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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "A Compact Ocean Bottom Electromagnetic Receiver and Seismometer" *by* Kai Chen et al.

Kai Chen

ck@cugb.edu.cn

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A Compact Ocean Bottom Electromagnetic Receiver and Seismometer (ID: gi-2019-25) Response to Reviewers

Dear Anonymous Referee,

Thank you very much for your comments and suggestions. Thank you for your positive comments on this manuscript. According to your advice, we have revised this manuscript as follows.

Comment #1: Thus, I don't really understand how to join the OBEM and OBS data to investigate gas hydrate or petroleum exploration within a few kilometers below seafloor? I would recommend the authors to distinguish what is the scientific purpose of the instru-

ment? Response #2: Marine controlled-source electromagnetic (CSEM) sounding is a new tool available to geophysicists for offshore gas hydrate exploration (Weitemeyer, 2011). And the technique has been developed for the detection of deep hydrocarbon reservoirs (Fanavoll, 2010). The OBEM is the receiver which measure the EM field for the marine CSEM or/and MT method. OBS mainly provides deep geological information, and it also used to shallow gas hydrate mapping (Mienert, 2005). Therefore, these two offshore active/passive geophysical explorations instrument could jointly provide a complementary image to identify natural resources and/or geology structure. Thus, join the OBEM and OBS data acquisition to investigate gas hydrate or petroleum exploration within a few kilometers below seafloor is available. Comment #3: How to avoid the seismometer generates noise for magnetic sensors? Response #3: Three 8 Hz omni-directional geophones were used as seismometer to record artificial earthquakes signal. The moving coil geophone may generate EM noise for magnetic sensors, but the electronics (data acquisition circuit board, battery and geophone) are all shield by ferrite film, and the distance between induction coil and geophone is too large to measure the EM noise. We confirm the EM noise of geophone test in magnetic shield room. Comment #4: Please comparing and demonstrating the accuracy between the USBL attached to the OBEMS and other OBEM. Response #4: The resulting reduction in positioning uncertainty leads to significant improvements in target sensitivity. Acoustic ultra-short baseline communication (USBL) is used to establish the exact receiver positions. The OBEMS integrated USBL transponder which is from Sonardyne GyroUSBL underwater acoustic positioning solution, and the accuracy is approximately 1.5 ‰ of the slant distance. While the slant distance is 2000m, we estimate that receiver positions obtained this way are accurate to about 3 m. The OBEM which is from EMGS position is monitored by acoustic USBL transponders. The OBEM which are from SIO accurate navigational data were meant to be collected using a short baseline (SBL) acoustic navigation system. They estimate that receiver positions obtained this way are accurate to about 3-5 m. The USBL is more convenient to install and use than SBL, and the accuracy is enough. Comment #5: I can't find the related descriptions of figures 2 and 4 in the context. Please either add the descriptions or remove these figures. Response #5: Related descriptions of figures 2 and 4 have been added in the context. Figure 2 show the photo of the OBEMS while floating up on sea level. Figure 4 shows the Photo of the data logger installed in the glass sphere. Comment #6: P5, L159: How about the gain of the magnetic sensors? Response #6: The gain of magnetic sensor is 300mV/nT, and the output range is $\pm$5V. Comment #7: P6, L206: Which method? Please cite the reference or specify it in detail. Response #7: The reference has been added. (Egbert, G. D., Robust multiple-station magnetotelluric data processing, Geophys. J. Int., 130, 475– 496, 1997.) Comment #8: P6, L209: At high frequency ranges, the seafloor responses. Please rewrite it. Response #8: At high frequencies we see the sea floor response for both modes asymptote to 1Ωm. Comment #9: P6, L198: Figure 7 should be replaced by figure 5? P6, L218: Fig.8 should be replaced by Fig. 7? P6, L220: Figure 9 should be replaced by Figure 8? P6, L224: Fig.10 should be replaced by Figure 9? Response #9: We are very sorry for this carelessness. Figure 7 has been replaced by figure 5. Figure 8 has been replaced by figure 7. Figure 9 has been replaced by Figure 8. Figure 10 has been replaced by Figure 9. Comment #10: Table 1 should specify the seismometer in detailed. Response #10: Sensor type, dynamic range and gain preamplifier of the seismometer have been added in table 1.

Once again, thank you very much for your comments and suggestions. We tried our best to improve the manuscript and we have made all of the necessary changes in the manuscript. We truly appreciate the time and efforts of the editors and reviewers, and we sincerely hope that our corrections will meet your approval.

Sincerely, Kai Chen

China University of Geosciences Beijing 100083 ck@cugb.edu.cn

Please also note the supplement to this comment:
https://www.geosci-instrum-method-data-syst-discuss.net/gi-2019-25/gi-2019-25-SC1-supplement.pdf

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