Problem Set 1: Interpretation of Tension Fractures

Due: Thursday, February 11th

1. Consider the figure below, showing a map view of fractures in sandstone in Wales. Assume that north is up in this photo. Note that some of the very subtle linear patterns in this image are seams where a number of different photos were stitched together to form a mosaic.

(a) These tension fractures are tectonic fractures. What is their common name? (1)

(b) Indicate how many systematic fracture sets are present, and their orientations (strikes). (4)

(c) The nonsystematic fractures in this region appear to fill in the gaps between one of the systematic fracture sets. What is another name for this type of nonsystematic fracture set? (1)

(d) Using a piece of tracing paper or a graphics software package of your choice, trace out the pattern of fractures present in this image. Then color code the different fracture sets that formed at different times and thus have different orientations. Remember the rules of crosscutting tension fractures when determining which ones are older and which ones are younger. Some ambiguities may exist that you will need to try to resolve. (12)

(e) Now describe the age sequence (from oldest to youngest) of the different color fracture sets that you defined. For each one, provide your reasoning for where you placed it in the fracture sequence. Indicate how you resolved any ambiguities. (8)
(f) Where fractures of different ages intersect, they can meet orthogonally (T-intersections), or the younger fracture may curve into parallelism with the older fracture. On your fracture map, circle one example of each of these two types of intersections. (2)

(g) On your map, indicate where you might place a scan line in order to measure the average fracture spacing of the systematic fracture set that formed second in the fracture sequence. (2)