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Discussions

Interactive comment on "Bimodal or quadrimodal? Statistical tests for the shape of fault patterns" *by* David Healy and Peter Jupp

Anonymous Referee #2

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Dear editor and authors, This is a technical paper that present a new numeric tool for the analysis of fault/fracture sets. As the authors discuss, it not always easy to separate large (or small) orientation databases into sub-sets, and to identify the type of distribution. Therefore, the proposed method has the potential to be utilized by researchers in the field. In this respect, the paper can be a good contribution. The paper is clearly written and include multiple clear illustrations of synthetic and field data. It can be shorten as suggested below. The authors are strongly urged to revise the paper following the suggestions below. Major comments 1. The paper is written as a statistical manuscript and not as a tool for geologists. The methodology is presented as a black box without sufficient explanation on the rationale behind it and/or the statistical terminology. Below are few examples. a. The "eigenvalues of the 2nd and 4th rank orientation tensors" have relations to the actual distribution of the orientation data. The authors MUST give the eigenvalues AND the associated eigenvectors of the idealized cases of Figs. 1 d-f. b. The R language was probably chosen due to its power in statistical calculations, but the link to the code (lines 85-86) does not work and the potential users MUST get a compiles code. c. The paper presents the calculations results in relative length, with almost no discussion of the geologic significance. 2. It is not clear why there is a need for 16 synthetic sets (Fig. 3, 4), it appears as an exercise in statistics rather than a tool for geologists. Cut to 6 synthetic sets. This will also shorten the paper. 3. Lines 200-216 are the key for understanding the rationale of the method, but the authors just describe Fig. 6 without explaining the PHYSICAL meaning of the eigenvalues of S1, S2 and S3 and their relations. For example, Fig. 6 is a modified Flinn diagram is a presentation of the shape of strain ellipsoid by displaying the relations between strain axes of the ellipsoid. Such links to geology will strengthen the utility of the paper. 4. The paper deals only with the orientations of the fault surfaces, while the proposed method can be applied to other structural elements in geology. For example, the slip directions along faults that are essential for stress inversion and strain inversion of fault data, orientations of cross-bedding in sandstone deposits, and the orientations of joint sets (for separation of extension phases). This limitation by the authors simplifies the analysis, but restricts its utilization. It is suggested that the authors discuss the other cases of oriented data and maybe suggest possible utilization by the proposed method.

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