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Geometry of the Naval diapir (western end of the Sierras Marginales, Southern Pyrenees), based on gravimetric, surface and seismic data.

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The Naval diapir crops out in the western end of the Sierras Marginales (Southern Pyrenees). The Sierras Marginales constitutes the youngest unit belonging to the South Pyrenean Central Unit (SPCU), emplaced in piggyback sequence and detached over Triassic evaporites. The emplacement of thrust sheets was accompanied with the lateral and southward migration of the Triassic evaporites defining a salt province at the Sierras Marginales realm. The western end of the Sierras Marginales represents a zone of intersection of N-S and N120E trending structures, characterized by clockwise vertical-axis rotation of structures during the Eocene, salt tectonics and syntectonic sedimentation.

This work aims to characterize the geometry of the Naval diapir to understand salt migration kinematics and its relationships with the emplacement of associated thrust sheets. The Naval diapir is covered by syntectonic Oligocene-Miocene rocks that prevent its direct observation. The use of combined geophysical exploration methods as gravity, seismic reflection profiles and well log interpretation was therefore a necessary step to decipher the geometry of diapirs and salt kinematics in this area.

A detailed gravity survey with a 1.5km x 1.5km grid was done to calculate the Bouguer anomaly. Residual anomaly was calculated taking into account the regional gravimetric map of the Pyrenees that shows a northward-deepening regular surface. In parallel, detailed geological mapping and derived serial cross-section, interpretation of seismic lines and analysis of well logs were done. A 2.5D gravity model was derived from residual anomaly and geological cross-sections.

Residual anomaly shows and elongated N020E shape which turns to N160E southward. It reveals the continuity of the diapir in depth under the Oligocene-Miocene deposits, what agrees with seismic lines interpretation. The 2.5D model allows us to reconstruct the structure in depth characterized by reverse faults dipping steeply towards the diapir and abrupt changes in thickness of the Upper Triassic.

The deformation pattern of the cover over the diapir points to an active migration mechanism of emplacement whereas the external shape and the distribution of Triassic evaporites could be explained by a passive migration mechanism. A combined emplacement model is discussed based on the regional compresional tectonic regime and the rheological behaviour inherent to evaporitic facies. As the geometrical relations between syntectonic Oligocene-Miocene deposits and Keuper facies reveal, the onset of salt movement can be dated between Thanetian and Chattian. The diapiric activity ceased before the Chattian in the southeastern part of the diapir whereas it continued until Late Aquitanian in the northwest.