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Interactive Comment

Interactive comment on "Influence of high-latitude geomagnetic pulsations on recordings of broad-band force-balanced seismic sensors" *by* E. Kozlovskaya and A. Kozlovsky

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Response to Referee1 comments

There are point-to-point replies to particular questions. These issues will be incorporated in relevant ways to the final text.

General Comments

QESTION: The weakest point of the article is the very small number of cases analyzed: only two examples of geomagnetic disturbances and two glacial earthquakes (no teleseismic records have been considered). Such a small number strongly diminishes the soundness of the conclusions.

REPLY: The main target of the paper is to draw attention of seismologists and manufactures of seismological equipment to the influence of natural magnetic disturbances on seismic sensors in high latitudes. This target, in our opinion, is in agreement with the scope of the journal “Geophysical Instrumentation, Data and Systems”. For demonstration we selected one typical case of substorm (Section 2.1) and two typical cases of the pulsations interfering with glacial earthquakes.

Indeed, we make stress on glacial earthquakes. This is because our study was made during the International Polar Year (IPY) 2007-2009. Studying of glacial seismic events from Greenland was the targets of several seismological projects during the IPY. These events belong to a class of slow earthquakes, with long source duration, and their recordings are depleted in high frequencies typical for body waves of teleseismic earthquakes. That is why their detection and location is essentially based on analysis of long-period surface waves, with periods overlapping with those of geomagnetic pulsations. This increases the probability of misinterpretation. On the contrary, recordings of local, regional and teleseismic earthquakes usually contain also high frequencies corresponding to body waves. Therefore, such events are routinely detected and located using information of body waves. As we discussed in Section 3, seismic recordings in the correspondent high-frequency range are not affected by geomagnetic disturbances, that is why these disturbances do not create a problem for routine detection of tectonic earthquakes and man-made blasts and explosions (this is discussed in Section “Influence of high-latitude geomagnetic pulsations on recordings of glacial earthquakes”, page 118). It is quite possible, however, that geomagnetic pulsations could be the problem for detection of other types of slow seismic events, but this subjects needs a special study.

We agree that for reliable numerical estimation of the correlation between output of broadband seismometer and surrounding magnetic field one would need more data. However, coefficients of this correlation are unique for each pair of collocated instruments (e.g., Discussion section, page 126). Obtaining the correlation coefficients and studying the dependency on frequency is a technical work, which certainly should be done for each broadband seismic instrument installed in high latitudes, but it is out of the scope of the present paper.

Specific comments

QUESTION: The correlation between seismometer recordings and magnetic disturbances (Section 4) is a critical point in the article and deserves more attention. Please, comment the reason why the correlation between the Z - component of the STS - 2 and the Z - component of magnetic field is greater than for the other components.

REPLY: As one can see in Fig. 2 and Fig. 3, geomagnetic disturbances may influence on all components of seismometer recordings. However, magnitudes of natural seismic signal (seismic noise) in the horizontal components are usually larger than that in the vertical component. For this reason below in the present paper we consider only the vertical seismic component for clear demonstrating. (Obviously, because of the large seismic noise the correlation for horizontal components is essentially smaller.)

For discussing the reasons for why the correlation between the Z - component of the STS - 2 and the Z-component of magnetic field is greater than for the other components, we would need more information on the construction of the STS-2, which is not available. Indeed, for our instruments we have obtained the largest correlation between the Z-component of the STS-2 and the Z-component of magnetic field, but this is just a matter of observations. Moreover, we cannot (and do not) claim that this is valid for all cases. On the contrary, we recommend individual investigating the correlations for each pair of collocated instruments (conclusions in pages 125-126).

Technical corrections We thank Reviewer for the comments. All the suggested technical corrections will be made in the next revised version.

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 2, 107, 2012.