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| Supplementary Table 1. Whole rock major element compositions of the plutonic rocks from the Ardestan area. | | | | | | | | | | |
| Sample | AR2 | AR22 | ZR3 | ZR2 | AR5 | AR10 | ZR6 | AR14 | ZR4 | ZR6 |
| SiO2 | 63.53 | 63.16 | 64.03 | 62.98 | 63.02 | 62.81 | 63.08 | 61.85 | 62.97 | 62.87 |
| TiO2 | 0.98 | 0.67 | 0.55 | 0.59 | 0.64 | 0.75 | 0.54 | 0.86 | 0.71 | 0.72 |
| Al2O3 | 15.12 | 15.96 | 15.83 | 15.72 | 15.81 | 15.84 | 16.01 | 15.89 | 16.2 | 15.71 |
| Fe2O3 | 6.23 | 5.98 | 5.78 | 5.86 | 5.91 | 5.86 | 6.01 | 6.13 | 5.95 | 6.02 |
| MnO | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.1 | 0.14 | 0.1 | 0.1 |
| MgO | 2.23 | 2.61 | 2.12 | 2.62 | 2.61 | 2.55 | 2.38 | 2.86 | 3.08 | 2.62 |
| CaO | 5.44 | 5.36 | 5.78 | 5.71 | 5.54 | 5.51 | 5.68 | 5.74 | 4.85 | 5.12 |
| Na2O | 3.18 | 3.15 | 3.39 | 3.34 | 3.15 | 3.42 | 3.39 | 3.02 | 3.03 | 3.13 |
| K2O | 1.95 | 1.78 | 1.72 | 1.68 | 1.75 | 1.85 | 2.01 | 1.87 | 1.97 | 2.02 |
| P2O5 | 0.11 | 0.15 | 0.12 | 0.11 | 0.13 | 0.15 | 0.11 | 0.2 | 0.12 | 0.11 |
| L.O.I | 1.16 | 0.95 | 0.87 | 0.81 | 0.98 | 1.2 | 0.73 | 1.2 | 1.11 | 1.6 |
| Total | 100.04 | 99.88 | 100.3 | 99.54 | 99.66 | 100.07 | 100.04 | 99.87 | 100.09 | 100.02 |
| Zr (ppm) | 151 | 90 | 143 | 192 | 167 | 130 | 165 | 100 | 78 | 112 |
| Cr (ppm) | 8.02 | 18.12 | 7.36 | 23.25 | 18.56 | 5.64 | 22.12 | 8.54 | 7.25 | 17.04 |
| A/CNK | 0.88 | 0.95 | 0.88 | 0.89 | 0.92 | 0.89 | 0.89 | 0.90 | 1.02 | 0.92 |
| A/NK | 2.06 | 2.25 | 2.13 | 2.15 | 2.23 | 2.05 | 2.07 | 2.18 | 2.28 | 2.09 |
| Fe# | 0.72 | 0.67 | 0.71 | 0.67 | 0.67 | 0.67 | 0.69 | 0.66 | 0.63 | 0.67 |
| Mg# | 41.49 | 46.37 | 42.08 | 46.97 | 46.66 | 46.30 | 43.96 | 48.03 | 50.63 | 46.30 |
| M | 1.88 | 1.76 | 1.87 | 1.88 | 1.81 | 1.89 | 1.89 | 1.90 | 1.65 | 1.80 |
| TZr.sat °C | 747 | 714 | 743 | 767 | 760 | 734 | 753 | 713 | 711 | 728 |
| TAp.sat °C | 843 | 872 | 858 | 837 | 855 | 868 | 838 | 889 | 846 | 836 |

Magnesium number (Mg#) = 100 × molar Mg2+/ (Mg2++Fe2+).

*Ln Dzr*= {12900/*T*(K)}-0.85(*M*-1)-3.80; M= [(K+Na+2Ca)/ (Si.Al)]cat

*Ln DAp*= [8400 + ((SiO2-0.5)2.64 ˟ 104))/*T*(K)]-[3.1+ (12.4(SiO2) - 0.5))]

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| Supplementary Table 2. Representative electron-microprobe analyses of plagioclase from the Ardestan plutonic rocks | | | | | | | | | | | | | | | | | | | | | |
|  | Core | Core | Rim | Rim | Core | Core | Rim | Rim | Core | Rim | Rim | Rim | Rim | Core | Rim | Rim | Core | Rim | Rim | Rim | Rim |
| SiO2 | 43.88 | 47.76 | 52.10 | 52.97 | 44.56 | 46.83 | 52.98 | 55.65 | 45.42 | 50.99 | 52.45 | 48.76 | 58.46 | 45.42 | 49.40 | 82.72 | 35.96 | 59.39 | 60.28 | 59.20 | 60.66 |
| TiO2 | 0.015 | 0.036 | 0.039 | 0.035 | 0.004 | 0.021 | 0.017 | 0.032 | 0.005 | 0.013 | 0.045 | 0.015 | 0.005 | 0.005 | 0.036 | 0.015 | 29.46 | 0.01 | 0.02 | 0.02 | 0.02 |
| Al2O3 | 32.84 | 35.53 | 27.53 | 27.26 | 34.69 | 33.55 | 26.98 | 25.76 | 32.20 | 29.30 | 27.27 | 34.36 | 23.76 | 32.20 | 32.01 | 7.27 | 6.49 | 26.75 | 25.24 | 23.96 | 24.78 |
| FeO | 0.57 | 0.42 | 0.58 | 0.65 | 0.71 | 0.67 | 0.57 | 0.44 | 0.70 | 0.50 | 0.74 | 0.46 | 0.53 | 0.70 | 0.88 | 4.00 | 1.36 | 0.28 | 0.15 | 0.27 | 0.21 |
| CaO | 18.45 | 14.69 | 11.63 | 11.36 | 17.60 | 17.89 | 11.37 | 8.98 | 17.37 | 13.10 | 11.29 | 5.21 | 6.78 | 17.37 | 11.24 | 0.57 | 23.87 | 7.80 | 6.56 | 5.72 | 6.58 |
| Na2O | 1.13 | 1.17 | 4.95 | 5.21 | 1.33 | 1.35 | 5.07 | 6.35 | 1.81 | 4.16 | 5.07 | 7.57 | 7.55 | 1.81 | 4.33 | 2.13 | 0.03 | 6.95 | 7.45 | 8.24 | 8.32 |
| K2O | 0.02 | 0.23 | 0.13 | 0.15 | 0.04 | 0.06 | 0.17 | 0.29 | 0.01 | 0.06 | 0.19 | 0.32 | 0.53 | 0.01 | 0.22 | 0.28 | 0.20 | 0.29 | 0.17 | 0.26 | 0.23 |
| Si | 8.40 | 8.70 | 9.76 | 9.85 | 8.33 | 8.61 | 9.89 | 10.28 | 8.61 | 9.47 | 9.82 | 9.08 | 10.74 | 8.61 | 9.16 | 14.35 | 7.45 | 10.47 | 10.74 | 10.81 | 10.75 |
| Ti | 0.002 | 0.005 | 0.005 | 0.005 | 0.001 | 0.003 | 0.002 | 0.004 | 0.001 | 0.002 | 0.006 | 0.002 | 0.001 | 0.001 | 0.005 | 0.002 | 4.59 | 0.00 | 0.00 | 0.00 | 0.00 |
| Al | 7.41 | 7.62 | 6.08 | 5.98 | 7.64 | 7.27 | 5.94 | 5.61 | 7.20 | 6.41 | 6.02 | 7.54 | 5.15 | 7.20 | 7.00 | 1.49 | 1.58 | 5.56 | 5.30 | 5.16 | 5.17 |
| Fe2+ | 0.09 | 0.06 | 0.09 | 0.10 | 0.11 | 0.10 | 0.09 | 0.07 | 0.11 | 0.08 | 0.12 | 0.07 | 0.05 | 0.11 | 0.14 | 0.57 | 0.24 | 0.04 | 0.02 | 0.04 | 0.03 |
| Ca | 3.78 | 2.87 | 2.34 | 2.26 | 3.53 | 3.52 | 2.27 | 1.78 | 3.53 | 2.61 | 2.26 | 1.04 | 1.33 | 3.53 | 2.23 | 0.107 | 5.29 | 1.47 | 1.25 | 1.12 | 1.25 |
| Na | 0.42 | 0.412 | 1.80 | 1.88 | 0.481 | 0.48 | 1.83 | 2.27 | 0.66 | 1.50 | 1.84 | 2.73 | 2.69 | 0.66 | 1.56 | 0.72 | 0.01 | 2.37 | 2.57 | 2.92 | 2.86 |
| K | 0.004 | 0.053 | 0.031 | 0.036 | 0.009 | 0.015 | 0.041 | 0.068 | 0.002 | 0.014 | 0.045 | 0.077 | 0.124 | 0.002 | 0.053 | 0.062 | 0.05 | 0.07 | 0.04 | 0.06 | 0.05 |
| An | 89.96 | 86.02 | 56.05 | 54.20 | 87.80 | 87.69 | 54.81 | 43.15 | 82.40 | 63.26 | 54.55 | 27.01 | 32.16 | 84.10 | 58.12 | 12.06 | 98.83 | 37.64 | 32.37 | 27.30 | 30.02 |
| Ab | 9.94 | 12.38 | 43.20 | 44.94 | 11.99 | 11.94 | 44.21 | 55.20 | 17.36 | 36.40 | 44.37 | 70.99 | 64.85 | 15.84 | 40.50 | 80.92 | 0.20 | 60.70 | 66.61 | 71.23 | 68.73 |
| Or | 0.10 | 1.60 | 0.75 | 0.86 | 0.21 | 0.37 | 0.98 | 1.65 | 0.24 | 0.34 | 1.08 | 2.00 | 2.99 | 0.06 | 1.38 | 7.03 | 0.97 | 1.66 | 1.02 | 1.47 | 1.25 |

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| Supplementary Table. 3- Representative electron-microprobe analyses of amphibole from the Ardestan plutonic rocks | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SiO2 | 46.02 | 46.36 | 45.44 | 45.81 | 45.05 | 45.11 | 41.60 | 46.70 | 47.60 | 45.34 | 41.78 | 43.09 | 46.45 | 43.74 | 45.38 | 45.39 | 45.85 | 49.65 | 44.52 | 51.42 | 47.87 | 46.32 | 44.46 | 45.62 | 45.82 | 47.79 | 45.78 |
| TiO2 | 0.98 | 1.24 | 0.99 | 0.83 | 0.78 | 0.49 | 0.07 | 0.08 | 0.12 | 0.03 | 0.08 | 0.06 | 1.03 | 0.81 | 0.28 | 0.14 | 0.23 | 0.10 | 0.37 | 0.23 | 1.15 | 0.32 | 0.16 | 0.10 | 0.15 | 0.10 | 0.10 |
| Al2O3 | 6.03 | 6.19 | 5.52 | 5.19 | 5.69 | 1.48 | 8.39 | 5.43 | 9.54 | 8.04 | 8.92 | 8.39 | 4.46 | 6.92 | 5.11 | 5.72 | 4.09 | 5.40 | 6.98 | 6.62 | 4.87 | 6.88 | 6.17 | 7.30 | 5.70 | 5.43 | 6.26 |
| FeO | 20.07 | 19.20 | 20.63 | 20.78 | 20.40 | 16.89 | 27.21 | 23.40 | 17.49 | 24.61 | 26.88 | 23.87 | 21.00 | 21.90 | 22.45 | 21.78 | 22.85 | 18.76 | 19.79 | 15.97 | 18.17 | 19.29 | 16.56 | 14.79 | 22.11 | 14.61 | 15.20 |
| MnO | 0.53 | 0.56 | 0.62 | 0.50 | 0.65 | 0.47 | 0.43 | 0.67 | 0.40 | 0.36 | 0.43 | 0.42 | 0.46 | 0.38 | 0.52 | 0.49 | 0.45 | 0.60 | 0.39 | 0.33 | 0.40 | 0.46 | 0.47 | 0.28 | 0.75 | 0.12 | 0.01 |
| MgO | 12.65 | 12.46 | 13.02 | 12.30 | 13.11 | 14.12 | 13.72 | 11.56 | 11.47 | 12.21 | 13.02 | 11.67 | 11.82 | 11.95 | 13.35 | 12.37 | 12.85 | 12.02 | 14.28 | 13.42 | 14.27 | 14.45 | 15.75 | 17.75 | 12.84 | 15.76 | 12.35 |
| CaO | 10.51 | 11.05 | 10.39 | 10.54 | 11.35 | 19.16 | 6.22 | 9.39 | 11.36 | 7.66 | 6.37 | 9.35 | 10.19 | 10.06 | 10.43 | 10.93 | 10.55 | 10.22 | 10.79 | 9.73 | 10.71 | 10.09 | 11.54 | 11.27 | 10.64 | 14.08 | 18.60 |
| Na2O | 0.64 | 1.01 | 0.97 | 1.05 | 0.73 | 0.22 | 0.13 | 0.21 | 0.21 | 0.17 | 0.17 | 0.13 | 1.46 | 1.30 | 0.69 | 0.72 | 0.49 | 0.63 | 1.00 | 0.58 | 0.62 | 1.02 | 1.17 | 0.21 | 0.08 | 0.33 | 0.11 |
| K2O | 0.48 | 0.59 | 0.55 | 0.43 | 0.46 | 0.01 | 0.22 | 0.22 | 0.07 | 0.23 | 0.20 | 0.22 | 0.54 | 0.53 | 0.05 | 0.09 | 0.10 | 0.29 | 0.04 | 0.21 | 0.12 | 0.04 | 0.78 | 0.17 | 0.03 | 0.07 | 0.01 |
| Total | 97.90 | 98.64 | 98.12 | 97.42 | 98.21 | 97.94 | 97.98 | 97.66 | 98.24 | 98.64 | 97.84 | 97.20 | 97.39 | 97.57 | 98.26 | 97.64 | 97.47 | 97.66 | 98.16 | 98.51 | 98.17 | 98.87 | 97.05 | 97.48 | 98.10 | 98.29 | 98.42 |
| Si | 6.65 | 6.72 | 6.57 | 6.72 | 6.54 | 6.92 | 6.13 | 6.71 | 6.80 | 6.66 | 6.18 | 6.23 | 6.86 | 6.39 | 6.50 | 6.61 | 6.66 | 7.16 | 6.36 | 7.19 | 6.82 | 6.53 | 6.45 | 6.48 | 6.55 | 6.90 | 6.84 |
| Al(IV) | 1.06 | 1.07 | 0.95 | 0.93 | 0.98 | 0.25 | 1.53 | 0.90 | 1.02 | 1.16 | 1.54 | 1.35 | 0.79 | 1.17 | 0.87 | 0.95 | 0.70 | 0.62 | 1.11 | 0.59 | 0.79 | 1.11 | 1.10 | 1.26 | 1.02 | 0.94 | 1.10 |
| Alt | 1.07 | 1.07 | 0.95 | 0.93 | 0.98 | 0.25 | 1.53 | 0.95 | 1.65 | 1.43 | 1.63 | 1.53 | 0.79 | 1.19 | 0.87 | 1.00 | 0.70 | 0.94 | 1.19 | 1.12 | 0.83 | 1.18 | 1.10 | 1.27 | 1.02 | 0.94 | 1.10 |
| Al(VI) | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.051 | 0.632 | 0.264 | 0.083 | 0.170 | 0.000 | 0.020 | 0.002 | 0.050 | 0.000 | 0.320 | 0.082 | 0.531 | 0.042 | 0.069 | 0.000 | 0.014 | 0.000 | 0.000 | 0.000 |
| Ti | 0.11 | 0.13 | 0.10 | 0.09 | 0.08 | 0.09 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 | 0.13 | 0.03 | 0.01 | 0.02 | 0.01 | 0.11 | 0.14 | 0.11 | 0.03 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| Cr | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fe3+ | 1.94 | 1.41 | 2.11 | 1.80 | 1.94 | 0.00 | 2.19 | 2.66 | 1.22 | 1.19 | 1.98 | 2.89 | 1.54 | 2.23 | 2.67 | 2.14 | 2.49 | 1.37 | 2.37 | 1.38 | 1.84 | 2.27 | 1.94 | 1.76 | 2.62 | 0.80 | 0.00 |
| Fe2+ | 0.49 | 0.92 | 0.74 | 0.75 | 0.54 | 2.17 | 1.17 | 0.15 | 0.87 | 1.83 | 1.34 | 0.00 | 1.06 | 0.45 | 0.02 | 0.51 | 0.29 | 0.89 | 0.00 | 0.48 | 0.32 | 0.00 | 0.07 | 0.00 | 0.03 | 0.96 | 1.90 |
| Mn | 0.07 | 0.07 | 0.07 | 0.06 | 0.08 | 0.06 | 0.06 | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 | 0.07 | 0.05 | 0.04 | 0.05 | 0.05 | 0.06 | 0.03 | 0.09 | 0.01 | 0.00 |
| Mg | 2.73 | 2.62 | 2.81 | 2.69 | 2.75 | 3.23 | 3.01 | 2.47 | 2.44 | 2.67 | 2.87 | 2.52 | 2.60 | 2.60 | 2.85 | 2.68 | 2.78 | 2.58 | 3.04 | 2.80 | 3.03 | 3.04 | 3.41 | 3.76 | 2.74 | 3.39 | 2.75 |
| Ca | 1.63 | 1.67 | 1.71 | 1.66 | 1.76 | 3.15 | 0.98 | 1.44 | 1.74 | 1.20 | 1.01 | 1.45 | 1.61 | 1.58 | 1.60 | 1.70 | 1.64 | 1.58 | 1.65 | 1.46 | 1.63 | 1.52 | 1.79 | 1.72 | 1.63 | 2.18 | 2.98 |
| Na | 0.18 | 0.28 | 0.26 | 0.30 | 0.20 | 0.06 | 0.04 | 0.06 | 0.06 | 0.05 | 0.05 | 0.04 | 0.42 | 0.37 | 0.19 | 0.20 | 0.14 | 0.18 | 0.28 | 0.16 | 0.17 | 0.28 | 0.33 | 0.06 | 0.02 | 0.09 | 0.03 |
| K | 0.09 | 0.11 | 0.10 | 0.08 | 0.08 | 0.00 | 0.04 | 0.04 | 0.01 | 0.04 | 0.04 | 0.04 | 0.10 | 0.10 | 0.01 | 0.02 | 0.02 | 0.05 | 0.01 | 0.04 | 0.02 | 0.01 | 0.14 | 0.03 | 0.00 | 0.01 | 0.00 |
| Total | 16.89 | 17.05 | 17.07 | 17.03 | 16.99 | 17.11 | 16.52 | 17.06 | 16.81 | 17.09 | 17.09 | 16.64 | 17.05 | 17.02 | 16.73 | 16.88 | 16.72 | 16.81 | 17.11 | 17.17 | 16.93 | 16.84 | 17.27 | 17.07 | 16.66 | 17.28 | 17.62 |
| (Ca+Na) (B) | 1.81 | 2.00 | 1.88 | 1.95 | 1.97 | 3.15 | 0.98 | 1.50 | 1.80 | 1.21 | 1.01 | 1.48 | 2.00 | 1.94 | 1.79 | 1.91 | 1.78 | 1.75 | 1.93 | 1.61 | 1.81 | 1.80 | 2.00 | 1.74 | 1.65 | 2.18 | 2.98 |
| Na (B) | 0.18 | 0.28 | 0.27 | 0.30 | 0.20 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.04 | 0.39 | 0.37 | 0.19 | 0.20 | 0.14 | 0.18 | 0.28 | 0.16 | 0.17 | 0.28 | 0.21 | 0.02 | 0.02 | 0.00 | 0.00 |
| (Na+K) (A) | 0.09 | 0.11 | 0.10 | 0.08 | 0.09 | 0.07 | 0.08 | 0.04 | 0.01 | 0.09 | 0.08 | 0.04 | 0.13 | 0.10 | 0.01 | 0.02 | 0.02 | 0.05 | 0.01 | 0.04 | 0.02 | 0.01 | 0.27 | 0.06 | 0.00 | 0.11 | 0.03 |
| Mg/(Mg+Fe2) | 0.85 | 0.75 | 0.88 | 0.78 | 0.84 | 0.60 | 0.72 | 0.94 | 0.74 | 0.59 | 0.68 | 1.00 | 0.71 | 0.85 | 0.99 | 0.84 | 0.91 | 0.74 | 1.00 | 0.85 | 0.90 | 1.00 | 0.98 | 1.00 | 0.99 | 0.78 | 0.59 |
| Sum of S2 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 14.04 | 13.00 | 13.80 | 13.99 | 13.12 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | 13.06 | 13.00 | 13.26 | 13.00 | 13.00 | 12.61 |
| Fe\* | 0.15 | 0.26 | 0.21 | 0.22 | 0.16 | 0.40 | 0.28 | 0.06 | 0.26 | 0.41 | 0.32 | 0.00 | 0.29 | 0.15 | 0.01 | 0.16 | 0.09 | 0.26 | 0.00 | 0.15 | 0.10 | 0.00 | 0.02 | 0.00 | 0.01 | 0.22 | 0.41 |
| Mg\* | 0.85 | 0.74 | 0.79 | 0.78 | 0.84 | 0.60 | 0.72 | 0.94 | 0.74 | 0.59 | 0.68 | 1.00 | 0.71 | 0.85 | 0.99 | 0.84 | 0.91 | 0.74 | 1.00 | 0.85 | 0.90 | 1.00 | 0.98 | 1.00 | 0.99 | 0.78 | 0.59 |
| Ca+N+K | 1.89 | 2.05 | 2.07 | 2.03 | 2.04 | 3.22 | 1.06 | 1.54 | 1.81 | 1.29 | 1.09 | 1.52 | 2.13 | 2.04 | 1.80 | 1.93 | 1.80 | 1.81 | 1.94 | 1.65 | 1.83 | 1.81 | 2.27 | 1.80 | 1.66 | 2.28 | 3.01 |
| T (°C) Ridolfi et al (2010) | 724 | 715 | 696 | 693 | 731 | 716 | 731 | 690 | 729 | 683 | 726 | 751 | 661 | 724 | 715 | 701 | 693 | 658 | 756 | 698 | 721 | 732 | 754 | 794 | 727 | 735 | 739 |

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| Supplementary Table 4. Representative electron-microprobe analyses of biotite from the Ardestan plutonic rocks | | | | | | | | | | | | | | | | | | | | | | | | | |
| SiO2 | 36.61 | 36.66 | 38.05 | 36.42 | 35.85 | 37.27 | 34.11 | 36.7 | 36.82 | 38.1 | 37.25 | 36.74 | 37.79 | 36.25 | 36.51 | 37.34 | 36.46 | 36.25 | 36.5 | 37.4 | 37.35 | 36.31 | 36.14 | 36.38 | 36.55 |
| TiO2 | 3.83 | 5.75 | 4.42 | 4.47 | 4.58 | 4.8 | 3.34 | 4.94 | 5.84 | 4.33 | 4.9 | 5.1 | 4.69 | 4.35 | 3.62 | 4.53 | 4.47 | 5.05 | 4.51 | 4.42 | 4.22 | 4.46 | 5.04 | 4.44 | 6.1 |
| Al2O3 | 14.39 | 13.45 | 12.89 | 13.76 | 13.79 | 13.03 | 14.51 | 13.69 | 13.42 | 12.72 | 13.01 | 13.41 | 12.7 | 14 | 13.46 | 13.18 | 13.76 | 13.27 | 13.69 | 12.97 | 12.28 | 13.56 | 13.25 | 13.25 | 13.41 |
| Cr2O3 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.05 | 0.02 | 0.03 | 0.02 | 0.01 | 0 | 0.04 | 0.01 | 0 | 0.04 | 0.02 | 0.03 | 0.02 | 0.04 | 0.05 | 0.03 | 0.03 | 0.03 | 0 |
| FeO | 20.57 | 18.42 | 17.3 | 19.4 | 21.23 | 18.75 | 21.01 | 20.24 | 18.25 | 18.45 | 19.11 | 17.76 | 17.4 | 21.41 | 19.68 | 17.2 | 19.4 | 18.94 | 20.56 | 17.98 | 18.01 | 18.72 | 18.45 | 19.2 | 18.43 |
| MnO | 0.52 | 0.20 | 0.24 | 0.24 | 0.51 | 0.08 | 0.43 | 0.39 | 0.21 | 0.21 | 0.08 | 0.09 | 0.22 | 0.44 | 0.33 | 0.29 | 0.23 | 0.21 | 0.37 | 0.23 | 0.21 | 0.20 | 0.18 | 0.25 | 0.09 |
| MgO | 11.48 | 12.19 | 13.31 | 12.29 | 11.06 | 12.24 | 12.86 | 11.36 | 12.09 | 13.34 | 12.01 | 12.34 | 13.42 | 10.92 | 12.37 | 13.53 | 12.30 | 12.32 | 11.88 | 13.32 | 13.06 | 12.01 | 12.44 | 12.32 | 12.38 |
| CaO | 0.13 | 0.01 | 0.09 | 0.00 | 0.00 | 0.05 | 0.01 | 0.00 | 0.01 | 0.08 | 0.05 | 0.00 | 0.07 | 0.00 | 0.01 | 0.05 | 0.00 | 0.00 | 0.00 | 0.07 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 |
| Na2O | 0.15 | 0.10 | 0.18 | 0.13 | 0.10 | 0.07 | 0.10 | 0.09 | 0.11 | 0.16 | 0.06 | 0.15 | 0.12 | 0.12 | 0.17 | 0.11 | 0.13 | 0.10 | 0.04 | 0.12 | 0.14 | 0.10 | 0.11 | 0.19 | 0.16 |
| K2O | 9.77 | 9.72 | 10.14 | 11.37 | 9.95 | 9.80 | 8.64 | 10.13 | 9.52 | 10.15 | 9.98 | 11.93 | 10.45 | 9.36 | 11.09 | 9.23 | 11.37 | 9.84 | 10.18 | 9.49 | 10.86 | 11.47 | 9.45 | 11.24 | 11.65 |
| F | 0.31 | 0.28 | 0.32 | 0.48 | 0.38 | 0.48 | 0.45 | 0.40 | 0.37 | 0.36 | 0.35 | 0.28 | 0.31 | 0.31 | 0.32 | 0.47 | 0.45 | 0.45 | 0.45 | 0.44 | 0.42 | 0.34 | 0.35 | 0.38 | 0.40 |
| Cl | 0.25 | 0.24 | 0.21 | 0.26 | 0.24 | 0.30 | 0.29 | 0.31 | 0.22 | 0.20 | 0.20 | 0.20 | 0.19 | 0.20 | 0.30 | 0.26 | 0.24 | 0.25 | 0.30 | 0.33 | 0.31 | 0.24 | 0.24 | 0.22 | 0.25 |
| Li2O\* | 0.02 | 0.01 | 0.02 | 0.07 | 0.04 | 0.07 | 0.06 | 0.05 | 0.04 | 0.04 | 0.03 | 0.01 | 0.02 | 0.02 | 0.02 | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.03 | 0.03 | 0.04 | 0.05 |
| H2O\* | 3.63 | 3.63 | 3.64 | 3.54 | 3.56 | 3.51 | 3.43 | 3.57 | 3.6 | 3.64 | 3.6 | 3.64 | 3.64 | 3.61 | 3.57 | 3.53 | 3.56 | 3.51 | 3.55 | 3.52 | 3.51 | 3.57 | 3.54 | 3.56 | 3.62 |
| Si | 5.86 | 5.53 | 5.96 | 5.74 | 5.81 | 5.65 | 5.54 | 5.88 | 5.81 | 5.69 | 5.90 | 5.79 | 5.92 | 5.86 | 5.80 | 5.89 | 5.74 | 5.78 | 5.84 | 5.94 | 5.94 | 5.78 | 5.54 | 5.78 | 5.71 |
| Al T | 2.60 | 2.49 | 2.38 | 2.55 | 2.63 | 2.42 | 2.77 | 2.58 | 2.49 | 2.38 | 2.42 | 2.49 | 2.35 | 2.67 | 2.52 | 2.45 | 2.55 | 2.50 | 2.58 | 2.39 | 2.30 | 2.54 | 2.50 | 2.48 | 2.46 |
| Al IV | 2.12 | 2.19 | 2.04 | 2.26 | 2.19 | 2.10 | 2.46 | 2.12 | 2.19 | 2.04 | 2.10 | 2.21 | 2.08 | 2.14 | 2.20 | 2.11 | 2.26 | 2.23 | 2.16 | 2.06 | 2.06 | 2.22 | 2.23 | 2.22 | 2.29 |
| Al VI | 0.48 | 0.30 | 0.34 | 0.29 | 0.44 | 0.32 | 0.31 | 0.46 | 0.30 | 0.34 | 0.32 | 0.28 | 0.27 | 0.52 | 0.32 | 0.34 | 0.29 | 0.27 | 0.43 | 0.33 | 0.24 | 0.32 | 0.27 | 0.25 | 0.17 |
| Ti | 0.34 | 0.65 | 0.52 | 0.53 | 0.44 | 0.55 | 0.41 | 0.48 | 0.69 | 0.49 | 0.58 | 0.61 | 0.55 | 0.41 | 0.43 | 0.54 | 0.53 | 0.61 | 0.42 | 0.52 | 0.51 | 0.53 | 0.58 | 0.53 | 0.72 |
| Fe | 2.89 | 2.32 | 2.27 | 2.55 | 3.01 | 2.38 | 2.85 | 2.84 | 2.41 | 2.30 | 2.53 | 2.34 | 2.28 | 3.03 | 2.62 | 2.27 | 2.55 | 2.52 | 2.89 | 2.36 | 2.40 | 2.49 | 2.36 | 2.55 | 2.41 |
| Cr | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Mn | 0.07 | 0.03 | 0.03 | 0.03 | 0.07 | 0.01 | 0.06 | 0.05 | 0.03 | 0.03 | 0.01 | 0.01 | 0.03 | 0.06 | 0.05 | 0.04 | 0.03 | 0.03 | 0.05 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.01 |
| Mg | 2.50 | 2.74 | 3.11 | 2.89 | 2.43 | 2.76 | 3.11 | 2.47 | 2.84 | 2.97 | 2.83 | 2.91 | 3.13 | 2.39 | 2.93 | 3.18 | 2.89 | 2.93 | 2.60 | 3.11 | 3.10 | 2.85 | 2.84 | 2.91 | 2.85 |
| Ca | 0.23 | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Na | 0.05 | 0.03 | 0.05 | 0.04 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.05 | 0.02 | 0.05 | 0.04 | 0.04 | 0.05 | 0.03 | 0.04 | 0.03 | 0.01 | 0.04 | 0.04 | 0.03 | 0.03 | 0.06 | 0.05 |
| K | 2.00 | 1.87 | 2.03 | 2.28 | 2.06 | 1.89 | 1.79 | 2.07 | 1.91 | 1.93 | 2.02 | 2.40 | 2.09 | 1.93 | 2.25 | 1.86 | 2.28 | 2.00 | 2.08 | 1.90 | 2.20 | 2.33 | 1.85 | 2.28 | 2.32 |
| XFe | 0.54 | 0.46 | 0.42 | 0.47 | 0.55 | 0.46 | 0.48 | 0.53 | 0.46 | 0.44 | 0.47 | 0.45 | 0.42 | 0.56 | 0.47 | 0.42 | 0.47 | 0.46 | 0.53 | 0.43 | 0.44 | 0.47 | 0.45 | 0.47 | 0.46 |
| XMg | 0.46 | 0.54 | 0.58 | 0.53 | 0.45 | 0.54 | 0.52 | 0.47 | 0.54 | 0.56 | 0.53 | 0.55 | 0.58 | 0.44 | 0.53 | 0.58 | 0.53 | 0.54 | 0.47 | 0.57 | 0.56 | 0.53 | 0.55 | 0.53 | 0.54 |
| Xsid | 0.34 | 0.27 | 0.3 | 0.29 | 0.34 | 0.29 | 0.25 | 0.34 | 0.3 | 0.28 | 0.32 | 0.29 | 0.3 | 0.34 | 0.3 | 0.28 | 0.29 | 0.29 | 0.33 | 0.3 | 0.32 | 0.29 | 0.26 | 0.3 | 0.29 |
| Xan | 0.2 | 0.19 | 0.12 | 0.18 | 0.21 | 0.17 | 0.23 | 0.19 | 0.16 | 0.16 | 0.15 | 0.16 | 0.12 | 0.22 | 0.17 | 0.14 | 0.18 | 0.17 | 0.2 | 0.13 | 0.12 | 0.18 | 0.19 | 0.17 | 0.17 |
| Li | 0.013 | 0.007 | 0.015 | 0.046 | 0.027 | 0.047 | 0.042 | 0.031 | 0.025 | 0.023 | 0.021 | 0.007 | 0.013 | 0.013 | 0.015 | 0.045 | 0.04 | 0.041 | 0.04 | 0.039 | 0.035 | 0.019 | 0.021 | 0.027 | 0.03 |
| O=F,Cl | 0.19 | 0.17 | 0.18 | 0.26 | 0.21 | 0.27 | 0.25 | 0.24 | 0.21 | 0.2 | 0.19 | 0.16 | 0.17 | 0.18 | 0.2 | 0.26 | 0.24 | 0.25 | 0.26 | 0.26 | 0.25 | 0.2 | 0.2 | 0.21 | 0.22 |
| OH\* | 3.78 | 3.8 | 3.79 | 3.69 | 3.75 | 3.68 | 3.69 | 3.72 | 3.76 | 3.77 | 3.77 | 3.81 | 3.8 | 3.79 | 3.76 | 3.7 | 3.71 | 3.71 | 3.7 | 3.69 | 3.71 | 3.77 | 3.76 | 3.75 | 3.74 |
| F | 0.15 | 0.14 | 0.16 | 0.24 | 0.19 | 0.24 | 0.23 | 0.2 | 0.18 | 0.18 | 0.17 | 0.14 | 0.15 | 0.15 | 0.16 | 0.23 | 0.22 | 0.23 | 0.22 | 0.22 | 0.21 | 0.17 | 0.18 | 0.19 | 0.2 |
| Cl | 0.07 | 0.06 | 0.06 | 0.07 | 0.06 | 0.08 | 0.08 | 0.08 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.08 | 0.07 | 0.06 | 0.07 | 0.08 | 0.09 | 0.08 | 0.06 | 0.06 | 0.06 | 0.07 |
| log(XF/XOH) | -1.39 | -1.44 | -1.38 | -1.19 | -1.3 | -1.19 | -1.21 | -1.28 | -1.31 | -1.33 | -1.34 | -1.44 | -1.39 | -1.39 | -1.37 | -1.2 | -1.22 | -1.22 | -1.22 | -1.23 | -1.25 | -1.35 | -1.33 | -1.3 | -1.28 |
| log(XCl/XOH) | -1.76 | -1.78 | -1.83 | -1.73 | -1.77 | -1.66 | -1.67 | -1.66 | -1.81 | -1.85 | -1.85 | -1.86 | -1.88 | -1.85 | -1.67 | -1.73 | -1.77 | -1.74 | -1.67 | -1.62 | -1.65 | -1.77 | -1.76 | -1.8 | -1.76 |
| log(XF/XCl) | 0.36 | 0.34 | 0.45 | 0.54 | 0.47 | 0.47 | 0.46 | 0.38 | 0.5 | 0.53 | 0.51 | 0.42 | 0.48 | 0.46 | 0.3 | 0.53 | 0.54 | 0.53 | 0.45 | 0.4 | 0.4 | 0.42 | 0.43 | 0.51 | 0.47 |
| log(*f*Hf/*fH*Cl) | -2.32 | -2.14 | -2.18 | -2.01 | -2.05 | -2.07 | -2.21 | -2.13 | -1.96 | -2.11 | -2 | -2.1 | -2.12 | -2.08 | -2.36 | -2.08 | -2.01 | -1.98 | -2.12 | -2.22 | -2.21 | -2.12 | -2.11 | -2.04 | -1.96 |
| log(*f*HCl/*fH*F) | 2.23 | 3.07 | 3.08 | 2.89 | 2.41 | 2.96 | 2.67 | 2.56 | 3.09 | 2.96 | 2.94 | 3.06 | 3.12 | 2.32 | 2.74 | 3.12 | 2.89 | 3.02 | 2.47 | 3.04 | 2.98 | 2.90 | 3.04 | 2.89 | 3.12 |
| log(*f*H2O/*fH*Cl) | 3.13 | 2.04 | 2.07 | 2.05 | 2.69 | 1.97 | 2.43 | 2.48 | 1.86 | 2.16 | 2.1 | 2.07 | 2.02 | 2.91 | 2.48 | 1.84 | 2.08 | 1.89 | 2.58 | 1.96 | 2.03 | 2.19 | 2.02 | 2.15 | 1.78 |
| log(*f*H2O/*fH*F) | 5.36 | 5.11 | 5.15 | 4.94 | 5.10 | 4.92 | 5.09 | 5.04 | 4.95 | 5.12 | 5.04 | 5.13 | 5.14 | 5.23 | 5.22 | 4.95 | 4.97 | 4.91 | 5.05 | 5.00 | 5.01 | 5.09 | 5.05 | 5.04 | 4.90 |
| log(X*F*/X*OH*) | -1.39 | -1.44 | -1.38 | -1.19 | -1.30 | -1.19 | -1.21 | -1.28 | -1.31 | -1.33 | -1.34 | -1.44 | -1.39 | -1.39 | -1.37 | -1.20 | -1.22 | -1.22 | -1.22 | -1.23 | -1.25 | -1.35 | -1.33 | -1.30 | -1.28 |
| log(X*Mg*/X*Fe*) | -0.07 | 0.07 | 0.14 | 0.05 | -0.09 | 0.07 | 0.04 | -0.06 | 0.07 | 0.11 | 0.05 | 0.09 | 0.14 | -0.10 | 0.05 | 0.14 | 0.05 | 0.07 | -0.05 | 0.12 | 0.11 | 0.06 | 0.08 | 0.06 | 0.07 |
| IV(Cl) | -4.51 | -4.61 | -4.75 | -4.84 | -4.58 | -4.86 | -4.81 | -4.64 | -4.74 | -4.76 | -4.7 | -4.63 | -4.74 | -4.47 | -4.66 | -4.93 | -4.81 | -4.84 | -4.7 | -4.88 | -4.84 | -4.69 | -4.74 | -4.74 | -4.77 |
| IV(F) | 2.24 | 2.39 | 2.37 | 2.13 | 2.14 | 2.14 | 2.14 | 2.14 | 2.26 | 2.3 | 2.27 | 2.4 | 2.39 | 2.22 | 2.31 | 2.19 | 2.16 | 2.17 | 2.08 | 2.21 | 2.21 | 2.28 | 2.3 | 2.23 | 2.23 |
| IV(F/Cl) | 6.38 | 6.67 | 6.67 | 6.43 | 6.25 | 6.53 | 6.49 | 6.4 | 6.5 | 6.54 | 6.45 | 6.61 | 6.64 | 6.22 | 6.67 | 6.6 | 6.43 | 6.47 | 6.33 | 6.69 | 6.65 | 6.55 | 6.6 | 6.46 | 6.53 |
| log *f*O2 | -16.9 | -13.9 | -14.4 | -14.6 | -15.8 | -14.5 | -15.7 | -15.4 | -13.7 | -14.7 | -14.3 | -14 | -14.2 | -16.2 | -15.4 | -14.3 | -14.6 | -14.1 | -15.8 | -14.5 | -14.6 | -14.6 | -14.2 | -14.6 | -13.6 |
| P (kbar) | 5.73 | 5.39 | 5.06 | 5.57 | 5.82 | 5.18 | 6.25 | 5.67 | 5.39 | 5.09 | 5.18 | 5.39 | 4.97 | 5.92 | 5.48 | 5.27 | 5.57 | 5.42 | 5.67 | 5.09 | 4.81 | 5.54 | 5.42 | 5.35 | 5.31 |
| T (°C) | 675 | 774 | 755 | 748 | 708 | 754 | 712 | 723 | 781 | 744 | 758 | 768 | 762 | 698 | 721 | 761 | 748 | 766 | 708 | 753 | 749 | 749 | 762 | 748 | 786 |

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| Supplementary Table 5. Rare earth element data (in ppm) for zircons from the Ardestan plutonic rocks. | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Sample* | *Pb* | *U* | *Th* | *La* | *Ce* | *Pr* | *Nd* | *Sm* | *Eu* | *Gd* | *Tb* | *Dy* | *Ho* | *Er* | *Yb* | *Lu* | *Hf* | *P* | *Y* | *Nb* | *(La/Yb)N* | *Ce/Ce\** | *Eu/Eu\** | *U/Yb* | *(Gd/Yb)N* |
| AR2\_1 | 1 | 125 | 89 | 0.91 | 7.79 | 0.08 | 1.01 | 2.25 | 0.42 | 16.1 | 6.09 | 78.8 | 32.2 | 154 | 306 | 53.9 | 8723 | 90.7 | 981 | 2.09 | 0.44 | 5.38 | 0.14 | 0.41 | 0.04 |
| AR2\_2 | 1 | 170 | 99 | 0.01 | 9.56 | 0.05 | 1.42 | 3.88 | 4.43 | 23.8 | 10.1 | 132 | 55.2 | 260 | 544 | 104 | 8880 | 114 | 1652 | 2.77 | 0.01 | 52.92 | 0.18 | 0.31 | 0.04 |
| AR2\_3 | 1 | 165 | 84 | 0.39 | 9 | 0.04 | 0.71 | 2.37 | 0.86 | 16.9 | 7.1 | 99.3 | 40.4 | 203 | 435 | 80.8 | 9572 | 91.7 | 1251 | 3.14 | 0.12 | 14.30 | 0.17 | 0.38 | 0.03 |
| AR2\_4 | 1 | 176 | 116 | 0.02 | 10 | 0.05 | 1.36 | 3.88 | 1.42 | 24.9 | 10.4 | 133 | 52.5 | 249 | 510 | 90.3 | 9147 | 100 | 1632 | 2.44 | 0.01 | 50.52 | 0.23 | 0.34 | 0.04 |
| AR2\_5 | 2 | 252 | 207 | 0.07 | 10.4 | 0.19 | 2.94 | 7.51 | 0.62 | 53.1 | 20.2 | 244 | 98.1 | 421 | 808 | 138 | 8424 | 117 | 2803 | 2.62 | 0.03 | 14.85 | 0.23 | 0.31 | 0.05 |
| AR2\_6 | 1 | 105 | 61 | 0.06 | 5 | 0.11 | 1.73 | 3.75 | 1.06 | 25.3 | 9.65 | 118 | 46.8 | 216 | 409 | 76.5 | 8495 | 82.3 | 1421 | 1.25 | 0.05 | 12.06 | 0.23 | 0.26 | 0.05 |
| AR2\_7 | 6 | 700 | 506 | 0.04 | 27.1 | 0.08 | 2.03 | 5.68 | 1.02 | 47.1 | 18.1 | 227 | 90.2 | 420 | 827 | 143 | 10295 | 133 | 2731 | 8 | 0.01 | 84.85 | 0.17 | 0.85 | 0.05 |
| AR2\_8 | 5 | 529 | 445 | 0.09 | 21.9 | 0.36 | 6.49 | 15.3 | 0.61 | 102 | 37.4 | 457 | 168 | 738 | 1293 | 235 | 8487 | 161 | 5005 | 3.95 | 0.02 | 17.38 | 0.23 | 0.41 | 0.06 |
| AR2\_9 | 11 | 715 | 656 | 11.2 | 36.4 | 1.12 | 5.76 | 8.07 | 1.20 | 52.7 | 20.3 | 254 | 104 | 480 | 895 | 158 | 10020 | 192 | 3165 | 7.53 | 1.49 | 2.01 | 0.17 | 0.80 | 0.05 |
| AR2\_10 | 1 | 396 | 224 | 0.06 | 21.2 | 0.07 | 1.31 | 3.29 | 1.62 | 18.9 | 5.54 | 68.9 | 27 | 135 | 353 | 73.2 | 8707 | 56.1 | 815 | 1.94 | 0.03 | 74.24 | 0.67 | 1.12 | 0.04 |
| AR2\_11 | 1 | 176 | 122 | 0.04 | 9.43 | 0.07 | 1.20 | 3.21 | 10.1 | 24.5 | 9.77 | 123 | 51.1 | 243 | 516 | 91.7 | 8802 | 115 | 1563 | 2.56 | 0.02 | 35.15 | 0.20 | 0.34 | 0.04 |
| AR2\_12 | 2 | 260 | 194 | 0.05 | 12.7 | 0.11 | 1.77 | 5.26 | 3.40 | 41.5 | 15.8 | 197 | 76.8 | 365 | 714 | 131 | 8802 | 128 | 2402 | 3.69 | 0.01 | 30.61 | 0.21 | 0.36 | 0.05 |
| AR2\_13 | 1 | 177 | 112 | 0.01 | 8.13 | 0.10 | 2.92 | 5.74 | 0.84 | 37.4 | 13.6 | 177 | 68.5 | 329 | 635 | 118 | 8880 | 115 | 2066 | 2.11 | 0.01 | 24.68 | 0.19 | 0.28 | 0.05 |
| AR2\_14 | 1 | 119 | 64 | 0.01 | 7.16 | 0.05 | 0.60 | 1.67 | 1.67 | 17.9 | 7.09 | 94.7 | 39.1 | 180 | 371 | 71.3 | 9242 | 93.4 | 1139 | 2 | 0.01 | 39.31 | 0.21 | 0.32 | 0.04 |
| AR2\_15 | 2 | 222 | 138 | 1.32 | 14.3 | 0.17 | 1.70 | 2.94 | 1.25 | 25 | 9.70 | 128 | 53.8 | 246 | 525 | 92.5 | 10098 | 118 | 1579 | 3.37 | 0.39 | 6.34 | 0.20 | 0.42 | 0.04 |
| AR2\_16 | 1 | 118 | 66 | 0.02 | 8.13 | 0.05 | 0.69 | 2.37 | 1.11 | 15.3 | 6.32 | 86.4 | 35.7 | 169 | 369 | 69.1 | 8927 | 91.2 | 1011 | 1.17 | 0.02 | 40.43 | 0.27 | 0.32 | 0.03 |
| AR2\_17 | 2 | 149 | 140 | 0.18 | 11.6 | 0.21 | 3.30 | 8.26 | 1.18 | 49.5 | 17.7 | 213 | 78.9 | 346 | 633 | 110 | 8582 | 101 | 2322 | 1.33 | 0.14 | 12.93 | 0.30 | 0.24 | 0.06 |
| AR2\_18 | 2 | 188 | 182 | 1.31 | 14.8 | 0.28 | 3.12 | 6.20 | 1.57 | 38.4 | 14.2 | 178 | 70.6 | 320 | 605 | 115 | 8110 | 134 | 2040 | 2.28 | 0.57 | 5.73 | 0.30 | 0.31 | 0.05 |
| AR2\_19 | 3 | 165 | 91 | 31.2 | 23 | 1.88 | 8.03 | 4.13 | 0.65 | 21.6 | 8.07 | 109 | 44.3 | 224 | 465 | 85.7 | 9312 | 157 | 1395 | 3.33 | 9.37 | 0.49 | 0.21 | 0.35 | 0.04 |
| AR2\_20 | 1 | 102 | 52 | 5.53 | 9.76 | 0.51 | 3.16 | 2.40 | 0.34 | 14.6 | 5.61 | 71.7 | 29.4 | 137 | 297 | 54.3 | 8464 | 117 | 861 | 1.59 | 3.48 | 1.11 | 0.18 | 0.34 | 0.04 |
| AR2\_21 | 3 | 238 | 182 | 0.04 | 8.79 | 0.09 | 2.33 | 5.07 | 0.95 | 36.5 | 13.9 | 179 | 70.9 | 326 | 627 | 1 | 8699 | 110 | 1876 | 2.86 | 0.01 | 24.57 | 0.21 | 0.38 | 0.05 |
| AR2\_22 | 3 | 183 | 159 | 0.13 | 9.36 | 0.15 | 1.75 | 5.63 | 0.99 | 35 | 12.8 | 162 | 64.5 | 289 | 557 | 96.6 | 8857 | 106 | 1802 | 2.20 | 0.06 | 14.29 | 0.22 | 0.33 | 0.05 |
| AR2\_23 | 1 | 161 | 84 | 0.04 | 8.79 | 0.04 | 0.59 | 2.46 | 0.41 | 21 | 8.08 | 107 | 43.6 | 203 | 444 | 80.8 | 9627 | 108 | 1291 | 2.82 | 0.01 | 52.12 | 0.18 | 0.36 | 0.04 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AR14\_1 | 1 | 100 | 53 | 0.01 | 6 | 0.03 | 0.44 | 1.84 | 0.31 | 14.4 | 5.68 | 78.1 | 31.4 | 152 | 314 | 57.6 | 9375 | 81.4 | 943 | 1.73 | 0.01 | 69.65 | 0.18 | 0.32 | 0.04 |
| AR14\_2 | 2 | 216 | 170 | 0.03 | 8.84 | 0.16 | 3.28 | 9.20 | 1.37 | 58.1 | 19.8 | 243 | 95.1 | 424 | 796 | 139 | 9108 | 88.9 | 2783 | 1.39 | 0.02 | 15.48 | 0.18 | 0.27 | 0.06 |
| AR14\_3 | 2 | 181 | 132 | 0.01 | 7 | 0.13 | 2.51 | 6.47 | 1.16 | 38.9 | 16.7 | 188 | 73.8 | 331 | 633 | 109 | 9140 | 82.1 | 2152 | 1.14 | 0.01 | 16.88 | 0.22 | 0.29 | 0.05 |
| AR14\_4 | 2 | 140 | 113 | 29.6 | 22.4 | 2.51 | 11.7 | 7.98 | 1.27 | 36.9 | 12.5 | 149 | 57.9 | 272 | 503 | 97 | 8943 | 309 | 1746 | 1.54 | 19.22 | 0.48 | 0.23 | 0.28 | 0.06 |
| AR14\_5 | 1 | 94 | 53 | 0.03 | 4.30 | 0.06 | 1.30 | 3.07 | 0.66 | 20.7 | 8.4 | 104 | 41.5 | 194 | 359 | 69.5 | 8621 | 79.9 | 1233 | 1.24 | 0.02 | 18.44 | 0.25 | 0.26 | 0.05 |
| AR14\_6 | 2 | 201 | 127 | 0.01 | 10.5 | 0.04 | 1.42 | 3.90 | 0.50 | 25.5 | 9.61 | 118 | 51.3 | 235 | 463 | 84.7 | 9619 | 119 | 1525 | 3.22 | 0.01 | 71.77 | 0.15 | 0.43 | 0.04 |
| AR14\_8 | 1 | 131 | 93 | 0.05 | 6.17 | 0.14 | 2.60 | 6.66 | 1.17 | 38.4 | 14.3 | 173 | 67 | 294 | 533 | 102 | 9399 | 87.1 | 1976 | 1.26 | 0.04 | 11.71 | 0.22 | 0.25 | 0.06 |
| AR14\_9 | 1 | 115 | 75 | 14 | 13.7 | 1.01 | 8.68 | 5.91 | 0.88 | 33.2 | 11.1 | 137 | 54.3 | 240 | 466 | 89.6 | 8684 | 182 | 1581 | 1.16 | 12.07 | 0.63 | 0.19 | 0.25 | 0.06 |
| AR14\_10 | 1 | 155 | 112 | 0.02 | 7.42 | 0.16 | 2.71 | 6.29 | 1.15 | 43.4 | 15 | 187 | 71.3 | 341 | 597 | 107 | 9415 | 96.4 | 2208 | 1.26 | 0.02 | 13.95 | 0.21 | 0.26 | 0.06 |
| AR14\_11 | 1 | 109 | 59 | 0.01 | 6.22 | 0.04 | 0.92 | 2.67 | 0.59 | 19.8 | 7.54 | 94.2 | 39.4 | 184 | 369 | 65.8 | 9210 | 86.1 | 1097 | 1.77 | 0.01 | 40.95 | 0.25 | 0.29 | 0.04 |
| AR14\_12 | 1 | 149 | 111 | 0.05 | 9 | 0.05 | 1.59 | 4 | 0.73 | 31.5 | 11.5 | 147 | 56.4 | 265 | 509 | 90.9 | 9737 | 85.7 | 1704 | 1.30 | 0.04 | 38.33 | 0.20 | 0.29 | 0.05 |
| AR14\_13 | 1 | 103 | 52 | 0.01 | 6.32 | 0.03 | 0.67 | 2.42 | 0.33 | 16.9 | 7.44 | 91.3 | 37.2 | 179 | 391 | 72 | 9501 | 90.6 | 1143 | 2 | 0.01 | 59.14 | 0.16 | 0.26 | 0.03 |
| AR14\_14 | 1 | 151 | 96 | 61 | 39 | 4.97 | 29.2 | 12.7 | 1.31 | 42.7 | 15.1 | 184 | 65.5 | 310 | 585 | 96.4 | 8872 | 514 | 1940 | 2.26 | 26.99 | 0.41 | 0.17 | 0.26 | 0.06 |
| AR14\_15 | 1 | 131 | 82 | 0.14 | 6.30 | 0.10 | 1.65 | 4.66 | 0.95 | 31.5 | 12 | 158 | 61.5 | 277 | 546 | 98.5 | 8786 | 90.2 | 1806 | 1.52 | 0.09 | 12.51 | 0.24 | 0.24 | 0.05 |
| AR14\_16 | 1 | 115 | 77 | 0.01 | 5.38 | 0.10 | 1.87 | 5.87 | 0.73 | 32 | 12.1 | 153 | 58.3 | 262 | 502 | 87.2 | 9477 | 96.9 | 1680 | 1.17 | 0.01 | 15.98 | 0.16 | 0.23 | 0.05 |
| AR14\_17 | 1 | 116 | 73 | 0.04 | 5.72 | 0.10 | 2.08 | 5.07 | 0.89 | 34.3 | 11.8 | 144 | 55.5 | 254 | 497 | 87.8 | 9737 | 96.3 | 1656 | 1.13 | 0.04 | 16.10 | 0.21 | 0.23 | 0.06 |
| AR14\_18 | 1 | 122 | 72 | 4.64 | 10.2 | 0.40 | 2.11 | 3.10 | 0.50 | 19.2 | 7.33 | 87.1 | 38.3 | 167 | 360 | 68.7 | 9493 | 114 | 1129 | 1.79 | 2.59 | 1.40 | 0.20 | 0.34 | 0.04 |
| AR14\_19 | 1 | 105 | 55 | 0.82 | 6.67 | 0.12 | 1.71 | 2.12 | 0.42 | 16.3 | 6.12 | 82.9 | 32.1 | 156 | 340 | 58.4 | 9611 | 88.1 | 1037 | 1.86 | 0.44 | 4.61 | 0.22 | 0.31 | 0.04 |
| AR14\_20 | 1 | 111 | 59 | 0.03 | 6.30 | 0.02 | 1.31 | 2.77 | 0.53 | 21.1 | 8.58 | 102 | 40.8 | 204 | 405 | 78.5 | 9422 | 91.1 | 1303 | 2 | 0.02 | 61.59 | 0.21 | 0.27 | 0.04 |
| AR14\_21 | 1 | 118 | 65 | 0.02 | 5.90 | 0.03 | 1.01 | 2.53 | 0.42 | 18.3 | 6.65 | 89.4 | 36.5 | 162 | 332 | 60.6 | 8943 | 94.7 | 1077 | 1.40 | 0.01 | 44.17 | 0.19 | 0.36 | 0.04 |
| AR14\_22 | 1 | 107 | 57 | 0.01 | 6 | 0.04 | 0.69 | 2.40 | 0.36 | 16.9 | 6.65 | 89.5 | 36 | 171 | 360 | 62.7 | 9580 | 94.6 | 1051 | 1.64 | 0.01 | 46.97 | 0.17 | 0.30 | 0.04 |
| AR14\_23 | 1 | 167 | 83 | 9.45 | 14.9 | 0.84 | 4.14 | 3.46 | 0.48 | 20.3 | 7.74 | 100 | 40.8 | 188 | 410 | 74 | 9635 | 147 | 1293 | 2.92 | 3.24 | 1.00 | 0.17 | 0.41 | 0.04 |
| AR14\_24 | 1 | 114 | 56 | 0.03 | 6.14 | 0.05 | 0.76 | 2.30 | 0.42 | 17.5 | 6.32 | 84.9 | 34.7 | 152 | 355 | 61.9 | 9242 | 83.8 | 1063 | 1.81 | 0.02 | 33.14 | 0.20 | 0.32 | 0.04 |
| AR14\_25 | 1 | 78 | 42 | 3.76 | 6.59 | 0.34 | 2.03 | 2.73 | 0.42 | 17.6 | 6.47 | 82.6 | 32.7 | 153 | 335 | 58.4 | 8786 | 104 | 951 | 1.23 | 3.06 | 1.11 | 0.19 | 0.23 | 0.04 |
| AR14\_26 | 1 | 115 | 60 | 0.01 | 5.68 | 0.03 | 0.96 | 2.44 | 0.50 | 15.9 | 6.17 | 84.4 | 32.5 | 153 | 321 | 57.5 | 8684 | 90.9 | 965 | 1.47 | 0.01 | 54.76 | 0.25 | 0.36 | 0.04 |
| AR14\_27 | 1 | 141 | 109 | 30.1 | 24.1 | 2.88 | 13.9 | 8.45 | 1.08 | 36.7 | 12.4 | 147 | 57.2 | 262 | 486 | 89.6 | 9509 | 224 | 1619 | 1.88 | 16.01 | 0.50 | 0.19 | 0.29 | 0.06 |
| AR14\_28 | 1 | 95 | 49 | 101 | 63.5 | 8.81 | 35.7 | 12.1 | 1.11 | 25.2 | 6.93 | 86.8 | 32.8 | 148 | 314 | 56.7 | 9030 | 857 | 961 | 1.21 | 83.47 | 0.40 | 0.19 | 0.30 | 0.06 |
| AR14\_29 | 1 | 155 | 83 | 0.01 | 8.39 | 0.03 | 1.40 | 2.59 | 0.55 | 20.9 | 8.49 | 115 | 45.9 | 217 | 470 | 87.6 | 9815 | 96.2 | 1413 | 2.92 | 0.01 | 71.23 | 0.23 | 0.33 | 0.04 |
| AR14\_30 | 1 | 122 | 81 | 0.27 | 6.78 | 0.09 | 1.70 | 3.98 | 0.82 | 32.3 | 11.1 | 149 | 58.7 | 263 | 493 | 88.2 | 9721 | 87.9 | 1712 | 1.55 | 0.17 | 10.76 | 0.22 | 0.25 | 0.05 |
| AR14\_31 | 2 | 215 | 96 | 0.26 | 12.4 | 0.04 | 0.72 | 1.38 | 0.31 | 11.2 | 5 | 65 | 28 | 136 | 315 | 66.6 | 10428 | 77 | 881 | 2.47 | 0.11 | 26.76 | 0.24 | 0.68 | 0.03 |
| AR14\_32 | 2 | 463 | 118 | 12.1 | 18.6 | 0.94 | 4.30 | 2.96 | 0.44 | 14.7 | 5.47 | 68 | 29.5 | 150 | 370 | 72 | 9792 | 124 | 885 | 2.90 | 4.17 | 1.00 | 0.20 | 1.25 | 0.03 |
| AR14\_33 | 1 | 101 | 53 | 56.1 | 38.5 | 5.12 | 26 | 8.92 | 1.06 | 27.4 | 8.79 | 107 | 42.1 | 194 | 384 | 70.7 | 8621 | 504 | 1229 | 1.34 | 41.87 | 0.43 | 0.21 | 0.26 | 0.06 |
| AR14\_34 | 2 | 134 | 75 | 0.05 | 8.93 | 0.03 | 0.54 | 2.03 | 0.45 | 15.8 | 6.33 | 81.3 | 33.5 | 159 | 354 | 67.2 | 9454 | 83.7 | 969 | 2.09 | 0.02 | 58.93 | 0.25 | 0.38 | 0.04 |
| AR14\_35 | 1 | 72 | 37 | 0.04 | 4.08 | 0.03 | 0.58 | 2.22 | 0.49 | 15.3 | 6 | 78.6 | 29.9 | 148 | 299 | 54.7 | 9116 | 77 | 975 | 1.35 | 0.03 | 26.27 | 0.26 | 0.24 | 0.04 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ZR3\_1 | 2 | 235 | 140 | 0.03 | 14.9 | 0.07 | 0.81 | 3.43 | 0.44 | 22.7 | 9.95 | 135 | 52.8 | 248 | 488 | 92.1 | 9666 | 110 | 1575 | 4.16 | 0.01 | 59.45 | 0.15 | 0.48 | 0.04 |
| ZR3\_2 | 1 | 565 | 118 | 0.03 | 8.91 | 0.01 | 0.77 | 1.73 | 0.22 | 12.9 | 5.54 | 79.4 | 34.3 | 174 | 428 | 80.8 | 10971 | 90.9 | 1169 | 7.32 | 0.01 | 107.51 | 0.14 | 1.32 | 0.02 |
| ZR3\_3 | 4 | 358 | 366 | 0.20 | 13.7 | 0.42 | 6.17 | 12.1 | 1.53 | 76 | 27.5 | 360 | 148 | 659 | 1099 | 203 | 8637 | 166 | 4424 | 3.14 | 0.06 | 8.50 | 0.15 | 0.33 | 0.06 |
| ZR3\_4 | 1 | 168 | 102 | 0.66 | 10.6 | 0.09 | 0.75 | 3.60 | 0.41 | 18.5 | 8.10 | 106 | 42.8 | 207 | 410 | 78.9 | 9792 | 101 | 1287 | 2.86 | 0.23 | 9.23 | 0.15 | 0.41 | 0.04 |
| ZR3\_5 | 7 | 561 | 645 | 0.17 | 30.3 | 0.10 | 1.61 | 5.73 | 0.63 | 42.8 | 16.7 | 219 | 87.2 | 400 | 789 | 134 | 10971 | 151 | 2642 | 11.4 | 0.01 | 54.90 | 0.12 | 0.71 | 0.04 |
| ZR3\_6 | 0 | 84 | 40 | 0.02 | 4.46 | 0.03 | 0.75 | 1.84 | 0.33 | 12.3 | 5.68 | 71.1 | 27.8 | 14 | 278 | 53 | 9226 | 77 | 869 | 1.45 | 0.01 | 37.23 | 0.21 | 0.30 | 0.04 |
| ZR3\_7 | 2 | 195 | 119 | 0.10 | 12.9 | 0.05 | 0.81 | 2.39 | 0.48 | 20.5 | 8.17 | 108 | 45.7 | 217 | 493 | 82.2 | 10303 | 100 | 1375 | 3.61 | 0.03 | 47.59 | 0.21 | 0.40 | 0.03 |
| ZR3\_8 | 1 | 144 | 106 | 0.02 | 8.21 | 0.10 | 1.91 | 4.82 | 0.87 | 29.3 | 10.9 | 133 | 55.9 | 243 | 457 | 84.8 | 8927 | 98 | 1581 | 1.45 | 0.01 | 25.08 | 0.22 | 0.32 | 0.05 |
| ZR3\_9 | 1 | 163 | 128 | 0.65 | 9.46 | 0.10 | 1.52 | 3 | 0.58 | 21.3 | 8.49 | 104 | 44.9 | 200 | 401 | 72.8 | 9391 | 111 | 1311 | 1.78 | 0.37 | 8.24 | 0.22 | 0.41 | 0.04 |
| ZR3\_10 | 1 | 129 | 89 | 0.02 | 6 | 0.13 | 2.33 | 5.13 | 1 | 39.4 | 13.5 | 166 | 62.5 | 295 | 557 | 95.8 | 8896 | 81.9 | 1910 | 1.17 | 0.02 | 13.34 | 0.21 | 0.23 | 0.06 |
| ZR3\_11 | 1 | 139 | 86 | 0.02 | 8 | 0.06 | 1.35 | 4.11 | 0.47 | 24.3 | 9 | 123 | 47.4 | 227 | 461 | 82.2 | 9666 | 103 | 1491 | 2.22 | 0.01 | 36.98 | 0.14 | 0.30 | 0.04 |
| ZR3\_12 | 1 | 110 | 65 | 0.02 | 5.5 | 0.06 | 1.74 | 3.10 | 0.70 | 25.8 | 10 | 118 | 48.7 | 224 | 452 | 78.9 | 8652 | 88.7 | 1429 | 1.73 | 0.01 | 26.40 | 0.24 | 0.24 | 0.05 |
| ZR3\_13 | 43 | 2133 | 3831 | 0.47 | 165 | 0.59 | 12.1 | 36.8 | 5.38 | 251 | 88.6 | 1055 | 376 | 1590 | 2626 | 426 | 8762 | 336 | 10830 | 49.3 | 0.01 | 65.96 | 0.17 | 0.81 | 0.08 |
| ZR3\_14 | 3 | 303 | 268 | 0.06 | 16.2 | 0.35 | 5.52 | 15.6 | 2.60 | 96.2 | 32.6 | 396 | 158 | 625 | 1129 | 198 | 8432 | 135 | 4564 | 2.73 | 0.02 | 13.38 | 0.21 | 0.27 | 0.07 |
| ZR3\_15 | 1 | 129 | 62 | 0.01 | 7.67 | 0.02 | 0.50 | 2.02 | 0.24 | 15.9 | 7 | 95.1 | 39.4 | 191 | 419 | 80.6 | 10004 | 94.7 | 1199 | 2.73 | 0.01 | 113.94 | 0.13 | 0.31 | 0.03 |
| ZR3\_16 | 1 | 143 | 85 | 0.03 | 8.14 | 0.06 | 1.30 | 3.49 | 0.57 | 26.2 | 8.89 | 114 | 47.4 | 213 | 431 | 81.6 | 10098 | 95.3 | 1411 | 2.20 | 0.01 | 34.04 | 0.18 | 0.33 | 0.05 |
| ZR3\_17 | 3 | 251 | 223 | 0.19 | 10.7 | 0.27 | 4.71 | 11.1 | 2.42 | 73.8 | 27.7 | 342 | 128 | 553 | 1003 | 179 | 8786 | 115 | 3643 | 2.26 | 0.08 | 9.56 | 0.26 | 0.25 | 0.06 |
| ZR3\_18 | 3 | 255 | 227 | 0.05 | 10.9 | 0.21 | 4.46 | 7.98 | 1.66 | 59.7 | 21.2 | 278 | 111 | 502 | 891 | 156 | 8715 | 126 | 3103 | 2.94 | 0.02 | 14.43 | 0.23 | 0.29 | 0.05 |
| ZR3\_19 | 12 | 681 | 970 | 0.39 | 49.3 | 0.83 | 15.5 | 37.1 | 6.51 | 243 | 85.3 | 983 | 362 | 1502 | 2531 | 421 | 8314 | 318 | 10710 | 8.94 | 0.04 | 15.58 | 0.21 | 0.27 | 0.08 |
| ZR3\_20 | 1 | 131 | 77 | 6.65 | 10.6 | 0.55 | 3.21 | 3.27 | 0.42 | 17.9 | 7.42 | 99.4 | 39.4 | 198 | 391 | 68.5 | 9525 | 124 | 1161 | 2.07 | 3.21 | 1.02 | 0.17 | 0.34 | 0.04 |
| ZR3\_21 | 1 | 159 | 96 | 0.01 | 8.14 | 0.10 | 1.53 | 4.26 | 0.80 | 26.9 | 11.2 | 139 | 56.8 | 258 | 518 | 95.8 | 8975 | 93.4 | 1628 | 2.07 | 0.01 | 24.21 | 0.23 | 0.31 | 0.04 |
| ZR3\_22 | 3 | 312 | 246 | 0.03 | 13.6 | 0.18 | 3.93 | 8.35 | 1.57 | 61.3 | 24.6 | 297 | 109 | 495 | 966 | 158 | 9823 | 123 | 3383 | 2.82 | 0.01 | 21.94 | 0.21 | 0.32 | 0.05 |
| ZR3\_23 | 2 | 232 | 159 | 0.05 | 14.1 | 0.09 | 1.49 | 4.88 | 0.97 | 34 | 13.1 | 168 | 68.1 | 314 | 642 | 108 | 9281 | 127 | 2002 | 3.54 | 0.01 | 40.91 | 0.23 | 0.36 | 0.04 |
| ZR3\_24 | 4 | 353 | 324 | 1.20 | 18.7 | 0.18 | 3.33 | 4.99 | 0.91 | 40.3 | 14.2 | 187 | 69.8 | 339 | 638 | 118 | 9171 | 127 | 2190 | 6.38 | 0.19 | 8.75 | 0.20 | 0.55 | 0.05 |
| ZR3\_25 | 2 | 202 | 154 | 0.01 | 8.56 | 0.19 | 3.46 | 8.54 | 1.65 | 54.4 | 20.6 | 255 | 97 | 444 | 865 | 152 | 8998 | 102 | 2891 | 1.94 | 0.01 | 13.91 | 0.23 | 0.23 | 0.05 |
| ZR3\_26 | 1 | 146 | 81 | 6.41 | 11.2 | 0.61 | 3.89 | 3.32 | 0.61 | 23 | 8.75 | 116 | 47.2 | 222 | 457 | 89 | 9454 | 152 | 1393 | 2.60 | 2.47 | 1.10 | 0.21 | 0.32 | 0.04 |
| ZR3\_27 | 1 | 100 | 51 | 0.08 | 6 | 0.04 | 0.93 | 2.40 | 0.49 | 16.5 | 6.10 | 83.4 | 32.8 | 153 | 338 | 59 | 9116 | 91.7 | 989 | 1.39 | 0.06 | 26.59 | 0.24 | 0.29 | 0.04 |
| ZR3\_28 | 3 | 300 | 217 | 0.01 | 12.3 | 0.03 | 1.02 | 3.47 | 0.69 | 26 | 10.7 | 143 | 55.9 | 269 | 540 | 95.2 | 9187 | 102 | 1732 | 3.16 | 0.01 | 104.43 | 0.22 | 0.56 | 0.04 |
| ZR3\_29 | 3 | 353 | 321 | 0.01 | 16.6 | 0.07 | 1.20 | 3.88 | 0.63 | 29 | 12.1 | 161 | 63 | 294 | 600 | 101 | 9831 | 117 | 1900 | 4.20 | 0.01 | 76.00 | 0.18 | 0.59 | 0.04 |

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| --- | --- | --- | --- | --- |
| Supplementary Table 6. The estimated dimension of short (x), medium (y) and length (z) axis in CSDSlice environment of plagioclase for the Ardestan granitoids. | | | | |
| Sample | Counts | 3D Shape | | |
| Short | Intermediate | Long |
| Ar | 930 | 1 | 1.4 | 2.3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Supplementary Table 7. Line slope, primary nucleation density, and calculated of plagioclase crystallization from the Ardestan granitoids. | | | |
| Sample | m= regression slope | n0=regression intercept | Tr= (-1/G×m)/31536000 |
| Ar | -1.99 | 1.57 | 631.02 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Supplementary Table 8. Zircon LA-ICPMS Ti concentration (µg g-1) and temperature (ºC). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sample no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AR2 | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | |
| Ti (ppm) | | 5.33 | | 8.66 | | 7.29 | | 9.82 | | 3.89 | | 3.81 | | 6.69 | | 1.96 | | 9.18 | | 6.97 | | 10.22 | | 8.82 | | 9.98 | | 5.69 | | 7.45 | | 8.74 | | 12.82 | | 7.45 | | 13.42 | | 7.81 | |
| T (ºC) a | | 689 | | 728 | | 714 | | 739 | | 664 | | 663 | | 707 | | 616 | | 733 | | 710 | | 743 | | 730 | | 741 | | 694 | | 716 | | 729 | | 763 | | 716 | | 768 | | 720 | |
| T (ºC) b | | 718 | | 760 | | 745 | | 772 | | 692 | | 690 | | 737 | | 646 | | 765 | | 741 | | 775 | | 762 | | 773 | | 723 | | 747 | | 761 | | 797 | | 747 | | 802 | | 751 | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
|  | | 21 | | 22 | | 23 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Ti (ppm) | | 10.58 | | 7.97 | | 6.21 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| T (ºC) a | | 746 | | 721 | | 701 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| T (ºC) b | | 779 | | 753 | | 731 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Sample no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AR14 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | |
| Ti (ppm) | | 8.74 | | 6.49 | | 4.73 | | 8.42 | | 8.33 | | 6.81 | | 9.86 | | 4.81 | | 8.09 | | 8.25 | | 8.50 | | 5.33 | | 5.69 | | 5.57 | | 18.03 | | 7.97 | | 7.61 | | 7.01 | | 4.73 | | 7.13 | |
| T (ºC) a | | 729 | | 704 | | 679 | | 726 | | 725 | | 708 | | 740 | | 680 | | 723 | | 724 | | 727 | | 689 | | 694 | | 692 | | 796 | | 721 | | 718 | | 711 | | 679 | | 712 | |
| T (ºC) b | | 761 | | 734 | | 708 | | 757 | | 757 | | 739 | | 772 | | 709 | | 754 | | 756 | | 758 | | 718 | | 723 | | 721 | | 832 | | 753 | | 748 | | 741 | | 708 | | 743 | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
|  | | 21 | | 22 | | 23 | | 24 | | 25 | | 26 | | 27 | | 28 | | 29 | | 30 | | 31 | | 32 | | 33 | | 34 | |  | |  | |  | |  | |  | |  | |
| Ti (ppm) | | 5.65 | | 9.14 | | 9.94 | | 9.62 | | 6.25 | | 7.77 | | 6.37 | | 7.89 | | 10.54 | | 8.13 | | 6.53 | | 6.17 | | 7.93 | | 9.66 | |  | |  | |  | |  | |  | |  | |
| T (ºC) a | | 693 | | 733 | | 740 | | 738 | | 701 | | 719 | | 703 | | 721 | | 746 | | 723 | | 705 | | 700 | | 721 | | 738 | |  | |  | |  | |  | |  | |  | |
| T (ºC) b | | 722 | | 765 | | 773 | | 770 | | 731 | | 750 | | 733 | | 752 | | 778 | | 754 | | 735 | | 730 | | 752 | | 770 | |  | |  | |  | |  | |  | |  | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Sample no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZR3 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | |
| Ti (ppm) | | 7.09 | | 5.41 | | 8.98 | | 5.97 | | 6.17 | | 8.01 | | 5.49 | | 7.57 | | 13.30 | | 9.66 | | 7.41 | | 6.85 | | 6.69 | | 7.77 | | 13.18 | | 9.82 | | 4.21 | | 6.41 | | 7.89 | | 7.33 | |
| T (ºC) a | | 712 | | 690 | | 732 | | 698 | | 700 | | 722 | | 691 | | 717 | | 767 | | 738 | | 715 | | 709 | | 707 | | 719 | | 766 | | 739 | | 670 | | 703 | | 721 | | 714 | |
| T (ºC) b | | 742 | | 719 | | 763 | | 727 | | 730 | | 753 | | 720 | | 748 | | 801 | | 770 | | 746 | | 739 | | 737 | | 750 | | 800 | | 772 | | 698 | | 733 | | 752 | | 745 | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
|  | | 21 | | 22 | | 23 | | 24 | | 25 | | 26 | | 27 | | 28 | | 29 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Ti (ppm) | | 7.89 | | 9.58 | | 11.22 | | 9.02 | | 6.77 | | 5.97 | | 7.05 | | 7.85 | | 7.41 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| T (ºC) a | | 721 | | 737 | | 751 | | 732 | | 708 | | 698 | | 711 | | 720 | | 715 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| T (ºC) b | | 752 | | 769 | | 784 | | 764 | | 738 | | 727 | | 742 | | 751 | | 746 | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| The formulae used for the Ti-in-zircon calculation are:  ;  from Watson et al. (2006) and Lowery et al. (2006), respectively. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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