Comunicaciones Nº 42 - 1991: 179 - 181
Departamento de Geología, Universidad de Chile, Santiago

CRUSTAL GROWTH OF THE IBERIAN MASSIF BY ACCRETION OF EXOTIC TERRANES DURING THE VARISCAN OROGENY: FIELD AND GEOCHRONOLOGICAL CONSTRAINTS

C. Quesada
IGME, 23 Ríos Rosas, 28003 Madrid, Spain

R.D. Dallmeyer
Department of Geology, University of Georgia, Athens, GA 30602 USA

Application of terrane concepts in the tectonic study of the Iberian Massif allows the recognition of various, palinspastically distinct continental units which are separated by variably dismembered ophiolitic units (Fig. 1). These suggest cryptic sutures occur in both northern Iberia (Galicia-Tras-os Montes Zone) and southern Iberia (Pulo do Lobo Zone). The former represents an intermediate, far-traveled, internally imbricated, nappe complex structurally emplaced over allochthonous units composed of native Iberian units correlative with those in the autochthon. Structurally

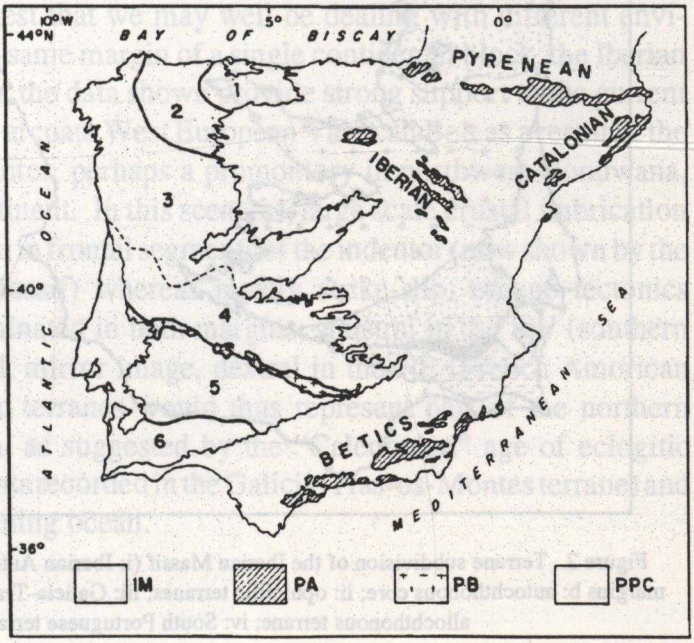

Figure 1: Tectonostratigraphic units of the Iberian Massif: 1- Cantabrian Zone; 2- West Asurian Leonese Zone; 3- Galicia-Tras-os Montes Zone; 4- Central Iberian Zone; 5- Ossa Morena Zone; 6- South Portuguese Zone (Pulo do Lobo Zone along tectonic contact between 5 and 6).

overlying allochthonous continental and/or volcanic arc successions represent exotic terrane elements (Fig. 2). These record a complex polyphase tectonothermal evolution which includes lower Paleozoic intrusive and eclogitic stages which likely occurred palinspastically removed from Iberian cratonic elements. In southern sectors, the Paleozoic Beja-Acebuches ophiolite and related oceanic sequences collectively comprise the Pulo do Lobo Zone, and likely accreted to Iberia largely as a result of Devonian transpressive processes. Upper Devonian ophiolitic melange sequences in the vicinity of the suture zone closely date accretion of ophiolitic units. They were obducted (together with the adjacent Ossa-Morena Zone) southward onto another continental unit (the South Portuguese zone: Fig. 1), which represents another Paleozoic terrane (Fig. 2). This approached the Iberian Autochthon mostly by strike-slip motion, but a subsequent change to more convergent conditions resulted in subduction beneath the Ossa Morena and previously accreted oceanic units. This is recorded by southward progression of flysch deposition and coeval thin-skinned deformation from the upper Visean to the lower Westphalian.

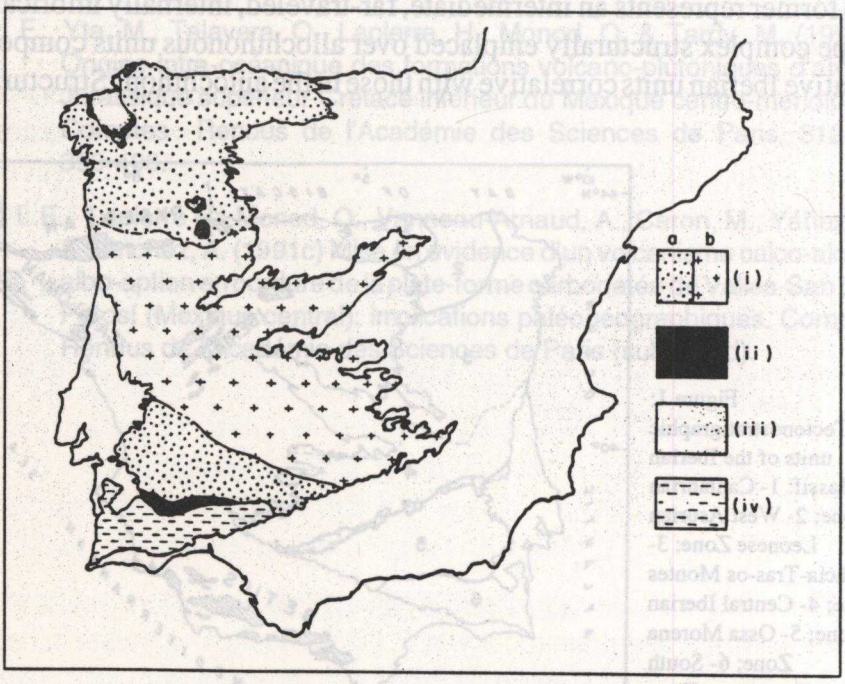

Figure 2. Terrane subdivision of the Iberian Massif (i: Iberian Autochthon; a: imbricated margins b: autochthonous core; ii: ophiolitic terranes; iii: Galicia-Tras-os-Montes uppermost allochthonous terrane; iv: South Portuguese terrane).

Hornblende records c. 380-390 Ma $^{40}Ar/^{39}Ar$ cooling ages within both ophiolitic units in the Galicia-Tras-os Montes ophiolite and in structurally overlying, exotic continental allochthons. This suggests initial obduction of previously amalgamated units onto the Iberian Autochthon, since this metamorphic event, with prograde characteristics, is the only affecting the ophiolitic terrane. Final emplacement into positions close to their present situation is dated by muscovite cooling ages in the underlying parautochthonous sequences (locally blue-schists) and in the basal mylonite of c. 330-340 Ma. A similar range of cooling ages is obtained in southern segments of the Iberian Autochthon (Ossa-Morena Zone), but initial tectonothermal activity along the suture zone cannot be solved with this technique due to extensive thermal rejuvenation during lower Carboniferous transtension, accompanied by a extremely high geothermal gradient. It is proven however by the presence of ophiolitic, and Ossa-Morena source clasts in the upper Devonian melanges which occur near the suture zone. Subsequent (transpressional) uplift is neatly shown by c. 340 Ma hornblende cooling ages. This age approximately coincides with the onset of flysch deposition and thin-skinned deformation in the South Portuguese Terrane which characterize the final docking of this terrane.

Despite the largely contrasting tectonic regimes operating in northern and southern segments of the Iberian Massif during the Variscan orogeny, the strong similarities shown by their respective tectonothermal histories, among others, suggest that we may well be dealing with different environments within the same margin of a single continental block, the Iberian Autochthon. In fact, the data shown provide strong support to the current interpretation of the arcuate West European Variscan Belt as a result of the collision of an indentor, perhaps a promontory in northwest Gondwana, with a northern continent. In this scenario, large scale crustal imbrication would have occurred in frontal segments of the indentor (now shown by the northern Iberian Massif) whereas mostly strike-slip, escape tectonics would have predominated in both margins; sinistral in the SW (southern Iberian Massif) and, mirror image, dextral in the NE (French Amorican Massif). The exotic terranes would thus represent part of the northern continent (Laurasia, as suggested by the "Caledonian" age of eclogitic tectonothermal events recorded in the Galicia-Tras-os-Montes terrane) and relics of the intervening ocean.