

| a | 1. | a | , | a | a | aa | a | a | | | | | | | | | | | | |
|-----|-------|------|-------|------|-------|------|-------|------|---------------------------|------|-------|-----|-------|-----|-------|------|-------|------|-------|------|
| a | 2013 | 01-1 | 2013 | 01-3 | 2013 | 01-4 | 2013 | 01-5 | 2013 | 01-6 | 2013 | 01- | 2013 | 01- | 2013 | 01 1 | 2013 | 01 2 | 2013 | 01 4 |
| | | | | | | | | | <i>Major elements (%)</i> | | | | | | | | | | | |
| 2 | 3 . 0 | | 4 .20 | | 3 .41 | | 3 .62 | | 3 .22 | | 3 . 2 | | 3 .05 | | 4 .22 | | 46.4 | | 51.2 | |
| 2 | 0.05 | | 0.20 | | 0.05 | | 0.05 | | 0.04 | | 0.05 | | 0.04 | | 0.14 | | 0.12 | | 0.2 | |
| 2 3 | 0.61 | | 1. 6 | | 1.04 | | 0.6 | | 0. 0 | | 0. 4 | | 0. 0 | | 1 . 2 | | 1 .64 | | 1 .33 | |
| 2 3 | .44 | | 4.6 | | . | | .36 | | .5 | | .16 | | . 4 | | 3.6 | | 3.24 | | 3. | |
| | 0.0 | | 0.10 | | 0.11 | | 0.11 | | 0.11 | | 0.0 | | 0.11 | | 0.0 | | 0.0 | | 0.0 | |
| | 3 .21 | | 24.5 | | 3 . 2 | | 3 . | | 3 .0 | | 3 .31 | | 3 .44 | | 10.04 | | .03 | | 5. | |

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|----------------|-----------------------------|------|-------|------|-------|---------|-------|---------|-------|---------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
| | 0.005 | | 0.064 | | 0.00 | | 0.005 | | 0.00 | | 0.003 | | 0.003 | | 0.051 | | 0.044 | | 0.222 | |
| | 0.021 | | 0.34 | | 0.044 | | 0.042 | | 0.0 2 | | 0.031 | | 0.033 | | 0.310 | | 0.25 | | 1.450 | |
| | 0.004 | | 0.04 | | 0.00 | | 0.00 | | 0.011 | | 0.005 | | 0.005 | | 0.04 | | 0.043 | | 0.21 | |
| | 0.011 | | 0.232 | | 0.036 | | 0.044 | | 0.012 | | 0.034 | | 0.00 | | 0.123 | | 0.0 0 | | 0. 3 | |
| a | 0.0 0 | | 0.036 | | 0.03 | | 0.03 | | 0.06 | | 0.026 | | 0.025 | | 0.046 | | 0.031 | | 0.06 | |
| | 0.26 | | 1. 10 | | 6.600 | | 1. 0 | | 0. 3 | | 0.233 | | 1.150 | | 1.5 0 | | 0.516 | | 0.1 5 | |
| | 0.406 | | 0.0 2 | | 0.12 | | 0.112 | | 0.0 | | 0.1 | | 0.054 | | 0.16 | | 0.1 1 | | 0.6 5 | |
| | 0.046 | | 0.034 | | 0.014 | | 0.02 | | 0.050 | | 0.030 | | 0.010 | | 0.050 | | 0.02 | | 0.130 | |
| | 0.1 1 | | 0.144 | | 0.203 | | 0.364 | | 0.042 | | 0.0 4 | | 0.0 | | 0.066 | | 0.042 | | 0.0 3 | |
| a | 2013 | 01 5 | 2013 | 01 6 | 2013 | 01 (1) | 2013 | 01 (1) | 2013 | 01 (1) | 2013 | 03 2 (1) | 2013 | 03 3 (1) | 2013 | 03 4 (1) | 2013 | 03 5 (1) | 2013 | 01 3 (2) |
| | <i>Major elements (%)</i> | | | | | | | | | | | | | | | | | | | |
| 2 | 4 .1 | | 45. | | 4 . | | 53.1 | | 51. 1 | | 50.40 | | 50.54 | | 50.52 | | 51.22 | | 52.3 | |
| 2 | 0.34 | | 0.15 | | 1.40 | | 1.24 | | 1.31 | | 1. 0 | | 1.63 | | 1.31 | | 1.1 | | 0.33 | |
| 2 3 | 1 . | | 1 .5 | | 16.5 | | 16.1 | | 15. 3 | | 15. . | | 16. 6 | | 15.55 | | 15.4 | | 1 .61 | |
| 2 3 | 4.52 | | 3.34 | | . | | .11 | | .43 | | .0 | | .50 | | .42 | | . 2 | | 3.44 | |
| | 0.0 | | 0.0 | | 0.11 | | 0.10 | | 0.11 | | 0.13 | | 0.11 | | 0.14 | | 0.12 | | 0.0 | |
| | 6. | | .42 | | 4. 0 | | 4.2 | | 4.41 | | 5. . | | 3.2 | | 6.06 | | .14 | | 4. . | |
| a | 11.03 | | 12.61 | | 6.22 | | 5. 5 | | 6.3 | | 6. 5 | | 4.52 | | .4 | | .26 | | . 0 | |
| a ₂ | 4. 6 | | .3 | | . 2 | | .3 | | .00 | | 4.52 | | .31 | | 4. 0 | | 4.0 | | .11 | |
| 2 | 0.13 | | 0.11 | | 0.3 | | 0.31 | | 0.42 | | 2.04 | | 0.33 | | 1.2 | | 2.03 | | 0.1 | |
| 2 5 | 0.04 | | 0.02 | | 0.62 | | 0.62 | | 0.65 | | 0. 4 | | 0.6 | | 0.4 | | 0.44 | | 0.04 | |
| | 3. 2 | | 3.26 | | 4.24 | | 2.54 | | 2. 3 | | 2.2 | | 5.14 | | 2.65 | | 1. 3 | | 2. . | |
| | . 5 | | . 2 | | . 6 | | . 0 | | .4 | | .40 | | . 1 | | .6 | | .6 | | . 1 | |
| | 4. . | | .4 | | .11 | | . 0 | | .42 | | 6.56 | | .64 | | 6.0 | | 6.11 | | .2 | |
| # | 5 | | 1 | | 55 | | 54 | | 54 | | 56 | | 41 | | 56 | | 64 | | 4 | |
| | <i>Trace elements (ppm)</i> | | | | | | | | | | | | | | | | | | | |
| | .0 | | 4. 5 | | 1.16 | | 1.12 | | 1.4 | | .0 | | 40.4 | | 5.2 | | 6. 2 | | 5. 1 | |
| | 0.22 | | 0.135 | | 1.2 4 | | 1.6 3 | | 1.316 | | 1. 53 | | 1.034 | | 1.100 | | 0.5 5 | | 0.62 | |
| | 25.0 | | 23. . | | 1 .6 | | 1 .5 | | 1 .5 | | .5 | | 1 .2 | | 25.2 | | 1 . | | 1 .0 | |
| | 11 | | 3. . | | 1 6 | | 166 | | 1 2 | | 22 | | 22 | | 254 | | 1 | | 5. . | |
| | 34. . | | 163 | | 60.5 | | 62.6 | | 64.1 | | 116 | | 1 . | | 0. . | | 203 | | 23. . | |
| | 24.2 | | 21.6 | | 26. . | | 23.6 | | 24.6 | | 2 . | | 2 .5 | | 2 .0 | | 2 .0 | | 16.4 | |
| | 4. . | | 1 5 | | 63.6 | | 50. . | | 51.4 | | 6. . | | 2 . | | 5 .3 | | 132 | | 1.1 | |

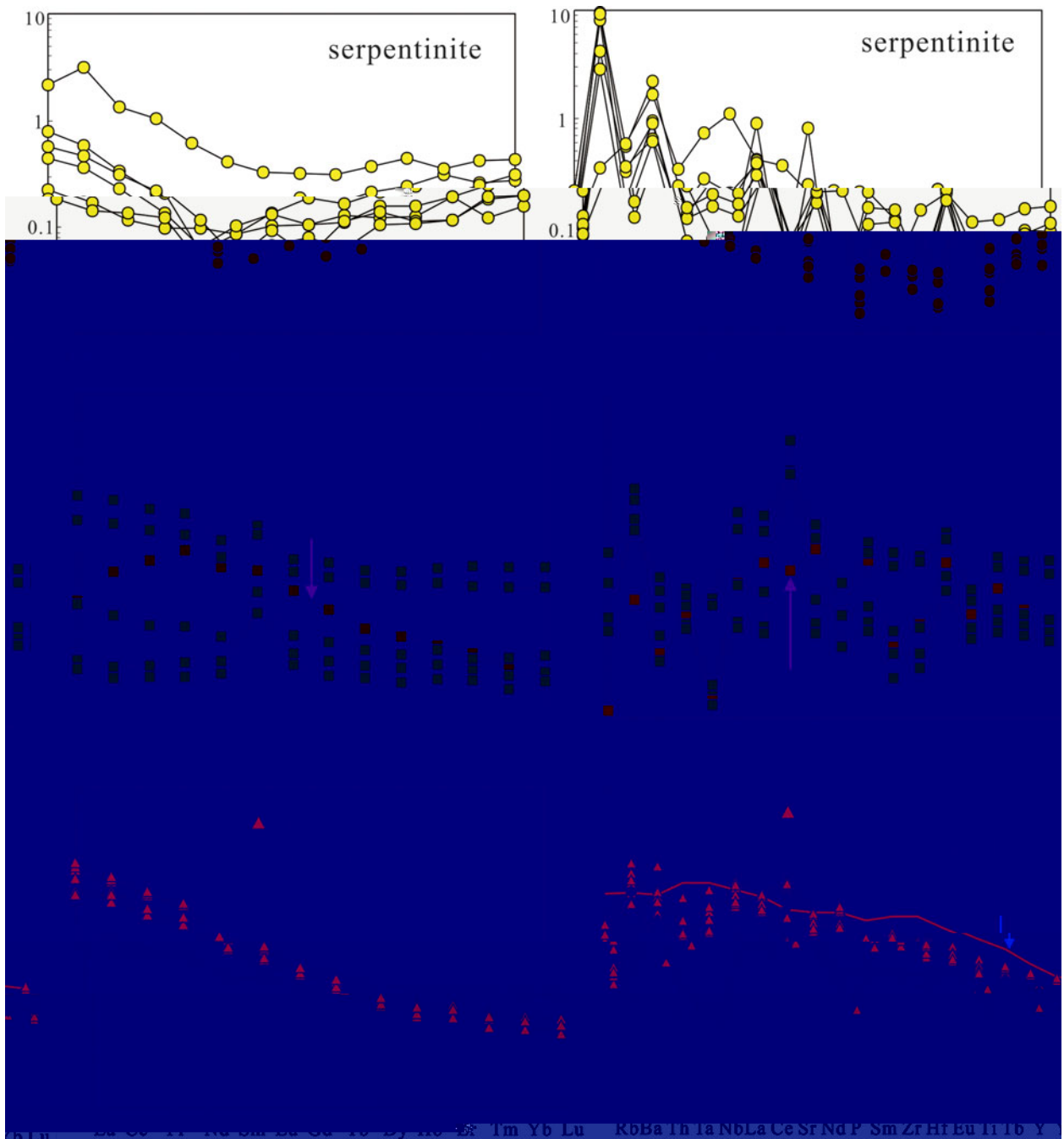
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| a | 2013 01 5 | 2013 01 6 | 2013 01 (1) | 2013 01 (1) | 2013 01 (1) | 2013 03 2 (1) | 2013 03 3 (1) | 2013 03 4 (1) | 2013 03 5 (1) | 2013 01 3 (2) |
| a | 3. | 1.20 | 3 .60 | 46. 0 | 4 .30 | 23.40 | 43.00 | 25.20 | 32. 0 | 6.56 |

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| a | 2013 (2) | 01 11 | 2013 (2) | 02 1 | 2013 (2) | 02 2 | 2013 (1) | 03 1 | 2013 (1) | 03 6 | 2013 (2) | 01 10 | 04 06 (1) | 04 24 (1) | 04 2 (1) | 03 1 (1) |
|---|-----------------------------|-------|--------------|------|--------------|------|--------------|------|--------------|------|--------------|-------|---------------|---------------|--------------|--------------|
| | <i>Trace elements (ppm)</i> | | | | | | | | | | | | | | | |
| | 1 .4 | | 36. | | 42.4 | | 26.0 | | 32.4 | | 1 . | | / | / | / | / |
| | 0.3 5 | | 0.153 | | 0.35 | | 1.1 | | 0. 4 | | 0.46 | | / | / | / | / |
| | 32.5 | | 33.2 | | 34.5 | | 25.1 | | 26.3 | | 32.1 | | 13.4 | 20.5 | 1 . | 20.3 |
| | 1 4 | | 203 | | 21 | | 33 | | 341 | | 1 5 | | 144 | 1 4 | 214 | 265 |
| | 56.5 | | 44.2 | | 4 . | | 1 . | | 22.2 | | 53. | | 15 | 162 | 214 | 265 |
| | 34. | | 3 .5 | | 3 .3 | | 23.1 | | 24. | | 33. | | 20.6 | 30. | 2 . | 20.2 |
| | 66.4 | | 4.6 | | 6.4 | | 25.4 | | 2 .1 | | 66.6 | | .1 | 114 | 5.5 | .02 |
| | 6.4 | | 236.4 | | 256. | | 205.4 | | 20 . | | 114.20 | | / | / | / | / |
| | 4 .0 | | 44.1 | | 4 .0 | | 4. | | 103 | | 44.1 | | / | / | / | / |
| a | 12.0 | | 11.1 | | 11.2 | | 14. | | 13.6 | | 12.0 | | / | / | / | / |
| | 0.5 | | 1.420 | | 1.0 0 | | 3.130 | | 3.2 0 | | 0.5 3 | | 4. | 1 .1 | 22.0 | 1 .2 |
| | 1 | | 1 50 | | 5 | | 2 0 | | 24 | | 6 6 | | 1 | 31 | 111 | 6 |
| | 13.0 | | 13.0 | | 13.2 | | 21.1 | | 22. | | 12.5 | | 13.2 | 13.2 | 14. | 20.1 |
| | 54. | | 42.3 | | 41.5 | | 144 | | 154 | | 52. | | 243 | 133 | 164 | 151 |
| | 1.2 | | 0. 4 | | 0. 55 | | 11.315 | | 11. 5 | | 1.25 | | 20.2 | 12. | 21. | 12.2 |
| | 0.025 | | 0.030 | | 0.02 | | 0.051 | | 0.052 | | 0.02 | | / | / | / | / |
| | 0.3 1 | | 0.2 6 | | 0.32 | | 1.560 | | 1.450 | | 0.360 | | / | / | / | / |
| | 0.2 | | 1. 20 | | 1.030 | | 0.365 | | 0.406 | | 0.336 | | / | / | / | / |
| a | 11 | | 3 2 | | 346 | | 25 | | 50 | | 4.3 | | / | / | / | / |
| a | 10. 0 | | . 40 | | .610 | | 26.40 | | 26. 0 | | 10.50 | | 30.6 | 32.2 | 40.1 | 26.4 |
| | 23.00 | | 1 . 0 | | 1 .40 | | 51.50 | | 54. 0 | | 22.30 | | 5 . | 62. | 2.3 | 52.5 |
| | 2. 0 | | 2.520 | | 2.510 | | 5. 50 | | 6.1 0 | | 2.6 0 | | 6. | . 4 | 10.5 | 6.4 |
| | 11. 0 | | 11. 0 | | 11.60 | | 22.30 | | 24.30 | | 11.60 | | 2 .5 | 31.2 | 43.1 | 24.4 |
| | 2.540 | | 2. 00 | | 2.6 0 | | 4.4 0 | | 4. 00 | | 2.3 0 | | 4.5 | 5.2 | 6. | 4. 5 |
| | 0. 6 | | 0. 1 | | 0. 0 | | 1.163 | | 1.25 | | 0. 3 | | 1.45 | 1.5 | 2.0 | 1.03 |
| | 2.4 0 | | 2. 13 | | 2. 54 | | 4.14 | | 4.46 | | 2.522 | | 3.56 | 4.01 | 5.35 | 4.23 |
| | 0.3 6 | | 0.3 | | 0.3 | | 0.612 | | 0.660 | | 0.3 4 | | 0.4 | 0.54 | 0.64 | 0.63 |
| | 2.1 0 | | 2.150 | | 2.220 | | 3.420 | | 3.6 0 | | 2.130 | | 2.5 | 2. | 3.24 | 3. 5 |
| | 0.46 | | 0.446 | | 0.444 | | 0. 2 | | 0. 5 | | 0.46 | | 0.4 | 0.52 | 0.5 | 0. |
| | 1.350 | | 1.230 | | 1.240 | | 2.120 | | 2.2 0 | | 1.310 | | 1.32 | 1.3 | 1.45 | 2.25 |
| | 0.1 0 | | 0.16 | | 0.1 5 | | 0.304 | | 0.32 | | 0.1 4 | | 0.1 | 0.2 | 0.2 | 0.34 |
| | 1.210 | | 1.050 | | 1.120 | | 1. 60 | | 2.110 | | 1.210 | | 1.25 | 1.23 | 1.24 | 2.13 |
| | 0.1 4 | | 0.164 | | 0.165 | | 0.2 1 | | 0.323 | | 0.1 3 | | 0.20 | 0.1 | 0.1 | 0.34 |
| | 1.3 0 | | 0. 41 | | 1.040 | | 3.2 0 | | 3.510 | | 1.460 | | 5.3 | 3.2 | 4.16 | 3. 2 |
| a | 0.0 4 | | 0.062 | | 0.051 | | 0.5 | | 0.644 | | 0.0 | | 1.35 | 0.6 | 1.16 | 0.6 |
| | 0.151 | | 2.0 | | 1.50 | | 2. 5 | | 1. | | 0.33 | | / | / | / | / |
| | 0.3 4 | | 0.206 | | 0.200 | | 45.20 | | 35.10 | | 0.41 | | .13 | .0 | 4.1 | 21.06 |
| | 1. 0 | | 0. 61 | | 0. 1 | | . 60 | | .2 0 | | 1. 0 | | 4.50 | 2.63 | 3.20 | .41 |
| | 0.500 | | 0.304 | | 0.302 | | 2. 30 | | 3.4 0 | | 0.501 | | 1. | 0.6 | 1.46 | 2.5 |

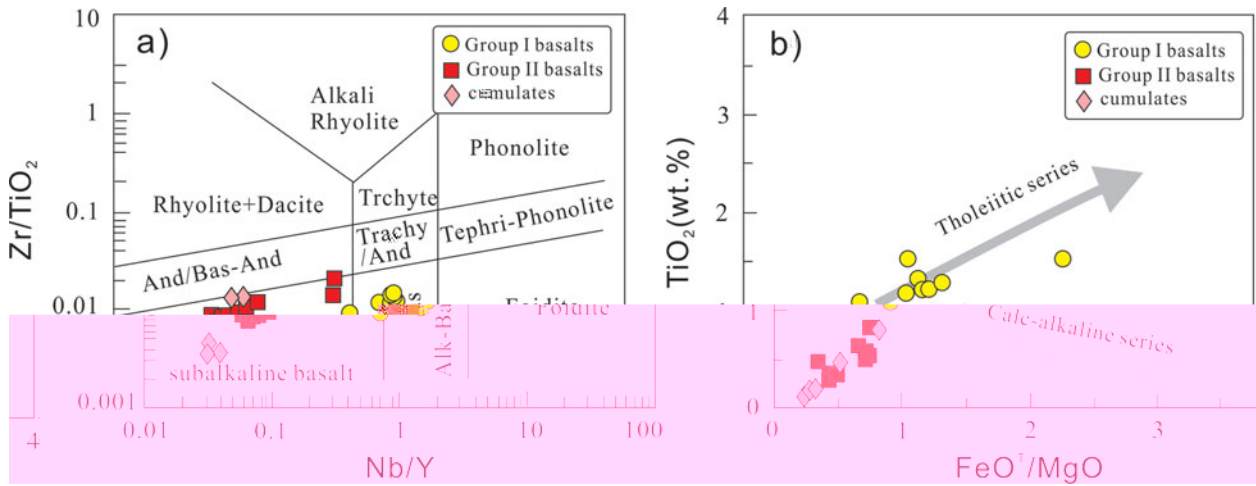
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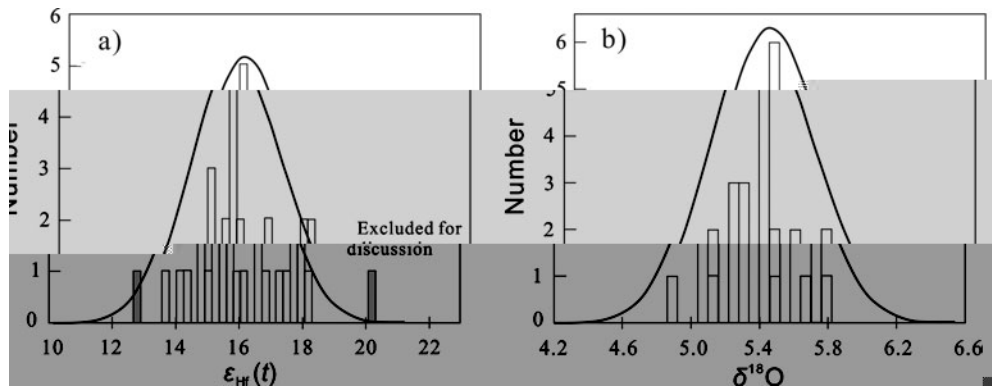
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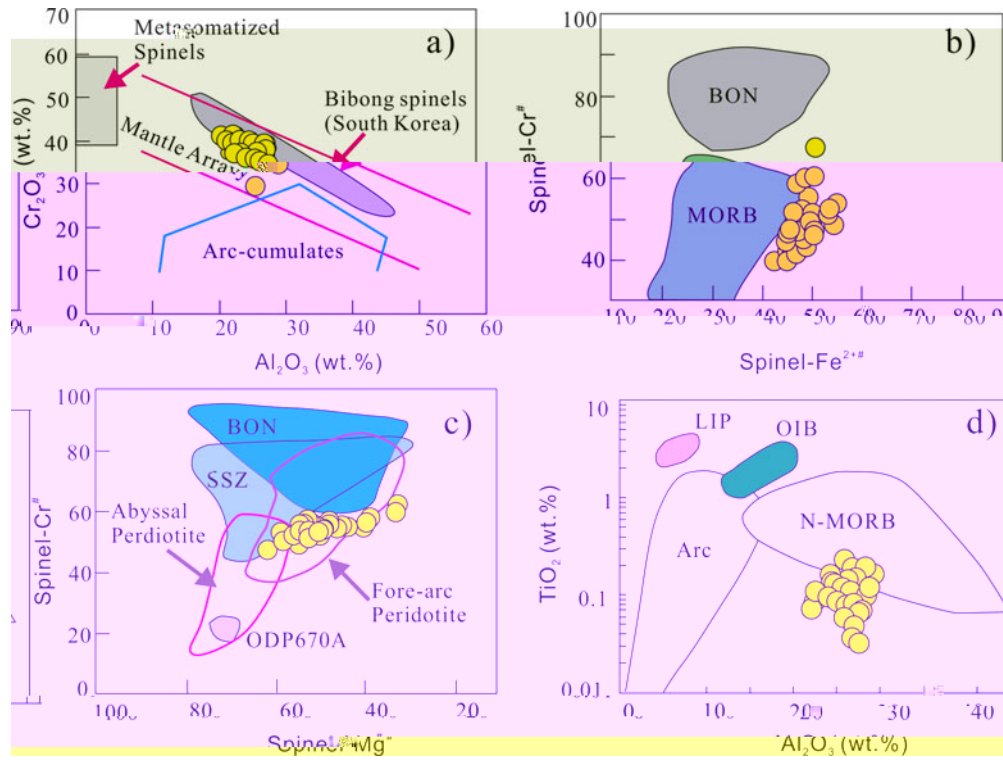
(a) Zr/TiO₂ vs Nb/Y diagram showing various volcanic fields. (b) TiO₂ (wt.%) vs FeO^T/MgO diagram showing Tholeiitic and Calc-alkaline series. Legend: Group I basalts (yellow circles), Group II basalts (red squares), cumulates (red diamonds).



(a) Histogram of ε_{Hf}(t) values. (b) Histogram of δ¹⁸O values.

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5. Discussion
5.a. The numerical members of the Zhaheba ophiolite
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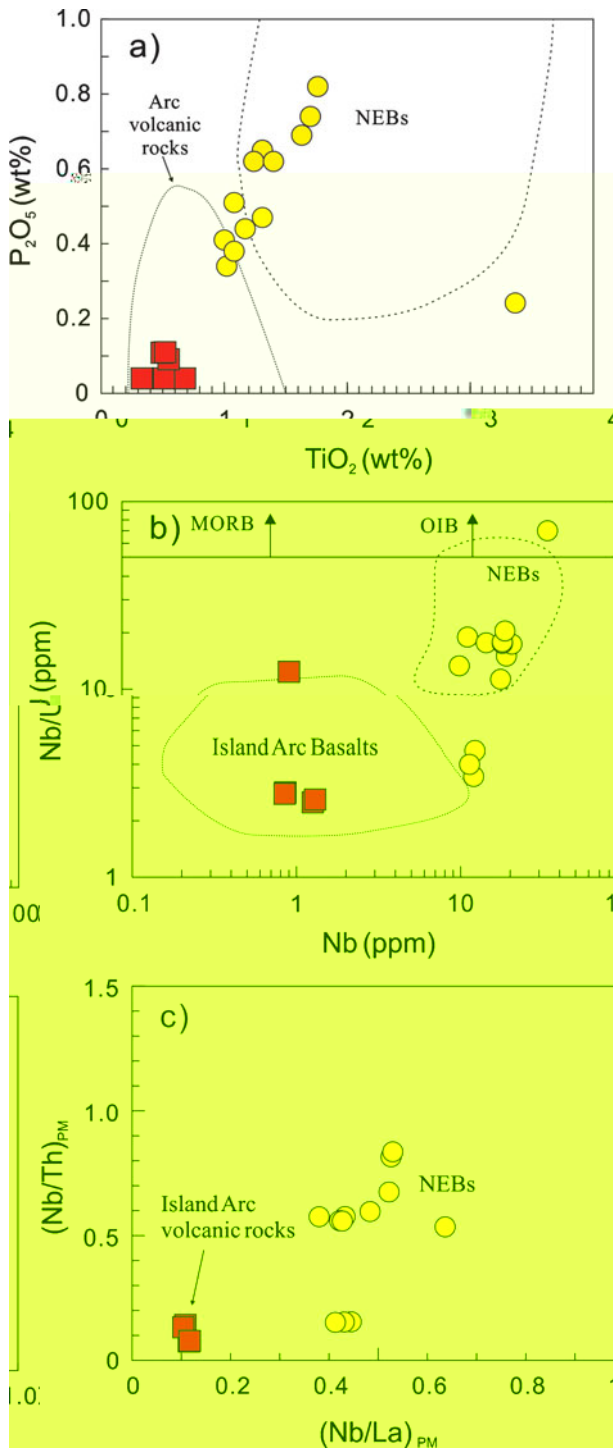


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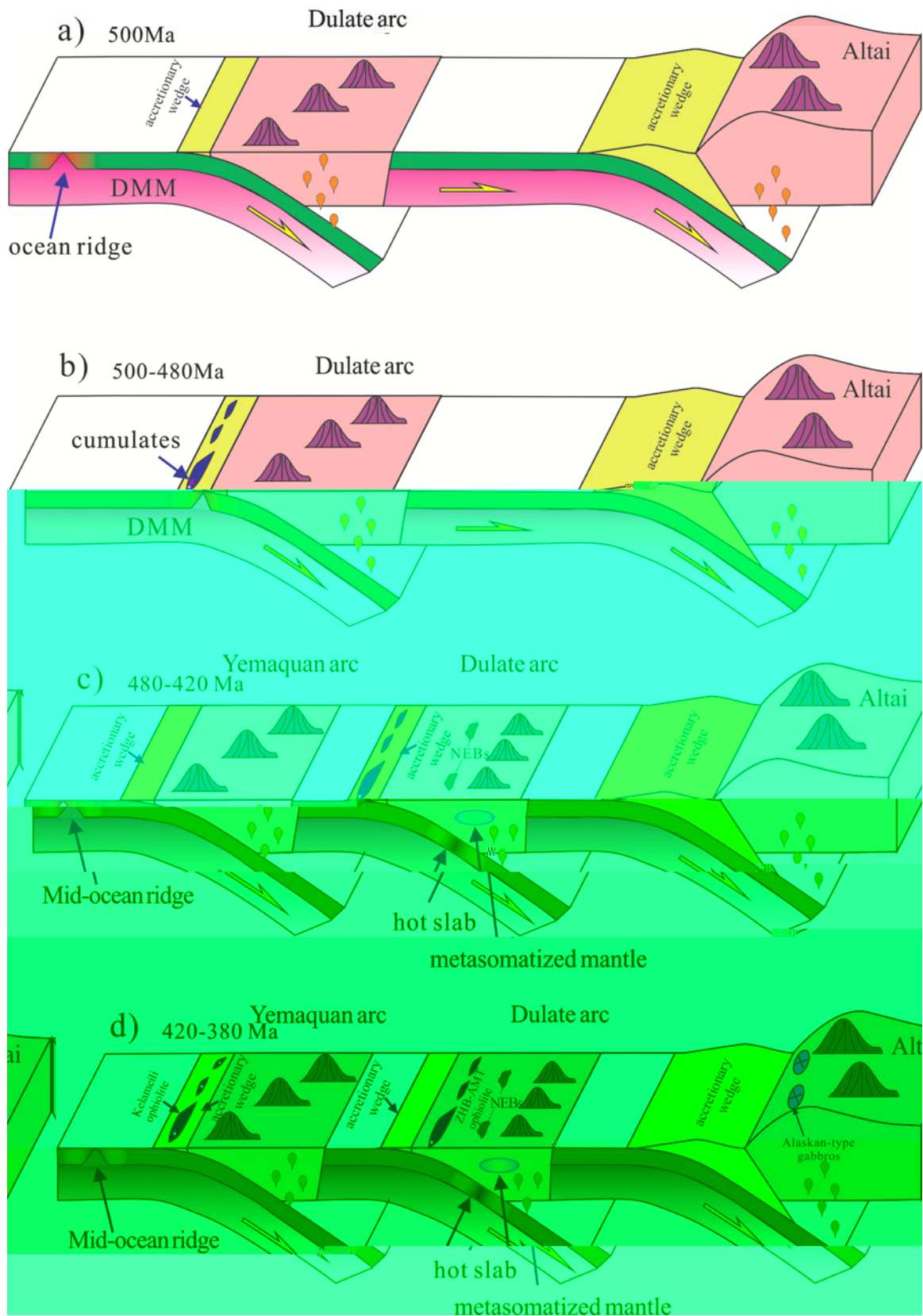
5.b. Or g n of the serpent n te an cumulates

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14. (a) P_2O_5 vs TiO_2 (wt%) diagram showing the distribution of the Zhaheba ophiolite rocks (red squares) and NEBs (yellow circles). The field for Arc volcanic rocks is outlined by a dashed line. (b) Nb/L vs Nb (ppm) diagram showing the distribution of the Zhaheba ophiolite rocks (red squares) and NEBs (yellow circles). The field for Island Arc Basalts is outlined by a dashed line. (c) $(Nb/Th)_{PM}$ vs $(Nb/La)_{PM}$ diagram showing the distribution of the Zhaheba ophiolite rocks (red squares) and NEBs (yellow circles). The field for Island Arc volcanic rocks is outlined by a dashed line.

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