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Intraplate mountain building in Iberia: Insights from scaled physical models.

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The Iberian microplate is located between the African and Eurasian plates. It comprises the Variscan Massif, inverted Mesozoic basins (Pyrenean and Iberian Ranges) and several Tertiary sedimentary basins (Ebro, Duero, Tajo, Guadiana and Guadalquivir basins). The Spanish Central System (SCS), located in central Iberia, is an elongated intraplate mountain range that separates the Duero and Tajo (Madrid) intraplate basins. The WSW–ENE-trending Sierra de Gredos and the NE–SW-trending Sierra de Guadarrama form the central part of the SCS. Highest topography in Gredos attains 2592 m, with a maximum relief of 2100 m. Elevation and relief for the Guadarrama domain are 2429 and 1400 m, respectively.

In central Iberia the far field effects of Alpine tectonics are expressed by the reactivation of pre-existing Variscan weakness zones. These zones play an important role in controlling the development of crustal-scale intraplate structures. Their kinematics and style of deformation is related to the regional stress regime reigning at that time. The main present day relief in central Spain trends orthogonal to the present day stress field (NW-SE), indicating a clear tectonic control. To investigate the creation of this topography and the role of pre-existing Variscan structures in Iberia with relation to resultant Alpine stress regimes, a series of scaled physical models have been developed. Results of our 3D sandbox modelling fits well with the low frequency (high wavelength) topography of central Iberia. This is indicating that one of the main factors controlling the evolution of this topography is the geometrical angle between the Gredos and Guadarrama domains as well as their orientation with respect the maximum compression direction (Shmax).