



## **Iberia foreland Cenozoic Ranges: A reologic - cinematic classification.**

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The intraplate mountain chains of the Iberian Peninsula show a collection of the possible structural types that can appear in continental foreland areas.

Fundamentally, the presence or absence of sedimentary cover, mainly corresponding to the Mesozoic sequence, produces two well-differentiated sets of mountain ranges: In the eastern part of Iberia, and coinciding with the location of the Mesozoic rift, mountain ranges are related to the Iberian Chain, where, although the deformation involves the Palaeozoic basement, there are décollements in the mesozoic sedimentary cover showing a clear tectonic inversion. In contrast, the absence of a detached cover and a thin non-detached cover in the central and western parts of Iberia (Central System. Serra da Estrela) discards inversion as the tectonic mechanism for uplift in these areas. Conversely, cenozoic deformations developed on a zone with a more homogeneous behaviour, producing a more regular distribution of mountain chains and sedimentary basins, from the Cantabrian Mountains in N Iberia to Sierra Morena in the S.

In mountain ranges without sedimentary cover, several types of structures can be distinguished depending on the behaviour of the basement and its location with respect to the big crustal and lithosphere flexions which seem to control their formation. These structures correspond to: pop-ups and pop-downs involving either the lithosphere (Gredos) or only the upper crust (Los Ancares pop-up and El Bierzo

pop-down) by thick-skin thrust systems; monocline ramps with basin formation in the depressed limb (Guadalupe-Montánchez thrust); imbricate thick-skin thrusts systems above the not longitudinal finite deformation surface of the lithosphere folds and piggy-back basins (Northern border of Somosierra-Guadarrama. N Portuguese ranges) and thin-skin imbricate thrusts in basement areas with variscan subhorizontal foliation (Honrubia-Sepúlveda imbricate thrusts in the northeastern end of the Central System).

The ranges with a thick sedimentary pre-orogenic cover and/or a tegument also present imbricate thrusts involving the basement and thin-skin thrusts, generally nucleated on non-competent mesozoic rocks. In the same way, deformation can be accumulated in a main reverse fault (monocline ramp) or raise or sink triangular zones (limited by two thrusts of opposite vergence). Likewise, the Almazán basin constitutes a good example of piggyback.

Apart from these important rheologic constrains, the type of deformation and related stresses also contribute to a series of structural features, that also produce different types of mountain ranges. Excluding the neogene extensional structures associated with the Valencia Trough and with the Teruel-Jiloca graben system, the mountain chains of the Iberian foreland are the result of compressional stresses (uniaxial compression and strike-slip). Though most structures are poliphasic, being active throughout the Cenozoic under different stress fields, we can differentiate those showing a dominant transpressional deformation (Vilariça-Braganza faults system) from those showing a clear compressional character associated with thrusts (Camerós-Demanda Unit). Nevertheless, the individual structures formed in each case, especially when there is a thick sedimentary cover, do not allow to distinguish between these regimes. It is still under discussion the number of structures related to each process, particularly in the Iberian range.