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## ***Interactive comment on “Brief Communication: The effect of submerged vents on probabilistic hazard assessment for tephra fallout” by R. Tonini et al.***

**R. Tonini et al.**

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Dear Editor,

on the behalf of the other authors, I would like to thank the reviewers for their comments and suggestions that helped to improve the clarity of the manuscript. We have revised the manuscript accordingly and below you can find a point-by-point reply to all the comments (authors comments are denoted with AC). Together with this letter, you can also find a tracked document of the revised manuscript.

Thank you very much

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Best regards,

Roberto Tonini and coauthors

### Reviewer #1 (R1)

I have found the Brief Communication by Tonini et al. “ The effect of submerged vents on probabilistic hazard assessment for tephra fallout” very interesting as it explores different approaches to take into account the effect of possible submerged events in the assessment of the tephra fallout hazard. I think that this paper is of potential interest to the readers of NHESS, and within the scope of the journal. I hope the authors find my comments and suggestions useful.

### MAJOR COMMENTS

The communication is in general well-structured, well-written and concise. Nevertheless, there are some points that, in my opinion, need further explanation or discussion

**R1:** One of the most interesting points of this brief communication is the comparison between the results obtained in CFc for the different approaches proposed. However, I was surprised to see that there is no comparison between CF2 and CF3 either in the text or in figure 3. I would appreciate the inclusion in figure 3 of a map showing the comparison between CF2 and CF3, and a short comment in the text.

**AC:** We added 2 new panels (sub-plots) in Figure 3, reporting the direct comparison between CF2 and CF3 and the comparison between CF2 and CF4. We also comment in the text (end of page 9, beginning of page 10 in the revised version of the manuscript) how these new plots emphasize the hazard underestimation of CF2 model.

**R1:** On the results and discussion section the authors state that, due to the similarity of the results for CF3 and CF4, both approaches can be used to estimate the

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PVHA to CFc (p.7190, lin.11-12). However, on the results section (p.7191, lin. 6-9) they propose that a comparison of PHVA based on H3 and H4 could be a good strategy to quantify the effect of submerged vents on tephra fallout. I wonder if the authors propose that this conclusion is valid for every active volcanic area or only in the case of CFc. If the conclusion is general, I think that this application to CFc is not enough to support it, mainly due to the peculiar factors of CFc described in page 7189 lin 15-18 and 20-24. If the above mentioned conclusion is only applicable to CFc, I would like to know the influence of the chosen weights (0.5 and 0.5) in CF3. Maybe a simple sensitivity analysis like the one performed for Dmax value in CF4 (p.7189, lin.11-18) would be enough to have a clearer picture on the usability of H3 in CFc and even in other volcanic areas

**AC:** The methodology is general, meaning that both H3 and H4 can be applied to any submerged volcanic system, even though it is not generally true that they lead to similar results as for CFc, since this depends on local conditions. We add a sentence in Conclusions. What is also not general is that for CFc we set equal weights in the statistical mixing because we were not able to identify a priori which of the two end members CF1 and CF2 was more reliable. A sensitivity analysis using different weights here does not tell us much, since it means just to explore the gradual changes from CF1 to CF2 with no reference. The idea of the mixing is to set the weights which better reflect the knowledge of the volcano. Of course in cases in which one model is more reliable than an other, the choice of the weights could be more tricky. The fact that we found results very similar to the CF4 model can be specific of CFc and cannot be generalized to other volcanic systems.

## MINOR COMMENTS

**R1:** P.7182, lin16: among the many others -> among many others

**AC:** Corrected.

**R1:** P.7183, lin.4: all of studies -> in all of the studies

**AC:** Corrected.

**R1:** Fig.2 I find the maps rather small. Maybe deletion of repeated scales could help to enlarge the maps. Although the meaning of columns and rows is clearly explained in the caption, addition of a short title to each column and row would increase the readiness of the figure.

**AC:** Images have been enlarged as much as it was possible and the target area has been zoomed in. Also describing titles have been added.

**R1:** Fig. 3 I also find the maps too small. I would appreciate using the same scale for the four maps, autoscaling each map makes the comparison between them difficult. There is an obvious mistyping error in the caption, as it says that both the top right panel and bottom left panel correspond to variation between CF1 and CF4. I suppose that bottom left panel corresponds to variation between CF1 and CF3. There is another mistyping error in the caption: lef panelt -> left panel

**AC:** Figure 3 has been modified by adding two new sub-plots in order to answer to the first major comment of the Referee 1. Caption has been corrected and sub-plots have been enlarged and zoomed in similarly to Figure 2. Finally, all the sub-plots refer now to the same colorbar.

## Reviewer #2 (R2)

Overall Impressions

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I read the Brief Communication “Tonini et al., The effect of submerged vents on probabilistic hazard assessment for tephra fallout” with interest considering that is a new research focused on the quantification of the effect of submerged vents on probabilistic volcanic hazard assessment for tephra fallout. I think that is a new aspect for scientific investigations within the NHESS scope.

This Brief Communication shows a strategy to quantify the effect of submerged vents on probabilistic volcanic hazard assessment for tephra fallout, based on a simplified empirical model where the efficiency of tephra production decreases as a function of the water depth above the eruptive vent. The method is presented through an application to Campi Flegrei caldera, comparing its results to those of two reference end-member models and their statistical mixing.

**R2:** The Introduction is well structured, but I think that it is too large (also sentences too long – P7183/L8-15) and some information can be moved in the other sections.

**AC:** Without other specific indication on what it could be moved, we just shortened the mentioned sentences.

**R2:** However, I think that in “Application to CFc case study: PVHA input” Section it would be useful to have more details about input parameters of simulations.

**AC:** We avoided to report the input parameters of the simulations since they are exactly the same than those published in Selva et al. 2010 and for reasons of length of the Short Communication we cannot repeat them here.

**R2:** I think in the “Results and Discussion” Section it is not very clear the conclusion about the similarity between CF3 and CF4 to estimate the effect of the sea on the final PVHA. How would it change assigning different weights in the statistical mixing (CF3)?

**AC:** For CF there is no reason to assign different weights in the statistical mixing, since we have no evidence that one of the end-member hypothesis is more reliable than the other. Please see also our answer to reviewer1.

Some specific comments

**R2:** P7189/L23 – “Fig. 1”, I will change in “Fig. 1, bottom panel”

**AC:** Modified accordingly.

**R2:** P7189/L27 – In the text, you refer to residual probability of the results “between CF1 and CF2, CF1 and CF3, and CF1 and CF4 respectively, all divided by CF1”. But in Figure 3, CF1 and CF3 is not included. Why?

**AC:** It was a mistake in the caption. In the revised version we added two panels at Figure 3 (see comment 1 of Reviewer 1), however the description of each panel in Figure 3 has been updated and also includes the percent variation between models CF1 and CF3.

**R2:** P7190/L8 - It could be useful to refer at Figure 3 to show the result obtained for the percentage variation between CF4 and CF3.

**AC:** Modified accordingly.

**R2:** Figure 3 – “bottom lef panelt” “bottom left panel”

**AC:** Corrected.

**R2:** Figure 2 and Figure 3 - I will extend the area of CFc to improve the visualization of the PVHA for tephra.

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**AC:** Figure 2 and 3 have been zoomed

**R2** It could be better to organize figures using subfigure names (a, b, i, ii, ..) to make easier the reading of this brief communication.

**AC:** We added titles to sub-figures in both Figure 2 and 3

**R2:** In general, revise english/american words (e.g. modelling/modeling).

**AC:** Modified accordingly

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/2/C3267/2015/nhessd-2-C3267-2015-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7181, 2014.

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