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# Tectonothermal evolution of the Southwestern central zone, Damara Belt, Namibia

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**Appendix 4b - Compositional averages and AX data used for average P-T calculations**

**CZRL19**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | CZRL19 | | | | | | | | |
| 34.10 | 18.70 | 6.61 | 23.62 | 0.17 | 9.24 | 3.91 | 0.00 | 0.04 | 0.13 |
| g | CZRL19 | | | | | | | | |
| 36.56 | 21.38 | 2.45 | 37.55 | 0.00 | 0.00 | 0.00 | 0.64 | 0.00 | 1.88 |
| cd | CZRL19 | | | | | | | | |
| 47.29 | 33.21 | 6.77 | 10.79 | 0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.41 |
| fsp | CZRL19pl | | | | | | | | |
| 67.41 | 20.13 | 0.00 | 0.00 | 11.31 | 0.12 | 0.00 | 0.25 | 0.00 | 0.00 |
| fsp | CZRL19ksp | | | | | | | | |
| 63.62 | 19.33 | 0.00 | 0.00 | 2.19 | 13.36 | 0.00 | 0.05 | 0.00 | 0.00 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.0142 |
| ann | 0.091 |
| east | 0.019 |
| py | 0.00133 |
| gr | 0.0000089 |
| alm | 0.56 |
| crd | 0.29 |
| fcrd | 0.24 |
| an | 0.017 |
| ab | 0.98 |
| san | 0.82 |
| ab | 0.55 |
| q | |
| H2O | 0.5 |
| sill | |

**CZRL20**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | CZRL20 | | | | | | | | |
| 34.05 | 19.10 | 6.20 | 23.66 | 0.18 | 8.96 | 3.71 | 0.01 | 0.06 | 0.03 |
| g | CZRL20 | | | | | | | | |
| 36.48 | 21.52 | 2.60 | 37.28 | 0.00 | 0.00 | 0.00 | 0.65 | 0.00 | 1.79 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity | |
|---|---|---|
| phl | 0.01 | |
| ann | 0.09 | |
| east | 0.02 | |
| py | 0.00 | |
| gr | 0.00 | |
| alm | 0.54 | |
| q | | |
| H2O | 0.50 | |
| sill | | |
| crd | 0.29 | |
| fcrd | 0.24 | *Note - these* |
| an | 0.02 | *activities are* |
| ab | 0.98 | *estimates from* |
| san | 0.82 | *CZRL19* |
| ab | 0.55 | |

**LCZ11-1b**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LCZ11-1b | | | | | | | | |
| 34.52 | 17.43 | 8.86 | 20.96 | 0.13 | 9.3 | 4.81 | 0.01 | 0.03 | 0.13 |
| g | LCZ11-1b | | | | | | | | |
| 37.05 | 21.82 | 4.5 | 32.12 | 0 | 0 | 0 | 1.27 | 0 | 3.57 |
| cd | LCZ11-1b | | | | | | | | |
| 47.76 | 33.53 | 8.27 | 8.45 | 0.09 | 0 | 0 | 0 | 0 | 0.29 |
| sp | LCZ11-1b | | | | | | | | |
| 56.8 | 0 | 3.49 | 35.1 | 0 | 0 | 0 | 0 | 0 | 0.49 |
| * | | | | | | | | | |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity | |
|---|---|---|
| phl | 0.027 | |
| ann | 0.065 | |
| east | 0.025 | |
| py | 0.0079 | |
| gr | 0.000086 | |
| alm | 0.32 | |
| crd | 0.41 | |
| fcrd | 0.15 | |
| mt | 0.86 | |
| q | | |
| H2O | 0.5 | |
| ilm | | |
| san | 0.8 | *Note - these* |
| an | 0.5 | *activities are* |
| ab | 0.5 | *estimates* |

**LG003**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LG003 | | | | | | | | |
| 34.45 | 18.27 | 9.26 | 20.43 | 0.18 | 9.01 | 3.50 | 0.04 | 0.07 | 0.06 |
| g | LG003 | | | | | | | | |
| 36.89 | 21.84 | 4.49 | 34.68 | 0.00 | 0.00 | 0.00 | 0.70 | 0.00 | 1.77 |
| cd | LG003 | | | | | | | | |
| 47.62 | 33.50 | 8.11 | 8.95 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity | |
|---|---|---|
| phl | 0.034 | |
| ann | 0.059 | |
| east | 0.034 | |
| py | 0.0076 | |
| gr | 0.0000146 | |
| alm | 0.4 | |
| crd | 0.4 | |
| fcrd | 0.16 | |
| q | | |
| H2O | 0.5 | |
| mt | | |
| ilm | | |
| ru | | |
| san | 0.8 | *Note - these* |
| an | 0.5 | *activities are* |
| ab | 0.5 | *estimates* |

**LID004**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LID004 | | | | | | | | |
| 36.54 | 16.18 | 12.57 | 17.75 | 0.18 | 8.99 | 3.51 | 0.01 | 0.05 | 0.08 |
| g | LID004 | | | | | | | | |
| 37.54 | 22.08 | 5.30 | 30.59 | 0.00 | 0.00 | 0.00 | 2.11 | 0.00 | 3.04 |
| fsp | LID004 | | | | | | | | |
| 55.00 | 28.76 | 0.00 | 0.00 | 5.73 | 0.05 | 0.00 | 10.14 | 0.00 | 0.00 |
| opx | LID004 | | | | | | | | |
| 49.30 | 1.30 | 13.80 | 25.12 | 0.14 | 0.06 | 0.05 | 0.27 | 0.02 | 0.90 |
| amph | LID004 | | | | | | | | |
| 36.47 | 33.04 | 5.90 | 8.05 | 1.55 | 0.07 | 0.74 | 2.02 | 0.00 | 0.01 |

*

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.076 |
| ann | 0.04 |
| east | 0.036 |
| py | 0.01 |
| gr | 0.00042 |
| alm | 0.26 |
| ann | 0.66 |
| ab | 0.52 |
| san | 0.8 |
| en | 0.19 |
| fs | 0.2 |
| mgts | 0.03 |
| q | |
| H2O | 0.50 |

*Note - activity for san is an estimate*

**LID039**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LID039 | | | | | | | | |
| 37.06 | 17.10 | 13.64 | 15.97 | 0.18 | 8.87 | 3.09 | 0.04 | 0.04 | 0.12 |
| g | LID039 | | | | | | | | |
| 37.75 | 22.09 | 5.58 | 28.73 | 0.00 | 0.00 | 0.00 | 2.69 | 0.00 | 3.69 |
| fsp | LID039 | | | | | | | | |
| 57.51 | 26.68 | 0.00 | 0.00 | 6.90 | 0.14 | 0.00 | 8.49 | 0.00 | 0.00 |
| opx | LID039 | | | | | | | | |
| 50.36 | 1.45 | 15.29 | 29.05 | 0.03 | 0.03 | 0.06 | 0.32 | 0.00 | 1.35 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.094 |
| ann | 0.025 |
| east | 0.052 |
| py | 0.015 |
| gr | 0.00089 |
| alm | 0.24 |
| ann | 0.54 |
| ab | 0.6 |
| san | 0.8 |
| en | 0.21 |
| fs | 0.24 |
| mgts | 0.025 |
| q | |
| H2O | 0.5 |

*Note - activity for san is an estimate*

**LID042**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LID042 | | | | | | | | |
| 35.39 | 18.51 | 9.25 | 20.21 | 0.19 | 9.23 | 3.93 | 0.01 | 0.04 | 0.05 |
| g | LID042 | | | | | | | | |
| 37.51 | 21.55 | 4.21 | 34.88 | 0.00 | 0.00 | 0.00 | 0.83 | 0.00 | 1.38 |
| cd | LID042 | | | | | | | | |
| 48.27 | 33.85 | 7.87 | 9.19 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity | |
|---|---|---|
| phl | 0.03 | |
| ann | 0.06 | |
| east | 0.03 | |
| py | 0.01 | |
| gr | 0.00 | |
| alm | 0.46 | |
| crd | 0.38 | |
| fcrd | 0.18 | |
| q | | |
| H2O | 0.50 | |
| ilm | | |
| mt | | |
| san | 0.80 | *Note - these activities are estimates* |
| an | 0.50 | |
| ab | 0.50 | |

**LKR012**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LKR012 | | | | | | | | |
| 36.09 | 17.82 | 11.85 | 17.52 | 0.11 | 9.37 | 3.93 | 0.01 | 0.08 | 0.03 |
| g | LKR012 | | | | | | | | |
| 37.41 | 22.20 | 6.41 | 32.68 | 0.00 | 0.00 | 0.00 | 0.79 | 0.00 | 0.75 |
| fsp | LKR012ksp | | | | | | | | |
| 63.49 | 19.34 | 0.00 | 0.00 | 1.81 | 13.83 | 0.00 | 0.07 | 0.00 | 0.00 |
| fsp | LKR012pl | | | | | | | | |
| 61.90 | 23.96 | 0.00 | 0.00 | 8.84 | 0.27 | 0.00 | 4.41 | 0.00 | 0.00 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity | |
|---|---|---|
| phl | 0.062 | |
| ann | 0.035 | |
| east | 0.046 | |
| py | 0.021 | |
| gr | 0.000026 | |
| alm | 0.32 | |
| san | 0.84 | |
| ab | 0.47 | |
| an | 0.3 | |
| ab | 0.78 | |
| q | | |
| H2O | 0.5 | |
| mt | | |
| ilm | | |
| crd | 0.4 | *Note - these activities are estimates* |
| fcrd | 0.15 | |

**LKR013**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LKR013 | | | | | | | | |
| 35.17 | 17.85 | 11.33 | 18.01 | 0.21 | 8.35 | 5.53 | 0.04 | 0.06 | 0.06 |
| g | LKR013 | | | | | | | | |
| 37.39 | 21.97 | 5.61 | 32.59 | 0.00 | 0.00 | 0.00 | 1.01 | 0.00 | 1.64 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.045 |
| ann | 0.033 |
| east | 0.037 |
| py | 0.014 |
| gr | 0.00005 |
| alm | 0.33 |
| q | |
| H2O | 0.5 |
| an | 0.5 |
| ab | 0.5 |
| san | 0.8 |
| crd | 0.4 |
| fcrd | 0.2 |

*Note - these activities are estimates*

**LHA006**

*Mineral Compositions (averages from probe data)*

| $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|
| bi | LHA006 | | | | | | | | |
| 35.59 | 17.49 | 10.72 | 19.00 | 0.17 | 9.33 | 4.26 | 0.01 | 0.04 | 0.29 |
| g | LHA006 | | | | | | | | |
| 37.53 | 21.53 | 4.17 | 27.43 | 0.00 | 0.00 | 0.00 | 0.59 | 0.00 | 8.80 |
| cd | LHA006 | | | | | | | | |
| 48.18 | 34.41 | 9.36 | 6.49 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.57 |
| fsp | LHA006 | | | | | | | | |
| 63.70 | 23.12 | 0.00 | 0.00 | 9.81 | 0.25 | 0.00 | 3.08 | 0.00 | 0.00 |
| sp | LHA006 | | | | | | | | |
| 58.16 | 0.00 | 4.96 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.17 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.046 |
| ann | 0.047 |
| east | 0.035 |
| py | 0.0057 |
| gr | 0.0000086 |
| alm | 0.23 |
| crd | 0.57 |
| fcrd | 0.065 |
| an | 0.21 |
| ab | 0.84 |
| san | 0.8 |
| mt | 0.81 |
| q | |
| H2O | 0.5 |
| sill | |

*Note - activity for san is an estimate*

**LHA008**

*Mineral Compositions (averages from probe data)*

| | $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|---|
| bi | | LHA008 | | | | | | | | |
| | 37.89 | 13.61 | 12.98 | 17.57 | 0.09 | 9.32 | 4.41 | 0.01 | 0.05 | 0.03 |
| fsp | | LHA008 | | | | | | | | |
| | 50.42 | 32.26 | 0.00 | 0.00 | 3.56 | 0.12 | 0.00 | 13.79 | 0.00 | 0.00 |
| fsp | | LHA008 | | | | | | | | |
| | 58.85 | 26.40 | 0.00 | 0.00 | 7.11 | 0.78 | 0.00 | 7.07 | 0.00 | 0.00 |
| fsp | | LHA008 | | | | | | | | |
| | 63.77 | 18.87 | 0.00 | 0.00 | 1.05 | 14.82 | 0.00 | 0.15 | 0.00 | 0.00 |
| sp | | LHA008 | | | | | | | | |
| | 57.51 | 0.00 | 4.35 | 37.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 |
| cd | | LHA006 | | | | | | | | |
| | 48.18 | 34.41 | 9.36 | 6.49 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.57 |

*

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.087 |
| ann | 0.042 |
| east | 0.011 |
| an | 0.6 |
| ab | 0.51 |
| san | 0.9 |
| mt | 0.83 |
| crd | 0.57 |
| fcrd | 0.065 |
| q | |
| H2O | |
| py | 0.0057 |
| gr | 0.0000086 |
| alm | 0.23 |

*Note - these activities are estimates from LHA006*

**LHA009**

*Mineral Compositions (averages from probe data)*

| | $SiO_2$ | $Al_2O_3$ | MgO | FeO | $Na_2O$ | $K_2O$ | $TiO_2$ | CaO | $Cr_2O_3$ | MnO |
|---|---|---|---|---|---|---|---|---|---|---|
| bi | | LHA009 | | | | | | | | |
| | 35.16 | 18.33 | 7.80 | 21.97 | 0.13 | 9.20 | 4.13 | 0.00 | 0.08 | 0.05 |
| cd | | LHA009 | | | | | | | | |
| | 47.43 | 33.40 | 7.74 | 9.45 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 |
| fsp | | LHA009ksp | | | | | | | | |
| | 64.71 | 19.04 | 0.00 | 0.00 | 1.99 | 13.71 | 0.00 | 0.03 | 0.00 | 0.00 |
| fsp | | LHA009ksp2 | | | | | | | | |
| | 67.38 | 20.13 | 0.00 | 0.00 | 9.75 | 3.11 | 0.00 | 0.52 | 0.00 | 0.00 |
| fsp | | LHA009pl | | | | | | | | |
| | 65.81 | 19.40 | 0.00 | 0.00 | 3.91 | 11.24 | 0.00 | 0.04 | 0.00 | 0.00 |
| sp | | LHA009 | | | | | | | | |
| | 55.12 | 0.00 | 3.07 | 35.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 |

*Activities (AX file for THERMOCALC)*

| Endmember | Activity |
|---|---|
| phl | 0.0209 |
| ann | 0.072 |
| east | 0.023 |
| crd | 0.43 |
| fcrd | 0.14 |
| san | 0.83 |
| ab | 0.51 |
| san | 0.6 |
| ab | 0.89 |
| san | 0.73 |
| ab | 0.77 |
| mt | 0.87 |
| q | |
| H2O | 0.5 |
| sill | |
| py | 0.0057 |
| gr | 0.0000086 |
| alm | 0.23 |

*Note - these activities are estimates from LHA006*