

## ***Interactive comment on “A volcanic hazard demonstration exercise to assess and mitigate the impacts of volcanic ash clouds on civil and military aviation” by Marcus Hirtl et al.***

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General comments: The presented approach of flight optimisations and simulations during natural airborne aviation hazards is a novel and important concept to minimise disruptions during a volcanic crises. However, the submitted manuscript has some shortfalls that need addressing. The described exercise was technically challenging and apparently a lot of planning went into the different modelling and calculation aspects. Unfortunately, the manuscript does not fully reflect this. In order to improve the manuscript and to emphasise the importance of such an approach some of the manuscript sections require reworking. Furthermore, the different aspects are not out-

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lined clearly which makes it hard to follow to understand the individual details (clarity of concept). It can be assumed that the target audience of the manuscript will be geologists, atmospheric and earth sciences scientists as well as the flight planners, decision makers and engineers. Therefore, it is recommended to explain some aspects in section 3 in more detail. An overview chart (more detailed than Fig. 3) would help guide the audience through the manuscript. Section 5 and 6 need most of the reworking. The drawn conclusions do not reflect the archived aspects and novel concept. Another aspect the manuscript forfeits is to describe the difference between the current flight planning approach and the novel approach. That includes model assumptions, safety risk assumptions as well as airway structure and ATM flow restrictions. Only if the difference is clearly described and compared, the reader can understand the benefits of such an approach. The novel concept i.e. use of maintenance costs are used in flight planning software were mentioned but a more detailed description of those methods would be useful to better understand and stress the new approach. In summary, the submitted manuscript can be a valuable contribution to future flight planning and tasks, but in the current state does not exhaust its potential. A substantial reworking of the manuscript can be beneficial and is strongly suggested.

Addressing individual scientific questions/issue:

1. The difference between the presented flight planning approach (described exercise) and the current operational approach is not clear or sufficiently described. Also, the link to ICAO and airline procedures could be further elaborated.
2. Describe concentration levels and why certain levels are acceptable and certain level not with the main focus on aircraft engines as the main critical parts.
3. The text includes a lot of names/acronyms that are sometimes only mentioned once. Perhaps it would be better to not introduce acronyms if the name is only mentioned once. This would allow a better readability.
4. Describe the mentioned factors in section 5.2 (page 12) further. This is needed to

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better understand the novel approach.

5. Statement in conclusion about “future natural disasters” can be misleading. The exercise was setup for volcanic ash particulates. The situation, for example sulphur dioxide, might be completely different, e.g. different detection, distribution, aircraft and engine threats etc.

6. Figures and Table are a bit detached from the text. It would be welcomed to add some more “scientific” plots to explain the procedure a bit more. Perhaps in combination with an overview chart. Table 1 is not even mentioned in the text.

Please also see the supplement to this comment.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-265/nhess-2019-265-RC2-supplement.pdf>

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