

Kris MacLennan

**Evaluating Well Casing Integrity with Non-
Invasive Electromagnetic Methods**

August 26th 2020 5 pm ..Zoom talk

Abstract: Among the most serious issues facing the oil and gas and geothermal industries is the condition of older wells. The metallic casing in wells is subject to degradation over time, and wells with damaged casings can leak fluids into their surroundings causing impaired production and significant environmental risks. Damage to well casings may occur for multiple reasons, including corrosive wellbore fluids, mechanical failures, or external forces. I will discuss a novel, rapid, noninvasive tool for evaluating well integrity based on the electrical continuity of the casing pipe itself. Electrical current flowing down a well casing is discontinuous where there is a break or a corroded interval, and this is reflected in electrical fields measured at the surface near the wellhead. By comparing forward modeling results using other local intact casings to the observed fields, we can estimate if the casing has

been damaged and to what extent. The method is demonstrated through both synthetic modeling and a field case study analyzing the response from a series of wells of mixed condition (some intact and some damaged) where we were able to positively identify and discriminate between the two types of wells.



Bio: A native to the SF Bay Area, Kris did his undergraduate work at UC Berkeley, followed by completing a PhD in Geophysics at the Colorado School of Mines in 2013, where his work focused on geophysical inversion, hydrology, and improving SNR of EM data. After a stint assisting with the Summer of Applied Geophysical Experience (SAGE), Kris began working for

GroundMetrics, Inc. as a geophysicist in 2014. During his five and a half years there, he designed and carried out field surveys and performed research on CO₂ sequestration, casing integrity, and reservoir monitoring using EM and deep learning. He has also served as PI on multiple DOE projects and has written papers and given award-winning conference presentations based on his work. Kris is currently volunteering with SEG and independently consulting on proposal writing and project management.

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