Solid Earth
Discussions

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Interactive comment on "Modelling complex geological angular data with the Projected Normal distribution and mixtures of von Mises distributions" *by* R. M. Lark et al.

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We are grateful for the Editor's helpful comments, and propose the following edits to the script in response.

1. Since our examples are all in 2D we agree to use 'circular' rather than 'angular' to refer to our variables.

2. We agree that a clarification is required about the treatment of the orientation (undirected) variables. We suggest that the edits proposed in point (5) of our response to Reviewer 1 will cover this point.

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3. We propose some restructuring as follows.

    i. Put a 'Key findings' section into each case study. For the West Cumbria example this would be Section 3.1.3 which would begin near line 294 of the current paper and include the material that related the statistical properties of the directional data to the geology. For the eastern Bangladesh example this would be section 3.2.4. This would present material specific to eastern Bangladesh, currently in the Conclusions section.

    ii. Rewrite the conclusions section to focus on more general points, with the following structure.

        a. The case studies have illustrated that, while the PN distribution is flexible, complex directional data in geology may be better-represented by a MVM. The procedure that we have used shows how one may select between alternative models with differing degrees of complexity. The West Cumbria example illustrates the structural origins (folding and faulting) of complex distributions of dip directions which may require the MVM model.

        b. The Landsat-derived lineaments data from Bangladesh show how an angular distribution which is too complex to be represented by a simple von Mises distribution may be modelled by the PN process. This illustrates the flexibility of the PN distribution, in this case it was more parsimonious than a MVM alternative.

        c. We have shown how the PN distribution can be used in a model with covariates (in this case a categorical variable distinguishing the anticline axial planes from Landsat-derived lineaments for the structural orientation data from Bangladesh). In this case we were able to show that the two sets of orientations are different, indicating that the two sets of features are different.

Minor points

1. Yes, 'stress' can be substituted for 'strength' in the text.

2. The text needs to be amended. In an earlier version of the paper we tabulated the models in different order.

Interactive comment on Solid Earth Discuss., 5, 2181, 2013.