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Identification of the Lacustrine Delta Architecture and Lithology Prediction through the Application of Simultaneous Angle Dependant Inversion (SADI) on the D-129 Formation, Manantiales Behr, San Jorge Basin, Argentina

Since the D-129 Fm. is the main source rock of the San Jorge Basin, most of the studies have been focused on its organic rich intervals. However, minor attention has been paid to the reservoir potential of the sandstones at the lowermost and top sections. The D-129 Fm represents the deposition in a large lacustrine system. The facies assemblage is composed of sandstones and reworked tuffs sedimented in deltas and fluvial channels, oolitic limestones formed in litoral shoals, and offshore shales accumulated under a moderate anoxic regimen. Volumes of P-impedance, S-Impedance and Density were calculated through a simultaneous inversion process and several DHI, like Vp/Vs, Lambda-Rho, Mu-Rho, and Poisson´s Ratio were derived from them. A correlation between seismic, lithology, and strata-geometries at bed-set scale (gross thickness 15 m) was interpreted from the cubes generated by SADI and the functional relationships of the same elastic properties, through well log crossplots. The layer model was visualized in impedance sections where the sandstones of D-129 Fm showed distinctive foreset delta geometries pinching out towards basinal shales. Coarsening and thickening up-wards sandy bed sets display low impedance, contrasting with the non-reservoir facies composed of more compact shales with higher values of P-impedance, S-impedance and Mu-Rho. The SADI process allowed the seismic prediction of small delta reservoirs in the top of the D-129 Fm which were previously undetected by the conventional seismic inversion. This approach combined with a migration pathway model led to the discovery and the later development of the La Carolina oil field.