

## ISOTOPE AND TRACE ELEMENT GEOCHEMISTRY OF LATE-PROTEROZOIC TO SILURIAN METASEDIMENTS IN THE HERCYNIAN OF N. PORTUGAL

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Late Proterozoic to Paleozoic metasedimentary successions occupy major parts of the Central Iberian Zone (CIZ) of the Iberian Massif. In N. Portuguese parts of the CIZ, this sequence is composed of metaturbidites of Late-Proterozoic to Cambrian age (LPC), separated from Ordovician and Silurian siliciclastics by a major discontinuity, both of which were affected by recrystallization during Hercynian lower greenschist to amphibolite facies metamorphism.

The geochemical variation observed in the >10 km thick LPC series can be attributed to 3 main processes: (i) mechanical sorting, resulting in the strong inverse correlation of most geochemical parameters with the SiO<sub>2</sub> content of the sample, (ii) heavy mineral effect, observed through constant levels of P<sub>2</sub>O<sub>5</sub>, CaO, Zr, Hf and partly TiO<sub>2</sub> in all samples, and (iii) influence of Hercynian metasomatic alteration accompanying regional metamorphism, which is found to be limited to small scale redistribution of geochemical components, and partial resetting of the Rb-Sr isotope systematics.

Mechanical sorting appears to be the dominant process determining the observed geochemical features of the LPC series. In order to characterize the provenance of the sediments requires the elimination of this dominant controlling factor. This may be achieved by using ratios of trace elements rather than their absolute abundances, combining elements present in crustal sources (e.g. Ga, Th, LREE) and those in mafic/mantle sources (e.g. Sc, V, Cr). Using literature datasets, the combination of initial Nd isotopic compositions and a limited number of trace element ratios was found to be effective in establishing the geochemical nature of the terrigenous detritus and hence the tectonic setting in which the sediments were deposited. Applied to the N. Portuguese metasedimentary succession, the LPC series are characterized by comparatively low Th/Sc, La/Cr and La/V ratios, combined with high Zr contents and initial  $\epsilon_{Nd}$  values.

series (n)	Th/Sc	La/V	La/Cr	Zr	$\epsilon_{Nd}$ [i]	TDM
Late Proterozoic (2)	0.64	0.42	0.69	143	-6.3	1.59
Late Proterozoic/Cambrian (15)	0.57	0.29	0.54	222	-2.3	1.33
Ordovician (3)	0.95	0.54	0.97	225	-9.5	1.74
Silurian(7)	1.03	1.96	1.01	195	-9.0	1.59

These features suggest that large amounts of juvenile crustal material were added to the sedimentary mass during the Late Proterozoic to Cambrian, most probably in a continental arc tectonic setting. In contrast to the LPC series, Ordovician and Silurian metasediments show no evidence for the addition of juvenile material, and have geochemical characteristics typical of sediments deposited in passive marginal settings.

The selected geochemical data on the Late Proterozoic to Silurian sequence thus underline similar conclusions based on geological and Nd-isotopic data for other parts of the Iberian Massif and the European Hercynides, demonstrating that the Late Proterozoic/Early Paleozoic Cadomian orogenic event was an important episode of crustal growth.