

Interactive comment on “Real-time prediction of rain-triggered lahars: incorporating seasonality and catchment recovery” by Robbie Jones et al.

L. Capra (Referee)

lcapra@geociencias.unam.mx

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The paper represents an original contribution aimed to define lahar occurrence, that represents a very useful tool to be implemented in volcanoes where lahar monitoring systems are not available, or to anticipate the occurrence of an event respect to an early warning system. The model is based on two years records of lahars and their associated rainfalls of the Belham River Valley at Soufrière Hills Volcano, Montserrat. The 1-hour rainfall intensity is used to correlate lahar occurrence in dry and wet season, and lahar probability is defined considering also the 3-day antecedent rainfalls and the catchment evolution. The paper is well organized and nicely illustrated. I have identified some points that need to be better discussed:

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A more detailed description of how lahars were grouped in these three different categories is needed (small, medium and large) at least indicating which the main differences are: i.e. duration, magnitude (i.e. maximum amplitude from the seismic record?); runout, flow-depth? Can author also provide a simple description of these lahars, if they are debris flow or hyperconcentrated flow? In addition will be useful to have a table with rainfall characteristics (total accumulated rain, peak intensity) for some selected lahar events, some examples for each lahar category (small, medium, large) in dry and wet season.

Why 1-hour rainfall intensity is here considered? Is a limitation due to the record? I don't know the weather conditions at Monserrat, but in other volcanoes (i.e. Merapi and Colima for example) especially for orographic rains (in the “dry” season), rainfall intensity is calculated over a 5 o 10 min. window, which is much more representative of these type of rains, of short duration (< 1 hours) and high intensity. Do shorter rainfalls (< 1 hrs) have triggered lahars at Montserrat? Is 1-hour peak intensity representative of different rainfall behaviors at Montserrat? Would you expect any difference in your model with a 10-min. peak rainfall intensity?

Line 116. How the 1-hourPRI threshold is defined?

Line 124-129. From figure 2 at least two large lahars occurred in the dry season 2, with accumulated rainfall less than 20 mm for at least one of them. There are any evidences of hydrophobicity? Which type of vegetation grows at Soufrière Hills volcano? In addition, small lahars are more common in the wet season. For example during dry seasons 1 and 2 only medium (and 2 large) lahars were recorded and small events are only observed in the wet season. Please add some consideration about this behavior in the discussion section, at line 215-218.

Line 140-141. “This indicates that more intense rainfall is required to trigger lahars in the dry season 141 than in the wet season.” Can author please discuss this behavior? Is this correlated with a higher permeability of the substratum in the dry season? How

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much rains accumulate during these high intensity events in the dry season?

Line 165: 3-day antecedent rainfall values is a common time interval also used in previous works, such as at Colima volcano, please add some references.

Line 166. Can authors be more specific about the definition of the term "total cumulative rainfall since significant eruptive activity"? In their model will be the total rain since Phase 5? And, how this term reflect the catchment evolution?

Line 215-218. This point needs a better discussion in light of Figure 2 (see previous comment at line 124-129).

Line 225-227. This is questionable based on data here presented; see previous comment about figure 2.

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