

North American and Global Patterns in the Detrital Zircon Database

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A meta-analysis compilation of detrital zircons has been constructed over the past four years by the Virginia Tech Geosciences Sedimentary Geology Group. The data set includes approximately 200,000 individually dated detrital zircon grains cited in peer-reviewed literature. Initial work with the database included statistical analysis of sample size issues and characterization of the error in estimating stratigraphic age of host sediments from detrital zircon age dates (Voice et al. 2006; 2008). This abstract presents new data based on analysis of histograms of the entire dataset from individual continents and from different tectonic settings.

A "Global Age Spectrum" constructed from the data set exhibits prominent peaks at 3.5-3.4 Ga, 2.7-2.5 Ga, 2.0-1.7 Ga, 1.2-1.0 Ga, 0.7-0.5 Ga and 0.2-0.1 Ga. Chronologically these peaks match closely those recorded by magmatic zircons (Condie, 1989), although the younger peaks are not as intense in the magmatic zircon record. The presence of distinct peaks suggests that continental crustal generation was episodic. In addition, associated Hf isotope model ages and Th-Pb ages exhibit similar peak structure. The Hf isotope record on average is offset from the U-Pb record by ~500 Ma.

Construction of histograms for each of the seven continents shows that the major peaks observed in the global age spectrum, with the exception of the 0.2-0.1 Ga and 3.5-3.4 Ga peaks, are present on all continents. Histograms for four sets of tectonic settings (rifts, passive margins, foreland basins, and arc settings) from the entire database, illustrate the same set of peaks observed in the global age spectrum in all four settings. Detrital zircons from modern sediments (fluvial, eolian and paralic deposits) exhibit the younger four peaks.

In addition, individual continental age spectra can be used as reference blocks for comparison with age spectra analyzed in the future. This will provide a valuable tool for basin analysis and provenance studies. To test this, published detrital zircon data from the east coast of North America will be contrasted with the North American spectrum and the global spectrum.

Global and Continental age spectra provide a means of understanding sediment recycling patterns. This detrital zircon dataset suggests that regardless of tectonic setting or geographic location, sedimentary systems preserve a record of continental crustal growth.