

Interactive comment on “Short-term volcano-tectonic earthquake forecasts based on a MRT algorithm: the El Hierro seismo-volcanic crisis experience” by A. García et al.

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Garcia et al review on VT forecasts using a moving Mean Recurrence Time algorithm

The rationale for this study is very well stated and is convincing. It develops the usefulness of VT forecasting as well as its practicability in a specific volcanic setting and is a significant contribution to the area of operational earthquake forecasting.

The title might be a bit better to include the word “Moving” before MRT and maybe even spell out “Mean Recurrence Time”. I don’t have strong feelings about this change.

Introduction line26: I take exception to the comment about “earthquake forecasting requiring answers to three questions: where, when, and how large?” This sounds

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more like “earthquake prediction”. i.e. a deterministic approach rather than forecasting which MUST include some estimate of the likelihood of the possibly damaging event. Thus, indeed, “where, when and how large” are important but just as important is “how likely”.

Lines 50-54: These statements make it sounds as if forecasting large VT events is significantly different than forecasting an eruption. It seems to me that, while the exact same parameters might not be appropriate in these two cases, they still are never-the-less forecasts of a very similar nature and similarly useful.

Lines ~60-90: I do not find any descriptions here of what VT ie. volcano-tectonic (sometimes called Type-A) earthquakes are and how they may be different in this case from the more typical pre-eruption earthquakes that are often called low-frequency volcanic earthquakes or “Type-B earthquakes”. In this case are ALL earthquakes considered VT events? At what depths do they occur? What is their frequency content? Was there any change in seismogram character just prior to the eruption of winter 2011-2012?

lines 145-155: Its not clear if your MRT calculations are based on the energy threshold or the >200 events threshold and if the latter what does the former have to do with anything?

lines ~155: The GRL algorithm explanation seems clear enough though its not clear if it always is run for a delta-T of five days or if once started it uses the previous 200 events. If it is the former, what happens when the number of events in a later 5 day period drops below 200?

lines ~169 (Fig 5): Figure 5 of MRT is a great figure and very clear but many people are much more familiar with looking directly at GR plots with a regression line on them. A very useful additional figure might be examples of such plots for a period early in a sequence and one after the MRT drops below 10 days. This would give the reader a much better sense of the nature of the data and how the completeness magnitude

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might change and possibly influence the resulting a & b parameters.

line ~200: Indeed, GRP techniques (or similar seismicity change parameters) have been attempted in many cases of tectonic sequences. The time scaling of short-term (hours-minutes) to long-term (years to decades) is not really the only issue. Rather it seems that orderly evolution patterns either don't occur or are very difficult to see... at any time scale for most tectonic cases. I think your envisioning of the process at El Hierro is absolutely correct in that it is very different in time and spacial scale than most major tectonic systems. It is the superposition of the rapid concentrated magma related stresses on a background stress that makes for the rapid changes in the seismicity characteristics.

line 219: Surely your MRT algorithm was not applied in real time to all five cases you illustrate. Certainly you must have had one or 2 sequences to recognize, develop the procedures and set the parameters before it was applied in real time. If not what was the basis for even trying it? Please clarify which ones resulted in a realtime notification. It might also be interesting for a sentence or two about the reaction of public officials or the public to the notifications. Ie Did the notifications make any difference?

In general an excellent and very interesting paper. I do wonder if you know of, or have looked into any other volcano-tectonic situations where this technique could be applied, even in retrospect. Surely there are data from the literature or other published catalogs that you could easily apply your technique to or at least speculate about.

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