Northeastern Section - 53rd Annual Meeting - 2018

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Presentation Time: 8:00 AM-12:00 PM

AN OBJECTIVE APPROACH TO THE QUANTIFICATION OF STRAIN IN THREE-DIMENSIONS WITH CONSIDERATION OF ERROR ASSESSMENT

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The quantification of strain in three-dimensions is a powerful tool for structural investigations, allowing for the direct consideration of the localization and delocalization of deformation in space, and potentially, in time. Furthermore, characterization of the distribution of strain in three-dimensions may yield information concerning large-scale kinematics that may not be obtained through the traditional use of asymmetric fabrics. In this contribution, we present a streamlined methodology for the calculation of three-dimensional strain using objective approaches that allow for consideration of error assessment. This approach begins with the collection of suitable samples for strain analysis following either the Rf/ϕ or normalized Fry techniques. Samples are cut along three mutually perpendicular orientations using a set of jigs designed for use in a large oil saw. Cut faces are polished and scanned in high resolution. Scanned images are processed following a standard convention. The boundaries of objects are outlined as "Regions Of Interest" in the open-source program ImageJ and saved. A script reads the saved files of object outlines and statistically fits an ellipse to each digitized object. The parameters of fitted objects are then extracted and saved. Two-dimensional strain analyses are completed following the normalized Fry method or the Rf/ϕ technique following a bootstrap statistical approach. For the normalized Fry method, an objective fitting routine modified from Mulchrone (2013) is used to determine the parameters of the central void. For the Rf/ϕ method, an inverse straining routine is applied and tests the resulting object orientations to a random uniform distribution following a Kolmogorov–Smirnov test in order to obtain the sectional strain ratio and orientation. Bootstrap sampling of Fry coordinates or objects results in a distribution of possible sectional strains that can be sampled for fitting of strain ellipsoids following the technique of Robin (2002). As such, the parameters of three-dimensional strain including Lode parameter and octahedral shear strain can be contoured based on confidence intervals for each sample processed. The application of the objective approach is presented in a corresponding poster.

Session No. 7--Booth# 5

T23. Application of Strain, Fabric, and Textural Analyses to Ductile Fabrics in Investigations of Orogenic Processes (Posters)
Sunday, 18 March 2018: 8:00 AM-12:00 PM

Lake Champlain Exhibition Hall (DoubleTree by Hilton)