

## ***Interactive comment on “Lidar observation of the 2011 Puyehue-Cordón Caulle volcanic aerosols at Lauder, New Zealand” by K. Nakamae et al.***

### **Anonymous Referee #1**

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The authors present lidar observations of the Puyehue-Cordón-Caulle volcanic complex eruption in June 2011 performed over New Zealand, where the ash plume caused significant disruptions of air traffic. The paper is very well written, methods and explanations are absolutely appropriate for the task and it adds a lot of valuable information to the current knowledge about volcanic ash dispersal in the atmosphere. So I fully recommend publication as ACP paper. Having said this, I only have a couple of minor and/or technical comments to the manuscript.

p. 13466 l. 21: Please shortly introduce the volcanic explosivity index to readers who may not be familiar with this. Also indicate how the index is related to injection height.

p. 13467 l. 11: It might be worth mentioning, that also windshield abrasion and reduction

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of visibility and sight are volcanic hazards to aviation.

p. 13468 ll. 1ff.: Derivation of the tropopause height is a key element of this study. Nevertheless the authors do not explain how the tropopause height is determined (e.g. by temperature minimum, by windspeed maximum, by potential temperature slope, by potential vorticity,... There are a lot of definitions of "tropopause" out there). It would be good to add a short paragraph on this method here.

p. 13469 l. 14: I agree with the value of the lidar ratio, nevertheless the authors are encouraged to reference section 3.3 here in order to reduce confusion for the reader.

p. 13469 ll. 21ff.: Which radiative transfer model has been used for calculating the molecular backscatter coefficient?

p. 13470 ll. 4f.: A reference to nonspherical particles being related to positive delta would be appreciated.

p. 13472 ll. 16ff.: Do the authors have any explanation, why delta is significantly lower for the Eyjafjalla case compared to PCC? Might the reason be the different mineralogical composition (mid-ocean ridge volcano versus subduction zone volcano), the amount of ejected SO<sub>2</sub>/H<sub>2</sub>SO<sub>4</sub>, or anything else?

eq. (6): It would be good to shortly explain which assumption goes into this equation (as it is a strong simplification of the radiative transfer problem).

p. 13474 l. 1: A value of 13% AOD difference is quite a close coincidence given the uncertainties and simplifications. How does it relate to the lidar ratios discussed above (i.e. could the difference be explained by the spread of potential lidar ratios)?

p. 13474 l.2: How do the authors get the uncertainty of about 20% for the AOD from IBC? A short explanation would help understanding these numbers.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 13465, 2014.

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