2017 SEG DISC is Coming to Taiwan!

Course: Electromagnetic Fundamentals and Applications

2017 Distinguished Instructor:

Doug Oldenburg

Doug is a UBC professor of Geophysics, director of the Geophysical Inversion Facility (GIF) and world leader in geophysical inversions.

This course is intended for

- Practitioners in academia or industry who want to use EM data to answer geoscience problems
- Industry geoscientists (geophysicists and geologists) who are not familiar with EM and its applications
- Graduate students and academia even if they have never used EM
- Researchers who want to carry out forward modelling and inversion of EM data.

Instructor

Doug is a professor of Geophysics, director of the Geophysical Inversion Facility (GIF) and world leader in geophysical inversions. He is dedicated to making geophysics more useful for solving problems of relevance to society. Doug's research career has focused upon the development of inversion methodologies and their application to solving applied problems in a variety of fields. Motivated to make geophysics more accessible and engaging, he has and continues to lead efforts for distributing software codes and learning resource material for students and practising geoscientists. In 2017, Doug will be on tour presenting the SEG Distinguished Instructor Short Course with the intention of promoting fundamental understanding about principles of electromagnetics and how the different surveys make use of these principles to tackle a broad spectrum of problems using EM geophysics.

Goals

1. Inspire geoscientists to explore if EM geophysics can be relevant to their problem
2. Build a foundation for choosing an appropriate survey based upon knowledge of physical principles
3. From physical principles, set realistic expectations for what information you might be able to extract from a survey

Vision

Our goals for the 2017 DISC are to make a lasting, positive impact. Our objectives include connecting participants with resources and technical material as well as fostering an EM community. In particular, our goals are to:

1. Inspire geoscientists to explore the use of EM geophysics to help solve their problems
2. Expand the visibility of SEG and applied geophysics to new audiences around the world
3. Catalyze the building of a community of researchers and practitioners who communicate and work together on electromagnetic problems

SCAN THIS TO WATCH DOUG TALK ABOUT THIS COURSE.

SEG SOCIETY OF EXPLORATION GEOPHYSICISTS

seg.org/DISC

Content

Case histories are the underlying framework used to bind the material together. Each case history is presented in a seven-step process that begins with the description of the geologic or geophysical problem to be solved, and ends with the impact of the EM geophysical survey to help solve the problem. At intermediate points, we investigate the details of the particular EM survey, some fundamentals of electromagnetic induction, and processing/inverting the data. The ability to move seamlessly between these different levels of information, so that relevant questions or concepts can be addressed, is facilitated by the open-source resource em.geosci.xyz.

Although we work continually with Maxwell's electromagnetic equations, the presentations are mathematically "light" and the learning aspect is facilitated by the use of Jupyter notebooks. These provide an interactive computing environment in which you can ask questions and explore concepts. As an example, you are invited to use the Electric Dipole Notebook that allows you to explore the EM fields for an electric dipole in a cross-well survey using frequencies that range from DC to those used in a radar survey.

The case histories pertain to problems in resource exploration, environmental, and geotechnical areas and are contributed by experts worldwide. We successively look at surveys that make use of steady state fields (DC resistivity, IP, MMR), and then move on to FDEM (frequency domain) and then to TDEM (time domain). The energy sources for these surveys are both man made and natural. The latter allows us to explore MT and ZTEM surveys. The various surveys can be carried out in the air, on the earth's surface or underground and the case history determines which survey is selected. The choice of case histories and surveys to focus on depends upon the location at which the DISC is presented and the problems that are of general interest to that location. This is why we are requesting locally generated case histories.

It is not possible to cover all of EM geophysics in a single day but attendees will obtain new insight about EM fundamentals and applications. The DISC, and the associated open source resources, can then act as a catalyst to develop a community that can share information, interact on EM problems of mutual interest, and elevate the use of EM geophysics to solve applied problems.
For more, see the Interview with Doug.

Why Electromagnetics can be diagnostic for ...

Are you _________?

Exploring	Monitoring	Characterizing
Mineral deposits	**sea water intrusion**	**slope stability**
Oil and gas reservoirs	**enhance oil recovery**	**unexploded ordnance**
Groundwater aquifers	**hydraulic fracturing**	**environmental remediation**
Geothermal reservoirs	**carbon sequestration**	**nuclear waste storage**

Fundamentals: Maxwell's equations connect EM fields and fluxes with physical properties: electrical conductivity, magnetic permeability and dielectric permittivity. Understanding the relationship between the transmitter, physical properties and data is key to success. Learning is promoted with interactive application software. **Applications:** Exploration (minerals, hydrocarbons, water, geothermal energy), environmental (salt water intrusion, contaminant spills, UXO) and geotechnical (slope stability, near-surface geology) problems are addressed through case histories, each of which is presented in a Seven-Step process.