

# Test Results for Mesh Hydro Code

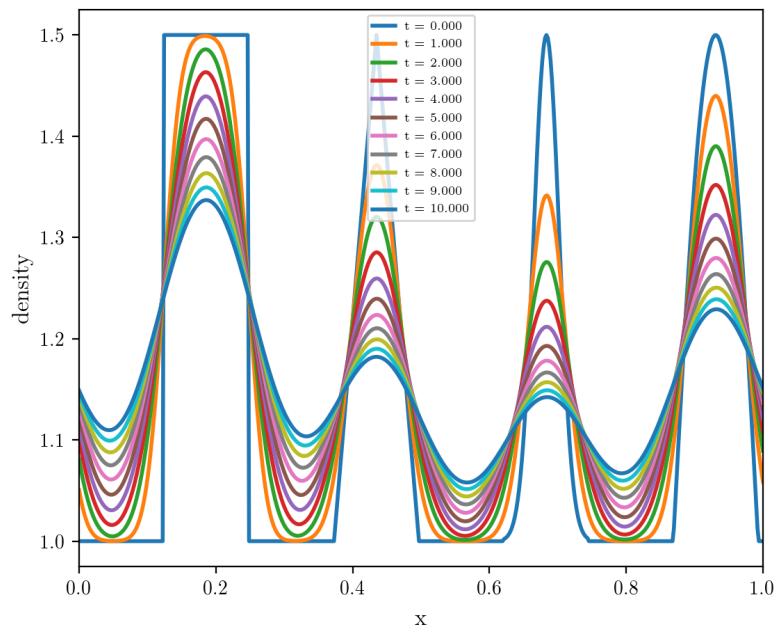
This computer

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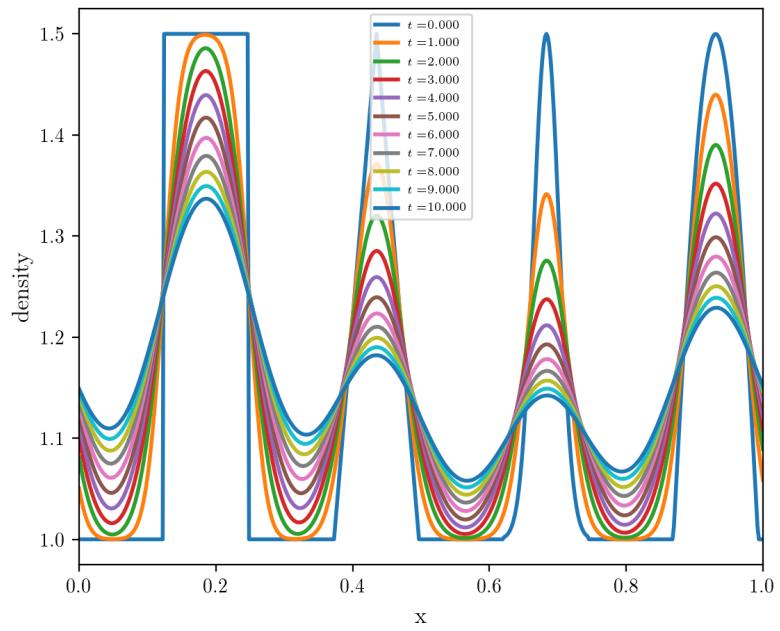
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# 1 Advection

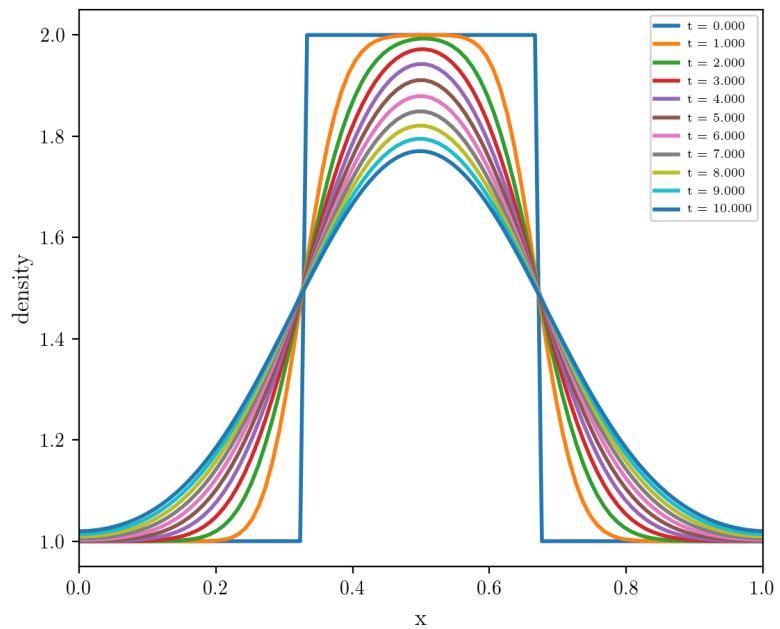
## 1.1 Piecewise Constant



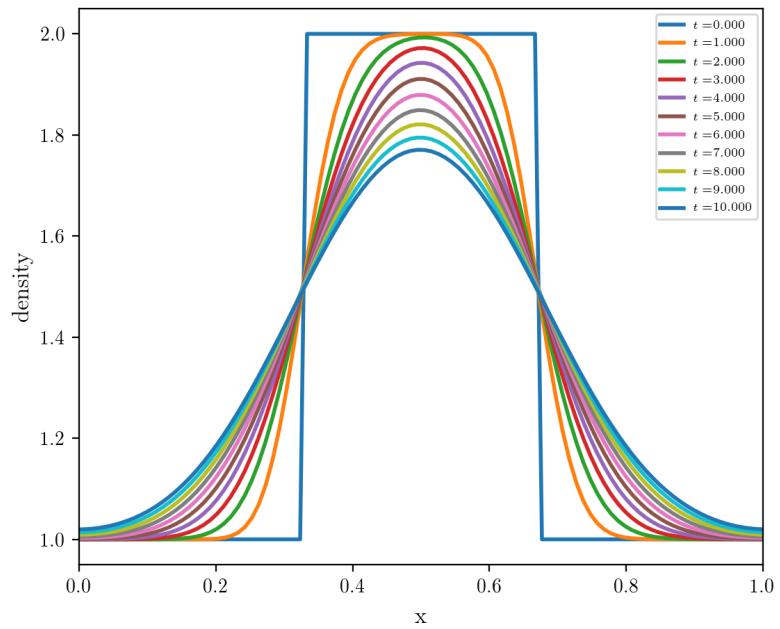
**Figure 1:** Expected result 1D



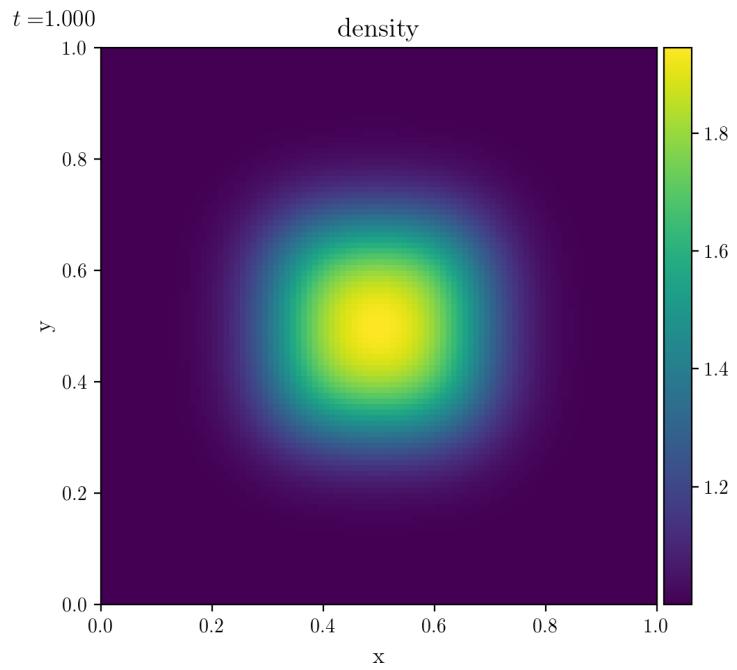
**Figure 2:** Obtained result 1D



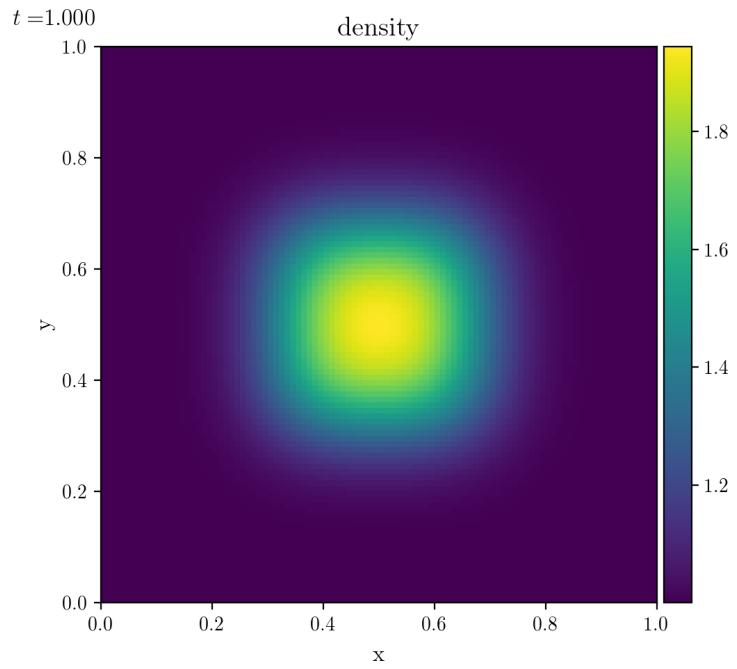
**Figure 3:** Expected result 1D negative velocity



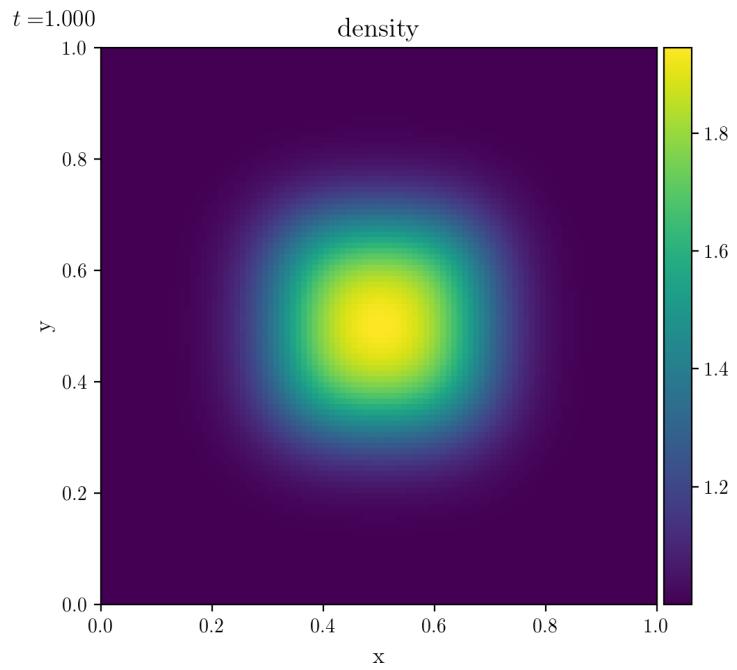
**Figure 4:** Obtained result 1D negative velocity



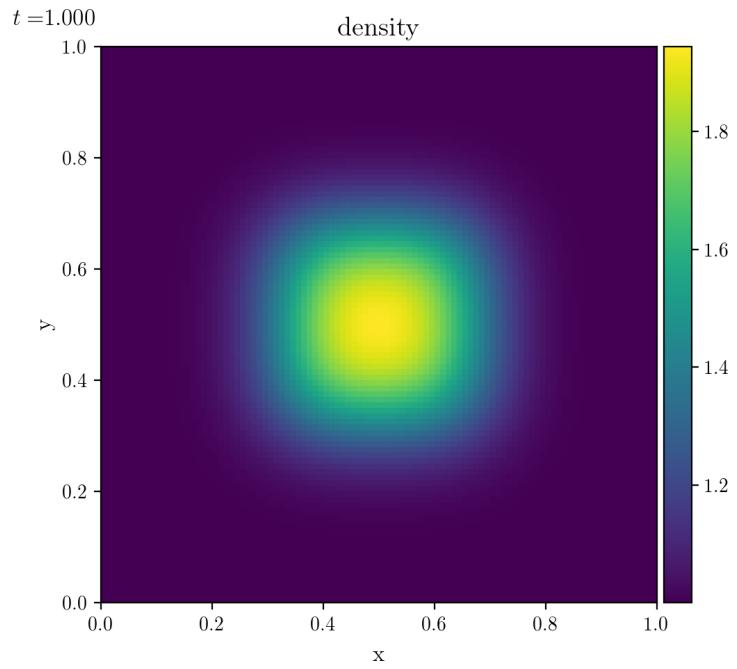
**Figure 5:** Expected result 2D



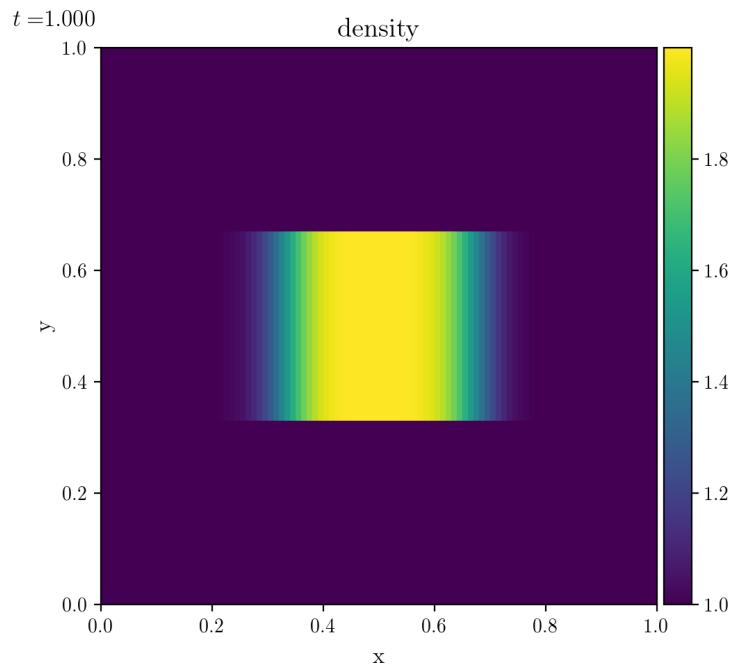
**Figure 6:** Obtained result 2D



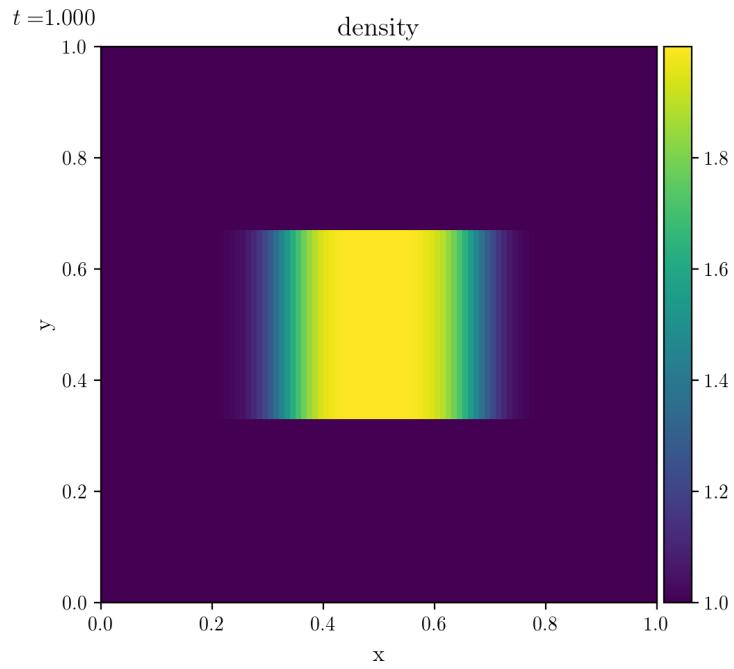
**Figure 7:** Expected result 2D negative velocity



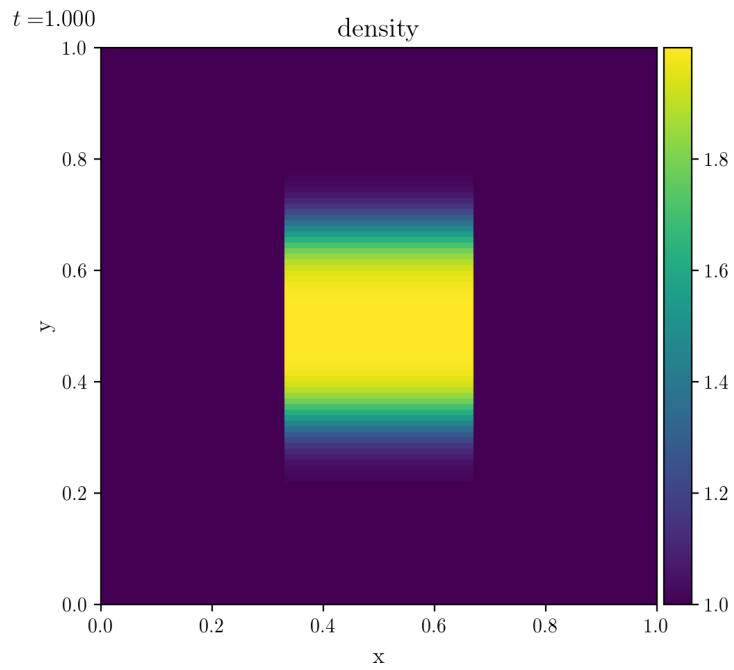
**Figure 8:** Obtained result 2D negative velocity



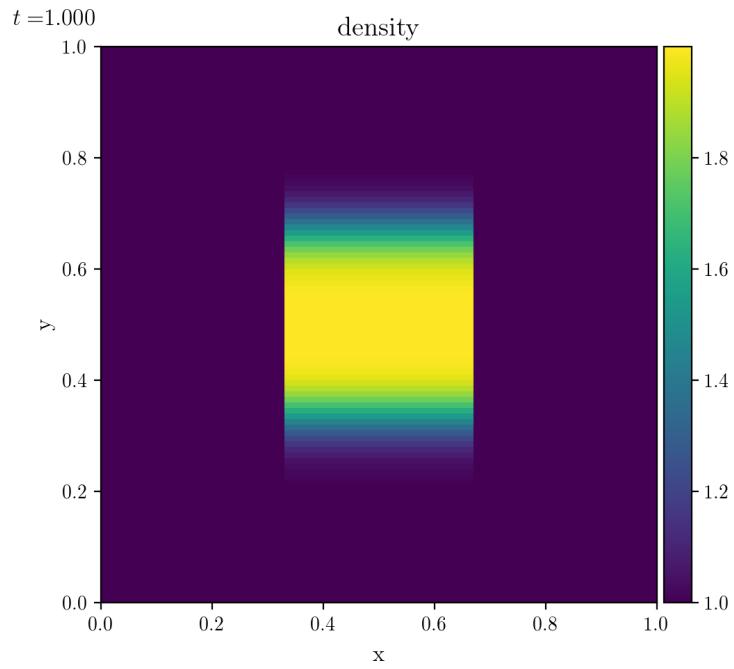
**Figure 9:** Expected result 2D velocity in x direction only



**Figure 10:** Obtained result 2D velocity in x direction only

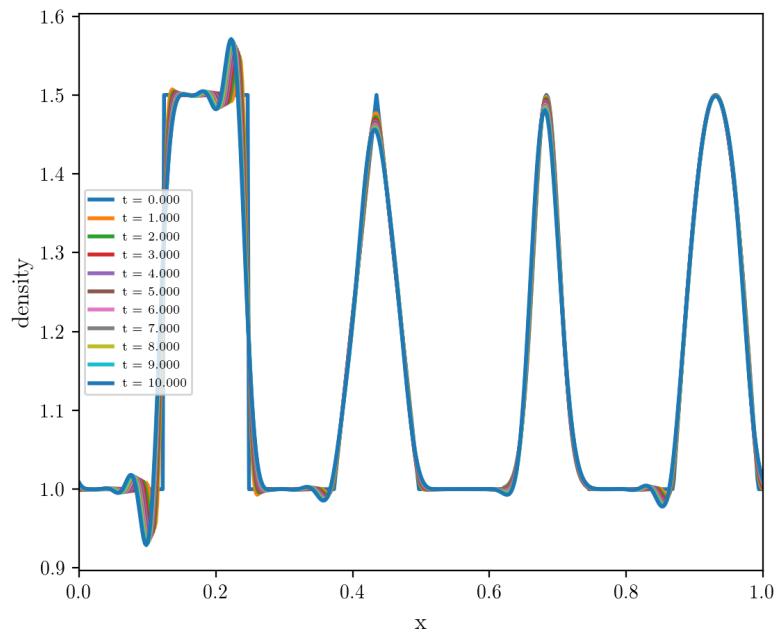


**Figure 11:** Expected result 2D velocity in y direction only

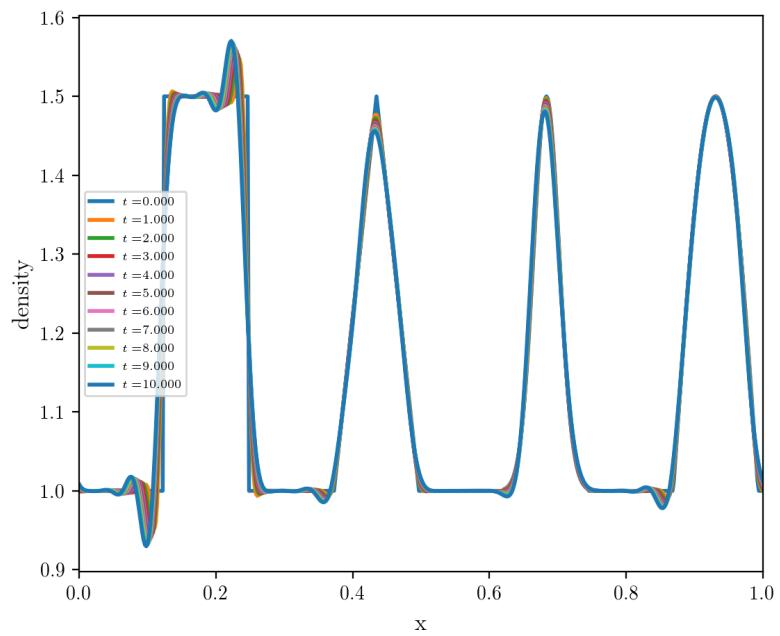


**Figure 12:** Obtained result 2D velocity in y direction only

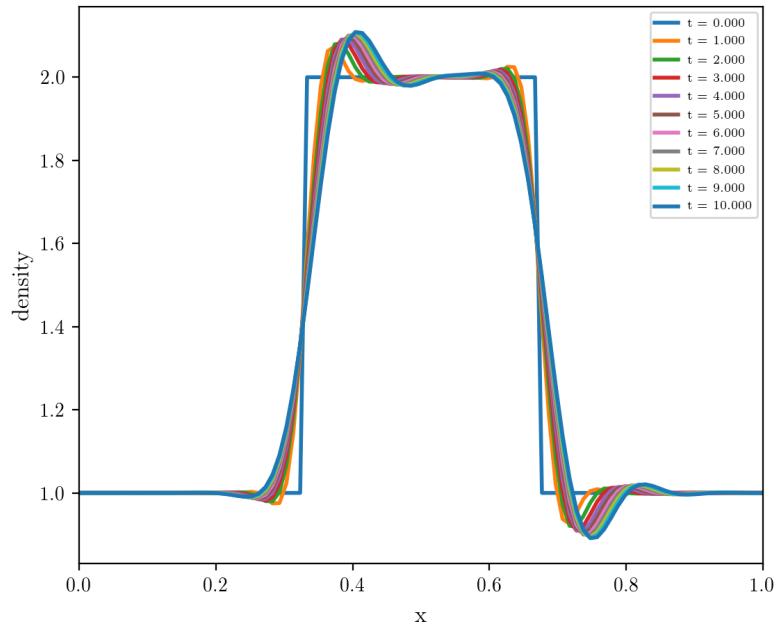
## 1.2 Piecewise Linear



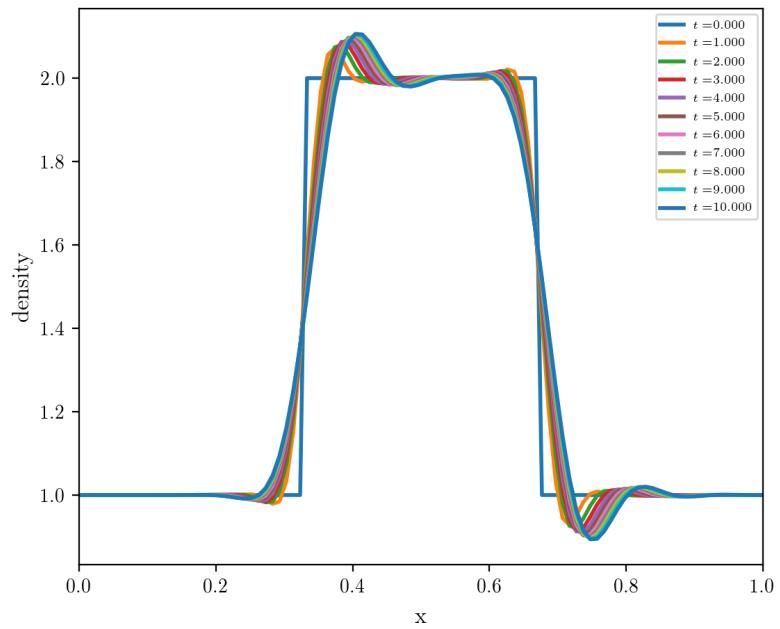
**Figure 13:** Expected result 1D



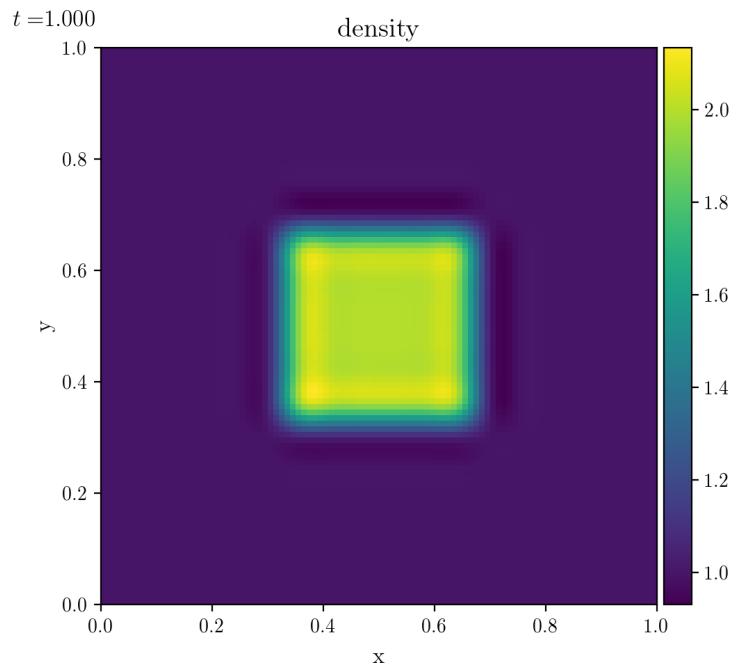
**Figure 14:** Obtained result 1D



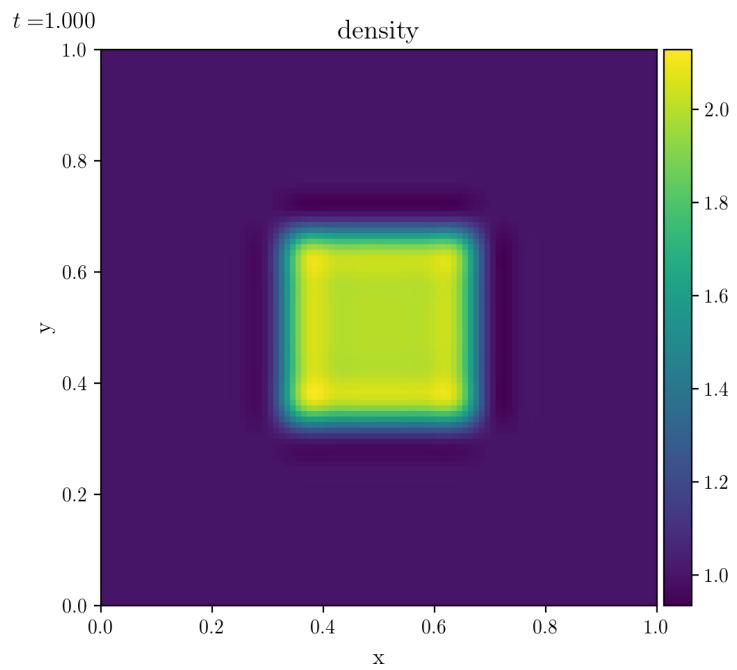
**Figure 15:** Expected result 1D negative velocity



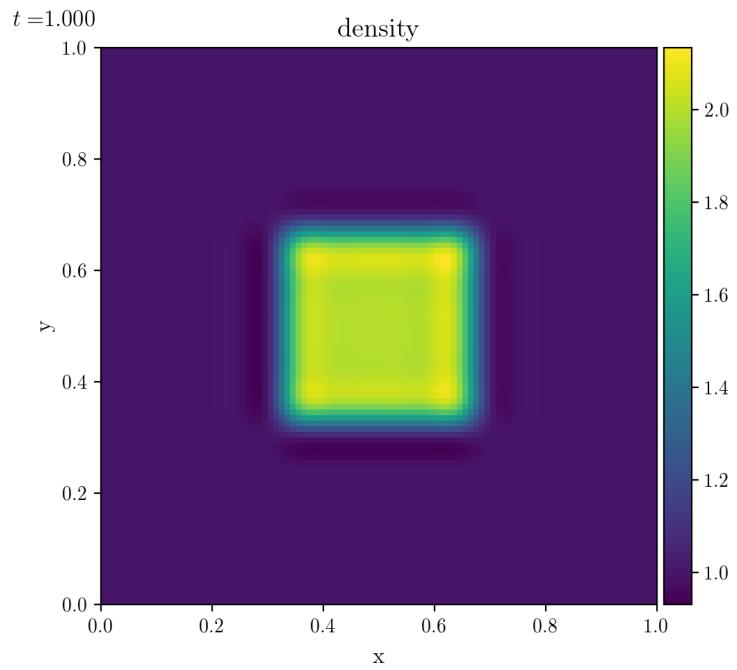
**Figure 16:** Obtained result 1D negative velocity



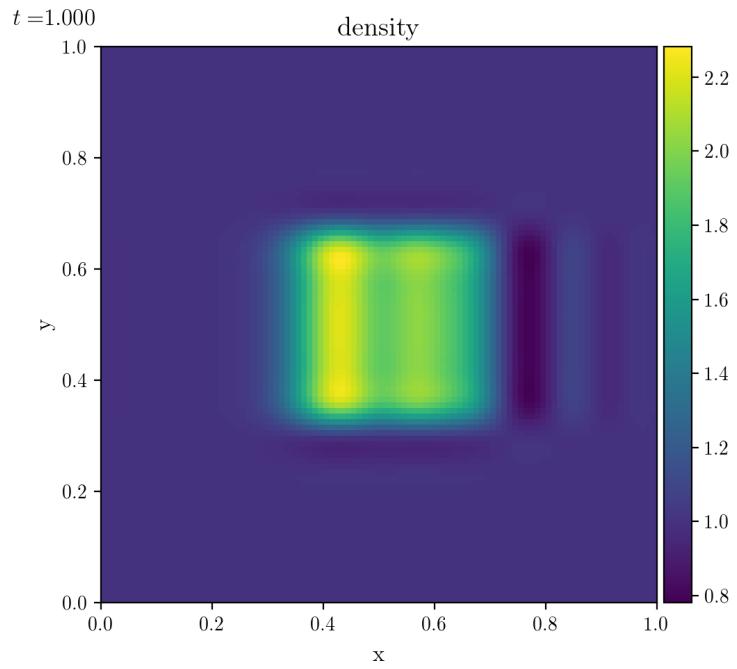
**Figure 17:** Expected result 2D



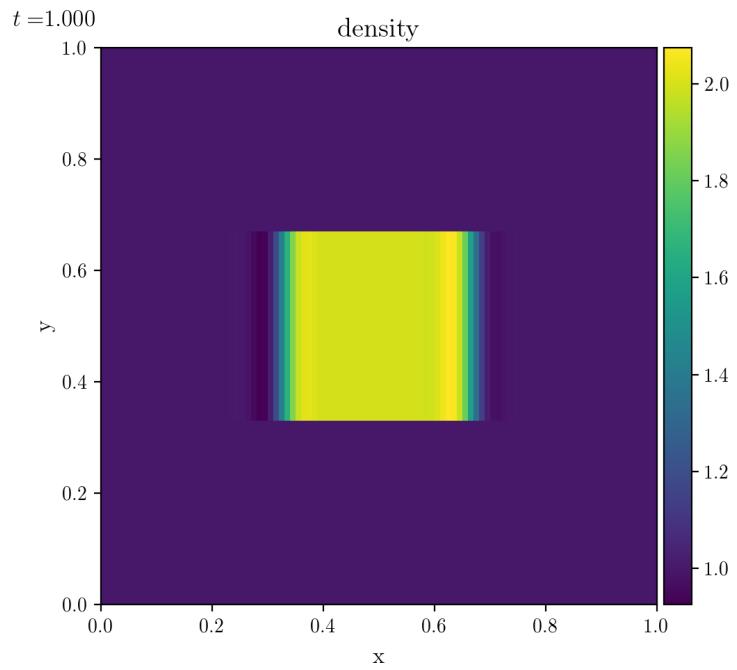
**Figure 18:** Obtained result 2D



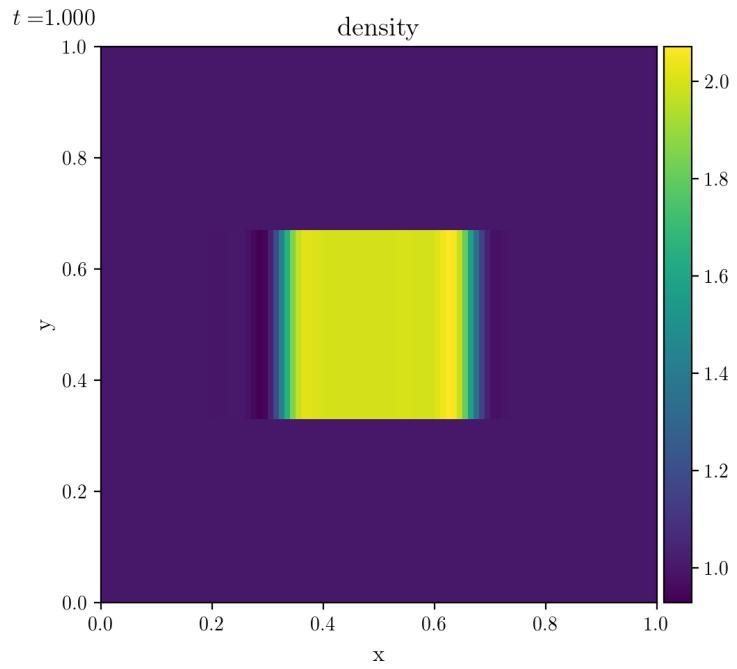
**Figure 19:** Expected result 2D negative velocity



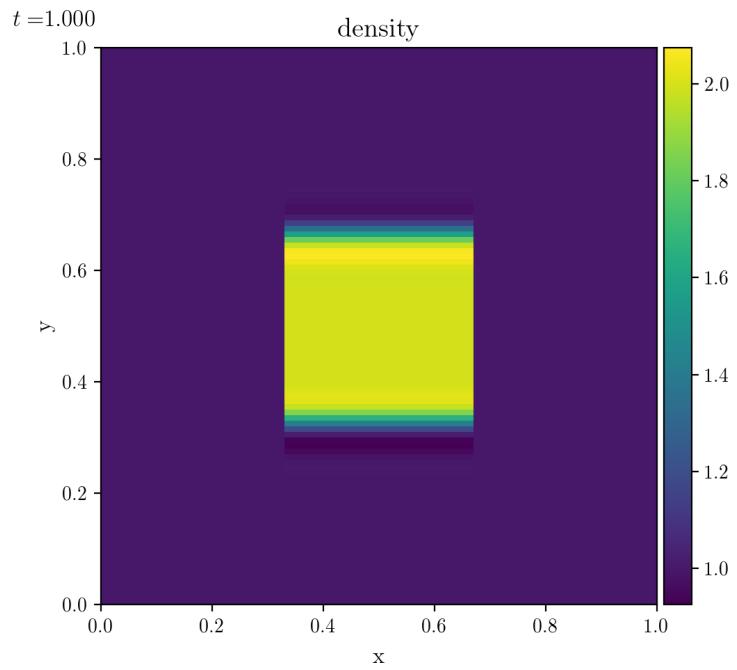
**Figure 20:** Obtained result 2D negative velocity



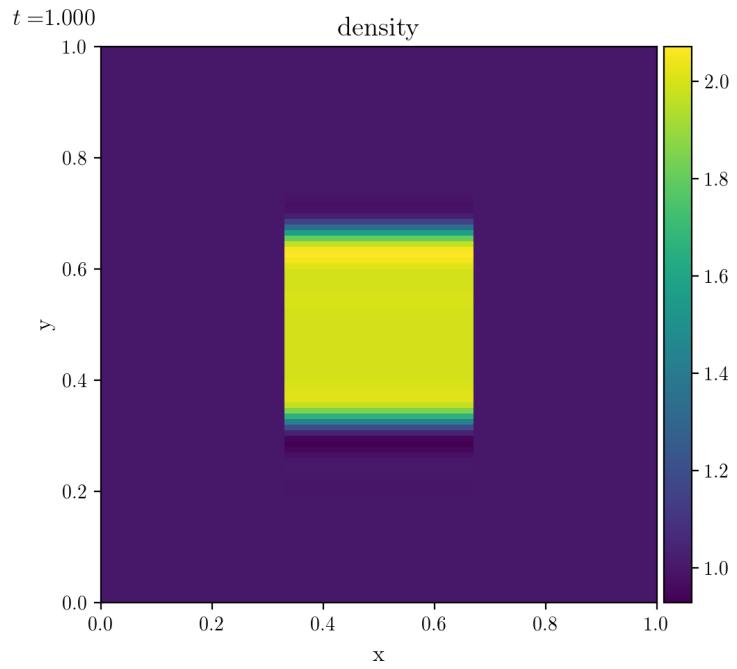
**Figure 21:** Expected result 2D velocity in x direction only



**Figure 22:** Obtained result 2D velocity in x direction only

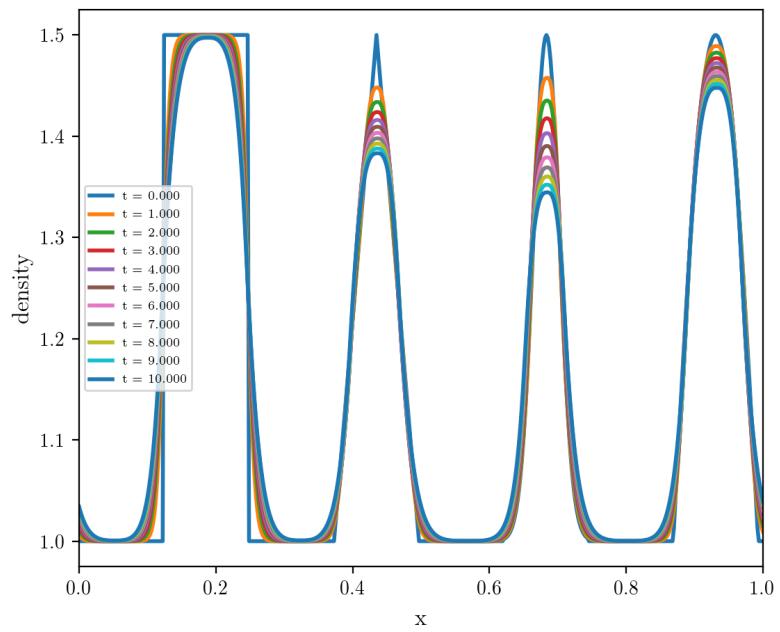


**Figure 23:** Expected result 2D velocity in y direction only

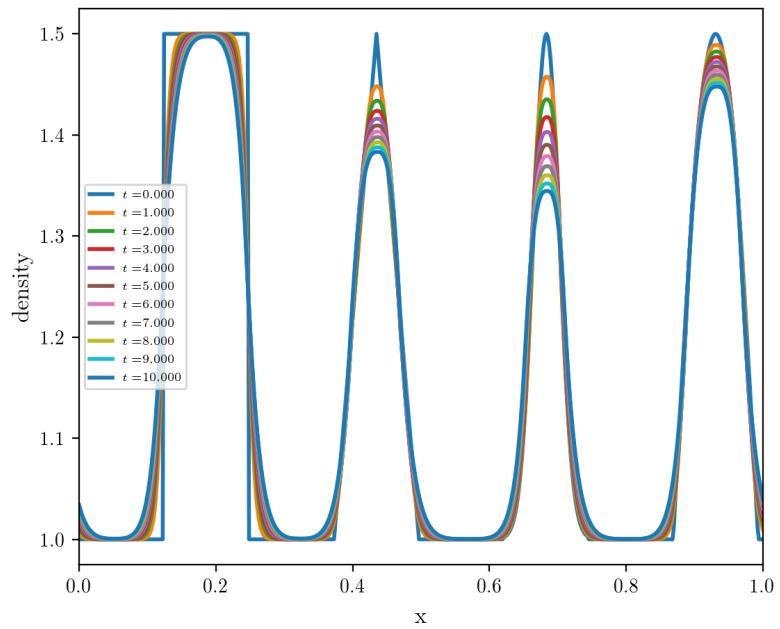


**Figure 24:** Obtained result 2D velocity in y direction only

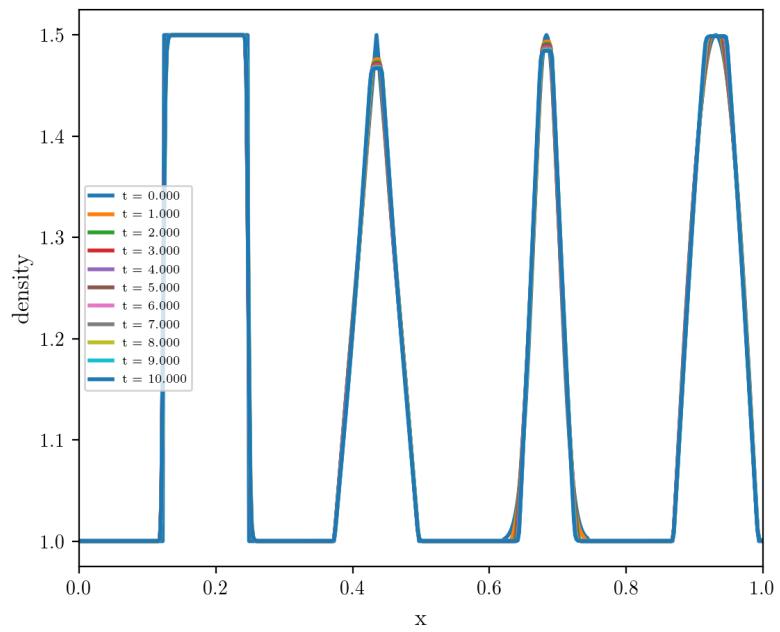
### 1.3 Piecewise Linear with Slope Limiters



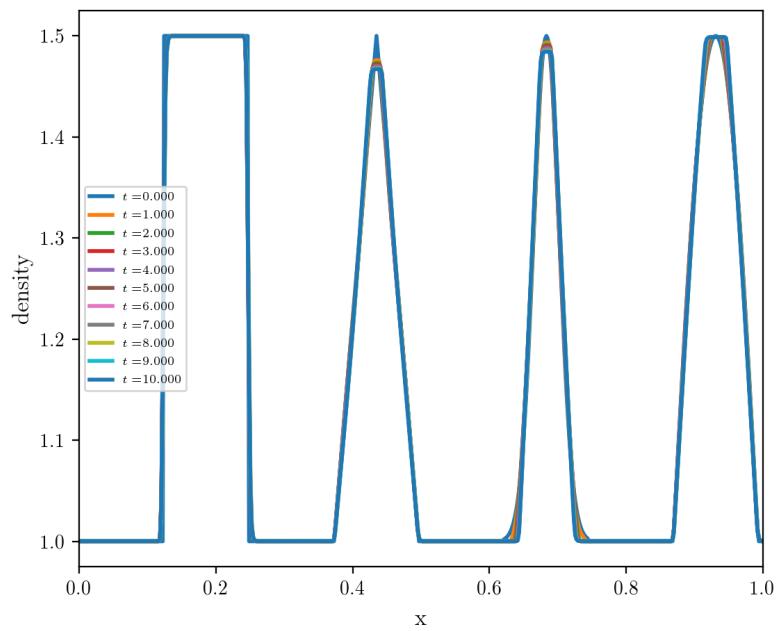
**Figure 25:** Minmod Slope Limiter. Expected result 1D



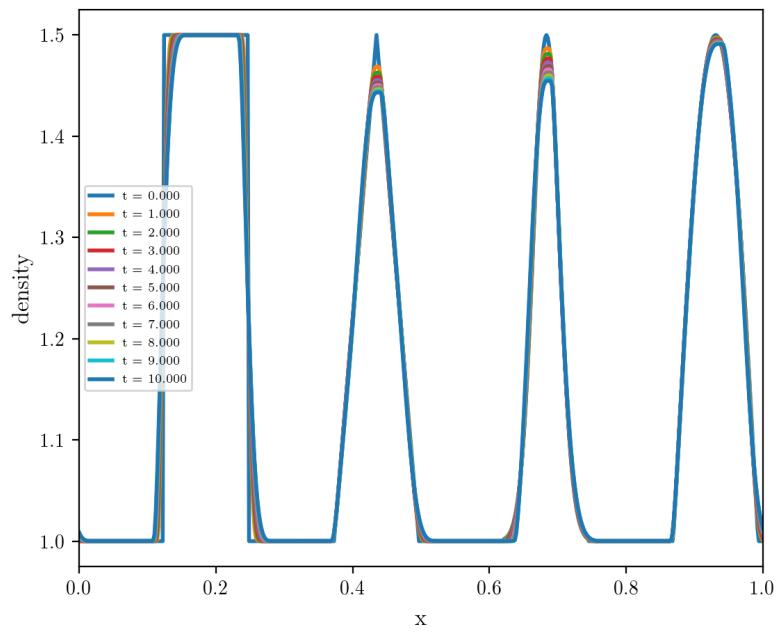
**Figure 26:** Minmod Slope Limiter. Obtained result 1D



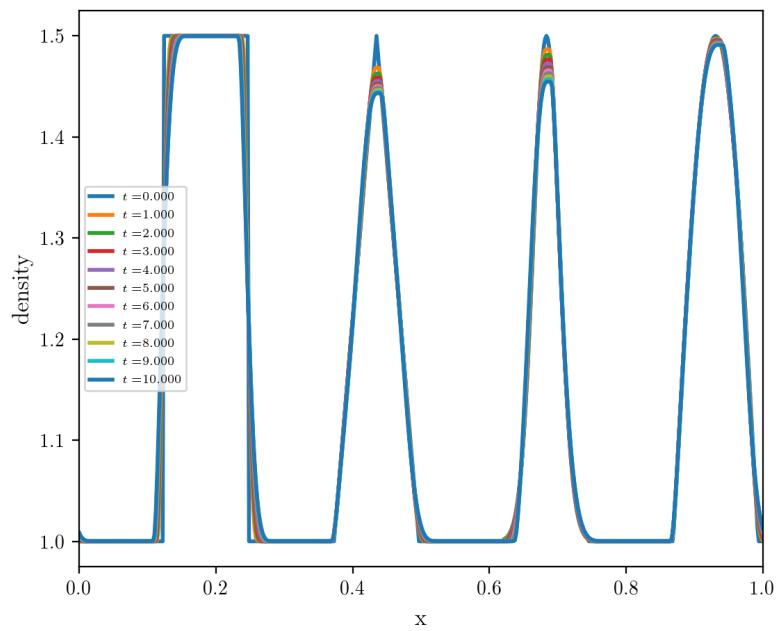
**Figure 27:** Superbee slope limiter. Expected result 1D negative velocity



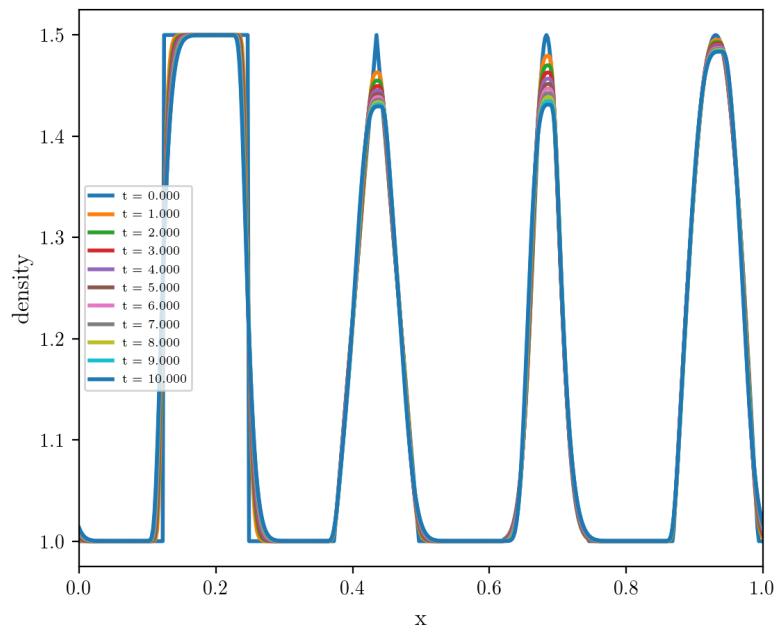
**Figure 28:** Superbee slope limiter. Obtained result 1D negative velocity



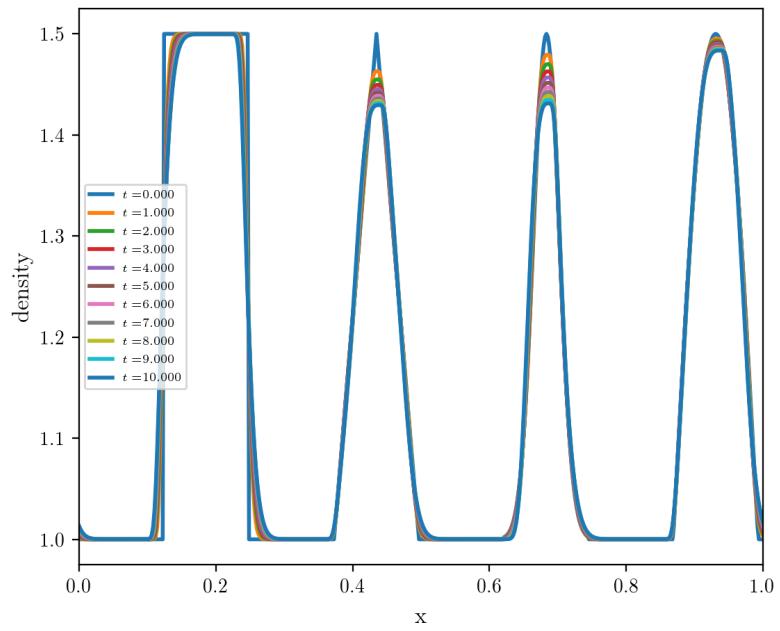
**Figure 29:** Monotonized central limiter. Expected result 1D



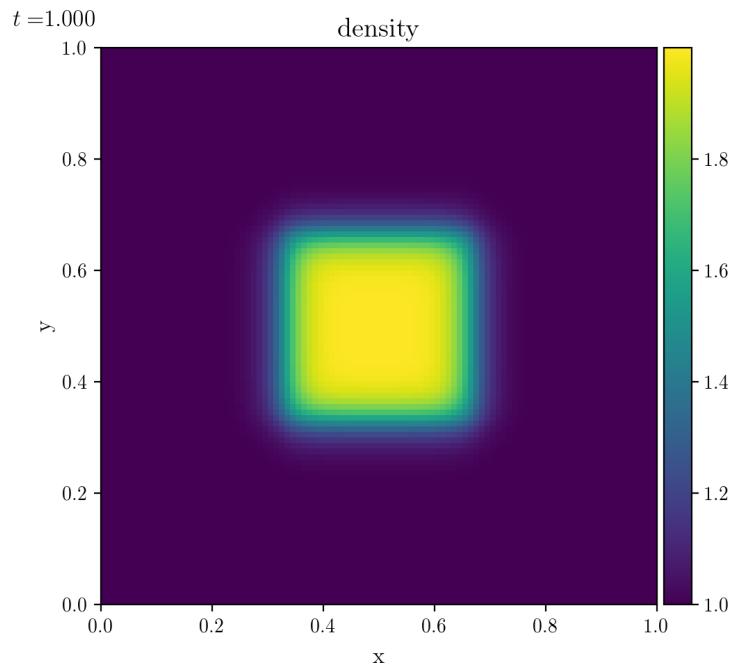
**Figure 30:** Monotonized central limiter. Obtained result 1D



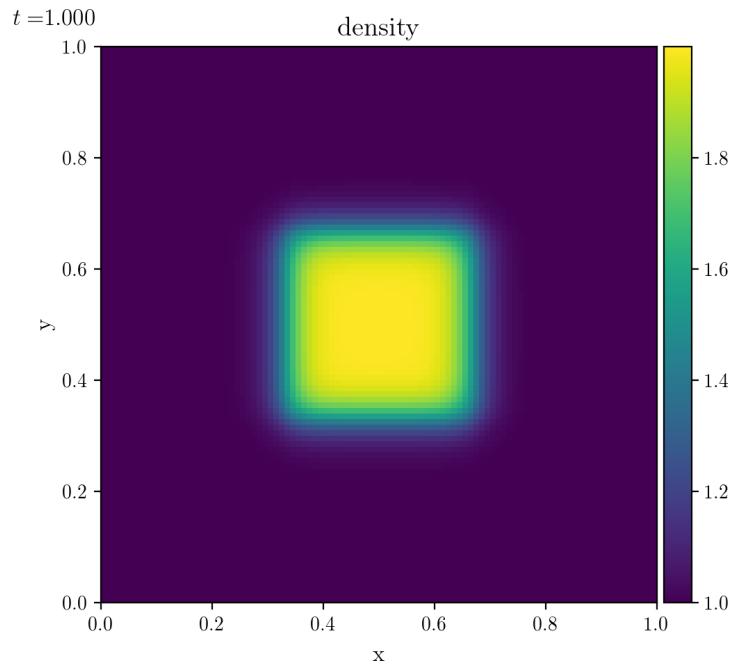
**Figure 31:** Van Leer Limiter. Expected result 1D



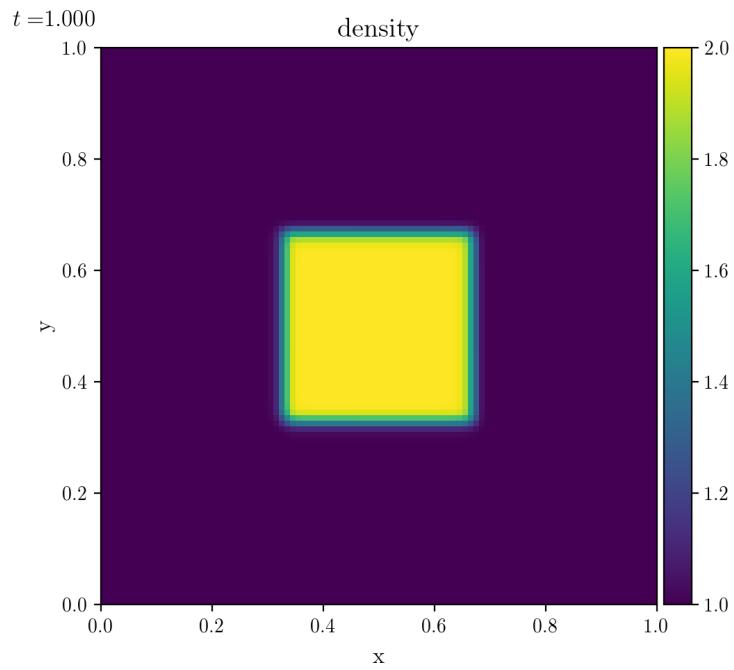
**Figure 32:** Van Leer Limiter. Obtained result 1D



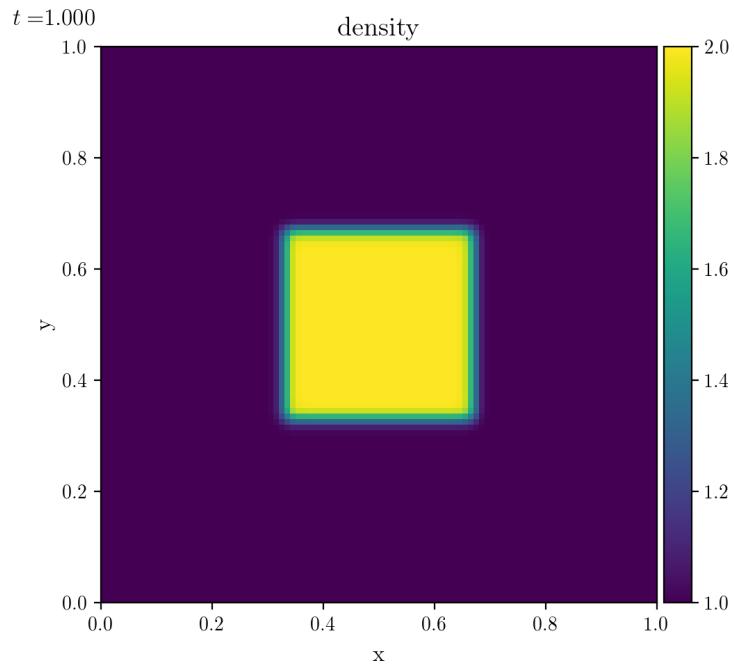
**Figure 33:** Minmod Slope Limiter. Expected result 2D



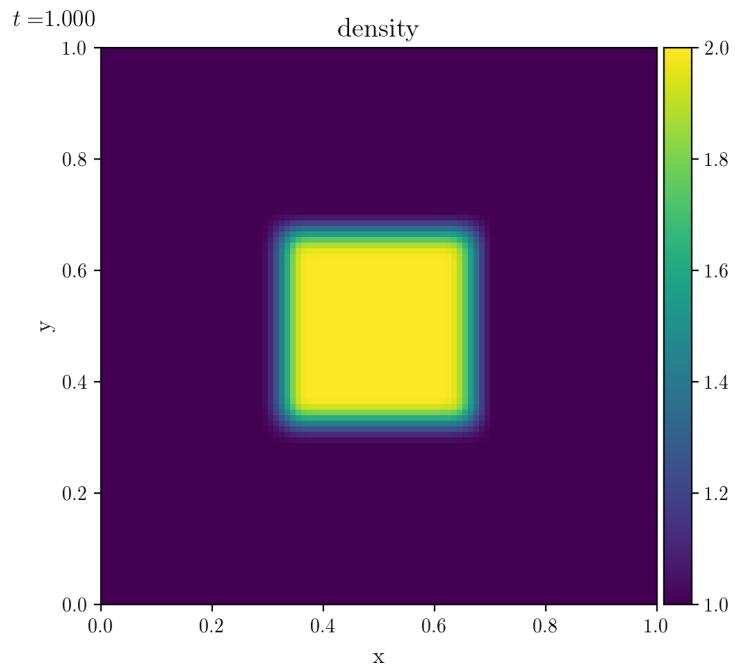
**Figure 34:** Minmod Slope Limiter. Obtained result 2D



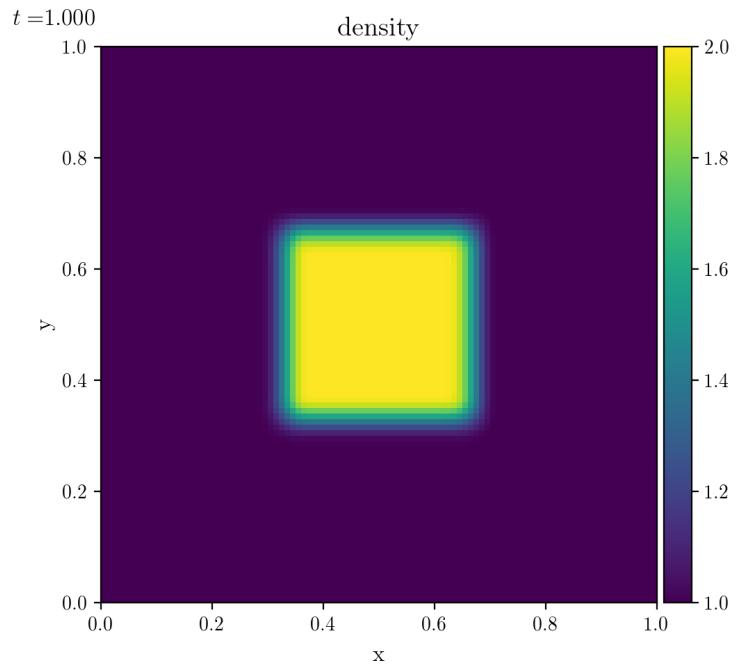
**Figure 35:** Superbee slope limiter. Expected result 2D negative velocity



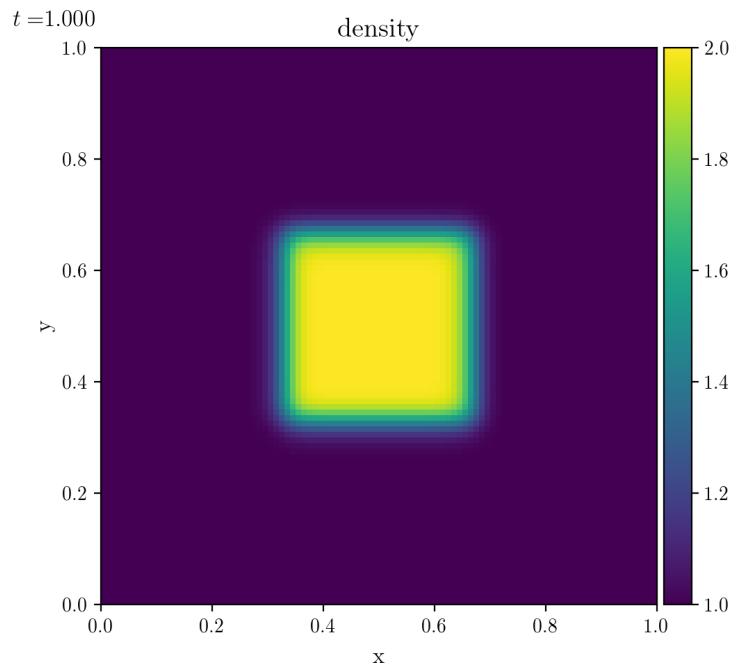
**Figure 36:** Superbee slope limiter. Obtained result 2D negative velocity



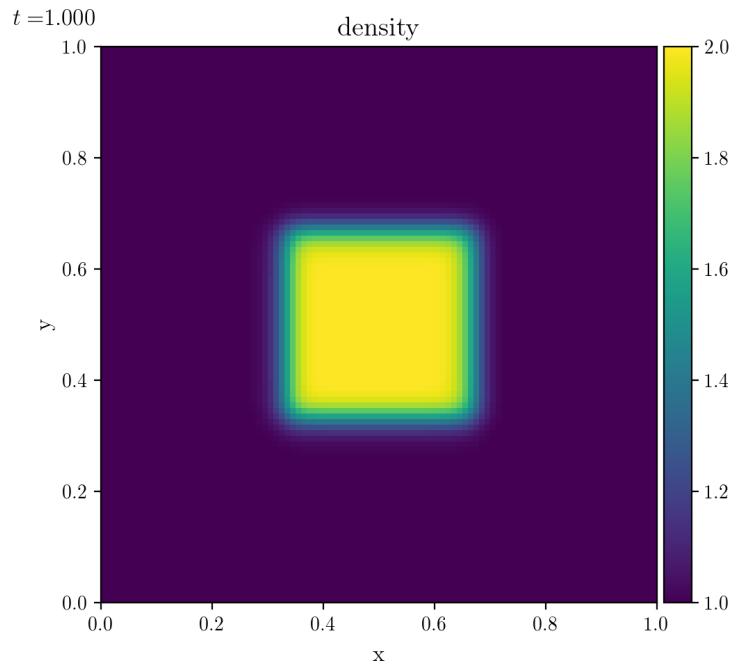
**Figure 37:** Monotonized central limiter. Expected result 2D



**Figure 38:** Monotonized central limiter. Obtained result 2D

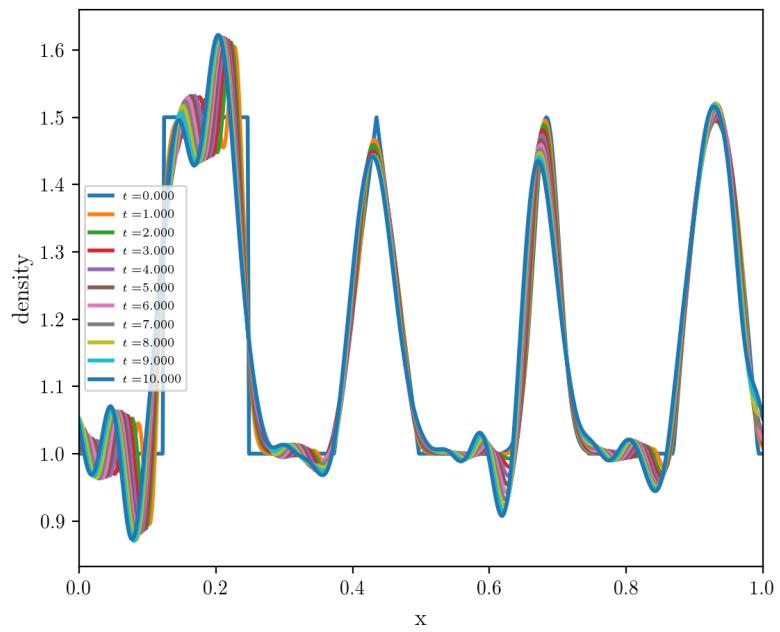


**Figure 39:** Van Leer Limiter. Expected result 2D

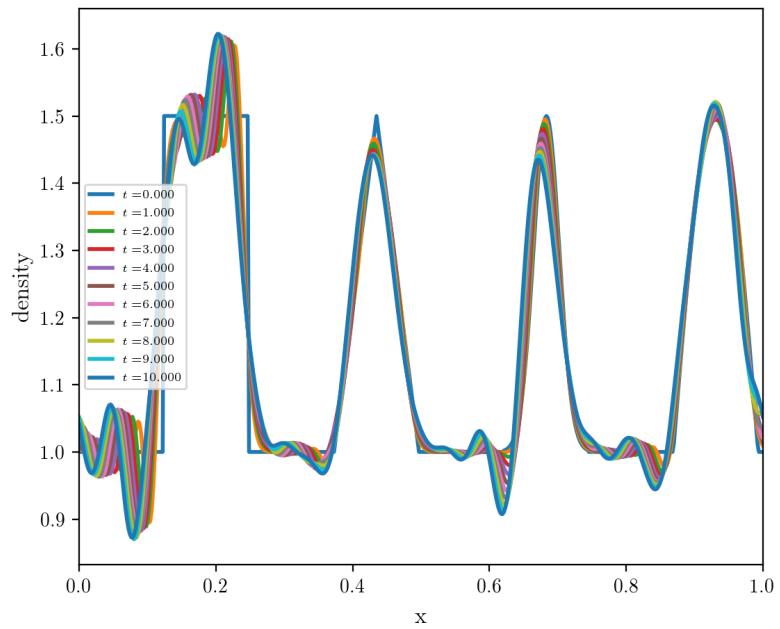


**Figure 40:** Van Leer Limiter. Obtained result 2D

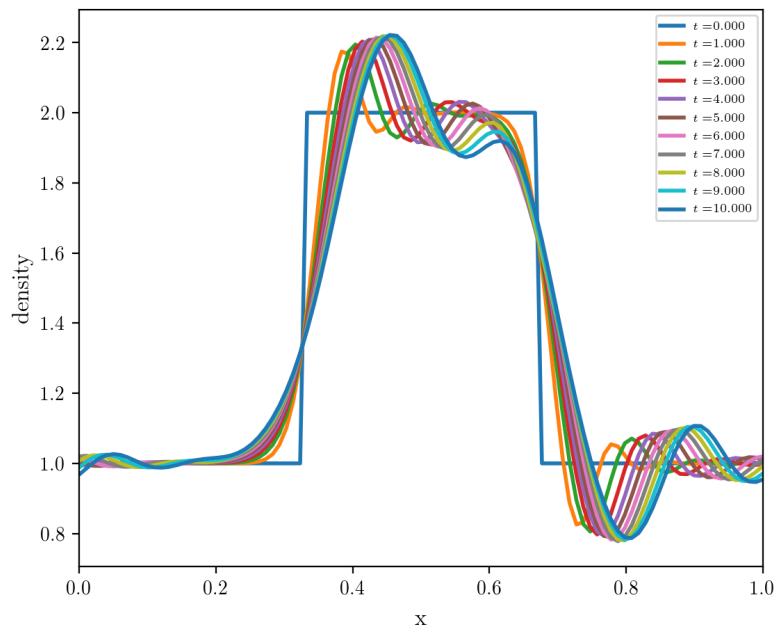
## 1.4 WAF



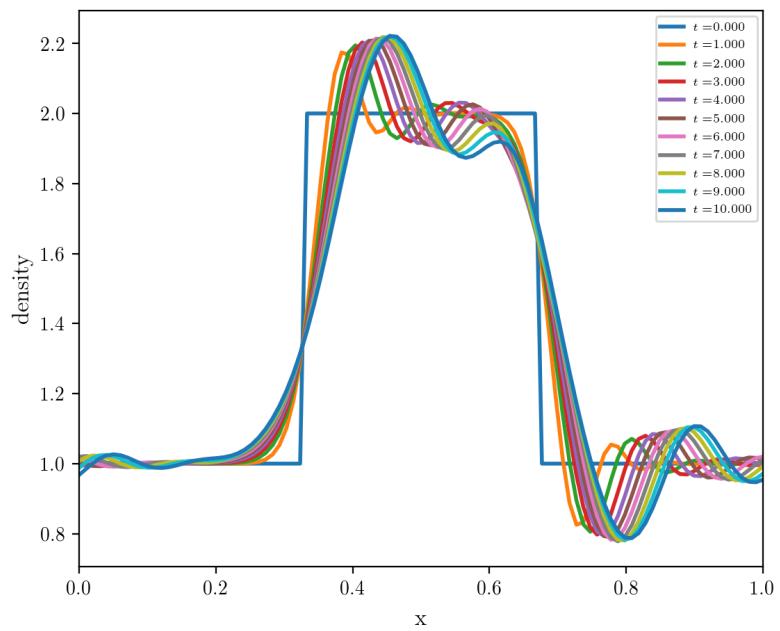
**Figure 41:** Expected result 1D



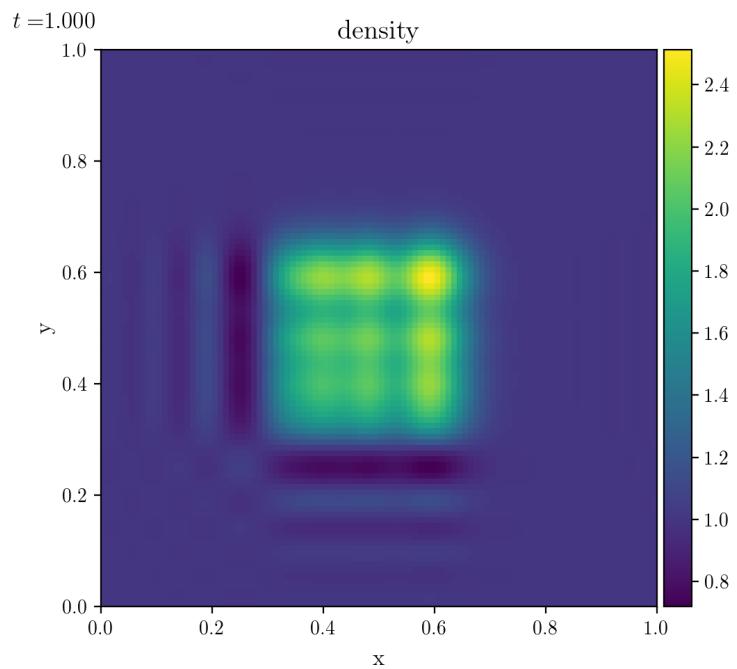
**Figure 42:** Obtained result 1D



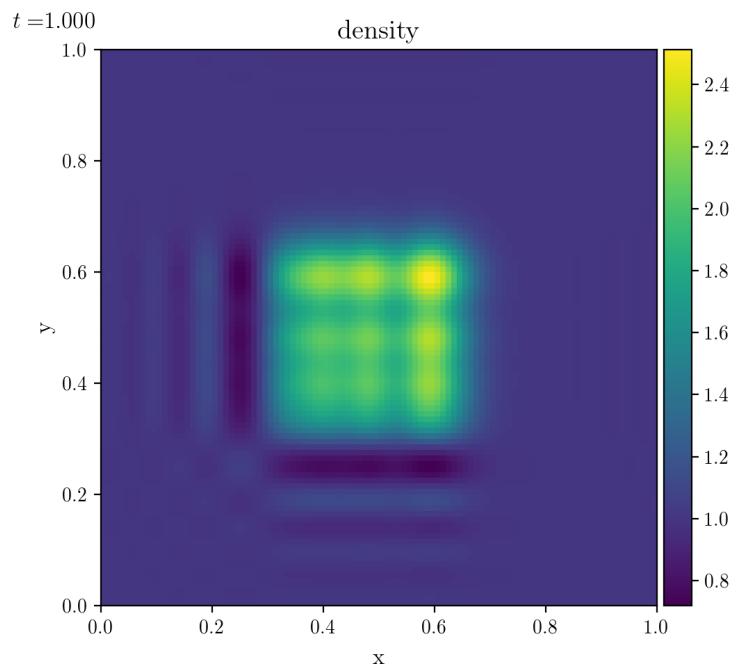
**Figure 43:** Expected result 1D negative velocity



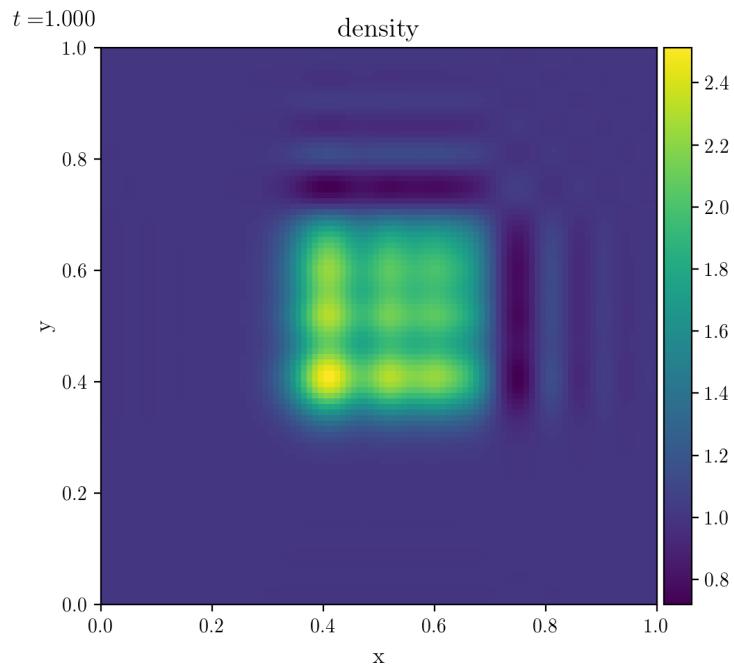
**Figure 44:** Obtained result 1D negative velocity



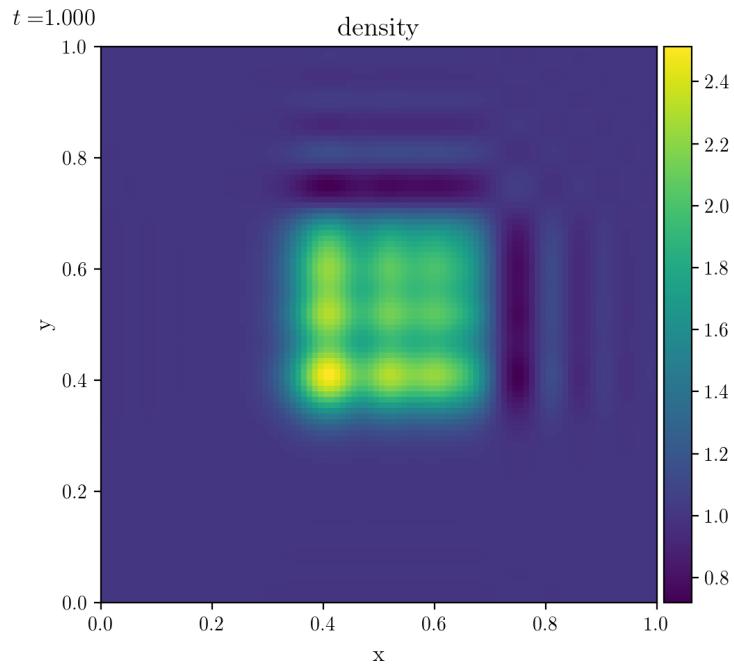
**Figure 45:** Expected result 2D



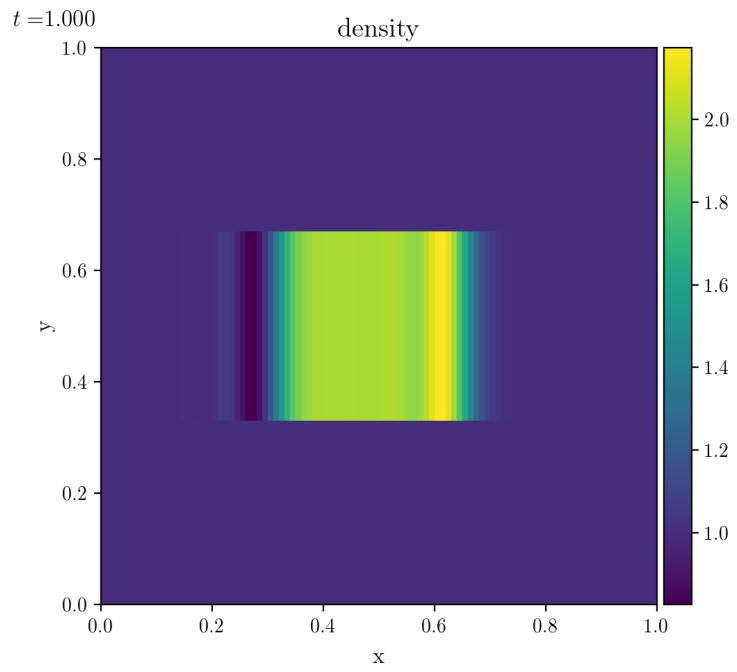
**Figure 46:** Obtained result 2D



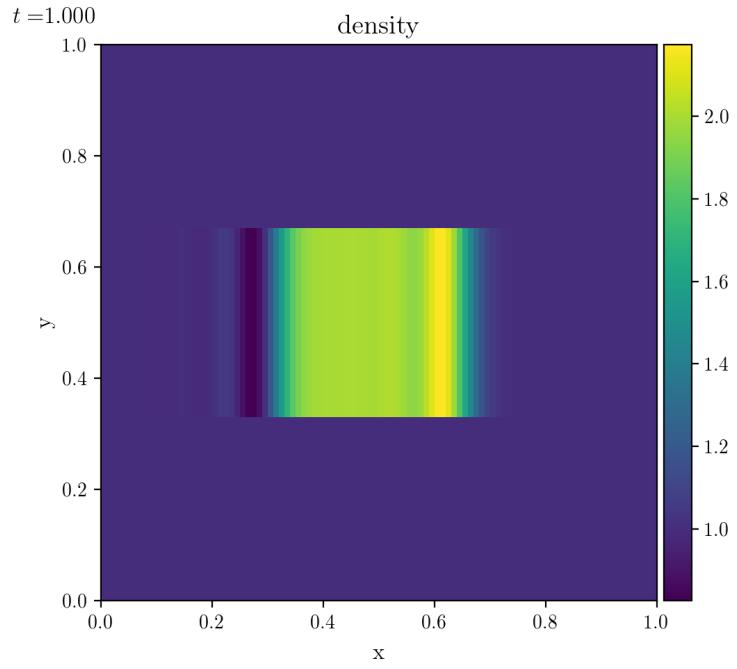
**Figure 47:** Expected result 2D negative velocity



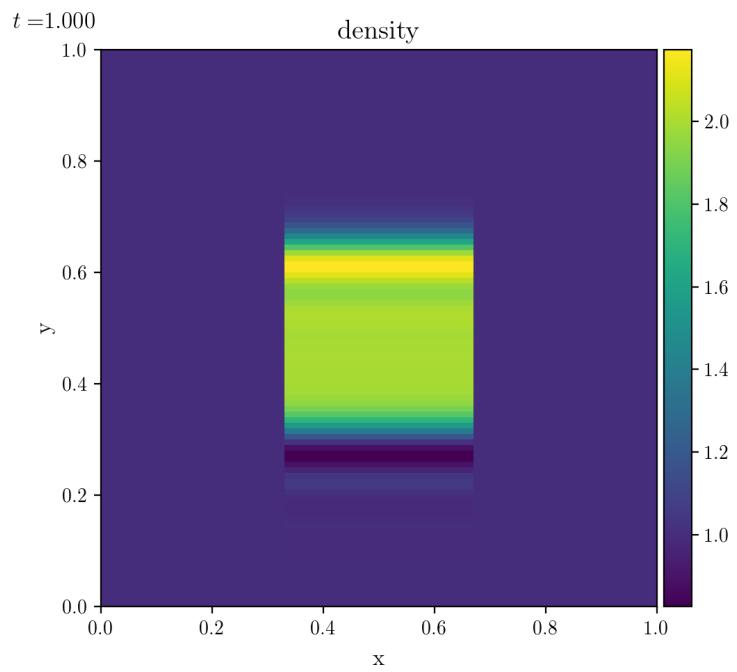
**Figure 48:** Obtained result 2D negative velocity



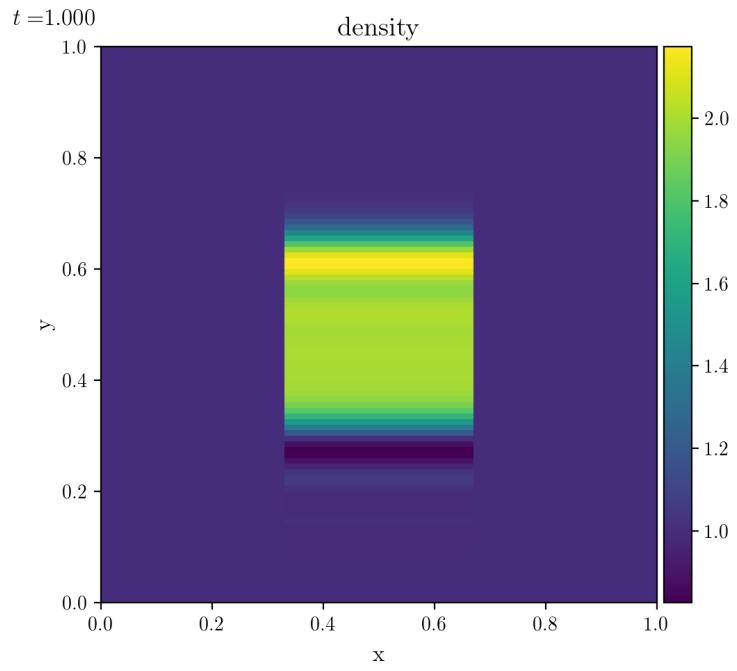
**Figure 49:** Expected result 2D velocity in x direction only



**Figure 50:** Obtained result 2D velocity in x direction only

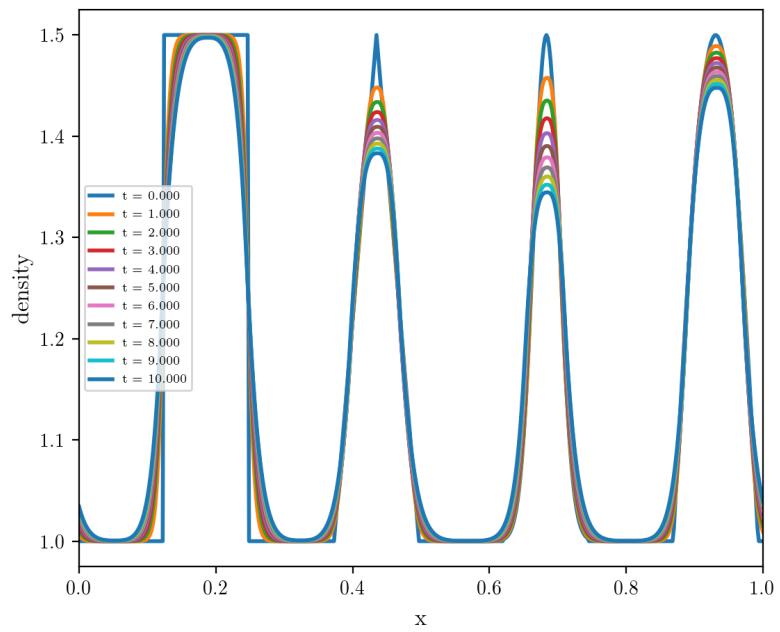


**Figure 51:** Expected result 2D velocity in y direction only

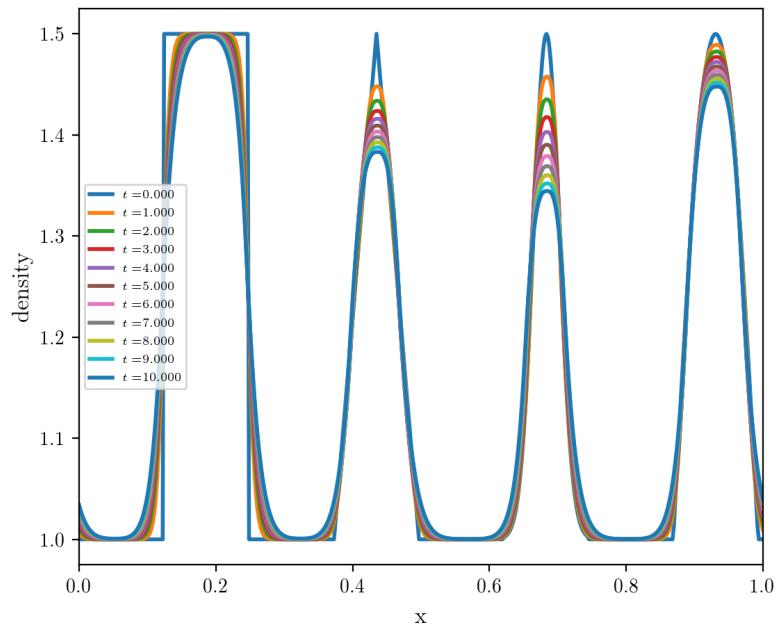


**Figure 52:** Obtained result 2D velocity in y direction only

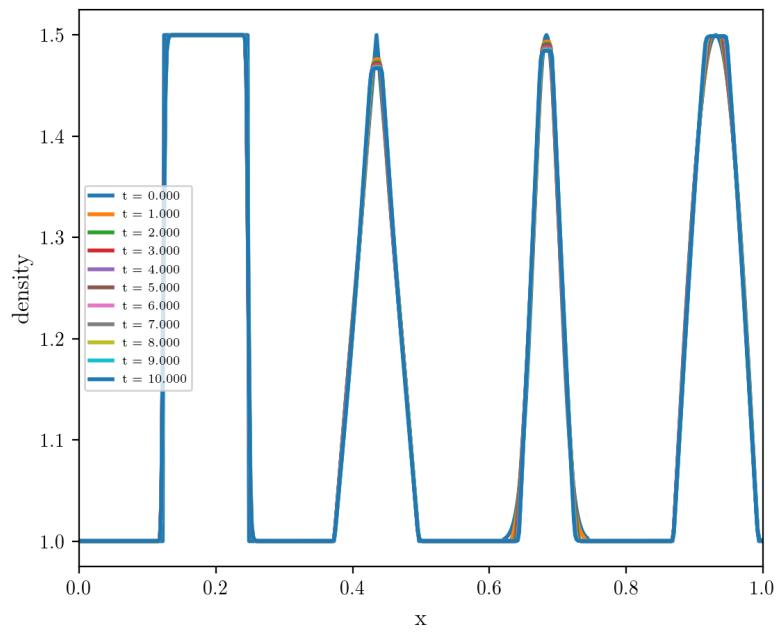
## 1.5 WAF with Slope Limiters



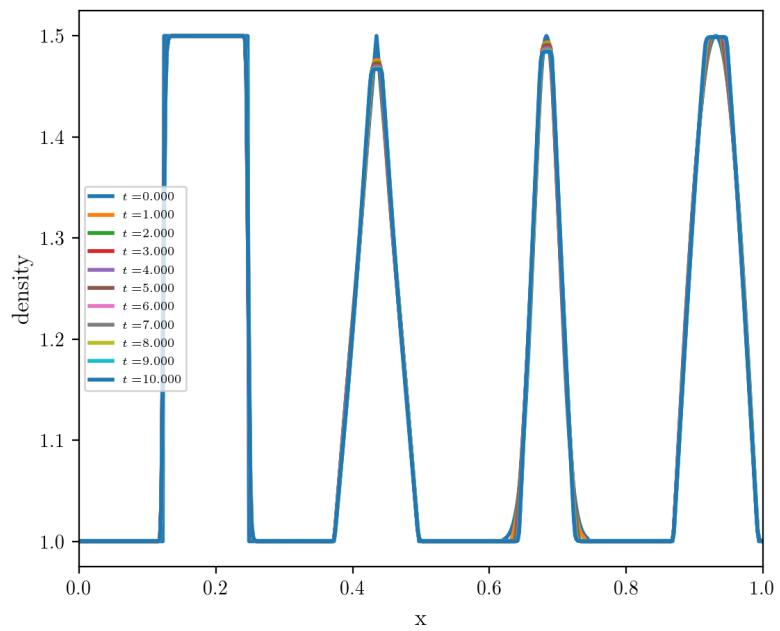
**Figure 53:** Minmod Slope Limiter. Expected result 1D



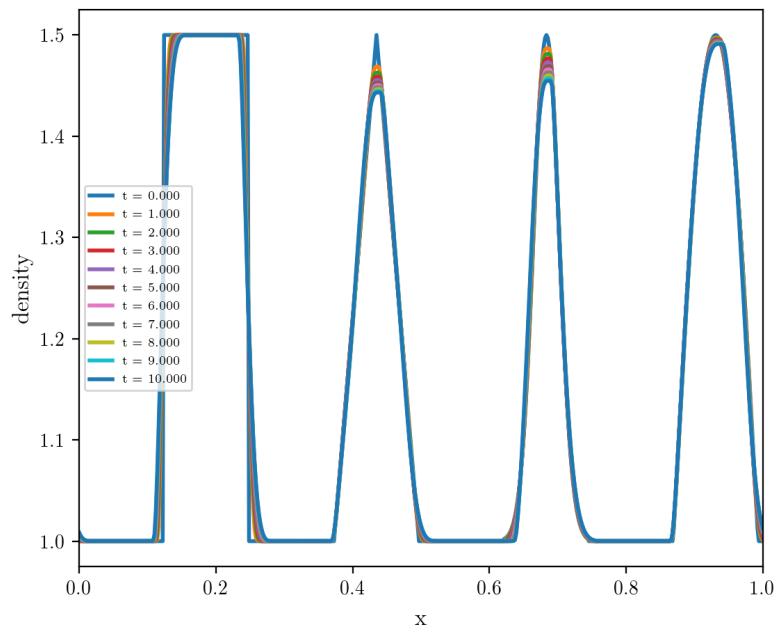
**Figure 54:** Minmod Slope Limiter. Obtained result 1D



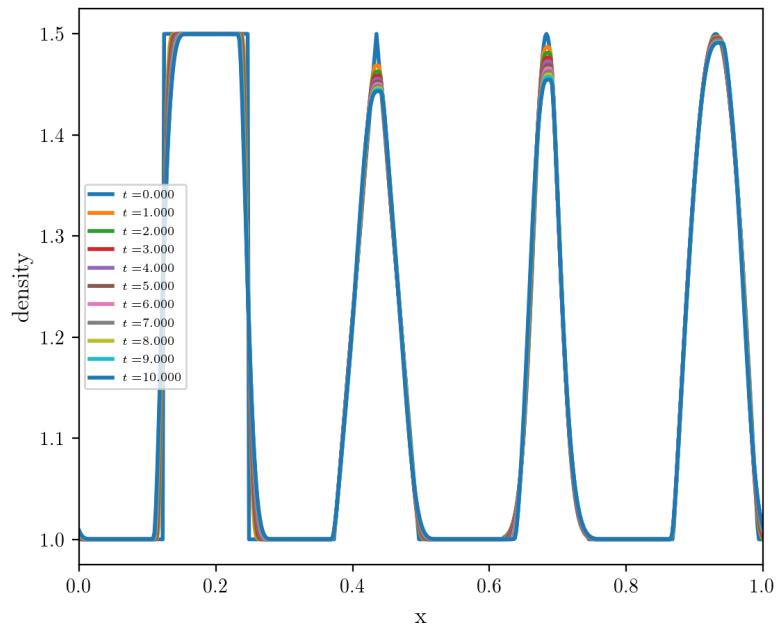
**Figure 55:** Superbee slope limiter. Expected result 1D negative velocity



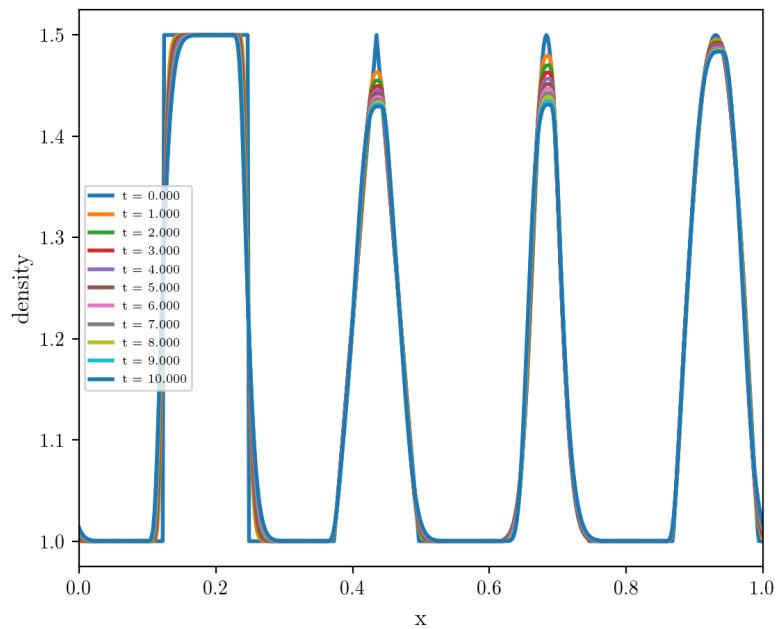
**Figure 56:** Superbee slope limiter. Obtained result 1D negative velocity



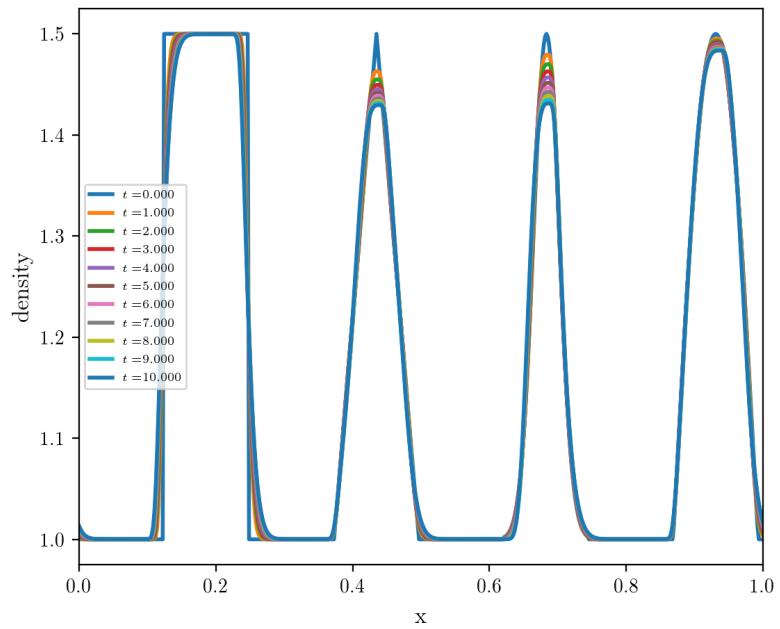
**Figure 57:** Monotonized central limiter. Expected result 1D



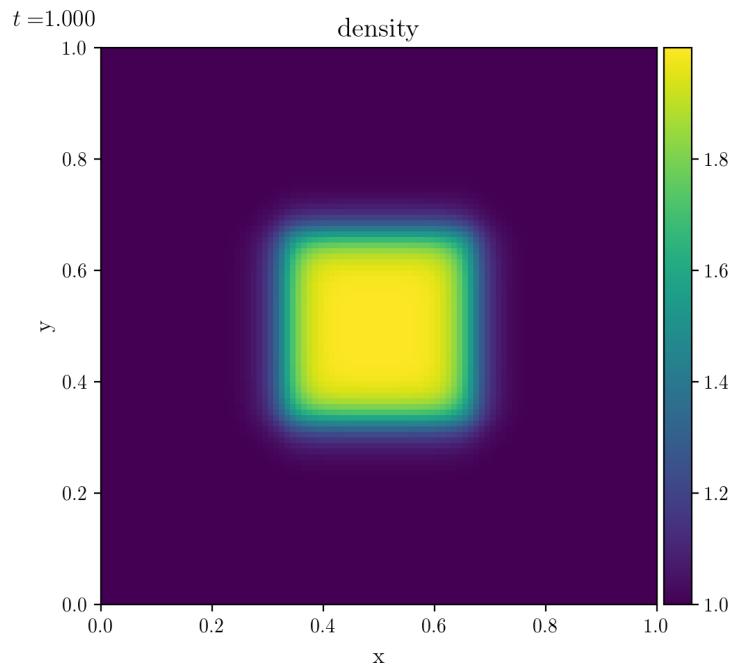
**Figure 58:** Monotonized central limiter. Obtained result 1D



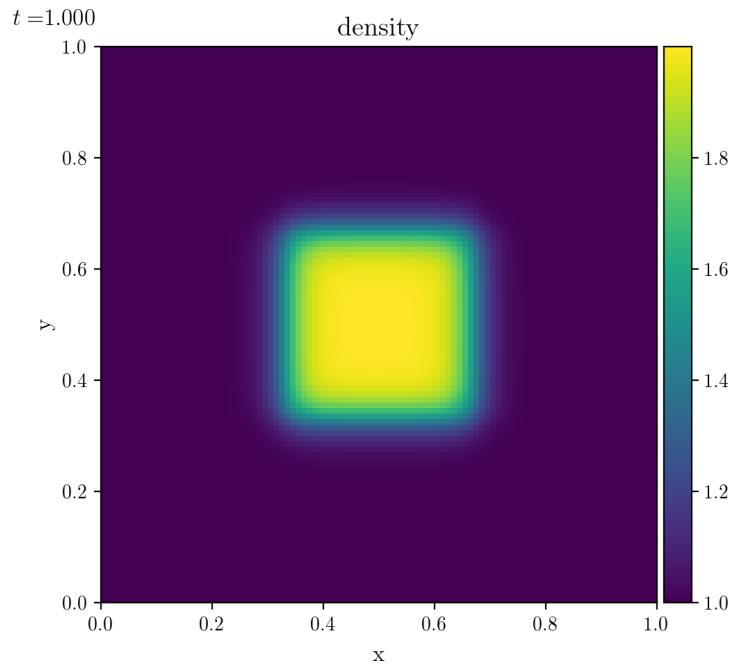
**Figure 59:** Van Leer Limiter. Expected result 1D



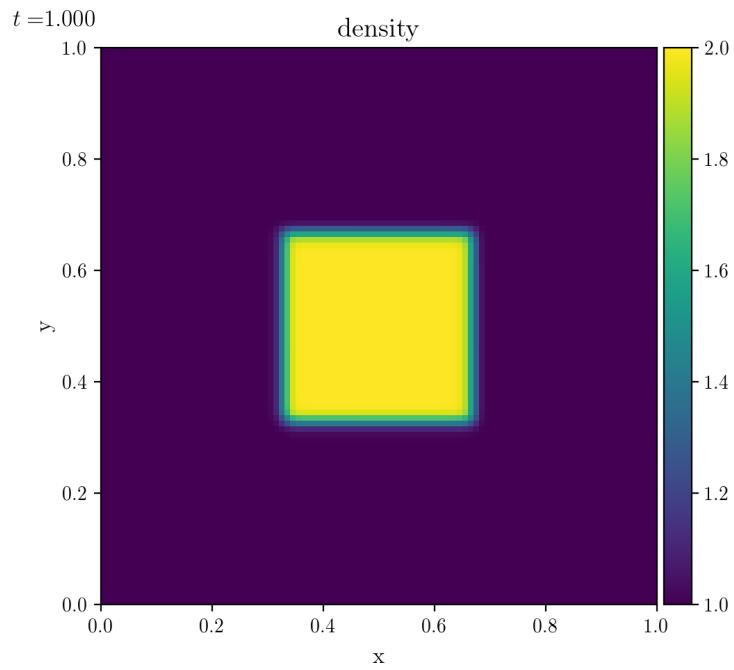
**Figure 60:** Van Leer Limiter. Obtained result 1D



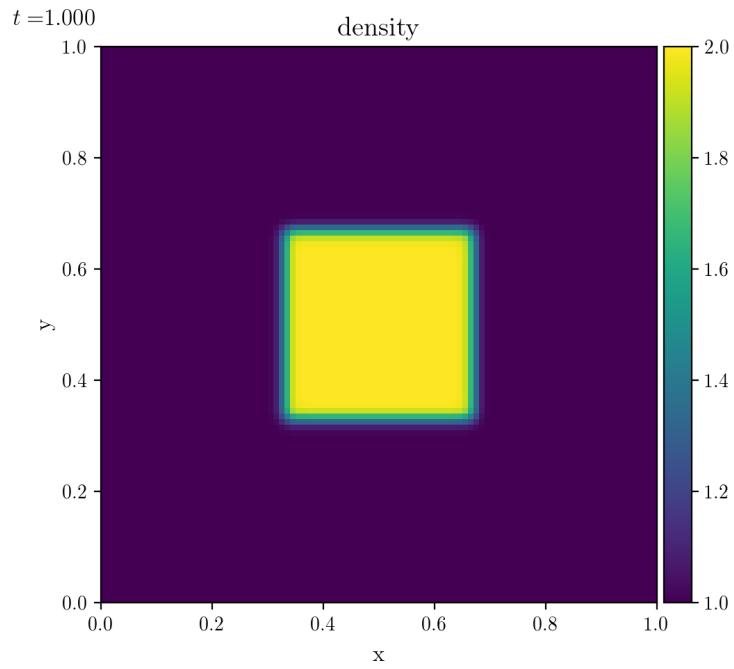
**Figure 61:** Minmod Slope Limiter. Expected result 2D



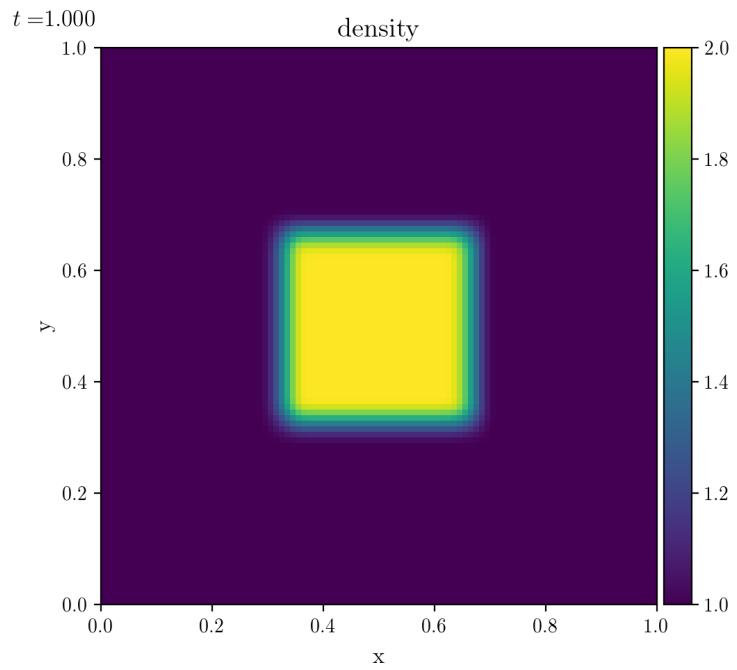
**Figure 62:** Minmod Slope Limiter. Obtained result 2D



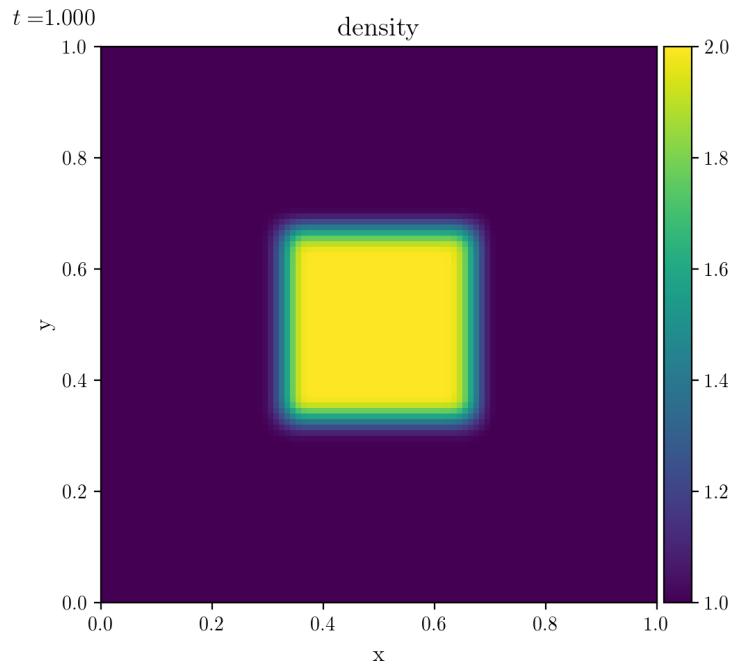
**Figure 63:** Superbee slope limiter. Expected result 2D negative velocity



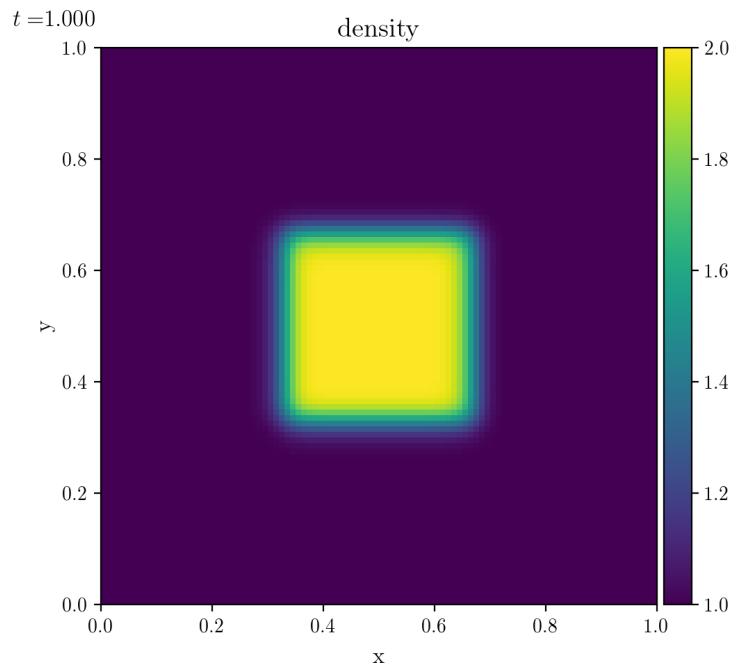
**Figure 64:** Superbee slope limiter. Obtained result 2D negative velocity



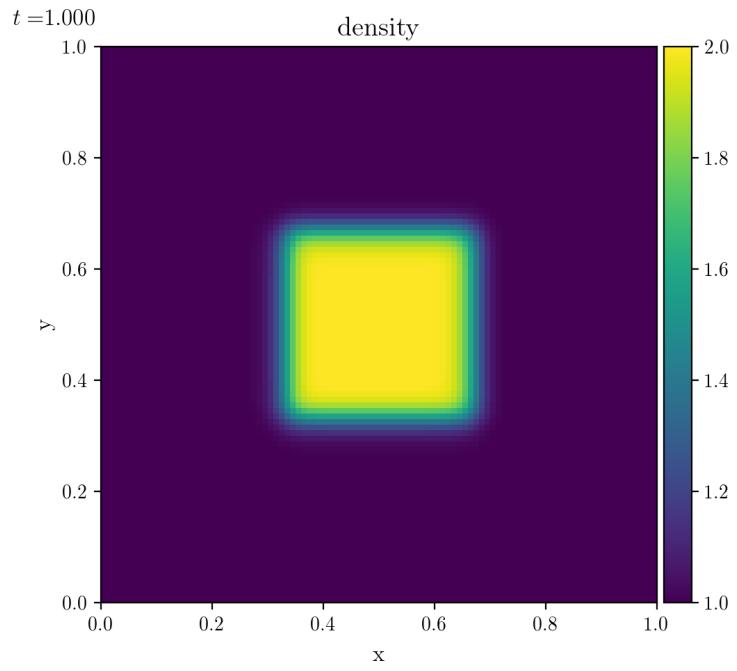
**Figure 65:** Monotonized central limiter. Expected result 2D



**Figure 66:** Monotonized central limiter. Obtained result 2D



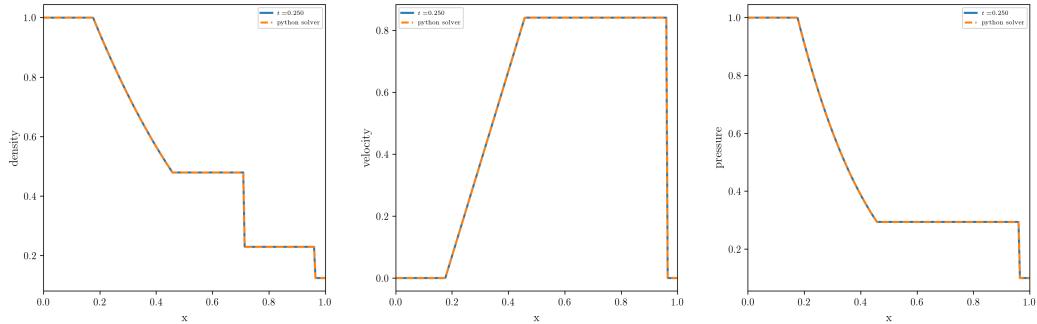
**Figure 67:** Van Leer Limiter. Expected result 2D



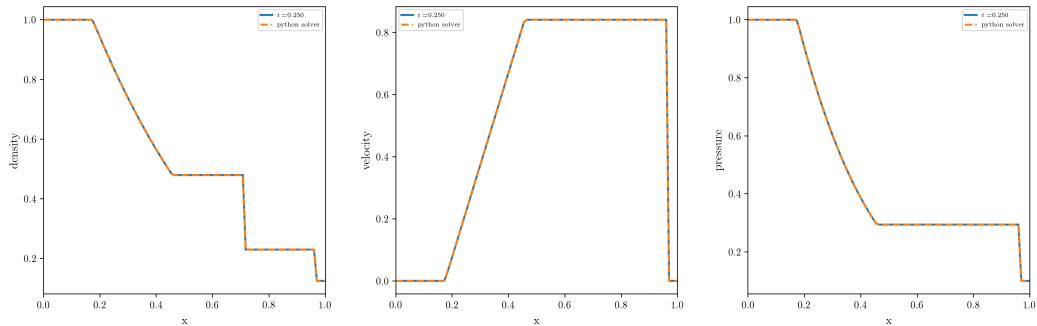
**Figure 68:** Van Leer Limiter. Obtained result 2D

## 2 Riemann Solvers

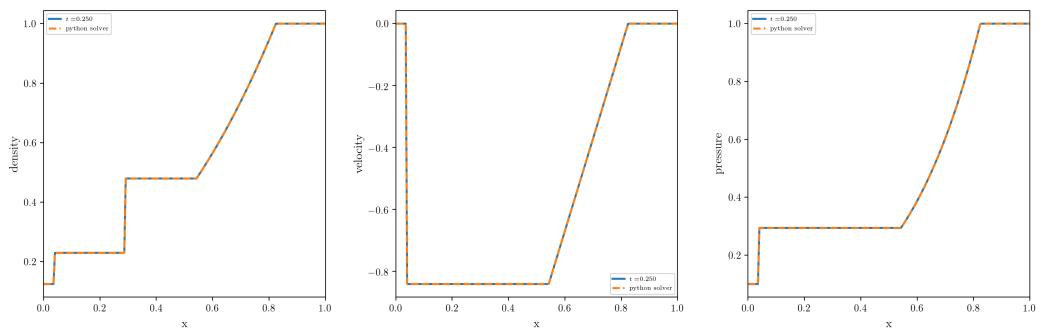
### 2.1 Exact vs Python



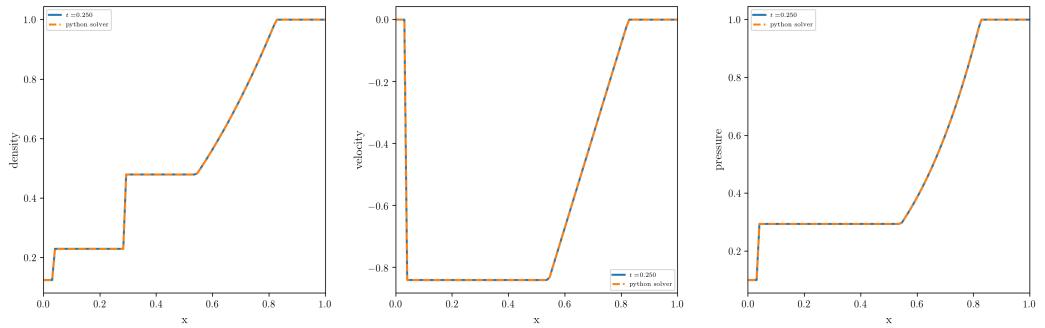
**Figure 69:** Exact solver for (right facing) sod shock. Expected result.



**Figure 70:** Exact solver for (right facing) sod shock. Obtained result.

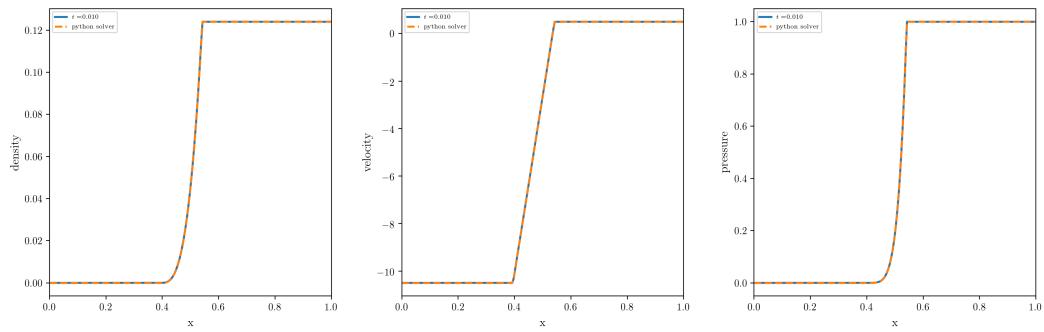


**Figure 71:** Exact solver for (left facing) sod shock. Expected result.

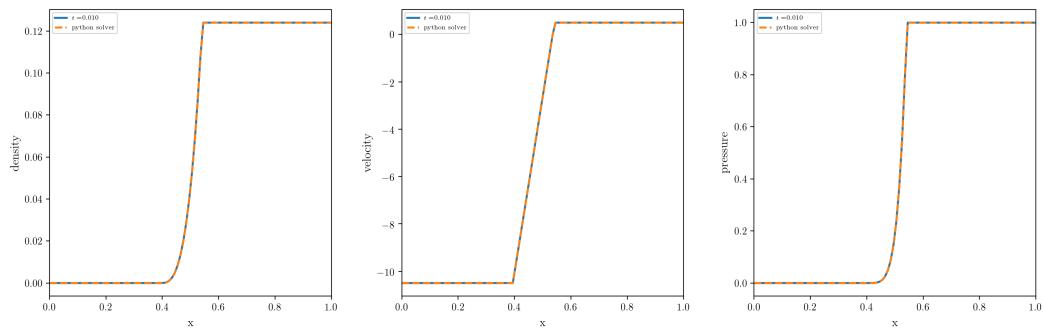


**Figure 72:** Exact solver for (left facing) sod shock. Obtained result.

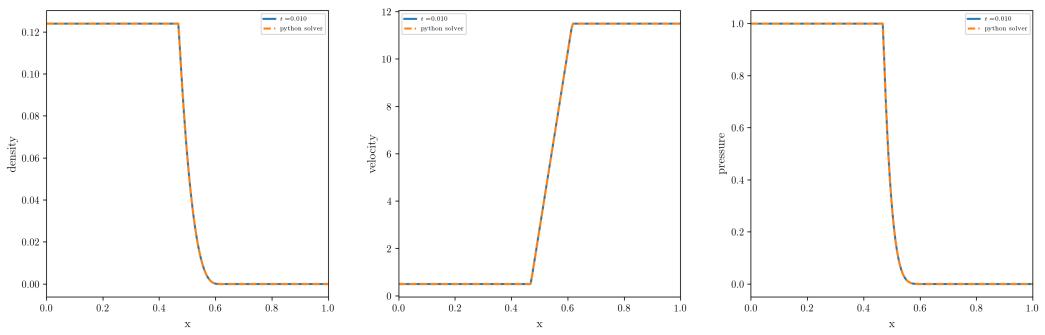
## 2.2 Vacuum



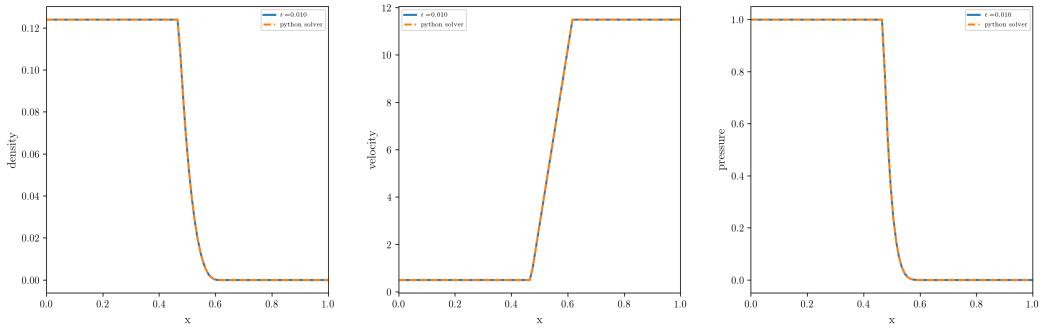
**Figure 73:** Exact solver for left vacuum state. Expected result.



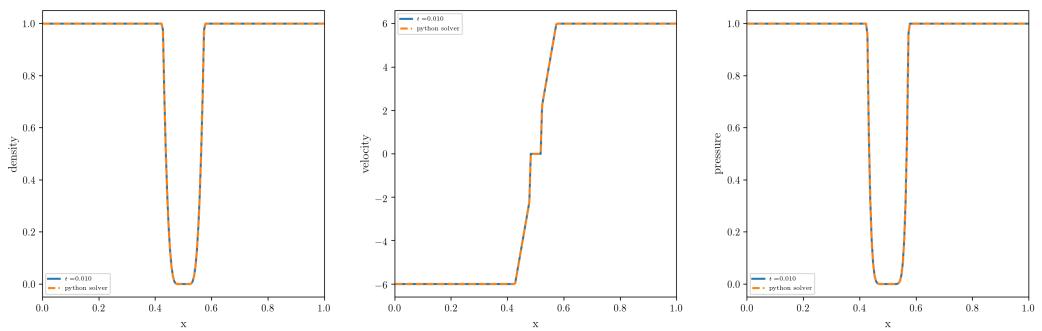
**Figure 74:** Exact solver for left vacuum state. Obtained result.



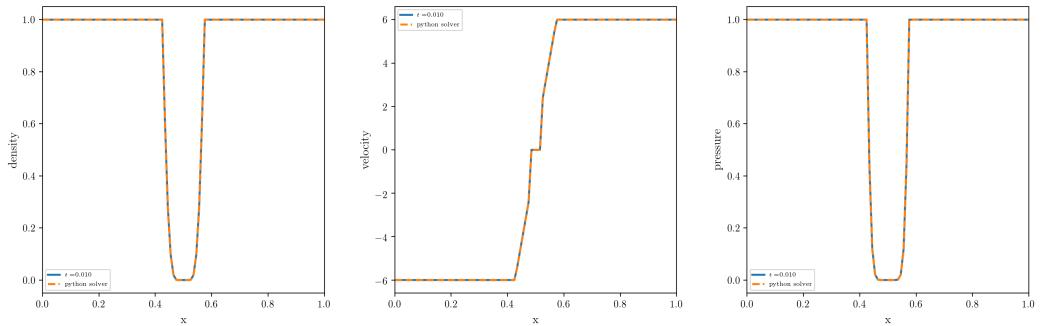
**Figure 75:** Exact solver for left vacuum state. Expected result.



**Figure 76:** Exact solver for left vacuum state. Obtained result.



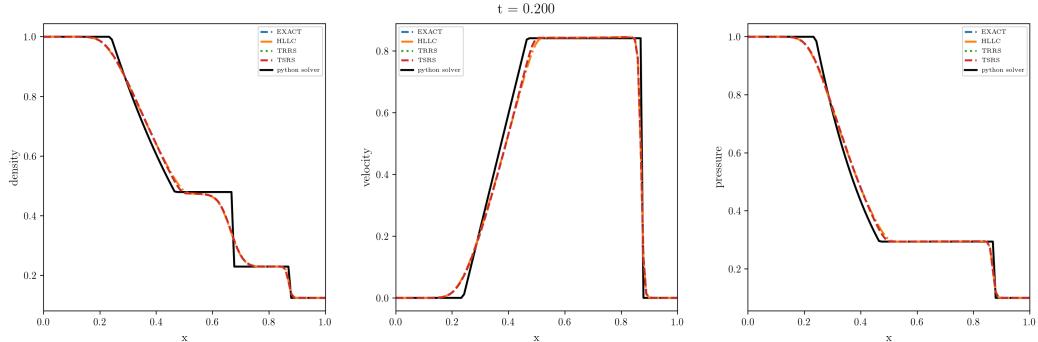
**Figure 77:** Exact solver for vacuum generating conditions. Expected result.



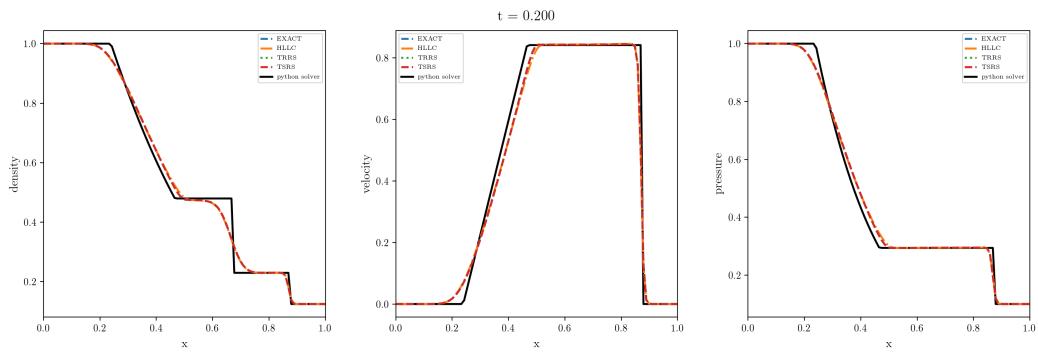
**Figure 78:** Exact solver for vacuum generating conditions. Obtained result.

### 3 Godunov's Method

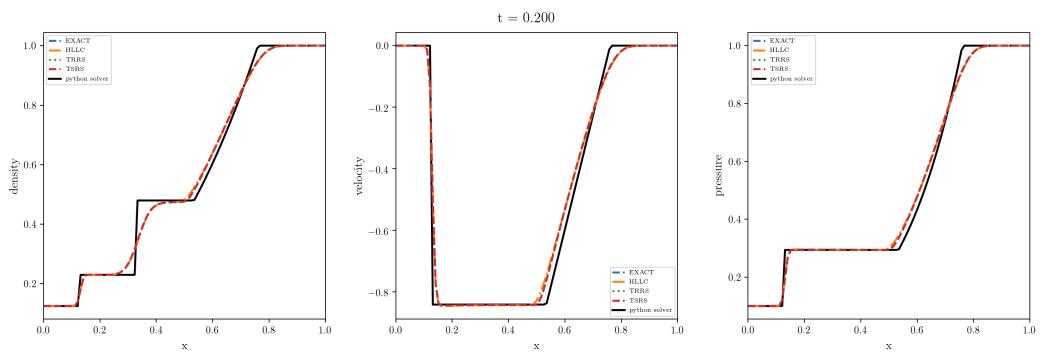
#### 3.1 1D with different Riemann Solvers



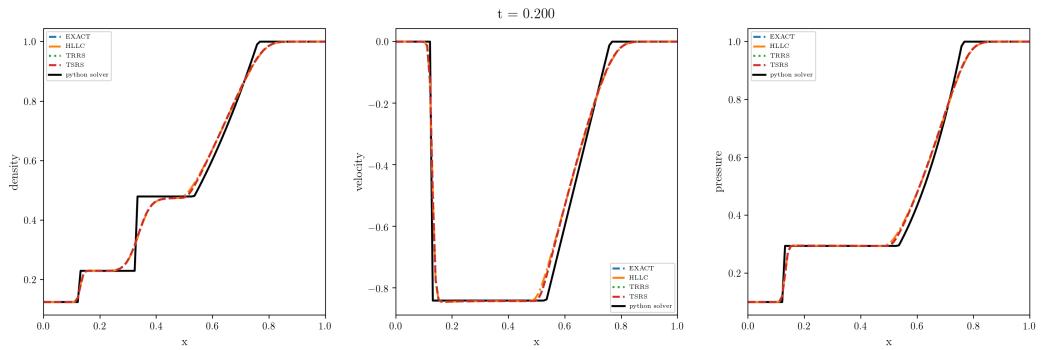
**Figure 79:** Godunov's method for (right facing) sod shock. Expected result.



**Figure 80:** Godunov's method for (right facing) sod shock. Obtained result.

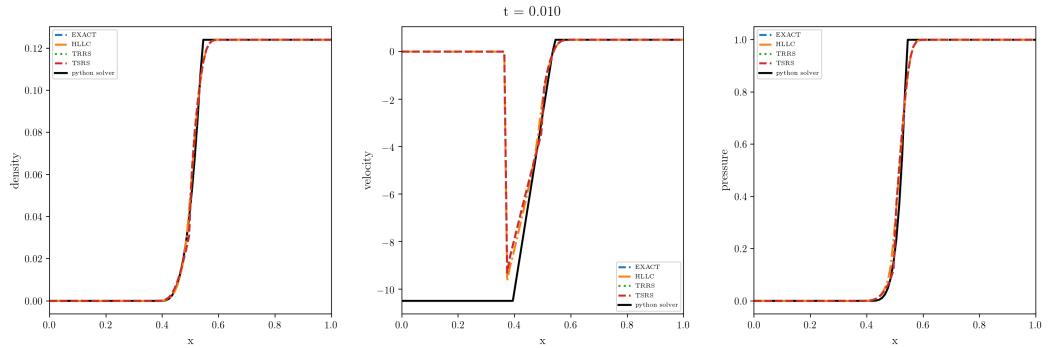


**Figure 81:** Godunov's method for (left facing) sod shock. Expected result.

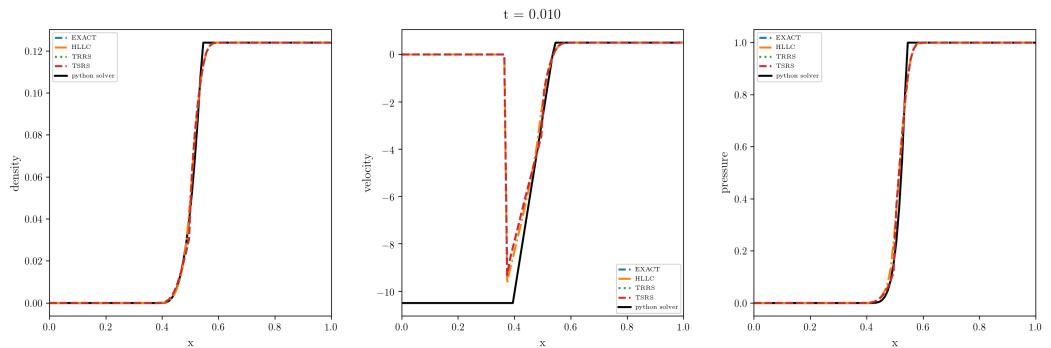


**Figure 82:** Godunov's method for (left facing) sod shock. Obtained result.

### 3.2 Vacuum in 1D

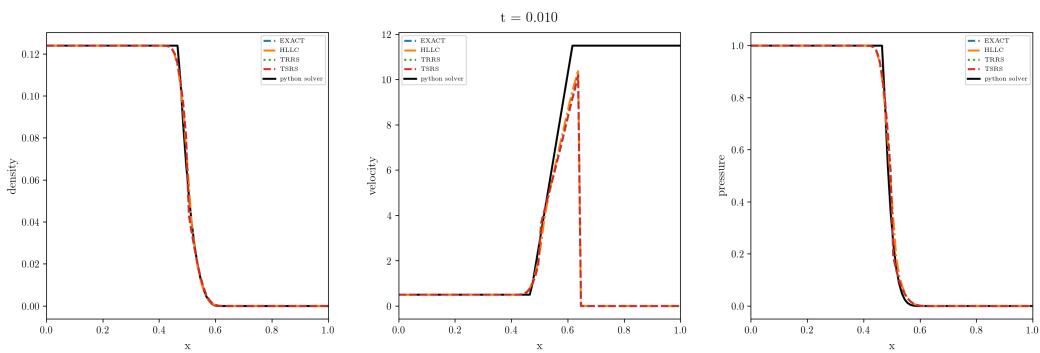


**Figure 83:** Godunov's method for left vacuum state. Expected result.

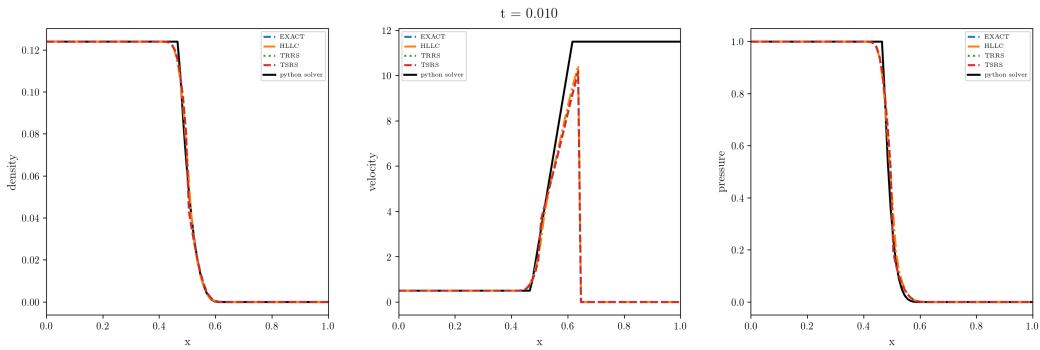


**Figure 84:** Godunov's method for left vacuum state. Obtained result.

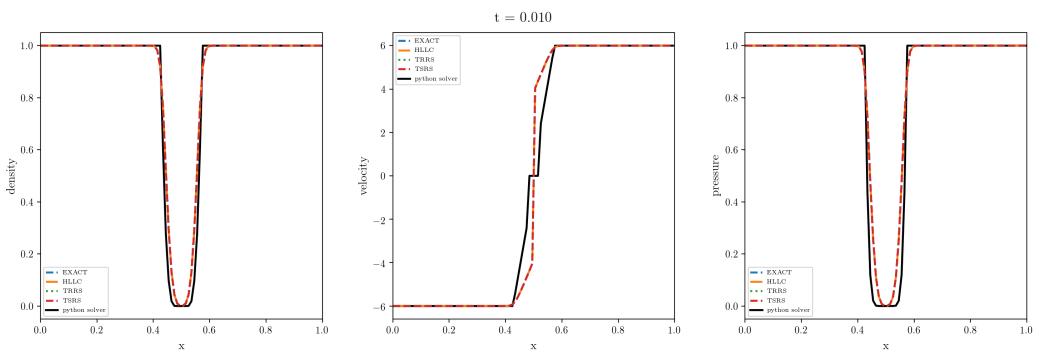
### 3.3 2D with different Riemann Solvers



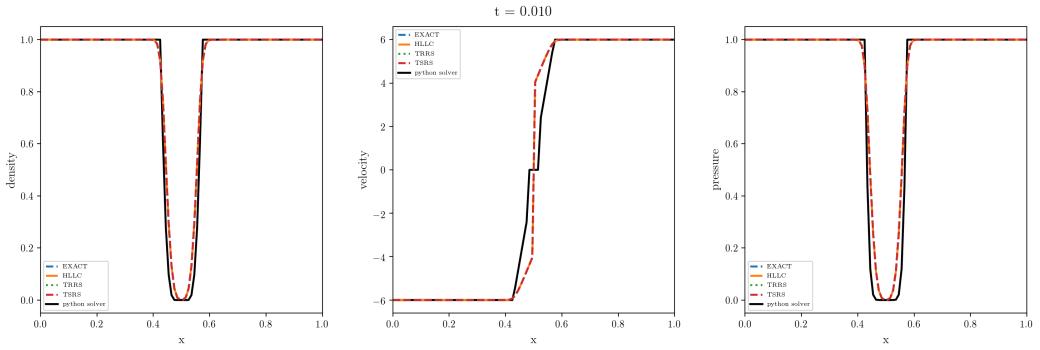
**Figure 85:** Godunov's method for left vacuum state. Expected result.



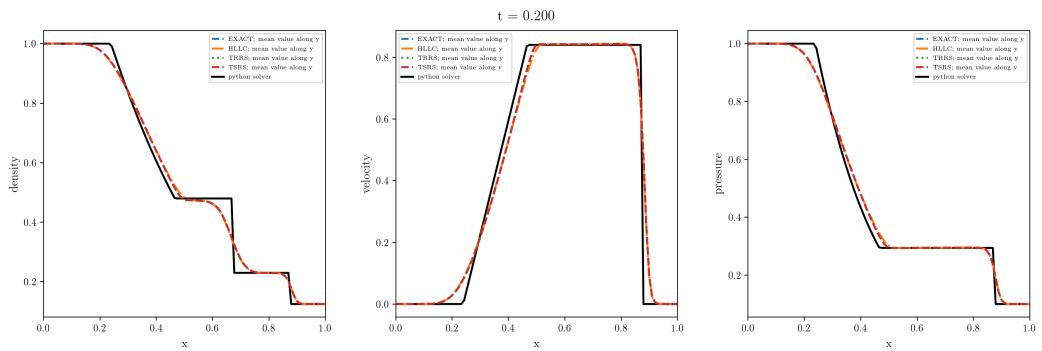
**Figure 86:** Godunov's method for left vacuum state. Obtained result.



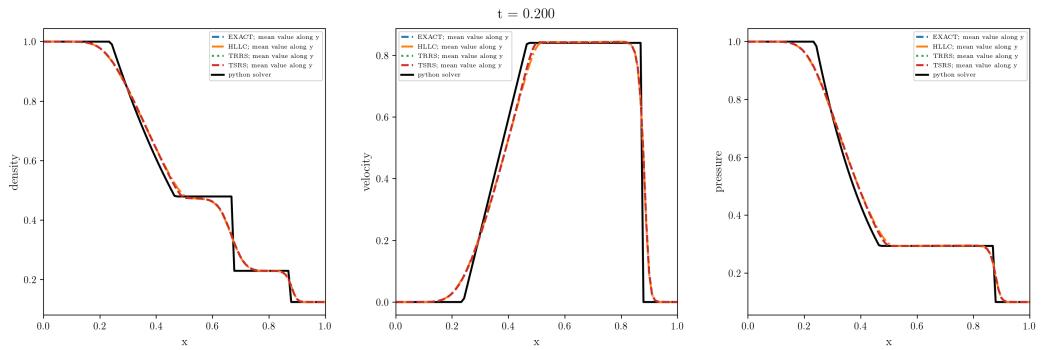
**Figure 87:** Godunov's method for vacuum generating conditions. Expected result.



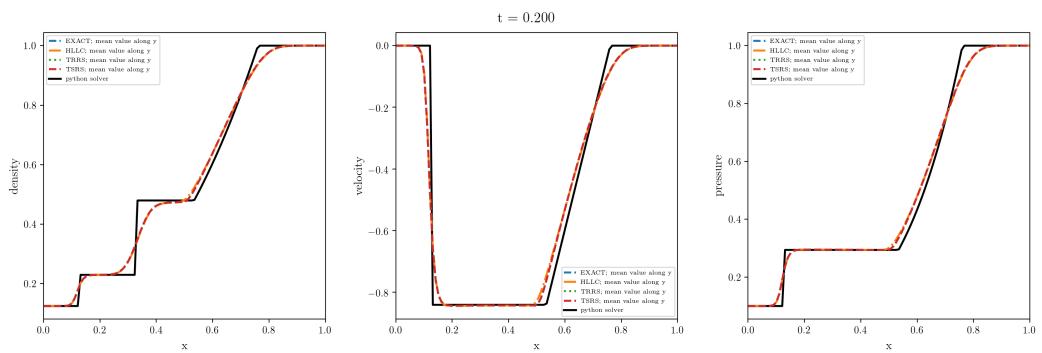
**Figure 88:** Godunov's method for vacuum generating conditions. Obtained result.



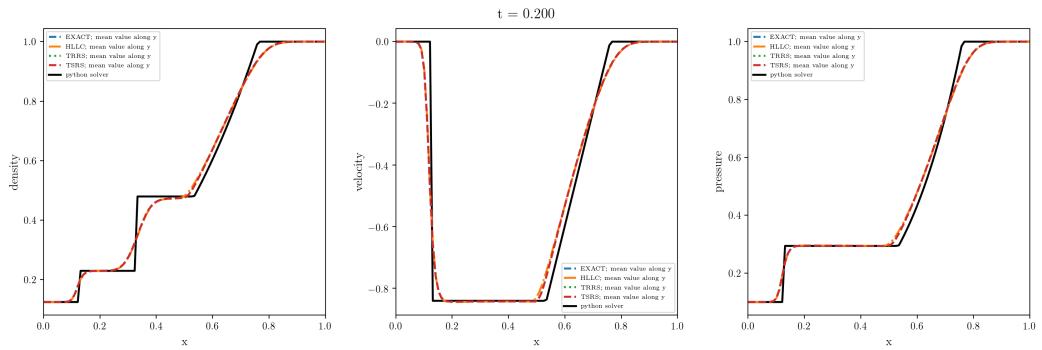
**Figure 89:** Godunov's method for (right facing) sod shock. Expected result.



**Figure 90:** Godunov's method for (right facing) sod shock. Obtained result.

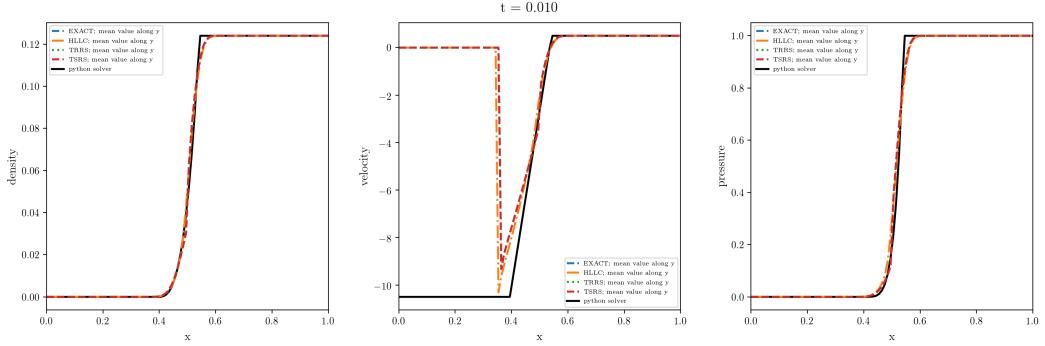


**Figure 91:** Godunov's method for (left facing) sod shock. Expected result.

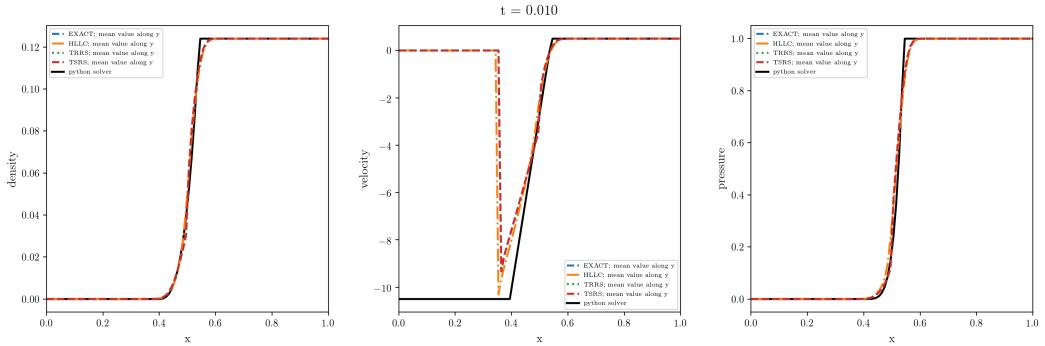


**Figure 92:** Godunov's method for (left facing) sod shock. Obtained result.

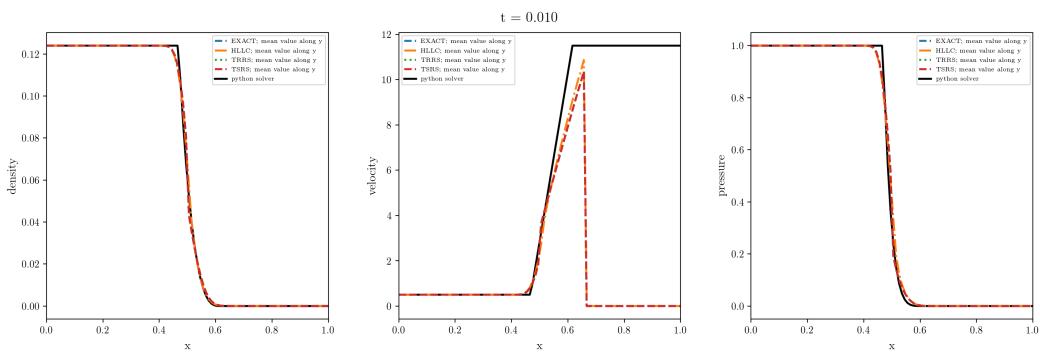
### 3.4 Vacuum in 2D



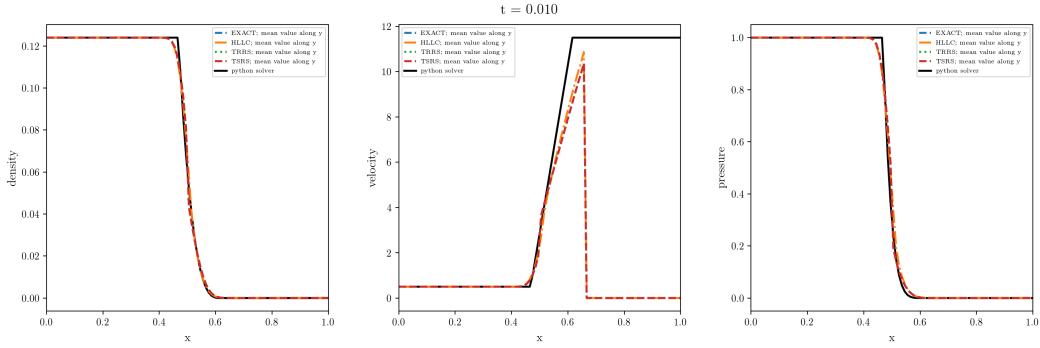
**Figure 93:** Godunov's method for left vacuum state. Expected result.



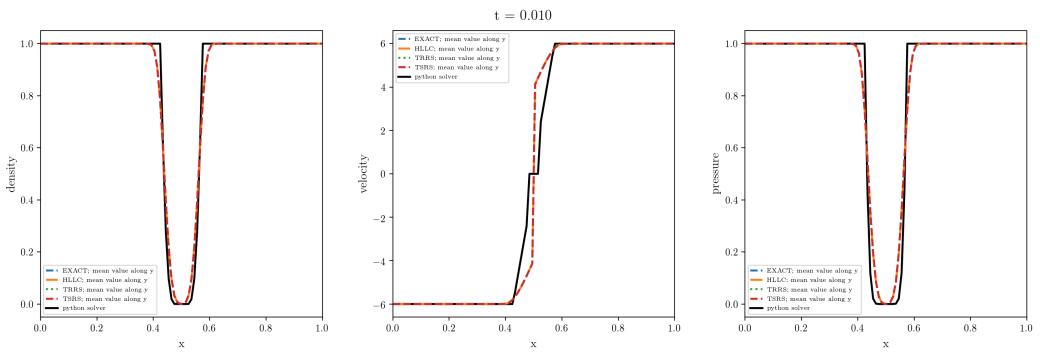
**Figure 94:** Godunov's method for left vacuum state. Obtained result.



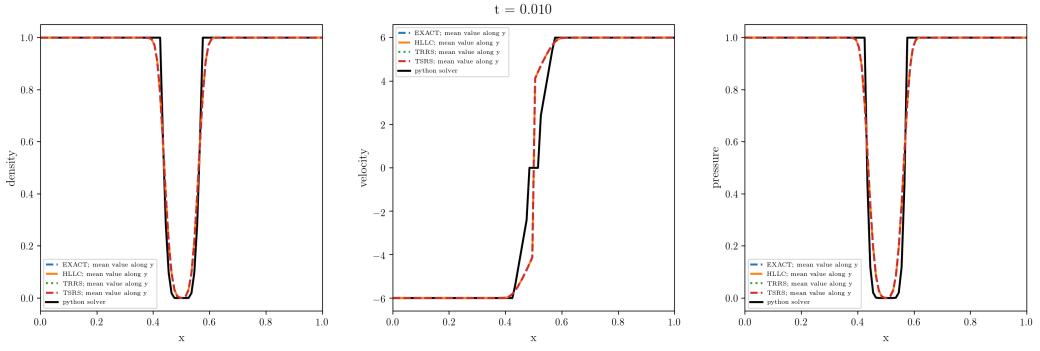
**Figure 95:** Godunov's method for left vacuum state. Expected result.



**Figure 96:** Godunov's method for left vacuum state. Obtained result.

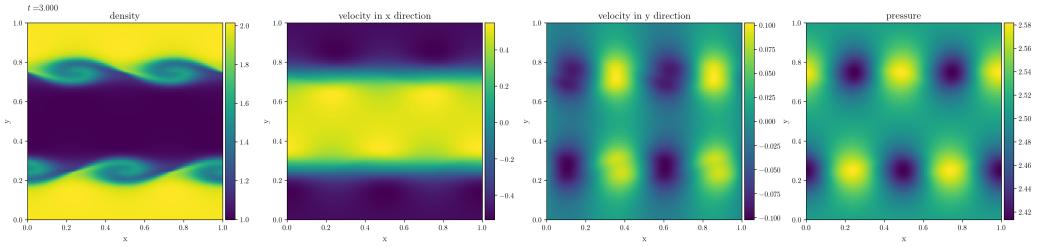


**Figure 97:** Godunov's method for vacuum generating conditions. Expected result.

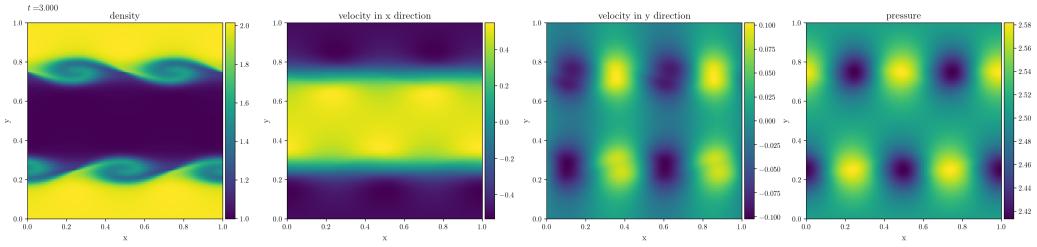


**Figure 98:** Godunov's method for vacuum generating conditions. Obtained result.

### 3.5 Others in 2D



**Figure 99:** Godunov's method for Kelvin Helmholtz instability. Expected result.



**Figure 100:** Godunov's method for Kelvin Helmholtz instability. Obtained result.