

## ***Interactive comment on “Electromagnetic field observations by the DEMETER satellite in connection with the 2009 L’Aquila earthquake” by Igor Bertello et al.***

### **Anonymous Referee #2**

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This article shows a particular multiscale and multifrequency analysis (that the Authors call ALIF) of DEMETER electric and magnetic satellite data over the region interested by the 2009 L’Aquila Earthquake, in order to search for specific anomalies that can be related to the impending earthquake. Although the resulting anomaly found around two days before the mainshock seems interesting, no strong evidence is given to support its pre-earthquake origin. However, the ALIF technique is very original and efficient, but I think, it would be applied to many more cases, than just a case, as applied in this work, before to assess its real value in detecting pre-earthquake anomalies.

The present version of the paper is not ready for publication, rather it needs a major

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revision in order to clarify all points I indicate below.

### Main points

- How unique is the 4 April 2009 anomaly? Were other 3-sigma+ anomalies in the considered epicentral region? What about analyzing a close but different region, in order to make an objective comparison? By the way, an analogous figure of Fig.2 (made for February 11, 2009) but for the 4 April 2009, when the major anomaly has been found, is missing.
- It is not clear the precise size and location of the area of analysis considered in the paper (pag.3, line 14-15), apart from expecting it was surrounding the L'Aquila earthquake epicenter. Neither the interval of time of the data. Apparently, it seems that all orbits from 2004 to 2010 passing over L'Aquila area were considered.
- From the direction of the Pointing vector the Authors affirm that the perturbations producing the found anomalies (on 11 February and 4 April 2009) come from the ground. However it is very strange that the corresponding lithospheric regions at the origin of the two perturbations are quite different (see the different angles). Could the authors explain this difference?
- The only geomagnetic index used in the analysis for discriminating the level of external magnetic activity is Kp. Although this is a good index to understand the overall level of activity, it is only partial. I would suggest to take into account more stringent conditions considering also Dst and AE indices (these indices – Dst in terms of its proxy Sim-H index- are just mentioned at the end of pag.7, the beginning of pag.8, for the case of the 4 April anomaly). In addition, also the behavior of the same indices in the previous 5-6 hours should be considered, because the magnetic activity could be at the stage of recovery phase, after some perturbation affecting initially auroral regions. For instance, Perrone et al. (2018) do not limit their attention only to the 3-hour period of interest, but they also consider AE for all the previous 6 hours in their work (and a daily Ap less than 15), otherwise the possible anomaly is rejected as internal origin.

- No reasonable and clear model of the generation of the 330 Hz frequency at the earthquake preparation is given, and how much it could be related to the L'Aquila main-shock fault and the composing rocks. From the supposed conductivity structure under L'Aquila area, this frequency seems to be largely attenuated by the skin-depth penetration condition avoiding to cross all lithospheric medium from the fault rocks and be transmitted above in the atmosphere.

## Minor points

Pag.1, Abstract. Doubts on the use of the term “noise” in this context. Line 13 (also pag.2, line 24) : Cicone et al, 2017 is missing in the references list.

Pag.1 Line 24. “dynamics” better than simply “dynamic”.

Pag.1 Line 25. Bell et al., 1982 is not a complete and appropriate reference for the first sentence of the paper. Use other more specific references.

Pag.2 line 4. “between internal and external components”

Pag.3 Line 20. Incongruence between citation Piersanti et al. 2018 and the references indicated as Piersanti line 24)

Pag.3 Line 23. The reference Cohen 2001 is missing.

Pag.3, line 29. SM Test is not defined in this section.

Pag.3 Line 31. Correct “proprieties” in “properties”.

Pag.4 Line 6. I do not find any Flandrin et al. 1998. Do you mean just Flandrin 1998?

Pag.4 Line 20. Please correct “measure” in “measures”

Pag.7, Line 22. Please define “BANT noise”.

Pag.9 Line 27. Buzzi 2007 is not available at the given link.

Pag.15, Line 7. Please correct “componets” in “components”.

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## Additional Reference

Perrone et al., Ionospheric anomalies detected by ionosonde and possibly related to crustal earthquakes in Greece, *Ann. Geophysicae*, 36, 361–371, 2018.

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Interactive comment on *Ann. Geophys. Discuss.*, <https://doi.org/10.5194/angeo-2018-67>, 2018.

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