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Comment on nhess-2022-100

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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-RC1, 2022

This paper attempts to evaluate the minimum volume of a large-scale pyroclastic density current (PDC) at Aso volcano. This kind of approach is necessary for the assessment of future effects by PDCs.

Although, I found several crucial points to be revised in this paper.

Lines 22-24: *This said, for Aso the current occurrence probability of such a colossal initiating eruption has been estimated <10-8 in the next 100 years.*

>>> This sentence is the result of the reference paper (Aspinall et al., 2021). It is not suitable to include in the abstract.

Lines 42-43 and 125-126: *It was and responsible for the emission of about 500 km3 DRE, 90% credible interval [370, 685] km3 (Aspinall et al., 2021).*

Aspinall et al., (2021) reassessed the volume estimates of PDC and fallout deposits of Aso-4, through a Bayesian Belief Network approach.

>>> Aspinall et al. (2021) is just a proceeding of an international workshop. This is not a peer-reviewed publication. The evaluation of the credibility of the volume estimation method through a Belief Network approach is still needed. More detailed evidence should be shown to use these estimated values in other peer-reviewed papers or in this paper. Details on how to determine the eruptive volumes of Aso-4 tephra and PDCs based on discussions among the mainly European "Experts" should be shown. Clear evidence is not indicated in Aspinall et al. (2021).

Line 82-83: *The PDCs generated from these eruptions reached runout distances from the caldera of ~30 km for Aso-1, ~30 km for Aso-2, ~70 km for Aso-3, and ~166 km for Aso-4 (Ono and Watanabe, 1983; Takarada and Hoshizumi, 2020).*

>>> As written here, the maximum runout distance of Aso-3 PDC is about 70 km. Therefore, it is unlikely the Aso-3 class PDC will affect the 3 target sites (130-145 km). Also, the estimated volume of Aso-3 PDC still contains large uncertainties. I think that the discussion on the assessment of Aso-3 PDC should be deleted.

Lines 87-88: *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.

Lines 140-141: *Our first-order integral PDC models aim at characterizing the potential distal impact of these flows, if any, at distances in the range 130 – 145 km.*

>>> Please describe why these three nuclear power plants have to be evaluated in this paper. The evaluation of TS1 (Ikata), TS2 (Genkai), TS3 (Sendai) nuclear power plants in Kyushu and Shikoku areas are quite sensitive matters in Japan. Still, a lot of debases including lawsuits after the Fukushima nuclear power plant event due to the 2011 Tohoku Earthquake. The description should be included why the evaluation of these three nuclear power plants is needed in this paper. Currently, the Japanese government NRA (Nuclear Regulation Agency), which handles the nuclear operation evaluations, does not use probability methods to assess the nuclear power plants in Japan. Other more important evaluation targets such as Fukuoka City, Kumamoto City, Saga City, Miyazaki City, and major airports in Kyushu are also possible candidates. If the next Aso-5 eruption occurs in Aso, most of the northern part of Kyushu area will be destroyed. I think that the evaluation of the effects on the largely populated cities is much more important.

Lines 299-300: *Note that our models assume that that 300 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. Therefore, the discussion based on this assumption is not acceptable.

Please remove repeated “that”.

Table 1 model 1: *Flow density 992 (50%) and 1511 (95%) kg/m^3.*

>>> These values are too high for PDC (These values are the density of debris avalanche or landslide).

Table 1 model 2: *Density of solid particles 1814 (50%) and 2357 (95%) kg/m^3.*

>>> These values (1814 and 2357 kg/m^3) are too high for the pumice rich PDC. The density of pumices is about between 800-1300 kg/m^3 in Aso PDC deposit.

Figure 1:

>>> The DEM used in this map should be cited. Probably GSI in Japan?

Figure 2:

>>> The DEM resolution for simulation should be indicated.

Figure 3 and Figure 4:

>>> The evaluation of Aso-3 PDC should be removed.

Minor comment are shown on the attached manuscript.

Please also note the supplement to this comment:
https://nhess.copernicus.org/preprints/nhess-2022-100/nhess-2022-100-RC1-supplement.pdf