

Provenance of the Variscan Upper Allochthon (Cabo Ortegal complex, NW Iberian Massif)

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The NW Iberian Massif shows very good exposures and complete sections of the Variscan orogeny of Western Europe. Located above ophiolitic units which outline the Variscan suture, the Upper Allochthon (Upper Units) of the NW Iberian allochthonous complexes is composed of Early–Middle Cambrian magmatic arc related rocks, with siliciclastic and pelitic sedimentary series connected with basin development in this arc context. This Upper Allochthon can be followed in the same structural position along the Variscan belt, from the Iberian to the Bohemian Massifs. This study focusses on the provenance of the Cariño gneiss formation, a gneissic metasiliciclastic unit located in the uppermost structural position of the allochthonous Cabo Ortegal complex. U-Pb and Lu-Hf zircon (LA-ICPMS) and Sm-Nd whole rock analyses have been performed to document the provenance of this unit and so constrain the paleogeographic evolution of the Upper Allochthon.

U-Pb geochronology of 6 samples indicates a Middle Cambrian maximum depositional age, with the following zircon age populations: Paleozoic–Neoproterozoic 36 %, Mesoproterozoic 3.6 %, Paleoproterozoic 46.8 % and Archean 13.6 %. Lu-Hf isotope analyses of these zircons typify Pan-African (Cadomian), Eburnean and Archean orogenic pulses in their respective source areas. Pan-African and Eburnean events entailed abundant input of juvenile material involving broad mixing with older crustal sources. Mesoproterozoic activity is scarce and scattered and so unlikely to represent a major crust generation pulse in the source area of the siliciclastic unit. Sm-Nd whole-rock analyses on 10 samples provide an average depleted mantle model age of 1.73 Ga.

This information is compatible with provenance from a source area with Archean crust that registered an important Eburnean orogenic cycle followed by a Pan-African–Cadomian event. Nd TDM ages suggest almost direct derivation from these sources. These data are interpreted as indicative of West Africa craton provenance. The siliciclastic series from which the Cariño gneisses were derived were probably deposited in a back-arc type basin where detritus were mostly sourced from the stable continental area instead of the magmatic arc. Pre-existing U-Pb and Sm-Nd data from another Upper Allochthon unit from NW Iberia (Órdenes complex) points to strong isotopic heterogeneity within this terrane, which is indicative of source area variability. This observation is interpreted to reflect either a temporal evolution of the arc or the possibility that the terrane represented by the Upper Units is composed of more than one domain of the arc-related system.