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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Investigation of a low-cost magneto-inductive magnetometer for space science applications" *by* Leonardo H. Regoli et al.

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First of all, thank you very much for reading the paper and providing very useful comments. We went through all the comments and addressed them, so please find below our replies for the comments that were not addressed specifically as suggested:

1. We are not including outputs of the oscillator as suggested, since the field is calculated based on the difference between the charge and discharge times of the RL circuit shown in the paper. The oscillator, in the commercial version, is part of the ASIC controller so the output cannot be measured.

In terms of hardware improvement, as discussed in the future work section, we are currently working on a new implementation. Two components are key to improve the performance of the sensor: the coils and the clock (specifically the frequency). We cannot provide details of performance yet since the new instrument is in the early stages of development, but based on initial calculations, we expect the improvement in resolution to scale linearly with the clock frequency.

2. Since we haven't performed any test on the alignment of the coils, we don't aim at giving a full characterization of the offset of the coils. The suggestion of performing a set of tests with rotation of 180 degrees is a very good one, but the test setup with which the measurements were taken does not allow for a precise rotation along a single axis. When the unit developed at the University of Michigan is ready, we expect to be able to perform these more thorough tests by using external facilities.

3. Figure 6 was not expanded because, as explained in comment 1, the way the fields are measured involved the measurement of the output of a timer. This is a very simplistic schematic of the electronics and we feel that a more detailed schematic would not help convey the working principle, which is better understood through a text description.

4. The amplitude of the signal is not included in the paper because at the current stage we are not able to distinguish between the attenuation caused by the sensor itself and that caused by the change in the impedance of the coil used to generate the field with frequency. I am attaching the plot for reference, but we feel that including it in the paper would lead to confusion, hence we decided to just include the SNR.

5. The error bars in Figure 10 are a consequence of the variability of the random noise of the instrument. Instead of presenting them as a function of the standard deviation of the signal, we used the standard error, which reduces the error bars significantly.

Note: a significant change with respect to the previous version is the noise floor. We were using a simple Fourier transform of the output instead of using the Fourier

transform of the autocorrelation function, as defined in Heinzel et al. (2012). This brought the noise floor down to 4 pT/sqrt(Hz) which is extremely good. It seems like different authors treat noise floor in different ways, so any comments on this respect are more than welcome.

Please also note the supplement to this comment:
https://www.geosci-instrum-method-data-syst-discuss.net/gi-2017-53/gi-2017-53-AC1-supplement.pdf

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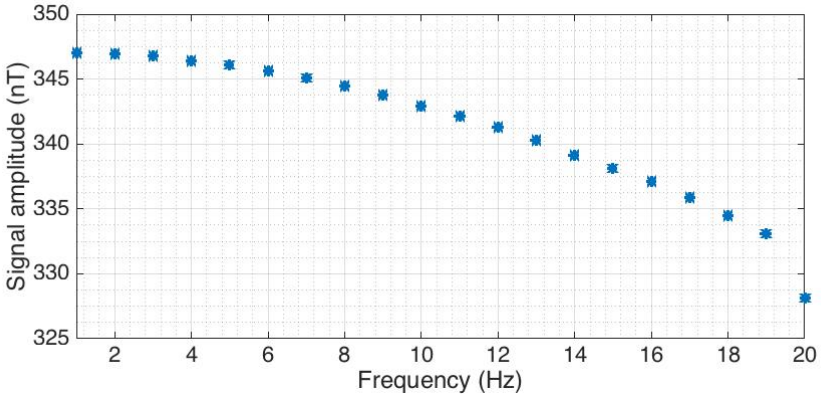

Fig. 1.