Time constraint on Brunhes-Matuyama inversion inferred by U-Series disequilibrium

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In southwestern Morocco (northern Sahara border) hydrothermal travertine deposits ($CaCO_3$) occurred covering several km^2 with a thickness up to 15m. The main interest in dating such deposits is that travertine formations are generally regarded as remnants of Quaternary humid phases. A continuous core of 12 m mainly consisting of pure $CaCO_3$ alternating with detrital layers of clay was sub-sampled for U-series dating (pure $CaCO_3$) and for magnetic properties in layers rich in detritus. The magnetic record results indicated two main features: 1) normal polarity inclinations with a mean value around 40° is found for all measured samples from surface until 9.03 meter deep and 2) at 9.05 meters deep, reverse polarity inclinations abruptly appear with a mean inclination value around –40°. This polarity inversion was attributed to the Brunhes-Matuyama transition.

U-series dating indicates that samples from the top of the core up to 5.6 m yield ages ($^{230}Th/^{234}U$), ($^{234}U/^{238}U$) compatible with statigraphy ranging between 500 ka and present-day. On the other hand, all samples below the depth of 5.6 m indicate infinite ages implying that secular radioactive equilibrium is reached from this depth down. However, samples above 5.6 m that yielded finite ages allowed us to calculate an initial $(^{234}U/^{238}U)_0$ value for the hydrothermal fluid from which the $CaCO_3$ was precipitated. This calculation was also carried on samples collected in outcrop or section near the coring site that gave calculable ages. Compiling these initial values, the frequency histogram of $(^{234}U/^{238}U)_0$ shows an almost unimodal distribution with a mean value of 5 ± 0.5 for all samples (< 500 ka). Assuming this value constant before 500 ka, we calculated the time needed for the $(^{234}U/^{238}U)_0$ of samples to reach the measured one for the samples older than 500 ka. The decay of ^{234}U excess depends on its half-life (245.2 ± 0.49 ka) and may allow to date up to 10^6 y. We find an age of 800 ± 50 ka for samples located at depth between 8 and 10 m. This age is in agreement, though less precise, than the age of Brunhes-Matuyama transition of 780 ka.

Two easy methods in evaluation of an exploration data set

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Mineralized factors and data

There are two type of statistical analyses for an easy and rapidly evaluation of an exploration data set. It is possible to evaluate and separate the mineralized and pathfinder elements in an exploration data set by using the discrimination and correspondence analyses [1,2,3]. The results of the two method confirm each other for a data set in the study area (Fig. 1 A and B) [4]. The data will be separated into a few sub-populations, if there are a few source of variation in the concentrations (Fig. 1-A). The anomalous sample numbers could distinguish by using correspondence analysis (Fig.1-B).

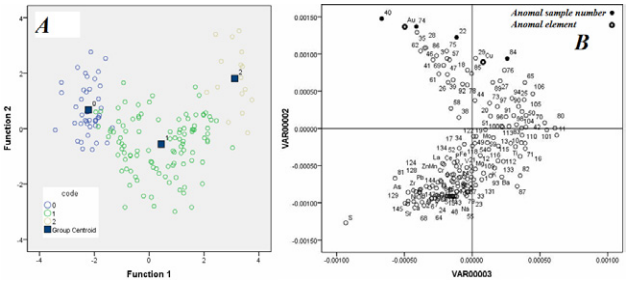

Figure 1: Discrimination (A) and correspondence (B) analysis of an exploration data set

Conclusion

It is important to identify the source of anomaly in a data set, paragentic parameters, and separation of the highly and relatively anomalous data in an exploration or envirnomental evaluation. These aims could be accessable by using discriminationa nd correspondence analyses togetther.

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