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Interactive comment on "Seismo-electrics, electro-seismics, and seismo-magnetics for earth sciences" *by* L. Jouniaux and F. Zyserman

Anonymous Referee #1

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General Comments: Seismo-EM signals resulting from electrokinetic effect are considered as a potential tool for the exploration of fluid resources, because they are closely connected with properties of fluid, electrical and poroelastic properties of porous material. This paper provides a very detailed introduction of the theory, theoretical and numerical developments, and field and laboratory observations. After reading this paper, one can have a profoundly and fully understanding of the theory, the historic and latest developments, and its potential advantage in the exploration industry. Therefore, I support it to be published. Please see some specific comments below regarding possible improvements on the manuscript.

Specific Comments: 1. Electrokinetic effect is one of the generation mechanisms of the coupling between seismic and EM wave-fields. There are also some other mech-

anisms, such as piezoelectric and piezomagnetic effects, that can result in seismo-EM coupling. Therefore, I suggest the authors to provide some information in the title indicating that the concerned seismo-EM coupling is based on electrokinetic effect.

2. Page 2564, Line 12. Add "(SEM)" after "seismo-electromagnetic".

3. The concerned SEM is based on electrokinetic effect and electrokinetic effect is related to electric double layer. In Section 1, the authors should give some introduction on the electrokinetic effect and electric double layer, just as those in Jouniaux and Ishido (2012), but can be more brief.

4. The abbreviation is given in the above and should be used in the following text. Page 2565, Line 5. Replace "seismo-electromagnetic" with "SEM". Page 2565, Line 20. Replace "seismoelectric" with "SE". Pay attention to similar mistakes.

5. Page 2565, Lines 5-10. References regarding the two kinds of conversions should be added. I believe "IR" is abbreviation of "interface response" (see Haines and Pride, 2006).

6. Page 2565, Line 21. The author tried to show that the SE signals have low amplitudes. The electric potential difference is shown by "from 100 μV to mV". If it is possible, provide the length of the potential-measuring electrode, or use electric field strength (V/m) rather than electric potential difference. Then the readers can have a better understanding.

7. Page 2578, Lines 5-9. The authors provide some introduction on the electric double layer here. I suggest moving this part to Section 1.

8. References regarding all equations should be clearly pointed out. Some of the equations are lack of references, for example eqs. (2), (6), (7), (20), (21), and (26).

9. Section 8. This article focuses on the industrial application of electrokinetic effect. Actually, electrokinetic effect is also esteemed as a possible generation mechanism of EM signals associated with natural earthquakes and volcanic activities. SEM has been

expected to play an important role in the prediction of seismic and volcanic activities. Further studies regarding these matters are likely to provide better and comprehensive understandings of natural SEM coupling phenomena and should be significant in seismic and volcanic hazard study. Maybe, a short and brief description on the SEM associated with natural earthquakes and volcanic activities will help readers to have a better picture of the potential applications of electrokinetic effect.

Interactive comment on Solid Earth Discuss., 7, 2563, 2015.