JOINT 3D INTERPRETATION OF ELECTROMAGNETIC AND SEISMIC DATA: CHALLENGES AND THE WAY FORWARD

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Electromagnetic (EM) methods provide vital constraints on fundamental flow and storage processes in the earth, at different spatial scales. Recent advances in multidimensional electromagnetic modelling and inversion have brought EM methods close to their theoretical resolving power, but there are still limitations in the way that data from multi-component and multi-scale field experiments in heterogeneous geological media are currently interpreted, especially because simulating the responses of 'field-realistic' earth structures is computationally demanding and the presence of measurement uncertainties limits model resolution to a large extent. Also, the fact that EM methods require large amounts of data to accurately image geological heterogeneity presents further computational challenges.

In this seminar, I will present my contributions in recently developed 2.5D and 3D EM inversion techniques for subsurface characterisation, methods developed for quantifying the impact of uncertainty in the interpretation of electromagnetic data (extreme bounds analysis), a recently developed method for simultaneous interpretation of electromagnetic and seismic travel-time data for improved characterisation of geological heterogeneity, and innovative multi-scale joint electromagnetic and seismic practical experiments whose realisations are presently hindered by lack of appropriate computational platform. Strategies to overcome some of the computational difficulties will be discussed and I will draw on examples from near-surface to mantle depths.

PRESENTER PROFILE

MAX MEJU joined Petronas Research in September 2008 as a principal researcher in EM and team leader. Before then, he was a Reader at Lancaster University (2002-2008) where his team developed a novel cross-gradient joint EM and seismic multidimensional inversion method. He was a lecturer in Geophysics at Leicester University (1988-2002) where he developed EM inversion and uncertainty analysis methods. He studied Geophysics at Imperial College London and Edinburgh University, published over 40 research papers in international journals and 6 textbooks, won national and international (including the G.W. Hohmann) awards for research excellence in EM. Current emphasis is on marine EM inversion and quantitative integration of multi-physics data to reduce interpretational ambiguity.

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