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Interactive comment on "Factors controlling erosion-deposition phenomena related to lahars at Volcán de Colima, Mexico" *by* R. Vázquez et al.

R. Vázquez et al.

rvazmor@geociencias.unam.mx

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The authors thanks to the referee L. Caballero for her positive suggestions for the improvement of our paper. According to her comments, we seek to go further with the description of each one of the factors that controls the changes in channel morphology in Montegrande ravine, according to flow dynamics and the related experiences observed in other volcanoes (e.g. Doyle et al., 2011), comparing these results with the conditions observed in Volcán de Colima. It is well known that channel morphology controls flow depth, flow velocity, peak discharge and also promotes bulking or debulking of a lahar. According to the observations made by Doyle et al. (2011), when these flows reach a steady state, they tend to have extremely dynamic interactions with their channel and may rapidly alternate between net deposition and erosion and thus exchange part of their sediment load. Dynamically, erosion normally occurs under

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rising of the peak flow, even when the degree of erosion-related bulking depends upon the erodibility of the channel bed, bank, and related material, the shear stress applied to these surfaces, and the volume of sediment available for erosion (Pierson, 1995). Hence, a narrow channel will increase the depth of the flow, its velocity and thus the discharge, promoting erosion, as seen on MG_01 and MG_02 checkpoints, where the channel mean width is ∼10 m, and is flanked by steep terraces, in comparison to the downstream sites (from MG_03 to MG_05), where the channel width is >10 m in average. Conversely, deposition tends to be concentrated in sites of local sudden slope decrease (Fannin and Wise, 2001; Hürlimann et al., 2003; Hungr et al., 2005; Schürch et al., 2011), increased channel width, channel bends, or bifurcations (Doyle et al., 2011; Schürch et al., 2011).

Finally, the referee mentioned also that it should be furtherly addressed the effects of the accumulated rainfall and the sediment availability. In response to this suggestion, it is worth to address that the rainfall data here presented are based only on one rain-gauge and, as observed before, rainfalls can be locally concentrated. Hence, the estimation of rainfall thresholds triggering a lahar cannot be very accurate at least for the events at the beginning of the season, which are strongly related to orographic rainfalls (high intensities – low rain accumulation) (Capra et al., 2010). At Volcán de Colima, after the last significant eruptive phase (i.e. 2004-2005 years), on the succeeding years (i.e. 2007-2012), the rain episodes needed to trigger lahars were of short duration and low accumulated rainfall values as reported by Capra et al. (2010). But from 2013, the precipitations required to detonate a lahar were of higher values of accumulated rainfall and/or longer duration). For example, rainfall episodes with characteristics similar to those that triggered lahars during the 2007-2012 period, did not induce any lahars during the 2014 season, which confirms the gradual increase in slope stability of the volcano.

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