PRESTACK SEISMIC INVERSION BY QUANTUM ANNEALING: APPLICATION TO CANA FIELD

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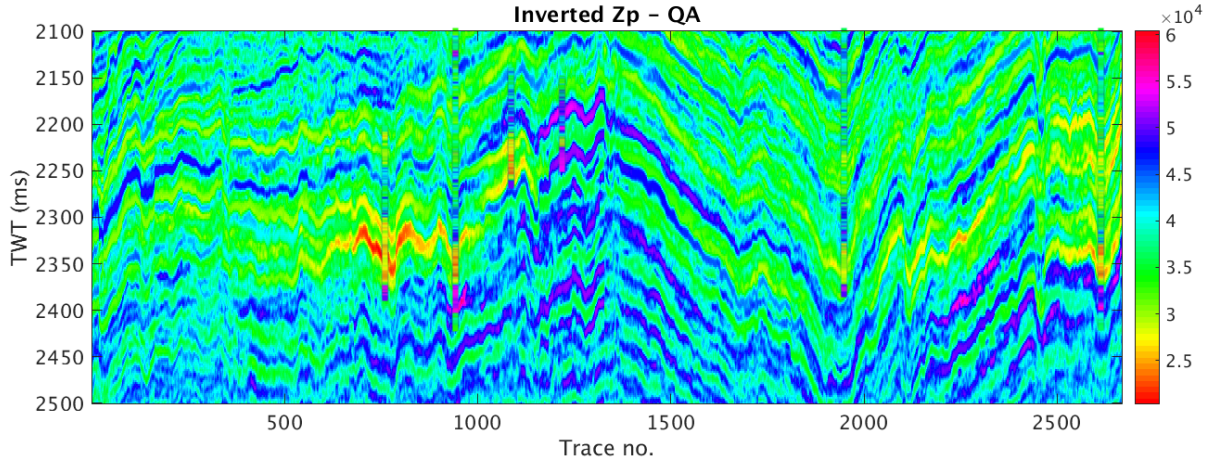
ABSTRACT

The aim of seismic inversion is to estimate subsurface elastic properties. Deterministic seismic inversion based on local optimization suffers from becoming trapped in a local minimum. Also, the inversion result is generally band limited. Various stochastic inversion algorithms have been introduced to address these issues. Many of them, however, are computationally very expensive or can be trapped in a local minimum if the inversion parameters are not carefully chosen. Quantum Annealing (QA) is a global optimization algorithm that is proven to be faster than the conventional Simulated Annealing (SA) method and is less prone to being trapped in a local minimum. Here, we develop a stochastic inversion algorithm using QA and apply it to a 2D seismic dataset from the Cana field, OK with the primary objective of resolving the Woodford formation. The results are compared with those obtained by a deterministic inversion. Our results clearly demonstrate superior performance of our stochastic QA inversion over standard SA and deterministic inversion of field data. The results show clear delineation of the Woodford formation in the inverted images.



Inverted acoustic impedance using QA inversion. The values of the acoustic impedance computed from the well logs are superimposed. The agreement between the inverted values and well logs are acceptable. By comparing the results of QA inversion to those obtained from deterministic inversion, we observe more detailed image of the subsurface in QA inversion results. In addition, we notice more continuity of the subsurface layers.