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CAN GEOCHEMISTRY HELP IN THE DISCRIMINATION OF THE PROVENANCE OF SEDIMENTS FROM A RECYCLED OROGEN? A CASE STUDY FROM THE BETIC CORDILLERA

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Traditionally provenance studies are carried out mainly through petrographic analysis, focusing attention on the ratios between different types of rock fragments as indicators of the geology of the source area. Geochemistry proved to be a very useful tool to integrate this kind of study since it can give an estimation of the influx of source rocks and can account for the type and influence of finer fractions in the sediment.

We combined geochemical analysis to classic petrographic approach on samples of fluvial and beach sands from the south-western coast of Spain, from Almeria to Cadiz, facing the Alboran Sea, presented in a previous study (Critelli *et al.*, 2002).

The inland geology of the mountain chain that feeds detritus to the coast, the Betic Cordillera; is rather complex since it contains several thrust units with a large variety of rock types: low- to high-grade metamorphic rocks, peridotites, carbonates, siliciclastic and evaporitic rocks as

well as volcanic ones.

According to the previous work (Critelli *et al.*, 2002) three main petrofacies were recognized in the sands:

petrofacies A - a metamorphic/sedimenticlastic quartzolithic petrofacies with abundant phyllite, schist dolostone, limestone and sandstone lithic fragments, locally volcanic lithic fragments are abundant;

petrofacies B - an ultramaficlastic quartzolithic petrofacies has abundant serpentinite and peridotite lithic fragments;

petrofacies C - a quartzose petrofacies, which extends across the Gibraltar area.

River sands have display distinct chemical features, particularly petrofacies C can be characterized by high SiO_2 , P_2O_5 , Zr, Nb ratios normalized to Al_2O_3 and referred to the Upper Continental Crust (Taylor & McLennan, 1985), and by low Na_2O , Ga Rb and Sr, whereas, compared to the other petrofacies, also MgO, CaO, Cr and Ni display relatively low ratios. Petrofacies B is clearly strongly enriched in those elements related to the ultramafic end-member (MgO, Cr, Co, Ni) and is relatively depleted in elements such as Y, Zr, Ce, Pb, Th. River sands from petrofacies A stay between the other two petrofacies, it is however strongly enriched in Cr, Ni, Co and MgO that might be related to ultramafic supply carried from one individual river.

As far as the relationships between beach and river sands are concerned, clear differences can be observed for the samples from petrofacies C, where a strong carbonate enrichment is observed in the beach sands compared to river sands and also the other beach sands analysed. Beach sands from petrofacies B are slightly depleted in the ultramafic related elements, due to a relative enrichment in SiO_2 and Na_2O . Samples from petrofacies A are those that display the more constant coherence between beach and river sands, apart from a slight enrichment in some samples of Cr coupled to high Ti, Fe Mn Y, Nb, P_2O_5 that might indicate the occurrence of spinel- or garnet-rich phases concentrated in placers-like settings, concentrated by the sedimentary processes occurring in the shore environment.

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