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eEarth Discussions

Interactive comment on "Impact vesiculation – a new trigger for volcanic bubble growth and degassing" *by* D. A. Rothery et al.

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The authors have identified a novel idea, and one that should have occurred to me the last time I dropped a bottle of beer. It is certainly worth brining this notion out into the ‘‘public eye" in eEarth. The ms reads well, and leads the reader to its logical conclusion. There are several points that could be improved, and a few key issues that should be addressed or otherwise explored to make their argument more convincing to the skeptic.

The last sentence of the abstract is too long, so the reader can get lost during this critically important point. Expand this into however many sentences it requires to make the point strongly.

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Interactive Discussion
Discussion Paper

Pg 1. The beer analogy gives me cause to do some testing at the local pub, but there is a basic difference that should be mentioned. Beer is impacted (shaken) first, and THEN decompressed by the unsuspecting thirsty person. Magma is always decompressed first, and THEN impacted. This would make a fundamental difference in terms of supersaturation and nucleation, that should be investigated, or at least mentioned in the paper. It is indeed an entire research project and potential future publication to explore this sequencing issue in detail, but for now, at least the reader should be made aware.

Replace ‘‘a commonplace observation” with ‘‘common knowledge”

Pg. 2 Did Walker, 1989 know that size characteristics resulted from coalescence in a static lava? I suspect not, and that this is inferred from more recent size distribution analyses such as Proussevitch and several others.

Pg. 3 Rarefaction pulse causes nucleation? The size distribution should be able to identify late stage nucleation - see 2 above.

Pg. 3 In magma... This section is unclear What do you mean?

Pg. 3 Cavitation of fluids... is irrelevant. delete.

Hurwitz spelling

A series of experiment THAT HAVE demonstrated

pg 4. ... eventually and rapidly... ??? I know what you mean here but, it sounds a bit odd. It doesn’t happen for a while, but when it does, it goes fast.

P 4 bottom. Drop a heavy steel cylinder on the sample resulting in powder and pulverizing it to tiny fragments? Why not just run it over with a steam roller if you want to destroy the sample? Perhaps this was more ‘‘impact” than necessary?

Pg. 5 middle. Delete ‘‘However”. This paragraph raises the question- ‘‘Do bombs have more/bigger vesicles on the side that hits the ground, as this is where the greatest

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shock is felt?" Viscous dissipation should reduce the impact elsewhere due to deformation of the bomb (and sometimes spatter accumulation).

Pg 4 bottom. This is perhaps a most important point. If the rind is solid so does not nucleate impact bubbles, then you should expect the concentration of dissolved water in glass to be higher in the rind than in the interior. Is this observed? Did you look? This would be a real clincher for your argument.

pg 6 top. 5 bubbles? 24 bubbles? These are not statistically significant numbers. Hopefully these are just examples of ratios that represent many more bubbles? It would be risky to make conclusions based on a handful of bubbles. Please clarify or explain why you don't need greater numbers of bubbles.

Pg 7 middle. ''Further studies..." Such as comparing glass water content in the rind vs. interior? I should think that such a fundamental test would be something to include in THIS paper.

Appendix A. Unnecessary. Just delete it.

Fig 2 needs a scale bar, as does Fig 3.

Fig 4 is where the action is. There are two observations that scream out for discussion. The first is that there is a clear minimum around 10 mm in. You should argue that this minimum is where impact-induced bubbles could not grow much because they are adjacent to the chilling rind. It would strengthen the argument. HOWVER, the second is in the interior. Why are there no large vesicles in the interior? If the large ones preserved in the rind were from conduit or even magma chamber times, then they should also appear in the interior. Are these large rind bubbles actually a product of very late stage growth during solidification of the rind, thus making a high confining pressure in the interior so that previously nucleated bubbles could not grow? I doubt it (as would the reader, I suspect). So what is one left to think about the fact that large bubbles only appear in the rind? This seems to be the first-order observation

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that needs explanation even more that the lack of small ones in the rind, or which the impact mechanism is proposed. This is not treated in the text, but should be, as it cannot escape the notice of anyone who see fig 4.

In general, this is a fun paper, and one I would like to see in eEarth. If these points of clarification can be addressed, it would strengthen the argument, and if figure 4 can be explained, it would be a fabulous contribution, turning the heads of many. I recommend publication after addressing as many of the above points as possible.

I would be happy to speak with the authors about the ms at any time.

-Dork Sahagian

Interactive comment on eEarth Discuss., 2, 151, 2007.