3D Inversion of Crosswell Electromagnetic Data Collected between Extremely Spaced Horizontal Wells

Ping Zhang[1], Alberto Marsala[2], Stig Lyngra [2], Wael Abdallah[1], and Mike Wilt[3]

[1]Schlumberger
[2]Saudi Aramco
[3]Groundmetrics Inc.

Abstract

A crosswell electromagnetics (called DeepLook EM) survey was applied to map oil and water saturation in a naturally fractured reservoir in Saudi Arabia between a 1-km-long horizontal water injection well and a 1-km-long horizontal producer 1.3 km away. Although high-quality data provide a solid foundation for interpretation, 3D inversions of DeepLook EM data collected from horizontal wells are very challenging. Many factors can affect the inversion results, especially the starting model and the inversion constraints. This paper reports the process to select and refine the starting models and choose constraints based on existing geological and geophysical information. We also demonstrate the impact of starting models and constraints on the final inverted conductivity structure.