Nat. Hazards Earth Syst. Sci. Discuss., 1, C1740–C1745, 2013
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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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Received and published: 14 November 2013

We appreciate the positive and constructive review by P.Webley. Below we detail how the comments/suggestions have been addressed during the revision:

P3, Line 4 – what is meant by huge? This is in terms of area, or amount? Huge -> widespread P3, Line 8 – edit to change having to with Accepted P3, Line 16 – WRF-ARW needs to be defined as this is acronym and this is firstuse in the text Weather Research and Forecasting – Advanced Research WRF P3, Line 24 – do you have a reference to the concern to human health? The references Baxter (1999) and Wil-

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Interactive Discussion

Discussion Paper

son et al. (2012) have been added P4, Line 1 – did Baxter (1999) shows this or just describe it? If they just describedit then it would be better to say (see Baxter, 1999) Done P4, Line 2 – edit to say (see Guffanti et al., 2009) Done P4, Line 4 – needs a reference that re-suspended ash can be dispersed large distances Katmai volcano example is mentioned below, in the same paragraph P4, Line 6 – change to read (such as strong winds... Done P4, Line 6 – edit to read (such as low soil... Done P4, Line 7 – needs a reference to enhancement under both fresh and relic ashfallout deposits References are given below P4, Line 8 – edit to read 'example, favorable meteorological conditions occur during' Accepted P4, Line 9 – edit to read '2003, that caused continuous resuspension' Accepted P4, Line 14 – what is the country here for Patagonia? Patagonia -> Argentinean Patagonia P4, Line 15 – what is the country here for Patagonia? Patagonia -> Agrentinean Patagonia P4, Line 18 – edit to read 'decades, and gained heightened interest in the aftermath' Done P4, Line 19 – change to read 'aviation impacts following' Changed to civil aviation disruptions following... P4, Line 21 – these have been called volcanic ash transport and dispersion (VATD)models and TTDM is personal taste Done P5, Line 6 – NAME needs the full acronym as first used here in the text Numerical Atmospheric dispersion Modeling Environment P6, Line 3 – in the term considerable, how much? considerable -> unknown P6, Line 3 – edit to read 'uncertainty as NWP models' Done P6, Line 4 – edit to read 'deposits, which can substantially alter moisture' Done P7, Line 8 – who defined the wind friction velocity? Added reference (Greeley and Iversen, 1985) P7, Line 8 – what are the soil properties that the velocity depends on? Depends on physical properties of soil particles (size and density), P7, Line 10 – edit to read 'elements on the ground' Accepted P7, Line 11 – edit to read 'rocks or vegetation) Accepted P7, Line 12 – what do you mean with the term 'absorb part of the momentum of wind' Added "a global decrease of wind shear stress acting on the erodible surface" P7, Line 15 – edit to read 'Simple dust emission schemes' Accepted P7, Line 19 – make two sentences so it reads '0.01 mm h-1. The cut-off' Accepted P7, Line 21 – remove bracket as suggested to be two sentences Done P7, Line 24 – edit to read 'is expected at more distal locations. In order' Accepted

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P8, Line 8 – where in the text does the Iversen and White, 1982 reference too? Is it the densities and/or the diameters? Clarified P9, Line 12 – edit to read 'Note that particles in the range of 30-200?m are more likely suspended' Accepted P10, Line 13 – edit to read 'The simplest dust emission' Accepted P12, Line 10 – add in so reads 'In this study,' Accepted P13, Line 1 – edit the section title to read 'The 14 -18 October 2011 resuspension event' Accepted P13, Line 6 – do you have a reference to the winds blowing over Patagonia in the spring? Added references (Lässig et al., 1999) y (Peri et al., 2002) P13, Line 6 – edit to read 'The small villages spread sparsely across' Accepted P13, Line 8 – edit to read 'were heavily impacted by this' Accepted P13, Line 12 – do you have a reference to the wind speeds and gusts? Added: measured by Bariloche and Neuquén meteorological stations P13, Line 13 – what do you mean by huge ash cloud? Size or amount of ash? Huge -> widespread P13, Line 15 – do you have a reference to how the impacts occurred at a national level? Not really, impacts have been compiled from media and personal observations. No reference added. P13, Line 17 – add into the bracket that the location can be seen in Figure 2 Accepted P13, Line 18 – do you have references to the accidents? Again newspapers P13, Line 18 – I am not sure what you mean by 'disruption hardly harmed' Changed to "affected" P13, Line 21 – edit to read 'on the early morning of October 16' Accepted P13, Line 21 – also you will need to state what time zone you mean for early morning Added: around 10UTC-3 P13, Line 23 – do you have reference for blanketing of the city Added: as reported by the meterological station METARs P13, Line 26 – full name of EPA? US Environmental Protection Agency P13, Line 27 – full name of GCBA? GCBA ? Government of Buenos Aires P14, Line 3 – where are the two airport on Figure 2? Added: located in CABA P14, Line 4 – do you have a reference to the 146 flights cancelled? Newspapers, not added P14, Line 7 – do you have a reference for the operations not resuming until 17th? Newspapers P14, Line 8 – do you have a reference for 40 cancelled flights? Newspapers P14, Line 9 – do you have location for the 3 airports? Added: located in ... cities P14, Line 16 – you need full name for 4-D 4-dimensional P14, Line 16 – switch furnished with generated Accepted P14, Line 18 – remove 'along others' Ac-

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cepted P14, Line 19 – change so reads ‘capabilities resolve a’ Capabilities to resolve a P14, Line 19 – do you have reference for FALL3D-7.0? Added reference (Folch et al., 2013) a http://bsccase02.bsc.es/projects/fall3d/Downloads/fall3d- 7.0.pdf P15, Line 10 – edit to read ‘break upon grounding’ Accepted P15, Line 13 – edit to read ‘proximal deposit’ Accepted P15, Line 15 – include above sea level for height 10km a.s.l. P15, Line 16 – include above sea level for altitude 3km a.s.l. P15, Line 18 – include full name of SE Accepted P15, Line 18- who observed the deposition lobe in the field? Changed by: as observed in the field (see Collini et al., 2013), the main deposition lobe is directed southeast P16, Line 9 – do you think the results show a good agreement? What is the correlation? The predictions of WRF-ARWat station M13, far from the ash emission region, show also a good agreement with measurements except during 16 October afternoon, where differences of up to 4m/s exist ->The predictions of WRF-ARW at station M13 on CABA, show largest discrepancy during October 16 where differences of up to 4m/s exist, concurrently with the plume arrival at CABA. P16, Line 17 – in Figure add a vertical line for the event times as then it will be easier to read and interpret Figure 5a Accepted P16, Line 26 – add in above sea level to altitudes Added “above terrain” P16, Line 26 – edit to read (model layer thickness increase gradually in order to have finer resolution... Accepted P17, Line 2 – what is the significance of the 250m injection height? Sentence changed to “The ash emission schemes in FALL3D-7.0 assume that the resuspended ash distributes homogeneously along the vertical up to a maximum height fixed by the user (250m in our case)” P17, Line 5 – what is the significance of fixing the maximum size to 250 ?m? Sentence changed to “ but fixing the maximum size of particles that can be resuspended to 250 um.” P17, Line 10 – what is full name of CMAQ? Community Multiscale Air Quality (CMAQ) modeling system P17, Line 15 – here you have a list and need to include (1), (2), (3) and (4) for each of the items you list Accepted P17, Line 18 – no need to include the ‘etc’ Accepted P17, Line 19 – edit to read (see Table 1 for location information) Accepted P18, Line 17 – have GOES and NOAA been defined earlier? If not then they need the full names here Geostationary Operational Environmental Satellite National Oceanic and Atmospheric

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Administration P18, Line 21 – it is very hard to see the different parts of Figure 7. I have provided some input on how to make changes later on in the section on figures Accepted P18, Line 22 – you don't need to say this if you don't show it. Accepted (deleted) P18, Line 22 – edit to read 'The model predicts the formation and evolution of the cloud matching the satellite data, and shows how' Accepted P19, Line 1 – edit to read 'which was detected and reported by the VAAC' Accepted P19, Line 16 – include above ground level with the height Accepted P19, Line 16 – I am not sure what you mean by decoded information. Please edit this statement Change by: we used information of .... reported in .... P20, Line 6 – what does FH62 C14 mean? This is the model instrument identification P20, Line 8 – what do you mean 'stick'? To stick to ->To agree with P20, Line 11to 15 – why include this as you say at the end that you did not have enough good quality data. This can all be removed as it does not assist the analysis or conclusions drawn from the results. We include this to show that we tried to verify results by all the means availables P20, Line 16 – it is hard to read all 15 different graphs from the figure. I've made suggestions in the figures section on how to improve this. P20, Line 20 – re-order to say 'the model correctly predicts' Accepted P21, Line 3 – you say that the data matches to a factor of 2. This is a significant difference given that the data have small values in comparison to the difference factor. A factor of 2 when the value is 2 is a very significant difference between the data. We believe that the matching to a factor of 2 is a good agreement, considering that the comparisons were carried out with visibility measurements, then subject to human uncertainties. On the other hand, a factor 2 implies a relative error up to 100% and is independent of small value data. P21, Line 18 – edit to read 'In fact we also analyzed results using' Accepted P21, Line 18 – edit to read 'correction, and found this gives' Accepted Table 1 – edit the title to read 'Location and altitude information of the stations used for the ground observation comparisons. Meteorological...' Accepted Figure 1 – needs ? included in the x-axis. Also needs the full name for WE so that the caption can be read without needed to find the full name in the text Accepted Figure 2 – needs the full name of CCVC so that the caption can be read without need to find the full name in the text

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Accepted (Caption changed) Figure 3 – in the caption deposit load in kgm-2 Accepted Figure 4 – needs (a), (b) and (c) in the caption for the three sites Accepted (Labels format changed) Figure 5 – Good (Labels format changed, arrows added) Figure 6 – would be easier to read if the Date is only include once per day and spreads across the 24 hour period. Accepted Figure 7 – this needs to be split into separate figures as each part is too small as one figure. Really needs 5 figures one for each day. Figure will occupy an entire page Figure 8 – Each station information is too small and so very hard to read. Should besplit into maybe 3 figures, each with 5 stations. Then one will be able to read the data. Figure will occupy an entire page Figure 9 – needs some information to explain the significance of the points below or above the 1:1 line. Also some thought onto the larger variation with time the longer the model simulations occurs. At the top of the graph, there are times when the model is forecasting it too early and others too late. Any thoughts to this? (Labels format changed) Figure 10 – each of the different graphs are two small and it is hard to read the axes. Look at a way to make it easier to read. Figure 11 – Good (Labels format changed)

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