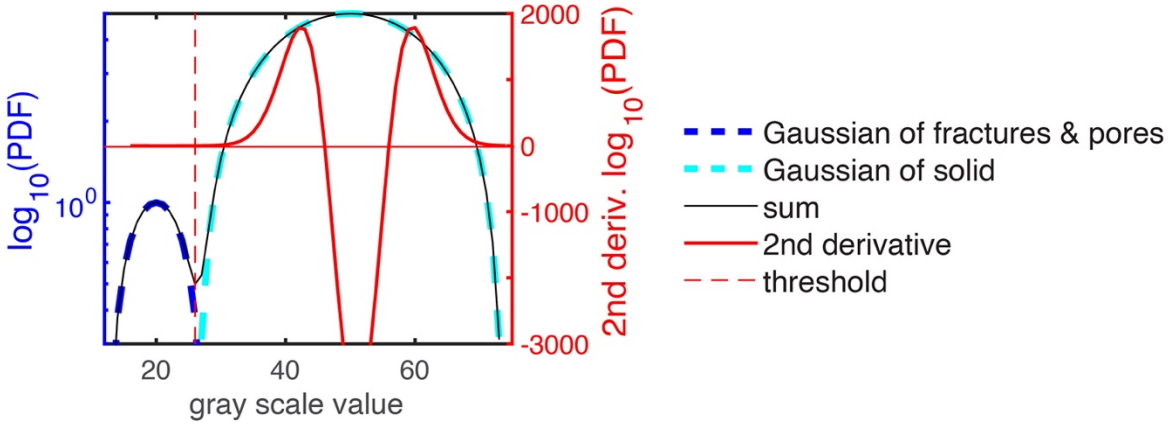
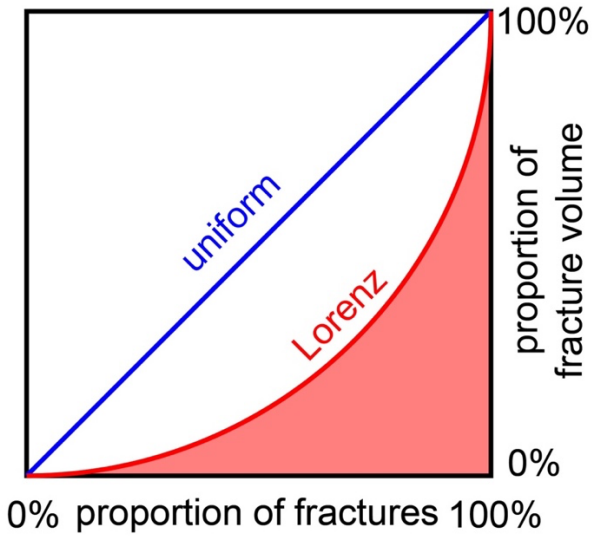
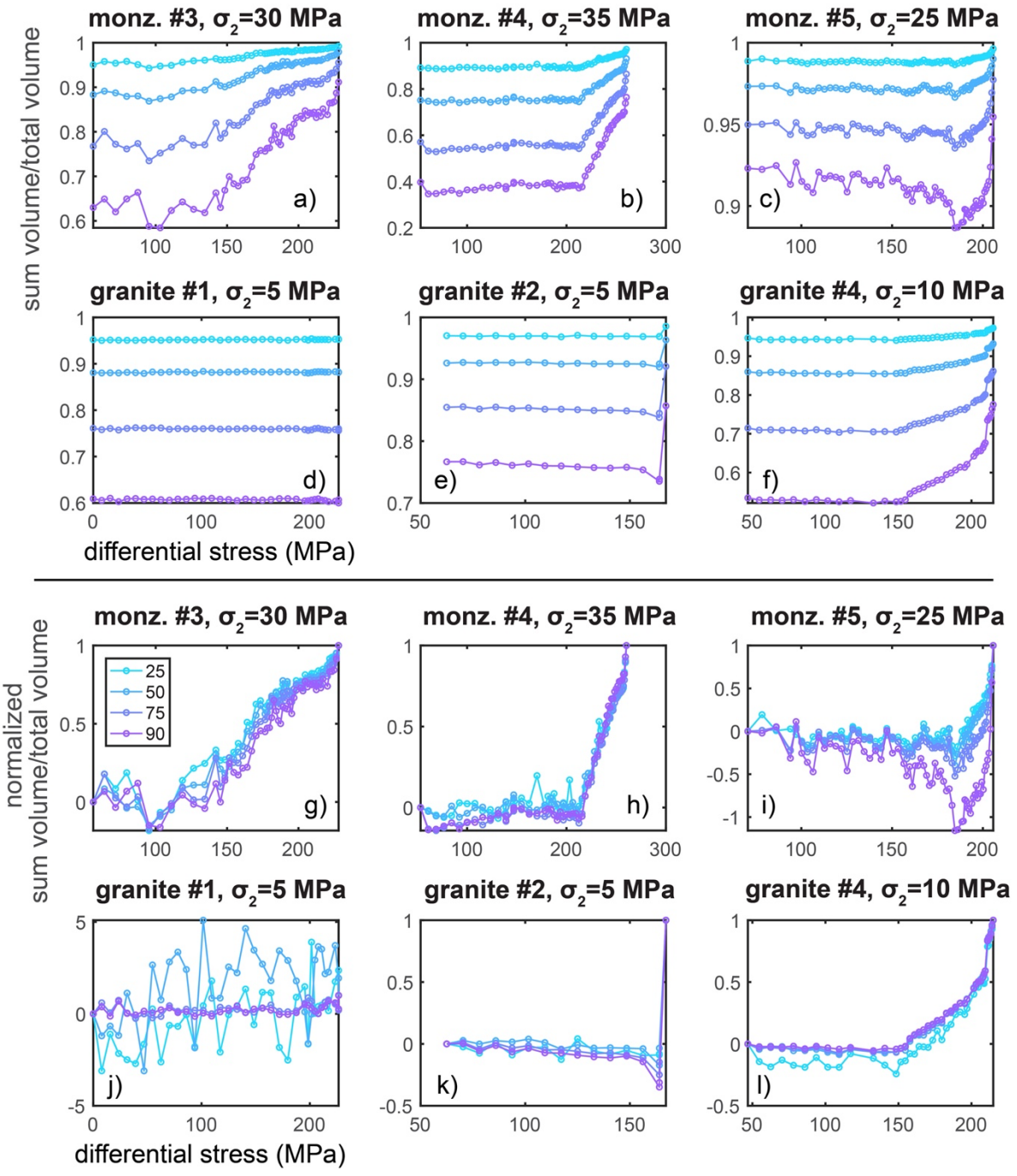
Supplementary Material



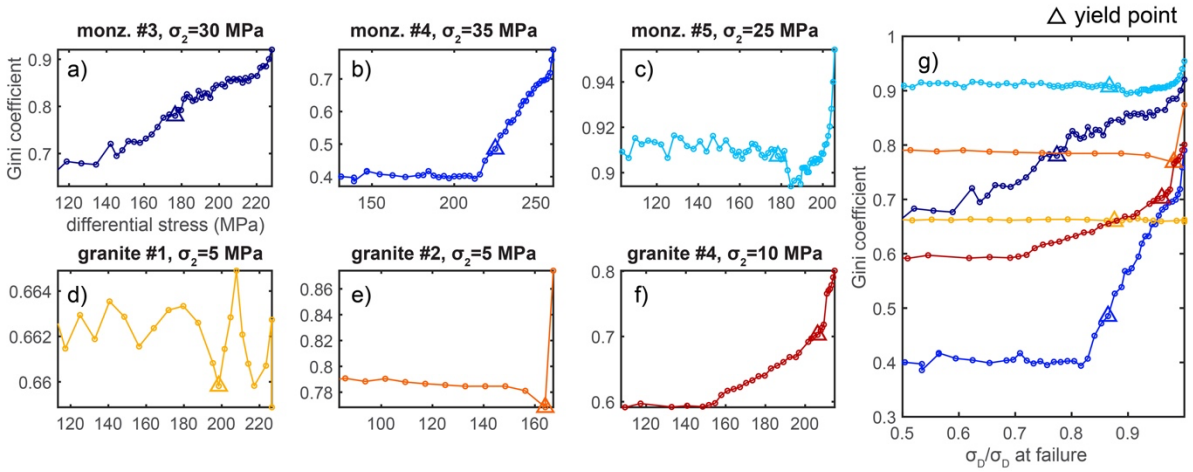
Supplementary Figure 1. Method of selecting the threshold between the solid rock and fractures shown with a synthetic distribution of gray scale values in an X-ray tomogram. First, two fit two Gaussian curves to the two populations of the voids (dark blue) and solid (light blue). Then we calculate the second derivative of the sum of these Gaussian curves (thick red line). Then we find where the second derivative is closest to zero to identify the threshold (dashed red line).



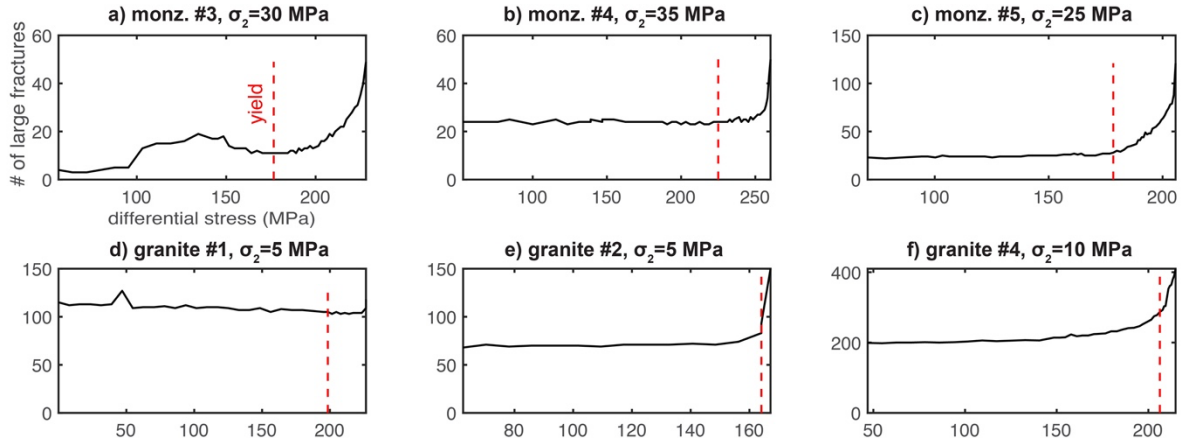
Supplementary Figure 2. The Gini coefficient uses the Lorenz curve of the distribution to measure inequality in a distribution (e.g., *Gini*, 1921). The Lorenz curve shows the proportion of the total amount of a population, such as fracture volume, that is earned by the bottom percentile of a population. The Gini coefficient is one minus twice the integral of the Lorenz curve, shown with the area in red. Thus, larger Gini coefficients indicate that the total volume of all the fractures in a network is dominated by a few fractures, whereas lower Gini coefficients indicate that the total volume is more equally distributed among all the fractures.



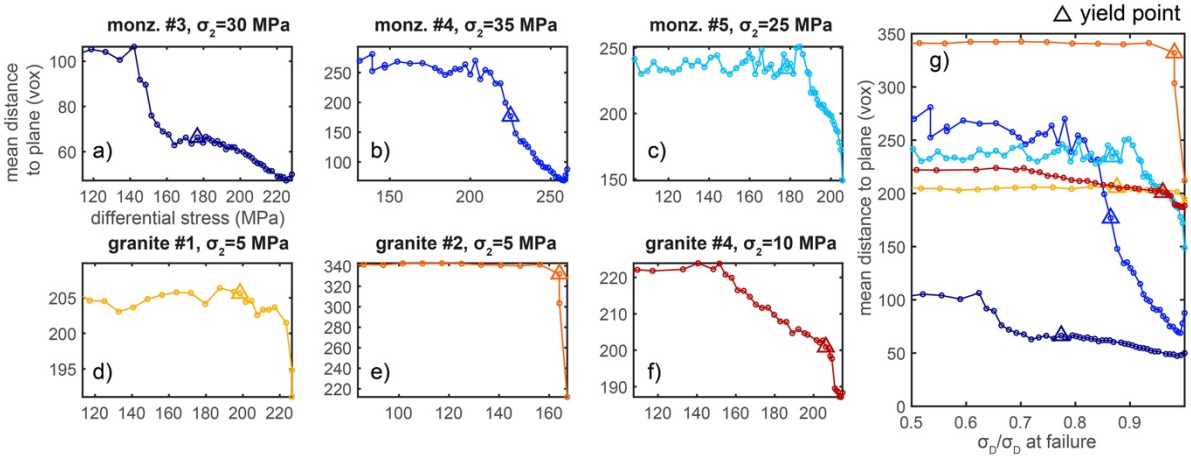
Supplementary Figure 3. Evolution of the sum of the fracture volumes above a range of percentile thresholds unnormalized (a-f) and normalized (g-l) for each experiment. Changing the threshold from the 25th percentile to the 90th percentile decreases the proportion of the sum relative to the total fracture volume, as expected. However, the normalized evolutions show that varying this threshold within this range does not change the general evolution of this metric. In particular, the general conclusion that the sum of the volumes of the largest fractures generally increases toward failure remains unchanged. Note, these evolutions begin to diverge when the threshold is greater than the 90th percentile, i.e., for v_{max}/v_{tot}.



Supplementary Figure 4. Evolution of the Gini coefficient throughout each individual experiment (a-f), and for all the experiments (g). Color of the lines in (g) matches the colors of each experiment shown in (a-f). Triangles show the conditions of the yield point. Increasing Gini coefficient indicates increasing localization toward the largest fractures in the network.



Supplementary Figure 5. Number of fractures in the population with volumes >90th percentile.



Supplementary Figure 6. Evolution of the mean distance between the top 10th percentile largest fractures and the final failure plane throughout each individual experiment (a-f), and

for all the experiments (g). Color of the lines in (g) matches the colors of each experiment shown in (a-f). Triangles show the conditions of the yield point.