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A Triangular Fabric Plot with Applications for Structural Analysis

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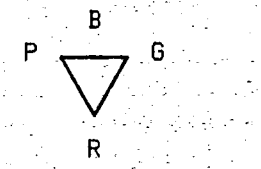
An eigenvalue-based diagram, a PGR plot, is proposed for the analysis of orientation data. Fabrics of non-directed lines or planes are assumed to fall within a three end-member system of perfect point, girdle and random distributions. Given a set of N orientation data defined by their direction cosines, $L = (l,m,n)'$, eigenvectors, $\tau_1 >= \tau_2 >= \tau_3$, are calculated from the matrix $\Sigma L_i L_i'$ (Watson, 1965, Biometrica, 52, 193-201). Woodcock (1977, Geol. Soc. Am. Bull., 88, 1231-1236) devised several graphical plots, including a plot based on the logarithms of the eigenvalue ratios. The PGR plot, in contrast, equally weights the three end members, and all possible distributions fall within the plot boundaries. In addition it is now possible to define an index representing cylindricity. The indexes are:

Point	$P = (\tau_1 - \tau_2)/N$
Girdle	$G = 2(\tau_2 - \tau_3)/N$
Random	$R = 3(\tau_3)/N$
Cylindricity	$B = P + G$



Note that $P + G + R = 1$. The plot has been used primarily for the location of structural domains within complexly deformed areas. To locate cylindrical domains a search is made to find domains such that the sum $S = \Sigma B_k N_k$ is maximized; N_k is the number of data points in domain k. The method has been used on a refolded nappe within the Norwegian Caledonides, and has been tested on several published examples of domain analysis. The method is being used to analyze complexly deformed sediments along the front of the Taconic Allochthon. The plot should also be useful for other types of fabric analysis, such as microfabric work, where a number of orientation data sets must be compared.