

Integrated Seismic, Gravity, and Magnetic Approach for Mapping Subsalt Structures: An Example from the Red Sea, Saudi Arabia

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ABSTRACT

The attenuation of seismic energy by salt accumulations is a well-recognized challenge in subsalt exploration. In such circumstances, it is important to incorporate as much supporting data as possible to reduce interpretation uncertainties. In this paper, we present an integrated approach using gravity, magnetic and seismic data for mapping subsalt structures, of the Red Sea continental margin of the Kingdom of Saudi Arabia. The integrated approach utilized a number of derivatives, transforms and filters of the gravity and magnetic data, to map subsurface structures. Several depth-to-basement methods were applied to the magnetic data, to first map the regional depth-to-basement. The magnetic depth-to-basement and top salt delineation — obtained from seismic interpretation — were then used to constrain an iterative inversion of gravity data to map the base salt. Our result enabled a better understanding of the sub-salt geological model and pre-salt sediment thickness. The integrated solution with results of the field example, demonstrated the power of combining potential fields and seismic data in defining the basement and sub-salt basin morphology, for a challenging geological area.