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## How many grains do we need for tracer thermochronology?

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Detrital tracer thermochronology exploits the relationship between bedrock thermochronometric ages and elevation to study spatial variations of upstream erosion from the distribution of detrital grain ages. If ages increase linearly with elevation and analytical uncertainties are negligible, spatially uniform erosion is expected to yield a detrital age distribution that mirrors the catchment's hypsometric curve. Alternatively, a mismatch between detrital and hypsometric distributions may indicate non-uniform erosion within a catchment. For studies of this sort, measured age populations rarely exceed 100 grains, because applying thermochronology is time consuming and expensive. With such limited sample sizes, discerning between two detrital age distributions produced by different catchment erosion scenarios may be statistically impossible with high confidence. However, there is no established method to quantify the sample-size-dependent uncertainty inherent to detrital tracer thermochronology. Here, we investigate how sample size affects the uncertainty of detrital age distributions and how such uncertainty affects the ability to uniquely infer the erosional pattern of the upstream area. We developed a new tool to consistently report confidence levels as a function of sample size and case-specific variables. The proposed tool will be made available as open-source script along with test data. Testing the hypothesized erosion scenarios will help tracer thermochronologists define the minimum sample size (i.e. number of grain ages) to answer their specific scientific question with high level of statistical confidence. Alternatively, in cases of unavoidable small sample size, the related confidence level can be quantified.