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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 #3

Received and published: 23 December 2014

The present work entitled "Estimate of ULF electromagnetic noise caused by a fluid flow during seismic or volcano activity" by Surkov and Pilipenko presents a theoretical models, even over simplified, to estimate an expected electromagnetic effect associated with seismic or volcanic activity. They estimate the electrokinetic (EK) and magnetohydrodynamic (MHD) effects due to an irregular flow of conducting rock fluid or magma flow. In their work the conventional theory of the EK effect has been extended by considering elliptic-shaped channels. They conclude that the contribution of both mechanisms to observed magnetic disturbance is depending on the pore/channel permeability. The magnetic and electric field perturbations depend on a contrast be-

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tween fluid/magma and rock conductivities. The suggested model gives the possibility to estimate analytically by order of magnitude the expected electromagnetic effect of the fluid/magma flow . Within this frame the work provides enough material that can support publication after some moderate revision which will improve the impact of the work.

One of the crucial modification is the updating of references that is very limited and does not give proper credit to previous published works. There is a significant part of science within this field and the authors has to give proper credit and to inform reader on the existance of previous work where can find significant contribution to the field.

Some other points are 1. Introduction (page 6478).. " possibly associated with the earthquake preparation process. " The authors has to add references. We suggest among other the following: Varotsos, P., Alexopoulos, K., Lazaridou, M., Latest aspects of earthquake prediction in Greece based on seismic electric signals, II Tectonophysics 224 (1-3), pp. 1-37 1993

F. Vallianatos and K. Nomikos, "Seismogenic radioemissions as precursors to earthquakes in Greece", Physics and Chemistry of the Earth, 23/9-10, 953-959, 1998.

F. Vallianatos and A. Tzanis, "Electric current generation associated with the deformation rate of a solid: Preseismic and coseismic signals", Physics and Chemistry of the Earth, 23/9-10, 933-939, 1998.

A Tzanis and F. Vallianatos, "A critical review of ULF electric earthquake precursors" Annali di Geofisica, 44/2, 429-460, 2001

D. Kiyashchenko, N. Smirnova, V. Troyan, E. Saenger and F. Vallianatos "Seismic hazard precursory evolution: fractal and multifractal aspects", Physics & Chemistry of the Earth, 29, 367-378, 2004.

D. Kiyashchenko, N. Smirnova, V. Troyan and F. Vallianatos, "Dynamics of multifractal and correlation characteristics of the spatio-temporal distribution of regional seismicity

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before the strong earthquakes", Natural Hazards and Earth Systems Sciences, 3, 285-298, 2003

V. Uritsky, N. Smirnova, V. Troyan and F. Vallianatos "Critical dynamics of fractal fault systems and its role in the generation of pre-seismic electromagnetic emissions", Physics & Chemistry of the Earth, 29, 473-480, 2004.

A. Tzanis and F. Vallianatos, "Distributed power-law seismicity changes and crustal deformation in the EW Hellenic Arc", Natural Hazards and Earth Systems Sciences, 3, 179-195, 2003

2. page 6477, line 3 "..... band accompanying sample fracture in laboratory (e.g., Cress et al., 1987; Freund, 2000). " Some recent references has to be added since the laboratory work the last decade is extensive with results that the reader of the present work has to kept informed by the authors. Suggested references:

Vallianatos, F.; Triantis, D.; Tzanis, A.; Anastasiadis, C.; Stavrakas, I. " Electric earthquake precursors: from laboratory results to field observations", Physics & Chemistry of the Earth, 29, 339-351, 2004.

F. Vallianatos and D. Triantis "Scaling in Pressure Stimulated Currents related with Rock Fracture", Physica A, 387, 4940-4946, 2008.

F. Vallianatos, A. Nardi, R. Carluccio and M. Chiappini, "Experimental evidence of a non-extensive statistical physics behavior of Electromagnetic Signals emitted from rocks under stress up to fracture. Preliminary results." Acta Geophysica, 60(3), 894-909, 2012.

F. Vallianatos, G. Michas, P. Benson, P. Sammonds, "Natural time analysis of critical phenomena: The case of acoustic emissions in triaxially deformed Etna basalt", Physica A: Statistical Mechanics and its Applications Article in Press , 2013

2. Page 6477 line 17 "..... I on the ground with a larger Z/G ratio than a magnetospheric/ionospheric source does ". Please refer and comment to the related extensive

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work done by Hayakawa

3. Page 6477 line 23 "..... further attempts to discriminate seismic and magnetospheric ULF sources were made with the use of the gradient observations (Krylov and Niki-forova, 1995; Kopytenko et al., 2006). Please note and comment on the following work on this point A. Tzanis, F. Vallianatos and S. Gruszow, "Identification and discrimination of transient electric earthquake precursors: Fact, fiction and some possibilities"" Phys. Eart Planet. Int., 121, 223-248, 2000.

4. page 6478 lines 18-19 For clarity of the proposed model add the following references
F. Vallianatos and A. Tzanis, " A model for the generation of precursory electric and magnetic fields associated with the deformation rate of the earthquake focus" in M. Hayakawa (ed.), Seismic Atmospheric & Ionospheric electromagnetic Phenomena, Terra Scientific Publishing Co., Tokyo, Feb., 1999.

F. Vallianatos and A. Tzanis, "Electric current generation associated with the deformation rate of a solid: Preseismic and coseismic signals", Physics and Chemistry of the Earth, 23/9-10, 933-939, 1998.

F. Vallianatos and A. Tzanis, "On possible scaling laws between electric earthquake precursors (EEP) and earthquake magnitude", Geophysical Research Letters, Vol.26, No. 13, 2013-2016, 1999.

F. Vallianatos and A. Tzanis, "On the nature, scaling and spectral properties of pre-seismic ULF signals" Natural Hazards and Earth Systems Sciences, 3, 237-242, 2003.

5. page 6481 line 20 . Keep the simpol < > where it is appropriate to mention to the reader the averaged mechanism used

6. page 6485 lines 5. Justify the validity of the approach using some order of magnitude estimation with data from magmatic champers.

7. page 6489. lines 3-8 "One of the weakest point.....has been used". I dong agree

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with this view. All the references proposed support that there is a science motivation and I propose the authors to modify this statement properly.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 6475, 2014.

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