

The provenance of heavy minerals, feldspars and clays from the Cambrian sandstones, Israel; Isotope and geochemical study

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Provenance studies are important for understanding continental-scale processes such as uplift, erosion and sedimentation and they are generally based on one or two proxies and usually analyzed on one mineral phase. Moreover, the potential of each component in the sediment to indicate a different source is not yet examined.

In order to examine the source for each sediment constituent, we applied mineralogical and elemental analyses along with isotopic measurements of Pb, Nd and Sr on each mineralogical phase separated from the Cambrian subarkoses samples exposed at the northmost tip of Gondwana, Southern Israel. Previous studies suggested that in general the sequence indicates a continental-scale long distance braided streams system with a general south to north flow direction (current configuration). However, the provenance of each of the siliclastic formations is not fully understood.

Heavy mineral assemblages, clays and feldspars separated from Cambrian subarkoses samples, clays separated from saprolite and feldspars separated from the Arabian Nubian Shield were analyzed and their provenance was studied.

Results of this study lead to a discrete characterization of potential provenance for each mineralogical phase. For example, $^{87}\text{Sr}/^{86}\text{Sr}$ and $^{206}\text{Pb}/^{204}\text{Pb}$ ratios, Pb model age, μ values and Nd model ages (ca. 1400 Ma) of sedimentary feldspars (K-feldspar) indicate their derivation from remote and ancient craton/s and from the nearby Arabian Nubian Shield (ANS). Similarly, heavy minerals (predominantly ZTR) suggest a mixture of several sources of distinct geological and geochemical nature; the adjacent juvenile ANS and remote and ancient remobilized terrain/s. Clay size assemblages (predominantly illite/smectite) show intermediate geochemical properties, indicating a mixture of both local (ANS) and remote sources, along with a small authigenic component.

Finally, this study demonstrates the strength of the methodology which involves more than one mineral phase and several isotope and geochemical methods.