



Interactive comment on “Seismic imaging across fault systems in the Abitibi greenstone belt – An analysis of pre- and post-stack migration approaches in the Chibougamau area, Quebec, Canada” by Saeid Cheraghi et al.

Saeid Cheraghi et al.

saeid.cheraghi@gmail.com

Received and published: 16 March 2021

Please attached fin the revised manuscript with tack-change on

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-155>, 2020.

Printer-friendly version

Discussion paper

1 Seismic imaging across fault systems in the Abitibi greenstone belt –
2 An analysis of pre- and post-stack migration approaches in the
3 Chibougamau area, Québec, Canada

4

5 Saeid Cheraghi¹, Alireza Malehmir², Mostafa Naghizadeh¹, David Snyder¹, Lucie Mathieu³, Pierre
6 Bedeaux³

7

8 ¹ Mineral Exploration Research Centre, Harquail School of Earth Sciences, Goodman School of Mines, Laurentian
9 University, Sudbury, Ontario

10 ² Department of Earth Science, Uppsala University, Uppsala, Sweden

11 ³ Centre d'études sur les ressources minérales (CERM), Département des Sciences appliquées, Université du Québec à
12 Chicoutimi (UQAC), Chicoutimi, Québec

13 *Correspondence to:* Saeid Cheraghi (scheraghi@laurentian.ca)

14 **Abstract.** Two high-resolution seismic reflection profiles acquired north and south of Chibougamau, located in the northeast
15 of the Abitibi subprovince of Canada, help understand historic volcanic-hosted massive sulfide (VMS) deposits and
16 hydrothermal Cu-Au mineralization found there. Major faults crossed by the profiles include the Barlow fault in the north and
17 the Doda fault and the Guercheville fault in the south, all targets of this study that seeks to determine spatial relationships with
18 a known metal endowment in the area. Common-offset DMO corrections and common-offset pre-stack time migrations
19 (PSTM) were considered. Irregularities of the trace midpoint distribution resulting from the crooked geometry of both profiles
20 and their relative contribution to DMO and PSTM methods and seismic illumination were assessed in the context of the
21 complex subsurface architecture of the area. To scrutinize this contribution, seismic images were generated for offset ranges
22 of 0-9 km using increments of 3 km. Migration of out-of-plane reflections used cross-dip element analysis to accurately
23 estimate the fault dip. The seismic imaging shows the thickening of the upper crustal rocks near the fault zones along both
24 profiles. In the northern seismic reflection section, the key geological structures identified include the Barlow fault and
25 two diffraction sets imaged within the fault zone that represent potential targets for future exploration. The south seismic
26 reflection section shows rather a complicated geometry of two fault systems. The Guercheville fault observed as a
27 subhorizontal reflector connects to a steeply dipping reflector. The Doda fault dips subvertical in the shallow crust but as a
28 steeply dipping reflection set at depth. Nearby gold showings suggest that these faults may help channel and concentrate
29 mineralizing fluids.

1