Forum Comment

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Differentiated impact melt sheets may be a potential source of Hadean detrital zircon

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Kenny et al.'s (2016) ion microprobe zircon crystallization temperature data for the Sudbury impact crater adds to the existing database (Wielicki et al., 2012) for terrestrial impact melts. They note that zircons from the granophyre layer had not previously been analyzed by ion microprobe commensurate with its volumetric importance (20%–45%; Lightfoot et al., 1997) potentially biasing its comparator value when evaluating possible sources for the Hadean Jack Hills zircon population. However, the authors neglected to quantify the degree to which their data set further constrains this issue. Using data from their GSA Data Repository item 2016143, we tested the hypothesis that variants of the impact zircon record (as determined solely from ion microprobe data; Wielicki et al., 2012; Kenny et al., 2016) represent the same probability distribution (i.e., the null hypothesis) as the Hadean population (Harrison and Schmitt, 2007) through a Kolmogorov-Smirnov test (R Core Team, 2013). We reject the null hypothesis for both the case that the Kenny et al. data alone represent the Hadean population ($p = 2 \times 10^{-6}$), and that for all reported impact zircons ($p < 2 \times 10^{-16}$; Wielicki et al., 2012; Kenny et al., 2016). In fact, the hypothesis that the granophyre data alone are equivalent to the Hadean population can be rejected ($p = 4 \times 10^{-3}$).

Taken at face value, these results appear to support the conclusion of Wielicki et al. (2012) that the Hadean Jack Hills zircon temperature distribution was not derived in any significant way from impact-derived zircons. However, Kenny et al. raise the prospect of a selection process preferentially destroying high-temperature Hadean zircons and thus biasing the detrital record to lower temperatures. In fact, nature does tend to bias the detrital zircon record, but that mechanism operates in exactly the opposite sense. Late crystallizing, thus low-temperature, granitoid zircons are known to contain elevated U and Th concentrations which lead to metamictization (Claiborne et al., 2010) and thus their likely removal from the detrital record, resulting in preferential preservation of higher-temperature zircons (Harrison and Schmitt, 2007). Thus, without the benefit of some as yet unknown selection mechanism, the probability of extracting the Hadean Ti-in-zircon temperature distribution from the data reported by Kenny et al., or any published data set of impact-produced zircons, remains vanishingly small.

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