5.08	0.02	10.94	0.01	9.59	11.23	0.06	0.52	bdl	1.31
0.21	7.86	0.01	0.18	8.74	0.66	0.00	0.14	5.86	1.22	0.02	0.02	0.07	10.44
9.49	0.13	0.00	9.64	0.22	10.47	0.00	9.09	0.10	1.07	bdl	0.02	9.79	0.18
94.46	100.02	100.68	94.77	100.01	93.77	100.43	93.86	99.10	96.59	98.44	99.13	95.67	99.61
22 oxygens	8 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens	12 oxygens	22 oxygens	8 oxygens	22 oxygens	3 oxygens	12 oxygens	22 oxygens	8 oxygens
5.37	2.64	2.97	5.33	2.73	3.01	2.98	5.51	2.50	5.97	bdl	2.95	5.34	2.92
3.48	1.36	2.02	3.60	1.28	2.83	1.97	2.86	1.51	2.46	0.00	2.05	3.55	1.08
0.21	0.00	bdl	0.27	0.00	0.03	0.00	0.42	0.00	0.15	1.00	0.00	0.40	0.00
2.27	0.00	1.95	2.53	0.00	0.12	1.68	2.61	0.00	2.31	0.96	2.73	3.18	0.02
0.01	bdl	0.00	0.00	0.00	0.00	bdl	0.00	0.00	bdl	0.00	0.00	0.01	0.00
0.02	0.00	0.66	0.04	0.00	0.00	0.17	0.03	0.00	0.05	0.04	0.03	bdl	bdl
2.37	bdl	0.32	1.87	bdl	0.06	0.29	2.28	bdl	1.67	0.01	0.21	1.01	0.00
0.00	0.32	0.11	0.00	0.24	0.00	0.93	0.00	0.47	1.77	0.00	0.05	bdl	0.06
0.06	0.68	0.00	0.05	0.75	0.09	0.00	0.04	0.51	0.35	0.00	0.00	0.02	0.89
1.85	0.01	0.00	1.89	0.01	0.91	0.00	1.81	0.01	0.20	bdl	0.00	1.95	0.01
15.63	5.02	8.03	15.58	5.02	7.04	8.03	15.56	5.00	14.92	2.01	8.02	15.47	4.99
--	--	0.64	--	--	--	0.55	--	--	--	--	0.91	--	--
--	--	0.22	--	--	--	0.05	--	--	--	--	0.01	--	--
--	--	0.10	--	--	--	0.10	--	--	--	--	0.07	--	--
--	--	0.04	--	--	--	0.30	--	--	--	--	0.02	--	--
0.49	--	0.86	0.58	--	0.67	0.85	0.53	--	0.58	0.99	0.93	0.76	
0.51	--	0.14	0.42	--	0.33	0.15	0.47	--	0.42	0.01	0.07	0.24	
--	0.32	--	--	0.24	--	--	--	0.47	--	--	--	--	0.06

		BU12-221			
Muscovite	K-Feldspar	Garnet	Biotite	Plagioclase	Muscovite
Matrix rim	Matrix rim	near-rim	Matrix rim	Matrix rim	Matrix inner rim
45.14	64.85	36.37	34.30	64.53	47.06
34.78	18.78	21.14	18.59	23.57	35.50
1.04	0.01	0.01	2.24	bdl	0.38
1.70	0.23	30.63	22.96	0.01	1.99
0.00	bdl	bdl	0.00	0.04	0.00
0.01	0.02	8.14	0.41	0.00	0.01
0.36	bdl	2.33	6.31	0.00	0.45
0.00	0.06	1.38	0.01	4.44	bdl
0.45	1.45	0.01	0.06	7.69	0.44
10.06	14.04	bdl	9.62	0.30	10.37
93.52	99.45	100.01	94.50	100.58	96.20
11 oxygens	8 oxygens	12 oxygens	22 oxygens	8 oxygens	11 oxygens
3.06	2.99	2.96	5.39	2.82	3.10
2.78	1.02	2.03	3.44	1.21	2.76
0.05	0.00	0.00	0.26	bdl	0.02
0.10	0.01	2.08	3.02	0.00	0.11
0.00	bdl	bdl	0.00	0.00	0.00
0.00	0.00	0.56	0.05	0.00	0.00
0.04	bdl	0.28	1.48	0.00	0.04
0.00	0.00	0.12	0.00	0.21	bdl
0.06	0.13	0.00	0.02	0.65	0.06
0.87	0.83	bdl	1.93	0.02	0.87
6.96	4.98	8.03	15.60	4.91	6.96
--	--	0.68	--	--	--
--	--	0.18	--	--	--
--	--	0.09	--	--	--
--	--	0.04	--	--	--
0.7253129	--	0.88	0.67	--	0.71
0.2746871	--	0.12	0.33	--	0.29
--	0.00	--	--	0.24	--

Pressure–temperature–structural distance relationships within Greater Himalayan rocks in eastern Bhutan: implications for emplacement models

K.S. Agustsson, S.M. Gordon, S.P. Long, G.G.E. Seward, K. Zeiger, M. Penfold

Table S3. Titanium-in-biotite temperature estimates.

Biotite Analysis	Ti concentration (apfu[a]; based on 22 O)	X_{Mg}[b]	Biotite textural location	Temperature (ºC)[c]
BU13-01B				
01B-G2-Bi1a	0.23	0.60	Garnet	649
01B-G2-Bi1b	0.23	0.60	Garnet	653
01B-G2-Bi1c	0.23	0.61	Garnet	650
01B-G2-Bi2a	0.23	0.59	Garnet	644
01B-G2-Bi2b	0.23	0.58	Garnet	641
01B-G2-Bi2c	0.23	0.58	Garnet	643
01B-M1a	0.32	0.49	Matrix	673
01B-M1b	0.32	0.49	Matrix	672
01B-M1c	0.31	0.49	Matrix	669
01B-M1d	0.31	0.49	Matrix	669
01B-M1e	0.32	0.49	Matrix	674
01B-M2a	0.22	0.50	Matrix	612
01B-M2b	0.27	0.49	Matrix	643
01B-M2c	0.25	0.49	Matrix	629
01B-M3a	0.29	0.49	Matrix	658
01B-M3b	0.28	0.50	Matrix	656
BU12-182				
182-G3-Bi1	0.27	0.53	Garnet	656
182-G3-Bi2a	0.22	0.44	Garnet	595
182-G3-Bi2b	0.18	0.44	Garnet	556
182-G3-Bi3	0.30	0.58	Garnet	685
182-G3-Bi6	0.31	0.54	Garnet	678
182-M1a	0.29	0.42	Matrix	648
182-M1b	0.29	0.42	Matrix	644
182-M1c	0.29	0.43	Matrix	648
182-M2a	0.27	0.43	Matrix	632
182-M2b	0.28	0.44	Matrix	645
BU12-187				
187-G1-Bi	0.35	0.49	Garnet	687
187-M4a	0.33	0.41	Matrix	667
187-M4b	0.33	0.41	Matrix	665
187-M4c	0.34	0.41	Matrix	670
187-M4d	0.33	0.42	Matrix	669
187-M4e	0.33	0.42	Matrix	668
187-M4f	0.33	0.41	Matrix	668
187-M4g	0.34	0.41	Matrix	669

187-M4h	0.33	0.41	Matrix	667
187-M4i	0.31	0.39	Matrix	651
187-M1a	0.29	0.43	Matrix	648
187-M1b	0.29	0.41	Matrix	645
187-M1c	0.29	0.42	Matrix	645
187-M2a	0.28	0.41	Matrix	637
187-M2b	0.29	0.41	Matrix	645
187-M2c	0.29	0.40	Matrix	644
187-M2d	0.30	0.41	Matrix	650
187-M2e	0.29	0.42	Matrix	643
187-M3a	0.27	0.38	Matrix	628
187-M3b	0.29	0.40	Matrix	644
187-M3c	0.30	0.41	Matrix	647
187-M3d	0.31	0.41	Matrix	653
187-M3e	0.30	0.40	Matrix	647
BU13-13A				
13A-G1Bi2a	0.14	0.42	Garnet	473
13A-G1Bi2b	0.14	0.41	Garnet	470
13A-G1Bi2c	0.14	0.40	Garnet	482
13A-M2a	0.18	0.48	Matrix	568
13A-M2b	0.19	0.48	Matrix	570
13A-M2c	0.18	0.48	Matrix	565
13A-M2d	0.19	0.47	Matrix	578
13A-M2e	0.20	0.47	Matrix	581
13A-M4a	0.18	0.47	Matrix	559
13A-M4b	0.17	0.45	Matrix	546
13A-M5a	0.18	0.46	Matrix	554
13A-M5b	0.20	0.46	Matrix	582
13A-M5c	0.19	0.47	Matrix	576
13A-M6a	0.21	0.46	Matrix	597
13A-M6b	0.20	0.46	Matrix	584
BU12-198				
198-G2-Bi1a	0.35	0.43	Garnet	677
198-G2-Bi1b	0.36	0.42	Garnet	680
198-G2-Bi1c	0.37	0.43	Garnet	687
198-G2-Bi1d	0.36	0.43	Garnet	681
198-M1a	0.35	0.34	Matrix	669
198-M1b	0.32	0.34	Matrix	652
198-M1c	0.32	0.34	Matrix	653
198-M1d	0.30	0.34	Matrix	643
198-M1e	0.31	0.34	Matrix	646
198-M2a	0.35	0.35	Matrix	666
198-M2b	0.32	0.35	Matrix	653
198-M2c	0.33	0.34	Matrix	658
198-M2d	0.34	0.34	Matrix	663

198-M2e	0.31	0.33	Matrix	643
198-M2f	0.26	0.35	Matrix	620
198-M3a	0.33	0.36	Matrix	658
198-M3b	0.33	0.35	Matrix	660
198-M3c	0.32	0.34	Matrix	651
198-M3d	0.33	0.36	Matrix	657
198-M3e	0.31	0.35	Matrix	645
198-M3f	0.29	0.35	Matrix	636
198-M3g	0.31	0.35	Matrix	649
198-M3h	0.33	0.33	Matrix	654
198-M4a	0.29	0.33	Matrix	635
198-M4b	0.33	0.34	Matrix	659
198-M4c	0.36	0.34	Matrix	670
198-M4d	0.37	0.34	Matrix	676
198-G1-Bi1	0.47	0.41	Garnet	719
198-G1-Bi2a	0.34	0.33	Garnet	659
198-G1-Bi2b	0.35	0.34	Garnet	668
198-G1-Bi2c	0.33	0.34	Garnet	658
BU13-18B				
18B-M1a	0.25	0.41	Matrix	614
18B-M1b	0.24	0.42	Matrix	613
18B-M1c	0.24	0.42	Matrix	610
18B-M1d	0.23	0.41	Matrix	606
18B-M1e	0.24	0.43	Matrix	610
18B-M2a	0.26	0.42	Matrix	622
18B-M2b	0.25	0.42	Matrix	617
18B-M2c	0.24	0.42	Matrix	610
18B-M2d	0.22	0.42	Matrix	596
18B-M3a	0.24	0.41	Matrix	611
18B-M3b	0.24	0.42	Matrix	611
18B-M3c	0.26	0.41	Matrix	628
BU13-23B				
23B-G1-Bi2a	0.14	0.64	Garnet	565
23B-G1-Bi2a	0.17	0.63	Garnet	598
23B-G1-Bi2a	0.17	0.62	Garnet	602
23B-M1a	0.28	0.48	Matrix	648
23B-M1b	0.26	0.49	Matrix	638
23B-M1c	0.26	0.49	Matrix	640
23B-M1d	0.25	0.49	Matrix	634
23B-M1e	0.25	0.48	Matrix	633
23B-M2a	0.26	0.48	Matrix	638
23B-M2b	0.26	0.48	Matrix	635
23B-M2c	0.26	0.48	Matrix	639
23B-M3a	0.23	0.49	Matrix	615
23B-M3b	0.26	0.49	Matrix	636

23B-M3c	0.28	0.48	Matrix	651
23B-G5-Bi1a	0.22	0.53	Garnet	620
23B-G5-Bi1b	0.23	0.55	Garnet	630
23B-G5-Bi1c	0.23	0.55	Garnet	627
23B-G5-Bi1d	0.22	0.55	Garnet	625
23B-G5-Bi1e	0.22	0.54	Garnet	626
BU13-43A				
43A-G6-Bi1a	0.16	0.53	Garnet	555
43A-G6-Bi1b	0.15	0.53	Garnet	543
43A-M1a	0.19	0.51	Matrix	590
43A-M1b	0.19	0.52	Matrix	586
43A-M1c	0.20	0.51	Matrix	593
43A-M1d	0.20	0.53	Matrix	597
43A-M2a	0.21	0.52	Matrix	608
43A-M2b	0.22	0.51	Matrix	617
43A-M3a	0.21	0.51	Matrix	602
43A-M3b	0.20	0.51	Matrix	590
43A-M3c	0.19	0.51	Matrix	584
43A-M3d	0.19	0.52	Matrix	586
43A-M3e	0.20	0.52	Matrix	598
43A-M4a	0.22	0.52	Matrix	617
43A-M4b	0.22	0.52	Matrix	614
43A-M4c	0.22	0.49	Matrix	613
BU12-207A				
207A-G1-Bi1	0.30	0.47	Garnet	660
207A-G4-Bi1a	0.33	0.39	Garnet	662
207A-G4-Bi1b	0.34	0.42	Garnet	671
207A-G4-Bi1c	0.34	0.41	Garnet	672
207A-M1a	0.25	0.42	Matrix	618
207A-M1b	0.26	0.43	Matrix	624
207A-M1c	0.26	0.43	Matrix	626
207A-M1d	0.27	0.42	Matrix	634
207A-M1e	0.25	0.43	Matrix	619
207A-M2a	0.27	0.42	Matrix	631
207A-M2b	0.26	0.42	Matrix	627
207A-M2c	0.26	0.42	Matrix	625
207A-M2d	0.26	0.43	Matrix	628
207A-M2e	0.26	0.41	Matrix	626
207A-M3a	0.31	0.42	Matrix	654
207A-M3b	0.29	0.41	Matrix	644
207A-M3c	0.30	0.42	Matrix	649
207A-M3d	0.31	0.43	Matrix	656
207A-M3e	0.33	0.41	Matrix	667
207A-M4a	0.30	0.42	Matrix	653
207A-M4b	0.26	0.43	Matrix	628

207A-M4c	0.27	0.42	Matrix	631
207A-M4d	0.26	0.42	Matrix	626
207A-M4e	0.28	0.42	Matrix	641
BU13-42B				
42B-G4-Bi1a	0.38	0.42	Garnet	687
42B-G4-Bi1b	0.39	0.42	Garnet	691
42B-G4-Bi1c	0.37	0.42	Garnet	683
42B-G4-Bi2a	0.44	0.51	Garnet	725
42B-G4-Bi2b	0.44	0.50	Garnet	723
42B-G4-Bi2c	0.39	0.44	Garnet	695
42B-B1a	0.43	0.46	Matrix	712
42B-B1b	0.43	0.45	Matrix	711
42B-B1c	0.42	0.46	Matrix	709
42B-B1d	0.40	0.45	Matrix	700
42B-B2a	0.40	0.46	Matrix	702
42B-B2b	0.40	0.45	Matrix	702
42B-B2c	0.41	0.45	Matrix	703
42B-B2d	0.40	0.45	Matrix	701
42B-B2e	0.40	0.46	Matrix	701
42B-G2-Bi1a	0.38	0.45	Garnet	693
42B-G2-Bi1b	0.37	0.47	Garnet	694
42B-M1a	0.39	0.46	Matrix	699
42B-M1b	0.42	0.44	Matrix	706
42B-M2	0.42	0.47	Matrix	710
BU12-212B				
212B-G2-Bi1a	0.41	0.30	Garnet	687
212B-G2-Bi1b	0.41	0.31	Garnet	687
212B-G3-Bi3	0.45	0.31	Garnet	703
212B-G9-Bi2a	0.49	0.30	Garnet	713
212B-G9-Bi2b	0.48	0.30	Garnet	713
212B-G9-Bi2c	0.48	0.30	Garnet	712
212B-G9-Bi3a	0.39	0.31	Garnet	683
212B-G9-Bi3b	0.39	0.32	Garnet	683
212B-G9-Bi3c	0.39	0.33	Garnet	683
212B-G9-Bi4	0.32	0.36	Garnet	652
BU12-221				
221-M1a	0.26	0.32	Matrix	610
221-M1b	0.25	0.32	Matrix	608
221-M1c	0.25	0.32	Matrix	606
221-M1d	0.25	0.32	Matrix	609
221-M2a	0.34	0.32	Matrix	661
221-M2b	0.29	0.32	Matrix	631
221-M2c	0.27	0.33	Matrix	621
221-M2d	0.28	0.33	Matrix	630
221-M2e	0.30	0.33	Matrix	639

221-M3a	0.27	0.33	Matrix	620
221-M3b	0.26	0.32	Matrix	612
221-M3c	0.26	0.33	Matrix	611
221-M4a	0.26	0.33	Matrix	617
221-M4b	0.27	0.33	Matrix	622
221-M4c	0.27	0.32	Matrix	620

[a]apfu: atoms per formula unit

[b]X_{Mg} = Mg/(Mg+Fe)

[c]Temperatures are calculated after Henry *et al.* (2005).