Nat. Hazards Earth Syst. Sci. Discuss., 1, C186–C190, 2013
www.nat-hazards-earth-syst-sci-discuss.net/1/C186/2013/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Review "On the relation between the seismic activity and the Hurst exponent of the geomagnetic field at the time of the 2000 Izu swarm"" *by* F. Masci and J. N. Thomas

F. Masci and J. N. Thomas

fabrizio.masci@ingv.it

Received and published: 7 May 2013

Dear Referee #1, Thank you very much for your comments.

First of all, we would like to emphasize three points in relation to the introduction of your review.

a) Several papers, by using different methodologies, like Fractal Analysis, Polarization Ratio analysis, and Principal Component Analysis, have claimed the observation of ULF magnetic disturbances before and during the period of the swarm occurred at Izu during 2000. The common characteristic of these papers is that the authors have

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

related these disturbances to the seismic activity in a simplistic way, without any validation. Among these papers we can also include Hayakawa et al. (2004). Recently some reports (see Masci, 2010, 2011a, 2011b) have shown that the presumed magnetic seismogenic signatures obtained by Fractal Analysis, Polarization Ratio analysis, and Principal Component Analysis, were normal magnetic disturbances caused by solar wind-magnetosphere and magnetosphere-ionosphere interactions. Our manuscript is a further confirmation of the findings of these papers.

b) You claim that after June 26 the Hurst exponent of H and D components of the geomagnetic field varies very coherently with the seismic activity. This is not true. Figure 1 of Hayakawa et al. (2004) shows that the correspondence between the rise of the seismic activity and the rise of the Hurst exponent of H and D components may be found only during the period 23-29 of June (see also Figures 2 and 3 of our manuscript). This correspondence fails during all the remaining period, from July to December 2000 when the seismic swarm was still in progress. Hayakawa et al. (2004) justify this lack of correlation invoking "a kind of saturation" which took place during the evolution of the seismic swarm. May you explain what saturated? In our opinion the correspondence between the $\pm$ 3-day running means of the Hurst exponent and the seismic activity during the period 23-29 June is just a chance event that led the authors to believe that the behavior of the Hurst exponent was influenced by possible electromagnetic signals induced by seismicity.

c) We think that you have not seriously considered that the Hurst exponent (particularly in the H component) shows a strong correlation with geomagnetic activity not only during from 7 June to 18 July, but also during February-December 2000 (see Figure 2 of our manuscript), that is, the entire period of time reported in Figure 2 by Hayakawa et al. (2004). This fact clearly shows that the Hurst exponent of the geomagnetic field is closely related to geomagnetic activity changes.

Let us now discuss the four points highlighted by you.

NHESSD

1, C186–C190, 2013

1. You are right; Figure 1 by Hayakawa et al. (2004) shows lack of data in the Hurst exponent time series (± 3-day running mean) during the period 2-5 July in all the three components. Curiously, this hole in data disappears in the Hurst exponent daily value (and then also in the ± 3-day running mean) that are shown in Figure 2 by Hayakawa et al. (2004) (see also Figures 2 and 3 of our manuscript). Unfortunately, only the authors could explain this mystery! Probably there are some problems in Figure 1 by Hayakawa et al. (2004). Therefore, we don't think that the decrease of the ± 3-day running mean of the Hurst exponent after 5/7 is due to a lack of data. Conversely, from Figures 2a, 2b, and 3 of our manuscript you should note that the decrease (highlighted by you) of the ± 3-day running mean of the Hurst exponent is well inverse correlated with the ± 3-day running mean of the daily sum of the Kp index.

2. We don't think that in Figure 3 most of the discordant data are after 5/7. After 5/7, Figure 3a shows a strong inverse correlation between the daily values of the Hurst exponent and the daily sum of the Kp index. However, we agree with you if you refer to the evident lack of correlation after 5/7 between the Hurst exponent and M*. In our opinion, as previously reported, the lack of correlation during the months following 5/7, when the swarm is still in progress, casts serious doubts on the Hayakawa et al. (2004) claims. In addition, Figure 3d (not considered by you) clearly confirms the correspondence between the Hurst exponent and the daily sum of the Kp index. That is, the Hurst exponent constructed by the linear relationship with the geomagnetic index is very similar to the original Hurst exponent. This cannot be stated for the Hurst exponent time-series constructed by the linear relationship with M*. In any case, we have investigated the relationship between the ± 3-day running mean of HU_H and M* in three different periods of time: 7-22 June, 23-29 June, 30 June-18 July. In Figure 1 of this reply you can find Figure 3c of our manuscript in which we have reported these periods. As we have previously stated in point b) we can note a good correspondence between HU_H and M * only during the period 23-29 June. In our opinion this is just a chance event, which led the authors to think about a possible relation between HU_H and M *. The real problem is the lack of correlation between HU_H and M* after 29

NHESSD
1, C186–C190, 2013

June (and also in the following months) when the swarm were still in progress. In addition, the studies Masci (2010, 2011a, 2011b) are a further confirmation that, at the time of the Izu swarm, the geomagnetic field components were not affected by seismic activity.

3. We don't think that it is necessary to consider also the D component because Figure 2 clearly shows that we will find the same results of the H component. The only difference is that there is lower correlation between the Hurst exponent of the D component and the daily sum of the Kp index.

4. We will take into account your suggestion in the final version of the manuscript.

Fabrizio Masci, Jeremy Thomas

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 681, 2013.

NHESSD
1, C186–C190, 2013

Interactive Comment

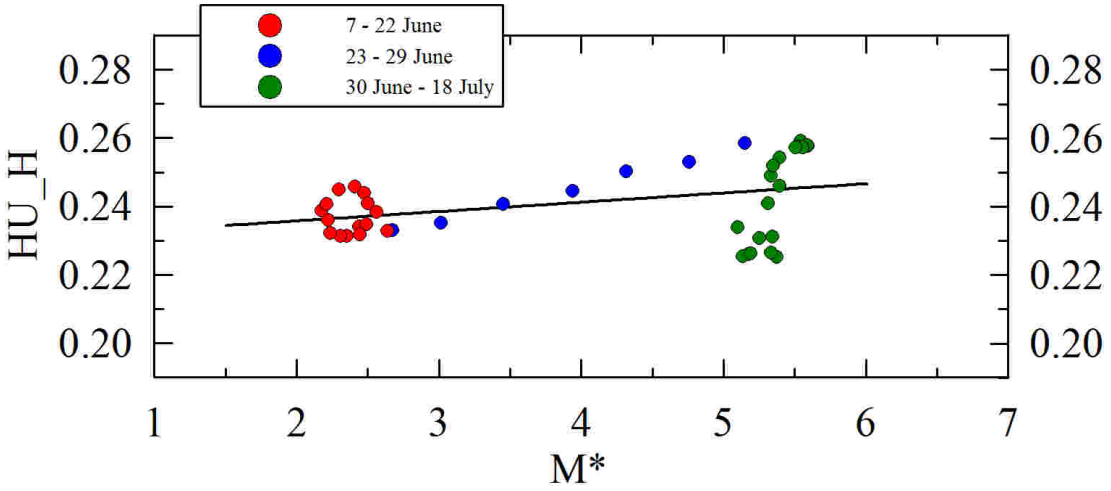

Fig. 1.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper