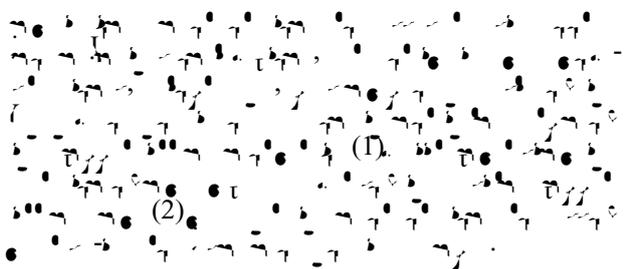


Fig. 1. (a) Geological map of the Altai region in Mongolia and northern China, showing major tectonic units and structural features. (b) Detailed view of the Habahe area, highlighting the Habahe ophiolite and associated structures. The map includes a scale bar (0-400 km) and a north arrow.



2. Regional geology, field observations and petrography

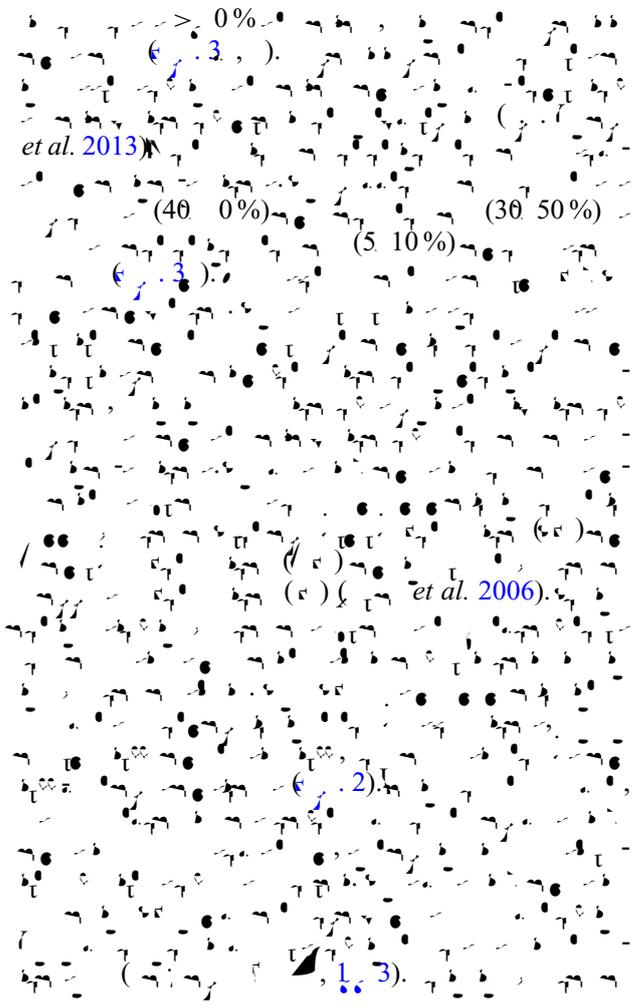
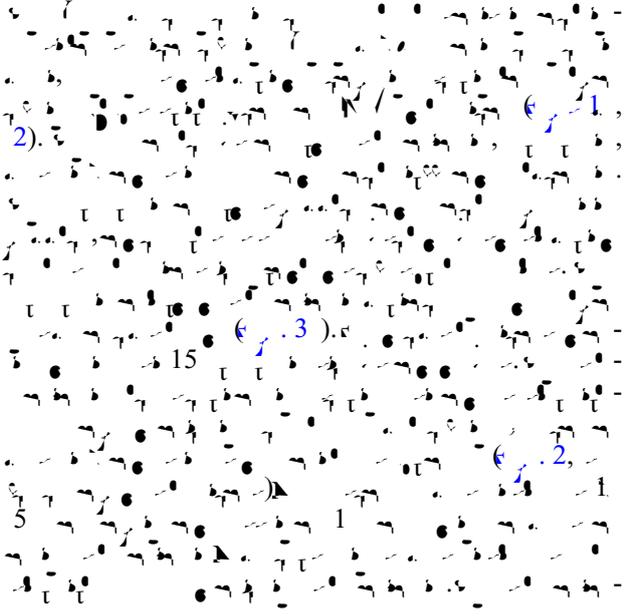


Fig. 2. Photomicrographs of mineral assemblages from the study area. (1) and (2) show similar assemblages with scale bars of 100 micrometers. (3) shows a different assemblage with a scale bar of 100 micrometers. The images illustrate the texture and composition of the rocks at the microscopic level.

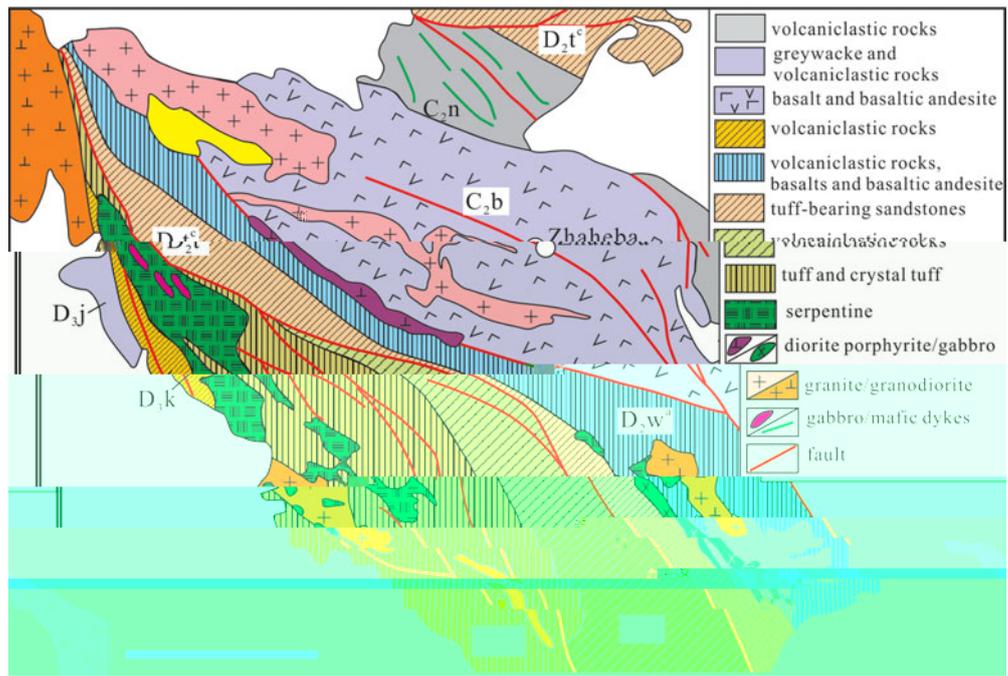


Figure 2. Geological map of the Zhaheba ophiolite complex (see text for details) (Zhang et al. 2000, 2001a, 2001b, 2001c, 2001d, 2001e, 2001f, 2001g, 2001h, 2001i, 2001j, 2001k, 2001l, 2001m, 2001n, 2001o, 2001p, 2001q, 2001r, 2001s, 2001t, 2001u, 2001v, 2001w, 2001x, 2001y, 2001z, 2002a, 2002b, 2002c, 2002d, 2002e, 2002f, 2002g, 2002h, 2002i, 2002j, 2002k, 2002l, 2002m, 2002n, 2002o, 2002p, 2002q, 2002r, 2002s, 2002t, 2002u, 2002v, 2002w, 2002x, 2002y, 2002z, 2003a, 2003b, 2003c, 2003d, 2003e, 2003f, 2003g, 2003h, 2003i, 2003j, 2003k, 2003l, 2003m, 2003n, 2003o, 2003p, 2003q, 2003r, 2003s, 2003t, 2003u, 2003v, 2003w, 2003x, 2003y, 2003z, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f, 2004g, 2004h, 2004i, 2004j, 2004k, 2004l, 2004m, 2004n, 2004o, 2004p, 2004q, 2004r, 2004s, 2004t, 2004u, 2004v, 2004w, 2004x, 2004y, 2004z, 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2005g, 2005h, 2005i, 2005j, 2005k, 2005l, 2005m, 2005n, 2005o, 2005p, 2005q, 2005r, 2005s, 2005t, 2005u, 2005v, 2005w, 2005x, 2005y, 2005z, 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Table 1. $^{40}\text{Ar}/^{39}\text{Ar}$ ratios

	2013 年 01 月 5	2013 年 01 月 6	2013 年 01 月 (C 1)	2013 年 01 月 (C 1)	2013 年 01 月 (C 1)	2013 年 03 月 2	2013 年 03 月 3	2013 年 03 月 4	2013 年 03 月 5	2013 年 01 月 3
$^{40}\text{Ar}/^{39}\text{Ar}$	3.	1.20	3.60	46.0	4.30	23.40	43.00	25.20	32.0	6.56

Table 2. U-Pb zircon ages and geochemistry of the Zhaheba ophiolite. Data are presented in the following order: sample number, zircon grain number, $^{206}\text{Pb}/^{238}\text{U}$ ratio, $^{207}\text{Pb}/^{235}\text{U}$ ratio, $^{206}\text{Pb}/^{238}\text{U}$ error (1 σ), $^{207}\text{Pb}/^{235}\text{U}$ error (1 σ), $^{206}\text{Pb}/^{238}\text{U}$ error (2 σ), $^{207}\text{Pb}/^{235}\text{U}$ error (2 σ), $^{206}\text{Pb}/^{238}\text{U}$ age (Ma), $^{207}\text{Pb}/^{235}\text{U}$ age (Ma), $^{206}\text{Pb}/^{238}\text{U}$ age error (1 σ), $^{207}\text{Pb}/^{235}\text{U}$ age error (1 σ), $^{206}\text{Pb}/^{238}\text{U}$ age error (2 σ), $^{207}\text{Pb}/^{235}\text{U}$ age error (2 σ), $^{206}\text{Pb}/^{238}\text{U}$ age error (3 σ), $^{207}\text{Pb}/^{235}\text{U}$ age error (3 σ), $^{206}\text{Pb}/^{238}\text{U}$ age error (4 σ), $^{207}\text{Pb}/^{235}\text{U}$ age error (4 σ), $^{206}\text{Pb}/^{238}\text{U}$ age error (5 σ), $^{207}\text{Pb}/^{235}\text{U}$ age error (5 σ).

Sample	Grain	$^{206}\text{Pb}/^{238}\text{U}$	$^{207}\text{Pb}/^{235}\text{U}$	$^{206}\text{Pb}/^{238}\text{U}$ (1 σ)	$^{207}\text{Pb}/^{235}\text{U}$ (1 σ)	$^{206}\text{Pb}/^{238}\text{U}$ (2 σ)	$^{207}\text{Pb}/^{235}\text{U}$ (2 σ)	Age (Ma)	Age (Ma)	Age (1 σ)	Age (1 σ)	Age (2 σ)	Age (2 σ)	Age (3 σ)	Age (3 σ)	Age (4 σ)	Age (4 σ)	Age (5 σ)	Age (5 σ)		
2013-01-3	(2)	0.36	0.40	0.002	0.04030	0.04015	2.4	10.1	0.13	4.0	0.512	3.4	0.5124	4.6	0.5124	4.6	0.5124	4.6	0.5124	4.6	
2013-01-10	(2)	0.5	0.5	0.0024	0.045	0.045	2.3	11.6	0.1235	0.512	0.43	0.5124	6.1	0.5124	6.1	0.5124	6.1	0.5124	6.1	0.5124	6.1
2013-03-1	(1)	3.13	0.63	0.0335	0.06324	0.06133	4.4	22.3	0.121	0.5125	3.4	0.5122	1.1	0.5122	1.1	0.5122	1.1	0.5122	1.1	0.5122	1.1
2013-03-2	(1)	2.1320	0.42	0.0063	0.042	0.04255	4.5	2.6	0.1046	0.512	1.51	0.512445	6.3	0.512445	6.3	0.512445	6.3	0.512445	6.3	0.512445	6.3
2013-03-3	(1)	0.06	0.05	0.0452	0.0536	0.05111	5.2	36.0	0.0	0.512	0.30	0.512450	6.4	0.512450	6.4	0.512450	6.4	0.512450	6.4	0.512450	6.4
2013-03-4	(1)	0.65	0.42	0.01	0.0422	0.04120	4.55	24.5	0.1123	0.512	0.53	0.51250	5.5	0.51250	5.5	0.51250	5.5	0.51250	5.5	0.51250	5.5

$$t = 10000 \left(\frac{^{206}\text{Pb}/^{238}\text{U}}{^{206}\text{Pb}/^{238}\text{U}} \right) / (\lambda - 1) \ln \left(\frac{^{206}\text{Pb}/^{238}\text{U}}{^{206}\text{Pb}/^{238}\text{U}} \right) + t_0$$

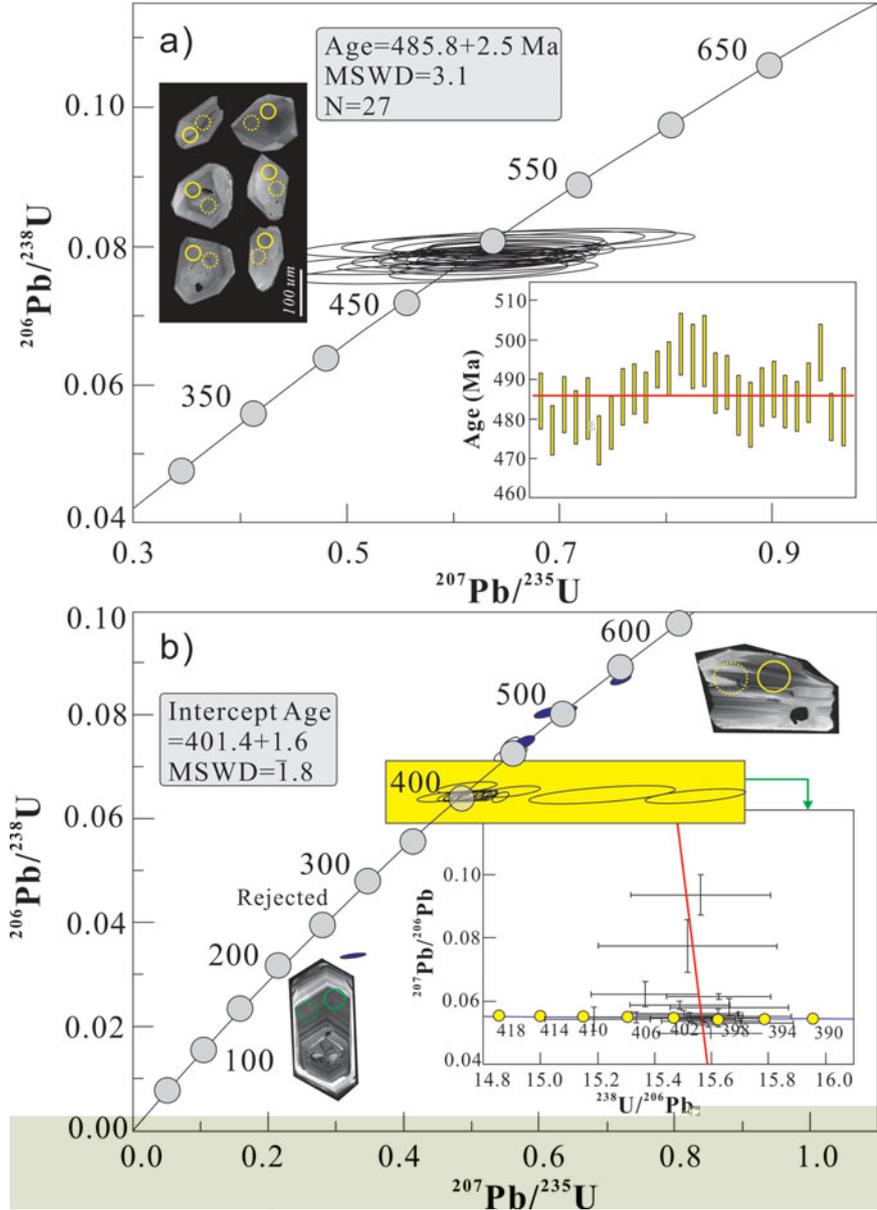


Figure 4. U-Pb zircon ages and geochemistry of the Zhaheba ophiolite. The concordia diagrams show the relationship between $^{206}\text{Pb}/^{238}\text{U}$ and $^{207}\text{Pb}/^{235}\text{U}$ ratios. The intercept ages are 485.8 ± 2.5 Ma (a) and 401.4 ± 1.6 Ma (b). The MSWD values are 3.1 and 1.8, respectively. The insets show zircon grains with a 100 μm scale bar.

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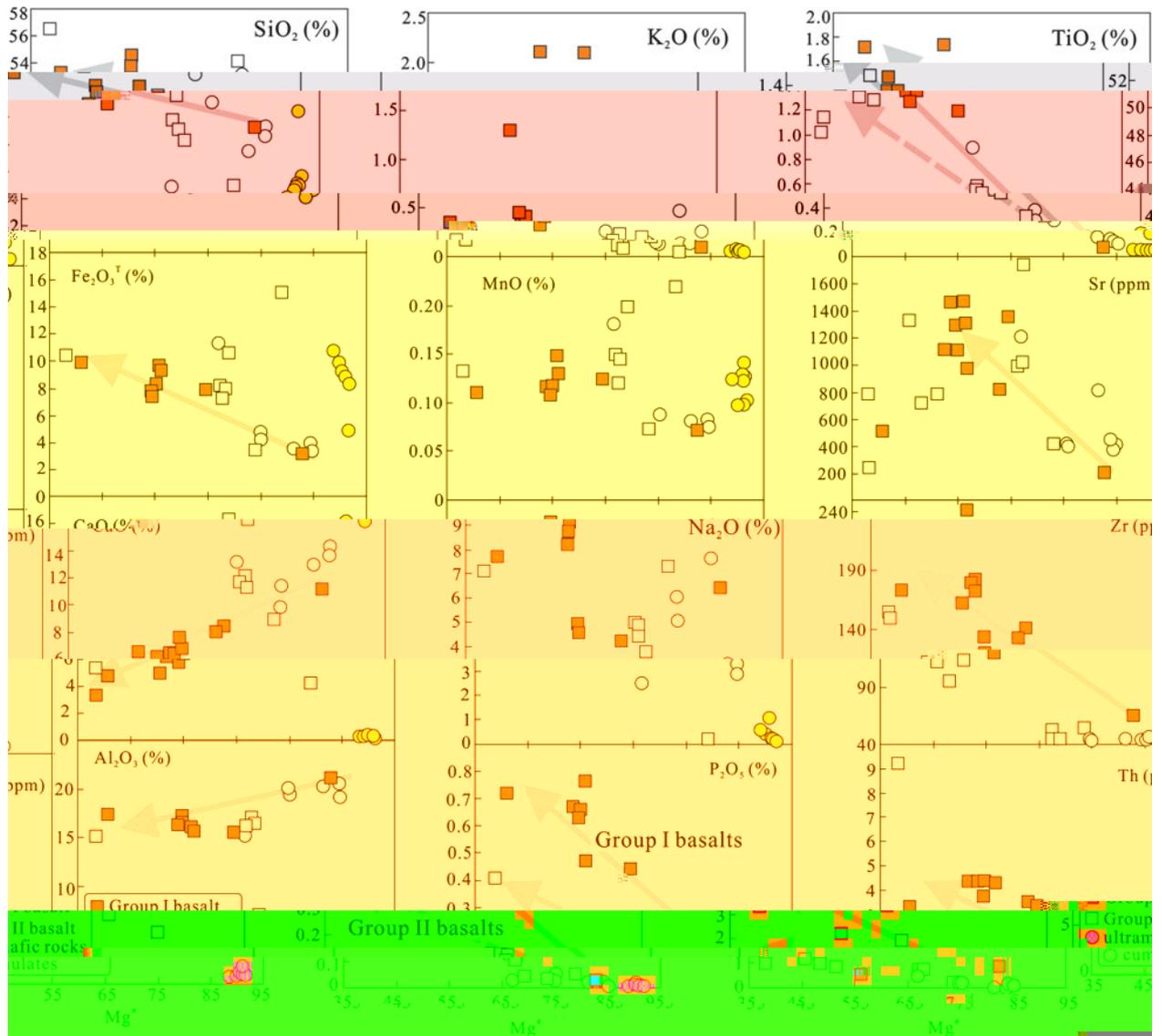


Figure 6. Geochemical characteristics of the Zhaheba ophiolite. The diagram shows the variation of various oxides and trace elements (SiO₂, K₂O, TiO₂, Fe₂O₃, MnO, Sr, CaO, Na₂O, Zr, Al₂O₃, P₂O₅, Th) versus Mg# (55-95). The plot is divided into colored regions: red (top), yellow (middle), orange (bottom), and green (bottom-most). A legend at the bottom right identifies 'Group I basalt', 'Group II basalts', and 'ultramylonites'. Arrows indicate trends for different groups.

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4.c.2. Basalts

43.15% 5.65% (52%,

124 205 2 50 60 1. 10 30 (20)

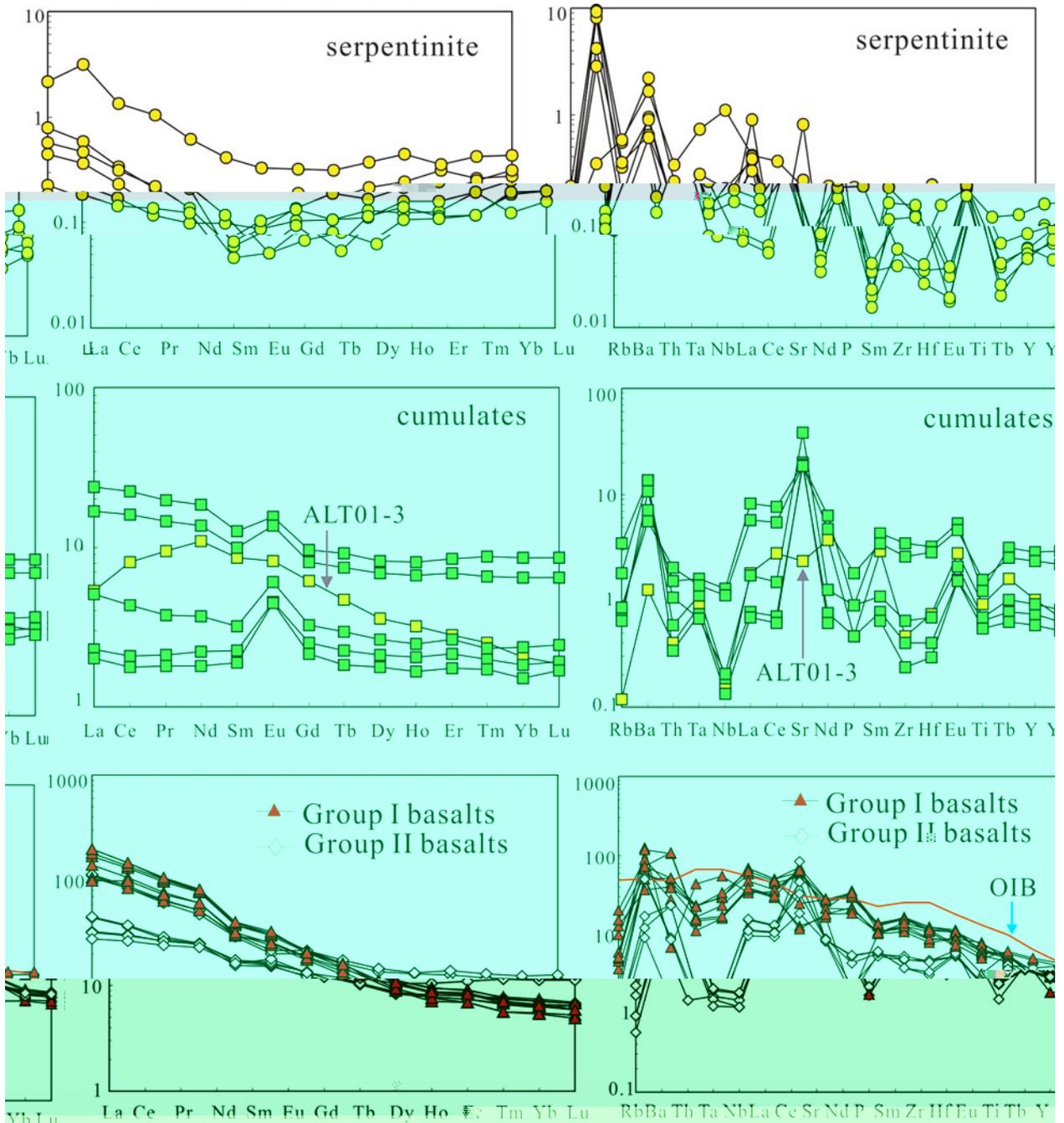
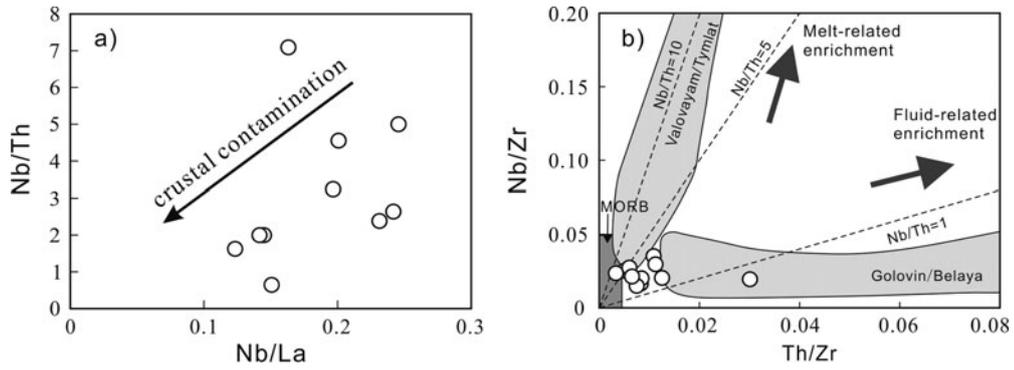
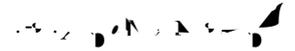


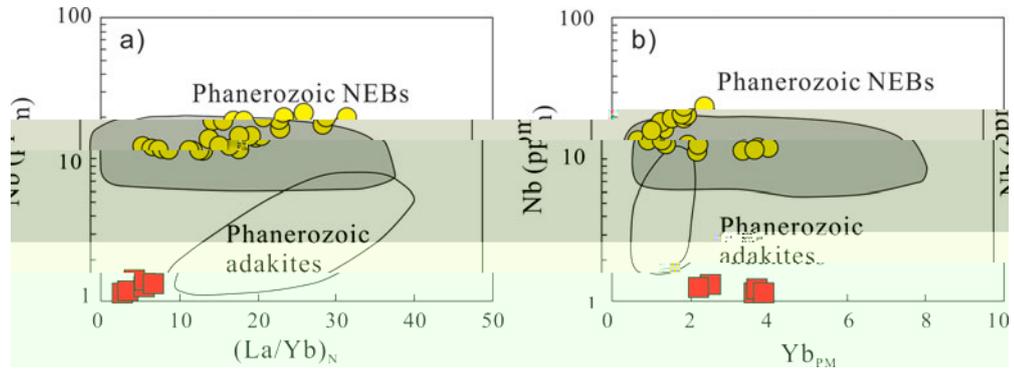
Figure 1. REE patterns of serpentinites, cumulates, and basalts. The top row shows REE patterns of serpentinites (y-axis: 0.01 to 10), the middle row shows REE patterns of cumulates (y-axis: 1 to 100), and the bottom row shows REE patterns of Group I basalts (red triangles) and Group II basalts (green diamonds) (y-axis: 1 to 1000). The x-axis for the left column is La to Lu, and for the right column is Rb to Y. Specific features like 'ALT01-3' and 'OIB' are labeled.

$(\text{D}_T/\text{D}_U = 0.0 \text{--} 1.14)$
 $(\text{D}_T/\text{D}_U = 1.02 \text{--} 1.21)$
 $(\text{D}_T/\text{D}_U = 0.44)$
 (~ 0.11)

4. Whole-rock Sr-N and zircon Hf-O isotopes
 2.1 ± 0.1
 $(0.0024 \text{--} 0.0452)$ / $(0.04030 \text{--} 0.0536)$
 $(0.04015 \text{--} 0.05171)$
 2013 ± 0.3 (1)
 $0.0 \text{--} 0.13$ (4) $^{143}\text{Nd}/^{144}\text{Nd}$
 $0.512 \text{--} 0.512$ (3) $^{176}\text{Yb}/^{174}\text{Yb}$ (t)
 $+6.3 \pm 0.5$ (2013 \pm 0.3) (1) ± 1



12. (a) Nb/Th vs Nb/La diagram showing crustal contamination. (b) Nb/Zr vs Th/Zr diagram showing melt- and fluid-related enrichment fields.



13. (a) Nb vs (La/Yb)_N diagram. (b) Nb vs Yb_{PM} diagram. Both plots show fields for Phanerozoic NEBs and Phanerozoic adakites.

(1.5) (0.76) (0.04120 0.06133)

(2)

(/6)

(< 0.3)

& (1.1, 2002).

(0.1-0.2) (0.6-1.0)

(1.6)

(1.4)

(14)

2

2

5. Implications for the Palaeozoic accretion process in eastern Junggar

(416 et al. 2014

et al. 2015), (503

45 et al. 2003 et al. 2015)

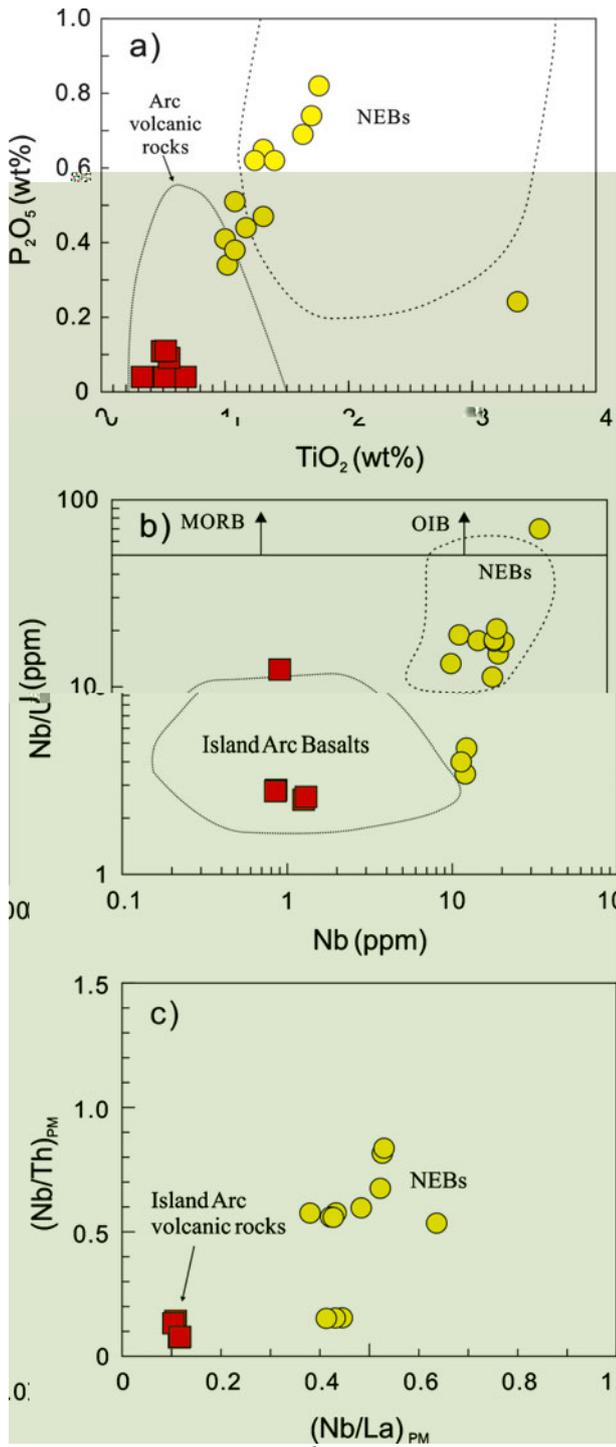
(400) (1)

(et al. 2014),

et al. 200, 200 a,b et al.

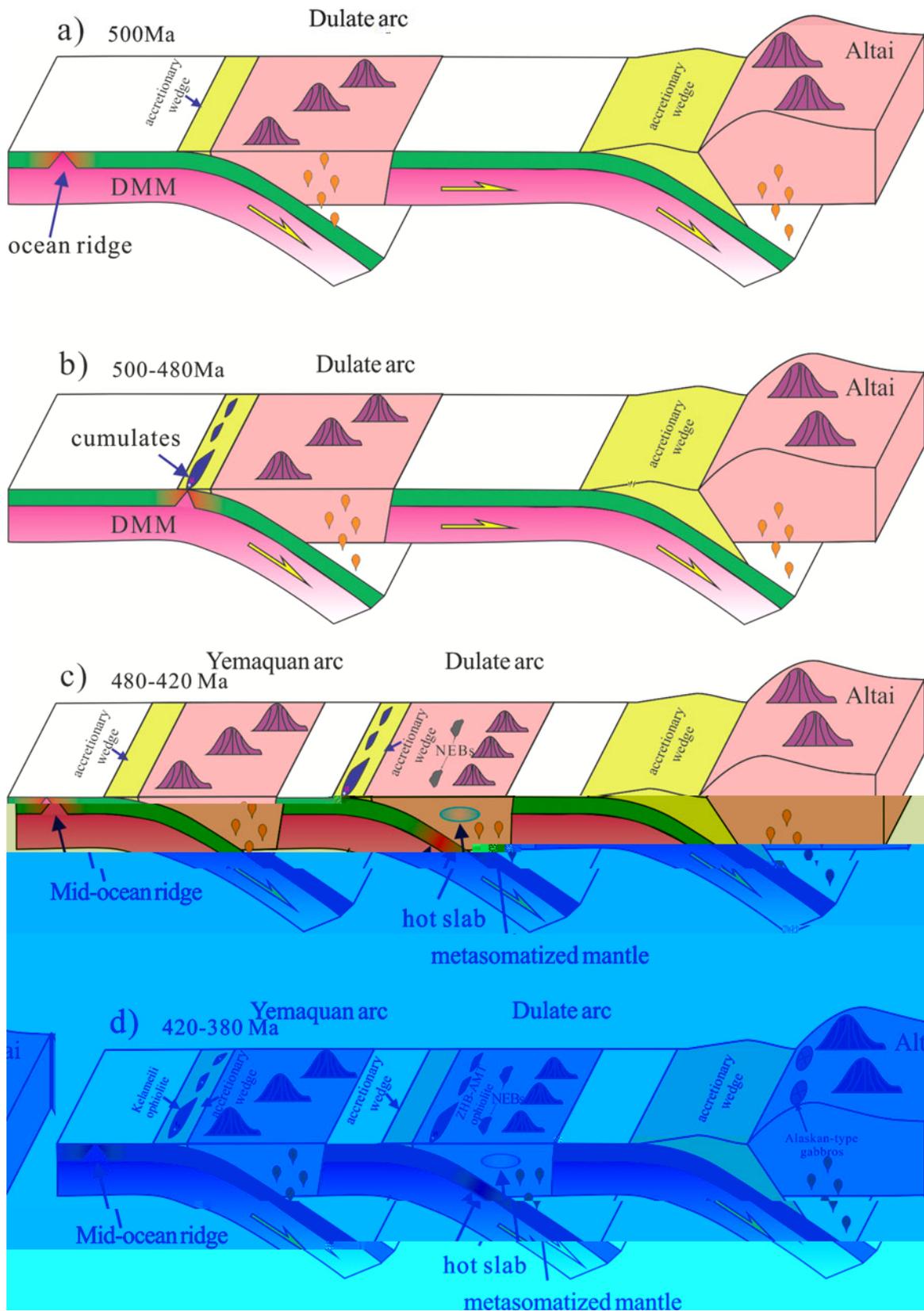
200 a).

(et al. 200 b).



460 3 5 (c. 400) (l
 et al. 2006, 200 et al. 200 et al. 200
 et al. 200, 200 et al. 2012 et al.
 2015).
 2002 / et al. 200).
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 (5.),
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 (15). et al. (200, 200 b)
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 (3) (4 0
 420) (45 et al.
 2015)
 (440 et al. 2014)
 (15)

14. () () () () ()
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 et al. (1, 5), (1, 2)
 et al. (2015)
 400 3 0



15. (a) 500 Ma, (b) 500-480 Ma, (c) 480-420 Ma, (d) 420-380 Ma. The diagrams illustrate the tectonic and magmatic evolution of the Dulate and Yemaquan arcs, showing features such as accretionary wedges, DMM, ocean ridges, hot slabs, and various ophiolite and gabbro units.

(4) *et al.* 2014 *et al.* 2015). (420 3 0)
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100) (101) (102) (103) (104) (105) (106) (107) (108) (109) (110) (111) (112) (113) (114) (115) (116) (117) (118) (119) (120) (121) (122) (123) (124) (125) (126) (127) (128) (129) (130) (131) (132) (133) (134) (135) (136) (137) (138) (139) (140) (141) (142) (143) (144) (145) (146) (147) (148) (149) (150) (151) (152) (153) (154) (155) (156) (157) (158) (159) (160) (161) (162) (163) (164) (165) (166) (167) (168) (169) (170) (171) (172) (173) (174) (175) (176) (177) (178) (179) (180) (181) (182) (183) (184) 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6. Conclusions

(1) 45 400
 (2)
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Acknowledgements.

(2011, 06-03-01). 305

Supplementary material

// /10.101 / 0016 56 16000042.

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