*All following abstracts are sorted alphabetically according to the first author named in the program.*

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# Methodical seismic inversion techniques for quantitative interpretation in the Libyan Murzug basin

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The Murzug basin, situated in the northern region of the Sahara Desert, it is a significant petroleum province in South Libya. The basin is bordered to the southwest by the Tibesti uplifts, by the Tihemboka High to the southwest, to the north by the Atshan Arch, and to the west by the Akakus mounted area. The Murzur Basin covers an area of over 350,000 square kilometers and accounts for roughly 7.5% of Libya's reserves and 30% of its total hydrocarbon production.
The Murzug Basin is an intracraton and originated from the collision n of the Laurasia and Gondwana protocontinents, and the paleo-geographical evolution of Pangea supercontinent throughout the Paleozoic era in North Africa. Orogens and fragmentation of Gondwana and Pangea continents, as well as evolution of the Para-Thetis ocean and the Mediterranean Sea are controlled of the Murzug basin development in Mesozoic to Cainozoic epoch.
The Murzug basin reaches over 11,000 ft in depth and main oil discovery refer to Cambro-Ordovician marine sediments.
The primary objective of the study is to define the properties and prospects of the Murzug Basin using a complex of seismic and petrophysical information. The various seismic inversion methods were employed for the quantitative interpretation and properties prediction.
The interpreted horizons of targeted sequences and resulting fault's system of NNW-SSE and W-E orientation were applied to determine the desirable background model. The diverse array of inverted attributes utilized in seismic inversion, coupled with the distinctive characteristics of the geological formations under investigation, necessitated the implementation of distinct inversion methodologies.
In order to characterize lithotypes and reservoir properties in the Silurian-Ordovician Paleozoic complex, a number of elastic and rock-properties attributes were selected for inversion transformation. The principal set of inverted parameters applied for the subsequent properties of discrimination is included the following parameters: P-wave impedance, S-wave impedance, density, porosity, Poisson's ratio, Lame constants (MuRo and LambdaRo). As already noted, the particular qualities needed for each technique to seismic inversion rely on the features of the underlying geology.
P-acoustic impedance is a fundamental parameter of inversion results. In order to ascertain the characteristics of this attribute a synthetic 1D modelling was accomplished based on the 5 wells spanning the Late Cambrian (Dembaba formation) to the Hawaz unconformity (Middle Ordovician). Low and Middle Manuniyat sublayers were designated as the base lap in reference to the Hawaz horizon.
The deterministic seismic inversion algorithm was deemed an appropriate means of defining density. The density displays specific behavior in the Murzug basin, particularly in the interval of transition from the Tanezzuft shale (low impedance) to the Mamuniyat sandstones (high impedance value), where the density assumes an opposite character. In this interval, the Mamuniyat sandstones exhibit lower density and high impedance, in contrast to the low impedance values and high density of the Tanezzuft shale at the top. Associated with this phenomenon is the high porosity of the Mamuniyat sands and their very solid matrix properties.
To obtain porosity an additional external elastic cube was generated based on AVO determined attributes. EEI inversion was applied for the porosity cube definition.
Neural network detection was applied to extract S-velocity from petrophysical data. To receive S-Impedance a pre-stack inversion was run. Determined S- and P-Impedance allowed to find Poisson's ration and Lame parameters. Poisson's ratio and the Lame parameters were discovered in order to the obtained inverted S- and P-Impedance.

The cross-plotting analysis of P-Impedance, Poisson's ratio and LambdaRo/MuRo attributes enabled the segregation of sand facies within the Mamuniyat formation and to make predictions for further exploration activities. The received correlation of final inverted results with petrophysical data is ranging from 0.78 up to 0.91.

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