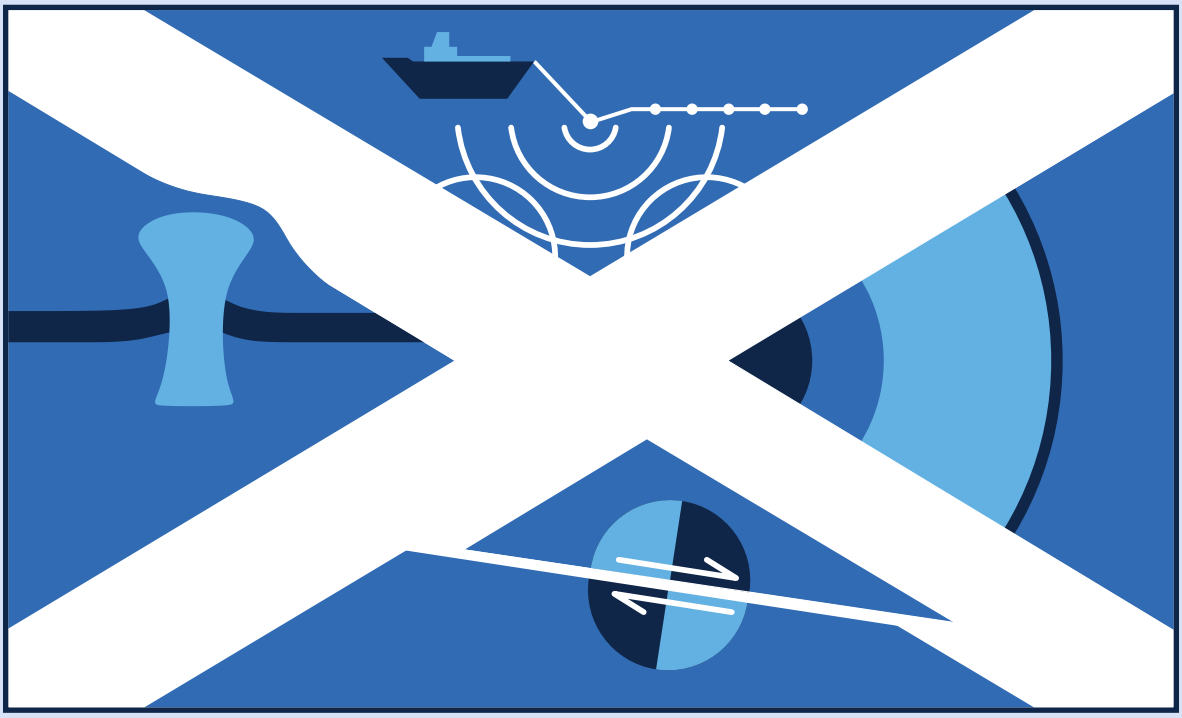
SEISMIX 2016

seismology at the crossroads



ABSTRACT VOLUME

17th International Seismix Symposium
Macdonald Aviemore Resort
Aviemore, Scotland
15-20 May

Geophysical data integration for a joint interpretation in a shallow gypsiferous context.

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As every geophysical technique suffers from its own limitation, a proper survey has to combine different geophysical methods. The integration of different geophysical data in order to derive a joint geological interpretation is complicated beyond qualitative (subjective) correlations. We propose a new numerical method (less subjective) to integrate three separated datasets: seismics, electrics and well logging. The study area is the shallow subsurface of a planned singular facility in Villar de Cañas (Cuenca, Central Spain). Lithology down to 100 m deep consists of a transition from shale to massive gypsum. In 2013, we acquired a3D Traveltime Tomography to characterize this transition. After data processing, the velocity model showed, in general, a good correlation with geological profiles, being able to identify the three main layers: shales, transition gypsum and massive gypsum. The correlation for the massive gypsum limit (high velocity contrast) is very good, but is not that good for the transition shale-gypsum (low velocity contrast). As electrical resistivity is a good tool to characterize shale-gypsum transitions, we decided to improve our resolution capacity by integrating resistivity data from a collection of ERT panels. By means interpolation IDW, we built a new 3D bi-parametric grid that nests velocity and resistivity values in every node. In order to derive from de grid a geological interpretation benefiting from both seismic and electrical resolution capacities, we applied a supervised statistical classification (Linear Discriminant Analysis, LDA). The LDA algorithm was fed with velocity, resistivity and lithology values from wells and it classified every node lithologically according to its velocity-resistivity pair, resulting in a new 3D lithological model. This new model joins seismic and electrics resolution capacities, showing for the two limits under discussion a better geological fitting than those techniques separately. (Research supports: CGL2014-56548-P, 2009-SGR-1595 , CGL2013-47412-C2-1-P)