

Interactive comment on “Secondary lahar hazard assessment for Villa la Angostura, Argentina, using Two-Phase-Titan modelling code during 2011 Cordón Caulle eruption” by G. Córdoba et al.

Anonymous Referee #1

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I revised the manuscript “Secondary lahar hazard assessment for Villa la Angostura, Argentina, using Two-Phase-Titan modelling code during 2011 Cordón Caulle eruption”, by Córdoba et al. I think the manuscript is of interest for the readers of NHES, but it needs substantial improvements before publication. My recommendation is to publish after major revisions have been done. I will explain in the following the main points on which my recommendation is based.

- What means secondary lahars? This term is not of current use in international literature. - The authors stated that most of the pyroclastic material was transported into the valley floors, where it is assumed that it was stored. I wonder in which kind of deposits,

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and under which conditions the authors assume that it is further available for formation of lahars. - The TITAN2D program was developed for granular flows, like debris flows, in which grain contact is prevalent with respect to the fluid phase. I wonder if the new program, which derives from TITAN2D, is able to account also for more diluted flows, in which the fluid phase contributes to particle support and flow motion. This is an issue not sufficiently explained in the text. In particular, which is the maximum dilution at which the model outputs are physically sound? - If you talk about lahars avoid use the term debris flows. The two terms are not equivalents. - Lines 5-10 page 6379. The statement requires references, otherwise the reliability and robustness of the program need to be proved showing some examples - Initial conditions. The assumptions made for setting the initial conditions seems to contradict some previous statements. The Authors state: “ From the estimated deposited material at each basin done by Elissondo et al. (2011) and the depth of the deposits shown in Baumann et al. (2011), we set the initial volume for the piles located at Las Piedritas, Colorado and Florencia creeks”. It is not clear which kind of thickness they used. The assumed solid fluid ratio of 0.3 seems not effective, because they previously stated that these deposits are no longer present on the valley catchments. Therefore, this is a pure hypothesis that needs to be better constrained (as an example using observed lahars in the area), or compared with results obtained using other solid-fluid ratios. - “As it is of low probability for all the deposited material to become a lahar in large catchments, we assumed different fractions of the total deposited volume as initial height and medium volumes”. Which kind of probability you are talking about? From which data you derived it? - “It is outstanding to see that the flow from Piedritas creek inundates part of a planned urban expansion zone”. I do not understand this statement. The authors consider exceptionally good that the simulated flows inundate the urban expansion zone? - It is not clear throughout the manuscript if the Authors describe results used during the volcanic crisis or they talk about something that could be happen in the future. Statements like: “Based on such prediction of the program, we advised the local governmental authorities of the city to take appropriate decisions about that possibility. Then, the Mayor ordered to

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temporary relocate the kids to another school located in a safer place” seem to support the first hypothesis. If this is true, the results need to be compared with what really occurred in the following 3 years (we are now in 2014 and the data are from 2011). - The DEM precision is a vital parameter when dealing with computer programs that use the topography as input parameter. A good discussion of this point can be found in Capra et al. (2011; *Natural Hazards*, 59, Issue 2, pp 665-680), and should be cited. - “These results constitute the first scientific tool, produced from quantitative data that has been made available to the authorities in order to make decisions during the course of the emergency”. *NHESS* is a scientific journal, not a report for authorities. Therefore, the science need to be better explained and discussed in order to be of appeal for a wide international audience. A more accurate and expanded discussion section is therefore needed.

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