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Reply on RC2

Matthieu Plu et al.

Author comment on "An ensemble of state-of-the-art ash dispersion models: towards probabilistic forecasts to increase the resilience of air traffic against volcanic eruptions" by Matthieu Plu et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-96-AC2, 2021

The authors thanks RC2 for his positive evaluation of the manuscript and for his insightful remarks.

- RC2 suggests to modify the title of the manuscript: *Maybe this is a hint, that the paper title is sort of misleading, and could better read: "On the aid of state-of-the art probabilistic ash plume forecast modelling to increase the resilience of air traffic against volcanic eruptions" but I leave this with the authors. Anyway the word tailored should be moved forward so it reads "A multi-model ensemble tailored for air traffic management"*

We agree with RC2 that the title can be improved so as to: alleviate the tailored/optimization aspects, better reflect the ash dispersion aspect of the article and remove the "air traffic management" terminology (as suggested by RC1 also). However, the article does not consider truly "forecasts" since the meteorological input data are not forecasts (analyses instead). Our best suggestion for a new title based on RC2's remark is: "An ensemble of state-of-the art ash dispersion models: towards probabilistic forecasts to increase the resilience of air traffic against volcanic eruptions"

- However there's some redundancy Section 2 that could be avoided by adding one or two tables listing all model realisations along their critical features stating in particular where they are similar and where not. For example FLEXPART and MATCH are pretty similar in the meteorological forcing (wind fields) at least this is my understanding. The authors could make this clear by such a comprehensive table on the model configurations.

Following this suggestion, we propose to add in the manuscript a table that summarizes the main characteristics of the model configurations :

Model	FLEXPART	MATCH	MOCAGE	WRF-Chem

Version	9	6.0	2018	4.2
Horizontal resolution	n/a (Lagrangian model)	0.1°	0.2°	0.1°
Vertical resolution	n/a (Lagrangian model)	45 vertical levels	47 vertical hybrid sigma-pressure levels from the surface up to 5~hPa	47 vertical levels
Simulated time period	10 to 20 May	10 to 20 May	10 to 20 May	4 to 20 May
Meteorological input	ECMWF analyses and forecasts at 3 hourly step	ECMWF analyses and forecasts at 3 hourly step	ARPEGE 6-hourly analyses, interspersed with 3-hours forecasts	WRF meteorology using ECMWF analysis as initial condition, and ECMWF 6-hourly analyses, interspersed with 3-hours forecasts as boundary conditions
Fine ash size bins	Centred at 4 (bin 1), 6 (bin 2), 8 (bin 3), 10 (bin 4), 12 (bin 5), 14 (bin 6), 16 (bin 7), 18 (bin 8), 25 (bin 9) µm	Bulk description physically regarded as coarse fraction (2.5-10 mum).	0.98 to 1.95 µm (bin 1), 1.95 to 3.91 µm (bin 2), 3.91 to 7.81 µm (bin 3), 7.81 to 15.63 µm (bin 4), 15.63 to 31.25 µm (bin 5), and 31.25 to 62.5 µm (bin 6)	<3.91 µm (3.5 %), 3.91 to 7.81 µm (5.0 %), 7.81 to 15.62 µm (8.0 %), 15.62 to 31.25 µm (11.0 %
Fine ash distribution	7.6 % (bin 1), 6	n/a (bulk	Non-constant:	<3.91 µm (3.5 %),

(a priori source terms)	13.3 % (bin 2), 11.8 % (bin 3), 11.1 % (bin 4), 10.8 % (bin 5), 10.5 % (bin 6), 10.8 % (bin 7), 11.1 % (bin 8), 12.7 (bin 9%)	description)	physically resolved by the FPLUME plume-rise model	3.91 to 7.81 μm (5.0 %), 7.81 to 15.62 μm (8.0 %), 15.62 to 31.25 μm (11.0 %); the percentage refers to the amount of total ash rather than that of fine ash
Fine ash distribution (a posteriori source terms)	Same as a priori source term	n/a (bulk description)	0.05% (bin 1), 0.25% (bin 2), 3.2% (bin 3), 25% (bin 4), 71.5% (bin 5), 0.0% (bin 6)	<3.91 μm (3.5 %), 3.91 to 7.81 μm (5.0 %), 7.81 to 15.62 μm (8.0 %), 15.62 to 31.25 μm (11.0 %); the percentage refers to the amount of total ash rather than that of fine ash

Some text to describe the models remain, particularly regarding the representation of transport and of ash processes, but without redundancy with the information that is provided in the table.

Besides, a single statement has been added about the post-processing of model outputs: "All model outputs are post-processed every hour, on the same 0.1° latitude-longitude grid, y interpolating the values horizontally, and on 13 vertical layers, by calculating the mean concentration of fine volcanic ash between the corresponding FLs."

We hope that we have addressed RC2's comments satisfactorily and that, after implementation of theses changes in the manuscript, it can be accepted for publication.