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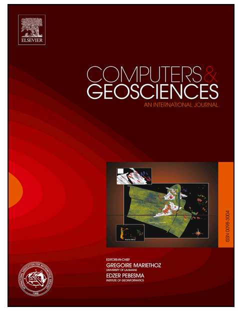

Automatic contouring of geologic fabric and finite strain data on the unit hyperboloid

Frederick W. Vollmer

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Automatic contouring of geologic fabric and finite strain data on the unit hyperboloid

Frederick W. Vollmer

Department of Geology, State University of New York at New Paltz, New Paltz, NY 12561, USA
E-mail address: vollmerf@newpaltz.edu

Abstract

Fabric and finite strain analysis, an integral part of studies of geologic structures and orogenic belts, is commonly done by the analysis of particles whose shapes can be approximated as ellipses. Given a sample of such particles, the mean and confidence intervals of particular parameters can be calculated, however, taking the extra step of plotting and contouring the density distribution can identify asymmetries or modes related to sedimentary fabrics or other factors. A common graphical strain analysis technique is to plot final ellipse ratios, R_f, versus orientations, ϕ_f on polar Elliott or R_f/ϕ plots to examine the density distribution. The plot may be contoured, however, it is desirable to have a contouring method that is rapid, reproducible, and based on the underlying geometry of the data. The unit hyperboloid, H^2, gives a natural parameter space for two-dimensional strain, and various projections, including equal-area and stereographic, have useful properties for examining density distributions for anisotropy. An index, I_a, is given to quantify the magnitude and direction of anisotropy. Elliott and R_f/ϕ plots can be understood by applying hyperbolic geometry and recognizing them as projections of H^2. These both distort area, however, so the equal-area projection is preferred for examining density distributions. The algorithm presented here gives fast, accurate, and reproducible contours of density distributions calculated directly on H^2. The algorithm back-projects the data onto H^2, where the density calculation is done at regular nodes using an weighting value based on the hyperboloid distribution, which is then