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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Modeling volcanic ash resuspension – application to the 14–18 October 2011 outbreak episode in Central Patagonia, Argentina" *by* A. Folch et al.

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Overall

The paper addressees a subject that has received little attention i.e. that of volcanic ash resuspension. The comparison of several approaches and the manner in which this highlights the many outstanding challenges represents a useful contribution. The paper is also beneficial in drawing attention to the concentrations and extent that are possible from these events and their potential for impacting on health and aviation.

The paper is in general well laid out and clear. There are however a number of minor

clarifications, corrections and adjustments, outlined below, that I feel are necessary.

I am happy for this paper to be published subject to these minor revisions.

General Comment The assertion that there is no operational re-suspension forecast is incorrect. Since 2011 London VAAC/UK Met Office have been providing an operational warning forecast service for resuspended ash to IMO (Icelandic Met Office). This service is follows along the work published by Leadbetter et al.

The findings relating to the most simple scheme performing better than the others I believe is indicative of the numerous sources of error/uncertainty present in what is being simulated. This is counter to the much more complex schemes used for 'normal' soil in but is in keeping with the discussion in other papers concerned with freshly deposited material. The authors quite correctly highlight that further work is required. It would be beneficial if they were able to elaborate further on this and what they feel the next step might be. If this is unclear to them then that is fine.

Specific Comments

– Page 4567 —

Line 2 - Change in to on

Line 9 - Change In opposition to as opposed

Line 11 - Insert re-suspended between for and volcanic

Line 11 - No operational service - Not correct. See General Comment This sentence should be removed or modified.

— Page 4568 —

Line 1 Change affectation to disruption

Line 4 - Change at to over

Line 8 Remove a combination adequate

Line 9 - Change Originated to resulted in

Line 15 Change or to and

Line 19 Change outbreaks to impacts

Line 29 - It is not correct that no TTDM are used operationally in this way. London VAAC/UK Met Office NAME model is used.

— Page 4569 —

Line 8 - the scheme also uses the occurrence of precipitation to control resuspension.

Line 13 - I assume that this station is measuring composition as well as meteorological parameters? It would be useful to describe what measurement is being made/used as it is not common practice for Met stations to record composition data.

— Page 4571 —

Line 12 - Insert the between of and wind

Line 13 - Remove of from requires of data

Line 14 - Many national met service weather forecast models use and calculate this information at a variety of scales that in many would be considered 'local'. I would therefore not say 'often' though I appreciate this will not be the case everywhere.

I think the major issue here is that those models will use the data for the underlying soil type to determine drainage rates and soil moisture which is not related to the characteristics of the ash deposit. This is one of the major reasons why your use of NWP soil moisture later in the paper does not work well.

Strikeout (red), 26 Oct 2013 15:35: Line 15 - Change Simplest to Simple

— Page 4576 —

Line 12, 15 and 18 - Change on to of

Line 23 - change 'determined comparing model with' to 'determined by comparing model values with'

— Page 4577 —

Line 6 Change sparse to sparsely scattered

Line 18 Change hardly harmed to had little impact on

— Page 4578 —

Change 'only on Sunday 16th' to 'on Sunday 16th alone'

— Page 4579 —

Section 5.1. I understand and agree, in this case, with using the model to define the deposit. However there are a number of reasons why this will result in a deposit map with varying degrees of error e.g. TSG, winds, disaggregation, etc. some of these you do mention. Your scaling, will also act as a correction of these errors but obviously only for the limited case used to produce the scaling. Did you do any verification of the model deposit map with deposit measurements to assess these issues. Some more exploration of the sources/reasons for uncertainties would be useful.

Line 8 - Insert they after because

Line 9 - Change desegregation to disaggregation

Line 19 - Change break when grounding to impact the ground

— Page 4580 —

Highlight (yellow), 27 Oct 2013 14:02: You draw attention to only errors in M13 but the other sites show equal potentially important errors: M1 - Observations at M1 show a second peak in winds that is under predicted by the model by upto $\sim$4m/s. Apart from this the model is in good agreement.

M2 - the model shows a systematic over prediction of $\sim$4 m/s. For much of 15 and 16.

M1 is the only station in the area of deposit but the varying performance in surface winds does indicate that surface winds are not very well captured or systematically under/over predicted. This will mean that the scaling step may be highly specific to given time window used the will affect day to day use.

Line 14 - Change along to over

— Page 4581 —

Line 2 - So do the resuspension emissions occur uniformally from 0-250m agl?

Why do you do this and not just emit at the surface (or over just the first grid box/point) and leave the model diffusion/winds to provide all the vertical spread/movement? Releasing at up to 250 may result in different transport directions and speeds depending on the variation of the met with height. It also may not dependent on conditions.

I should add that a pragmatic choice is fine but it is useful to understand.

Line 6 - Insert they after because

Line 7 - Do you assume/impose this or does it happen due to gravitational settling?

Line 21 - Change on to at

— Page 4582 —

I think that altitude also plays a role in the efficiency of detection which for observation of resuspension events might be a significant concern.

— Page 4583 —

Change can to may I don't think that it is possible to make the explicit link without more analysis.

Line 15 - Are the model outputs also grouped into the two size ranges or are they total?

Line 24 - This is based on mineral dust and the PSD is rather different I think (from

memory). This is likely to significantly effect an visibility based validation. Errors in this are likely to be far larger than the other observations you compare against.

— Page 4584 —

Line 21 - Change in to for

— Page 4585 —

Highlight (yellow), 27 Oct 2013 14:02: This is perhaps not surprising given that the ash has very different characteristics to the soil and will drain/dry differently - likely much more quickly. The better performance with no soil moisture I.e. Dry ash would seem to support this though there are many sources of uncertainty and approximation which make firm conclusion from one study hard. This issue was also discussed in Leadbetter et al

— Page 4586 —

Highlight (yellow), 27 Oct 2013 14:02: Is the WE scheme not essentially the same process adopted by Leadbetter? In Leadbetter they just use a unit release and then scale but the essential on/off link to a friction velocity is the same. I do not raise this to diminish what has been done here but rather to raise the fact that for these types of application the unknowns are large and varied and simple approaches are currently likely to be preferable. A situation that can only change with large empirical data set to validate against and/or more understanding specifically of ash deposition characteristics relevant to resuspension.

Figure 1 - axis labels and legend text likely to be small in final article.

Figure 3 - Ground station labels rather small

Figure 4 - individual plots are small

Figure 5 - axis text to small

Figure 7 - suggest making each image bigger

Figure 10 - different symbols on scatter plots hard to distinguish as to small.

Figure 11 - Would be nice to see the original 'moist soil' results plotted here as well.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 4565, 2013.