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Solid Earth Discussions

Interactive comment on "The Mohr–Coulomb criterion for intact rock strength and friction – a re-evaluation and consideration of failure under polyaxial stresses" *by* A. Hackston and E. Rutter

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This paper examines a well-known but under-acknowledged problem in rock mechanics: the influence of the intermediate principal stress on failure criteria. The widely used Mohr Coulomb criterion makes no allowance for this influence, yet its effect has been established for a long time, giving rise to a number of other less generally used criteria. The clever experimental design allows two extremes of stress states to be employed, which test the two end-member possibilities for the influence of the intermediate stress, both for intact failure and frictional sliding. The data give rise to many interesting ideas, but the paper focusses clearly on testing alternative failure and frictional sliding criteria.

The experiments, data, results, diagrams and writing are all of the highest quality, and the conclusion that the modified Mogi criterion is a good fit is appropriate and useful. These data could have several other implications and it is therefore very useful that they have been published.

One question is why only the modified Lade and Mogi alternatives were considered. In the paper by Colmenares and Zoback, several other criteria were tested, and the general conclusion was that the modified Wiebols and Cook criterion was a good fit. There are also two versions of the Mogi criterion. In neither of these papers is Murrell's (1963, 1965) criterion tested.

A minor point is the inconsistent terminology used for the test types, which is also a problem through much of the literature. On page 3845, compression (stress) is used in one case and extension (strain) in the other. These terms are not used consistently: the conclusions refer to axially symmetric shortening. Maybe uniaxially symmetric shortening - as in the paragraph above and the abstract – is a consistent alternative.

Page 3847, Lines 4 and 11. The similar equations have different formats, .

Page 3852, Line 24: should read (sigma1 = sigma2), I think.

Page 3854, lines 10 – 20. It is not quite clear how the three parameters of the Mogi criterion were obtained: were they all simultaneous solved for?

Page 3855, lines 23/24. this is an awkward sentence, and I'm not sure of the meaning. Does it mean that when seeking a failure criterion, the influence on anisotropy can not be allowed for?

Fig. 5. Why do some points on the Pennant sandstone compression (sic) plot not have associated Mohr circles? Likewise for the Darlely Dale extension plot.

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