Supplementary Material.



Supplementary Fig 1. Major Harker Variation plots of Tirit Granitoids of Nubra Valley.



Supplementary Fig. 2. Trace Harker Variation plots of Tirit Granitoids of Nubra Valley.



Supplementary Fig. 3. Major elements binary plots against Zr (ppm) of Tirit granitoid samples.



Supplementary Fig. 4. Trace elements binary plot against Zr (ppm) of Tirit dyke samples

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SupplementaryTable 1. Geochemica analyses(wt%) of Tirit Granitoids** | | | | | | | | | | | | |  |
| **Major elements** | |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sample #** | **PS3** | **PS7** | **TB3** | **TBS7** | **DM4** | **DM5** | **T9** | **T10** | **T11** | **T5** | **KS3** | **KS4** | **TB7** |
| **SiO2** | **63.51** | **63.98** | **64.85** | **63.06** | **72.11** | **71.88** | **66.98** | **65.55** | **66.43** | **62.15** | **50.91** | **52.1** | **65.44** |
| **Al2O3** | **12.81** | **12.92** | **13.68** | **12.87** | **11.42** | **11.62** | **13.4** | **13.52** | **13.45** | **14** | **12.24** | **13.19** | **13.24** |
| **Fe2O3** | **3.4** | **1.18** | **4.02** | **5.07** | **3.9** | **3.62** | **3.14** | **3.14** | **1.29** | **5.92** | **9.42** | **8.8** | **4.3** |
| **FeO** | **3.05** | **1.06** | **3.61** | **4.56** | **3.51** | **3.26** | **2.82** | **2.82** | **1.16** | **5.33** | **8.48** | **7.91** | **3.87** |
| **MnO** | **0.03** | **0.02** | **0.03** | **0.06** | **0.05** | **0.04** | **0.03** | **0.04** | **0.02** | **0.1** | **0.12** | **0.13** | **0.04** |
| **MgO** | **5.64** | **5.21** | **3.12** | **4.87** | **1.69** | **1.7** | **2.36** | **2.91** | **2.93** | **5.19** | **10.69** | **8.66** | **3.03** |
| **CaO** | **6.46** | **9.08** | **3.24** | **3.7** | **3.67** | **3.73** | **3.31** | **3.84** | **5.95** | **5.49** | **9.31** | **8.79** | **3.55** |
| **Na2O** | **5.03** | **4.68** | **4.01** | **3.19** | **4.18** | **4.34** | **4.34** | **4.26** | **7.16** | **3.89** | **2.96** | **3.08** | **3.77** |
| **K2O** | **0.88** | **0.37** | **5.42** | **5.27** | **1.17** | **1.66** | **4.52** | **4.71** | **0.38** | **1.16** | **1.57** | **2.36** | **5.39** |
| **TiO2** | **0.7** | **0.69** | **0.68** | **0.75** | **0.22** | **0.21** | **0.48** | **0.54** | **0.64** | **0.85** | **1.23** | **1** | **0.69** |
| **P2O5** | **0.17** | **0.19** | **0.14** | **0.15** | **0.05** | **0.05** | **0.13** | **0.14** | **0.14** | **0.17** | **0.22** | **0.19** | **0.15** |
| **Sum** | **98.64** | **98.32** | **99.19** | **98.98** | **98.48** | **98.86** | **98.66** | **98.64** | **98.39** | **98.91** | **98.67** | **98.3** | **99.6** |
| **LOI** | **0.01** | **0.01** | **1.35** | **0.98** | **0.71** | **0.56** | **0.79** | **0.88** | **0.98** | **1.4** | **0.01** | **2.49** | **0.6** |
| **Trace Elements (ppm)** | | |  |  |  |  |  |  |  |  |  |  |  |
| **Sc** | **7.99** | **8.38** | **7.41** | **9.5** | **8.72** | **7.63** | **6.34** | **6.78** | **7.97** | **11.58** | **18.06** | **17.56** | **7.81** |
| **V** | **30.33** | **38.48** | **25.05** | **29.33** | **16.56** | **14.69** | **19.44** | **20.29** | **18.39** | **31.83** | **70.04** | **68.19** | **26.44** |
| **Cr** | **45.66** | **60.8** | **54.1** | **55.65** | **62.74** | **58.94** | **54.94** | **51.69** | **51.66** | **60.94** | **68.24** | **43.62** | **54.74** |
| **Co** | **9.4** | **4.18** | **8.14** | **10.02** | **7.81** | **6.98** | **6.92** | **6.42** | **4.31** | **5.82** | **30.86** | **25.98** | **9.1** |
| **Ni** | **14.89** | **12.99** | **11.3** | **11.46** | **11.3** | **10.45** | **10.71** | **11.99** | **11** | **11.1** | **19.11** | **15.19** | **11.66** |
| **Cu** | **1.56** | **1.21** | **1.21** | **1.08** | **1.12** | **0.96** | **0.93** | **1.14** | **1.07** | **0.96** | **1.98** | **1.29** | **1.32** |
| **Zn** | **29.16** | **25.01** | **22.69** | **55.41** | **26.48** | **31.55** | **20.76** | **35.73** | **44.72** | **39.87** | **40.14** | **93.34** | **31.08** |
| **Ga** | **17.62** | **18.26** | **15.99** | **17.93** | **12.19** | **11.38** | **16.39** | **16.57** | **16.67** | **22.09** | **16.73** | **17.73** | **17.31** |
| **Rb** | **15.7** | **4.46** | **146.3** | **168.4** | **25.65** | **30.67** | **118.1** | **105.3** | **6.57** | **82.81** | **31.09** | **51.61** | **162.4** |
| **Sr** | **473** | **470.7** | **186.6** | **424.3** | **131.2** | **122.5** | **214.3** | **268.8** | **202.1** | **589.7** | **367** | **364.6** | **258.1** |
| **Y** | **14.83** | **16.43** | **27.17** | **21.77** | **10.54** | **9.56** | **24.51** | **24.55** | **28.59** | **25.22** | **21.68** | **24.87** | **29.02** |
| **Zr** | **29.85** | **45.24** | **27.19** | **26.09** | **31.63** | **15.11** | **39.61** | **38.83** | **44.85** | **31.28** | **24.35** | **35.57** | **29.16** |
| **Nb** | **10.72** | **13.92** | **12.4** | **14.93** | **3.72** | **3.26** | **12.22** | **12.17** | **12.53** | **16.86** | **6.65** | **6.38** | **14.42** |
| **Cs** | **0.6** | **0.25** | **3.3** | **2.63** | **0.6** | **0.42** | **2.88** | **1.81** | **0.47** | **2.16** | **2.16** | **1.81** | **3.67** |
| **Ba** | **165.6** | **119.1** | **669.4** | **1006** | **612** | **586.4** | **566.9** | **606.4** | **36.94** | **154.7** | **239** | **440.6** | **603.2** |
| **Hf** | **1.31** | **1.63** | **1.23** | **1.25** | **1.43** | **0.75** | **1.69** | **1.67** | **1.89** | **1.5** | **1.25** | **1.69** | **1.43** |
| **Ta** | **0.62** | **1.79** | **0.81** | **0.99** | **0.29** | **0.32** | **0.83** | **0.86** | **0.75** | **1.17** | **0.51** | **0.72** | **0.84** |
| **Pb** | **13.13** | **11.8** | **14.99** | **24.46** | **12.51** | **10.11** | **12.21** | **13.89** | **16.89** | **25.92** | **13.62** | **13.45** | **17.57** |
| **Th** | **6.28** | **6.75** | **23.68** | **15.03** | **2.35** | **1.42** | **17.12** | **16.26** | **21.32** | **22.62** | **4.44** | **8.03** | **22.96** |
| **U** | **1.62** | **1.94** | **4** | **3.5** | **1.03** | **0.65** | **3.74** | **4.05** | **3.59** | **2.64** | **0.94** | **1.98** | **2.81** |
| **Rare Earth Elements (REE)** | | | |  |  |  |  |  |  |  |  |  |  |
| **La** | **11.55** | **12.46** | **28.56** | **32.93** | **5.63** | **6.02** | **38.52** | **24.47** | **26.3** | **60.81** | **17.87** | **25.37** | **40.84** |
| **Ce** | **27.76** | **30.25** | **58.31** | **64.39** | **11.68** | **12.36** | **73.32** | **54.94** | **60.94** | **110.6** | **37.56** | **47.74** | **81.06** |
| **Pr** | **3.53** | **3.77** | **6.43** | **6.87** | **1.28** | **1.3** | **7.36** | **6.12** | **6.87** | **10.69** | **4.37** | **5.15** | **8.39** |
| **Nd** | **15.98** | **15.99** | **25.3** | **26.8** | **5.35** | **5.37** | **26.77** | **23.93** | **27.06** | **37.59** | **18.75** | **20.83** | **31.04** |
| **Sm** | **3.4** | **3.3** | **4.91** | **4.98** | **1.3** | **1.15** | **4.81** | **4.59** | **5.21** | **6.01** | **4** | **4.22** | **5.54** |
| **Eu** | **0.83** | **0.7** | **0.93** | **1.14** | **0.32** | **0.29** | **0.79** | **0.84** | **0.86** | **1.15** | **1.06** | **1.02** | **0.9** |
| **Gd** | **2.45** | **2.33** | **3.51** | **3.28** | **1.09** | **1.03** | **3.18** | **3.17** | **3.66** | **3.89** | **3.18** | **3.2** | **3.97** |
| **Tb** | **0.39** | **0.38** | **0.6** | **0.53** | **0.19** | **0.19** | **0.53** | **0.53** | **0.62** | **0.61** | **0.53** | **0.54** | **0.64** |
| **Dy** | **2.54** | **2.5** | **4.1** | **3.4** | **1.48** | **1.32** | **3.61** | **3.67** | **4.17** | **3.94** | **3.53** | **3.78** | **4.4** |
| **Ho** | **0.51** | **0.51** | **0.86** | **0.69** | **0.33** | **0.29** | **0.76** | **0.77** | **0.87** | **0.81** | **0.73** | **0.8** | **0.92** |
| **Er** | **1.26** | **1.33** | **2.28** | **1.8** | **0.93** | **0.82** | **2.05** | **2.05** | **2.31** | **2.09** | **1.94** | **2.14** | **2.43** |
| **Tm** | **0.17** | **0.19** | **0.33** | **0.25** | **0.14** | **0.13** | **0.3** | **0.3** | **0.33** | **0.29** | **0.28** | **0.31** | **0.35** |
| **Yb** | **1.06** | **1.23** | **2.25** | **1.66** | **1.05** | **0.91** | **2.08** | **2.04** | **2.27** | **1.94** | **1.87** | **2.14** | **2.37** |
| **Lu** | **0.16** | **0.19** | **0.34** | **0.26** | **0.16** | **0.14** | **0.32** | **0.31** | **0.35** | **0.29** | **0.29** | **0.33** | **0.37** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplementary Table 2. Tirit dykes analyses; major oxides (wt%)** | | | | | | |  |  |
| **Sample #** | **SB R31** | **SB R32** | **SB R33** | **SB R34** | **SB R35** | **SB R36** | **SB R37** | **SB R38** |
| **SiO2** | **51.52** | **57.49** | **48.95** | **49.29** | **52.57** | **52.3** | **52.17** | **50.75** |
| **TiO2** | **1.07** | **0.88** | **0.96** | **1.11** | **0.88** | **0.64** | **0.97** | **0.85** |
| **Al2O3** | **14.62** | **16.59** | **16.49** | **14.63** | **16.98** | **15.26** | **15.27** | **15.56** |
| **FeO(t)** | **9.12** | **6.66** | **10.01** | **9.58** | **8.64** | **8.59** | **8.6** | **8.36** |
| **MnO** | **0.13** | **0.09** | **0.15** | **0.14** | **0.12** | **0.15** | **0.14** | **0.12** |
| **MgO** | **9.66** | **5.77** | **8.3** | **10.31** | **7.02** | **8.41** | **8.24** | **8.52** |
| **CaO** | **6.72** | **6.13** | **9.55** | **7.26** | **7.66** | **6.31** | **6.84** | **6.95** |
| **Na2O** | **3.14** | **3.22** | **0.44** | **3.1** | **1.31** | **3.44** | **3.43** | **2.95** |
| **K2O** | **1.31** | **2** | **5.03** | **1.17** | **4.12** | **1.69** | **1.92** | **1.14** |
| **P2O5** | **0.28** | **0.28** | **0.27** | **0.33** | **0.27** | **0.27** | **0.28** | **0.25** |
| **LOI** | **3.26** | **2.05** | **2.3** | **3.95** | **1.99** | **2.89** | **2.95** | **4.69** |
| **Total** | **100.83** | **101.16** | **102.45** | **100.87** | **101.56** | **99.95** | **100.81** | **100.14** |
| **Trace Elements (ppm)** | | |  |  |  |  |  |  |
| **Ba** | **403.8** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **502.9** | **574.3** |
| **Cr** | **295** | **155** | **262** | **256** | **215** | **209** | **203** | **164** |
| **Ni** | **146** | **34** | **96** | **120** | **72** | **84** | **81** | **217** |
| **Cu** | **66** | **3** | **6** | **35** | **5** | **10** | **47** | **68** |
| **Zn** | **83** | **58** | **99** | **85** | **71** | **99** | **86** | **76** |
| **Ga** | **18** | **17** | **15** | **16** | **16** | **19** | **17** | **14** |
| **Pb** | **135** | **7** | **11** | **24** | **9** | **7** | **9** | **5** |
| **Th** | **6.07** | **10.23** | **3.9** | **4.97** | **6.52** | **5.15** | **4.31** | **5.8** |
| **Rb** | **47** | **67** | **152** | **39** | **132** | **62** | **71** | **53** |
| **U** | **1.74** | **2.13** | **4.19** | **1.56** | **3.5** | **2.08** | **2.24** | **1.9** |
| **Sr** | **389** | **402** | **176** | **477** | **159** | **248** | **380** | **5.1** |
| **Y** | **22** | **21** | **17** | **23** | **17** | **22** | **22** | **24** |
| **Zr** | **139** | **184** | **121** | **136** | **142** | **154** | **149** | **124** |
| **Nb** | **7** | **9** | **7** | **7** | **7** | **8** | **8** | **8** |
| **Rare Earth Elements (ppm)** | | |  |  |  |  |  |  |
| **La** | **22.2** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **18.1** | **18.9** |
| **Ce** | **37.45** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **32.2** | **32.8** |
| **Nd** | **21.7** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **17.4** | **18.3** |
| **Sm** | **5.04** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **4.07** | **4.41** |
| **Eu** | **1.4** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **1.22** | **1.33** |
| **Gd** | **4.04** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **3.48** | **4.08** |
| **Dy** | **3.48** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **3.39** | **3.9** |
| **Er** | **1.59** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **1.69** | **1.95** |
| **Yb** | **1.63** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **1.61** | **1.91** |
| **Lu** | **0.248** | **n.d** | **n.d** | **n.d** | **n.d** | **n.d** | **0.237** | **0.284** |