



Contribution ID: 0

Type: **Presentation**

## Geophysical targeting and detection of kimberlites and characterization of the critical zone

*Tuesday, 13 August 2013 08:30 (4h 30m)*

This course deals with the application of geophysical methods to regional targeting and detection of kimberlites, and to the characterisation of the critical zone.

Kimberlites are complex hybrid rocks derived from the Earth mantle through intrusive and extrusive emplacement processes. As carriers of xenoliths, kimberlite pipes offer a valuable window into the crust and mantle and are targeted by the mineral industry as primary sources of diamonds. Diamond-bearing kimberlites are known to be associated with cratonic domains underlain by rigid sub-continental lithospheric mantle that can be delineated by regional scale geophysical data. The detection and determination of the precise location of kimberlite pipes is better achieved using higher-than-regional-scale resolution geophysical surveys. This is because most pipes are located at depth and hidden from direct observation at the surface where only indicator minerals may be found in soil.

Soil is the central component of the near-surface Earth extending from the top of the vegetation canopy (the lower limit of airborne survey altitude) down to and including the zone of freely circulating groundwater. This near-surface Earth is known as the critical zone. This zone is dynamic and sustains all terrestrial life through its resources. Characterisation of the critical zone is thus important and can be done through various geophysical applications that are, amongst others, environmental, geotechnical, groundwater, archaeological, or mining in focus. These near-surface geophysical applications are distinguished by shallow depths of investigation, requirement for high-resolution, and the possibility for real-time validation of results.

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**Track Classification:** Workshop Programme