2010 Fall Meeting
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Cite abstracts as **Author(s) (2010), Title, Abstract xxxxx-xxxx presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.**

Your query was:
**vollmer**

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HR: 0800h
AN: **T21B-2166 *Poster***
TI: A Comparison of Ellipse-Fitting Techniques for Two and Three-Dimensional Strain Analysis, and Their Implementation in an Integrated Computer Program Designed for Field-Based Studies
AU: ***Vollmer, F W**
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AF: *Geological Sciences, SUNY New Paltz, New Paltz, NY, USA*
AB: A new computer program, EllipseFit 2, was developed to implement computational and graphical techniques for two and three-dimensional geological finite strain analysis. The program includes an integrated set of routines to derive three-dimensional strain from oriented digital photographs, with a graphical interface suitable for field-based structural studies. The intuitive interface and multi-platform deployment make it useful for structural geology teaching laboratories as well (the program is free). Images of oriented sections are digitized using center-point, five-point ellipse, or n-point polygon moment-equivalent ellipse fitting. The latter allows strain calculation from irregular polygons with sub-pixel accuracy (Steger, 1996; Mulchrone and Choudhury, 2004). Graphical strain ellipse techniques include center-to-center methods (Fry, 1979; Erslev, 1988; Erslev and Ge, 1990), with manual and automatic n-point ellipse-fitting. Graphical displays include axial length graphs, Rf/Φ graphs (Dunnet, 1969), logarithmic and hyperbolic polar graphs (Elliott, 1970; Wheeler, 1984) with automatic contouring, and strain maps. Best-fit ellipse calculations include harmonic and circular means, and eigenvalue (Shimamoto and Ikeda, 1976) and mean radial length (Mulchrone et al., 2003) shape-matrix calculations. Shape-matrix error analysis is done analytically (Mulchrone, 2005) and using bootstrap techniques (Efron, 1979). The initial data set can be unstrained to check variation in the calculated pre-strain fabric. Fitting of ellipse-section data to a best-fit ellipsoid (b*) is done using the shape-matrix technique of Shan (2008). Error analysis is done by calculating the section ellipses of b*, and comparing the misfits between calculated and observed section ellipses. Graphical displays of ellipsoid data include axial-ratio (Flinn, 1962) and octahedral strain magnitude (Hossack, 1968) graphs. Calculations were done to test and compare computational techniques. For two-dimensional best-fit ellipses, eigenvalue and mean radial length shape-matrix calculations give identical results, and bootstrap error analysis using 1000 resamples indicates identical errors. The analytical calculation for the mean radial length is very close to the bootstrap analysis. To test the implementation of the ellipse-section fitting method of Shan (2008), b* was calculated from a set of sectional data from Owens (1984), along with the individual section-ellipse misfits. The calculated section-ellipses were used to calculate a new best-fit ellipsoid (b**). The resulting section-ellipses has zero misfit between the b** and b* section-ellipses. This data set was also used to compare Shan's method with ellipse-section fitting methods of Owens (1984), and Robin

(2002; Launeau and Robin 2005), the results calculated here (stretch, trend, plunge: 2.565, 035.0°, 10.9°; 1.131, 127.4°, 12.2°; 0.345, 264.4°, 73.5°) are similar to theirs.

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SC: Tectonophysics (T)
MN: 2010 Fall Meeting

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