The authors of the manuscript titled “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” presents a processing strategy to image strong dipping reflections from a crooked-line acquisition. The manuscript is well written and the methodology is well described. Although, the geological interpretation is not really developed. The manuscript should be a significant and valuable work, and it fits the scope of Solid Earth's special issue “State of the art in mineral exploration”. However, some suggestions and technical comments are as follow:

1) It is not clear why the different offset ranges of 0-3, 3-6, and 6-9 km are selected, even considering that, the seismic profile is 10 km. In addition, during the text, these ranges are changing from 0-3, 3-6, and 6-9 km to 0-3, 0-6 and 0-9 km. Which is the correct one?

2) In the interpretation, some of the reflections are associated with different geological structures. However, the geological map does not provide any strike and dip information. Also, the profile, to the south, does not cross the Doda fault while in the interpretation one of the reflections is associated with the fault. In the conclusions, it is mentioned that this fault is only imaged in the first 2 km, while the chs4 (associated with the fault) is observed around 2–3 km depth. Are you sure that chs4 is the fault? In the text, it is not clear the origin of the diffractions. Is it the fault or a potential ore body?

3) It is possible to provide a geological model of the final interpretation? Which are the relationship between chn1 and chs1?

4) Can you provide the orientation of the seismic profiles in Figures 5–12? In Figure 7, why is represented 12 km, if only there are interpreted the first 6 km, why chn4-chn6 are not to interpreted in this figure? Also, in Figure 10, the chn_diff seems not agree on the shot gather and the stacked section.

5) In the text is mentioned that for DMO it is used a range velocity of 5000–6500 m/s, while for the CDMO is used a constant velocity of 5500 m/s. Why this decision was made, can you explain it further? In addition, in my understanding, a range of velocities, such as 5000–6500 m/s, will not be considered a constant velocity.

6) Some references are missing.

Minor comments:

L.15 Canada,

L.17-18 with a known metal endowment in the area

L.24 key geological structures // sets

L.35-36 (Juhlin, 1995a; Juhlin et al., 1995 and 2010; Bellefleur et al., 1998 and 2015; Perron and Calvert, 1998; Ahmadi et al., 2013)

L. 36 add comma after “however”

L. 67 Mercier-Langevin et al., 2014

L.33 crystalline rock

L. 35-36 Juhlin, 1995a; Juhlin et al., 1995, 2010; Bellefleur et al., 1998, 2015 … // remove ; // . However, all …

L.37 than a coherent

L. 38 Petrophysical measurements, where available, complemented with reflectivity/velocity models of the shallow crust, …

L. 39 permit a more

L.42 limited the application

L.45-46 confusing sentence. Can you rephrase it?

L.47 change “which” for “that”

L.59 Bedides

L.61-63 confusing sentence. Can you rephrase it?

L.78 Are the offset ranges between 0-10 km or 0-9 km? In the abstract is mentioned 0-9 km, while here is between 0 and 10 km. It is somewhat confusing.

L.90felsic lava flows

L. 92 Mueller et al., 1989; Leclerc et al., 2017

L.92-93 …, observed along the southern profile, …

L.102 , and

L. 103 Dimroth et al., 1995

L.106 change “to” for “with”

L. 108-109 Leclerc et al., 2012 and 2017 // schistosity

L.114 at the surface

L. 117 Dimroth, 1985; Mueller et al., 1989

L.120-121 confusing sentence. Can you rephrase it?

L. 148 low-velocity

L.142 DMO or PSTM,

L.152 artifacts

L.158 . for example,

L.161 , for example, // , however,

L.162 , for example,

L. 166 add space between two paragraphs

L.167 am irregular

L.169-170 In Figure 4 the ranges are: 0-3 km, 3-6 km and 6-9 km, while in the text is 0-3 km, 0-6km and 0-9 km. Which is correct? Why did you choose those ranges? If the profile is 10 km, why only 9 km were considered for the CMPs? This needs to be clarified.

L.173 remove “than”

L.171 , whereas many …

L.172 lies

Table 1 change “1000 m” for “10 km” // the offset ranges do not agree with Figure 4

L. 240 , as well as …

L. 244 … refraction, and …//… filter, and …

L.247 again, the offset range do not match with figure 4

L. 251 .. was derived // Is this a range of constant velocities that you have use, or is the final velocity? 5000 – 6500 m/s I will not consider a constant velocity. // … a step range

L.258 New paragraph, then add space between paragraphs

L.262-263 unclear sentence

L. 268 Labeled

L.276 New paragraph, then add space between paragraphs

L.283 summarizes

L.289-292 unclear sentence

L. 294 remove “;”

L.299 why did you use a constant velocity of 5500 m/s for the CDMO, while a range of velocities was used for the DMO and PTSM? This needs to be clarified

L.300 to the west to 40^{o} to the east with …

L.307 ... of the seismic …

L310 in the deeper

L.313 remove “the” before “diffraction”

L.321 to the west

L. 325 Fig. 9a-c

L.326 …, and its coherency decreases (Fig. 9c-f).

Figure 5. Can you add the orientation of the profile? Also, the offset ranges are not the same as Figure 4

L.356357 to address the challenges of the applications of the method in a crystalline rock environment.

L.368 In this study,

Figure 6 same as Figure 5

Figure 7 add the orientation. Also, why are represented 12 km, while only the first 6 km are interpreted. Why chn4-chn6 are not interpreted in this figure?

Figure 8 I cannot see chn4 on Figure 8d-f, neither chn5 in e-f. Am I supposed to see them?. What is chn2 pointing out?

Figure 9, aren't chs3 and chs4 pointing the same reflection? What is chs1 point out?

L.403 remove "the" borfee "regularity#

L.407 with an offset

L.406 Artifacts

L. 407 artifacts

L.412 … of CMPs, especially for longer offsets.

L.413, for example,

L.416 near-surface

L.424 south-dipping

L.439 at the surface

L.444 CDMO towards the west

L.446 structure of

L.449 Unless the north profile was …

L.453 cross-dip elemts

L.470 remove ";"

L.476-480 I do not think this fits in the interpretation section, as it is more like an observation of the results. Can you explain what is related to the diffractions?

L.493 ... towards the east or the west.

Figure 10. The diffraction on the shot gather is observed at 0.5 s, while on the stack section is observed at 2.5 km. Can you explain how is diffraction observed so dip, should not be seen around 1.5 – 2 km? Why do you not compare the shot gather with an unmigrated stacked section (in the time domain)?

L.522 ~8000 ms^{-1}

L.525 of

L. 544 remove point before (Mathieu et al., 2020b)

Figure 12. Why the CDP dash line is so short? What does it means? Also, the change on chs2 is observed more towards the right of the dash line. Is it well located?

Section 6.3 can you provided a geological sketch that correlated the north and south interpretations?

L.586 missing spaces "… processing work flow applied in this study ..."

L. 596 (Vermeer, 1990, 1998 and 2010)

References

The following citations are missing in the reference list

Cheraghi et al. (2011); Bellefleur et al. (2018); David et al. (2011); Daigneault and Allard (1990); Bedeaux et al. (2020); Vermeer (1994); Dimroth et al., 1995

The following reference is not cited in the text

Juhlin, C.: Finite difference elastic wave propagation in 2D heterogeneous transversely isotropic media, Geophysical Prospecting, 43, no.6, 843–858, 1995b