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Development of First and Second Generation Fractures MARTIN FERER, National Energy Technology Laboratory and West Virginia University, DUANE SMITH, U. S. Department of Energy, National Energy Technology Laboratory — In fractured reservoirs, one often finds a first generation of nearly parallel fractures and a second generation of fractures approximately perpendicular to the first-generation fractures. We have developed a simple blocks and springs model to study how the first generation fractures affect the development of the second generation. In the model, a layer of squares is connected to a substrate by spring-like shear forces, and each square is connected to its neighbors by intra-layer spring-like shear and tensile forces, of randomly chosen strengths. First the substrate gradually expands in the x direction generating stresses on the layer, which cause the failure of some of the intra-layer springs. Stopping this expansion at a maximum value X, we have the first generation of fractures. Then the substrate gradually expands in the y direction to a maximum value, Y, producing the second generation of fractures. During these expansions, we determine the length distribution of the first and the second generation fractures. Comparing the two distributions shows how the first-generation fractures affect the development of the second-generation fractures. After expansion has stopped, we determine the size (number of broken bonds) of each fracture, the maximum linear extent of each fracture, and the distributions of each.

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