analysis by principal component analysis (PCA) was used to test the hypothesis of three discrete sources suggested by the petrologic model. Major element PCA on sandstones discriminated the sources but results from trace element PCA required further investigation using element biplots to understand their significance. Only a few elements were found to be diagnostic of different sources, namely K, Rb, Sr, U, Th, Nb and Ti, with the latter two of value only for sandstones. These are all elements that are abundant in the granites of the Appalachians. Most published geochemical discrimination diagrams did a poor job of distinguishing the three petrographically recognized sources. In other basins with quite different hinterland geology, other elements are known to be of value in discriminating provenance. Thus it is unlikely that a globally applicable set of elemental discriminants can identify terrigenous sediment sources. Rather, systematic investigation is needed that evaluates processes such as diagenesis and sorting and then tests geographic and stratigraphic variability in bulk geochemistry, informed by at least semi-quantitative petrographic data.

Geochemical identification of clastic sediment provenance from known sources of similar geology: the Cretaceous Scotian Basin, offshore eastern Canada

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This study tests the effectiveness of a geochemical approach in identifying provenance in a basin where different sources do not show strongly contrasting geology. Petrological studies indicate that at least three distinct rivers, draining reactivated horsts of the Appalachian orogen, supplied sediment to the Lower Cretaceous deltaic sandstones and mudrocks in the offshore Scotian Basin. 95 samples mostly from conventional core were analyzed for 44 major and trace elements. The data were first screened for variability unrelated to provenance, including changes in elemental abundance due to weathering and diagenesis, and the effects of grain size and sorting on element variation. The effect of hydraulic sorting was distinguished from the effects of concentration of ultrastable heavy minerals from polycyclic sources. Multivariate statistical

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