

# Exploration '17

## Sixth Decennial International Conference on Mineral Exploration

Toronto, Canada \* October 21 to 25, 2017

### Workshop on Uncertainty in 3D modelling and Inversion

3D Geoscience Team, Centre for Exploration Targeting, UWA

Saturday October 21<sup>st</sup>, 2017

#### Presenters from the Centre for Exploration Targeting

Prof Mark Jessell, Dr Mark Lindsay, Dr Li Nan, Dr Vitaliy Ogarko, Evren Paykuz-Charrier, Jérémie Giraud

This workshop will introduce industry, government and research end-users to the latest developments in 3D geological modelling and inversion, with particular reference to new workflows that enable us to characterise and analyse geological uncertainty in 3D. The workshop will introduce the basics of 3D geological modelling and uncertainty analysis using implicit modelling codes. Workshop participants will have the opportunity to use first-hand these techniques applied to the 3D geology of a complexly deformed terrain. The transfer of geological uncertainty into geophysical inversion codes will be presented as an example of using knowledge on uncertainty to downstream applications.

We will provide an overview of the key drivers and methods that have been used to characterise regional 3D geology, with particular emphasis on the strengths and weaknesses of currently available systems. This will include an introduction to new workflows for 3D modelling that allow estimation of geological uncertainty. Participants will have the opportunity to discuss how these methods can lead to downstream application for drilling optimization, resource estimation, process simulation and prospectivity analysis.

Participants will gain hands-on experience in using a three-stage approach for developing their understanding of uncertainty in 3D geological model space: 1) Manual tuning of key geological parameters to provide alternate hypotheses using an implicit modelling code (we will use the GeoModeller system) 2) Systematic evaluation of uncertainty using parameter sweeps of multiple inputs 3) Monte Carlo analysis of uncertainty for complex geological models.

The workshop will present an overview of the fundamentals of a new workflow integrating geology, geophysics and petrophysics while quantifying the related uncertainty. We discuss how these geoscience disciplines are integrated in a statistical framework to improve imaging through inversion of geophysical data. This approach allows results and related uncertainty to be evaluated in a statistical way. This will include hands-on experience in using prior knowledge of petrophysical and geological uncertainty as constraints for joint inversion of geophysical datasets.

Each session will close with a group discussion that covers current capabilities and future trends in combining geological and geophysical uncertainty, including improved data to geometry engines, new visualisation and analysis tools for uncertainty estimation, and extension of these techniques to other downstream applications.

**Integrating the Geosciences: The Challenge of Discovery**

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8:30-9:00	<i>Registration</i>	
9:00-9:15	Introduction	Mark Lindsay
9:15-9:45	History of 3D modelling and inversion	Mark Jessell
9:45-10:30	Introduction to geological uncertainty	Evren Pakyuz-Charrier
10:30-11:00	<i>coffee/tea</i>	
11:00-12:30	Hands-on exercise: manual tuning, parameter sweeps and data uncertainties in 3D	Nan Li & Evren Pakyuz-Charrier
12:30-13:00	Group discussion	All
13:00-14:00	<i>lunch</i>	
14:00-14:45	Introduction to petrophysical uncertainty	Jeremie Giraud
14:45-16:00	Hands-on exercise: geologically and petrophysically constrained inversion	Vitaliy Ogarko & Jeremie Giraud
16:00-16:45	<i>coffee/tea</i>	
16:45-17:15	Group discussion	All
17:15-17:30	Wrap-up	Mark J & Mark L
17:30	<i>close</i>	

#### Registration

<b>Early Bird Price</b>	<b>Canadian \$450</b>
<b>Regular and On Site Price (On Site Registration if space permitting)</b>	<b>Canadian \$500</b>
<b>Student Rate</b>	<b>Canadian \$270</b>

The Date of the Early Bird Price cut-off date is yet to be determined. It will likely be around the date of July 31, 2017.

Workshop attendees do NOT have to be registered for the Conference itself to register for the workshops.

Participants will be provided with demonstration licenses for all software used for installation **on their own Windows 64 bit machines** prior to the workshop. **No computers will be provided.**