The value of full tensor magnetotellurics, gravity and electrical resistivity tomography for Lithium prospecting. A case study in Argentina.

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SUMMARY

The energy transition drives the energy sector to renewable energy and electrification, being the critical minerals key players in the industrial development map. They comprise rare earth elements and 35 other elements including lithium that holds the 60% of its world reserves in the so-called lithium triangle located in Argentina-Bolivia-Chile.
The low electrical resistivity, variations in salt concentrations, low acoustic impedances, and dynamics of the hydrogeological system, makes brine monitoring a complex geophysical exploratory problem. So, the objective is to find a suitable combination of geophysical techniques that fit the lithium exploration objectives, which are the characterization of the salt flat in depth, fluid detection, basement delineation, definition of the main structures and main faults and detection of semi-freshwater aquifers that contribute to its recharge and that are key to the water balance of the endorheic basin, which has the resource in solution. For this purpose, the evaluation of several prospecting methods in different salt flats was executed, concluding that full tensor magnetotellurics, electrical resistivity tomography and gravity comprises a toolkit that fit the objectives set. The results are validated with production and exploration wells and a methodology through pseudo wells will be discussed. Finally, similarities between lithium and hydrocarbon industry as well the exploration frontiers will be discussed.

Keywords: Lithium, multiphysis, magnetotellurics, electrical resistivity tomography, gravity.