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Subsurface characterization of geological CO₂ storage sites from gravity, passive seismic and seismic data; a case study from the southern Ebro basin (Spain)

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The geological storage of CO₂ requires the search and characterization of a suitable porous formation and caprock to ensure a favorable and safe trap. One of the first steps of this search consists of performing a detailed definition of its geometry at depth. The structure of Lopín (southern Ebro basin, Spain) was identified as a potential structure valid for CO₂ storage in the frame of the ALGECO2 project (*Selection and characterization plan of favorable areas and structures for Geological CO₂ Storage in Spain, 2009-2014*) led by IGME. A preliminary characterization carried out during these years showed positive conditions for the storage of this gas. However, the poor quality of the available reflection seismic data precluded accurate enough conclusions to select this location as geological storage site. The biggest uncertainty was the closure of the structure in its SE margin and further exploration was ruled out at that time. Within the PilotStrategy project (2021-2026), funded by UE on the frame of the H2020, the structure of Lopín is proposed for further studies and a gravimetric and passive seismic surveys have been carried out for in order to resolve this question. The Lopín structure constitutes an antiform affecting Paleozoic and Mesozoic sequences overlain by subhorizontal Neogene deposits located in the southern Ebro basin. It is defined by NW-SE and NNW-SSE oriented faults several tenths of kilometres long which are subparallel to the orientation of the dominant structures of the Iberian Chain, located to the South of the study area. At the Lopín structure, the target reservoir and seal formations consist of the Lower and Upper Triassic rocks, respectively.

The aim of the new geophysical surveys is to improve the geometric characterization at depth of the Lopín structure. The gravimetric surveys have coverage of two stations for km² in the structure area. In addition, 7 profiles have been built up in the uncertainty area with a coverage of a station every 250 m. The models have been constrained by the newly acquired passive seismic data and the reinterpretation of some of the vintage seismic reflection profiles. The preliminary results of the joint modelling improve the geometrical characterization of the Lopín structure at depth in order to define its suitability as geological CO₂ reservoir site.