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Solid Earth
Discussions

Interactive comment on "Ionospheric influence on the seismo-telluric current related to electromagnetic signals observed before the Wenchuan $M_S = 8.0$ earthquake" *by* Mei Li et al.

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I have read this paper with great interest. It is a good paper, addressing an important issue, namely the ability to record over long distances the ultralow frequency EM emission prior and during a major seismic event, here the M=8 Wenchuan earthquake of May 12, 2008. The paper focuses on the enhancement of the EM signal in the waveguide between the surface of the Earth and ionosphere.

I tried my best to help the authors improve the English of their text. see attached annotated pdf.

I have a few questions regarding (1) the introduction of "peroxy defects" in the early part

of the paper, and (2) geometry of the actual situation on the ground, i.e. the SW-NE trending Longchanming fault and the location of the receiving stations of the emitted ULF waves in the NE direction, almost exactly in the extended direction of the fault.

(1) Since I am the one who recognized for the first time the presence of "peroxy defects" and their ubiquity in essentially all crustal rocks down to at least 35-45 km depth, I am sensitive to the way "peroxy defects" are introduced. Here they are introduced without direct reference. This reference is given only later to my papers cited such as Freund, F.: Charge generation and propagation in igneous rocks, J. Geodynamics, 33, 543–570, 2002., and Freund, F.: Toward a unified solid state theory for pre-earthquake signals, Acta Geophys., 58(5), 719–766, 2010. It stands to reason to insert those citations where the word "peroxy defect" is first used.

I also want to point out that, while it is correct that I first developed the idea that stresses will generate dislocations which then activate peroxy defects and release mobile positive hole charge carriers, I have since come to realize that this is an unlikely mechanism. Much more probably is that stresses cause ever so slight displacements of mineral grains in the rocks, which in turn lead to the activation of peroxy defects that preferentially sit on or across grain boundaries. A more recent reference relevant to this question is:

Scoville, J., J. Sornette and F. T. Freund (2015). "Paradox of peroxy defects and positive holes in rocks Part II: Outflow of electric currents from stressed rocks." Journal of Asian Earth Sciences 114, Part 2: 338-351.

(2) The authors do not discuss one important aspect of their model, namely the fact that a linear dipole will emit more intensity perpendicular to the dipole axis and, theoretically, zero intensity in the direction of the dipole axis. However, the location of the receiving stations from which the authors obtain their data is nearly exactly in the direction of the dipole axis. The question arises: how much stronger would the received EM signals have been, if data had been used from receiver stations at about

right angle to the length of the Longshanming fault? Though I don't think that this omission is a major weakness of this paper, it would be advisable that the authors include a paragraph to indicate that this question exists and the numerical results may be different.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/se-2016-89/se-2016-89-RC1-supplement.pdf

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