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How is the western termination of the Alpine-Himalayan Orogen reliefs?

Fidel Martín-González (1) and Nemesio Heredia (2)

(1) Área de Geología. Universidad Rey Juan Carlos, ESCET, Mostoles (Madrid), Spain (fidel.martin@urjc.es), (2) Instituto Geológico y Minero de España (IGME), Oviedo, Spain

The Alpine-Himalayan Orogen has its westernmost expression onshore in the Iberian Peninsula: the Alpine Pyrenean orogen in the north (or Pyrenean-Cantabrian) and the Betic Chains in the south. It is one the best-known orogens in the world. However, in the western end the structures get into an old basement (Variscan Basement), which makes difficult the tectonic Cenozoic studies. Therefore, structures and timing of its tectonic evolution remain poorly defined.

How is the geological structure of the western termination? When did it happen? In this work the geometry, structures and tectonic evolution of the western termination have been studied. We present the results of structural mapping and detailed studies of Cenozoic-age rocks and structures, palaeontological data and AFT studies carried out at this termination.

The relief of the Alpine Orogeny in northern Iberian Peninsula trends east-west and is constant width of around 80 km. However, in the northwestern part, changes direction (southwards) and separates into a series of individual mountain ranges with peaks above 2,000 m. a. s. l. This work proposes a tectonic model for this termination. According to this, three main regions could be recognized: the Astur-Galaica region (AG) or the western part of the Cantabrian Mountains (CM), characterized by thrusts with a south vergence, which are the continuation of the Pyrenean structures, (2) The Galaico-Leonese Mountains (GLM), characterized by thrusts with a north vergence, and (3) The Rías Baixas-Terra Chá region (RBT) characterized by strike-slip faults with no relevant associated relief, but with recent seismic activity (Martín-González and Heredia, 2011). The main thrusts displacement decreases progressively towards the west, and they end in an N-S-oriented lateral structure. The western termination of the Alpine-Pyrenean Orogen end due to the superposition of two mountain ranges: Cantabrian Mountains and Galaico-Leoneses Mountains (CM and GLM). The CM was emplaced southwards and subsequently the GLM were emplacing northward. According to palaeontological data, sedimentation related with the Alpine tectonic activity commenced in the CM during the middle Eocene and migrated towards the west and south during the early Oligocene and probably until the beginning of late Miocene (Martín-González, et al, 2014). The tectonothermal histories obtained by modeling of the apatite fission-track data (AFT) shows that the beginning of the Cenozoic cooling episodes is in agreement with the infilling of the Tertiary basins (late Eocene or Oligocene) and calculated uplift for the Alpine Orogeny is around 2,400 m, in this sector. Thus, the CM were mainly uplifted and emplaced southwards in the Palaeogene, however the GLM, were uplifted and emplaced northwards during the Neogene (mainly during the Late Miocene), showing more rapid uplift rates.

References

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