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Fry strain methodology: some constraints concerning initial point distributions

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The Fry method, either in the classical (Fry, 1979) or in the normalized (Erslev, 1988) approaches, is widely used in order to estimate the finite strain of tectonites. Indeed it is easy to use and can be applied to a wide range of rocks (e.g. conglomerates, quartzites, gneisses and ironstones) and strain markers (e.g. pebbles, quartz grains, phenocrysts, oolites and Skolithos sections). However, the application of this method could only be used in the absence of sedimentary fabrics and for anti-clustered point distribution. Nevertheless, there is not an objective criterion in order to control the initial fabrics, leading to a general application of the method without any test of material suitability.

In this work we use simulated initial fabrics and deformations to investigate how the ratio between the areas of the strain markers versus the matrix (R_{PM}) influences the degree of anti-clustered distribution; in fact, for very low ratios, it should be expected a spatial random distribution of the strain markers centers, a situation that make impossible the use of Fry method.

16 undeformed fabrics have been simulated with a random orientation of the elliptical particles representing the strain markers, which are uniformly distributed and have R_{PM} ranging from 0.3% to 88,9%. These fabrics were latter deformed by homogeneous pure shear (Rs from 1.2 to 2.0 with 0.2 increments) and simple shear (with shear angles from 15º to 75º with 15º increments). The finite strain of these deformed fabrics has been estimated using normalized Fry method (Erslev, 1988). The difference between the applied strains and the calculated ones were done either to the strain ellipse axial ratio (Rs) or its orientation could be used as an indication of the possibility to apply Fry method to access the finite strain of the original undeformed fabrics. The results indicates that for R_{PM} bellow 15% the estimated strain, mainly in what concern strain ellipse orientation, is not consistent and so the method could not be used. Indeed, for such a low ratios the center distribution of the strain markers is not anti-clustered, one of the original theoretical assumptions of the method.

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