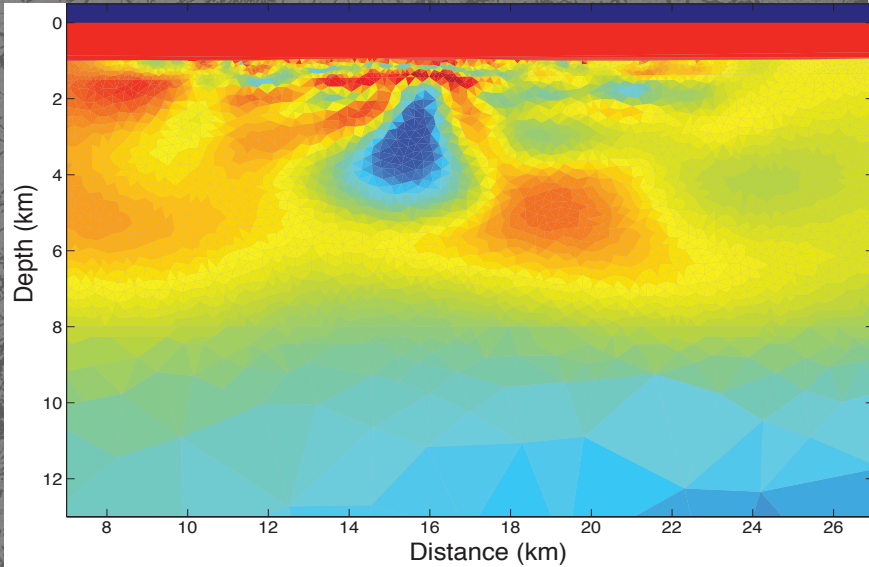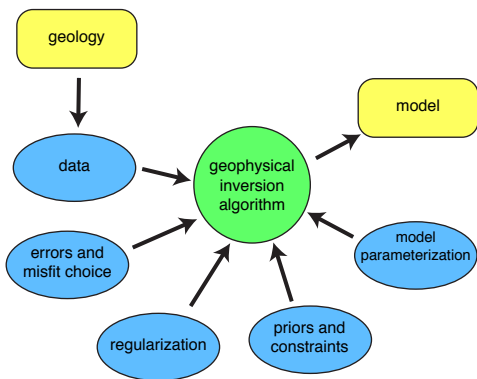# 2016 SEG/AAPG
DISTINGUISHED LECTURER

Geophysical Inversion: Which Model Do You Want?

Presented by Steven Constable, Ph.D
Scripps Institution of Oceanography

OVERVIEW

With a broad suite of geophysical inversion tools now available, it is seductively easy to submit your data, turn the crank, and obtain a model. But is the model meaningful? Are the data properly fit? How much does the model depend on the data, and how much on parameters in the inversion code, such as model discretization and regularization penalty? The inversion process depends as much, if not more, on the error structure of the data and inversion parameters as the data themselves. We all know that geophysical inversion is nonunique, but many people are surprised just how different models can be that fit the data equally well. And what exactly constitutes an adequate fit to the data? Without a rigorous analysis of error structure, choice of misfit can be highly subjective. Some rely on "L-curves", but it can be shown that they too are subjective, and depend very much on the choice of plotting parameters. Seeking to drive misfit down as low as possible can also be perilous – the least squares best fitting models for some problems are known to be pathological, and it is likely that this is true in general. In this lecture I shall attempt to provide an understanding of the practical issues associated with geophysical inversion, and provide a roadmap for avoiding common pitfalls.

WHY ATTEND?

-Keep current with the latest developments in geophysics
-Network with your colleagues
-Lectures are 45 minutes to an hour long

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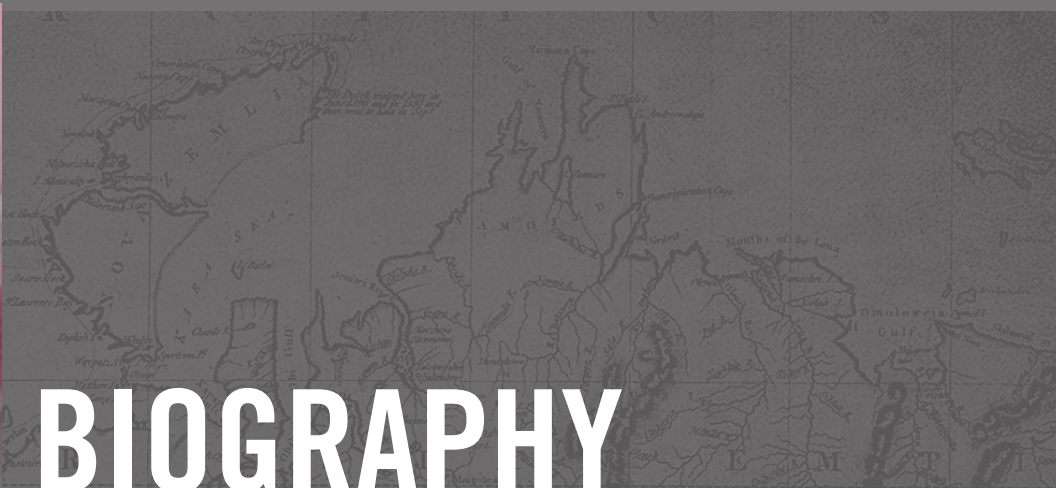
BIOGRAPHY

Steven Constable studied geology at the University of Western Australia, graduating with first class honors in 1979. In 1983 he received a Ph.D. in geophysics from the Australian National University for a thesis titled "Deep Resistivity Studies of the Australian Crust" and later that year took a postdoc position at the Scripps Institution of Oceanography, University of California San Diego, where he is currently Professor of Geophysics. Steven is interested in all aspects of electrical conductivity, and has made contributions to inverse theory, electrical properties of rocks, mantle conductivity, magnetic satellite induction studies, global lightning, and instrumentation. However, his main focus is marine electromagnetism; he played a significant role in the commercialization of marine EM for hydrocarbon exploration, work that was recognized by the G.W. Hohmann Award in 2003, the 2007 SEG Distinguished Achievement Award, and now the SEG 2016 Reginald Fessenden Award. He also received the R&D 100 Award in 2010, the AGU Bullard Lecture in 2015, followed in 2016 by being named Fellow of the AGU. More recent efforts have involved the development of equipment to map gas hydrate and permafrost. Steven has served as an associate editor for the journal Geophysics, as a section secretary and corresponding editor for the American Geophysical Union, and on the MARELEC steering committee.

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