

## ***Interactive comment on “Ship-borne lidar measurements showing the progression of the tropical reservoir of volcanic aerosol after the June 1991 Pinatubo eruption” by Juan-Carlos Antuña-Marrero et al.***

**Anonymous Referee #2**

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The paper discusses a very old shipborne lidar data set on stratospheric Pinatubo aerosol observations. The data were collected on two Russian research vessels almost 30 years ago, in July-September 1991 and in January-February 1992. The measurements were published in two papers (in GRL 1993).

Why do we now need another paper on this? This question needs to be answered more clearly! I did not get the point.

Now, in this publication, all 48 out of 48 and 11 out of 20 lidar measurement sessions

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are re-analyzed. Ok! But the question remains!

Minor revisions are needed.

Details:

Abstract ... formation of an associated cirrus cloud. ... This hypothesis on the role of the volcanic particles on cirrus crystal nucleation ... is based on what? ... Are the ash particles favorable INPs? ... or were the sulfuric acid particles responsible for ice nucleation? Sulfuric acid leads to homogeneous ice nucleation. All this remains speculative.

Table 1: Both lidars had a huge receiver mirror (110 cm diameter of the primary mirror). What motivated the Russians to have such big lidars on both ships...? This is just a question! You do not have to answer that in the paper.

Lines 95-96: These personal notes sound strange in a paper... I would avoid ... to mention Prof. Keckhut and ... PhD dissertation of the lead author... Is that information really worthwhile to be mentioned?

Line 118: Did you use CIRA-86 atmospheric profiles here in the re-analysis? I hope not. You probably used 'modern' GDAS or ERA-Interim reanalysis data or ECMWF profiles, I hope?

Line 124: You did not use Russel et al., 1979, right? You used the Fernald (1984) procedure, I hope! Otherwise you have to repeat the re-analysis by using the Fernald (1984) approach.

Line 131: The question on the lidar ratio of 25 sr for 539 or 589 nm... Please have a look into the article of Jäger and Deshler (correction paper, GRL 2003). I think, 25 sr is ok for the first phase after the eruption. And later on the lidar ratio increased with decreasing mean or effective size of the sulfuric acid droplets.

Jäger, H. and Deshler, T.: Lidar backscatter to extinction, mass and area conversions

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for stratospheric aerosols based on mid-latitude balloon-borne size distribution measurements, *Geophys. Res. Lett.*, 29, 1929, doi:10.1029/2002GL015609, 2002.

Jäger, H. and Deshler, T.: Correction to "Lidar backscatter to extinction, mass and area conversions for stratospheric aerosols based on midlatitude balloonborne size distribution measurements", *Geophys. Res. Lett.*, 30, 1382, doi:10.1029/2003GL017189, 2003.

Line 148-155: If there is agreement, why do you then publish the observations again? I did not get the point.

Figure 1: Would be nice to have an x-axis also in terms of latitude... You need to explain all shown features in the figure caption. To have the explanation in the main text body is not sufficient. The white line... shows what? The color scale is quite poor.

Line 164: Please avoid any speculation. You need a convincing argumentation when it comes to the point: volcanic influence on cirrus. Even Ken Sassen's paper (*Science*, 1992?) could not explain it. And offered just speculative arguments.

Line 176: day 250 is probably 8 September ... and not 8 August...

Line 184... alpha increased... not decreased...

Line 190: Cirrus and volcanic liquid particles ... Even if the volcanic particles would have had an influence on cirrus development, it would be homogeneous freezing, because there is no solid phase... and thus there is no chance to distinguish that from the influence of background sulfate particles.

Line 194... so if there are only a few cirrus clouds in the volcanic layers... the link to volcanic aerosol is not very solid... And meteorological conditions (midlatitudes vs tropics) play a role as well...

Figure 2: please explain Ho, Hf, UTS, UT, S in the caption... It is just one sentence...

Figure 3: similar to Figure 2...

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Figure 4 results. Are there other tropical lidar observations for comparison? Hawaii lidar observations, maybe?

Figure 4 top: ...Heitgh...

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