

A rapid retrodeformational method for strain estimation from randomly oriented elliptical markers

Ashok Kumar¹, Vipul Rastogi² & Deepak Chandra Srivastava¹

¹Department of Earth Sciences, IIT Roorkee, Roorkee 247667(India) (2006ak@gmail.com).

² Department of Physics, IIT Roorkee, Roorkee 247667(India).

Strain estimation from distorted elliptical markers is considered tedious due to a large number of steps in data extraction from natural samples and subsequent steps in the data analysis. This article presents a brief review of the existing techniques and proposes a more direct and rapid method for data extraction and, a retrodeformational method for strain estimation. Without using any digitization, the method directly fits ellipses on the image of distorted markers with the help of any readily available computer-graphics software and uses a simple MATLAB code for progressive retrodeformation of the distorted ellipses. While retrodeforming the sample progressively, it identifies the optimal stage as the one at which the standard deviation of retrodeformed ellipses is minimum. The total amount of retrodeformational strain up to the optimal stage represents finite strain in the given sample. Tests on several computer-simulated examples and a natural example of 222 distorted ooids validate the efficacy of the method.

The method can be applied irrespective of the fact whether the distorted elliptical markers bear or lack any evidence for inferring the principal strain directions. In the latter case, the method searches rather than assumes the maximum principal strain direction by testing a large number of possible orientations and using the minimum standard deviation algorithm. The execution of program is quick and user-friendly. By hitting any key successively, the user obtains an animation of retrodeformation, the restored image of undistorted markers along with its graphical representation and, the two-dimensional finite strain in the given sample.