BCGS

BC Geophysical Society

Developed by Dr. Yaoguo Li and offered in collaboration with the BCGS

Interpretation of gravity and magnetic data: from geophysics to geology

Dr. Yaoguo Li
Center for Gravity, Electrical, and Magnetic Studies
Department of Geophysics, Colorado School of Mines.

A 1-day short course presenting the state of art and practice in 3D inversion-based quantitative interpretation of gravity and magnetic data.

Friday, January 25, 2019

8 am to 5 pm PST
SFU Harbour Centre | 515 West Hastings St, Vancouver, BC

REGISTRATION NOW AVAILABLE
www.bcgsonline.org

Industry: $180 CAD | Student: $50 CAD

Note: To keep the course costs low, lunch is not included in the registration fee.

COURSE OUTLINE

Gravity and magnetic data are among the most widely available geophysical data in mineral exploration and arguably have the most extensive areal coverage among all geophysical data with large depths of investigation. 3D inversion techniques have emerged as a major tool kit in the quantitative interpretation of these data over the last two decades. The ability to reconstruct the distribution of density or magnetic properties in various geological units through inversions has shifted interpretations from the data domain to the model domain and, thereby, transformed the interpretation from bump hunting in data displays to imaging structure and composition in 3D representations of the subsurface. More recently, the integration of inversion techniques is also poised to make major contributions to the emerging field of geology differentiation, which seeks to differentiate and characterize different lithology units, mineralized zones, or alteration zones by constructing quasi-geology models.

This course presents the state of art and practice in 3D inversion-based quantitative interpretation of gravity and magnetic data. The course will review the data acquired for mineral exploration with focus on newer data types, present the basic concepts of 3D inversion and the use of inverted models in the interpretation of gravity, gravity gradient, and magnetic data to extract geologic information, and demonstrate the power of integrated interpretation through joint inversion with petrophysical constraints and geology differentiation. The six topic areas covered in the course are as follows:

- **Basics:** magnetic, gravity, and gravity gradiometry data in mineral exploration
- **3D Inversion:** A means to image subsurface geology
- **Gravity and Gravity Gradiometry:** data processing and case studies
- **Remanent Magnetization Inversion:** new information about geology
- **Joint Inversions:** connecting to geology through property data
- **Geology Differentiation:** moving geophysics to geology interpretation

"No one cares about geophysics unless it can solve geology problems." Thus, the focus should be on geology and not necessarily on geophysics by itself. Adopting this mindset logically requires geophysicists in research and practice to think and act as geoscientists with some understanding of the geologic and mineral systems in which we explore, of mineralogy, and of geochemistry. Consequently, we cannot focus primarily on geophysical methods in a semivacumm setting".
Li, et al., The Leading Edge, January 2019, Vol. 38. No. 1: pp. 60-66.
https://library.seg.org/doi/full/10.1190/tle38010060.1

Dr. Yaoguo Li is a Professor in the Department of Geophysics at the Colorado School of Mines, and Director of the center for Gravity, Electrical and Magnetic Studies (CGEM). He currently leads the Gravity and Magnetics Research Consortium (GMRC) sponsored by the petroleum and mining industry. He is specialized in geophysical inversion methods for potential-field, DC/IP, and electromagnetic data and in geology differentiation with a focus on applications in mineral and petroleum exploration and production. He is an Associate Editor for the journal GEOPHYSICS. He is a member of AGU, EAGE, and SEG.