

HEAD IN THE SAND? AN INTER-LABORATORY COMPARISON ON DETRITAL ZIRCON AGE SPECTRA REPRODUCIBILITY

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Detrital zircon (DZ) U-Pb geochronology is the gold standard in single-grain sedimentary provenance analysis (>58,000 results on Google Scholar) and is applied to tackle a wide array of geoscientific questions. In the past two decades, broader instrument availability and technological advances have led to increasing numbers of DZ analyses per study; thereby heralding the age of “big data” in detrital geochronology. To digest these larger datasets and to evaluate inter-sample relationships, many authors employ computational and statistical techniques that are sensitive to both the presence and the relative abundance of DZ age components. The results of such techniques often provide a framework for geological interpretations. At the same time, it is common practice to contextualize original data with literature data (e.g., to quantitatively compare different sedimentary units). However, DZ data originating from different laboratories are usually generated using distinct workflows. Importantly, some methodological steps during sample handling are known to potentially bias relative abundances of DZ age components (e.g., selection bias during handpicking). In turn, comparing data collected under variable circumstances can influence the results of computational or statistical techniques and hence, may result in flawed results and invalid interpretations. Yet, there is no community-wide study that has estimated the extent of sampling bias in natural samples originating from the methodological discrepancies. We propose such a study and are inviting contributors. Specifically, we are distributing heavy mineral and zircon concentrates to contributors, who are asked to conduct DZ geochronology using their established workflows. Consequently, contributors are expected to report results and methodological details for evaluation for anonymised collaborative publication. We aim to conduct a comprehensive assessment with a focus on understanding controls of intra-sample variability in the context of the various sample handling techniques. Ultimately, quantifying the degree of intra-sample variability introduced by different approaches, is expected to strengthen the robustness of future DZ studies (e.g., by providing empirical guidelines on handling data generated in different laboratories).

Key words: detrital zircon U-Pb geochronology, inter-laboratory comparison, sampling bias, sedimentary provenance analysis, round robin