Datashare 170

Geomechanical insights on the importance of mechanical stratigraphy to hydraulic fracture containment

Kevin J. Smart, David A. Ferrill, and Alan P. Morris

AAPG Bulletin, v. 107, no. 10 (October 2023), pp. 1811–1835

Here, we provide additional model results to complement those included in the main part of the paper. Results are shown for the uniformly strong mechanical stratigraphy configuration where slip is not permitted (Figure S1), where slip is permitted on strong interfaces (Figure S2), and where slip is permitted on weak interfaces (Figure S3). Results are shown for the dominantly strong mechanical stratigraphy configuration where slip is not permitted (Figure S4), where slip is permitted on strong interfaces (Figure S5), and where slip is permitted on weak interfaces (Figure S6). Results are shown for the dominantly weak mechanical stratigraphy configuration where slip is not permitted (Figure S7), where slip is permitted on strong interfaces (Figure S8), and where slip is permitted on weak interfaces (Figure S9). Results are shown for the uniformly weak mechanical stratigraphy configuration where slip is not permitted (Figure S10), where slip is permitted on strong interfaces (Figure S11), and where slip is permitted on weak interfaces (Figure S12).

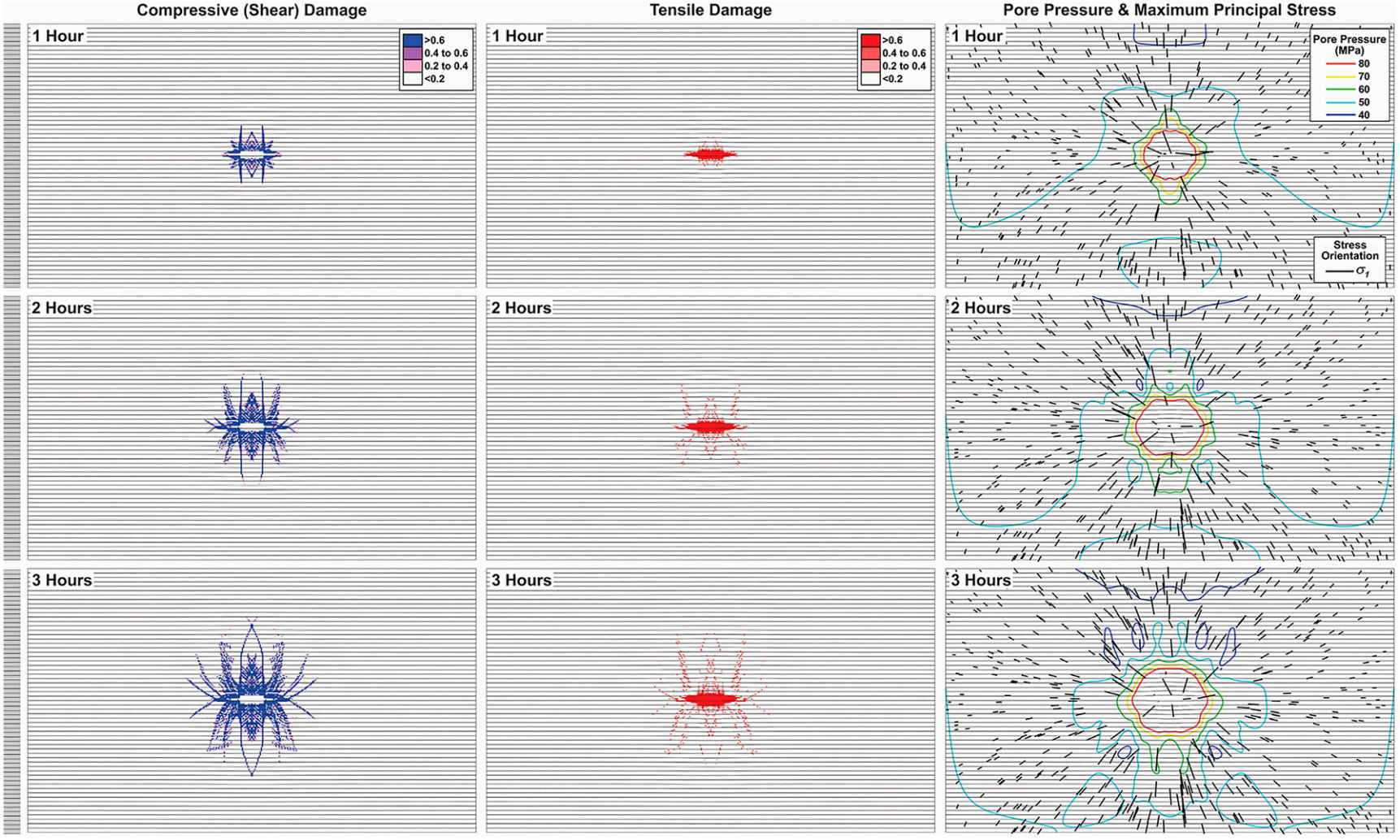

Figure S1. Temporal evolution for model using uniformly strong (gray) mechanical stratigraphy configuration and interface behavior with slip not allowed, showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

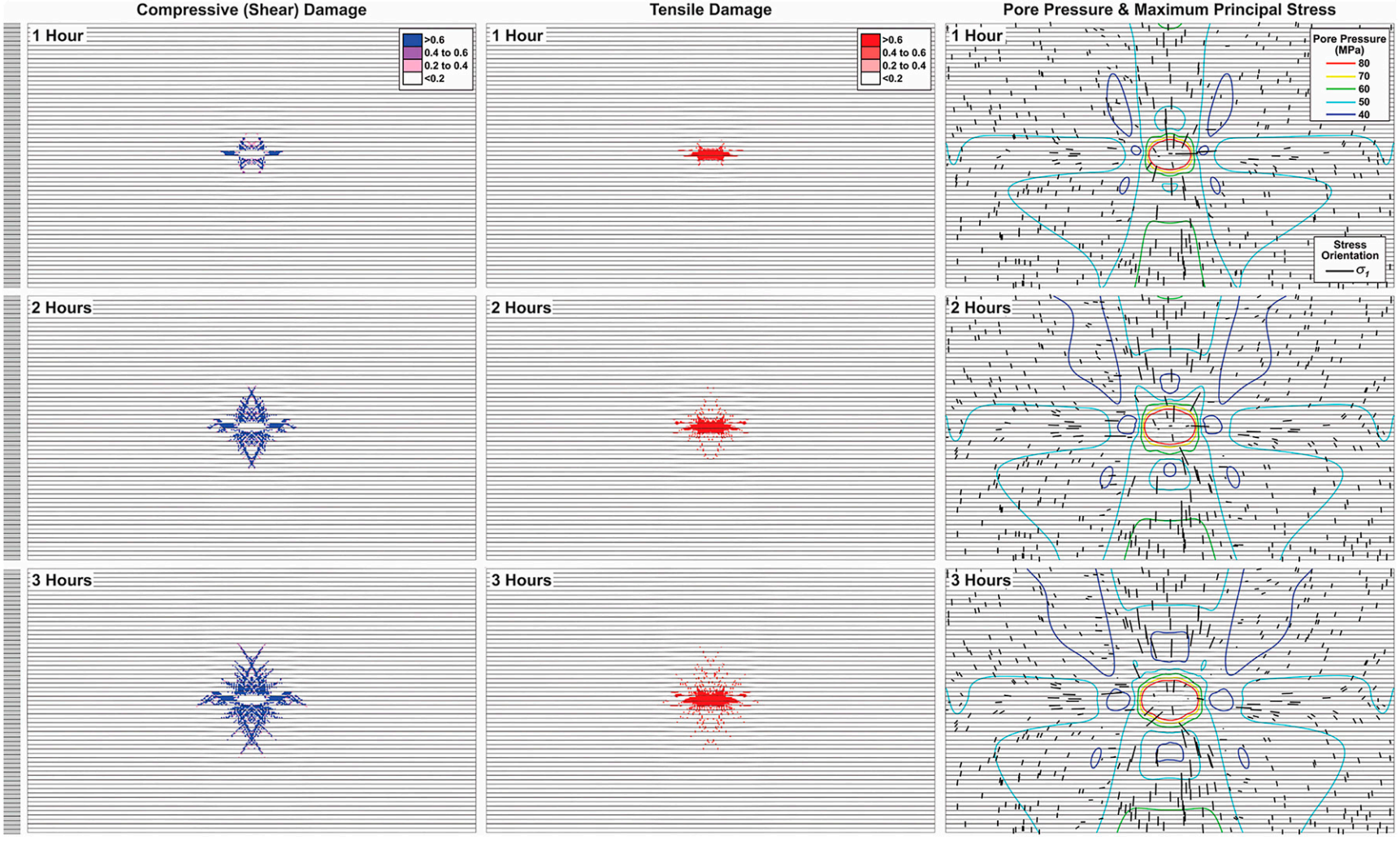

Figure S2. Temporal evolution for model using uniformly strong (gray) mechanical stratigraphy configuration and strong sliding interfaces (friction coefficient = 0.65), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

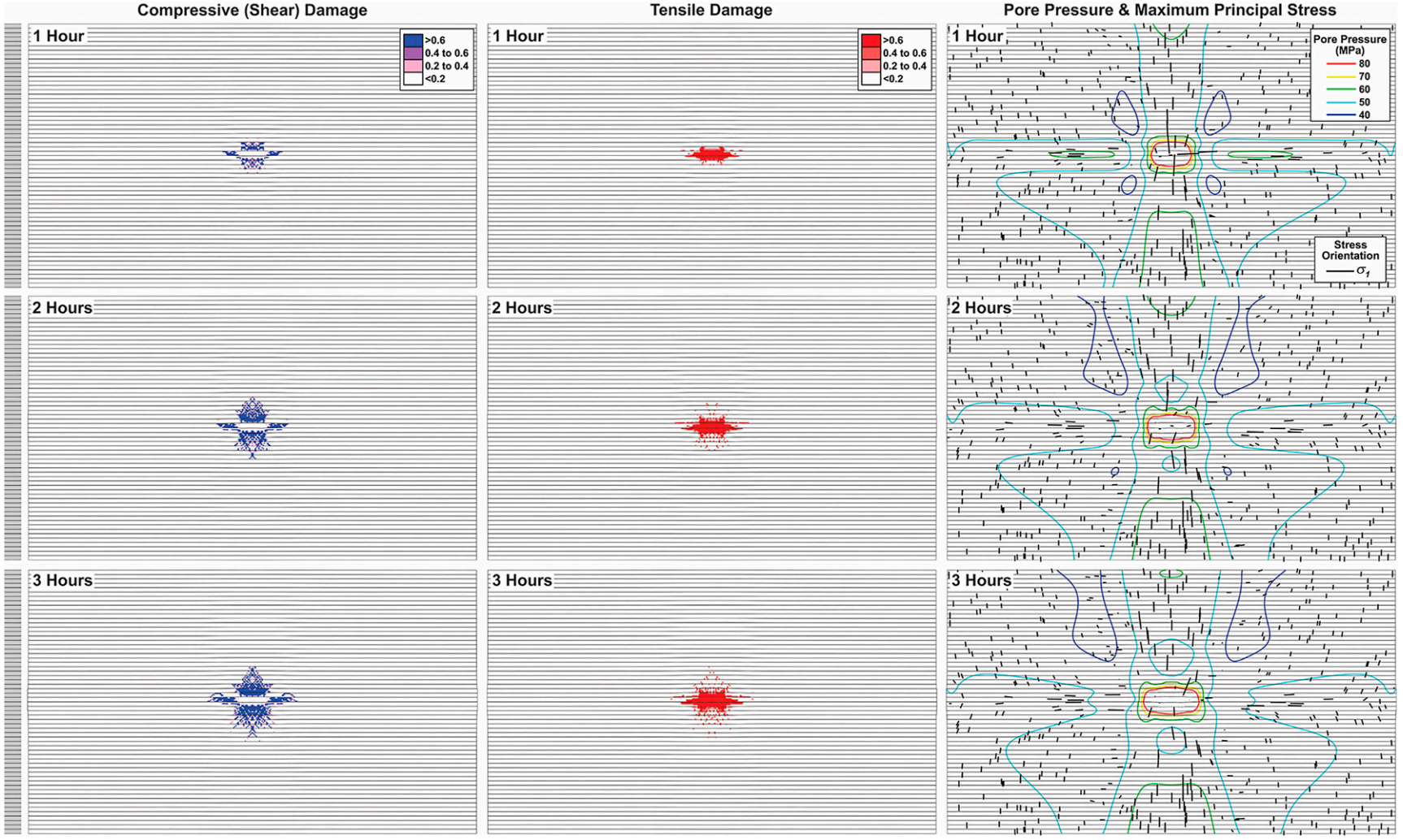

Figure S3. Temporal evolution for model using uniformly strong (gray) mechanical stratigraphy configuration and weak sliding interfaces (friction coefficient = 0.20), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

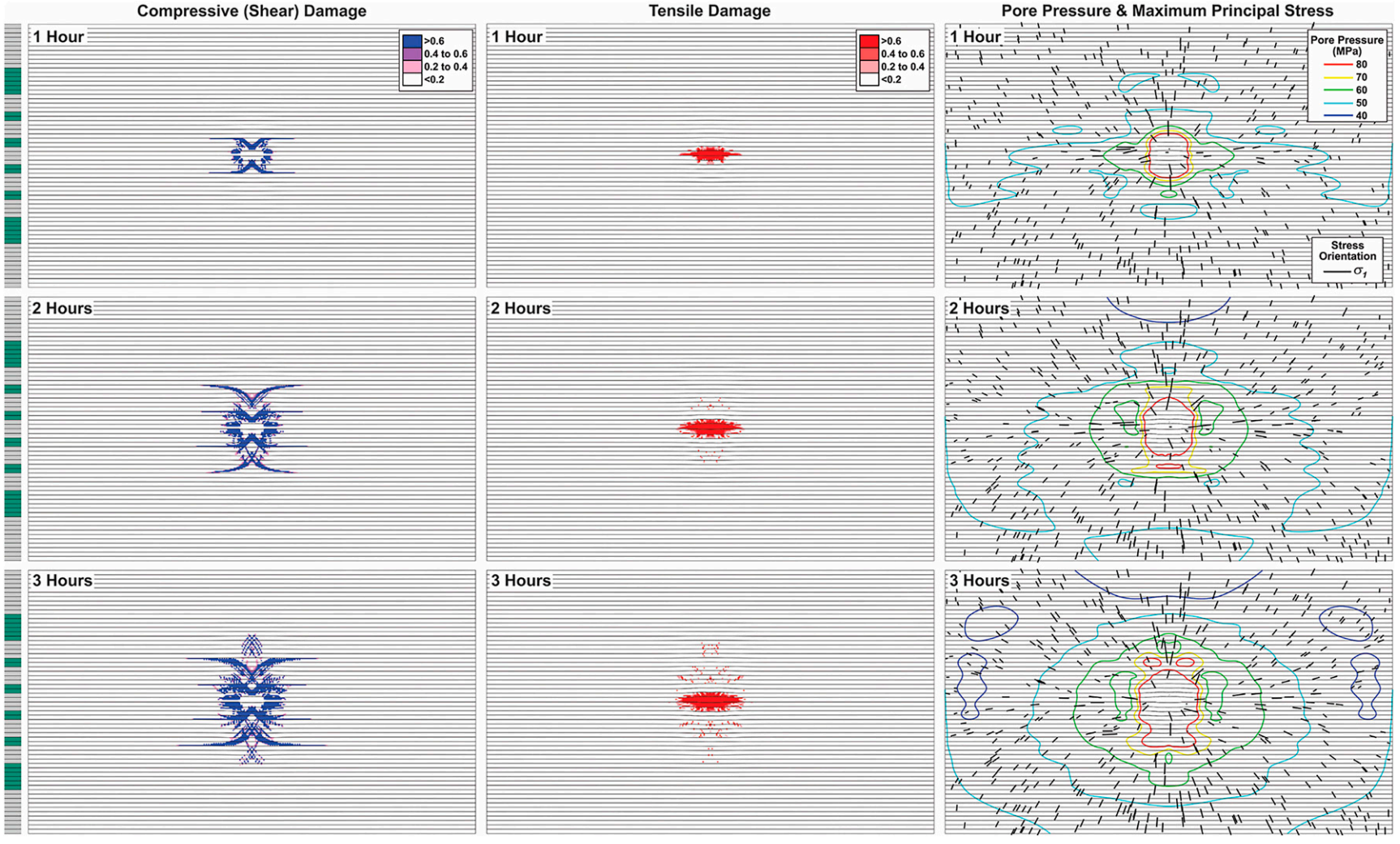

Figure S4. Temporal evolution for model using dominantly strong mechanical stratigraphy configuration and interface behavior with slip not allowed, showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

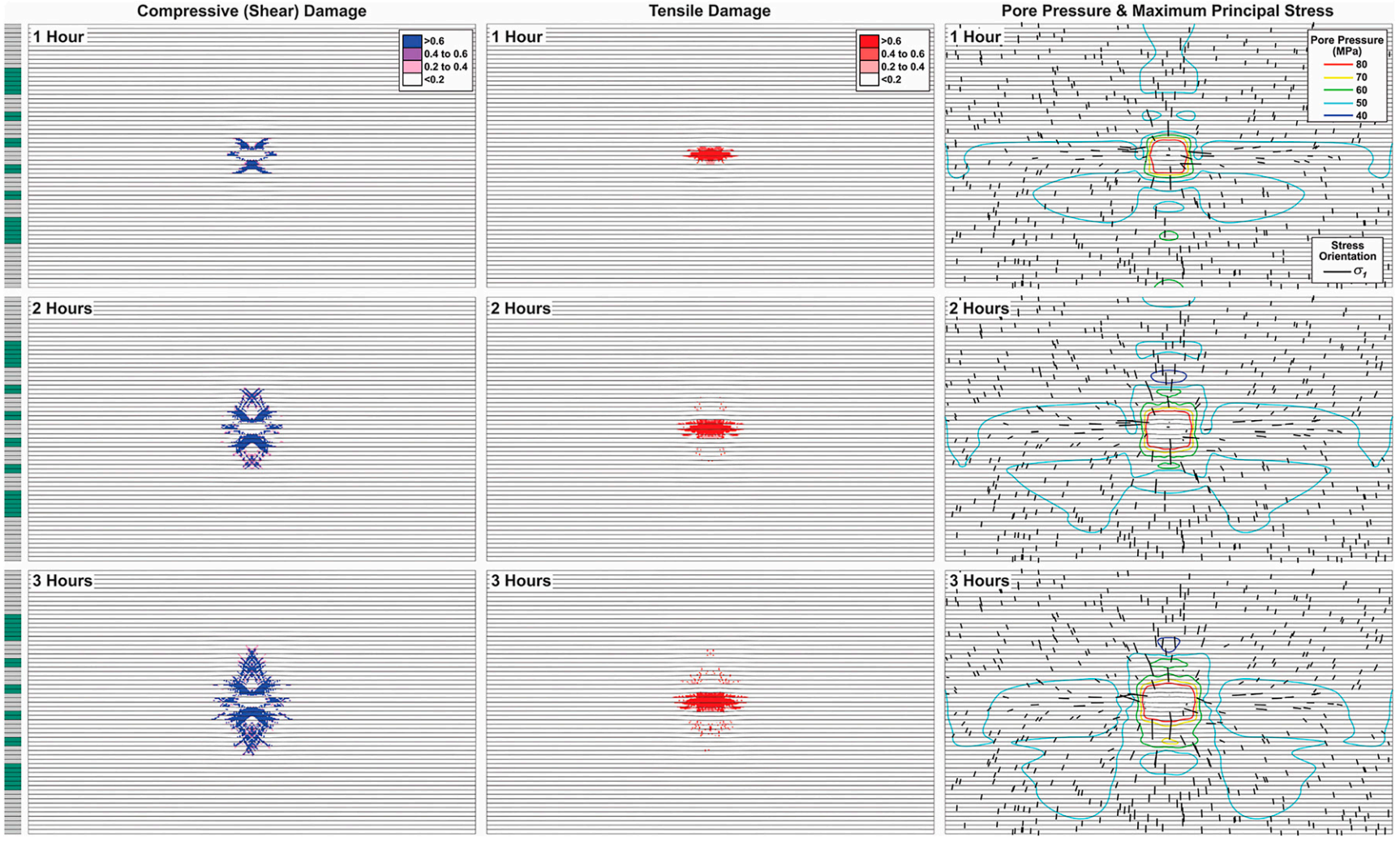

Figure S5. Temporal evolution for model using dominantly strong mechanical stratigraphy configuration and strong sliding interfaces (friction coefficient = 0.65), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

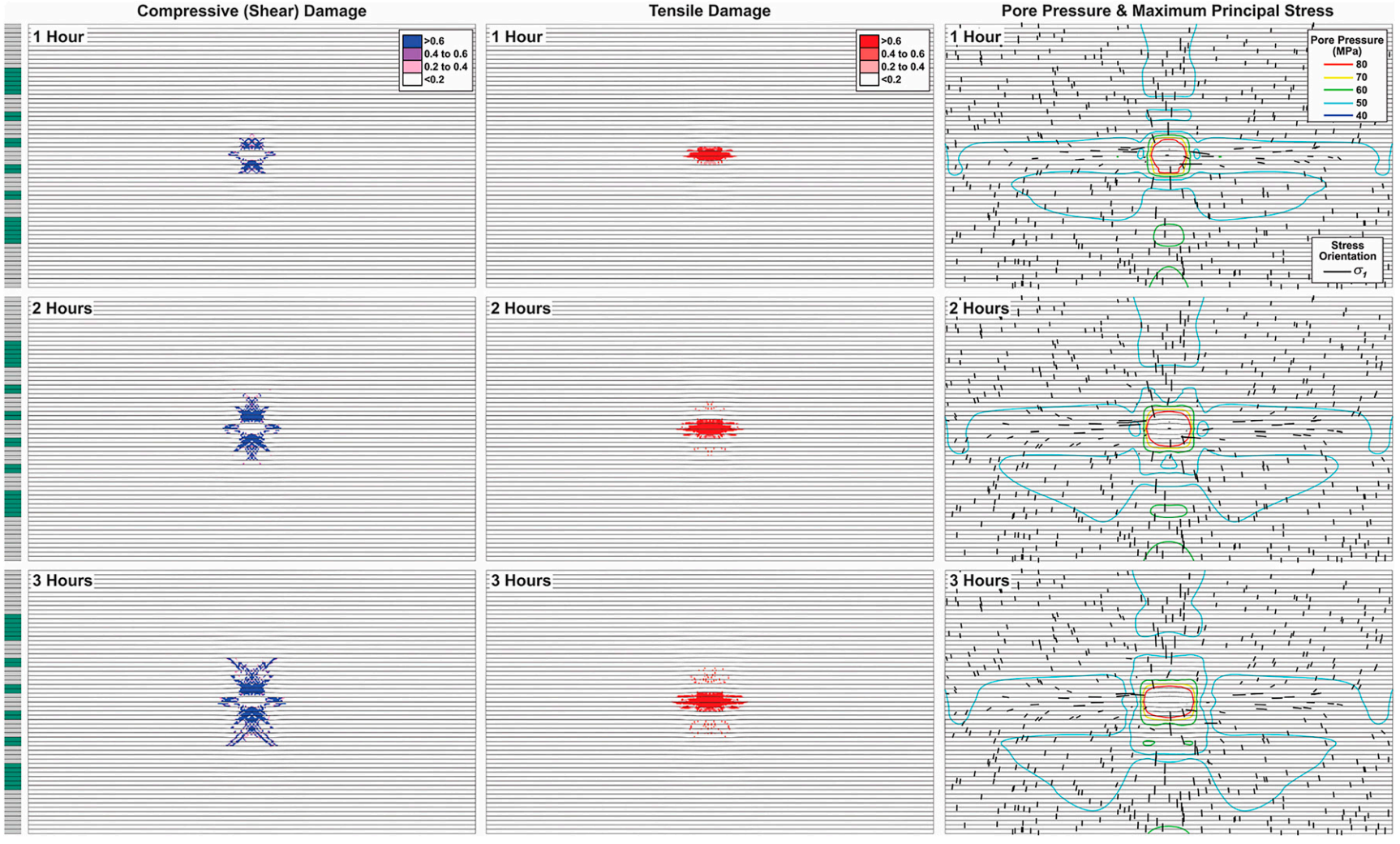

Figure S6. Temporal evolution for model using dominantly strong mechanical stratigraphy configuration and weak sliding interfaces (friction coefficient = 0.20), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

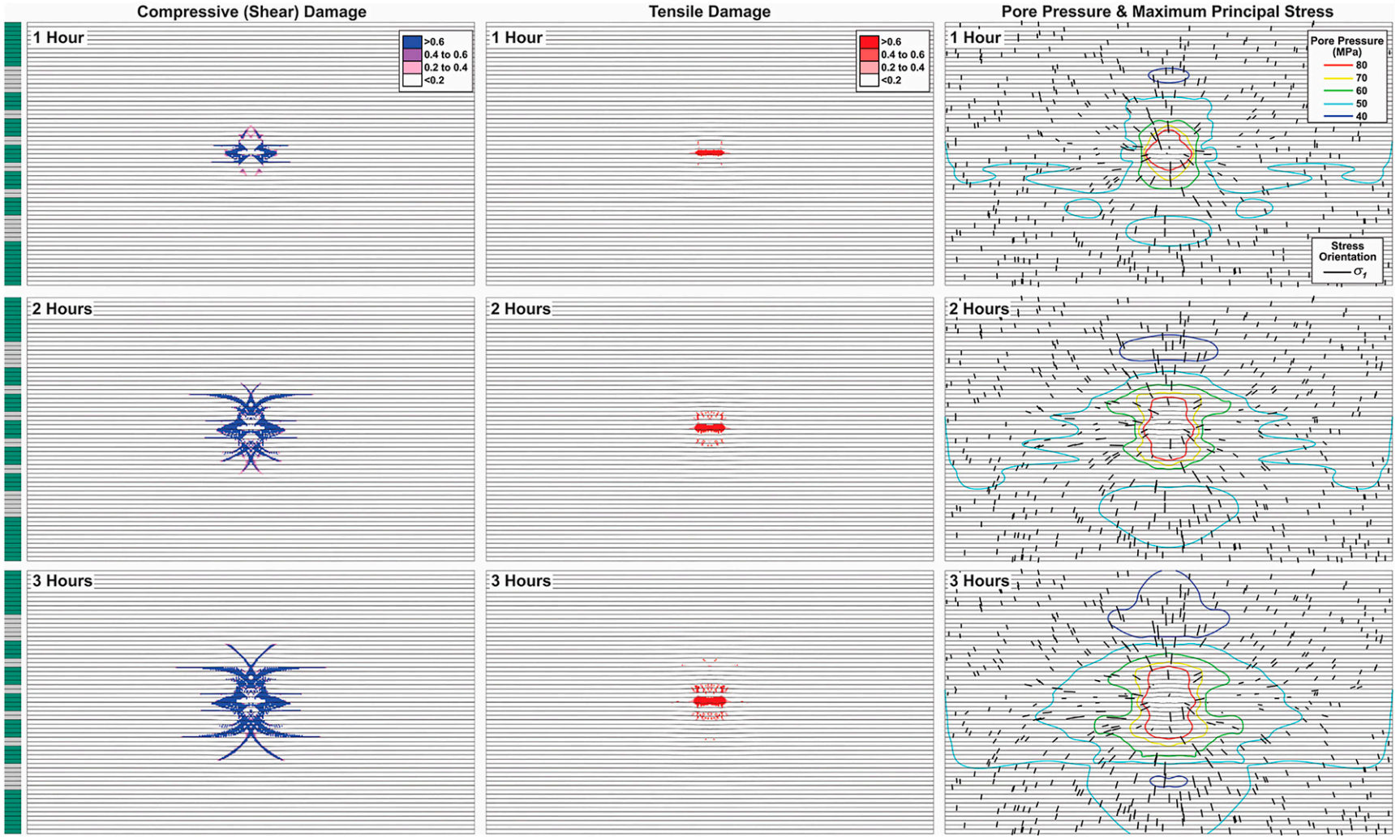

Figure S7. Temporal evolution for model using dominantly weak mechanical stratigraphy configuration and interface behavior with slip not allowed, showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

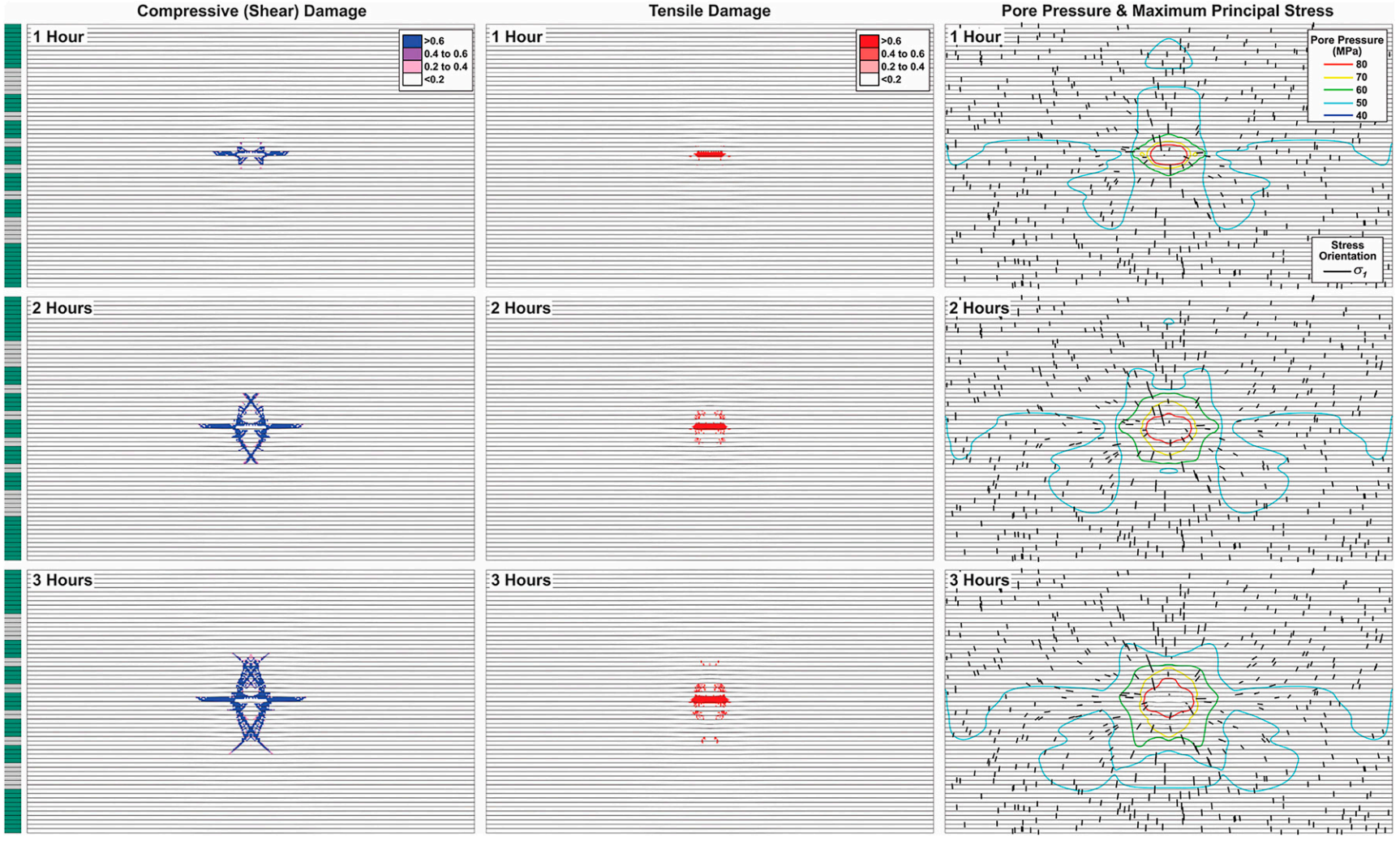

Figure S8. Temporal evolution for model using dominantly weak mechanical stratigraphy configuration and strong sliding interfaces (friction coefficient = 0.65), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

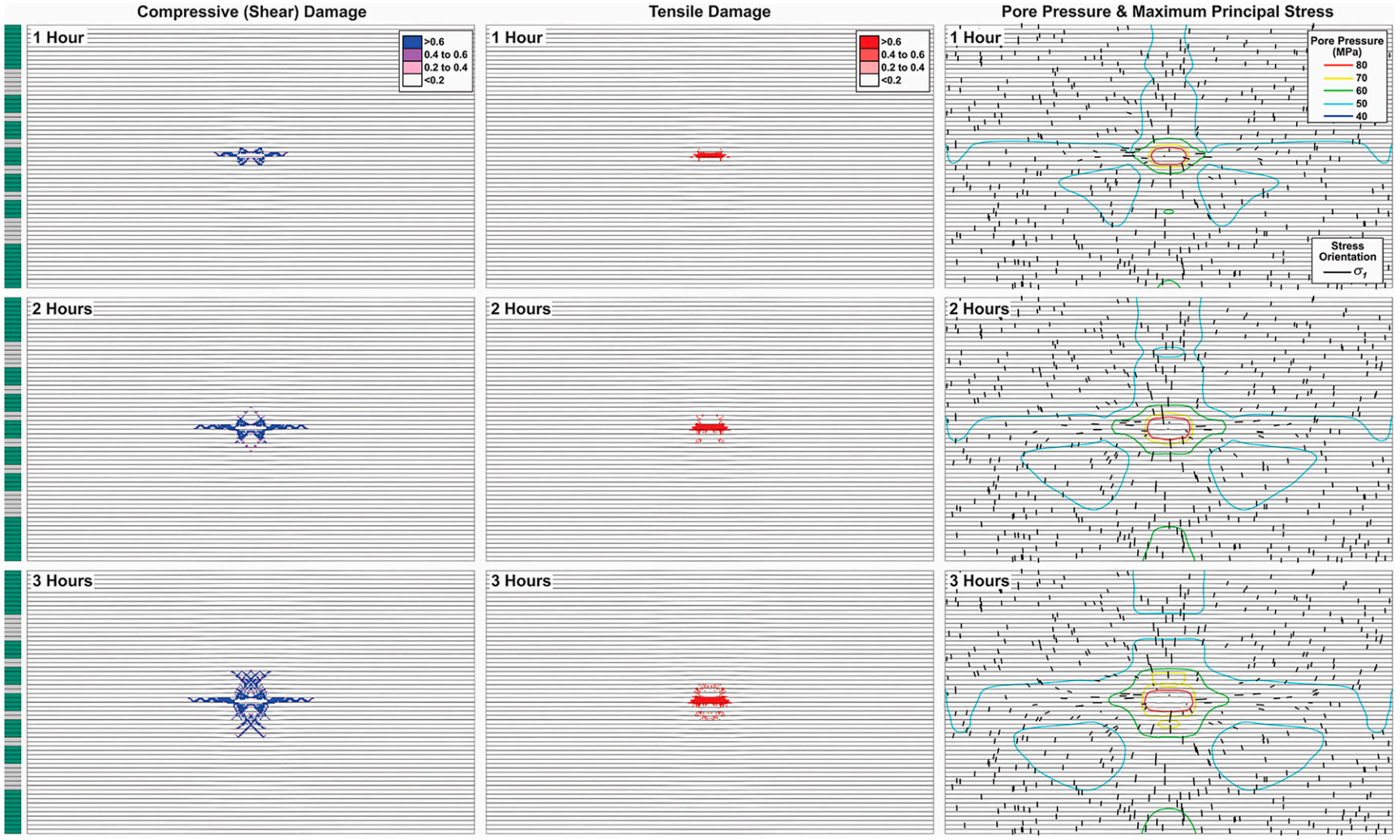

Figure S9. Temporal evolution for model using dominantly weak mechanical stratigraphy configuration and weak sliding interfaces (friction coefficient = 0.20), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. In the mechanical stratigraphy column at far left, gray layers are strong and green layers are weak. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

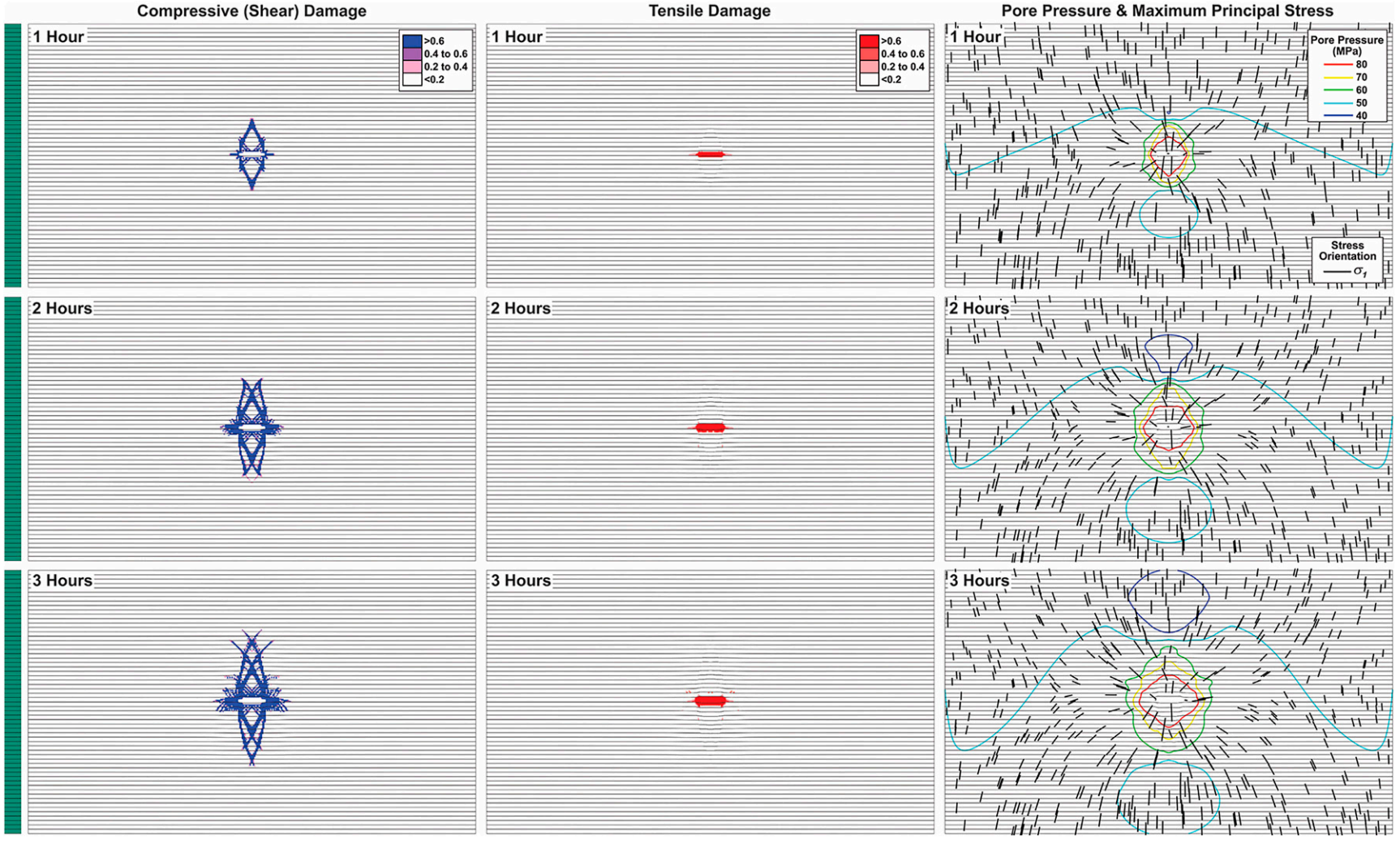

Figure S10. Temporal evolution for model using uniformly weak (green) mechanical stratigraphy configuration and interface behavior with slip not allowed, showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

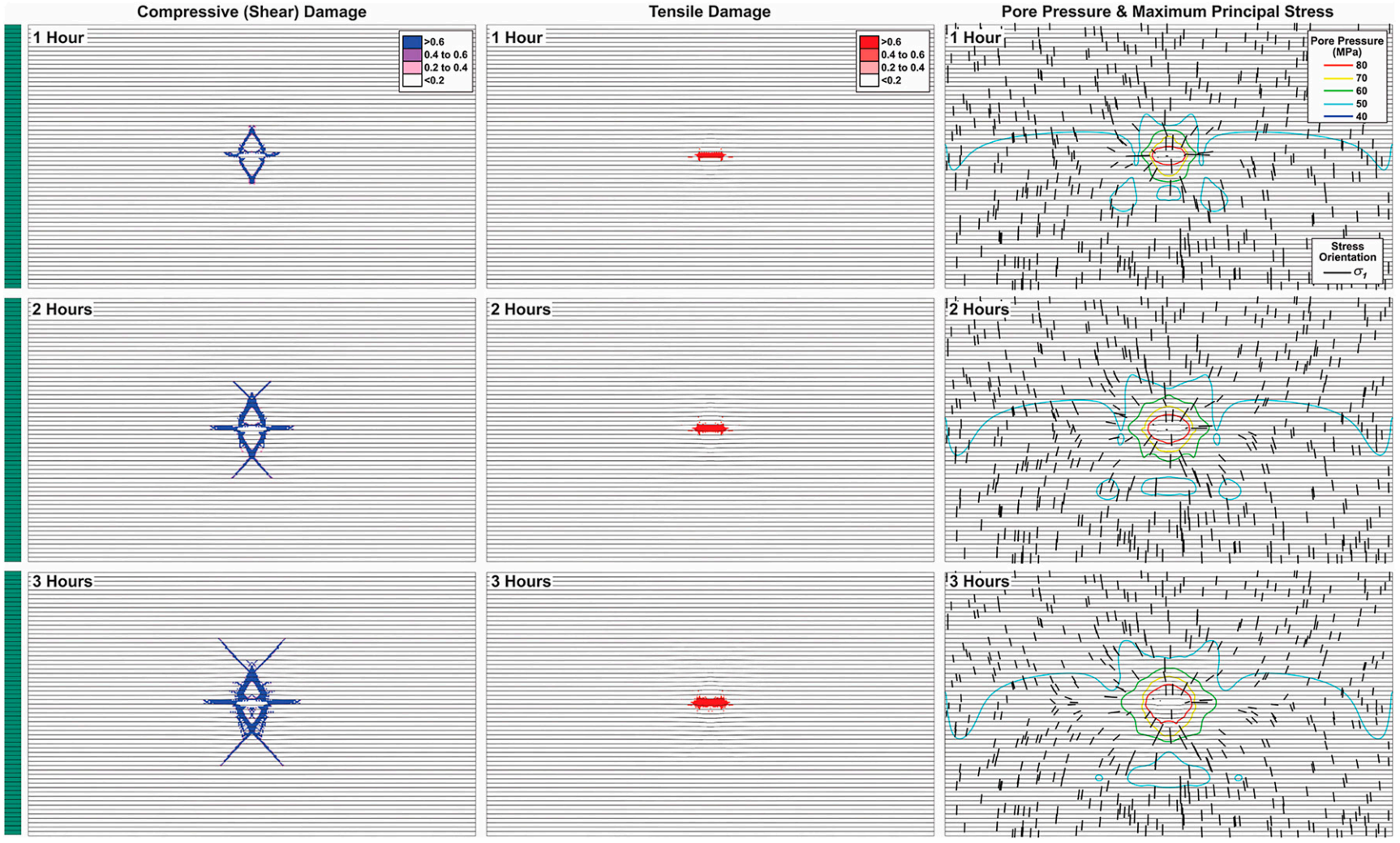

Figure S11. Temporal evolution for model using uniformly weak (green) mechanical stratigraphy configuration and strong sliding interfaces (friction coefficient = 0.65), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.

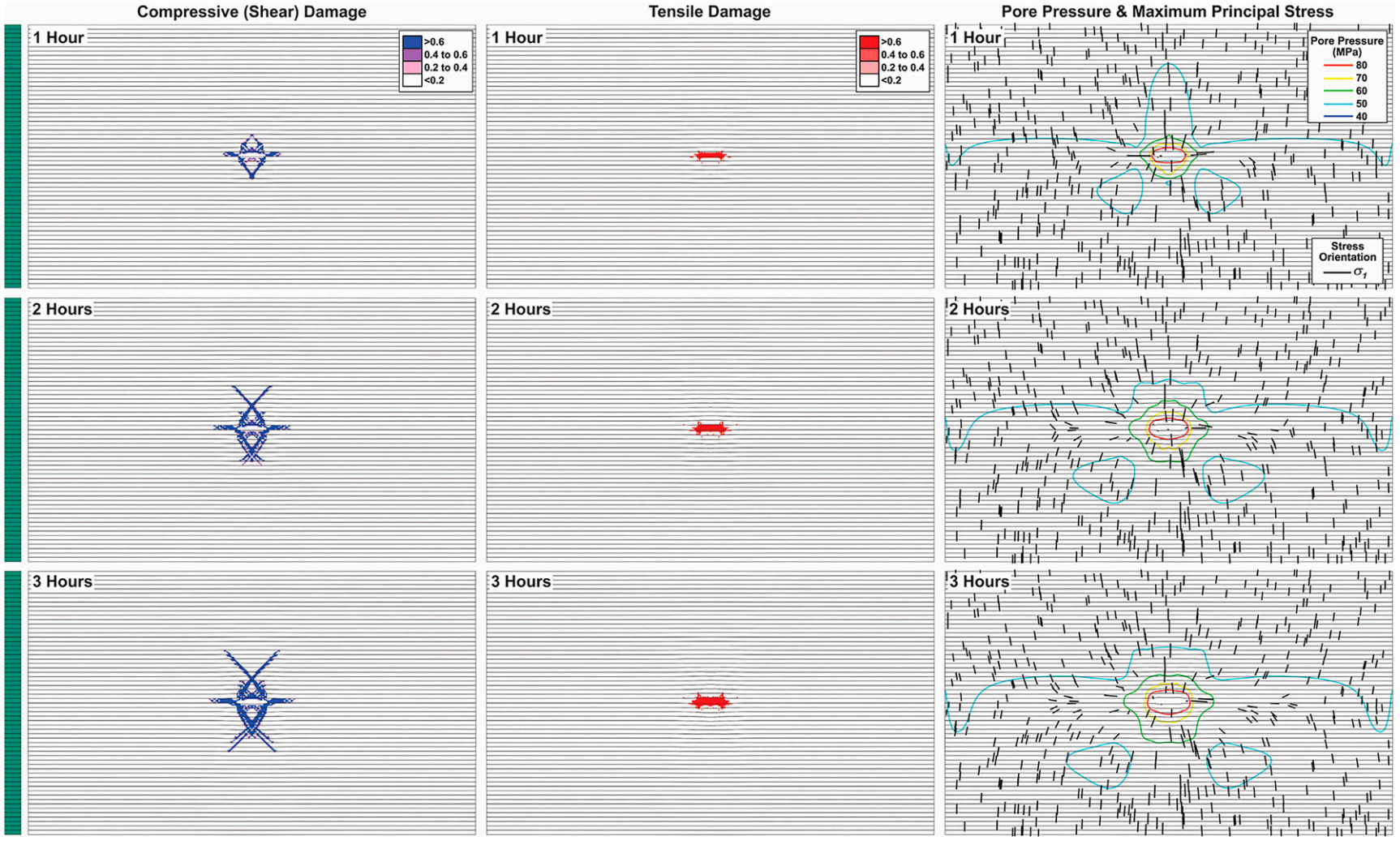

Figure S12. Temporal evolution for model using uniformly weak (green) mechanical stratigraphy configuration and weak sliding interfaces (friction coefficient = 0.20), showing compressive (shear) damage (left column), tensile damage (center column), and principal stress orientations and pore pressure (right column) after 1, 2, and 3 hr of injection. Note that these panels show the full 1000-m width of the model domain but only the central 600 m vertically. σ_1 = maximum principal compressive stress.