Table S1. The minimum detection limits (MDLs), uncertainty of samples of the elements and oxides using the X-ray fluorescence spectrometer (Panalytical Magix PW2403 (Netherlands) X-ray fluorescence spectrometer).

|  |  |  |
| --- | --- | --- |
| Element/Oxide | MDLs | Sample uncertainties  (%) |
| (ppm) |
| Cl | 3 | ±12.86 |
| P | 3 | ±3.81 |
| Ba | 6 | ±5.42 |
| Ce | 5 | ±5.71 |
| Co | 1 | ±7.04 |
| Cr | 1 | ±6.45 |
| Cu | 0.6 | ±9.52 |
| Hf | 1 | ±11.76 |
| La | 5 | ±5.88 |
| Mn | 1.5 | ±3.58 |
| Nb | 0.6 | ±8.43 |
| Nd | 3 | ±7.14 |
| Ni | 1 | ±8.82 |
| Rb | 0.5 | ±4.29 |
| Sr | 0.5 | ±4.52 |
| V | 1 | ±4.65 |
| Y | 0.6 | ±12.00 |
| Zn | 0.6 | ±3.68 |
| Zr | 0.8 | ±4.90 |
| Ti | 1 | ±3.31 |
| Fe2O3 | 1 | ±1.73 |
| SiO2 | 5 | ±0.22 |
| Al2O3 | 5 | ±0.99 |
| MgO | 5 | ±4.42 |
| CaO | 3 | ±3.49 |
| Na2O | 5 | ±2.41 |
| K2O | 3 | ±1.54 |

Table S2. Correlations among the contents of the elements and oxides in the Aeolian surface sediments collected from the Badain Jaran Desert. (n = 100).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Cl | P | Ba | Ce | Co | Cr | Cu | Hf | La | Mn | Nb | Nd | Ni | Rb | Sr | Ti | V | Y | Zn | Zr | Fe2O3 | SiO2 | Al2O3 | MgO | CaO | Na2O | K2O |
| Cl | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| P | **0.20** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ba | **0.22** | **0.06** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ce | **-0.18** | **-0.26** | **-0.47** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Co | **-0.25** | **-0.48** | **-0.32** | **0.80** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cr | **0.02** | **0.36** | **-0.05** | **-0.08** | **-0.24** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cu | **0.03** | **0.66** | **-0.29** | **0.05** | **-0.20** | **0.50** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hf | **0.25** | **0.51** | **0.29** | **-0.29** | **-0.39** | **0.17** | **0.20** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| La | **-0.05** | **0.09** | **-0.21** | **0.35** | **0.19** | **0.16** | **0.25** | **0.00** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mn | **0.15** | **0.85** | **-0.14** | **-0.18** | **-0.40** | **0.45** | **0.83** | **0.36** | **0.17** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nb | **0.04** | **0.64** | **-0.20** | **-0.10** | **-0.34** | **0.38** | **0.66** | **0.56** | **0.12** | **0.67** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nd | **0.07** | **0.22** | **0.14** | **0.04** | **0.06** | **0.13** | **0.23** | **0.25** | **0.24** | **0.24** | **0.15** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ni | **0.02** | **0.63** | **-0.14** | **-0.06** | **-0.28** | **0.84** | **0.77** | **0.14** | **0.24** | **0.75** | **0.47** | **0.18** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Rb | **0.28** | **0.24** | **0.90** | **-0.52** | **-0.44** | **0.02** | **-0.17** | **0.39** | **-0.10** | **0.06** | **-0.06** | **0.12** | **0.01** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sr | **0.25** | **0.45** | **0.27** | **-0.32** | **-0.33** | **0.12** | **0.27** | **0.12** | **0.02** | **0.52** | **0.03** | **0.24** | **0.30** | **0.32** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |
| Ti | **0.05** | **0.86** | **-0.07** | **-0.15** | **-0.38** | **0.43** | **0.83** | **0.42** | **0.19** | **0.92** | **0.78** | **0.24** | **0.73** | **0.10** | **0.27** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |
| V | **0.02** | **0.79** | **-0.18** | **-0.18** | **-0.42** | **0.49** | **0.84** | **0.28** | **0.17** | **0.92** | **0.66** | **0.18** | **0.78** | **-0.03** | **0.34** | **0.92** | **1.00** |  |  |  |  |  |  |  |  |  |  |
| Y | **0.25** | **0.57** | **0.18** | **-0.32** | **-0.50** | **0.26** | **0.42** | **0.66** | **-0.06** | **0.48** | **0.77** | **0.16** | **0.21** | **0.21** | **0.18** | **0.55** | **0.41** | **1.00** |  |  |  |  |  |  |  |  |  |
| Zn | **0.18** | **0.86** | **0.03** | **-0.33** | **-0.58** | **0.40** | **0.78** | **0.48** | **0.13** | **0.88** | **0.79** | **0.19** | **0.66** | **0.20** | **0.35** | **0.93** | **0.86** | **0.69** | **1.00** |  |  |  |  |  |  |  |  |
| Zr | **0.03** | **0.61** | **0.01** | **-0.14** | **-0.25** | **0.22** | **0.30** | **0.48** | **0.03** | **0.49** | **0.49** | **0.22** | **0.31** | **0.19** | **0.18** | **0.53** | **0.43** | **0.42** | **0.51** | **1.00** |  |  |  |  |  |  |  |
| Fe2O3 | **0.02** | **0.81** | **-0.17** | **-0.09** | **-0.33** | **0.46** | **0.89** | **0.30** | **0.22** | **0.93** | **0.72** | **0.21** | **0.78** | **-0.01** | **0.27** | **0.98** | **0.95** | **0.45** | **0.90** | **0.44** | **1.00** |  |  |  |  |  |  |
| SiO2 | **-0.33** | **-0.72** | **-0.42** | **0.47** | **0.60** | **-0.27** | **-0.42** | **-0.43** | **-0.05** | **-0.72** | **-0.34** | **-0.23** | **-0.49** | **-0.64** | **-0.77** | **-0.61** | **-0.58** | **-0.42** | **-0.69** | **-0.44** | **-0.56** | **1.00** |  |  |  |  |  |
| Al2O3 | **0.31** | **0.44** | **0.73** | **-0.54** | **-0.56** | **0.16** | **0.11** | **0.49** | **-0.04** | **0.36** | **0.21** | **0.12** | **0.23** | **0.90** | **0.33** | **0.39** | **0.28** | **0.38** | **0.49** | **0.29** | **0.31** | **-0.77** | **1.00** |  |  |  |  |
| MgO | **0.13** | **0.91** | **-0.05** | **-0.22** | **-0.43** | **0.38** | **0.75** | **0.32** | **0.15** | **0.93** | **0.56** | **0.23** | **0.73** | **0.15** | **0.58** | **0.88** | **0.87** | **0.39** | **0.85** | **0.54** | **0.87** | **-0.76** | **0.37** | **1.00** |  |  |  |
| CaO | **0.22** | **0.64** | **0.00** | **-0.23** | **-0.32** | **0.19** | **0.43** | **0.19** | **0.09** | **0.71** | **0.22** | **0.23** | **0.45** | **0.16** | **0.91** | **0.47** | **0.53** | **0.21** | **0.49** | **0.35** | **0.47** | **-0.79** | **0.25** | **0.77** | **1.00** |  |  |
| Na2O | **0.44** | **0.38** | **0.53** | **-0.50** | **-0.60** | **0.12** | **0.09** | **0.56** | **-0.10** | **0.35** | **0.32** | **0.10** | **0.09** | **0.71** | **0.34** | **0.31** | **0.21** | **0.57** | **0.48** | **0.35** | **0.22** | **-0.72** | **0.85** | **0.28** | **0.28** | **1.00** |  |
| K2O | **0.25** | **0.13** | **0.93** | **-0.50** | **-0.40** | **-0.01** | **-0.25** | **0.32** | **-0.13** | **-0.04** | **-0.15** | **0.10** | **-0.05** | **0.98** | **0.28** | **0.01** | **-0.11** | **0.15** | **0.10** | **0.07** | **-0.10** | **-0.56** | **0.86** | **0.04** | **0.08** | **0.64** | **1.00** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Cl | P | Ba | Ce | Co | Cr | Cu | Hf | La | Mn | Nb | Nd | Ni | Rb | Sr | Ti | V | Y | Zn | Zr | Fe2O3 | SiO2 | Al2O3 | MgO | CaO | Na2O | K2O |
| Cl | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| P | **0.20** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ba | **0.22** | **0.06** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ce | **-0.18** | **-0.26** | **-0.47** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Co | **-0.25** | **-0.48** | **-0.32** | **0.80** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cr | **0.02** | **0.36** | **-0.05** | **-0.08** | **-0.24** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cu | **0.03** | **0.66** | **-0.29** | **0.05** | **-0.20** | **0.50** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hf | **0.25** | **0.51** | **0.29** | **-0.29** | **-0.39** | **0.17** | **0.20** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| La | **-0.05** | **0.09** | **-0.21** | **0.35** | **0.19** | **0.16** | **0.25** | **0.00** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mn | **0.15** | **0.85** | **-0.14** | **-0.18** | **-0.40** | **0.45** | **0.83** | **0.36** | **0.17** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nb | **0.04** | **0.64** | **-0.20** | **-0.10** | **-0.34** | **0.38** | **0.66** | **0.56** | **0.12** | **0.67** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nd | **0.07** | **0.22** | **0.14** | **0.04** | **0.06** | **0.13** | **0.23** | **0.25** | **0.24** | **0.24** | **0.15** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ni | **0.02** | **0.63** | **-0.14** | **-0.06** | **-0.28** | **0.84** | **0.77** | **0.14** | **0.24** | **0.75** | **0.47** | **0.18** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Rb | **0.28** | **0.24** | **0.90** | **-0.52** | **-0.44** | **0.02** | **-0.17** | **0.39** | **-0.10** | **0.06** | **-0.06** | **0.12** | **0.01** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sr | **0.25** | **0.45** | **0.27** | **-0.32** | **-0.33** | **0.12** | **0.27** | **0.12** | **0.02** | **0.52** | **0.03** | **0.24** | **0.30** | **0.32** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |  |
| Ti | **0.05** | **0.86** | **-0.07** | **-0.15** | **-0.38** | **0.43** | **0.83** | **0.42** | **0.19** | **0.92** | **0.78** | **0.24** | **0.73** | **0.10** | **0.27** | **1.00** |  |  |  |  |  |  |  |  |  |  |  |
| V | **0.02** | **0.79** | **-0.18** | **-0.18** | **-0.42** | **0.49** | **0.84** | **0.28** | **0.17** | **0.92** | **0.66** | **0.18** | **0.78** | **-0.03** | **0.34** | **0.92** | **1.00** |  |  |  |  |  |  |  |  |  |  |
| Y | **0.25** | **0.57** | **0.18** | **-0.32** | **-0.50** | **0.26** | **0.42** | **0.66** | **-0.06** | **0.48** | **0.77** | **0.16** | **0.21** | **0.21** | **0.18** | **0.55** | **0.41** | **1.00** |  |  |  |  |  |  |  |  |  |
| Zn | **0.18** | **0.86** | **0.03** | **-0.33** | **-0.58** | **0.40** | **0.78** | **0.48** | **0.13** | **0.88** | **0.79** | **0.19** | **0.66** | **0.20** | **0.35** | **0.93** | **0.86** | **0.69** | **1.00** |  |  |  |  |  |  |  |  |
| Zr | **0.03** | **0.61** | **0.01** | **-0.14** | **-0.25** | **0.22** | **0.30** | **0.48** | **0.03** | **0.49** | **0.49** | **0.22** | **0.31** | **0.19** | **0.18** | **0.53** | **0.43** | **0.42** | **0.51** | **1.00** |  |  |  |  |  |  |  |
| Fe2O3 | **0.02** | **0.81** | **-0.17** | **-0.09** | **-0.33** | **0.46** | **0.89** | **0.30** | **0.22** | **0.93** | **0.72** | **0.21** | **0.78** | **-0.01** | **0.27** | **0.98** | **0.95** | **0.45** | **0.90** | **0.44** | **1.00** |  |  |  |  |  |  |
| SiO2 | **-0.33** | **-0.72** | **-0.42** | **0.47** | **0.60** | **-0.27** | **-0.42** | **-0.43** | **-0.05** | **-0.72** | **-0.34** | **-0.23** | **-0.49** | **-0.64** | **-0.77** | **-0.61** | **-0.58** | **-0.42** | **-0.69** | **-0.44** | **-0.56** | **1.00** |  |  |  |  |  |
| Al2O3 | **0.31** | **0.44** | **0.73** | **-0.54** | **-0.56** | **0.16** | **0.11** | **0.49** | **-0.04** | **0.36** | **0.21** | **0.12** | **0.23** | **0.90** | **0.33** | **0.39** | **0.28** | **0.38** | **0.49** | **0.29** | **0.31** | **-0.77** | **1.00** |  |  |  |  |
| MgO | **0.13** | **0.91** | **-0.05** | **-0.22** | **-0.43** | **0.38** | **0.75** | **0.32** | **0.15** | **0.93** | **0.56** | **0.23** | **0.73** | **0.15** | **0.58** | **0.88** | **0.87** | **0.39** | **0.85** | **0.54** | **0.87** | **-0.76** | **0.37** | **1.00** |  |  |  |
| CaO | **0.22** | **0.64** | **0.00** | **-0.23** | **-0.32** | **0.19** | **0.43** | **0.19** | **0.09** | **0.71** | **0.22** | **0.23** | **0.45** | **0.16** | **0.91** | **0.47** | **0.53** | **0.21** | **0.49** | **0.35** | **0.47** | **-0.79** | **0.25** | **0.77** | **1.00** |  |  |
| Na2O | **0.44** | **0.38** | **0.53** | **-0.50** | **-0.60** | **0.12** | **0.09** | **0.56** | **-0.10** | **0.35** | **0.32** | **0.10** | **0.09** | **0.71** | **0.34** | **0.31** | **0.21** | **0.57** | **0.48** | **0.35** | **0.22** | **-0.72** | **0.85** | **0.28** | **0.28** | **1.00** |  |
| K2O | **0.25** | **0.13** | **0.93** | **-0.50** | **-0.40** | **-0.01** | **-0.25** | **0.32** | **-0.13** | **-0.04** | **-0.15** | **0.10** | **-0.05** | **0.98** | **0.28** | **0.01** | **-0.11** | **0.15** | **0.10** | **0.07** | **-0.10** | **-0.56** | **0.86** | **0.04** | **0.08** | **0.64** | **1.00** |