Visualisation of detrital zircon age data relative to deposition age and identification of potential provenance regions

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Conventional probability function diagrams are routinely used to illustrate detrital zircon age data. Where numerous samples are available from stratigraphic successions, these probability plots require a lot of space and can not capture the link between zircon age and inferred stratigraphic (depositional) age. We present an alternative view of the probability plots which emphasise the relative stratigraphic age of different samples or lithostratigraphic units while illustrating which time intervals the majority of its detrital grains come from. In effect, one views the probability curves from above with the highest frequency sections of the curves plotted in emphasised ornament and colour relative to lower probability intervals in minimised ornament and shades of grey. This methodology has been built in to the DateView and StratDB online databases and into a standalone software package (FitPDF), all available from http://sil.usask.ca.

Once probability distributions have been associated with lithostratigraphic units in StratDB and DateView, the online software allows users to find all samples in the DateView geochron database which match detrital age peaks. These potential provenance localities may be further refined to take into account sediment transport directions and other geological constraints, after which it is possible to generate a probability plot for the most likely provenance localities for comparison with the actual (sample) detrital age distribution.

Locality information may also be illustrated on palaeogeographic reconstructions so as to enhance the regional provenance interpretation of detrital zircon data.

This approach is illustrated using data from the Kalahari and Pilbara cratons so as to assess different models for the Vaalbara hypothesis and of collision between the Zimbabwe and Kaapvaal cratons.

Geochemistry and the spatial patterns of water management are reflected in human hair

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Element concentrations and isotopes of human tissues within urban regions are known to reflect human health, to provide diagnostic dietary information, and to provide region-of-origin information in a linear fashion. Here, we show the importance of isotopes of both oxygen in water and strontium within tap waters to the isotope ratios preserved within hair. We test the concept that oxygen isotopes in hair are predictable based of local drinking water values at the time that hair proteins (keratin) are initially produced within hair follicles, whereas strontium isotopes in hair reflect a progressive input from external tap waters after hair has emerged from the scalp. The contrasting inputs of oxygen and strontium isotopes to hair provide a predictable diagnostic tool that can be used in a wide array of forensics and region-of-origin studies. Since both oxygen isotope and strontium isotopes within drinking water are known to vary independently and spatially across continents in a predictable manner, the simultaneous measurement of both isotopes provides a new and powerful modern tool to reconstruct the region-of-origin of unidentified murder victims in forensic investigations.

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