

Dear Editors,

We thank you and the reviewers for your thoughtful suggestions and insights. The responses to all comments have been prepared and attached herewith.

Anonymous Referee #1

Dear referee,

I sincerely thank you for your suggestions. My answers to your questions are listed below.

1) The introduction is written in a bad and generic way. There are few statements wrong such as “The borehole-surface electromagnetic method is an electromagnetic survey method that supplies a high-power alternating current with a horizontal electrical dipole and receives an electromagnetic response from the ground, tunnel, or borehole being measured.” This definition of the electromagnetic method is not correct since the description of the sensing phenomenon is not correctly stated.

Other statements are provided in a generic way and without references, such as. “In comparison with the conventional surface electromagnetic method, the borehole surface electromagnetic method has a deeper detection depth and a higher resolution.” “Multi-component data can help researchers better interpret the relevant properties of subsurface media.”

Response: Thank you for your comment. Please note, in the revised manuscript, the following modifications have been made to the sections pointed out by you.

“The borehole-surface electromagnetic method is an electromagnetic survey method that can deliver high-power alternating current with different frequencies through horizontal electric dipoles, and receive three-dimensional electromagnetic signals from the ground, tunnels, or boreholes.” (p. 1, lines 23-25)

“Compared to the conventional surface electromagnetic method, the borehole surface electromagnetic method has a deeper detection depth and a higher resolution (Li T.T. et al., 2013).” (p. 1, lines 25-26)

“Multi-component data can help researchers better interpret the relevant properties of subsurface media (Duncan et al., 1998).” (p. 2, line 35)

2) What is the attitude information? Please, provide the explicit definition/meaning of “attitude”.

Response: Thank you for your comment. As suggested, the term attitude information has been defined in the revised manuscript as follows.

“The attitude information includes pitch, roll, and yaw angles.” (p. 6, lines 153-154)

3) Row: 200. What is the nature of the interference at 50 and 200 Hz? Why the double interference for Bx?

Response: Thank you for your comment. The nature of the interference is the power frequency interference and its harmonic interference. “There were almost no peaks in the pass band, except for high interference levels at 50 Hz and 150 Hz.” (p. 7, lines 200-201)

4) Row 205. Please show the spectrum of the signal.

Response: Thank you for your comment. As suggested, the spectrum of the signal has been explained in the revised manuscript on (p. 8, line 206).

5) Figure 8 is not clear and should be redone.

Response: Thank you for your comment. As advised, we have revised Figure 8 to read as follows.

Figure 9: Field layout of the experiment. (p. 10, lines 239-240) BH1 and BH2 are placed at a certain depth in the borehole. The transmitter and the electrodes are on the ground.

6) Row 240. “The expected target frequency can be seen more intuitively from the time-frequency spectrum.” has not scientific meaning.

Response: Thank you for your comment. The text has been revised as follows. “Figure 10 shows the time-frequency spectrum of the signals from BH1 and BH2, from which the expected target frequency can be seen more clearly.” (p. 10, lines 242-243)

7) Figure 9. Is the scale in the figures provided in dB? what is the unit of the time (hours, minutes, seconds..) ?

Response: Thank you for your comment. We have provided the following explanation in the revised manuscript to address your feedback. “The scale in the figures is provided in dB; however, the data in the figure is calculated with the formula $10\log X$. The units of the time and frequency are minutes and Hz, respectively.” (p. 11, lines 250-251)

8) Explain explicitly the details on how the frequency time analysis has been done. At this stage, the section “field tests” is written in a very bad way.

Response: Thank you for your comment. The time window is used to perform a periodic sparse fast Fourier transform on the signal to obtain the time-frequency spectrum of the signal.

Anonymous Referee #2

Dear referee,

Thanks for your comments and looking forward to receiving your suggestions again.

Sincerely,
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