Dear Editor:

Please find enclosed a revised version of our manuscript entitled “AUV based self-potential observation” by Zhongmin Zhu, Jinsong Shen, Chunhui Tao, Xianming Deng, Tao wu, Wenyi Wang, Zuofu Nie and Chaoyang Su for submission to GI. The comments by the referee have been accounted for and are discussed below in details. A revised version of the manuscript with the changes overlaid in yellow is also provided Thanks for your time and professionalism.

Sincerely.

Zhaoyang Su

On behalf of the authors

Referee, kai Chen:

1. The Referee wrote: “*Line 130, the detail of SP source did not given, such as current magnitude*”.
Response: Agree, the detail of source power is described in the text now: *“The power supply provides a constant voltage about 36 V, the electric potential on the positive pole and the negative pole is 18 V and -18 V, respectively, when ignore the difference of copper plates. These electric potentials are also used in the subsequent numerical simulations.”*

2. The Referee wrote: *“Section 3.1 said that switching on and off manual power, changing navigation speed and steering will disturb SP measurement, but I can’t find the related descriptions in the result analysis about lake test”.*
Response: We only showed the results when the manual power is switch on indeed, in contrast, when the power is off, the collected signal is just consistent with the ambient noise, so we did not show the related results. About the contrast speed of the AUV, although we tried to change the speed of vehicle, we couldn't extract the stable data with obvious difference in speed, we will supply relevant experiments in future researches. Some researches (*Bloomer, S., Kowalczyk, M., Kowalczyk, P., Constable, S., Haber, E., & Kasuga, T. (2018). AUV-CSEM: An Improvement in the Efficiency of Multi-Sensor Mapping of Seafloor Massive Sulfide (SMS) Deposits with an AUV. oceans conference.*) have showed the contrast of electric signal at different speed of AUV, we hope it helps. The steering of AUV, which could be expressed in Heading, will disturb the sampled electric field a lot (see figure 6 in the text), that why we should perform Azimuth or rotation corrections.

3. The Referee wrote: *“Please demonstrating the accuracy of direction, pitch and roll measurement to the SP when corrected using a rotation transform in section 3.2”*.
Response: Ideally, we could recover the electric field completely, the error in the

synthetic case is less than 1%, but in the field data, it's hard to demonstrate the accuracy. 4 The Referee wrote: *"Line 64 "four electric field receivers" should be revised to "four channel electric field receivers""*. Response: We agree. Change done, thanks. 5 The Referee wrote: Line 67 *"human interference" should be revised to "artificial interference"*. Response: We agree, change done. 6 The Referee wrote: Line 77 *"electric field receivers" should be revised to "electrode" or" electric field sensor"*. Response: We agree, change done. 7 *Line 100 "electrode spacing" should be revised to "Electrode dipole length"*. Response: We agree, change done. 8 Line 103 *"electrode distance." should be revised to "Electrode dipole length"*, Response: We agree, change done. Appreciate.

Referee #2

1 The Referee wrote: *"It is suggested to provided more details, such as the spectrum analysis method and other parameters, about how the frequency spectrum (Figure 4) of the electric field time series obtained."*, Response: Thank you , We calculate the power spectrum of time series and convert the unit in dB by using 10log10(p) , the spectrum is obtained using *pspectrum* function in matlab. The main text is also update.

2 The Referee wrote: *"The relationship between the spectrum of electric field and the propeller speed (Figure 4a) should be analyzed in more detail"*, Response: Agree, The frequency components of 1.4 Hz and 3.5-4.5 Hz are caused by the speed of propellers The 1.4 Hz corresponds to the speed of 85 turns/min, the peaks of 3.5 - 4.5Hz corresponds to the speed from 210- 285 turns/min. The main text is also modified.

Referee #3

1. The Referee wrote: *"In section 2.1, how to deal with natural noise, such as noise caused by surge?"*, Response: Generally, the natural noise could be removed by detrend the observed data, we usually fit the original data by polynomial of low order, and subtract the results from observed data. More accurate processing requires other ocean current observations. we did not observe any obvious surge phenomenon in this case.

2. The Referee wrote: *"In section 3.1, could the author propose improvements in installation methods in more detail?"* Response: Deep-towed arrays are subject to noise from wave motion, and limits tow speeds to 1–2 knots (0.5– 1 m/s), In contrast, sensors mounted on AUV do not move with waves, AUV borne SP method are an efficient, effective, and low noise means of collecting marine SP data.

3. The Referee wrote: *"It may be better to add a schematic diagram of the navigation trajectory in Figure 2."* Response: Yes, it is better to add a AUV trajectory in Figure 2, but most of the time, The AUV move in the water it difficult to show the whole path of the vehicle in the picture, the path of AUV in water has been shown in Figure 5b.

4. The Referee wrote: *"The heat map in Figure 7 should add units"* Response: units have been added, sorry for the mistake.