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**  |