

## ***Interactive comment on “Evolution of a long-lived continental arc: a geochemical approach (Arequipa Batholith, Southern Peru)” by Sophie Demouy et al.***

### **Anonymous Referee #2**

Received and published: 4 June 2019

Please see annotated manuscript (attached).

Comments on Ms se-2019-43 by Demouy et al. This paper presents a large amount of welcome data on an important batholith that is not as well-known as it should be. There is nothing particularly surprising in the data or their discussion of it, but it still deserves to be published, and with significant shortening and revision it could be an excellent paper. The manuscript is way too long. There is extensive recounting of features that are common to nearly all subduction-related batholiths, and no need to go over that again here. Manuscript should be cut to about half its present length—easy to do if mundane observations are cut out and unit descriptions are relegated to a ta-

C1

ble. Figures need significant work—map is too small and muddy (patterns); legends on many are not helpful, but there is plenty of white space to put a meaningful legend in. The amphibole barometry is quite problematic—see comments below—and unfortunately these data form a significant part of their conclusions. All in all, I recommend significant shortening so that the new contributions and interpretations will be highlighted. As the manuscript is now, the good stuff is buried under the weight of all the mundane observations and acronyms. I think that a shortened, tightened-up manuscript would be a worthy contribution. There are minor problems with English (capitalization, word usage, etc.) throughout—I marked up many of these but stopped after several pages. Numbered comments keyed to manuscript 1. The proportion of magma that reaches the surface vs. being frozen as plutons is an important question, but just saying it is “small” and citing White’s paper is insufficient. There is great disagreement about this. Just cut this as it is unimportant to your paper. 2. Too many references here; cut to perhaps 3. 3. There are way, Way, WAY too many acronyms! I’m on page 3 and already have hit HFE, AFC, MASH and CAO. AFC and MASH are not defined, and CAO is defined twice. Later we hit LFS, GDU, TU, LU (and that’s only on page 4); all are defined at least three times. Please! This makes the paper extremely difficult to read—it is in code. 4. “basaltic and granitic dykes”—I know what you mean, but if you’re using a plutonic term for one you should be consistent and use one for the other. 5. Petrography section is (1) mundane (just like every other subduction-related batholith), (2) boring as it is just recounting mundane data. Please put this in a table and point out anything unusual or noteworthy in a short paragraph. (note that here you use units for which you have defined acronyms, but don’t use the acronyms) 6. Entire amphibole thermobarometry section is problematic and probably should be cut. Specific problems: a) I cannot find any reference to how these were determined—what calibrations you used, etc. b) In my experience probing amphiboles there is a LOT of variability within single crystals, going all the way down to actinolite, but you don’t talk about this or how you deal with it. It looks like Appendix B has a lot of point analyses(?) of single samples—you should average them instead of plotting

C2

the smears on Figure 4. The positive slopes on that figure are correlated error, not real variability. c) Your figure 3 shows a lot of variability, but curiously you do not plot Al, which is key. d) What do these temperatures mean? The rock was formed at some T, intruded at another, and then cooled to surface Ts. How do you interpret them? e) As far as I know the Ps you get are well below the calibration ranges of various methods, and most people don't take such low-Al Ps seriously. 7. Your major-element data look just like so, so many other batholiths. AFM diagrams are archaic and all continental rocks (almost) look like your Fig 5b—cut it. Your rocks are metaluminous—you can just say that and not waste a figure on it. I would prefer to see selected oxide-oxide plots (e.g., MgO, Al<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O vs. SiO<sub>2</sub>) than a TAS plot, which serves little purpose but hides variability by combining oxides. 8. La/Sm ratios mean little to most geochemists, so don't put the numbers in the text—we can see the patterns on the figure. And are these normalized or not normalized? Regardless, each [(La/Sm) = 1.4-4.4] is a speed bump that the reader has to negotiate, and after a few of them, they give up. 9. What do you mean by “enriched” here? 10. Discussion of the Sr data is muddled by plotting measured ratios and then talking about errorchrons and isochrons. Just reduce your data to your best estimate of a sample's age and say what those ages are. Fig. 7 is difficult to interpret because the numbers are not age-corrected. 11. Section 7.1 on vertical movements is based on the problematic P estimates discussed above. I certainly would not try to interpret scattered and out-of-calibration data such as that. Comments on figures 1. Fig. 1 has color, but you rely on patterns as well. Patterns are very difficult for the eye to deal with, and your map looks very muddy. Just use color. 2. Fig. 1 text is way too small. 3. Fig. 2 adds very little and should be cut. 4. On Figs. 3 and 4 you have plenty of room (white space) to label things, but you have tiny symbols coded by color and shape, then one has to go to the legend to find a bunch of

sample names (meaningless to the reader) and a sideways acronym, and then they have to go to the caption to decode the acronyms. Please put meaningful legends on the figures. 5. On Fig. 9 you use <sup>143</sup>Nd/<sup>144</sup>Nd on one, and eNd on the other. This is unnecessarily complicated. Comments on supplement I got an alert about macros

C3

wanting to update, and one or two of the spreadsheets gave circular reference errors.

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2019-43/se-2019-43-RC2-supplement.pdf>

---

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-43>, 2019.

C4