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Report of Petr Broz thesis: Small-scale volcanoes on Mars

I have read the thesis presented by Petr Broz. Chapters 2, 3, 4, and 5 are based on papers published in peer-reviewed journals with high impact factors. Chapter 6 is a paper of similar quality submitted in June. I expect that to be accepted for publication with no more than the usual amount of changes

Chapter 1 is an introduction, chapter 7 draws some overall conclusions, and chapter 8 (which is very brief) looks to the future. These papers for chapters 2-6 all have co-authors, but Broz is the first author on each one. This is evidence of a mature approach to collaborative working, and I am satisfied that Broz's description (page iv) of the shared work is correct and that sufficient of the thesis is his own work. As a whole, these papers provide evidence that Mars experienced widespread, though small scale, explosive volcanic activity into at least Hesperian times, that is some cases is not related to the recognised large volcanic provinces on Mars. Chapter 8 suggests that it would be worth looking for small volcanic edifices in other parts of Mars too. It also notes that small scale edifices can help us to understand ancient environmental conditions on Mars.

One topic that I did not find clearly discussed, and which I would like Broz to elaborate on during his defence, is the scaling for Mars gravity and low atmospheric pressure that enables martian scoria cones to be more extensive (large diameter) but shallower sloped than terrestrial examples (chapter 5), whereas the features interpreted as hydrovolcanic edifices, such as tuff rings (chapter 3) although larger on Mars, have (crater diameter)/(cone diameter) ratios the same as on Earth. Is this a consequence of the involvement of water? The final paragraph of chapter 7 says something on this topic. I would have liked a fuller discussion here, although I think it would be unreasonable to demand it as a requirement of being awarded a PhD.

The standard of English is very good. I noted only a few mis-spellings.

In summary, the work assembled in this thesis represents significant advances in our knowledge of Mars. Subject to satisfactory defence, the candidate deserves to be awarded a PhD.

Yours faithfully,

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Professor of Planetary Geosciences