# Bay Area Geophysical Society Seminar Series

# EM Methods in GeoSteering and Reservoir Mapping


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## SLB


### March 19, 2026 5:30 PM

### 265 McCone Hall

### UC Berkeley Campus


Abstract: Logging While Drilling (LWD) tools can be used to measure formation resistivity from Depths of Investigation (DOI) of inches out to dozens of meters. Over the past twenty years, LWD EM tools have advanced from a relatively short transmitter-to-receiver spacing with a single tilted antenna, to the current technology architecture which has multiple collars each with several tilted antennas that are non-collocated. Using multi-depth, multi-frequency electromagnetic measurements, the spatial distribution of electrical resistivity and formation dip, can be inverted around the well and in turn analyzed to provide distance to resistivity boundaries and petrophysical information, in real-time. In this presentation the basic architecture of LWD tools is described and in turn examples are presented of applications in Geosteering and Reservoir Mapping (G&RM) for horizontal look-around and for vertical look-ahead problems.

In geosteering applications, while determining the resistivity distribution is important, evaluating its accuracy is equally relevant. Indeed, quantifying and analyzing the uncertainty of the inversion results undoubtedly helps to make confident geosteering decisions based on the interpretation of LWD data. The second part of the presentation focuses on recent work analyzing the sensitivity of LWD measurements to anisotropy and the methods used to quantify uncertainty of inverted 1D anisotropic models. Lastly, recent developments around LWD measurements applied to problems of ranging of metallic casing will also be discussed.

**Nestor Cuevas** is currently an SLB Scientific Advisor for the Geosteering and Reservoir Mapping (GRM) portfolio of services, based in the Houston Formation Evaluation technology center in Sugar Land, Texas, USA. He joined SLB in 1995, at the Electromagnetic Instruments wireline technology center, in Berkeley CA. Dr. Cuevas completed his BSc in Physics from Universidad de Santiago, Chile and subsequently received his MSc and PhD in Geophysics, at the University of Berkeley in CA, where he developed theories to describe electromagnetic (EM) sources associated to Electrokinetic coupling in Hydraulic Fracture Propagation. Since then, he has participated in numerous R&D projects for the development of instrumentation, and data processing and interpretation methods for various EM technologies. Dr. Cuevas publishes his work in International Geophysics Journals and conferences (EAGE, SEG), and he actively participates as a reviewer for Geophysics, Geophysical Prospecting and Geophysics Journal International.

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