Decipher a multi-event in a non-complex set of detrital zircon U/Pb ages

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The determination of U-Pb ages from detrital zircons of sedimentary rocks using LA-ICP-MS has been widely used to develop studies of provenance analysis. A problem that frequently arises is to find a population that appears to be non-complex despite of several perceptible age peaks in their spectrum. These peaks are qualitatively defined through diagrams of relative probability – PDF, but difficult to quantify their statistical significance relative to a zircon forming multi-event. As so, can we decipher and characterize a multi-event in a non-complex set of detrital zircon U/Pb ages?

This work is an attempt to answer the above question by means of a statistical analysis. The objectives are: a) to determine the most appropriate minimum number of zircon age populations (peaks), b) to characterize each peak in terms of age and event duration; c) to compare results obtained for two datasets showing similar zircon ages. The process starts by a cluster analysis aiming to group zircon ages into a set of consistent clusters. A Gaussian kernel function is then fitted to each cluster and summed up to obtain a theoretical PDF. At the end of the process, the best modeled PDF must coincide with the original PDF in >=95%, and the deciphered peaks can be characterized.

Keywords: Detrital zircon data, population, peaks, comparions of datasets, Gaussian kernel function.