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Review Article

Tectonic classification of Cenozoic Iberian foreland basins

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ABSTRACT

The Iberian microcontinent stands out because of its intense Alpine intraplate deformation. This is reflected in a large number of Cenozoic basins of very different sizes. Most of the contacts between topographic highs and basins are thrust or strike-slip faults. All these basins seem to have undergone a common sedimentary evolution, comprising four stages: initiation of sedimentation, intense syn-tectonic infilling, change from endorheic to exorheic drainage, and accelerated erosion related to fluvial incision. This simple evolutionary model shows a migration from East to West, in which basins are still tectonically active at the Atlantic margin of Iberia. This common evolution is also found in a series of geometrical characteristics, such as the ratio *r* of length of strike-slip fault and length of thrust fault, that are very similar in both types of basin border settings. Thrust-related basins are mainly associated with segmented pop-downs, whereas the main basins have the characteristics of open-ramp basins. Strike-slip related basins are mostly transpressive structures, although small pull-apart basins are usual along the Vilariça and Messejana faults. For basin areas larger than 100–1000 km^2, a constant *r* value of 0.6 is found (including the Ebro, Duero, Madrid, Lower Tagus and Badajoz basins). Within the Iberian microcontinent, the total amount of Cenozoic contractional deformation was distributed between strike-slip and thrust faults with an *r* ratio close to 0.6. However, for small basins this parameter seems to depend on the type of fault, range or deformation belt (pure strike-slip, transtension, transpression, and pop-up) independently of its local tectonic development.

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1. Introduction

The plate tectonics evolution of the Iberian microplate during the Cenozoic led to a drastic change in the topography of its continental part. From an average elevation close to sea level until the end of the Cretaceous (e.g. Cunha and Pena dos Reis, 1995; Dinis et al., 2008), the

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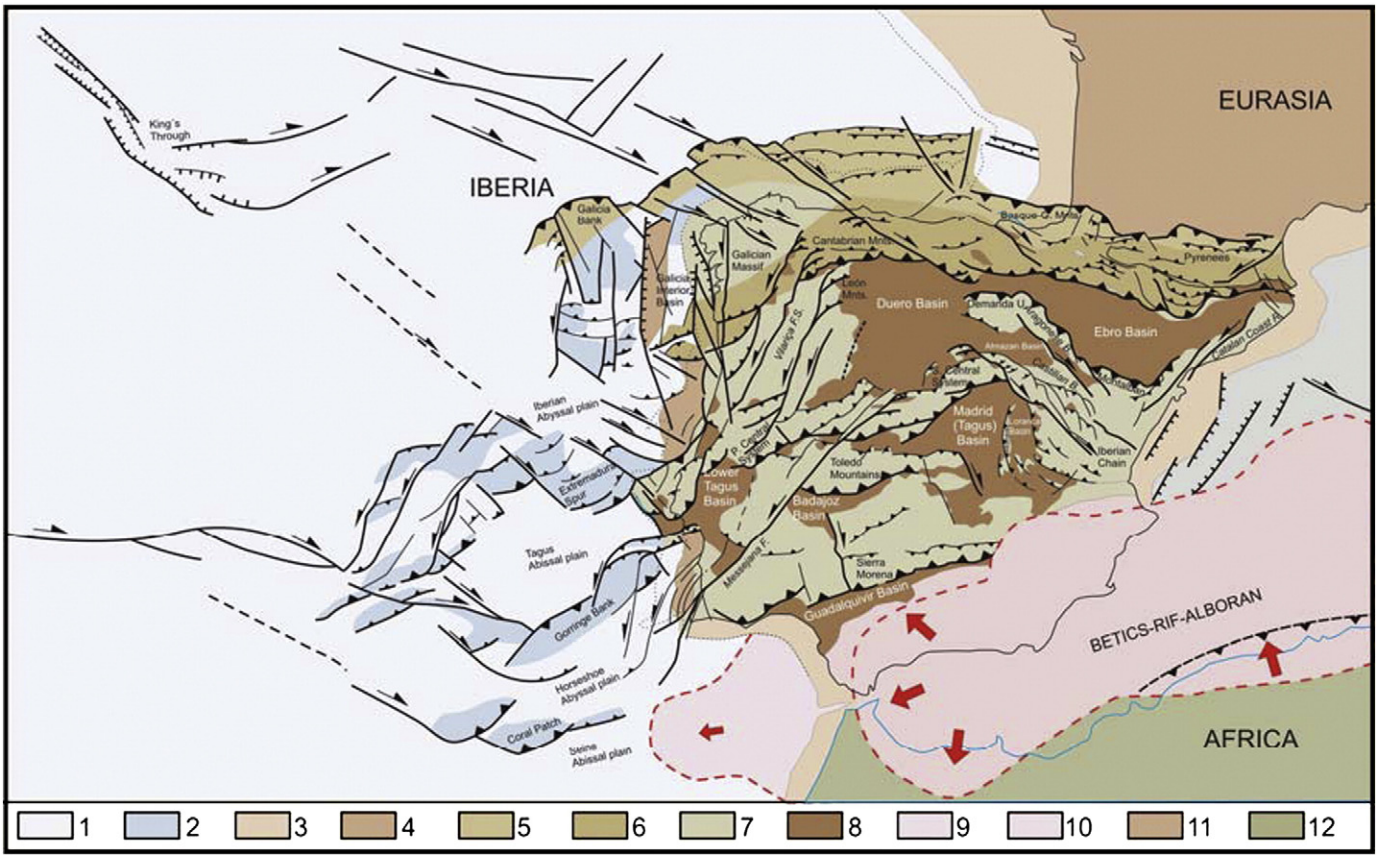

Fig. 1. Tectonic sketch showing the three thrust ranges (North, Centre and South) in continental Iberia and their prolongations within the oceanic crust. Main Cenozoic basins and strike-slip faults are also shown. Red arrows indicate the progressive westward shift in the emplacement of the Alborán domain. 1) Ocean crust. 2) Structural uplifts in the oceanic crust. 3) Continental platform. 4) Basins in continental platform. 5) Pyrenees N vergence. 6) Pyrenees south vergence. 7) Structural uplifts in continental crust. 8) Basins in continental crust. 9) Alborán domain. 10) Gulf of Cádiz fan. 11) Eurasia continental crust. 12) Africa continental crust.

Cretaceous planation surface is now commonly uplifted about 100–600 m, with mountain belts rising to ~2000 m. During the Cenozoic, several basement uplifts and sedimentary basins were formed. These basins were located in areas that were subsiding relative to the ranges, where sediments accumulated to form successions up to 3500 m thick (e.g. Madrid Basin; Lanaja, 1986).

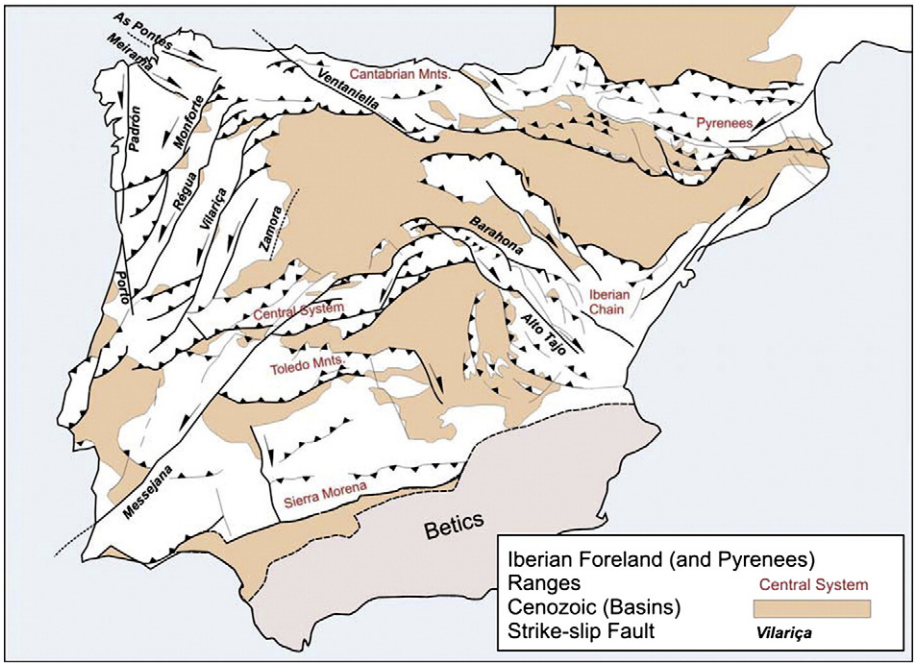

Fig. 2. Main strike-slip faults and ranges in the Iberian foreland (De Vicente and Vegas, 2009).