

Interactive comment on “Estimate of ULF electromagnetic noise caused by a fluid flow during seismic or volcano activity” by V. V. Surkov and V. A. Pilipenko

Anonymous Referee #2

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General comments

Anomalous EM disturbances were usually observed before and during seismic and volcano activities. But the understanding of this kind of

EM anomaly is still insufficient. We need the study to investigate how the EM anomaly is generated and to reveal the possible relation

between the EM disturbances and the seismic and volcano activities. The study of the
C2489

EM field can be made from the aspects of both

observational investigation and theoretical modeling, which are of the same importance and can supplement each other. Advances in the

observation aspect have been achieved during the past two decades, however, few works were conducted in the developing the theoretical

modeling. This article is a progress in this direction and we should encourage this kind of work. I think this article can be published,

although there are some corrects need to be made, which will be listed below.

Specific comments

1. I'm not very clear why the author use the words “ULF electromagnetic noise”. Usually, noise represents the signal that we do not

need and is expected to be removed from the useful signal we care about. However, the ULF EM signal discussed in this article seems to

be useful since it might be explain the process associated with seismic or volcano activity. Is it better to use ULF electromagnetic

field or ULF electromagnetic signal instead of ULF electromagnetic noise?

2. The authors compared the Hall current and EK current, and got a conclusion that the MHD effect should be less significant than the EK

effect in generating EM signals in natural rocks. This must be true because many experiments have proven that the coupling mechanism in

fluid-saturated porous rock is the EK effect in nature.

3. While the title of the article reads “Estimate of ULF electromagnetic noise caused by a fluid flow during seismic or volcano activity”

, the author did not estimate the EM field associated with seismic activity. They only evaluated the EM field caused by volcano magma

motion. Moreover, the author didn't estimate the EM signal resulting from the EK effect. A lot of observations show the EM disturbances

can be measured during earthquake events (e.g. Nagao et al., 2000) and theoretical simulations (e.g. Hu and Gao, 2010) indicate that the

EK effect can explain well. Before an earthquake happens, fluid flow might take place near the fault and could cause EM disturbances. It

will be better for the read if the author can estimate the fluid-flow-induced EM field due the EK effect by choosing typical and

realistic values for the variables in Eq. (5). The estimation of the EM response can be made in a way like they did for the case of the

volcano magma motion in Eqs. (15) and (17).

4. The estimation of the EM field caused by magma motion is useful and the amplitude of the magnetic disturbance agrees with some of the

observations. The EM responses caused by volcano activity are in principle similar to the EM variations induced by tsunami [e.g. Manoj

et al., 2011; Toh et al., 2011] and similar to the motion-induction effect (e.g., Gershenzon et al., 1993; Gao et al., 2014), which show

that the motion of conducting seawater and rock in geomagnetic field can generate observable EM signals. The authors are suggested to

read these related articles which study other mechanisms for the EM disturbances.

Minor mistakes:

Page 1 Line 9: rocks -> rock

C2491

Page 3 Line 17: does -> did?

Page 4 Line24: magnetohydrodynamic effet -> the magnetohydrodynamic effet

Page 8 Line 14: resulted -> resulting

References

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C2492

C2493