A LITERATURE COMPILATION OF DETRITAL ZIRCON AGE DISTRIBUTIONS: METHODOLOGICAL AND GEOCHRONOLOGICAL IMPLICATIONS OF DATED GRAINS

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A literature survey of detrital zircon data was conducted in order to assess controls on age spectra through analysis of statistical parameters (skewness, kurtosis, mean, standard deviation, and other related variables) of zircon samples. Crossplots of statistical parameters can also be used to test for differences in age spectra among various tectonic settings and through time.

Estimates of depositional ages based on the youngest zircon grain in a sample are often reported in the literature. Plots of the best estimate of stratigraphic age of the unit versus youngest zircon grain age illustrate that this technique generates mixed results: active margin systems tend to be better constrained by youngest zircons, whereas passive margins are poorly constrained. This trend likely reflects greater input of recycled zircons into passive margin sediments and greater input of magmatic zircons into active margin sediments. Archean and Proterozoic units are more commonly underestimated than Phanerozoic units, reflecting the difficulty in utilizing other radiometric or biostratigraphic data to constrain unit ages. Mean residuals (youngest zircon grain minus best estimate of unit stratigraphic age), plotted against sample size, suggest that for both active and passive margin systems the errors plateau out at samples sizes between 50 and 60 zircons. This suggests that in order to use the age spectra of zircons as reliable geochronological tool a minimum of 50 to 60 zircon grains needs to be dated.

Rift basins and arc settings exhibit symmetric to right-skewed distributions, suggesting greater input of zircons from one or two young point sources. Foreland basins and passive margins exhibit symmetric to left-skewed distributions suggesting input from multiple point sources (recycling of older sediments). Archean and Proterozoic units for any tectonic setting have age spectra with lower standard deviations and ranges than Phanerozoic units, most likely due to a boundary limit imposed by the age of the Earth.

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