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Supplementary data

Geochronology and geochemistry of mafic rocks in the Wutai area, North China: constraints on the latest Neoarchean–Paleoproterozoic tectonic setting of the Trans-North China Orogen and the onset of plate tectonics

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Supplementary tables

Supplementary Table 1. SHRIMP U-Pb data for zircons from gabbro and amphibolite in Wutai complex, North China Craton.

Spot No.	Th/U	$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$		$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$	
		Ratio	± 1σ	Ratio	± 1σ	Ratio	± 1σ	Age (Ma)	± 2s	Age (Ma)	± 2s	Age (Ma)	± 2s
Gabbro (19-WT-12)													
19WT-12-1	0.9	0.16891	1.21	10.8579	1.5	0.46631	1.5	2540	40	2507	29	2464	62
19WT-12-2	0.1	0.06155	2.96	0.6213	3.2	0.07325	2.4	639	131	490	25	456	21
19WT-12-3	0.2	0.04952	1.98	0.1572	1.7	0.02305	1.0	145	95	148	5	147	3
19WT-12-4	0.1	0.05785	0.94	0.6361	1.1	0.07965	1.0	518	41	499	9	494	9
19WT-12-5	1.1	0.16714	1.92	10.8508	1.7	0.47136	1.7	2522	64	2508	31	2488	70
19WT-12-6	0.6	0.16985	1.01	10.7986	1.4	0.45509	1.6	2574	51	2505	27	2416	65
19WT-12-7	0.5	0.05640	2.14	0.5157	1.9	0.06645	1.1	440	93	421	13	415	9
19WT-12-8	0.5	0.05851	4.31	0.5008	4.4	0.06209	1.4	492	185	410	29	388	11
19WT-12-9	0.8	0.15674	2.44	9.5484	2.5	0.44118	1.4	2414	84	2390	46	2355	56
19WT-12-10	0.5	0.17260	2.42	12.0793	2.0	0.50792	1.3	2574	82	2608	36	2647	59
19WT-12-11	0.3	0.05305	0.84	0.3139	0.9	0.04265	0.7	325	38	277	4	269	4
19WT-12-12	0.6	0.05615	3.46	0.3235	2.8	0.04276	1.3	383	157	284	14	270	7
19WT-12-13	0.6	0.17148	1.11	11.1537	1.3	0.47201	1.3	2567	36	2533	24	2490	53
19WT-12-14	0.5	0.16771	2.12	10.6024	1.8	0.45817	1.1	2530	71	2488	34	2431	44
19WT-12-15	0.5	0.16964	1.56	9.1909	1.1	0.39290	1.2	2550	53	2357	21	2136	45
19WT-12-16	0.4	0.16993	1.37	10.4706	1.0	0.44670	1.2	2554	46	2477	19	2380	49
19WT-12-17	0.6	0.16838	0.96	11.0342	1.2	0.47447	0.8	2537	32	2524	23	2502	32

Supplementary Table 1. *Cont.*

Spot No.	Th/U	$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$		$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$	
		Ratio	± 1σ	Ratio	± 1σ	Ratio	± 1σ	Age (Ma)	± 2s	Age (Ma)	± 2s	Age (Ma)	± 2s
Gabbro (19-WT-12)													
19WT-12-18	0.4	0.17043	1.62	10.6066	1.8	0.45150	1.7	2556	54	2487	33	2400	66
19WT-12-19	0.6	0.16363	1.64	11.0009	1.8	0.48689	1.1	2490	54	2522	35	2557	47
19WT-12-20	0.6	0.17081	1.72	11.1577	1.8	0.47317	1.0	2561	57	2534	34	2497	40
Amphibolite (19-WT-71)													
19WT-71-1	2.9	0.11129	2.09	3.9808	2.2	0.25941	1.5	1811	78	1627	37	1486	40
19WT-71-2	0.7	0.10972	0.74	2.9503	2.0	0.19436	1.6	1791	27	1390	32	1144	34
19WT-71-3	1.2	0.12874	1.42	6.2584	1.9	0.35269	1.5	2072	50	2007	33	1945	51
19WT-71-4	1.1	0.13237	1.78	6.3912	1.5	0.35033	1.2	2124	64	2030	26	1936	41
19WT-71-5	0.8	0.12986	1.59	5.2062	1.8	0.29054	1.2	2092	55	1852	30	1644	34
19WT-71-6	0.8	0.13139	2.13	6.6262	2.4	0.36592	1.8	2108	73	2059	42	2009	62
19WT-71-7	0.9	0.12435	1.24	4.6175	2.3	0.26887	1.8	2016	44	1749	39	1534	50
19WT-71-8	5.1	0.13145	1.32	5.4638	2.2	0.30099	1.6	2114	45	1892	37	1696	47
19WT-71-9	0.9	0.12763	1.17	5.2874	1.3	0.30023	0.9	2063	42	1866	23	1692	27
19WT-71-10	0.6	0.12318	1.19	6.1705	1.1	0.36140	0.8	1998	42	1999	18	1988	28
19WT-71-11	0.3	0.12054	0.59	4.9818	4.1	0.29919	3.9	1963	21	1808	63	1684	111
19WT-71-12	1.2	0.12787	0.83	5.6979	0.8	0.32334	0.7	2065	29	1930	14	1806	23
19WT-71-13	0.9	0.13346	1.44	7.0271	1.7	0.38229	1.5	2138	50	2112	30	2086	54
19WT-71-14	0.9	0.12953	1.12	4.7597	1.2	0.26658	1.1	2088	40	1777	21	1523	29
19WT-71-15	0.9	0.11717	1.09	2.6798	3.2	0.16432	2.8	1907	39	1312	48	979	51
19WT-71-16	0.9	0.13660	2.57	6.9715	2.1	0.37079	1.3	2176	89	2106	37	2033	45
19WT-71-17	1.0	0.12443	0.87	4.4302	1.3	0.25820	1.1	2017	30	1716	22	1480	28
19WT-71-18	0.8	0.15954	1.77	6.8553	2.8	0.31261	2.8	2444	57	2086	49	1750	85
19WT-71-19	0.9	0.13171	1.84	6.6060	1.7	0.36440	0.9	2109	67	2057	30	2002	31
19WT-71-20	1.1	0.13334	1.80	4.8147	3.6	0.26261	3.5	2132	62	1774	61	1498	93

Supplementary Table 2. Major and trace element compositions of the gabbros in Wutai complex, North China Craton.

Rock Type	Gabbro													
Sample Number	19WT02	19WT03	19WT04	19WT05	19WT06	19WT07	19WT08	19WT09	19WT10	19WT11	19WT13	19WT14	19WT15	19WT16
SiO_2	49.55	48.37	49.03	47.64	48.18	49.02	49.90	49.29	49.63	48.52	49.04	49.61	48.48	49.71
TiO2	1.72	1.97	1.67	2.25	2.03	1.65	1.85	1.80	2.29	1.73	2.13	1.96	2.24	2.03
Na_2O	2.59	2.26	2.50	2.59	2.24	2.07	2.35	2.45	2.38	2.00	2.31	2.38	2.43	2.36
TFe_2O_3	13.83	15.45	14.37	16.54	16.46	14.48	15	14.76	15.43	14.91	15.91	15.11	16.58	15.08
Al_2O_3	13.49	12.96	13.33	13.19	13.27	12.97	12.95	13.36	12.88	12.76	12.97	12.97	13.30	13.14
MnO	0.180	0.21	0.19	0.21	0.21	0.200	0.200	0.200	0.22	0.20	0.20	0.20	0.19	0.190
MgO	5.97	6.04	6.15	5.62	5.62	6.89	5.87	6.06	4.99	7.04	6.34	6.41	5.98	6.13
CaO	8.98	9.00	9.10	8.94	8.89	9.43	8.94	8.87	8.38	9.36	8.39	8.69	8.50	8.25
K_2O	0.93	0.99	1.00	0.80	1.08	1.07	1.09	1.20	1.20	1.17	1.15	1.09	1.01	1.17
P_2O_5	0.63	0.76	0.65	0.70	0.68	0.52	0.74	0.75	0.93	0.54	0.62	0.62	0.59	0.60
L.O.I	1.24	1.05	1.22	0.86	1.22	1.01	0.99	1.13	0.98	1.11	0.68	0.56	0.49	0.55
Total	99.11	99.06	99.21	99.34	99.88	99.31	99.88	99.87	99.31	99.34	99.74	99.60	99.79	99.21

Supplementary Table 2. *Cont.*

Rock Type	Gabbro													
Sample Number	19W T02	19W T03	19W T04	19W T05	19W T06	19W T07	19W T08	19W T09	19W T10	19W T11	19W T13	19W T14	19W T15	19W T16
Li	17.4	17.6	19.8	14.2	19.0	20.4	19.9	20.9	19.8	20.7	15.0	13.7	12.6	14.6
Be	1.18	1.37	1.11	1.33	1.19	1.17	1.35	1.31	1.57	1.08	1.22	1.26	1.13	1.24
Sc	35.6	37.1	36.9	36.5	38.2	37.6	38.5	36.1	36.1	39.1	35.7	36.4	35.2	34.1
Ti	10366	12271	10296	13637	12176	10114	11393	10507	14001	10561	12814	12010	13515	12344
V	281	315	300	401	401	290	309	288	310	316	356	319	407	343
Cr	302	250	273	216	172	350	234	263	128	354	267	287	247	282
Mn	1504	1779	1580	1774	1725	1636	1666	1648	1776	1640	1624	1699	1591	1529
Co	39.1	52.4	59.2	54.8	54.1	46.1	48.7	50.4	47.5	49.8	53.0	48.8	54.6	49.4
Ni	90.7	101	134	88.6	95.4	115	90.5	99.1	71.5	125	125	110	103	102
Cu	45.8	60.0	84.3	200	58.3	41.7	42.0	57.9	62.7	55.8	58.2	43.5	55.0	47.6
Zn	136	151	136	137	166	144	158	142	159	148	147	123	129	127
Ga	21.9	23.0	22.3	22.6	23.9	20.9	23.4	22.2	25.3	21.0	22.1	21.6	22.2	21.8
As	3.11	3.17	3.17	4.66	3.14	1.71	2.08	1.87	3.02	2.06	1.64	1.54	1.46	1.53
Se	1.50	1.47	1.38	1.59	1.86	1.08	1.31	1.22	1.75	0.82	1.35	1.68	1.03	1.23
Rb	14.4	14.4	16.5	9.08	17.4	19.4	18.5	27.6	23.4	22.5	22.4	21.7	20.1	23.4
Sr	412	363	415	459	360	323	377	377	413	278	397	447	421	410
Y	42.0	36.4	40.0	42.0	42.5	38.0	47.4	40.4	55.7	37.0	40.7	42.6	38.4	39.8
Zr	202	236	197	215	218	183	238	241	308	177	224	219	207	238
Nb	15.1	14.0	13.5	16.2	15.4	13.5	17.5	14.8	23.3	13.3	16.5	16.7	15.8	16.5
Mo	0.54	0.33	0.59	0.69	0.35	0.34	0.48	0.47	0.40	0.41	0.76	0.59	0.75	0.87
Sn	1.56	1.68	1.53	1.57	1.77	1.40	1.81	1.63	1.96	1.47	1.61	1.47	1.56	1.59
Cs	0.39	0.54	0.88	0.28	0.68	0.43	0.52	1.18	0.44	0.59	0.57	1.10	0.82	0.79
Ba	278	329	296	326	308	462	411	476	591	478	652	668	644	626
La	39.0	44.1	43.1	40.5	43.4	37.0	47.7	43.0	61.5	35.6	43.8	45.5	40.0	43.5
Ce	89.4	101	101	90.3	99.9	83.5	109	97.9	141	79.7	97.4	104	89.6	100
Pr	12.3	13.3	13.2	12.5	13.6	11.3	14.7	13.0	18.9	11.1	13.5	13.8	12.2	13.1
Nd	53.6	56.4	56.8	54.0	58.4	47.4	62.0	54.7	78.9	47.2	56.6	58.0	51.6	54.6
Sm	9.64	9.41	9.81	9.52	10.3	8.86	11.3	9.85	14.0	8.72	10.3	10.5	9.35	9.85
Eu	2.44	2.24	2.51	2.34	2.63	2.30	2.87	2.51	3.39	2.26	2.52	2.76	2.40	2.39
Gd	8.62	8.00	8.67	8.56	9.10	8.05	9.94	8.44	11.9	7.75	8.71	9.43	8.19	8.40
Tb	1.26	1.14	1.24	1.26	1.32	1.19	1.44	1.24	1.75	1.12	1.30	1.39	1.20	1.24
Dy	7.34	6.33	6.98	7.33	7.49	6.76	8.38	7.21	9.97	6.59	7.54	7.73	6.92	7.27
Ho	1.48	1.27	1.40	1.49	1.49	1.36	1.68	1.43	1.98	1.32	1.50	1.52	1.38	1.45
Er	4.14	3.65	3.90	4.20	4.22	3.85	4.74	4.12	5.62	3.71	4.27	4.30	3.91	4.15
Tm	0.60	0.51	0.55	0.60	0.60	0.54	0.68	0.58	0.79	0.53	0.60	0.59	0.55	0.59
Yb	3.78	3.34	3.48	3.79	3.85	3.50	4.25	3.73	5.02	3.37	3.83	3.93	3.54	3.79
Lu	0.58	0.52	0.54	0.58	0.60	0.52	0.63	0.55	0.74	0.49	0.56	0.58	0.51	0.56
Hf	4.71	5.40	4.65	4.93	5.13	4.38	5.57	5.44	6.99	4.13	5.08	5.38	4.79	5.50
Ta	0.73	0.60	0.65	0.72	0.71	0.61	0.81	0.73	1.20	0.65	0.82	0.76	0.78	0.80
Pb	8.47	4.20	9.33	8.63	8.83	8.34	6.96	7.35	12.2	8.26	4.36	3.12	3.47	3.56
Th	1.24	1.29	1.27	1.30	1.32	1.07	1.39	1.29	1.87	1.02	1.31	1.25	1.17	1.55
U	0.39	0.33	0.35	0.40	0.38	0.25	0.35	0.34	0.43	0.25	0.33	0.31	0.29	0.38

Supplementary Table 3. Major and trace element compositions for the Amphibolite in Wutai complex, North China Craton.

Rock Type	Amphibolite									
Sample Number	19WT72	19WT73	19WT75	19WT76	19WT77	19WT79	19WT81	19WT82	19WT83	19WT84
SiO_2	44.60	42.71	45.47	39.09	43.58	48.83	49.19	49.09	46.77	46.92
TiO_2	2.30	2.32	2.26	2.51	2.39	1.73	1.82	1.72	1.78	1.76
Na_2O	2.30	2.25	2.39	1.52	2.30	1.94	1.98	1.95	1.93	2.02
TFe_2O_3	16.02	17.03	16.04	18.39	16.88	17.76	17.51	17.59	18.14	18.39
Al_2O_3	14.55	14.49	14.47	14.30	14.51	12.83	12.96	13.01	13.52	13.60
MnO	0.20	0.26	0.19	0.270	0.230	0.240	0.24	0.23	0.25	0.25
MgO	5.78	6.05	5.73	6.53	6	5.13	5.23	5.2	5.77	5.67
CaO	8.56	8.82	8.58	9.22	8.86	9.31	8.84	9.38	9.49	9.55
K_2O	1.47	1.65	1.29	1.92	1.44	0.66	0.61	0.61	0.65	0.65
P_2O_5	0.40	0.40	0.39	0.39	0.39	0.25	0.24	0.25	0.25	0.24
L.O.I	3.17	3.92	2.45	5.04	3.09	0.56	0.58	0.57	0.58	0.46
Total	99.35	99.90	99.26	99.18	99.67	99.24	99.20	99.60	99.13	99.51
Li	10.8	10.0	9.94	14.4	9.56	8.45	10.7	8.71	11.0	10.8
Be	1.31	1.41	1.36	1.67	1.40	0.74	0.77	0.71	0.91	0.91
Sc	31.9	32.6	30.6	36.1	32.1	49.4	49.5	49.0	53.3	53.6
Ti	14104	14479	13881	15400	14961	10529	10655	10447	10763	10614
V	366	376	356	423	374	424	419	424	467	459
Cr	68.3	69.7	66.5	72.2	68.0	69.4	63.9	69.8	70.3	69.9
Mn	1634	2191	1561	2250	1899	1987	1975	1944	2038	2031
Co	60.1	59.6	61.6	53.6	58.6	44.0	49.4	66.2	49.3	50.1
Ni	75.9	71.9	80.4	59.5	75.0	27.0	32.9	45.7	32.3	31.3
Cu	55.6	39.6	45.5	1.20	33.3	35.1	72.2	73.7	29.1	27.6
Zn	124	125	126	145	128	117	122	121	131	130
Ga	23.5	24.0	23.5	25.6	23.7	19.8	19.2	19.2	19.8	19.6
As	1.14	1.64	1.12	1.49	1.56	0.68	0.80	0.85	0.89	0.89
Se	0.86	0.99	0.86	0.92	0.85	0.98	0.86	0.98	0.84	0.63
Rb	37.8	43.3	29.8	57.7	36.8	6.60	6.67	5.27	7.33	6.19
Sr	172	151	148	109	147	114	121	114	110	120
Y	31.4	31.5	28.5	29.9	29.6	36.9	39.1	37.6	38.6	39.3
Zr	120	119	117	127	121	119	129	122	125	120
Nb	6.60	5.35	6.38	5.07	5.64	5.94	6.35	5.80	5.69	5.54
Mo	0.67	0.67	2.49	0.46	0.53	0.45	0.40	1.23	0.33	0.30
Sn	1.49	1.33	1.39	1.65	1.34	1.07	1.09	1.05	1.14	1.10
Cs	2.51	2.38	2.38	4.49	1.94	0.10	0.12	0.07	0.13	0.13
Ba	742	269	283	191	217	208	158	110	181	171
La	18.5	19.2	18.4	20.4	19.7	16.7	17.0	17.4	18.4	18.8
Ce	42.6	44.2	42.2	46.8	44.9	37.4	37.7	39.1	39.8	40.5
Pr	5.55	5.78	5.50	6.09	5.91	4.87	4.92	5.05	5.20	5.33
Nd	25.3	26.4	24.8	27.5	26.6	21.8	22.2	22.6	23.1	23.8
Sm	5.83	6.06	5.71	6.25	6.09	5.16	5.16	5.33	5.44	5.56
Eu	2.09	2.00	1.99	1.93	2.03	1.70	1.75	1.73	1.65	1.72
Gd	6.04	6.30	5.74	6.18	6.30	5.83	5.88	5.95	6.19	6.15
Tb	0.93	0.95	0.90	0.96	0.93	0.94	0.98	0.99	0.99	1.02
Dy	5.54	5.70	5.30	5.63	5.47	6.12	6.45	6.33	6.47	6.60
Ho	1.12	1.16	1.07	1.12	1.08	1.31	1.41	1.34	1.38	1.41
Er	3.09	3.18	2.89	3.11	2.89	3.74	4.10	3.88	3.97	4.03
Tm	0.43	0.44	0.40	0.44	0.40	0.54	0.61	0.56	0.58	0.58
Yb	2.72	2.73	2.50	2.74	2.48	3.56	3.94	3.64	3.71	3.73
Lu	0.39	0.39	0.37	0.38	0.36	0.54	0.60	0.54	0.54	0.54
Hf	2.99	3.00	2.96	3.22	3.08	2.98	3.21	3.04	3.20	3.02
Ta	0.39	0.38	0.37	0.42	0.39	0.32	0.35	0.32	0.33	0.31
Pb	3.07	3.72	2.82	6.15	3.20	1.28	1.04	1.25	0.99	0.81
Th	2.49	2.56	2.48	2.71	2.56	1.02	1.10	1.07	1.07	1.07
U	0.66	0.80	0.66	0.75	0.69	0.23	0.33	0.25	0.26	0.26

Supplementary Table 4. Sr-Nd isotopic compositions for the Mafic intrusions in Wutai complex, North China Craton.

Sample no.	T(Ma)	Rb	Sr	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	± 2σ	$(^{87}Sr/^{86}Sr)_i$	Sm	Nd	$^{147}Sm/^{144}Nd$	$^{143}Nd/^{144}Nd$	± 2σ	$\varepsilon_{Nd}(t)$	T_{DM1}^{Nd}(Ga)	T_{DM2}^{Nd}(Ga)	$(^{143}Nd/^{144}Nd)_i$
Gabbro																
19WT-02	2564	14.4	412	0.10120787	0.7046609	0.000010	0.70092	9.6	53.6	0.109107562	0.511469359	0.000005	6.1	2.44	2.43	0.50962
19WT-13	2564	22.4	397	0.16338287	0.7067064	0.000006	0.70065	10	56.6	0.110398558	0.511429525	0.000004	4.9	2.53	2.52	0.50956
19WT-16	2564	23.4	410	0.165265046	0.7067584	0.000007	0.70063	9.9	54.6	0.109442548	0.511419704	0.000004	5.1	2.52	2.51	0.50956
Amphibolite																
19WT-73	2087	43.3	151	0.830347643	0.7226782	0.000008	0.69803	6.1	26.4	0.139255162	0.511911234	0.000003	1.0	2.52	2.42	0.50988
19WT-77	2087	36.8	147	0.724902324	0.7211088	0.000009	0.69959	6.1	26.6	0.13889233	0.511890856	0.000004	0.7	2.55	2.44	0.50987

Supplementary Table 5. Summary of previous and current zircon U-Pb ages and from the Wutai complex, North China Craton.

Sample No.	Coordinates	Rock type	Age	Method	Reference
		Gabbro rocks			
95-PC-55C	N = 38 56.21, E = 113 00.66	Gabbros	2528 ± 6 Ma	SHRIMP	Wang *et al.* (2000)
19 WT-12	N = 38 59 33, E = 112 58 39	Gabbros	2543 ± 20 Ma	LA-ICP-MS	This study
		Granitoids			
WL12	-	Longquan granitoids	2543 ± 7 Ma	SHRIMP	Zhao *et al.*, (2007), Wild *et al.*, (1997)
		Dioritic rocks			
WT1001-1	N = 39 14.52, E = 113 37.61	Diorite	2636 ± 22 Ma	LA-ICP-MS	Chen *et al.* (2015)
WT1003		Diorite	2548 ± 15 Ma	LA-ICP-MS	
C-1	N = 39 08.29, E = 113 37.61	Diorite	2420 ± 74 Ma & 2057 ± 53 Ma	LA-MC-ICP-MS	Yao (2017)
C-2	N = 39 08.10, E = 113 11.90	Diorite			
Ek-01	N = 39 06.4, E = 113 14.71	Diorite	2557 ± 20 & 2199 ± 20 Ma		Sun *et al.* (2019)
		Volcanic rocks			
96-PC-114	N = 39 04.01, E = 113 16.63	Meta-Basa-ltic andesite	2529 ± 10 Ma		
96-PC-115	N = 39 03.7, E = 113 15.1	Meta-Basaltic andesite	2524 ± 10 Ma	SHRIMP	
96-PC-119	N = 39 05.31, E = 113 16.83	Meta-Basaltic andesite, Baizhiyan 'Formation' (Ekou)	2513 ± 8 Ma	SHRIMP	Wilde *et al.* (2004)
WT-9	N = 39 02.86, E = 113 36.9	Meta-dacite	2523 ± 9 Ma	SHRIMP	

Supplementary Table 5. *Cont.*

Sample No.	Coordinates	Rock type	Age	Method	Reference
		Volcanic rocks			
WT-12	N = 39 02.81, E = 113 36.9	Meta-rhyodacite			
WT-13	N = 39 02.88, E = 113 37.22	Meta-rhyolite	2516 ± 10 Ma &2533 ± 8 Ma	SHRIMP	Wilde *et al.* (2004)
WT-17	N = 39 002.86, E = 113 36.75	Meta-rhyodacite	2524 ± 8 Ma		
HMY-1	N = 39 03.35, E = 113 39.26	Rhyolite	2518 ± 10 Ma	LA-ICP-MS	Sun *et al.* (2019)
WT-1/2A	N = 38 52.75, E = 113 18.14	Meta-basatic andesite	2557 ± 10 Ma	LA-ICP-MS	Gao and Santosh (2019)
12WT76-1	N = 38 57.77, E = 113 21.71	Meta-basatic andesite	2706 ± 17 Ma& 2548 ± 11 Ma	LA-ICP-MS	Liu *et al.* (2016)
		Meta-igneous and metasedimentary rocks			
19 WT-71	N = 38 53 3, E = 113 41 0	Amphibolite	2087 ± 33 Ma	LA-ICP-MS	This study
95-PC-60	-	Granite	2084 ± 16 Ma	SHRIMP	Wilde *et al.* (2005)
WT1001	N = 38 49.95, E = 113 44.73	Biotite-quartz schist	2663 ± 2 Ma	LA-ICP-MS	Chen *et al.* (2015)
12WT20-1	N = 39 00.0, E = 113 44.73	Garnet two-mica quartz schist	2498 ± 34 Ma	LA-ICP-MS	Liu *et al.* (2016)
12WT13-1	N = 39 12.29, E = 113 31.01	Biotite feldspar quartz schist	2706 ± 25 Ma & 2526 ± 29 Ma	MC-ICP-MS	
12WT38-1	N = 39 05.74, E = 113 35.25	Biotite quartz schist	2698 ± 18 Ma & 2518 ± 8 Ma		
12WT51-1	N = 39 12.06, E = 113 27.45	Sericite quartz schist	2678 ±21 Ma & 2533 ± 10 Ma		
WT-1/1E	N = 38 55.35, E = 113 18.02	Greenstone	2663 ± 2 Ma &1845 ± 190 Ma		
WT-1/2B	N = 38 55.35, E = 113 18.14	BIF intercalated with the felsic tuff			Gao and Santosh (2019)
WT-1/3	N = 38 55.35, E = 113 18.15	BIF	2585 ± 14 Ma 2471 ± 46 Ma	LA-ICP-MS	
WT-1/5	N = 38 55.35, E = 113 18.16	Phyllite	2594 ± 14 Ma		
GSM-1	N = 39 01.76, E = 113 39.66	Meta Igneous	2560 ± 62Ma	LA-ICP-MS	Sun *et al.* (2019)

Supplementary Table 6. Geochemistry data of previous studies from the Wutai complex, North China Craton.

Rock Type	Tholeiitic basalt					Meta-basalt														
References	(Wang *et al.* 2004, Liu *et al*, 2016)					(Wang *et al.* 2004, Polat *et al.* 2005, Liu *et al*, 2016)														
Sample Number	12WT66-1	12WT15-1	12WT47-1	WS68	WS73	12WT14-1	12WT55-1	12WT70-1	12WT68-1	2002-86	TK16	WS100	WS54	WS28	WS122	WS36	WS129	12WT08-1	WS109	WS104	WS74
SiO_2	49.8	48.7	48.7	50.8	48.7	53.2	50.4	49.6	50.4	47.7	49.3	48.2	50.2	49.5	49.7	49.7	50.0	51.4	48.6	45.8	51.5
TiO_2	0.9	0.9	1.4	0.8	1.2	1.2	1.0	0.9	0.9	0.6	1.0	1.3	0.6	0.9	1.4	0.9	0.9	0.4	0.8	1.9	0.6
Na_2O	2.2	2.2	4.1	1.2	2.1	2.6	2.1	2.2	1.9	0.1	0.1	1.6	1.9	1.9	2.8	1.1	1.8	2.7	2.6	4.3	1.8
TFe_2O_3	13.6	12.7	9.7	15.2	10.8	14.8	14.9	13.4	13.9	15.3	14.3	15.6	10.9	13.7	17.4	13.7	13.6	8.4	9.6	14.6	8.5
Al_2O_3	14.3	13.5	14.3	14.3	15.2	15.3	12.3	14.1	13.6	14.4	14.6	13.5	14.2	13.7	14.4	13.5	13.6	12.3	15.7	17.9	16.8
MnO	0.2	0.2	0.2	0.2	0.3	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
MgO	7.0	6.5	8.2	7.8	7.2	7.1	5.6	6.9	6.9	9.6	7.8	7.1	8.9	6.5	7.3	7.5	7.1	7.7	8.4	6.8	6.2
CaO	10.0	8.8	5.8	10.6	11.5	0.6	7.9	9.8	10.3	9.9	9.8	8.7	11.1	11.2	9.2	10.8	10.9	9.4	10.3	3.9	11.6
K_2O	0.2	0.0	0.3	0.4	0.2	0.1	1.0	0.4	0.4	1.8	2.8	0.4	0.2	0.4	0.2	0.7	0.4	0.1	0.2	0.2	0.4
P_2O_5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.0
L.O.I	1.0	5.7	6.8	2.3	1.6	5.0	3.4	1.7	1.2	0.9	2.6	4.2	2.6	3.0	1.8	2.3	1.8	7.2	1.8	5.3	1.8
Total	99.3	99.2	99.4	103.6	98.9	100.0	98.9	99.4	99.6	100.9	102.6	100.7	100.8	101.0	104.6	100.5	100.4	99.6	98.3	101.1	99.4
Sc	43.8	51.3	42.3			32.6	51.0	48.4	58.5									62.0			
V																					
Cr	180.0	218.0	220.0	159.0	303.0	24.4	82.6	162.0	109.0	207.0	211.0	109.0	238.0	127.0	169.0	118.0	68.0	109.0	323.0	294.0	257.0
Mn																					
Co	58.1	44.0	49.3			37.0	57.6	54.2	66.0	35.0	38.0							36.6			
Ni	107.0	92.3	143.0	115.0	205.0	23.4	61.6	85.3	63.1	63.0	97.0	84.0	136.0	51.0	65.0	60.0	46.0	92.8	122.0	160.0	190.0
Cu	144.0	131.0	17.1			8.5	108.0	100.0	108.0		52.0							56.3			
Zn	115.0	113.0	138.0			140.0	117.0	162.0	124.0	114.0	68.0							96.3			
Ga	17.3	17.0	16.9			22.7	17.7	17.4	18.8									10.8			
Rb	4.6	0.3	5.1	13.0	5.0	1.4	49.2	6.2	3.3	11.0	2.0	11.0	2.0	7.0	4.0	18.0	8.0	2.7	5.0	3.0	12.0
Sr	113.0	125.0	114.0	194.0	119.0	33.9	198.0	105.0	159.0	48.0	187.0	306.0	108.0	127.0	149.0	143.0	147.0	131.0	104.0	87.0	122.0
Y	19.3	20.8	17.7	15.5	13.8	26.7	24.4	21.6	24.1	16.0	17.4	25.4	11.8	20.0	28.9	18.1	19.5	8.9	19.8	11.4	11.1
Zr	45.7	46.9	39.2	34.0	34.0	121.0	50.2	52.1	57.2	15.0	25.0	43.0	4.0	52.0	85.0	10.0	46.0	16.8	39.0	6.0	37.0

Supplementary Table 6. *Cont.*

Rock Type	Tholeiitic basalt									Meta-basalt											
References	(Wang *et al.* 2004, Liu *et al*, 2016)									(Wang *et al.* 2004, Polat *et al.* 2005, Liu *et al*, 2016)											
Sample Number	12WT66-1	12WT15-1	12WT47-1	WS68	WS73	12WT14-1	12WT55-1	12WT70-1	12WT68-1	2002-86	TK16	WS100	WS54	WS28	WS122	WS36	WS129	12WT08-1	WS109	WS104	WS74
Nb	2.3	1.9	2.8	2.0	1.3	4.7	2.2	2.2	2.5	1.7	1.7	3.3	1.1	2.2	2.9	2.0	1.8	0.7	0.9	2.5	2.3
Mo	0.1	0.1	0.1			0.1	0.1	0.1	0.2									0.1			
Cs	1.0	0.1	0.4			0.1	4.3	0.1	0.1									0.1			
Ba	38.0	4.4	34.8	159.0	23.0	14.4	464.0	28.2	36.8	78.0	41.0	46.0	15.0	70.0	47.0	102.0	141.0	18.7	23.0	68.0	102.0
La	2.5	2.1	2.8	2.1	1.3	2.7	3.1	2.8	5.5	3.1	2.8	4.0	1.5	5.2	4.3	4.5	4.4	1.0	2.3	3.6	3.0
Ce	7.2	6.5	7.5	6.1	5.5	6.2	8.6	7.9	13.4	7.4	7.7	11.7	4.3	12.4	12.2	11.4	11.3	2.6	6.2	8.8	6.9
Pr	1.1	1.0	1.2	1.0	1.0	0.8	1.3	1.2	1.9	1.1	1.2	1.8	0.7	1.8	2.1	1.6	1.6	0.4	1.0	1.3	0.9
Nd	5.7	5.3	5.9	5.1	6.1	3.8	6.6	6.6	9.2	5.4	6.0	9.1	3.7	8.2	10.0	8.0	7.3	2.0	5.7	6.7	4.8
Sm	2.0	1.9	2.1	1.7	2.3	1.1	2.6	2.2	2.6	1.9	1.9	2.9	1.1	2.5	3.4	2.4	2.1	0.7	2.1	1.9	1.4
Eu	0.8	0.8	1.0	0.7	0.9	0.4	0.9	0.9	1.0	1.1	0.7	1.0	0.5	0.8	0.8	0.8	0.7	0.4	0.9	0.6	0.6
Gd	2.9	2.7	3.1	2.4	2.9	2.0	3.2	3.3	3.6	2.5	2.6	4.1	1.7	3.5	4.6	3.2	3.1	1.1	3.2	2.1	1.8
Tb	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.6	0.6	0.4	0.5	0.8	0.4	0.7	0.8	0.6	0.5	0.2	0.6	0.4	0.3
Dy	3.5	3.3	3.5	3.0	3.1	3.8	4.0	3.8	4.1	2.9	3.2	5.0	2.3	4.5	5.5	3.8	3.8	1.4	4.2	2.4	2.1
Ho	0.7	0.7	0.7	0.7	0.6	0.9	0.9	0.8	0.9	0.6	0.7	1.0	0.5	0.9	1.2	0.8	0.9	0.3	0.9	0.5	0.5
Er	2.2	2.3	2.1	1.9	1.8	3.0	2.6	2.5	2.7	1.8	2.0	2.8	1.5	2.7	3.3	2.5	2.2	0.9	2.5	1.5	1.5
Tm	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.3	0.3	0.5	0.2	0.4	0.5	0.3	0.3	0.1	0.4	0.2	0.2
Yb	2.1	2.2	1.9	2.2	1.5	2.9	2.6	2.4	2.6	1.6	1.9	2.8	1.5	2.8	3.3	2.3	2.4	0.9	2.8	1.1	1.6
Lu	0.3	0.3	0.3	0.4	0.2	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.2	0.4	0.5	0.4	0.4	0.1	0.4	0.2	0.3
Hf	1.6	1.5	1.6	1.3	1.5	3.8	1.8	1.7	1.9			1.5	0.3	2.1	2.6	0.5	1.5	0.6	1.4	0.3	1.2
Ta	0.2	0.1	0.2	0.2	0.1	0.4	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.0	0.2	0.2
Pb	1.2	3.2	2.1			0.7	4.4	9.4	1.4									11.0			
Th	0.3	0.3	0.2	0.2	0.1	2.1	0.4	0.3	0.5	0.2	0.2	0.3	0.1	0.5	0.2	0.4	0.1	0.3	0.2	0.2	0.3
U	0.1	0.1	0.1	0.0		0.6	0.2	0.2	0.2	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0