

Interactive comment on “New developments in the analysis of volcanic pyroclastic density currents through numerical simulations of multiphase flows” by S. Lepore and C. Scarpati

Anonymous Referee #1

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This paper investigates the transport and emplacement mechanisms of column-collapse pyroclastic density currents (PDCs) through numerical simulations of multiphase flows. Although I agree that this kind of study is of primary importance to improve our understanding of such processes and better assess the related hazards associated with PDCs, I would only recommend this manuscript for publication in this journal after major revisions.

Firstly, the language used by the authors in the text is sometimes limited and confusing. Many paragraphs are not readable and/or comprehensible, and some even lack of meaning. I have outlined some of the main issues in the annotated PDF version at-

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tached with this comment, but could not pay attention to every typo, grammar, waffles and sentence structure problems. I would invite the authors to entirely revise some parts of the manuscript by taking into account the attached comments in the PDF.

Secondly, the scientific part of the manuscript is somehow incomplete in some aspects. Although some of the issues related to numerical simulations of multiphase flows are correctly described and discussed, some of the concepts presented in this paper lack of new innovative ideas. The authors should provide more arguments to convince the reader of their modeling approach of PDCs, as some assumptions clearly lack of justifications. This could considerably straighten the results obtained in this study by bringing some new innovative ideas to solve the issues outlined in the previous sections.

Thirdly, I totally disagree with the last paragraph of the discussion. The authors cannot associate some volcano names with the type of numerical model they used to simulate the turbulence in PDCs! Stratified facies were found in many column-collapse PDC deposits at Montserrat, Pinatubo and Lascar, and were often related to the deposition of the dilute, turbulent ash-cloud surge component of these flows. Therefore, a discussion based on the type of PDC transport and emplacement mechanisms that can or cannot be reproduced with such models (i.e., kinetic, collisional, tractive or frictional regime) would be more appropriate. Another aspect that is totally disregarded in the discussion is the effects of both different generation mechanisms and topography on the dynamics and depositional regimes of such column-collapse PDCs. These have been fully documented from field investigations at many volcanoes and even investigated numerically in some recent papers:

Valentine et al. (2011). Effect of volcano profile on dilute pyroclastic density currents: Numerical simulations. *Geology*, v.39; n10, 947-950. Esposti Ongaro et al. (2008). Transient 3D numerical simulations of column collapse and pyroclastic density current scenarios at Vesuvius. *Journal of Geothermal and Volcanology Research*, v.178, n3, 378-396.

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Finally, the conclusions reach by the authors about the application of their model to different kind of eruptions from southern Italy are not satisfactory, because only based on a numerical attempt to reproduce some of the features that lead to the stratified facies observed from many other PDC deposits elsewhere. A detailed comparison between the model outputs and the properties of such PDCs as inferred from field investigations (thermal energy, dynamic pressure, velocities, runouts...) would have been more appropriate.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/4/C76/2012/sed-4-C76-2012-supplement.pdf>

Interactive comment on Solid Earth Discuss., 4, 173, 2012.