

Applications of Magnetotellurics in Oil & Gas Exploration

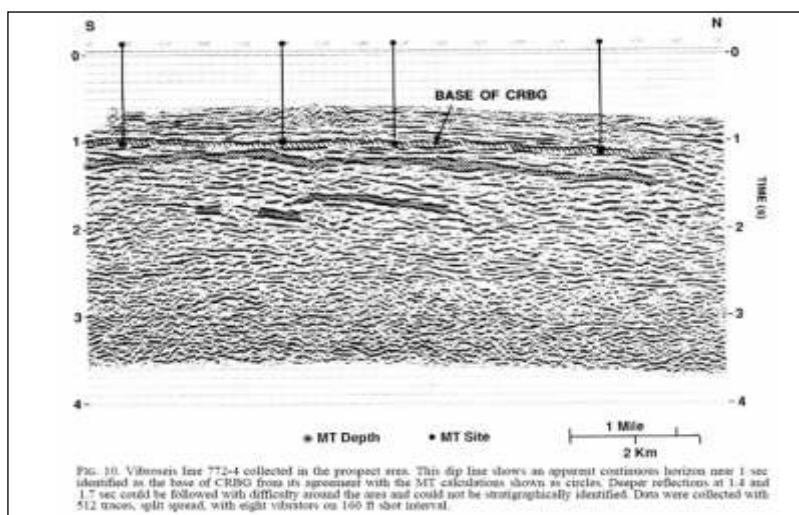
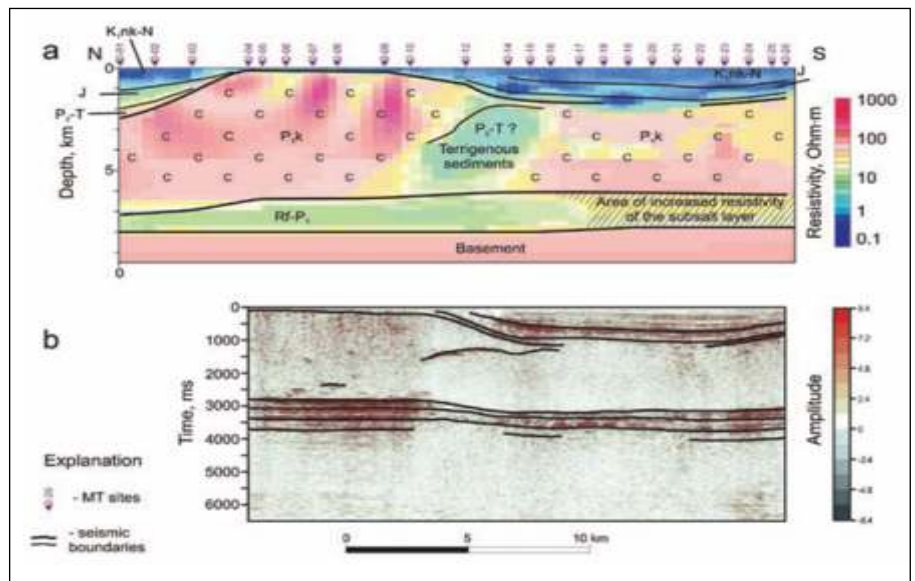
- Reconnaissance of prospective areas to delineate basin limits and depths, useful for planning of subsequent seismic surveys.
- Map salt domes, major structural deformations, high angle structures and lithologic variations.
- Provide 2D and 3D resistivity models as an aid to sei or unavailable due to: volcanic cover,smic survey interpretation.
- Map basement variations beyond the reach of seismic surveys.
- In some circumstances, provide direct detection of hydrocarbons.
- Map electrical resistivity variations of the major stratigraphic units in the basin.
- Provide lithologic and structural information in areas where seismic data is degraded population centres, nature preserves, extensive river tributary systems, rugged topography or difficult access.

A) Augmenting seismic results with Magnetotellurics

As magnetotellurics represent a unique physical property measurement, they are ideal for use in combination with seismic giving valuable new information regarding the electromagnetic structure of the ground and its relationship to various sediments and basement.

MT cross section (a) with corresponding seismic section (b) showing high coincidence of responses and additional detail provided by MT.

(Source: E. D. Aleksanova et al. Magnetotelluric studies in salt-dome tectonic settings in the Pre-Caspian depression.)



B) Augmenting seismic results through volcanic with Magnetotellurics

Volcanics, like salt domes, are an area in which seismic data quality can be degraded due to the presence of high velocity, crystalline rocks. Magnetotellurics offers a solution.

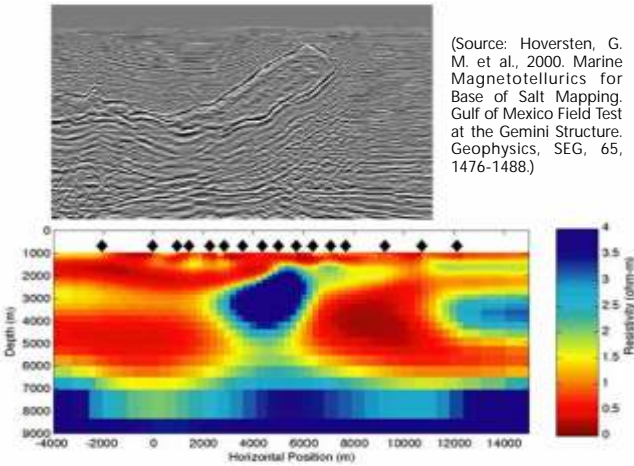


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C) Augmenting seismic results with Magnetotellurics

Magnetotellurics is ideal for the identification of structures and geology as represented in the following image.

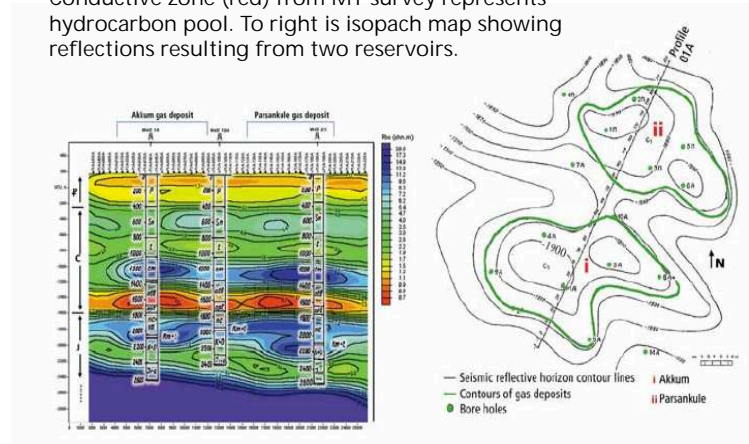
MT results showing correspondence of seismic and MT results over the Gemini Structure (Salt Dome). Increased resolution is possible with more densely spaced receivers.



D) Direct hydrocarbon detection with Magnetotellurics

Magnetotelluric data have been used as a highly effective mapping tool for direct detection of hydrocarbons.

Conductive zone (red) from MT survey represents hydrocarbon pool. To right is isopach map showing reflections resulting from two reservoirs.

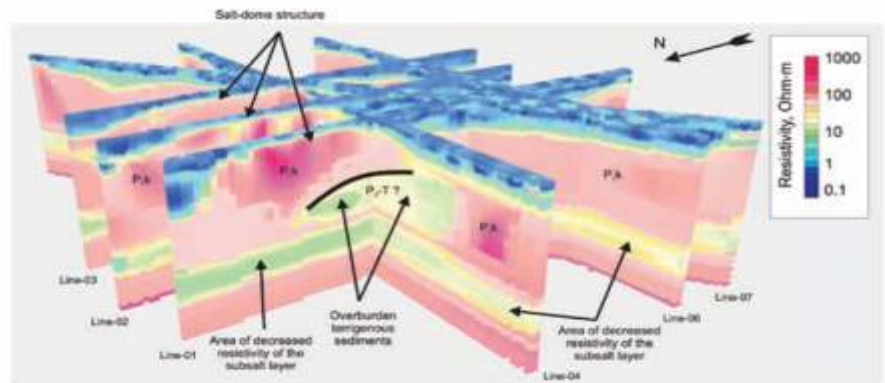


E) Mapping of salt domes

Salt domes are traditionally difficult for seismic reflection surveys to penetrate. When salt domes are present, magnetotellurics represent an attractive alternative for oil and gas exploration.

3-Dimensional MT results showing salt-dome structures, near surface units and units to depth.

(Source: E. D. Aleksanova et al. Magnetotelluric studies in salt-dome tectonic settings in the Pre-Caspian depression.)



About Quantec

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