

Earth Surf. Dynam. Discuss., author comment AC2  
<https://doi.org/10.5194/esurf-2022-61-AC2>, 2023  
© Author(s) 2023. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Reply on CC1

Martha Cary Eppes et al.

---

Author comment on "Introducing standardized field methods for fracture-focused surface process research" by Martha Cary Eppes et al., Earth Surf. Dynam. Discuss.,  
<https://doi.org/10.5194/esurf-2022-61-AC2>, 2023

---

My co-authors and I have reviewed Dr. Laubach's thorough and helpful comments. We are very grateful for this input and look forward to implementing these changes in the manuscript.

The only suggestion of his for which we disagree (albeit not entirely) is the comment regarding the use of the terms 'crack' and 'fracture'. (His comment is copied below for ease of reading this reply).

Though it is suggested that such a distinction has been made in the literature, we can find no consistent use or definition, even in the Anders et al., 2014 paper suggested. In fact, in this paper - there is common interchange of the two terms:

### *"4.3. Microfractures and fault zones*

*Faults (shear cracks) are inherently macroscale features. Faults formed by the coalescence of Mode I microcracks (Scholz, 1968b, Lockner et al., 1991) and propagate via a cloud of microfractures formed in the stress concentration at the fault tip; when crack density reaches a critical value, this cloud of microfractures breaks the rock down into a cataclastite that allows shear displacement to occur (Cowie and Scholz, 1992)."*

The AGI Glossary of Geology also seems to interchange the terms, but simultaneously imply a difference: *"fracture: (a) A general term for any surface within a material across which there is no cohesion, e.g. a crack. Fracture includes cracks, joints, and faults. (b) A crack in a rock where the movement of rock separated by the crack is normal to the surface." or "*

"crack [struc geol] A parting with crack-normal motion. Cf: joint [struc geol]. "

We feel that to suggest that there is some size cut-off between when a crack becomes a fracture or vice-versa, or that by bringing a rock from the field to the lab could be interpreted as arbitrary and confusing. From a process standpoint, in the field of geomorphology, both small and large cracks/fractures contribute to the rock properties of interest, namely hydrology and strength.

Also, to distinguish a 'crack' measured in the laboratory from a 'fracture' measured in the field, is to in some way discount the lab measurement as relevant to the field. I am sure that is not desirable by any of us.

We acknowledge a clear distinction between microcrack/microfracture and crack/fracture being what is visible with the human eye. In this field methods paper, however, we explicitly ignore all microcracks/microfractures.

We further acknowledge that despite there being no clear distinction in the literature, many geoscientists appear to have some distinction in their minds between the two terms fracture and crack.

We further acknowledge that the word 'crack' has various perhaps negative connotations in popular culture.

Thus, in order to be most clear and transparent our plan to address this comment is to 1) clearly define what we mean by the term 2) become consistent in our language in the manuscript, and 3) explicitly explain our decision making-process in the above why we have done so, laying out the argument above about no distinction really that we can find.

It has sparked very interesting conversations with geomorphologists, rock physicists and structural geology colleagues!

Many thanks again, MCE and co-authors

Comment on esurf-2022-61', from his attachment Stephen Laubach, 12 Dec 2022:

"On the use of 'crack' and 'fracture' interchangeably. Although this usage is widespread it has the potential to cause confusion, particularly where these may be language barriers. The text jumps back and forth between 'fracture' and 'crack' and I found this distracting. In brittle structural geology a case has been made for restricting 'crack' to experimental and theoretical applications, and 'fracture' for features observed in the field. I believe this convention is stated in Anders et al. 2014, Microfractures: a review, J. Struct. Geol.) Maybe field-monitored examples you have described on fracture propagation in outcrops or clasts would fall into the category of 'cracks' by this convention. My advice is to make a distinction between these two terms along these lines and revise the MS accordingly. Even if the distinction has not been made in the past in this field, it would be useful to do so now "