

Interactive comment on “Resolving the timescales of magmatic and hydrothermal processes associated with porphyry deposit formation using zircon U-Pb petrochronology” by Simon J. E. Large et al.

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I apologize for the lateness of this review, and hope that it will still be of use.

The CA-ID-TIMS dataset presented by Large et al. is impressive, and contributes significantly to our understanding of the timescale and tempo of economically significant porphyry associated magmatism. The reported analytical precision is excellent for grains of this young age, and the analytical techniques suggest confidence that this precision is backed up by equivalent accuracy. Among other points, the CL imaging

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and in-situ geochemical characterization of each dated grain is to be applauded.

My main point of discussion involves the use of single "oldest" and "youngest" zircons to constrain the duration of zircon crystallization and metal precipitation. For the particular regime the authors are working in ($N \sim 15$, apparent $\Delta t \sim 10-20\sigma$), the competing effects of undersampling and analytical dispersion likely mostly cancel. On such a basis, the authors could perhaps argue to continue with this approach if they wish. However, "oldest/youngest zircon" is still not inherently statistically robust. One general solution (to which I am obviously biased) would be that of doi:10.7185/geochemlet.1826 (if you go this route, I would probably suggest a uniform \vec{f}_{xtal}) – but my own work is certainly not the only option here. As I understand it, Pieter Vermeesch also has a perfectly workable analytical minimum age calculator (effectively based on an assumption of a truncated normal \vec{f}_{xtal}) in IsoplotR. In either case, it will not materially affect the major conclusions of the study.

While I can see the previous reviewer's point that the in-situ data could be cut since they are so imprecise, it also seems that this data is critical proof of the authors' claim that, at the very least for the Batu Hijau porphyry-Cu-Au deposit, "geologically rapid events or processes or the tempo of magma evolution are too fast to be reliably resolved by in-situ U-Pb geochronology and require ID-TIMS geochronology." Consequently, I would leave it up to the authors which way they wish to proceed on this front.

52-63: This may be somewhat overoptimistic; there is a substantial literature on hydrothermal alteration of zircon in both lab and field contexts. "Resistant" might be more accurate.

553: "petrochronological"

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