

Online supplement to the paper
“A benchmark study on reactive two-phase flow in
porous media: part II – results and discussion”
Full results

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1. Test 1.1: 1D kinetic chemistry

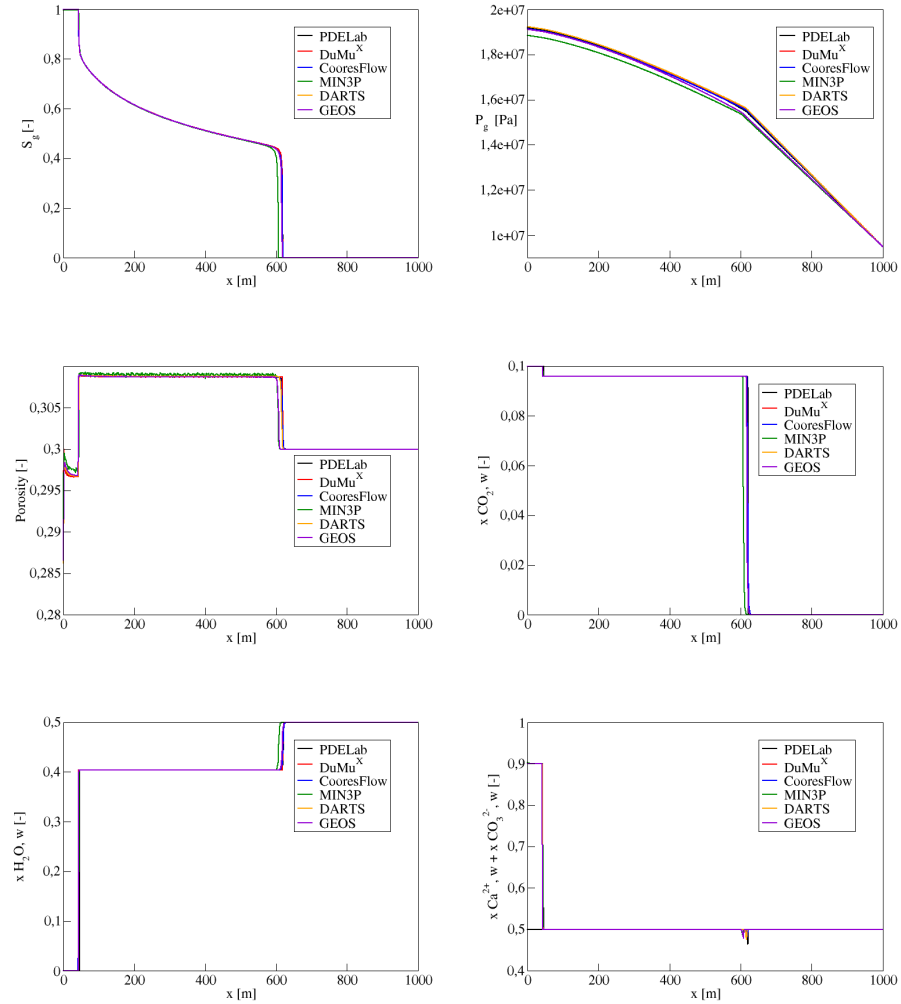


Figure 1: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days for Test 1.1.

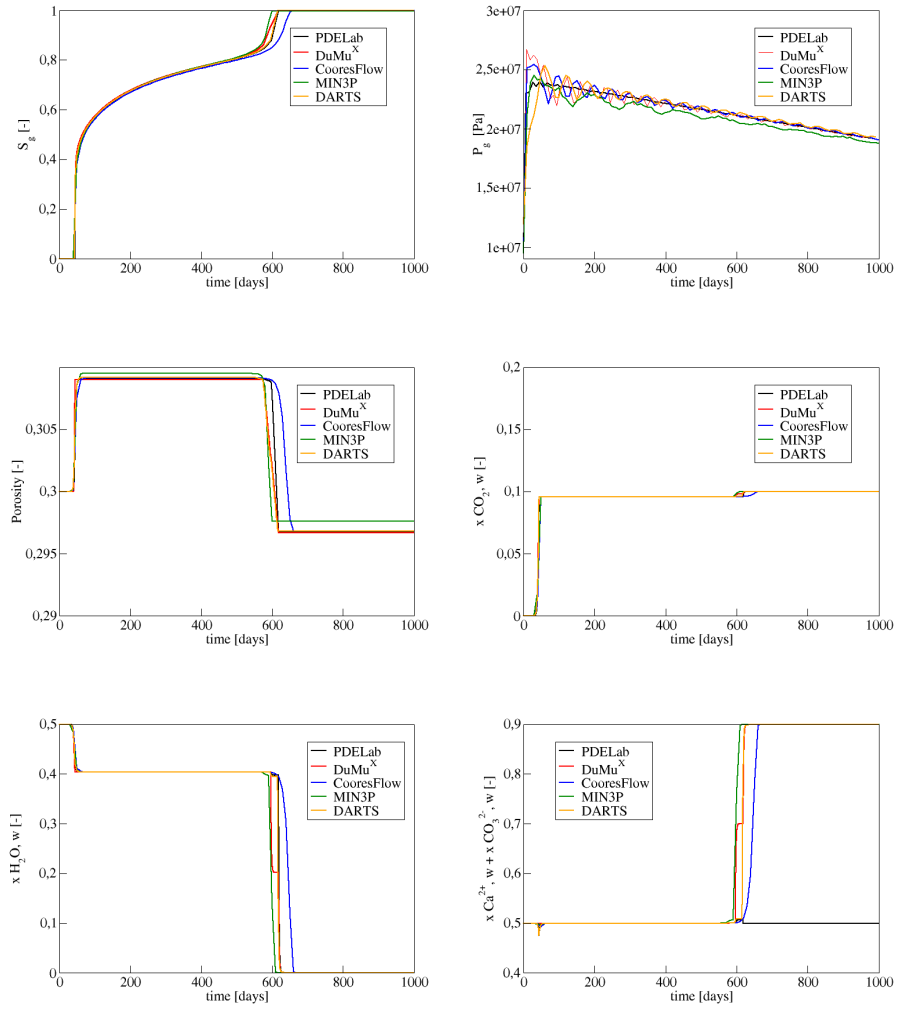


Figure 2: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $x = 25$ m for Test 1.1.

2. Test 1.2: 1D equilibrium chemistry

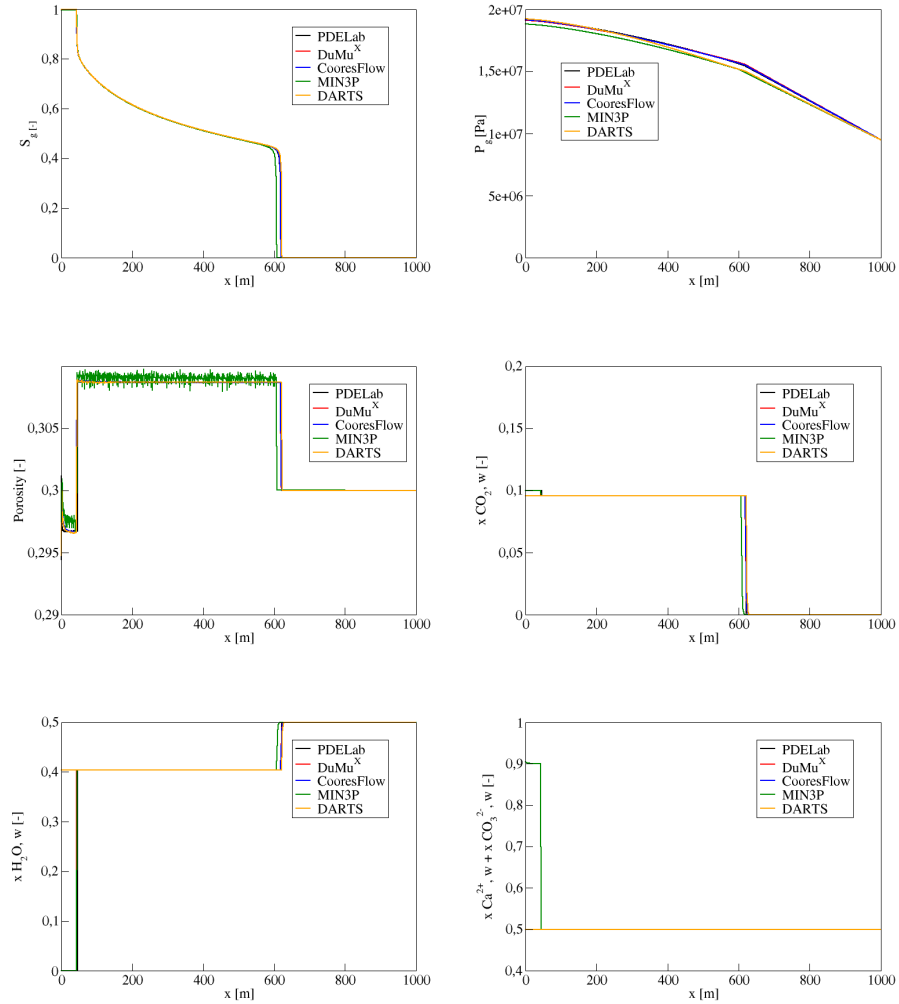


Figure 3: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO₂ fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days for Test 1.2.

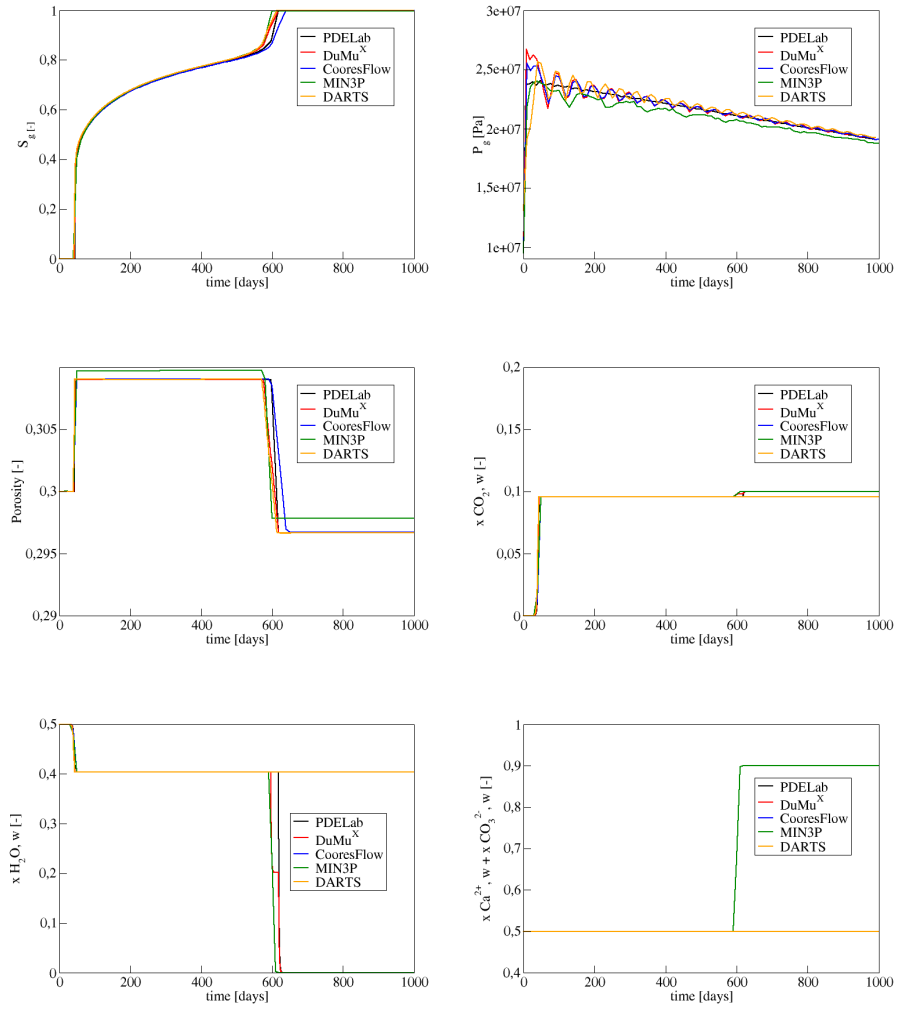


Figure 4: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $x = 25$ m for Test 1.2.

3. Test 2.1: 2D without gravity

3.1. Contour maps for the Test 2.1 without gravity

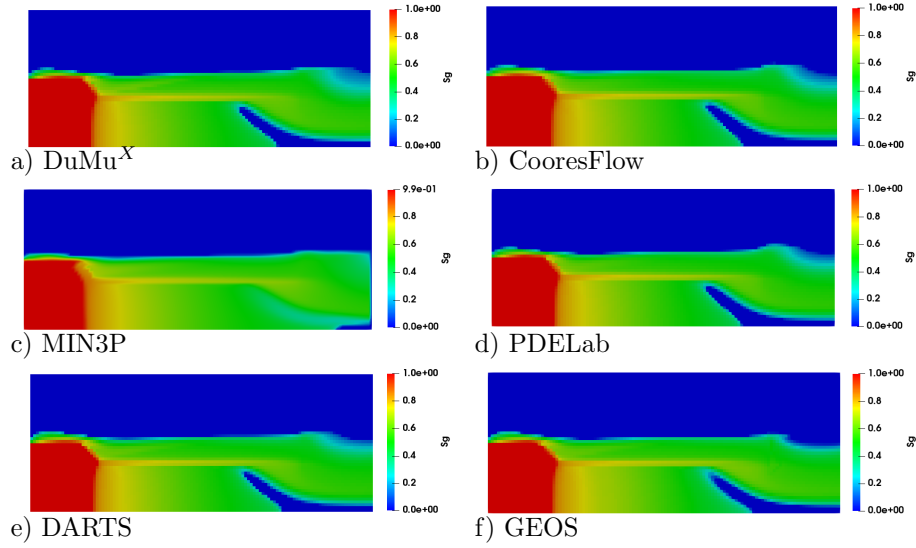


Figure 5: Comparison of gas saturation S_g at $t = 1000$ days for Test 2.1 without gravity.

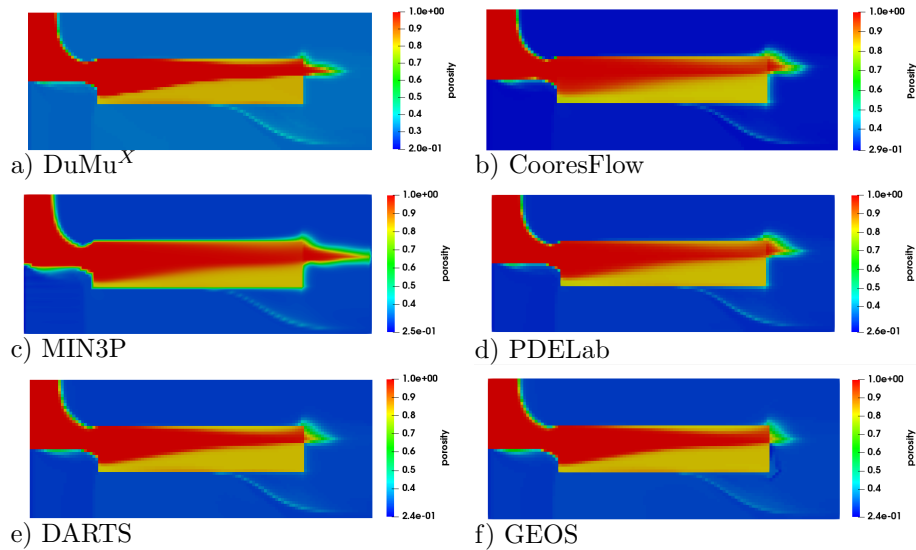


Figure 6: Comparison of porosity ϕ at $t = 1000$ days for Test 2.1 without gravity.

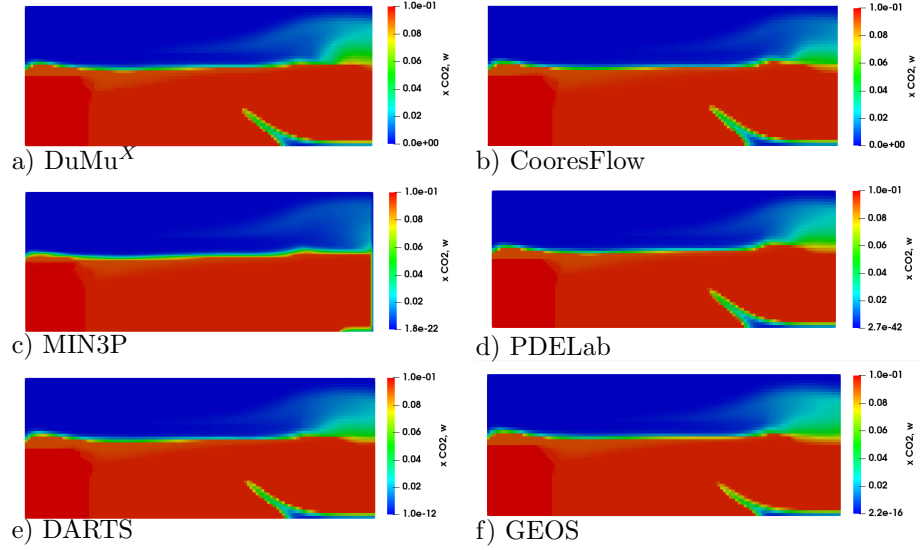


Figure 7: Comparison of liquid CO_2 fraction $x_{\text{CO}_2,w}$ at $t = 1000$ days for Test 2.1 without gravity.

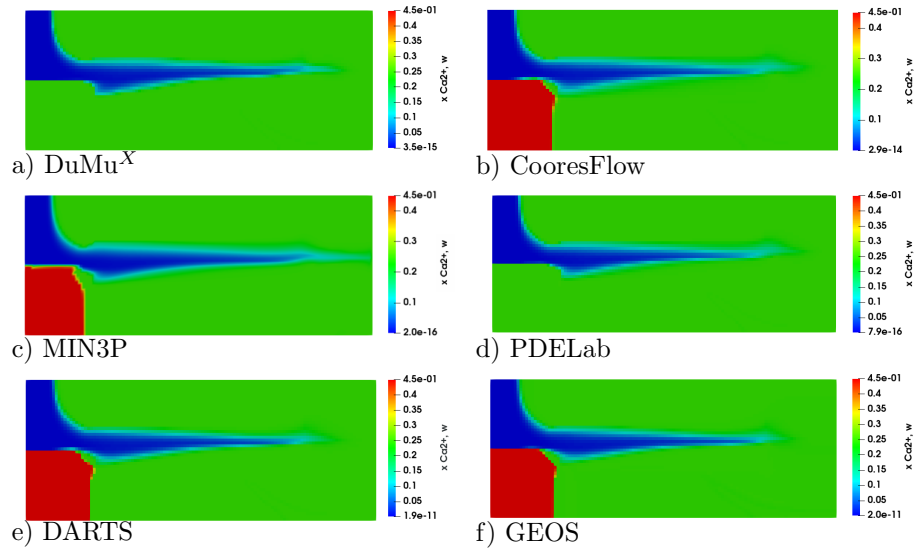


Figure 8: Comparison of liquid Ca^{2+} fraction $x_{\text{Ca}^{2+},w}$ at $t = 1000$ days for Test 2.1 without gravity.

3.2. Vertical line at $x = 40$ m for the Test 2.1 without gravity

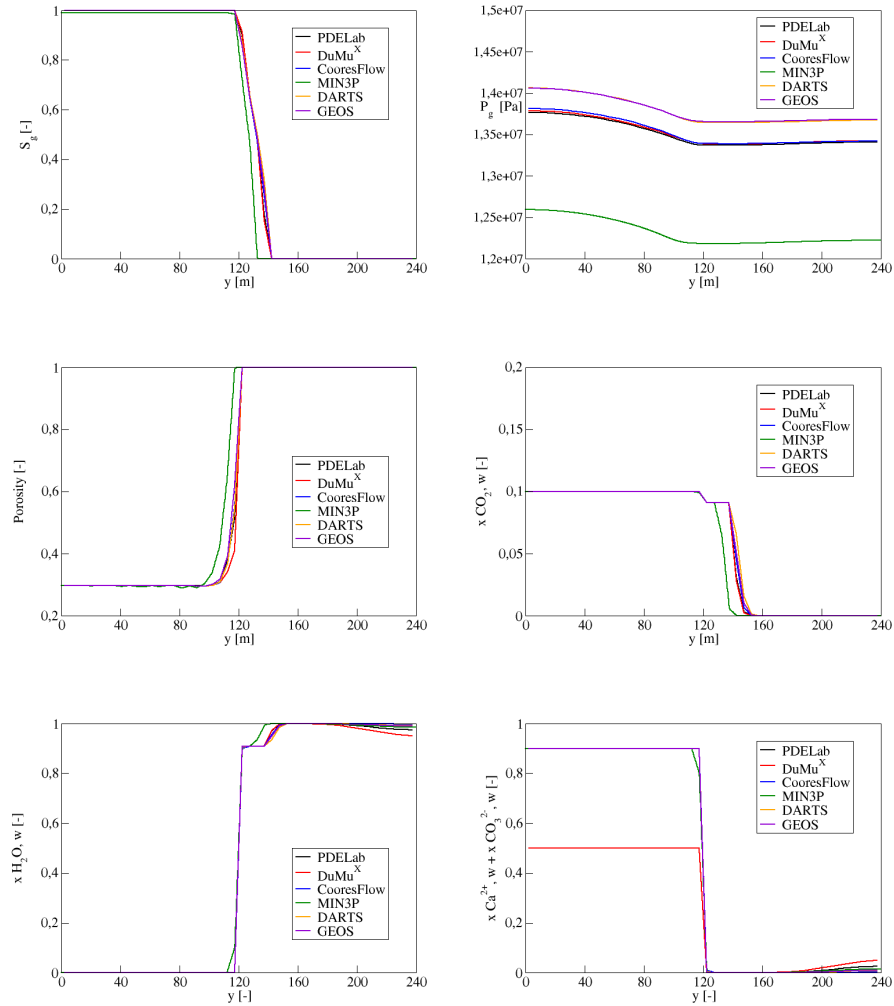


Figure 9: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days on vertical line $x = 40$ m for Test 2.1 without gravity.

3.3. Horizontal line at $y = 50$ m for the Test 2.1 without gravity

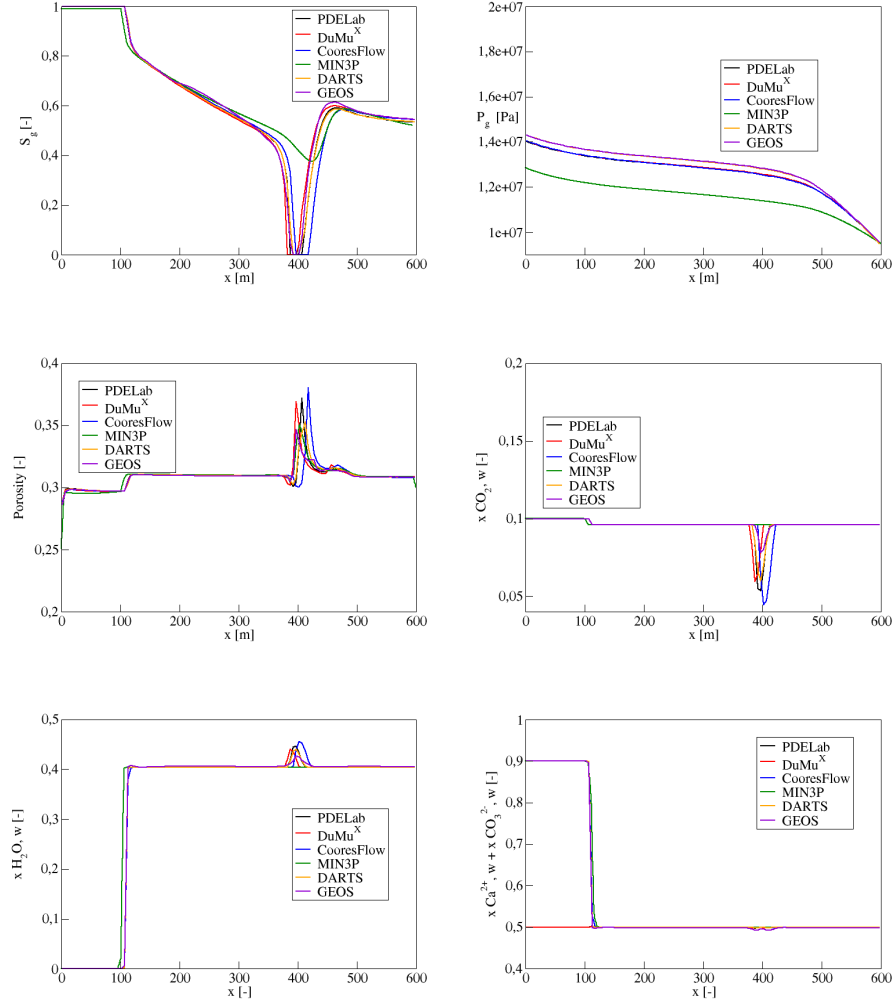


Figure 10: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days on the horizontal line $y = 50$ m for Test 2.1 without gravity.

4. Test 2.1 : 2D with gravity

4.1. Contour maps for the Test 2.1 with gravity

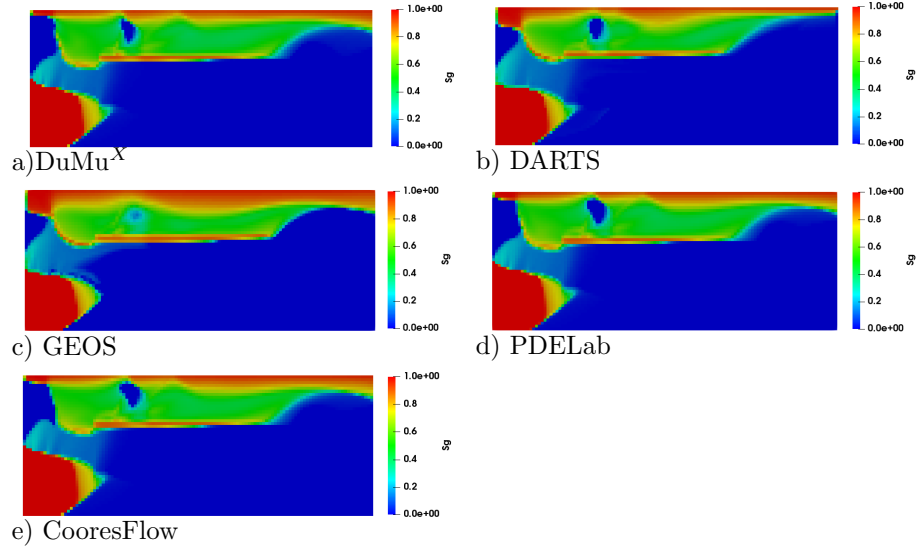


Figure 11: Comparison of gas saturation S_g at $t = 1000$ days for the 2D test with simple chemistry and with gravity.

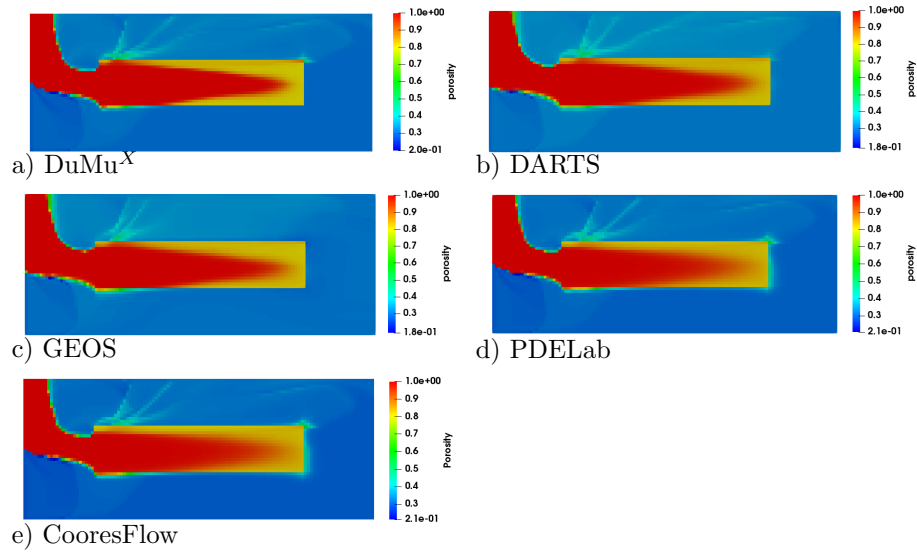


Figure 12: Comparison of porosity ϕ at $t = 1000$ days for the Test 2.1 with gravity.

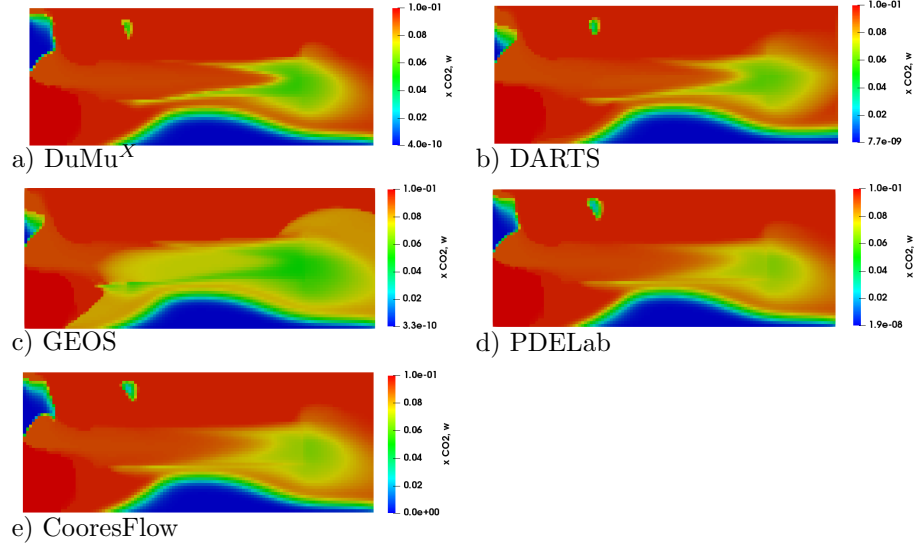


Figure 13: Comparison of liquid CO_2 fraction $x_{\text{CO}_2,w}$ at $t = 1000$ days for the Test 2.1 with gravity.

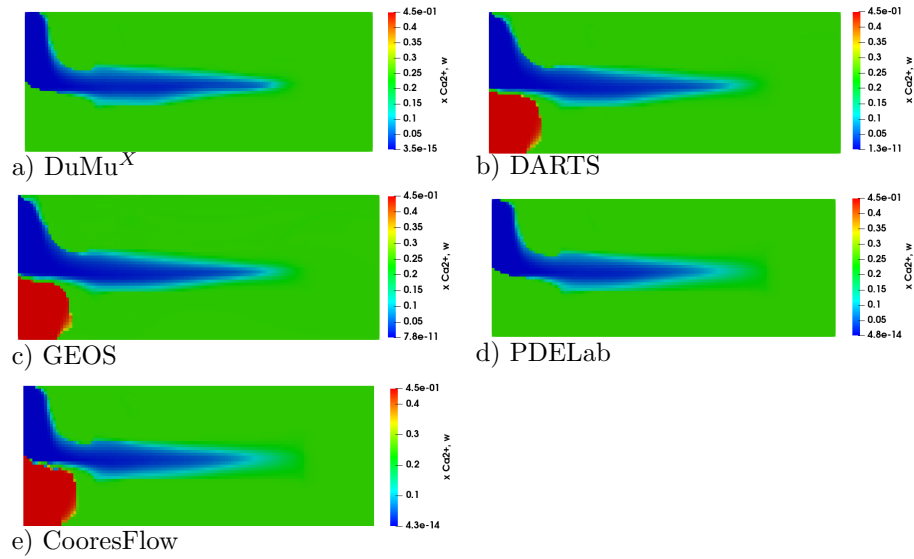


Figure 14: Comparison of liquid Ca^{2+} fraction $x_{\text{Ca}^{2+},w}$ at $t = 1000$ days for the Test 2.1 with gravity.

4.2. Vertical line at $x = 40$ m for the Test 2.1 with gravity

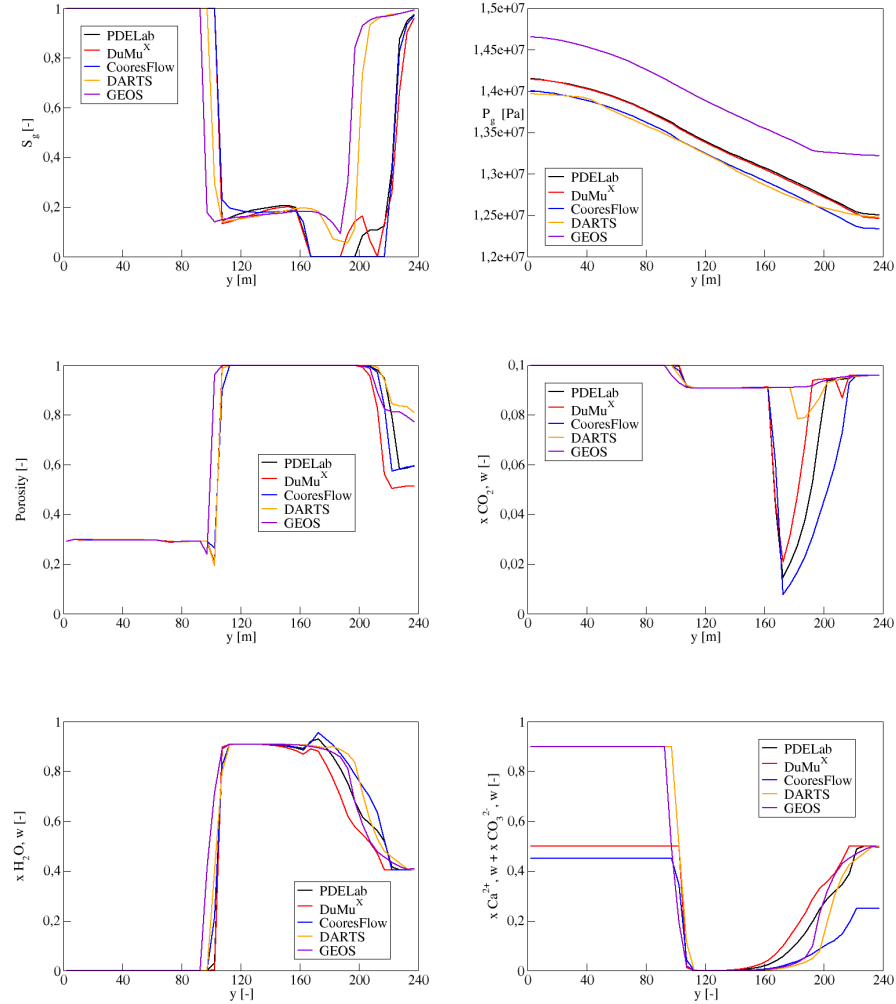


Figure 15: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days on vertical line $x = 40$ m for Test 2.1 with gravity.

4.3. Horizontal line at $y = 50$ m for the Test 2.1 with gravity

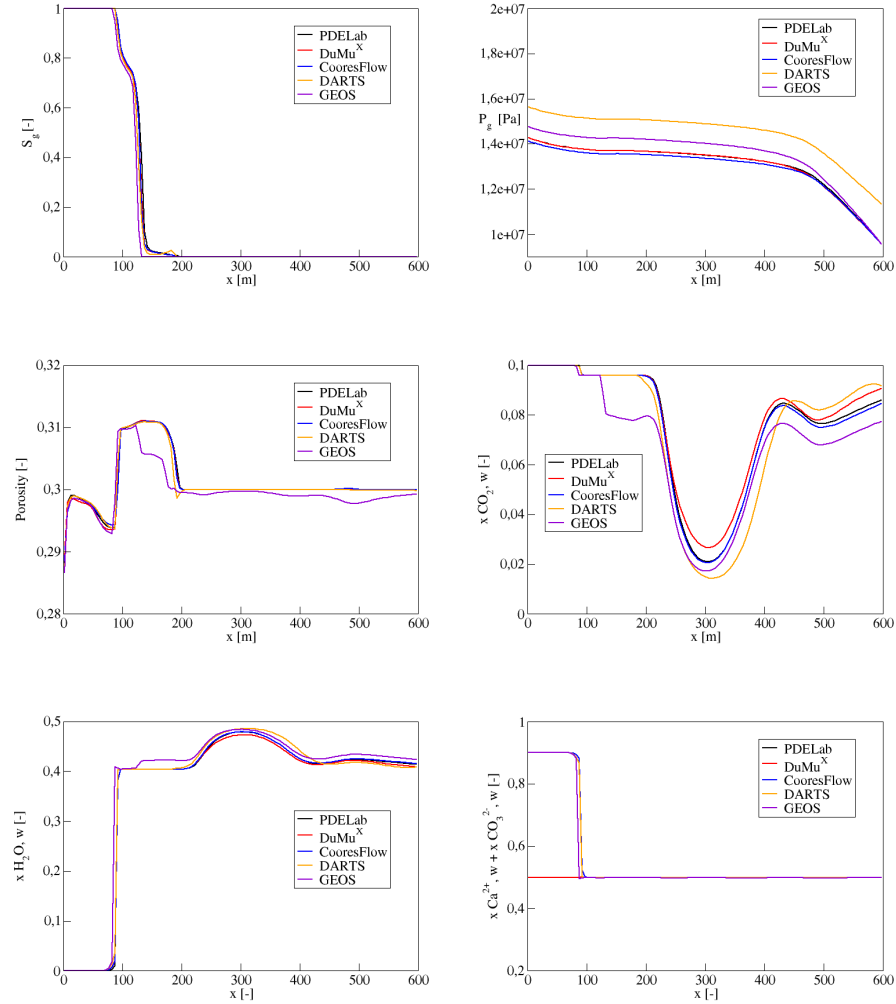


Figure 16: Comparison of gas saturation (top left), gas pressure (top right), porosity (middle left), liquid CO_2 fraction (middle right), liquid water fraction (bottom left), liquid total ion fraction (bottom right) at $t = 1000$ days on vertical line $y = 50$ m for Test 2.1 with gravity.

5. Test 2.2: 2D extended chemical system

5.1. Contour maps for Test 2.2

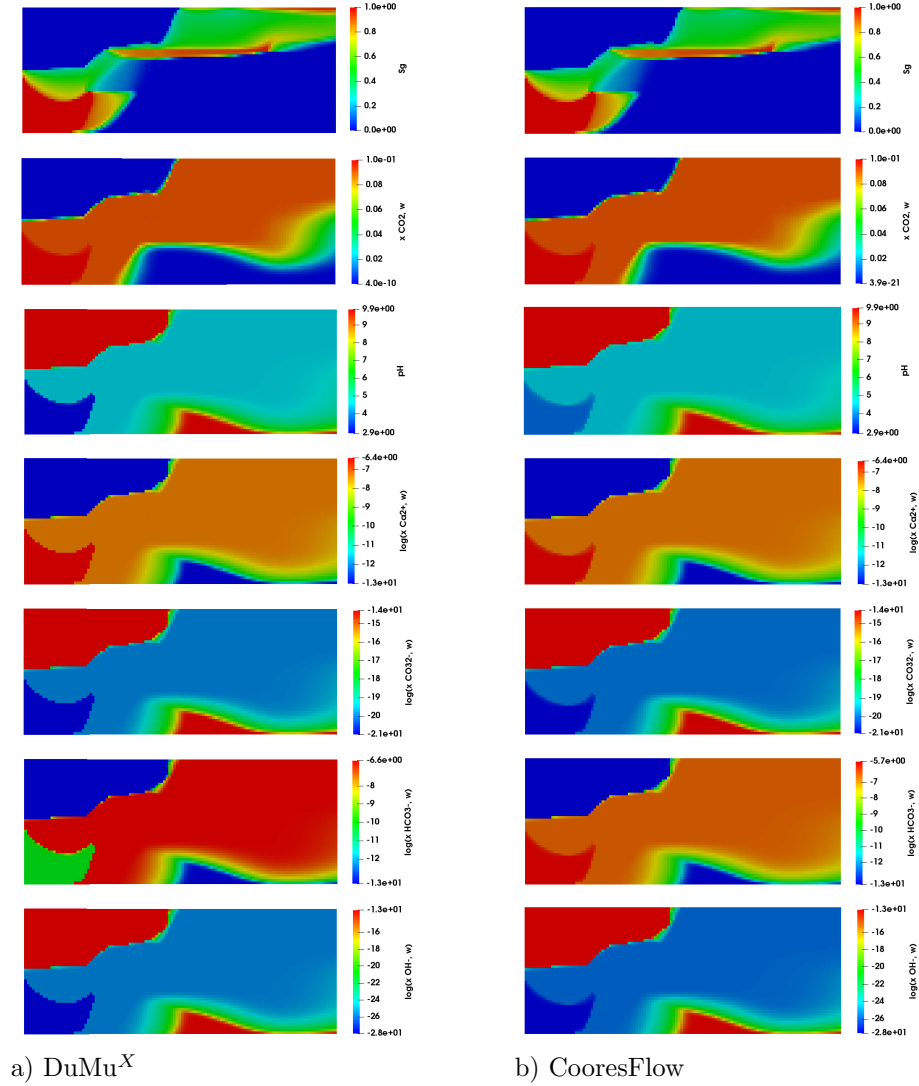


Figure 17: Comparison of several quantities at $t = 1000$ days for the Test 2.2 (left column: DuMu^X, right column: CooresFlow). From top to bottom: gas saturation, liquid CO₂ fraction, pH, logarithm of liquid Ca²⁺ fraction, logarithm of CO₃²⁻, logarithm of liquid HCO₃⁻ fraction, logarithm of OH⁻

5.2. Vertical line at $x = 40$ m for the Test 2.2

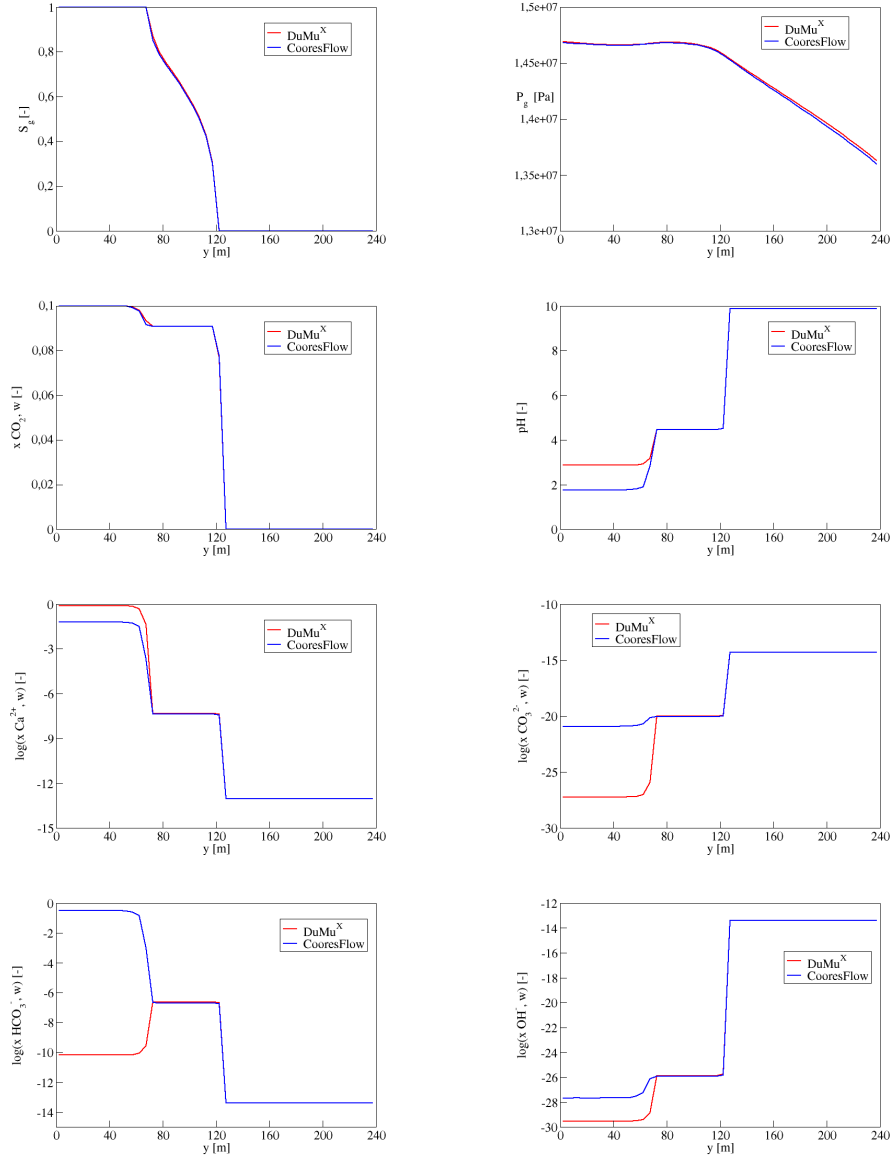


Figure 18: Comparison of gas saturation (top left), gas pressure (top right), liquid CO_2 fraction (second row left), pH (second row right), logarithm of liquid Ca^{2+} fraction (third row left), logarithm of liquid CO_3^{2-} fraction (third row right), logarithm of HCO_3^- (bottom left), logarithm of OH^- (bottom right) at $t = 1000$ days on vertical line $x = 40$ m for Test 2.2.

5.3. Horizontal line at $y = 50$ m for the Test 2.2

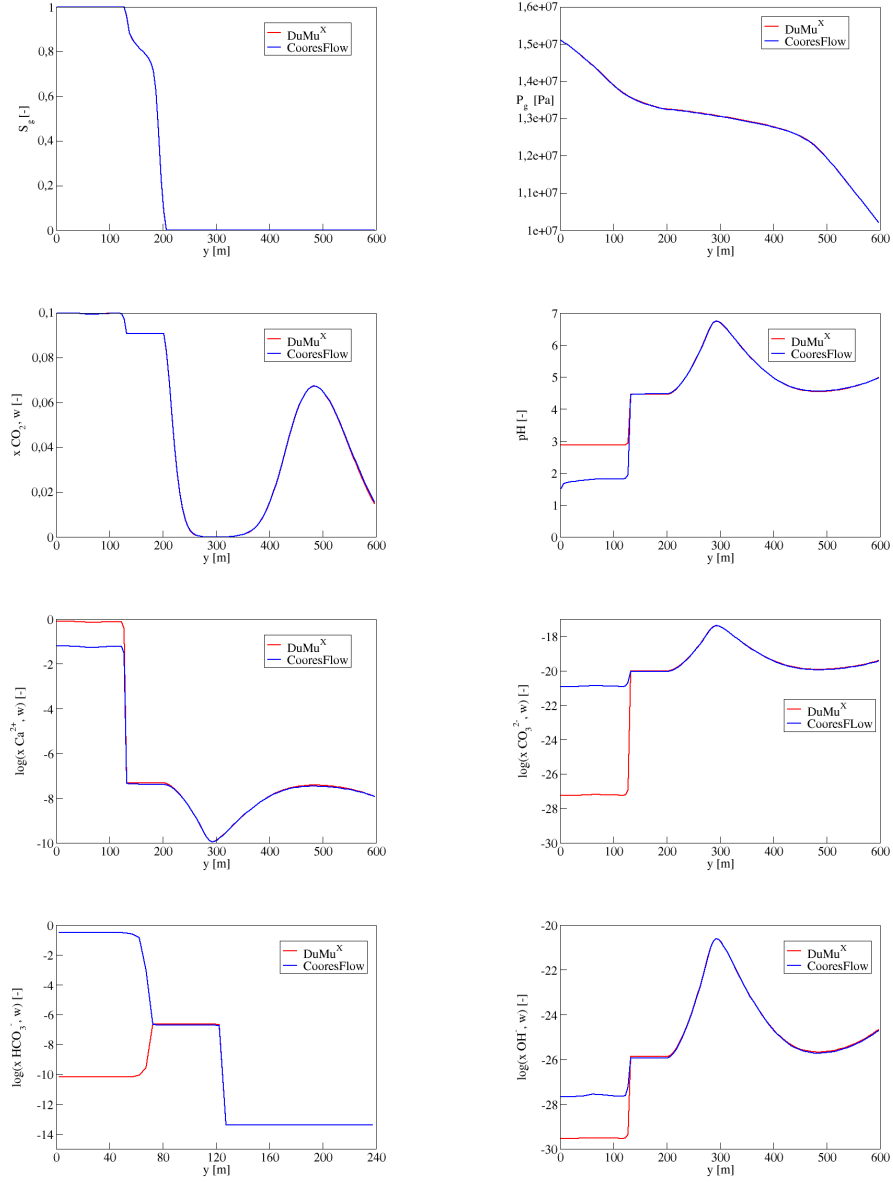


Figure 19: Comparison of gas saturation (top left), gas pressure (top right), liquid CO_2 fraction (second row left), pH (second row right), logarithm of liquid Ca^{2+} fraction (third row left), logarithm of liquid CO_3^{2-} fraction (third row right), logarithm of HCO_3^- (bottom left), logarithm of OH^- (bottom right) at $t = 1000$ days on vertical line $y = 50$ m for the Test 2.2.