

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Additional Comments on nhess-2022-100

Shinji Takarada (Referee)

Referee comment on "Assessing minimum pyroclastic density current mass to impact critical infrastructures: example from Aso caldera (Japan)" by Andrea Bevilacqua et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-100-RC2>, 2022

Additional comments.

Line 45: *Aso caldera is located in the densely populated Kyushu Island (~14M people),*

>>> 14 M people including the population in Okinawa Prefecture. The total population of Kyushu Island is about 12.7 M people (Oct. 2021).

Lines 695-696: *Ono, K., Matsumoto, Y., Miyahisa, M., Teraoka, Y., and Kambe, N.: Geology of the Taketa District. Quadrangle Series, 1:50,000. Kawasaki: Geological Survey of Japan, 1997.*

>>> 1997>>1977

Lines 87-88: *For instance, the deeply dissected stratovolcano Nakadake (see Fig. 1),*

>>> Nakadake is the youngest and most active post-caldera volcano within the Aso central cones. Not intera-caldera volcanoes. Please see Miyabuchi (2009) Sedimentary Geology. Probably, this is Nekodake.

Although, recent work suggests that the Nekodake volcano formed after Aso-4 eruption (50-82 ka; Shinmura et al., 2021).

https://www.jstage.jst.go.jp/article/vsj/2021/0/2021_51/_article/-char/ja/

Lines 144-145: *Our analysis relies on the implementation of four different versions of the box-model integral formulation for axisymmetric gravity-driven particle currents, based on the pioneering work of Huppert and Simpson (1980) and with theory detailed in Bonneau et al. (1995) and Hallworth et al. (1998).*

>>> Usually, the VEI 7-8 class eruption continues for several hours to sometimes more than several days. The mass eruption rates (MERs) fluctuate due to the change in magma and vent conditions. It is doubtful applying a simple model with constant coefficient parameters to the Aso-4 PDC.

Aso-4 PDC deposits consist of several units such as Aso-4A, Aso-4B, and Aso-4T. Also, these units are composed of many flow units. Therefore, the simulations should apply to a single flow unit, not the whole Aso-4 PDC.

As you already know, many previous works (such as Lipman, 1967; Watanabe, 1977; Kaneko et al., 2007 <<< please cite these papers) showed that Aso-4 PDC is composed of different units which consist of different characteristics. Therefore, one single eruption simulation model is not applicable in Aso-4 PDC.

Line 151: *Rock avalanche dynamics with constant stress over the flow basal area*

>>> Careful validations are needed to apply the rock avalanche dynamics with a constant stress model to the VEI-8 class large-volume PDCs.

Initially, the authors should show the validations comparing the distribution, volume, and flux of the past large-volume PDCs with the result of numerical simulations using this model.

Line 157: *Density current dynamics with particle deposition*

>>> Careful validations are needed applying density current dynamics with particle deposition model to the VEI-8 class large-volume PDCs.

Initially, the authors should show the validations by comparing the distribution, volume, and flux of the past large-volume PDCs with the result of numerical simulations using this model.

Lines 299-300: *Note that our models assume that that total volume of the long runout PDC is the same as the volume estimates for the total outflow PDCs of the eruption.*

>>> The Aso-4 PDC is composed of several units (Aso-4A, Aso-4T, and Aso-4B), and these units are composed of more than 10-20 flow units in total. Therefore, this estimation is not realistic. The volume of a single flow unit of Aso-4 should be much smaller on a scale of 1/10 to 1/20.

Aso-4T (Tosu unit) is the most widely distributed low-aspect-ratio ignimbrite (LARI) unit within Aso PDCs (Suzuki-Kamata and Kamata, 1990 <<< This paper should be cited).

The Tosu unit reached as far as 166 km within Yamaguchi Prefecture. Therefore, if the authors would like to access the possibility of reaching the target site, the assessment of LARI is necessary.

Therefore, the stochastic discussions based on the assumption using the total volume of PDC with constant parameters are not acceptable.

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2022-100/nhess-2022-100-RC2-supplement.pdf>