Interactive comment on "Automated field detection of rock fracturing, microclimate, and diurnal rock temperature and strain fields" *by* K. Warren et al.

Anonymous Referee #2

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Acoustic emissions technology has been used in geological and materials sciences and in engineering extensively. Their use in rock mechanics research, however, is typically done in a laboratory environment. The application of AE methods to a field study will provide valuable insight into the processes that govern rock fracture on Earth's surface, as well as robust bridge between laboratory and field studies in this area. The introduction provides a concise overview of previous research on thermo-mechanical rock fracture, as well as a history of research methods, the latter of which is very important for an instrumentation and methods paper. In general, the manuscript is well-organized and the figures provide helpful additional information and context. The

researchers displayed a high level of attention to detail in their instrumentation methods, ensuring that the preparation, attachment, calibration, and use of the instruments are done thoroughly and correctly. The description of these methods is clear enough to allow precise reproduction of the study in the future. The assumptions used in designing the experiment are reasonable and clearly stated. The preliminary conclusions reached by the authors show the value their dataset has and important implications their future analysis will have for the study of mechanical rock weathering.

The following specific comments and suggestions are offered for the authors' review:

383, 28 – The authors are correct that establishing direct correlation between AE data and actual damage is extremely difficult. It may be relevant to readers to note that while the mode of cracking that occurs can be determined (with very complex signal processing), the AE data cannot distinguish between crack initiation and crack propagation, nor can a single event be directly translated to a change in crack length.

393, 21 – The authors state that the surface of the rock specimen experiences tensile strains when expanding due to temperature increase. Theoretically, in a homogeneous body, compressional stress is experienced during expansion, and tensile during contraction. The authors should explain why it is their data shows a non-intuitive behavior. Additionally, the strains being measured are at the boulder's surface, normal to which grain motion is largely uninhibited. The authors should discuss whether these measured strain values represent a comparable experience to that of the boulder's interior where the majority of the AE events occur.

Figure 5 – The text in this figure is small and extremely difficult to read. Additionally, the authors should explain more clearly the orange boxes displaying "Total Events," and what "total" means if more than one box is displayed on each plot.

The manuscript is suitable for publication following some minor corrections:

373, 11 – Molero should be Molaro

383, 4 – spare parenthesis at "equipment, sensors), and..."

383, 15 – The authors note that an AE "hit" is also referred to in the literature as a "count," but this is inaccurate. According to the sensor documentation from PAC, a hit is registered after the signal exceeds a pre-defined threshold for the first time, and refers to the entire acoustic wave. The counts (or AE Threshold Crossing Counts) feature indicates the number of times during a hit that the signal rises above the threshold. See the figure below from the PAC documentation. The parenthetical statement that is in error should be removed and the remainder of the manuscript should be check to ensure the correct and desired terms are being used throughout. For example at (395, 25) the authors state a finding from a previous study. It is unclear as to whether or not they are discussing counts correctly in this paragraph due to this mis-definition.

388, 9 – "that used" should be "that were used"

391, 19 – The authors refer first (line 3) to a four-month period, but state here that the test period is three months. Later (page 393) the authors refer again to a four-month period. The length of the period used for this preliminary analysis should be made clear.
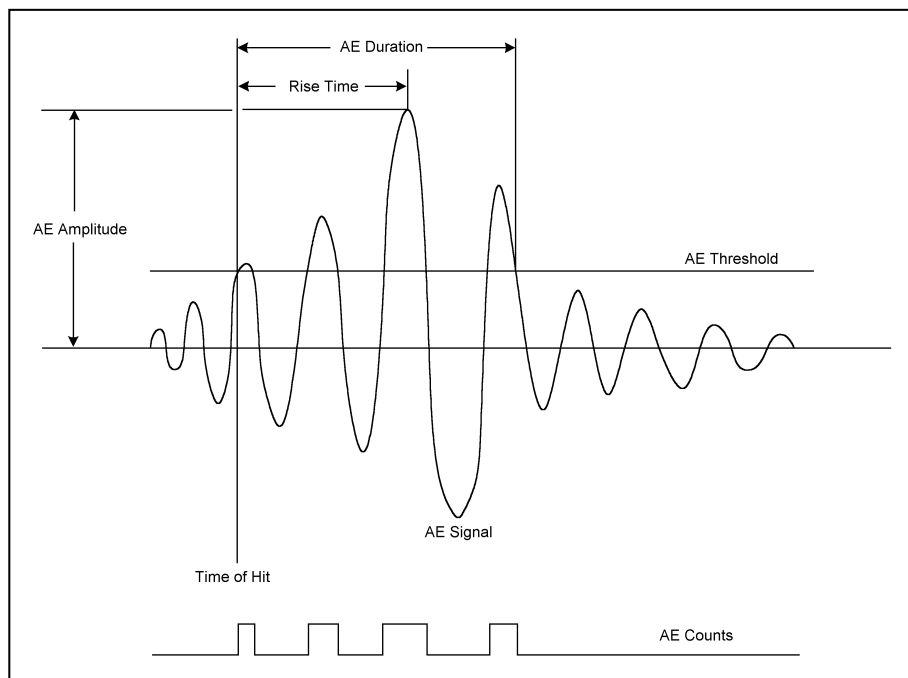
392, 8 – "an prominent" should be "a prominent"

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Figure 9. AE Hit Feature Extraction diagram

Fig. 1.