

# SEISMIC DELINEATION OF THE ORION SOUTH (140/141) KIMBERLITE, FORT À LA CORNE FIELD, SASKATCHEWAN, CANADA

# White, D.J., Kjarsgaard, B. A., Mwenifumbo, C. J., and Buffett, G. Geological Survey of Canada, Ottawa, Ontario, CAN

#### INTRODUCTION

The Orion South (140/141) kimberlite is a diamondiferous multiphase complex within the Fort à la Corne kimberlite field of Saskatchewan, Canada. High-resolution Vibroseis seismic reflection profiles were acquired along a network of 7 2D profiles totaling 10 km in length. These data are interpreted in conjunction with an extensive set of drillhole geological logs and limited geophysical logs to delineate the large-scale architecture of the kimberlite body.



## Lithostratigraphy



The 140/141 kimberlite constitutes a multiphase kimberlite complex that was formed from ca. 106 Ma to ca. 99 Ma by at least seven episodes of kimberlite volcanism (Kjarsgaard et al., 2006) punctuated by periods of volcanic quiescence, erosion, and sedimentary deposition within the Western Canadian Sedimentary Basin.

# **Seismic Acquisition**

#### Acquisition Parameters

**Source Parameters** Source type IVI-T2500 Mini Vibrator Peak Force 4.500 lbs Hold-down weight 12,000 lbs Control electronics Pelton Advance II Version 6 Layout Sweep length Number of sweeps/VP Sweep frequency range 30-300 Hz

Vibration point (VP) interval 21 m Line-end VP interval 3 m

Resonant frequency

**Recording Parameters** Geophone group interval 3 m Max. no. of channels 960 Correlated record length 3.072 s Sample interval 1 ms Recording system I/O Image System 24-bit telemetry End-of-line geometry Walk-in, walk-off Spread-type All channels live for all shots





Natural Resources

**Ressources naturelles** Canada

### Multiparameter Logs



Note: Plastic casing of drillholes makes the velocity logs unreliable within the till section.

# Synthetic Seismic Response





DB5

# **Seismic Results and Interpretation**







vents ).

# **Ring Fault System**



The seismically defined boundary is interpreted as the outer limit of a series of concentric ring faults that encircle the kimberlite feeder vents. It corresponds to a plan view region that is approximately 300x300 metres in extent

PERSPECTIVE VIEW OF RING FAULT SYSTEM

Perspective views of zone of chaotic reflectivity bounded by truncations on either side. This zone is observed along DB-2, 3, 5, 6 and 7, and is the locus of multiple feeder vents encompassing vents associated with eruptions of Pense-age equivalent (P-2 vent) and Joli Fou-age equivalent kimberlites (LJF and EJF-2

