

Surface catchment, fluvial and/or alluvial sediments at a depth of ~25cm from eight regions, i.e., Junggar Basin (n = 222), Tarim Basin (n = 170), eastern Tibetan Plateau (n = 39), Qaidam Basin (n = 63), South (S.) Alxa Plateau (n = 50), North (N.) Alxa Plateau (n = 89), Hetao Graben (n = 51) and northeastern deserts (n = 53) were collected. Meanwhile, last glacial loess (LGL) (n = 65) corresponding to the upper L1 layer of Quaternary loess and present interglacial sediments (PIS) (n = 65) corresponding to the S0 layer of Quaternary paleosol on the Chinese Loess Plateau were collected. All the samples were collected at a continental-scale, that is to document the abundance of elements in materials occurring at the Earth's surface often with a density and coverage larger than 1 sample/1000 km² and 0.5 million km², respectively. All the sites were designed far away from roads, farmland and residences to avoid any possible anthropogenic influence.

After being air-dried and homogenized, each sample was sieved to less than 75 μm using a stainless steel screen. We adopted a multi-method analytical scheme, by which 67 elements, 11 oxides and 3 parameters including Au, Ag, As, B, Ba, Be, Bi, Br, Cd, Cl, Co, Cr, Cs, Cu, F, Ga, Ge, Hf, Hg, I, In, Li, Mn, Mo, N, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Se, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Zn, Zr, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Tm, Y, Yb, Ir, Os, Pd, Pt, Rh, Ru, SiO₂, Al₂O₃, Fe₂O₃, FeO, MgO, CaO, Na₂O, K₂O, MnO, P₂O₅, TiO₂, H₂O⁺, total carbon and organic carbon were determined. Inductively coupled plasma mass spectrometry (ICP-MS) following 4-acid digestion (HF+HNO₃+HClO₄+aqua regia) for determination of Bi, Cd, Co, Cs, Cu, Hf, In, Mo, Nb, Ni, Pb, Ta, Te, Th, Tl, U, W, Zn, Rare Earth Elements (REEs) (i.e. Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Tm, Y, Yb) and Platinum Group Elements (PGEs) (Pt, Pd, Ir, Rh after fire assay) and X-ray fluorescence (XRF) with fused pellet preparation for determination of Ba, Br, Cl, Cr, Ga, Mn, P, Rb, S, Ti, V, Zr, SiO₂, Al₂O₃, CaO, K₂O, MnO, P₂O₅, TiO₂ and Fe₂O₃ are used as backbone methods. Other supporting methods include: (1) flame atomic absorption spectroscopy (F-AAS) for determining Au; (2) inductively coupled plasma optical emission spectrometer (ICP-OES) following 4-acid digestion (HF+HNO₃+HClO₄+aqua regia) for determination of Be, Li, Sr, MgO and Na₂O; (3) hydride generation atomic fluorescence spectrometry (HG-AFS) following aqua regia for As and Sb, HF+HNO₃+H₂SO₄ for Ge and HF+HNO₃+HClO₄+HCl for Se; (4) alkaline fusion followed by colorimetry (COL) for Os and Ru and (5) alkaline fusion followed by ion specific electrode analysis for F determination.

Quality control standard consists mainly of: (1) insertion of 3% field duplicates; (2) insertion of blind laboratory replicates; (3) insertion of Standard Reference Materials (SRMs) including soil standards (GSS-1, GSS-2, GSS-17, GSS-19, GSS-25, GSS-26, GSS-27), gold standards (GAu2a, GAu2b, GAu9a, GAu9b, GAu10a, GAu10b, GAu11a, GAu11b) and platinum group element standards (GPt-1, GPt-2, GPt-7 and GPt-8). Accuracy and precision are determined by the following equations:

$$\Delta \lg C = |\lg C_i - \lg C_s| \quad \text{Relative Standard Deviation (\%)} = \frac{\sqrt{\frac{\sum_{i=1}^n (C_i - C_s)^2}{n-1}}}{C_s}$$

where C_i is the i -th determination of the SRMs, C_s is the reference value of the SRMs.

$$\text{Relative Deviation (\%)} = |C_1 - C_2| / ((C_1 + C_2) / 2)$$

where C_1 is the 1st determination of the laboratory replicate, C_2 is the 2nd determination of the laboratory replicate.

$$\text{Relative Error (\%)} = |S_o - S_d| / ((S_o + S_d)/2)$$

where S_o is the determination of the original field sample, S_d is that of the field duplicate.