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Genesis of the Ibero-Armorican arc

Genèse de l'arc Ibéro-Armoricain

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ABSTRACT. – The Ibero-Armorican arc is continuous between Iberia and Armorica; its curvature increased with time due to subduction followed by continental collision; indentation produced left lateral transpression in Iberia and right-lateral transpression in Armorica. It is argued that whereas the antithetic shear is predominant in Iberia, in Armorica a synthetic shear prevailed because the identer rotated anticlockwise between the opposed forelands of the Variscan Fold Belt. It is proposed that the major Rheic ocean, closed by subduction towards the inner part of the arc, solving the space problem of centripetal vergences.

Key-word : Arc, Flake, Variscan Fold Belt, Indentation, Subduction/Obduction, Collision.

RÉSUMÉ. – L'arc Ibéro-Armoricain est continu entre Ibérie et Armorique; sa courbure s'accentue au cours du temps en fonction de la subduction suivie de collision continentale; l'indentation produit de la transpression sénestre en Ibérie et dextre en Armorique. Nous proposons qu'en Ibérie le cisaillement antithétique prédomine alors qu'en Armorique il est synthétique, parce que le poinçon tourne de façon anti-horaire entre les deux avant-pays de la Chaîne Varisque. Nous proposons aussi qu'un océan majeur, Rheic, se ferme par subduction vers l'intérieur de l'arc, ce qui résout le problème de l'espace posé par des déversements centripètes.

Mots-clés : Arc, « Flake » tectonique, Chaîne Varisque, Poinçonnement, Subduction/obduction, Collision.

I. HISTORY OF IDEAS

The continuity of the structural grain between Iberia and Armorica has been noticed since Argand (1924), Carey (1958) and Bard *et al.* (1971). The opening of Bay of Biscay, in upper Jurassic to Cretaceous times (for a review see Ries, 1978) made this original continuity even more obvious, and the existence of an Ibero-Armorican Arc (IAA) at the end of the Variscan orogeny was confirmed by most of the subsequent work. But the mechanism of generation of the arc was debatable and researchers on the problem followed two paths in order to discriminate between competing models: patterns of finite strain (Matte and Ribeiro, 1975; Ries and Schackleton, 1976) and paleomagnetism (Ries *et al.*, 1980; Pérroud and Bonhommet, 1981; Bachtadse and Van der Voo, 1986). Other geophysical data has been used by various authors to discuss the presence and genesis of the IAA (e. g. Haworth, 1977). We will not discuss in detail speculative interpretations based on such data; in fact we disagree with such interpretations for two reasons. First, some of them contradict well established direct evidence based on geological data. We cannot accept that the IAA, clearly depicted by Variscan structures, represents only a small part of a larger structure centered on the Grand Banks of Newfoundland (Lefort, 1979; Lefort and Haworth, 1979) with no Variscan deformation (Jansa and Wade, 1975). This would require that the arcuate Variscan displacements should exactly overprint a previous Precambrian arcuate structure; this is impossible because the Variscan deformation penetrates, as ductile shear zones, in the pre-Variscan basement of the IAA. In second place we have difficulties in interpreting geophysical anomalies that are undated or have been largely modified by lithospheric thinning related to passive margin evolution during the Atlantic opening (e. g. Boillot *et al.*, 1979).

The object of this paper is to review the problem of genesis of the IAA in the light of the more recent tectonic data (fig. 1). To do so we will address some questions, trying to see what alternatives are more probable as a function of the existing data.

II. HOW MUCH CONTINUOUS/DISCONTINUOUS

The original continuity of the IAA was based on similitude of zonal arrangement: the variations of all geological characters were arranged in such a way that there

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