Table A, supplementary information: All analyses of major element glass compositions (as weight percent oxides, normalised to anhydrous composition) of sampled tephra layers from lakes L5 and L6.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lake Core** | **Tephra Layer** | **Depth (cm)** | **Na2O** | **MgO** | **SiO2** | **Al2O3** | **K2O** | **TiO2** | **SO2** | **CaO** | **FeO** | **MnO** | **P2O5** | **Total** |
| L6 | C | 16 | 4.02 | 4.14 | 52.80 | 15.77 | 0.54 | 2.40 | 0.06 | 8.71 | 10.93 | 0.19 | 0.43 | 98.48 |
| L6 | C | 16 | 4.00 | 3.09 | 56.87 | 13.13 | 0.86 | 3.05 | 0.00 | 6.32 | 11.83 | 0.25 | 0.59 | 97.90 |
| L6 | C | 16 | 5.23 | 3.25 | 56.10 | 15.57 | 0.89 | 2.08 | 0.06 | 6.58 | 9.67 | 0.21 | 0.37 | 99.79 |
| L6 | C | 16 | 3.44 | 3.71 | 56.37 | 16.58 | 0.81 | 1.90 | 0.09 | 7.73 | 8.89 | 0.14 | 0.34 | 97.59 |
| L6 | C | 16 | 4.04 | 4.23 | 52.68 | 15.98 | 0.51 | 2.40 | 0.07 | 8.60 | 10.90 | 0.16 | 0.43 | 98.60 |
| L6 | C | 16 | 3.93 | 4.63 | 52.75 | 16.02 | 0.48 | 2.21 | 0.09 | 8.89 | 10.42 | 0.22 | 0.37 | 98.71 |
| L6 | C | 16 | 4.68 | 3.32 | 55.34 | 16.34 | 0.76 | 2.06 | 0.26 | 6.96 | 9.64 | 0.19 | 0.43 | 98.11 |
| L6 | C | 16 | 4.15 | 4.15 | 52.32 | 16.07 | 0.52 | 2.38 | 0.09 | 8.81 | 10.94 | 0.17 | 0.39 | 98.86 |
| L6 | C | 16 | 5.36 | 3.23 | 55.45 | 16.32 | 0.83 | 2.08 | 0.14 | 6.87 | 9.14 | 0.16 | 0.42 | 97.88 |
| L6 | C | 16 | 3.37 | 3.18 | 57.06 | 14.63 | 0.96 | 2.66 | 0.02 | 6.47 | 10.83 | 0.24 | 0.58 | 96.88 |
| L6 | C | 16 | 4.65 | 4.14 | 52.43 | 15.82 | 0.51 | 2.38 | 0.08 | 8.48 | 10.97 | 0.17 | 0.39 | 98.29 |
| L6 | C | 16 | 4.63 | 4.28 | 52.02 | 15.87 | 0.54 | 2.35 | 0.08 | 8.50 | 11.14 | 0.21 | 0.39 | 98.93 |
| L6 | C | 16 | 3.88 | 4.25 | 52.66 | 16.09 | 0.52 | 2.42 | 0.13 | 8.58 | 10.86 | 0.21 | 0.39 | 97.21 |
| L6 | C | 16 | 4.20 | 5.35 | 52.55 | 15.30 | 0.54 | 2.05 | 0.02 | 9.22 | 10.27 | 0.17 | 0.34 | 99.65 |
| L6 | C | 16 | 4.58 | 4.24 | 52.55 | 15.94 | 0.52 | 2.40 | 0.10 | 8.23 | 10.80 | 0.20 | 0.45 | 98.97 |
| L6 | B | 26 | 3.92 | 4.25 | 55.55 | 16.53 | 0.68 | 1.57 | 0.06 | 8.56 | 8.48 | 0.18 | 0.23 | 98.18 |
| L6 | B | 26 | 4.76 | 3.04 | 58.25 | 14.29 | 1.12 | 2.27 | 0.01 | 5.30 | 10.20 | 0.22 | 0.55 | 99.32 |
| L6 | B | 26 | 5.17 | 3.43 | 57.54 | 15.69 | 0.94 | 1.72 | 0.02 | 6.57 | 8.43 | 0.20 | 0.29 | 98.13 |
| L6 | B | 26 | 4.70 | 3.82 | 56.47 | 16.97 | 0.81 | 1.47 | 0.05 | 7.29 | 7.96 | 0.16 | 0.29 | 97.12 |
| L6 | B | 26 | 3.82 | 3.96 | 54.72 | 15.69 | 0.72 | 2.26 | 0.03 | 7.79 | 10.45 | 0.17 | 0.40 | 97.59 |
| L6 | B | 26 | 4.91 | 4.02 | 53.96 | 15.42 | 0.70 | 2.20 | 0.04 | 7.75 | 10.38 | 0.21 | 0.41 | 98.66 |
| L6 | B | 26 | 3.81 | 4.50 | 55.50 | 16.10 | 0.70 | 1.67 | 0.00 | 8.41 | 8.81 | 0.17 | 0.33 | 98.22 |
| L6 | B | 26 | 4.66 | 4.37 | 54.77 | 16.38 | 0.70 | 1.61 | 0.02 | 8.27 | 8.77 | 0.22 | 0.24 | 99.26 |
| L6 | B | 26 | 4.11 | 4.34 | 55.25 | 16.67 | 0.66 | 1.57 | 0.04 | 8.58 | 8.41 | 0.10 | 0.26 | 97.25 |
| L6 | B | 26 | 3.88 | 5.79 | 52.37 | 15.90 | 0.39 | 1.73 | 0.00 | 10.07 | 9.48 | 0.17 | 0.22 | 99.22 |
| L6 | B | 26 | 3.96 | 4.12 | 55.86 | 16.89 | 0.66 | 1.54 | 0.07 | 8.25 | 8.16 | 0.22 | 0.27 | 97.13 |
| L6 | B | 26 | 3.72 | 5.41 | 52.62 | 15.56 | 0.53 | 1.84 | 0.03 | 9.76 | 9.90 | 0.20 | 0.42 | 97.04 |
| L6 | B | 26 | 3.97 | 5.76 | 52.04 | 17.02 | 0.43 | 1.49 | 0.02 | 10.59 | 8.22 | 0.21 | 0.24 | 99.48 |
| L6 | A | 86 | 4.70 | 4.06 | 52.52 | 16.09 | 0.54 | 2.34 | 0.08 | 8.28 | 10.75 | 0.22 | 0.43 | 98.08 |
| L6 | A | 86 | 3.90 | 4.66 | 53.78 | 15.40 | 0.51 | 2.14 | 0.02 | 8.48 | 10.54 | 0.23 | 0.34 | 98.68 |
| L6 | A | 86 | 4.60 | 4.19 | 52.33 | 16.03 | 0.50 | 2.40 | 0.11 | 8.51 | 10.78 | 0.17 | 0.36 | 97.22 |
| L6 | A | 86 | 4.67 | 4.15 | 52.05 | 15.98 | 0.51 | 2.35 | 0.11 | 8.63 | 10.90 | 0.23 | 0.41 | 98.92 |
| L6 | A | 86 | 4.19 | 4.19 | 52.26 | 16.14 | 0.51 | 2.40 | 0.06 | 8.75 | 10.89 | 0.19 | 0.42 | 97.86 |
| L6 | A | 86 | 3.40 | 2.98 | 57.30 | 15.79 | 0.88 | 2.38 | 0.04 | 6.62 | 9.91 | 0.22 | 0.47 | 97.46 |
| L6 | A | 86 | 4.57 | 4.25 | 53.23 | 13.75 | 0.69 | 2.71 | 0.02 | 8.07 | 12.03 | 0.22 | 0.45 | 99.48 |
| L6 | A | 86 | 4.26 | 4.20 | 52.75 | 15.73 | 0.49 | 2.35 | 0.04 | 8.56 | 11.02 | 0.23 | 0.38 | 97.52 |
| L6 | A | 86 | 5.11 | 3.52 | 54.98 | 15.44 | 0.77 | 2.23 | 0.05 | 6.91 | 10.18 | 0.24 | 0.56 | 98.31 |
| L6 | A | 86 | 3.79 | 4.20 | 52.88 | 15.93 | 0.56 | 2.44 | 0.07 | 8.73 | 10.74 | 0.20 | 0.45 | 97.83 |
| L6 | A | 86 | 4.76 | 4.15 | 52.28 | 15.77 | 0.64 | 2.36 | 0.05 | 8.49 | 10.87 | 0.22 | 0.41 | 99.43 |
| L6 | A | 86 | 3.81 | 4.25 | 52.54 | 16.17 | 0.49 | 2.42 | 0.15 | 8.72 | 10.81 | 0.22 | 0.41 | 97.97 |
| L6 | A | 86 | 3.99 | 4.13 | 52.64 | 15.91 | 0.51 | 2.44 | 0.14 | 8.70 | 10.96 | 0.18 | 0.40 | 98.26 |
| L6 | A | 86 | 5.52 | 2.30 | 60.83 | 15.26 | 1.16 | 1.68 | 0.09 | 4.55 | 7.77 | 0.24 | 0.60 | 99.67 |
| L6 | A | 86 | 5.78 | 0.22 | 72.20 | 14.51 | 2.57 | 0.38 | 0.03 | 0.70 | 3.42 | 0.17 | 0.02 | 97.88 |
| L6 | A | 86 | 5.78 | 0.20 | 72.38 | 14.35 | 2.72 | 0.34 | 0.00 | 0.66 | 3.37 | 0.17 | 0.02 | 98.56 |
| L6 | A | 86 | 5.92 | 0.22 | 72.21 | 14.46 | 2.47 | 0.35 | 0.00 | 0.69 | 3.47 | 0.15 | 0.07 | 99.22 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| L5 | C | 4 | 4.40 | 4.20 | 55.32 | 14.21 | 0.79 | 2.32 | 0.00 | 7.68 | 10.55 | 0.17 | 0.34 | 98.13 |
| L5 | C | 4 | 4.53 | 4.08 | 53.82 | 14.33 | 0.76 | 2.45 | 0.03 | 7.92 | 11.47 | 0.17 | 0.43 | 97.77 |
| L5 | C | 4 | 4.52 | 4.45 | 54.52 | 16.38 | 0.67 | 1.56 | 0.05 | 8.69 | 8.69 | 0.21 | 0.29 | 97.80 |
| L5 | C | 4 | 4.55 | 4.85 | 52.83 | 15.77 | 0.60 | 1.94 | 0.02 | 8.96 | 10.03 | 0.17 | 0.29 | 97.85 |
| L5 | C | 4 | 3.49 | 3.96 | 55.65 | 14.39 | 0.78 | 2.38 | 0.02 | 7.59 | 11.07 | 0.23 | 0.43 | 97.34 |
| L5 | C | 4 | 4.67 | 3.50 | 55.57 | 14.22 | 0.81 | 2.49 | 0.02 | 6.94 | 11.12 | 0.21 | 0.43 | 97.68 |
| L5 | C | 4 | 3.96 | 4.80 | 54.13 | 14.58 | 0.64 | 2.12 | 0.03 | 8.67 | 10.51 | 0.20 | 0.36 | 97.45 |
| L5 | C | 4 | 4.35 | 5.39 | 52.72 | 15.16 | 0.51 | 1.96 | 0.01 | 9.28 | 10.10 | 0.23 | 0.29 | 98.79 |
| L5 | C | 4 | 3.96 | 4.40 | 55.34 | 16.53 | 0.70 | 1.63 | 0.01 | 8.19 | 8.77 | 0.20 | 0.26 | 97.45 |
| L5 | C | 4 | 4.55 | 3.64 | 55.38 | 13.87 | 0.88 | 2.61 | 0.03 | 6.96 | 11.37 | 0.20 | 0.50 | 97.50 |
| L5 | C | 4 | 3.04 | 3.73 | 55.94 | 13.71 | 0.92 | 2.75 | 0.04 | 7.05 | 12.17 | 0.18 | 0.48 | 97.30 |
| L5 | C | 4 | 4.49 | 3.68 | 54.69 | 15.80 | 0.71 | 2.18 | 0.01 | 7.84 | 10.03 | 0.18 | 0.39 | 97.44 |
| L5 | C | 4 | 3.67 | 4.25 | 55.71 | 14.15 | 0.85 | 2.29 | 0.00 | 8.00 | 10.48 | 0.19 | 0.39 | 97.26 |
| L5 | C | 4 | 4.60 | 4.37 | 53.48 | 14.03 | 0.69 | 2.56 | 0.00 | 8.17 | 11.49 | 0.22 | 0.39 | 98.32 |
| L5 | C | 4 | 4.27 | 4.87 | 53.39 | 15.45 | 0.58 | 2.04 | 0.02 | 8.81 | 10.08 | 0.16 | 0.34 | 97.72 |
| L5 | C | 4 | 4.76 | 3.52 | 55.35 | 14.79 | 0.78 | 2.45 | 0.01 | 6.90 | 10.87 | 0.18 | 0.39 | 97.09 |
| L5 | C | 4 | 3.41 | 3.16 | 56.06 | 15.57 | 0.80 | 2.44 | 0.00 | 7.54 | 10.39 | 0.23 | 0.39 | 97.08 |
| L5 | C | 4 | 4.47 | 4.09 | 53.96 | 13.83 | 0.83 | 2.54 | 0.02 | 7.82 | 11.82 | 0.23 | 0.40 | 97.67 |
| L5 | C | 4 | 2.92 | 3.67 | 56.27 | 14.43 | 0.88 | 2.61 | 0.02 | 7.34 | 11.22 | 0.22 | 0.42 | 97.05 |
| L5 | B | 15 | 4.43 | 5.24 | 53.00 | 15.43 | 0.56 | 1.96 | 0.02 | 9.08 | 9.81 | 0.19 | 0.28 | 97.82 |
| L5 | B | 15 | 4.09 | 5.30 | 53.25 | 15.39 | 0.57 | 1.97 | 0.02 | 9.11 | 9.77 | 0.22 | 0.32 | 97.57 |
| L5 | B | 15 | 4.55 | 4.28 | 55.35 | 16.59 | 0.65 | 1.53 | 0.07 | 8.26 | 8.29 | 0.17 | 0.26 | 97.86 |
| L5 | B | 15 | 4.13 | 5.93 | 52.12 | 14.61 | 0.35 | 1.96 | 0.02 | 10.38 | 10.06 | 0.18 | 0.25 | 98.50 |
| L5 | B | 15 | 5.26 | 4.02 | 52.89 | 14.20 | 0.72 | 2.86 | 0.05 | 7.44 | 11.77 | 0.20 | 0.59 | 98.58 |
| L5 | B | 15 | 3.45 | 3.63 | 56.24 | 14.53 | 0.89 | 2.33 | 0.01 | 7.56 | 10.76 | 0.22 | 0.38 | 97.15 |
| L5 | B | 15 | 4.10 | 6.83 | 50.01 | 16.74 | 0.56 | 1.92 | 0.03 | 10.09 | 9.28 | 0.12 | 0.31 | 98.45 |
| L5 | B | 15 | 3.92 | 4.47 | 55.21 | 14.56 | 0.80 | 2.02 | 0.00 | 8.34 | 10.12 | 0.18 | 0.39 | 98.27 |
| L5 | B | 15 | 4.62 | 3.71 | 55.00 | 14.29 | 0.88 | 2.42 | 0.01 | 7.45 | 10.95 | 0.25 | 0.42 | 98.19 |
| L5 | B | 15 | 2.81 | 3.35 | 57.33 | 13.71 | 1.06 | 2.72 | 0.02 | 6.87 | 11.47 | 0.22 | 0.45 | 97.15 |
| L5 | B | 15 | 4.48 | 3.97 | 54.42 | 14.17 | 0.78 | 2.44 | 0.03 | 7.90 | 11.26 | 0.22 | 0.34 | 97.78 |
| L5 | B | 15 | 4.62 | 4.48 | 52.90 | 13.98 | 0.63 | 2.48 | 0.02 | 8.77 | 11.47 | 0.21 | 0.43 | 98.36 |
| L5 | B | 15 | 3.55 | 4.46 | 53.36 | 13.32 | 0.57 | 2.84 | 0.00 | 8.75 | 12.57 | 0.24 | 0.35 | 97.97 |
| L5 | B | 15 | 4.83 | 4.17 | 52.54 | 15.90 | 0.59 | 2.45 | 0.09 | 7.95 | 10.84 | 0.24 | 0.40 | 97.77 |
| L5 | B | 15 | 4.21 | 3.89 | 53.55 | 14.78 | 0.73 | 2.45 | 0.02 | 8.35 | 11.32 | 0.27 | 0.42 | 98.21 |
| L5 | B | 15 | 3.96 | 7.21 | 49.52 | 16.59 | 0.54 | 1.88 | 0.02 | 10.31 | 9.47 | 0.19 | 0.32 | 98.66 |
| L5 | B | 15 | 3.21 | 3.71 | 55.92 | 13.81 | 0.88 | 2.83 | 0.03 | 7.38 | 11.61 | 0.18 | 0.44 | 96.90 |
| L5 | B | 15 | 4.84 | 4.07 | 53.98 | 14.29 | 0.77 | 2.52 | 0.03 | 7.43 | 11.39 | 0.26 | 0.43 | 98.02 |
| L5 | B | 15 | 3.02 | 3.47 | 53.91 | 12.48 | 0.83 | 3.65 | 0.05 | 7.57 | 14.12 | 0.28 | 0.62 | 97.33 |
| L5 | A | 17 | 4.65 | 4.27 | 53.27 | 14.13 | 0.66 | 2.83 | 0.02 | 7.80 | 11.79 | 0.18 | 0.40 | 99.20 |
| L5 | A | 17 | 4.01 | 4.20 | 53.37 | 15.15 | 0.64 | 2.62 | 0.03 | 8.33 | 11.03 | 0.25 | 0.38 | 97.99 |
| L5 | A | 17 | 4.76 | 4.28 | 52.63 | 15.20 | 0.60 | 2.52 | 0.03 | 8.37 | 11.05 | 0.20 | 0.34 | 98.33 |
| L5 | A | 17 | 3.83 | 4.53 | 53.33 | 14.34 | 0.65 | 2.72 | 0.03 | 8.09 | 11.88 | 0.24 | 0.36 | 97.62 |
| L5 | A | 17 | 4.84 | 4.11 | 53.17 | 14.92 | 0.62 | 2.69 | 0.01 | 7.61 | 11.17 | 0.20 | 0.66 | 99.49 |
| L5 | A | 17 | 4.29 | 4.30 | 53.20 | 14.43 | 0.60 | 2.73 | 0.03 | 7.98 | 11.65 | 0.23 | 0.57 | 98.21 |
| L5 | A | 17 | 4.79 | 3.86 | 52.25 | 12.86 | 0.77 | 3.48 | 0.02 | 7.81 | 13.35 | 0.26 | 0.55 | 97.80 |
| L5 | A | 17 | 4.10 | 4.09 | 53.56 | 14.91 | 0.62 | 2.69 | 0.02 | 8.00 | 11.11 | 0.22 | 0.67 | 98.06 |
| L5 | A | 17 | 4.70 | 4.25 | 53.10 | 14.99 | 0.62 | 2.59 | 0.05 | 7.91 | 11.11 | 0.18 | 0.51 | 97.94 |
| L5 | A | 17 | 4.88 | 4.21 | 53.08 | 15.00 | 0.60 | 2.68 | 0.03 | 7.67 | 11.04 | 0.22 | 0.60 | 98.35 |
| L5 | A | 17 | 4.73 | 4.24 | 52.83 | 15.28 | 0.59 | 2.55 | 0.04 | 8.14 | 11.02 | 0.18 | 0.39 | 98.60 |
| L5 | A | 17 | 4.74 | 4.35 | 52.83 | 14.87 | 0.64 | 2.63 | 0.02 | 8.01 | 11.29 | 0.21 | 0.39 | 99.75 |
| L5 | A | 17 | 3.96 | 4.22 | 53.44 | 15.35 | 0.60 | 2.58 | 0.02 | 8.27 | 11.00 | 0.19 | 0.37 | 98.14 |
| L5 | A | 17 | 4.63 | 4.58 | 52.67 | 14.80 | 0.60 | 2.58 | 0.01 | 8.11 | 11.44 | 0.20 | 0.38 | 99.23 |
| L5 | A | 17 | 4.01 | 4.13 | 53.40 | 15.11 | 0.65 | 2.66 | 0.01 | 8.08 | 11.21 | 0.18 | 0.56 | 98.06 |
| L5 | A | 17 | 4.84 | 4.44 | 52.39 | 15.15 | 0.61 | 2.59 | 0.03 | 8.19 | 11.10 | 0.21 | 0.45 | 97.89 |
| L5 | A | 17 | 3.03 | 3.96 | 53.93 | 13.40 | 0.73 | 3.21 | 0.02 | 8.04 | 12.75 | 0.26 | 0.67 | 98.10 |
| L5 | A | 17 | 4.77 | 4.08 | 52.70 | 13.39 | 0.71 | 3.13 | 0.04 | 7.81 | 12.48 | 0.22 | 0.67 | 98.05 |
| L5 | A | 17 | 4.80 | 4.27 | 52.69 | 15.10 | 0.62 | 2.65 | 0.02 | 7.90 | 11.06 | 0.22 | 0.67 | 97.66 |
| L5 | A | 17 | 3.99 | 4.28 | 53.31 | 15.04 | 0.61 | 2.66 | 0.01 | 7.92 | 11.23 | 0.26 | 0.68 | 98.31 |
| L5 | A | 17 | 4.77 | 4.48 | 52.61 | 14.68 | 0.64 | 2.67 | 0.06 | 8.02 | 11.48 | 0.21 | 0.39 | 99.20 |

Table B: PCA loadings, and relative importance, for the *n-1* principal components

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | PC1 | PC2 | PC3 | PC4 | PC5 |
| Proportion of variance (%) | 62 | 31 | 4 | 2 | 1 |
| MgO | 0.41 | -0.26 | -0.66 | 0.03 | -0.44 |
| SiO2 | -0.22 | 0.58 | -0.16 | -0.64 | -0.04 |
| Al2O3 | 0.40 | 0.33 | 0.40 | 0.46 | 0.07 |
| K2O | -0.42 | 0.23 | -0.57 | 0.52 | 0.42 |
| TiO2 | -0.39 | -0.39 | 0.19 | -0.05 | 0.12 |
| CaO | 0.42 | -0.27 | -0.13 | -0.33 | 0.77 |
| FeO | -0.35 | -0.46 | 0.09 | -0.01 | -0.10 |