

# 2D Two-Phase Jet Simulations

Yan Zhan

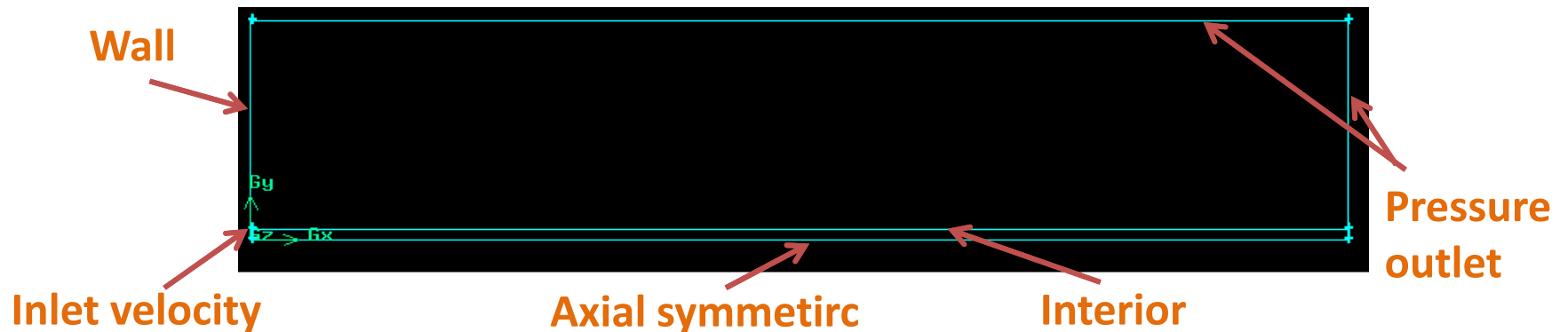
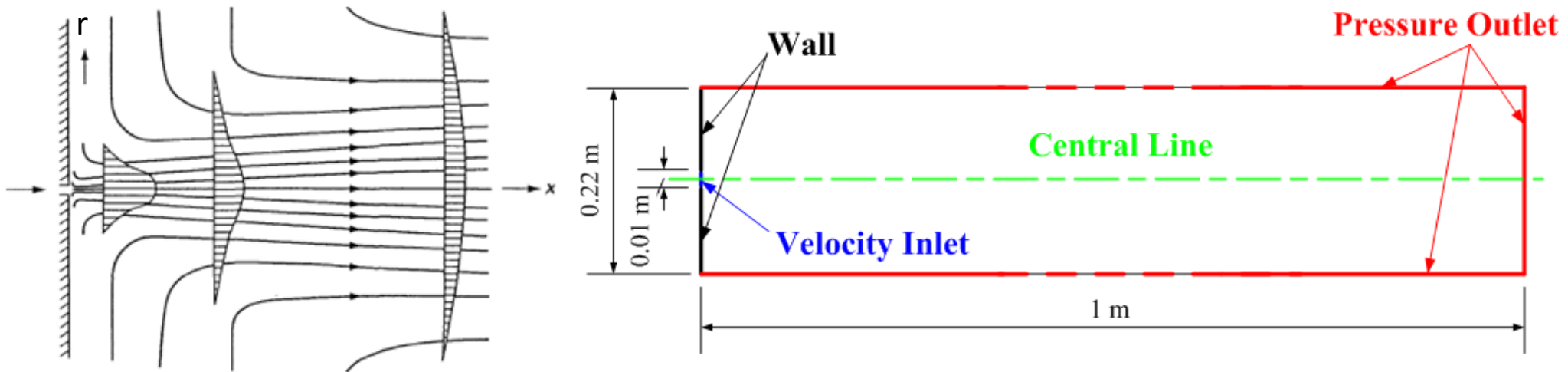
SUNY Stony Brook

Nov. 21, 2013

# Outline

- 2D Turbulent Jet Into Still Air
  - VOF (Volume Of Fluid Method, FLUENT code)
  - CLSVOF (Coupled Level Set Volume Of Fluid Method, FLUENT code)
- 2D Mercury-Air Jet
  - Movies
    - Axial Velocity Contour, Volume Fraction Of Water
  - Snapshots
- 2D Water-Air Jet
  - Movies
    - Axial Velocity Contour, Volume Fraction Of Water
  - Snapshots

# 2D Turbulent Jet Into Still Air



Mercury emerges into a still air from a circular orifice at  $x=0$

–  $Re_d = 1812785.017$  ( $u = 20$  m/s)

– Temperature = 300 K

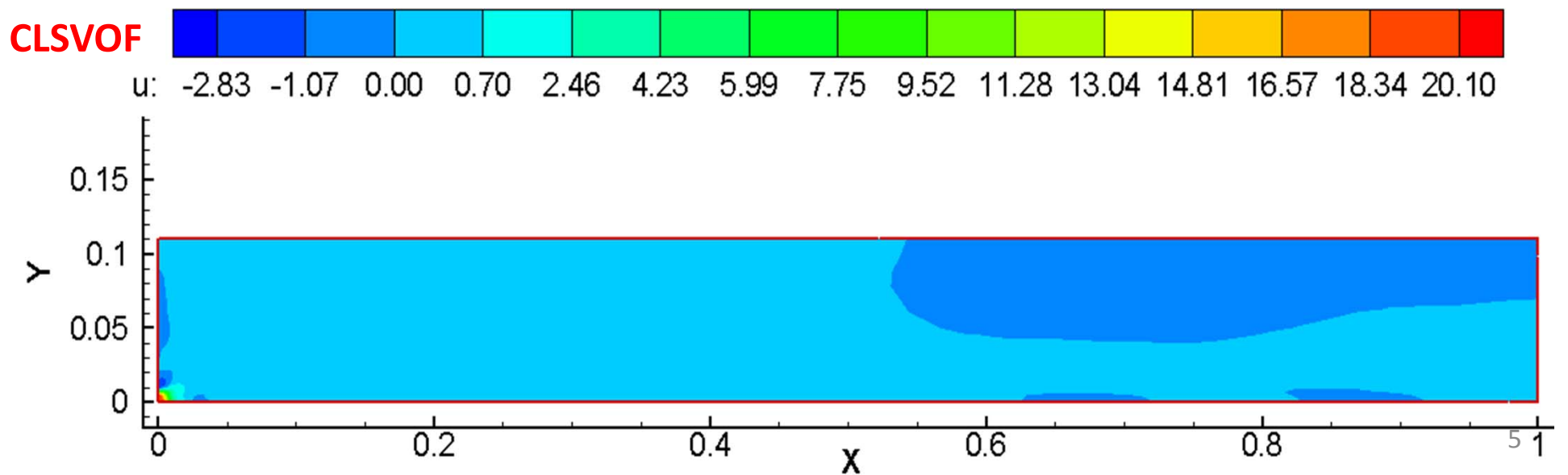
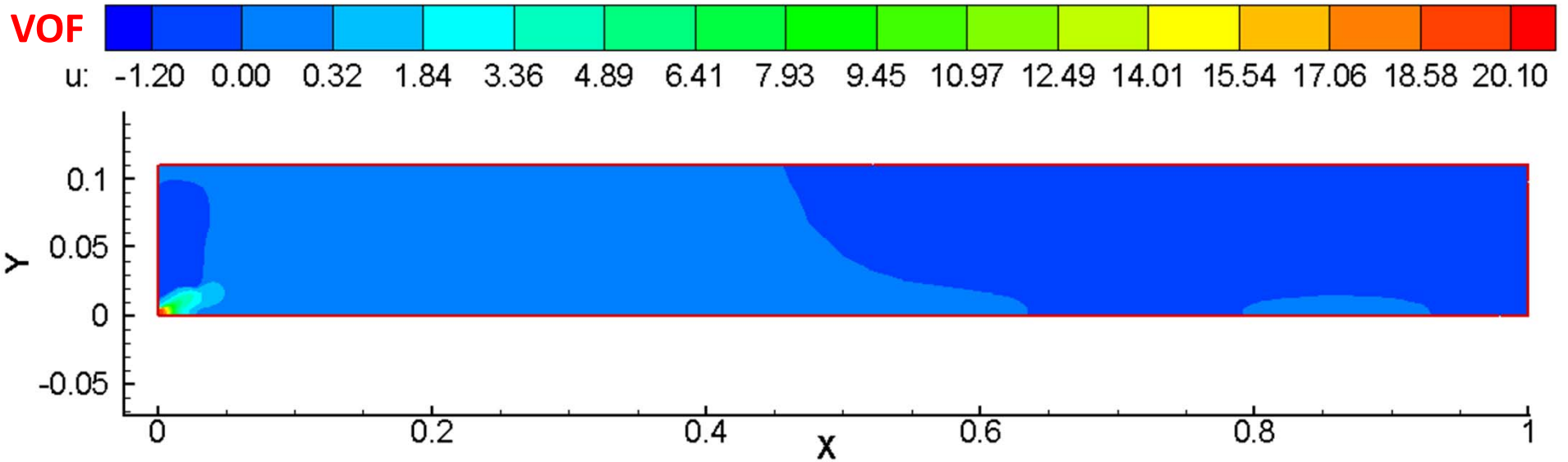
–  $\rho = 13456$  kg/m<sup>3</sup> ;  $\nu = 1.1147 \times 10^{-7}$  m<sup>2</sup>/s ;

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# Axial Velocity Contour (Mercury- Air )

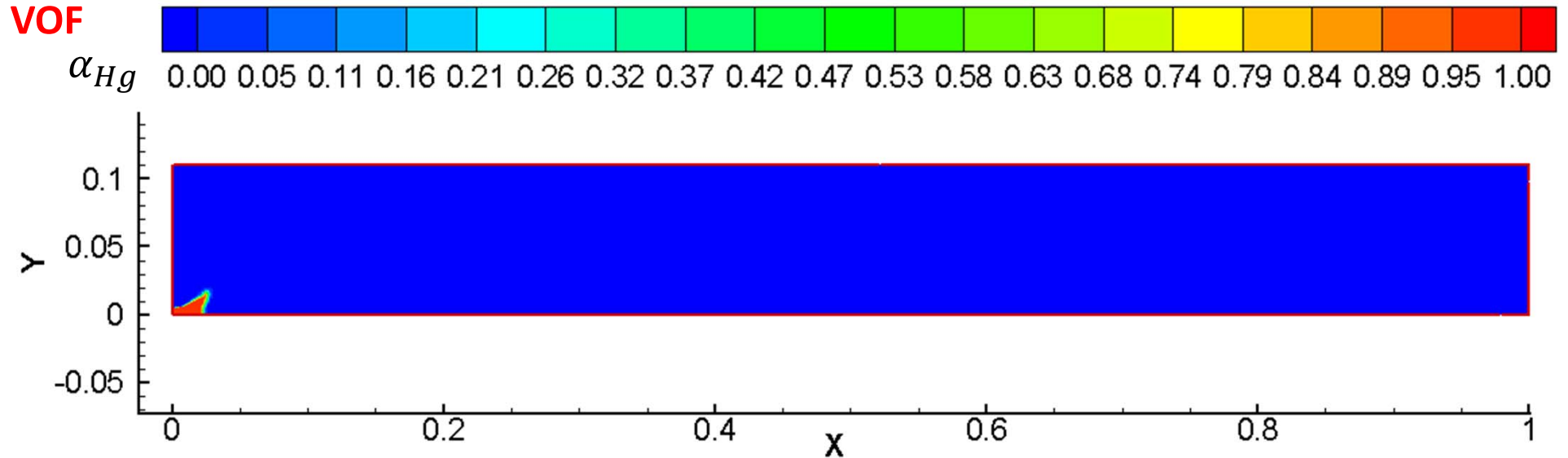
[click to watch the movie]



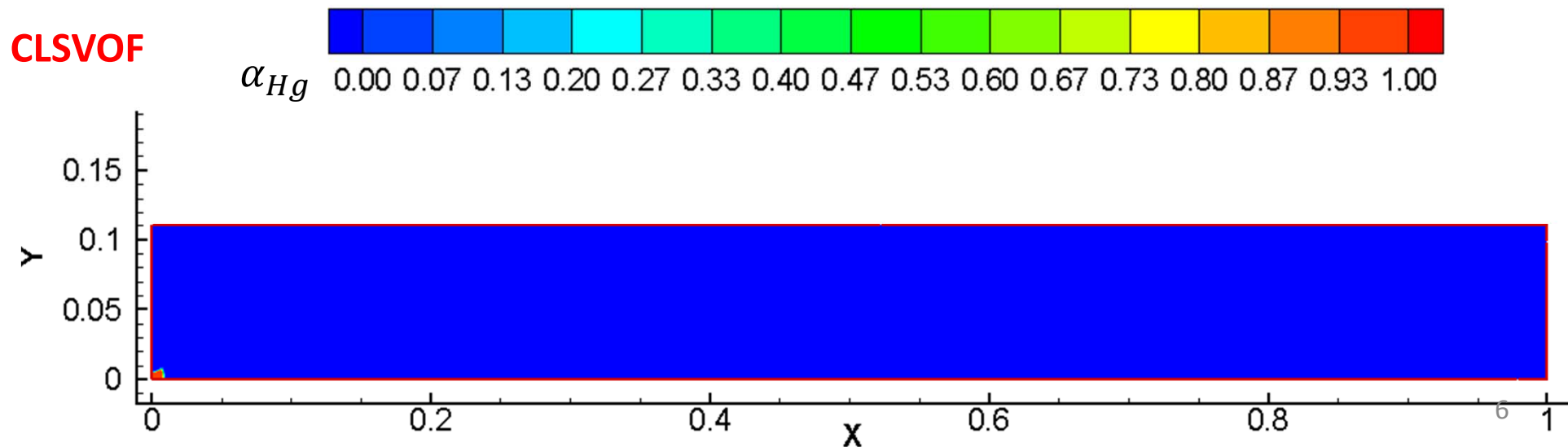
# Volume Fraction Of Water (Mercury - Air )

[click to watch the movie]

**VOF**

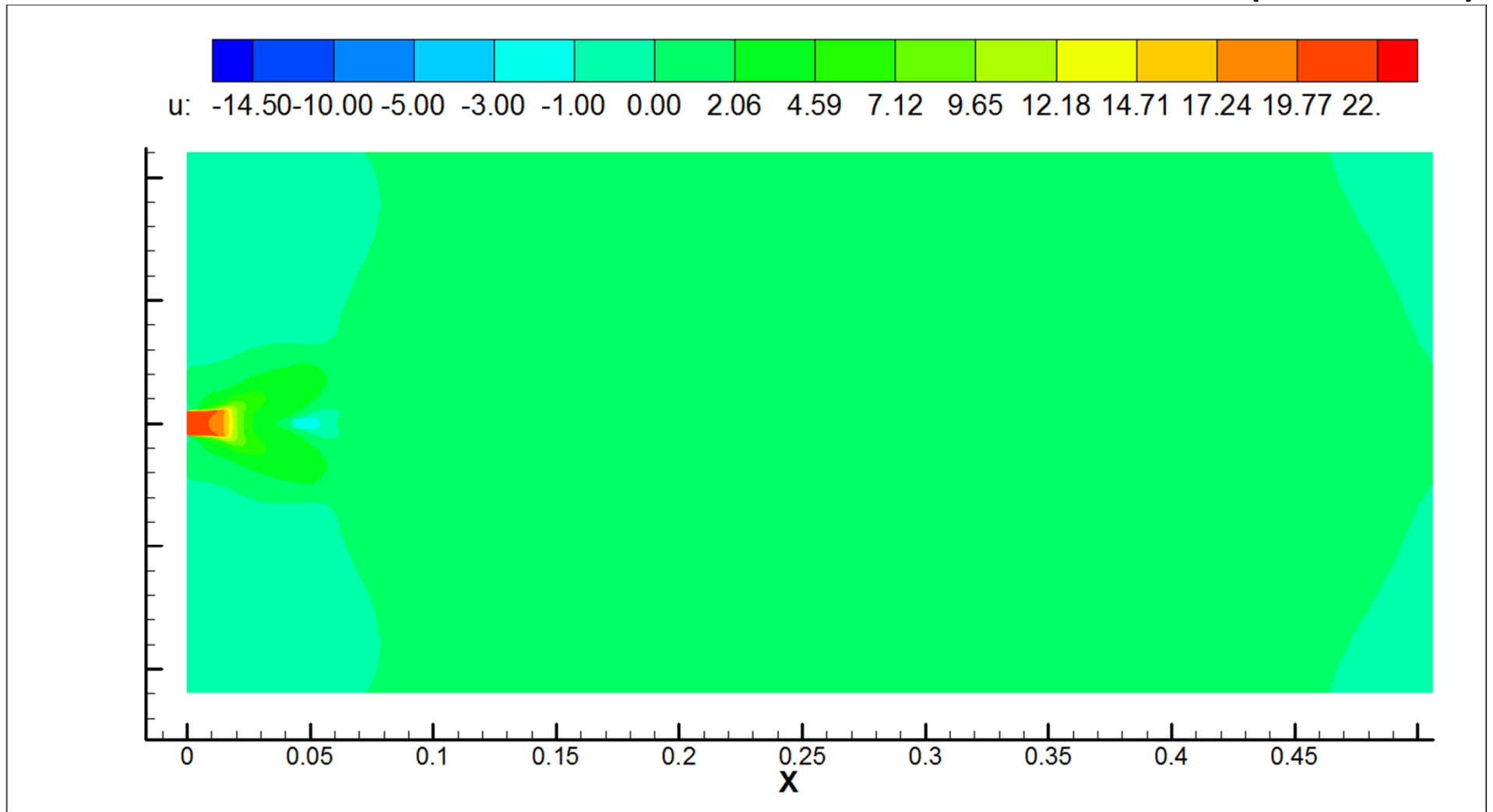


**CLSVOF**



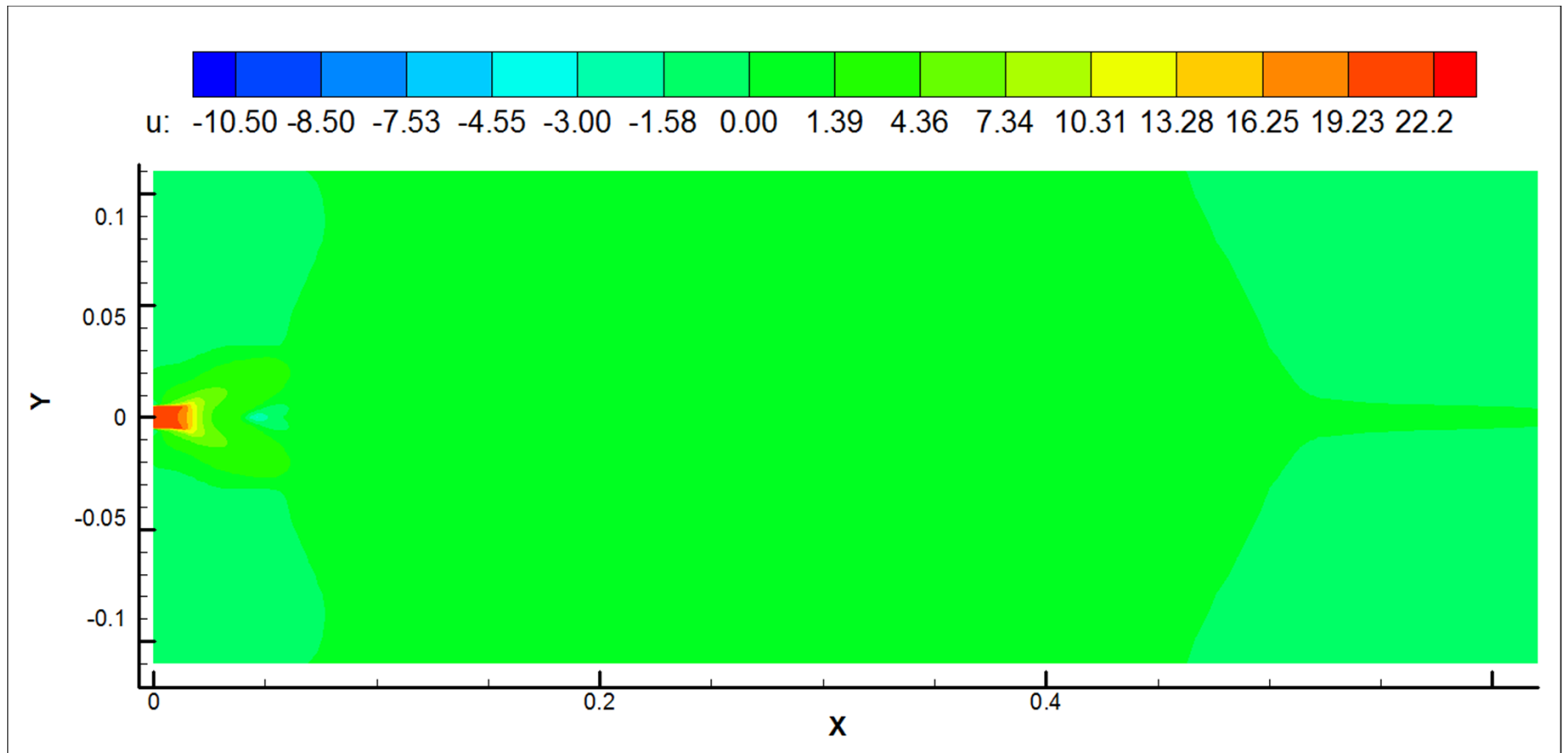
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0161 s)



# Snap Shots (Mercury - Air)

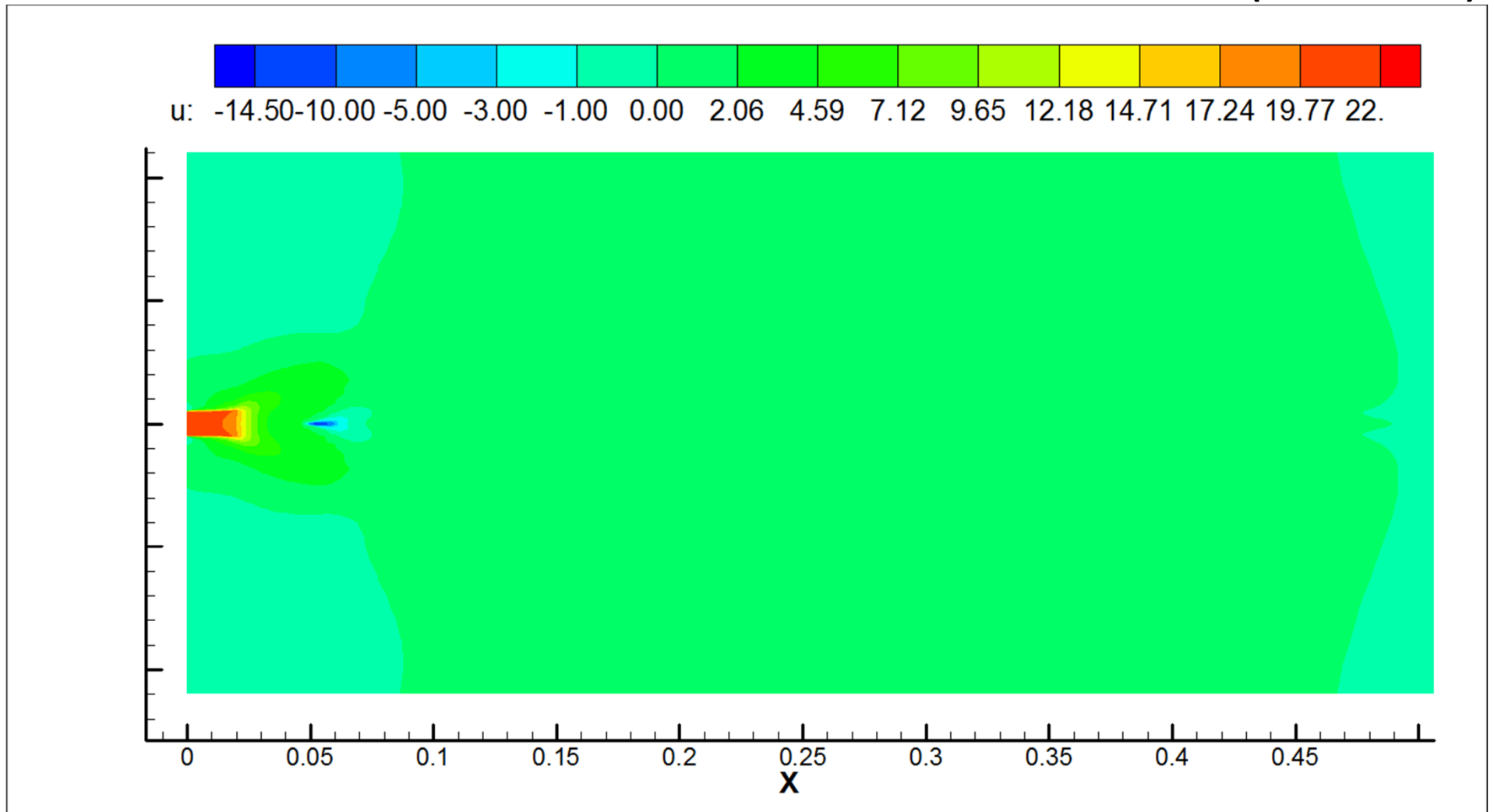
VOF( t = 0.0161 s)





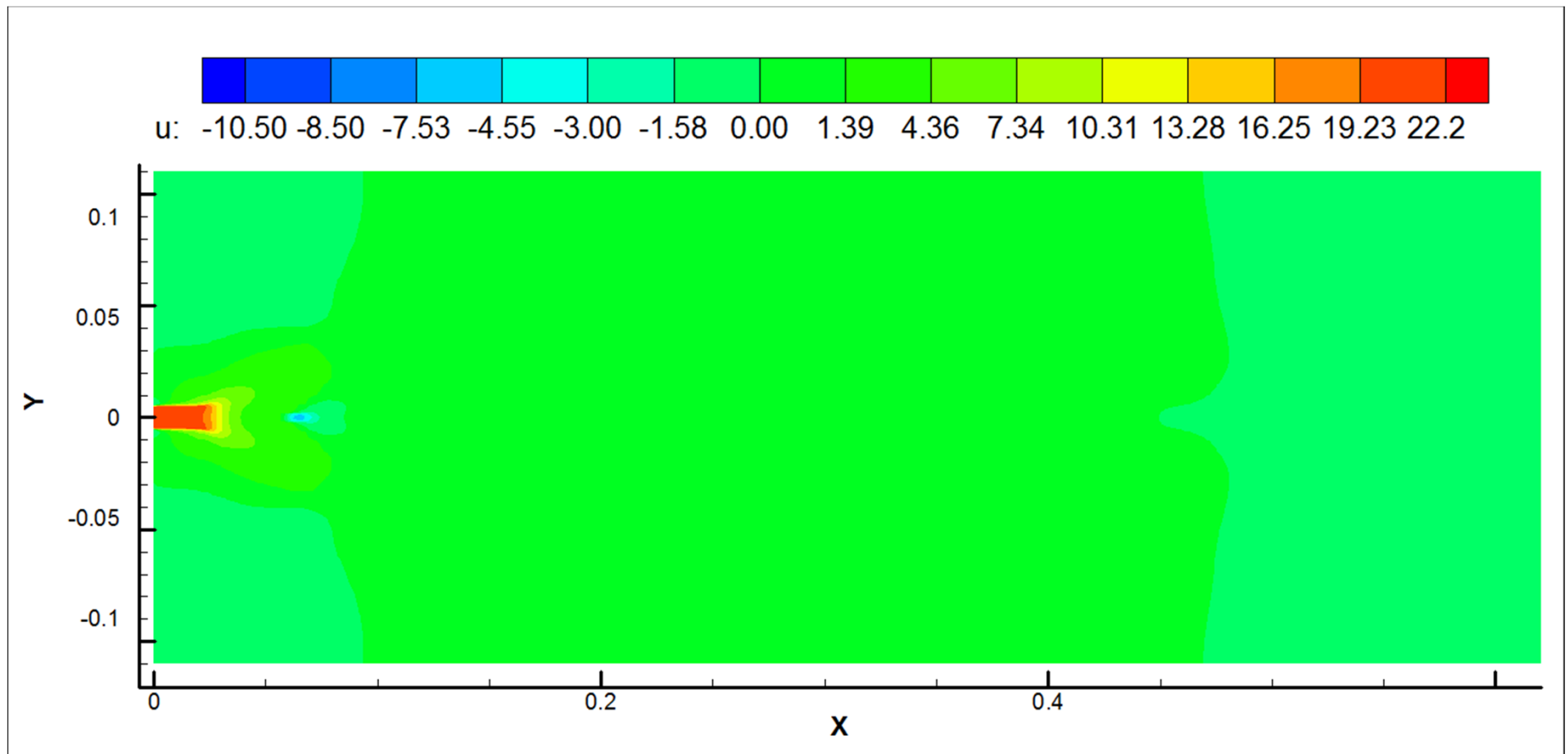
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0211 s)



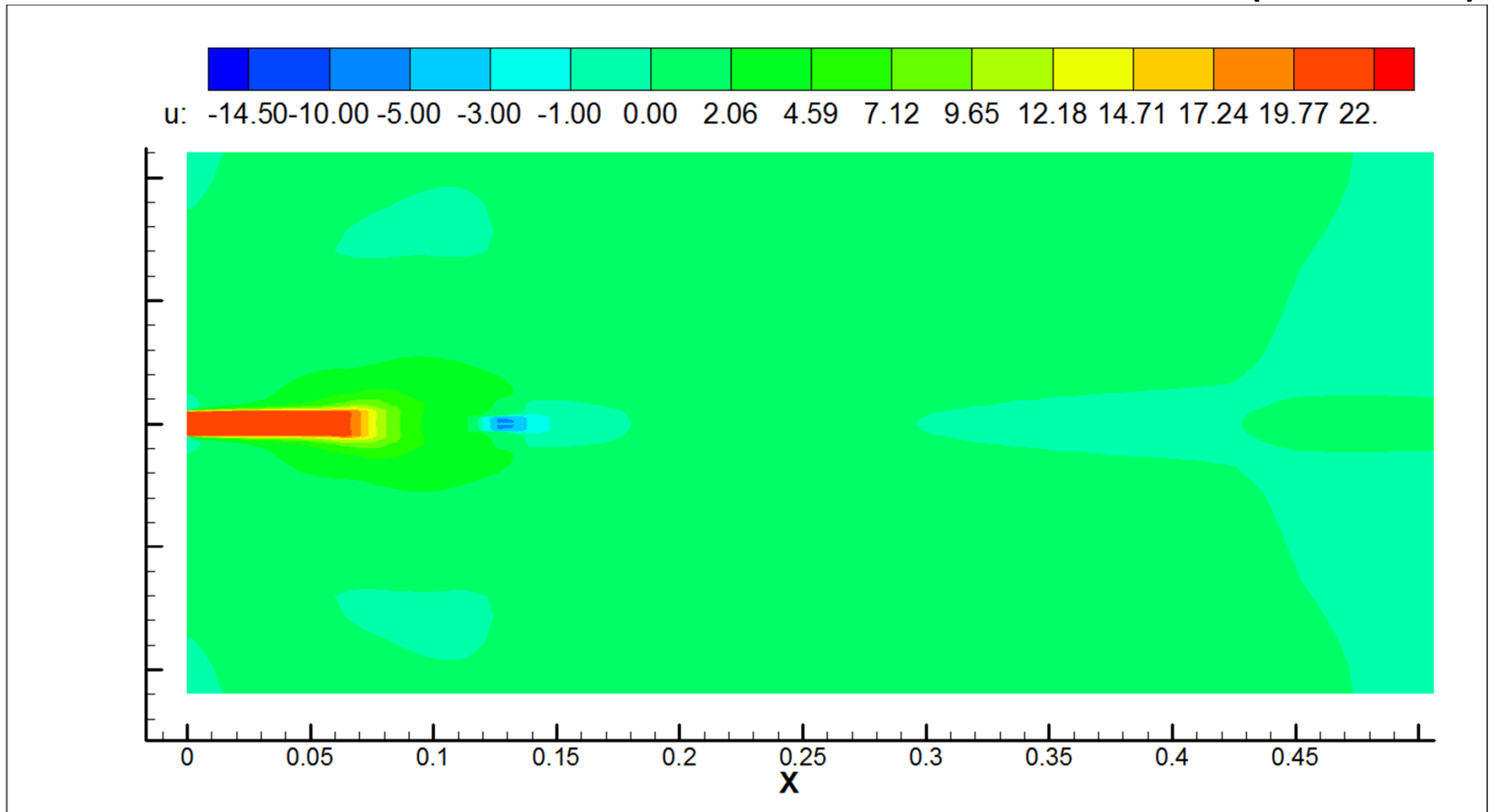
# Snap Shots (Mercury - Air)

VOF( t = 0.0211 s)



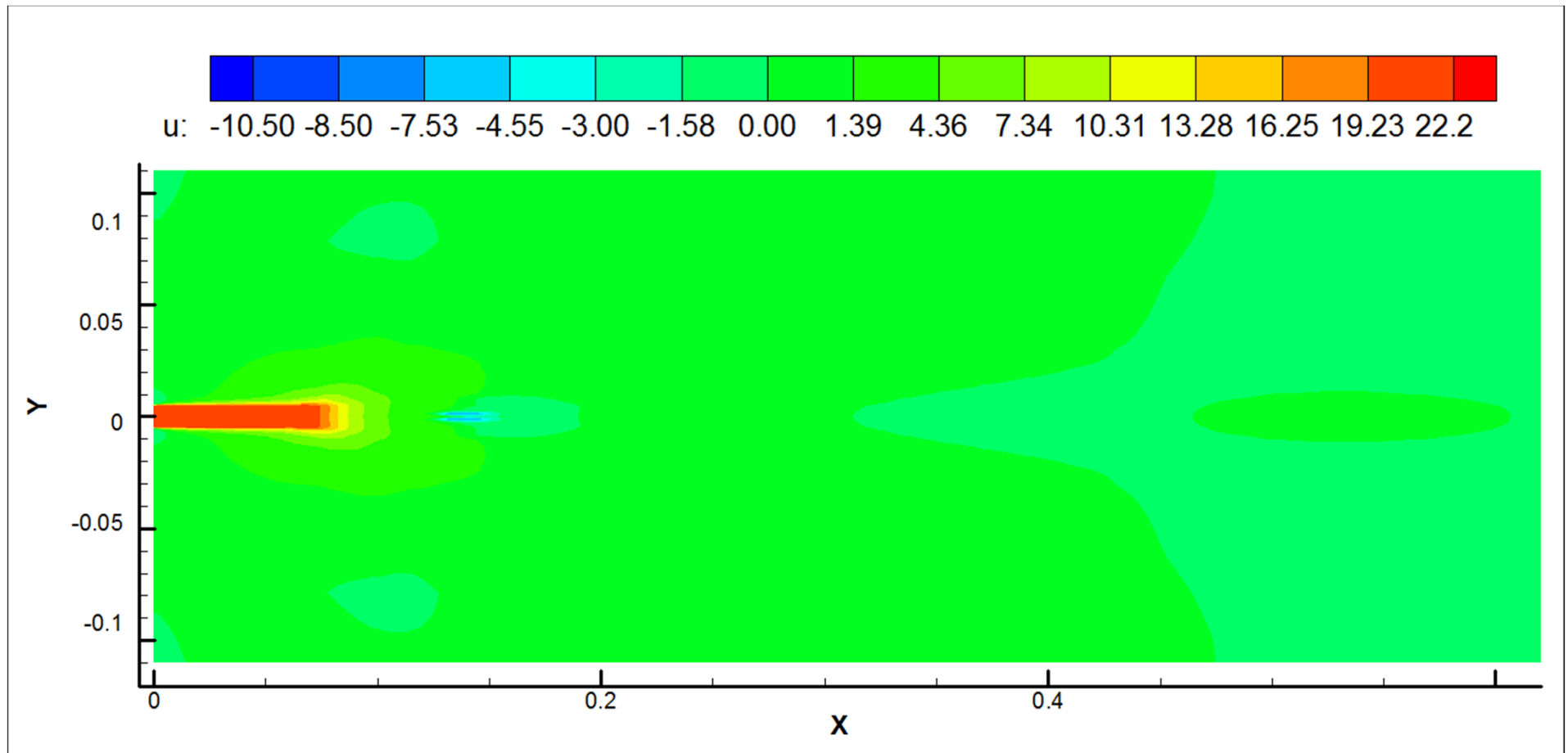
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0611 s)



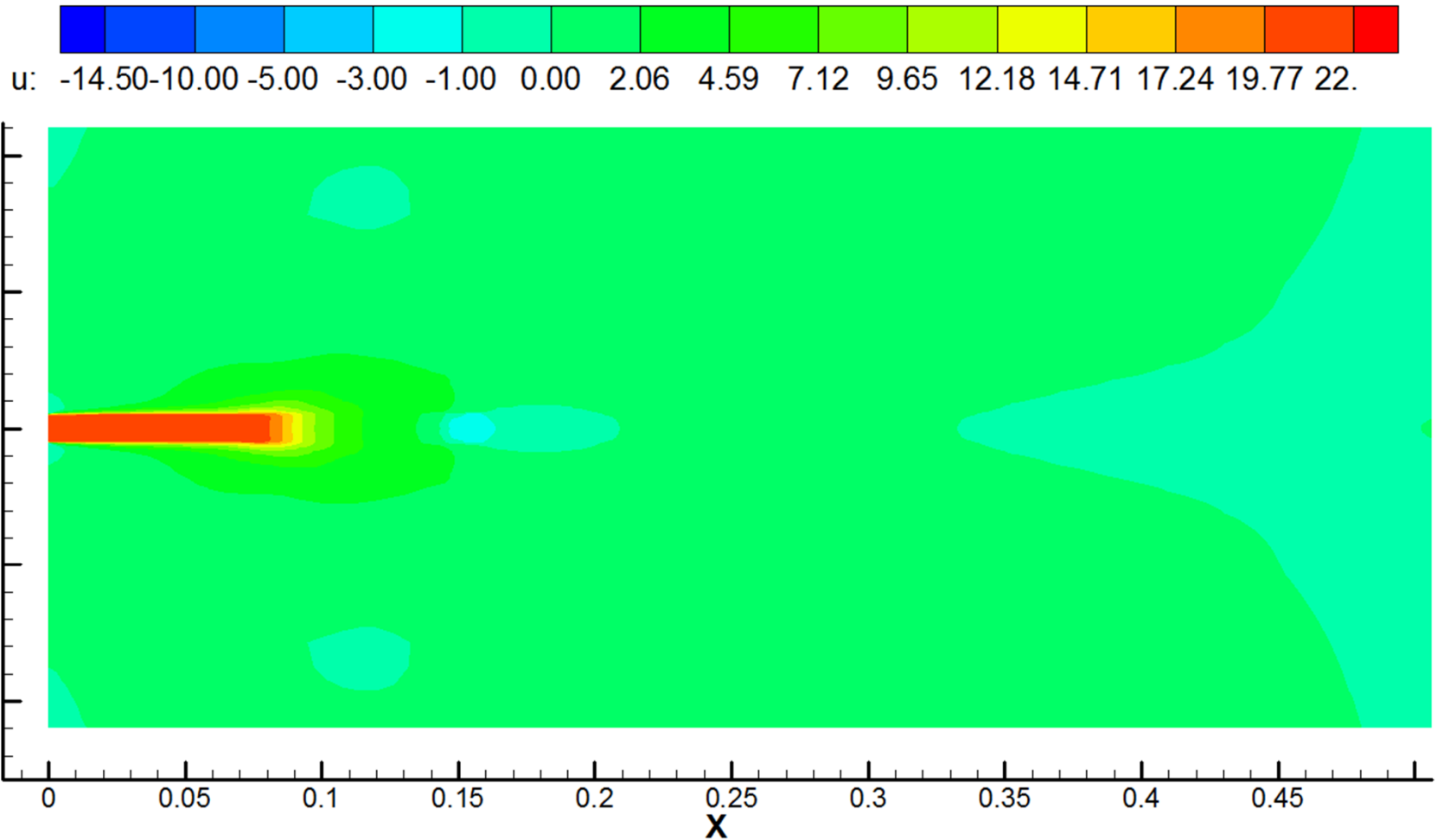
# Snap Shots (Mercury - Air)

VOF( t = 0.0611 s)



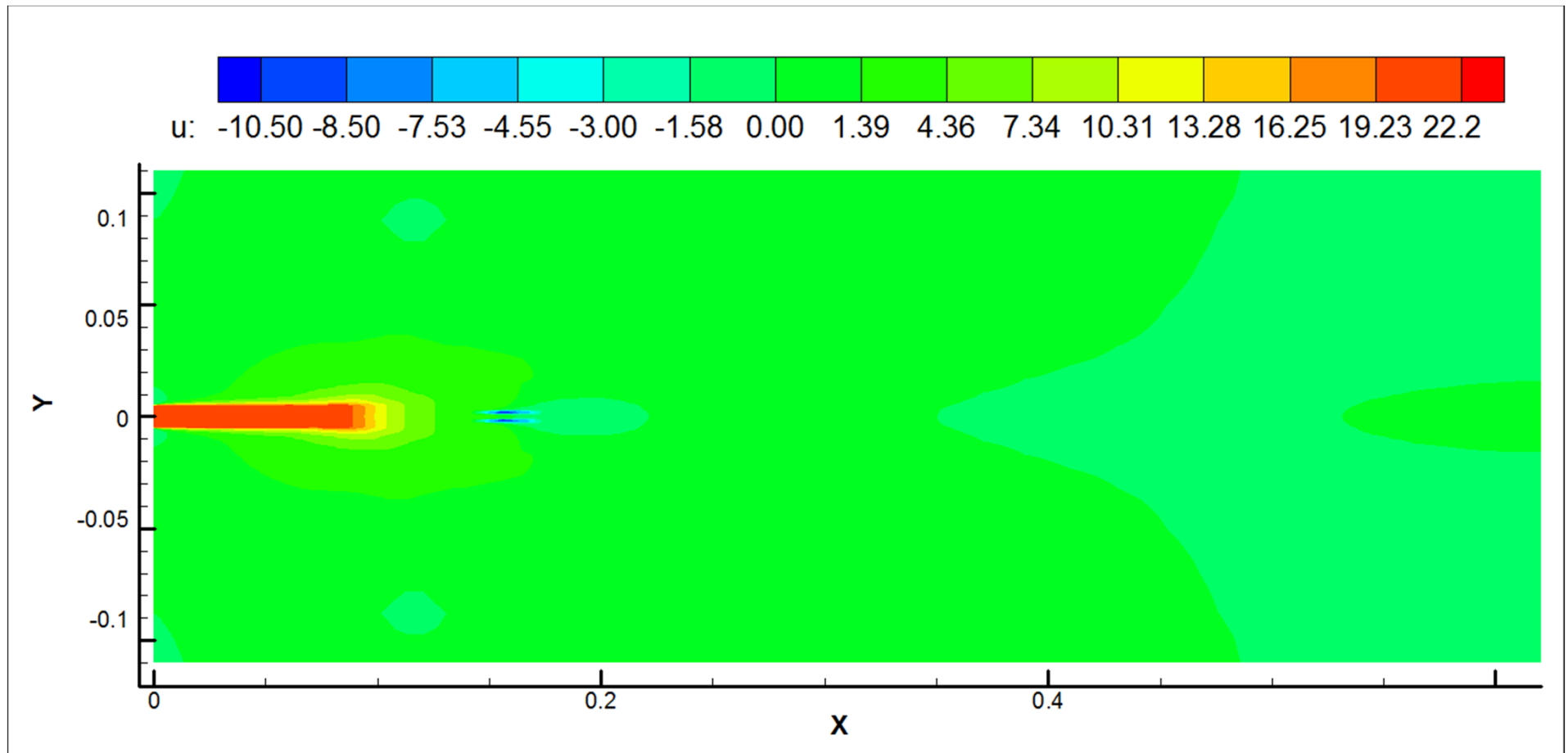
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.071 s)



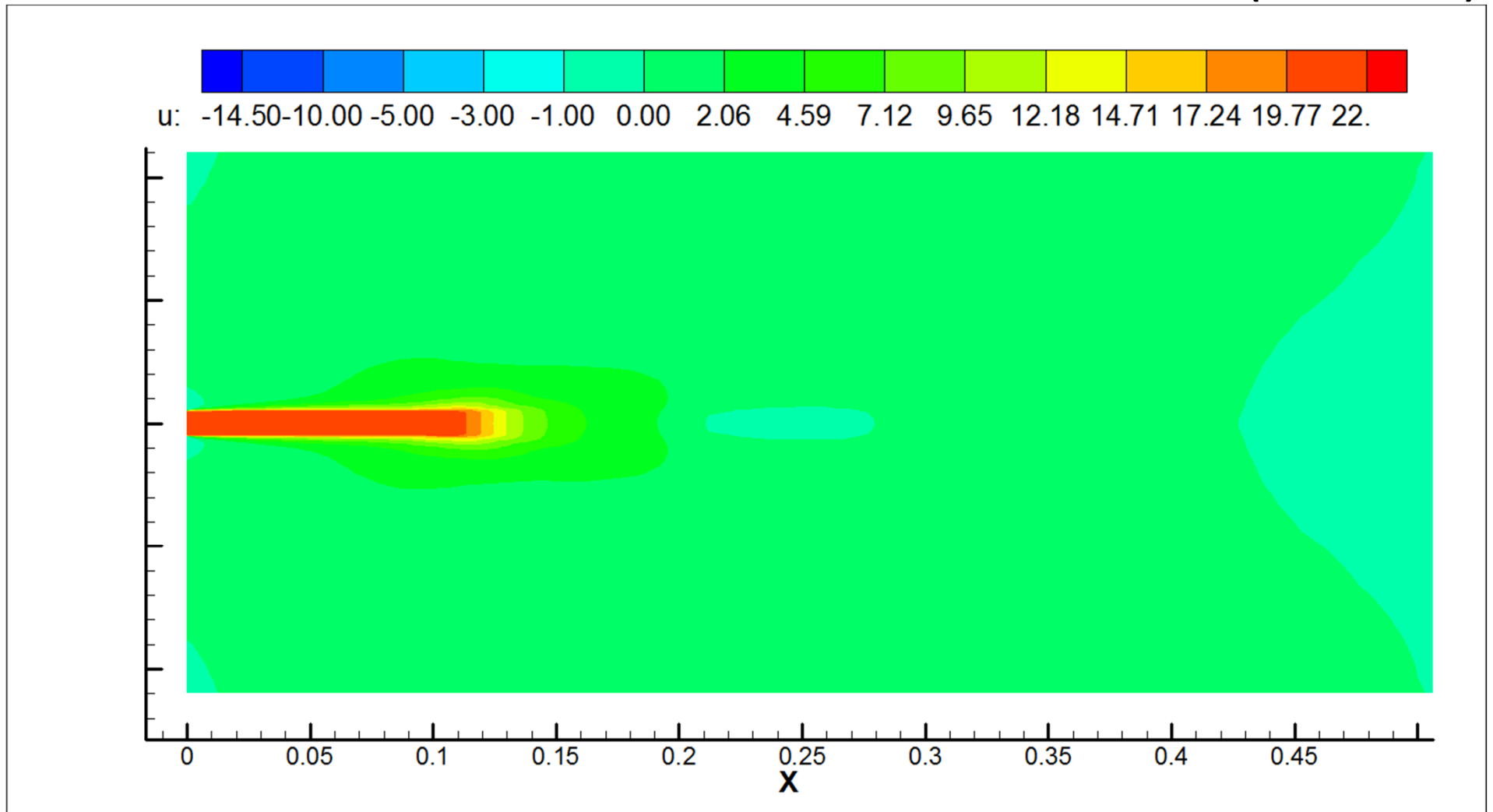
# Snap Shots (Mercury - Air)

VOF( t = 0.071 s)



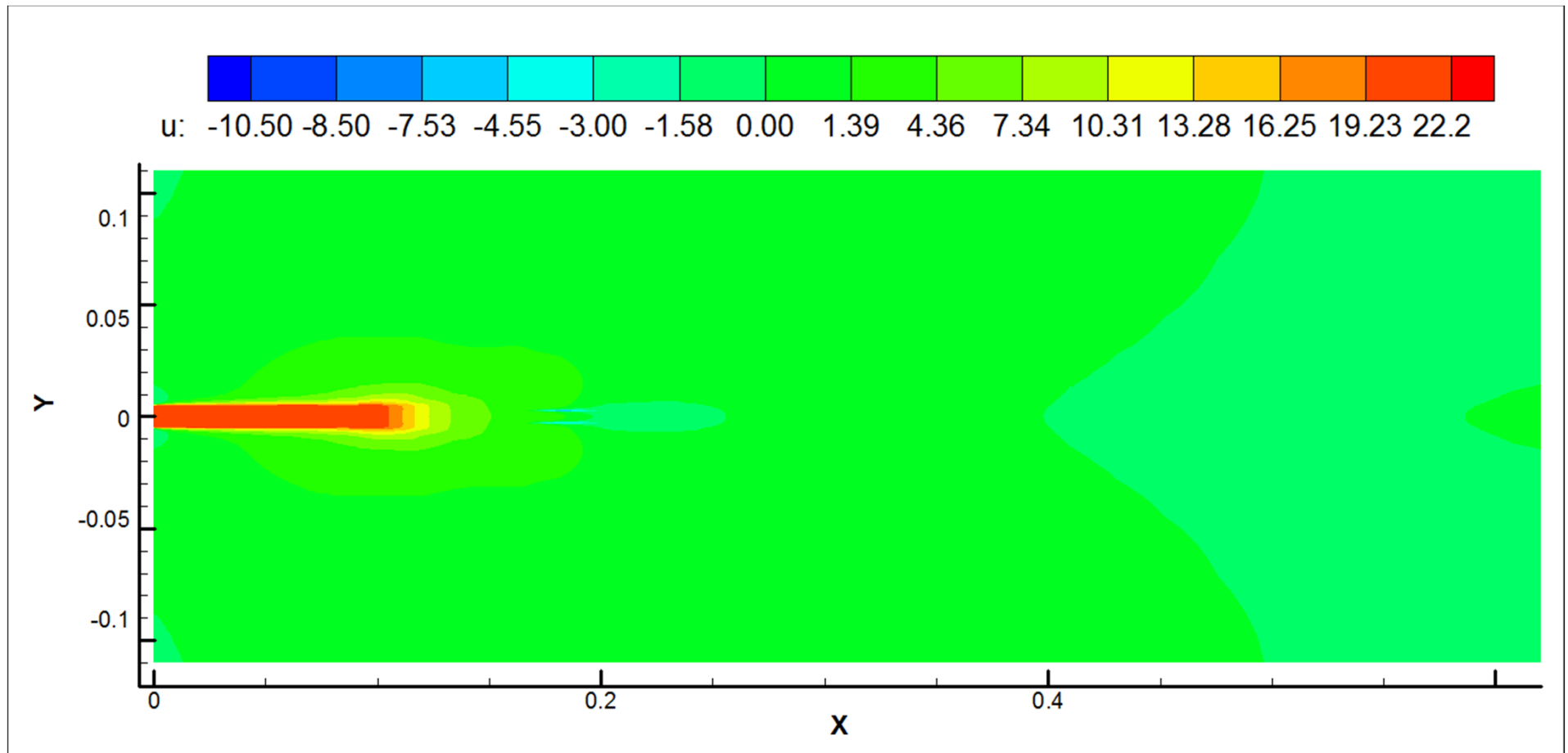
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0811 s)



# Snap Shots (Mercury - Air)

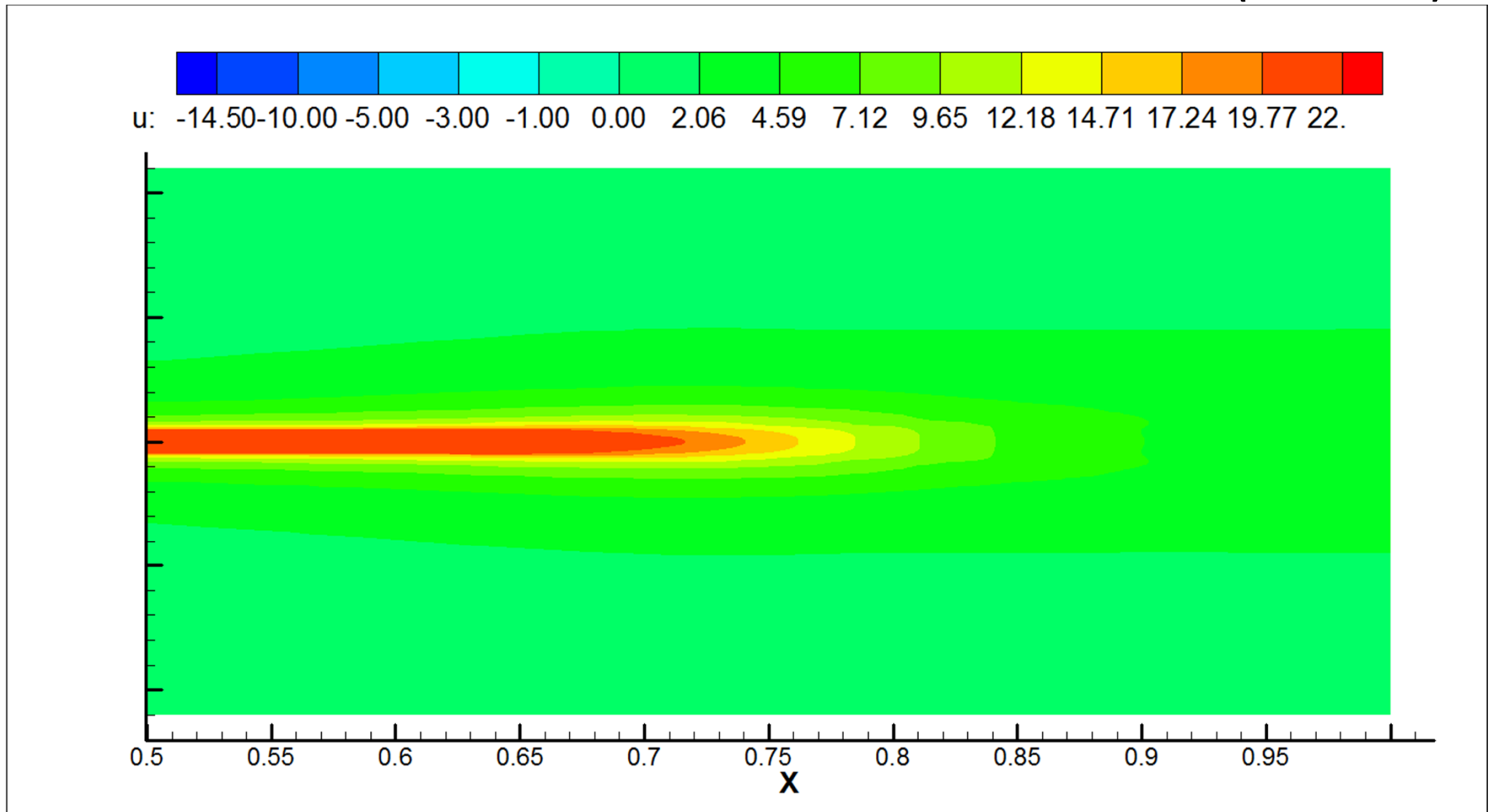
VOF( t = 0.0811 s)





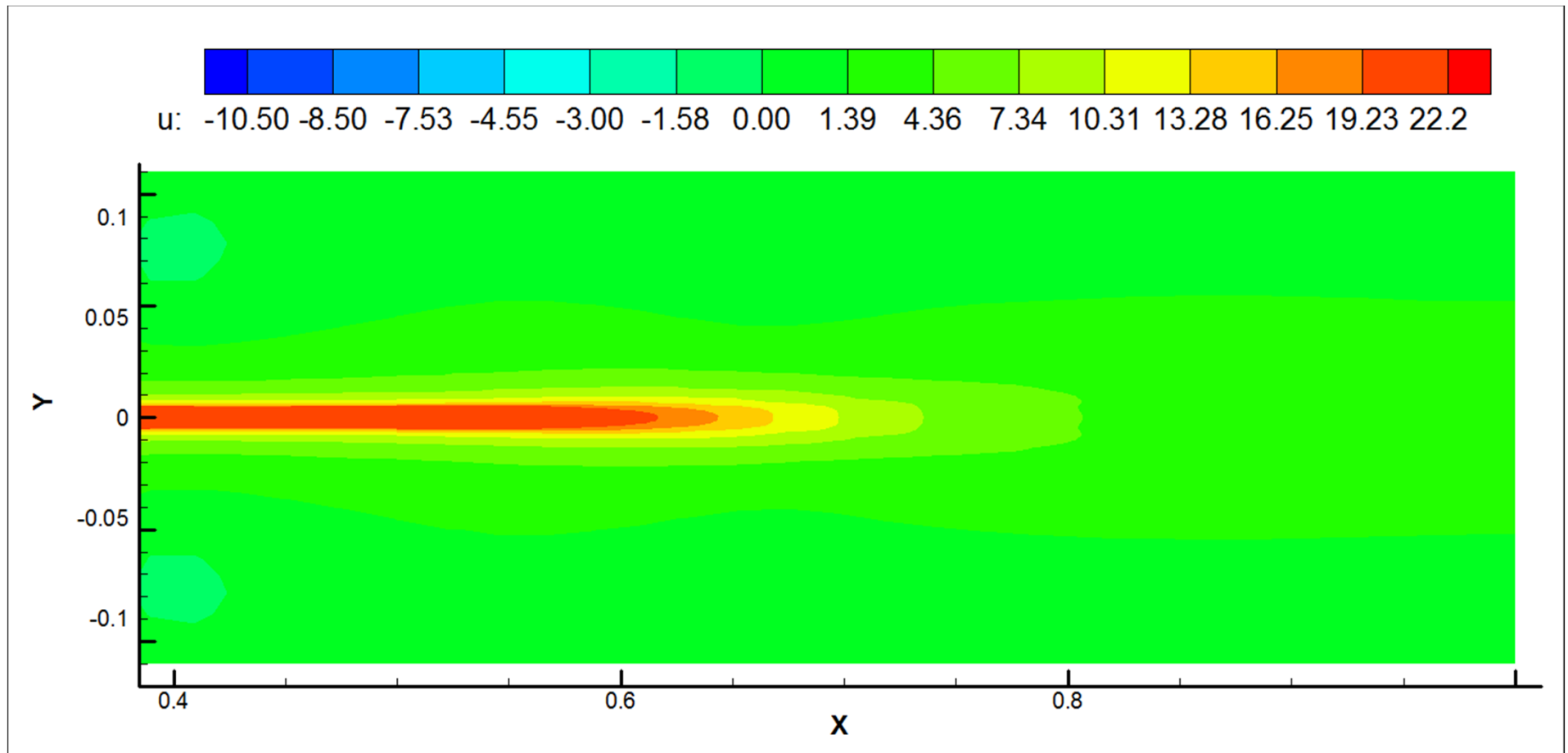
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.331 s)



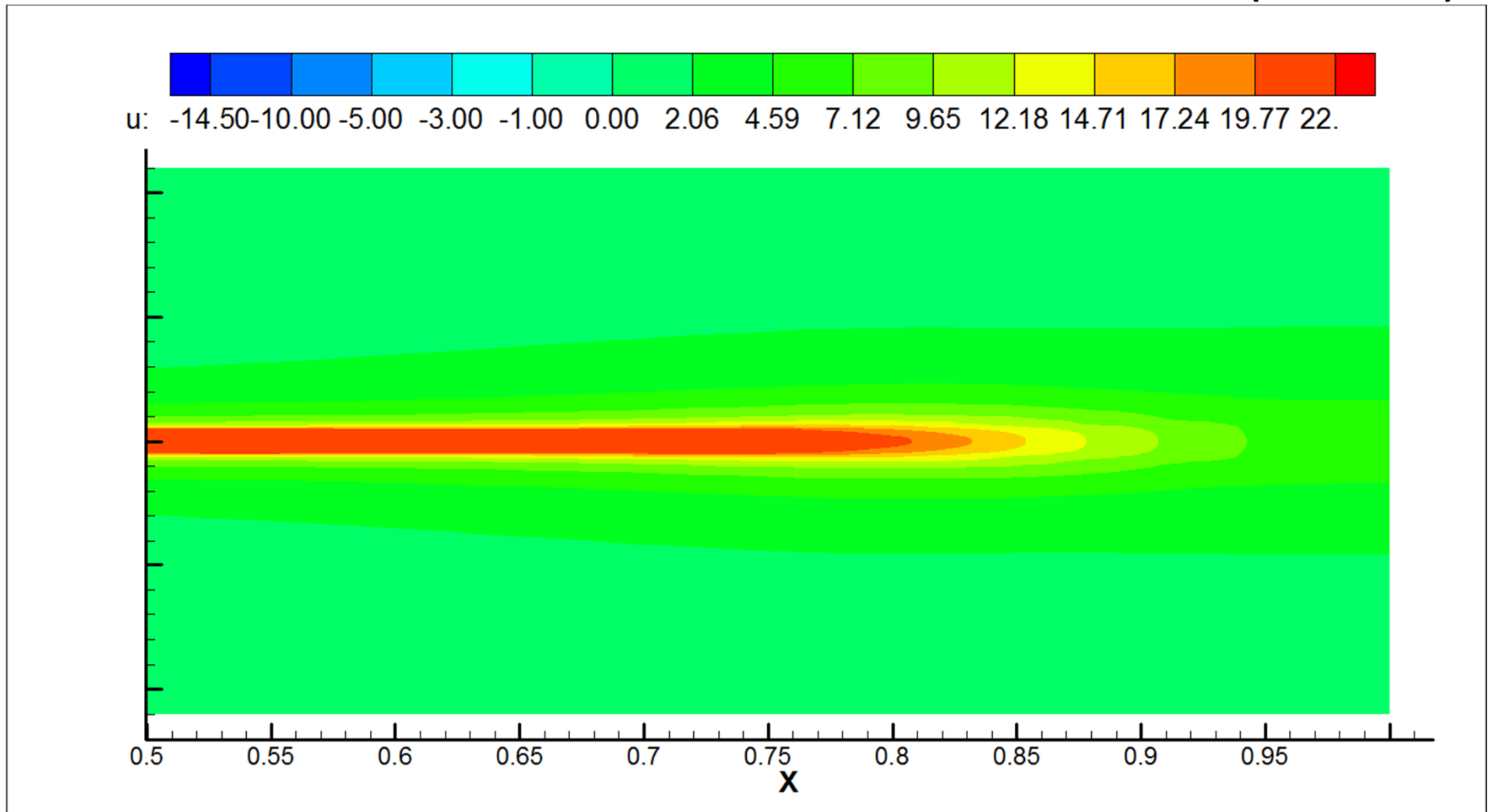
# Snap Shots (Mercury - Air)

VOF( t = 0.331 s)



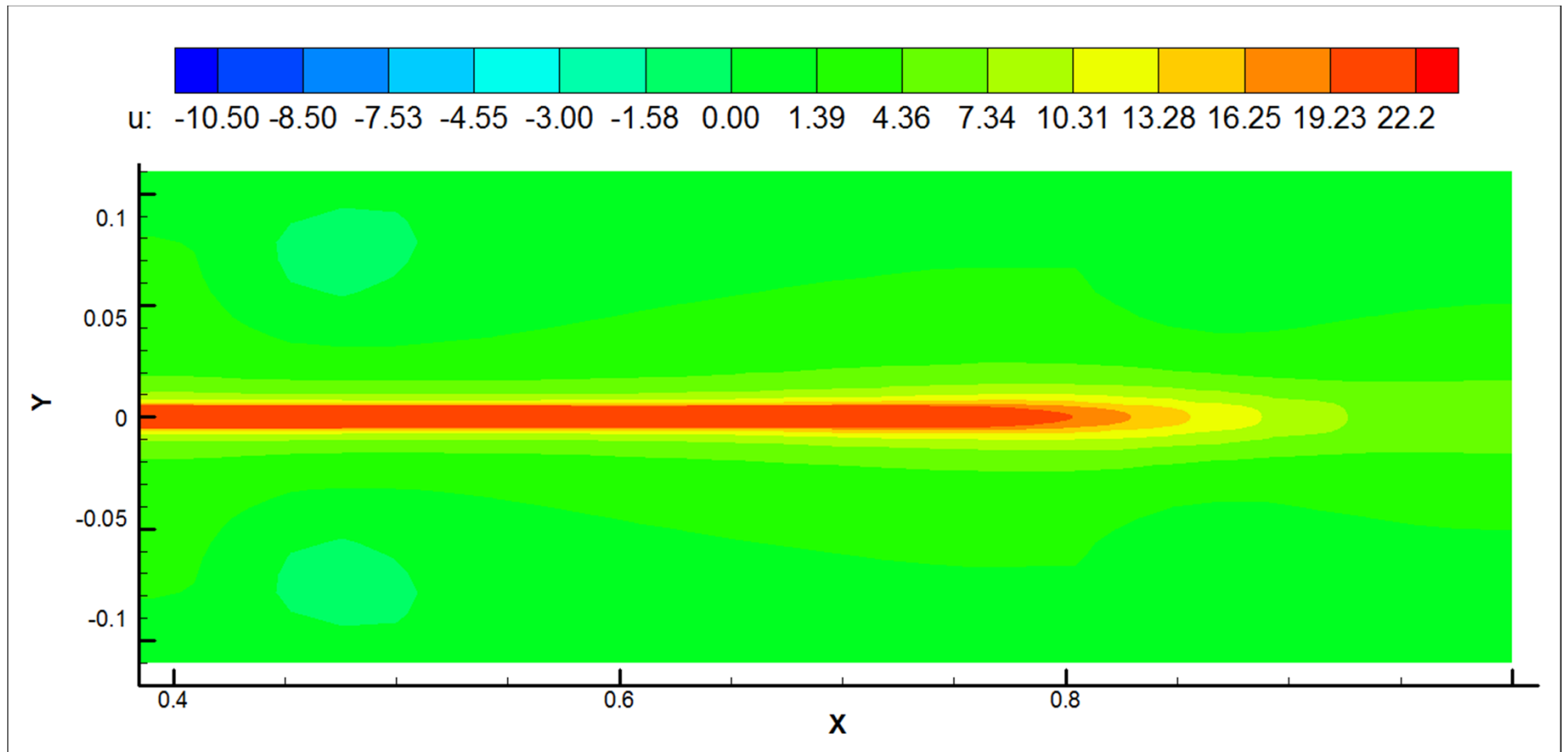
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.411 s)



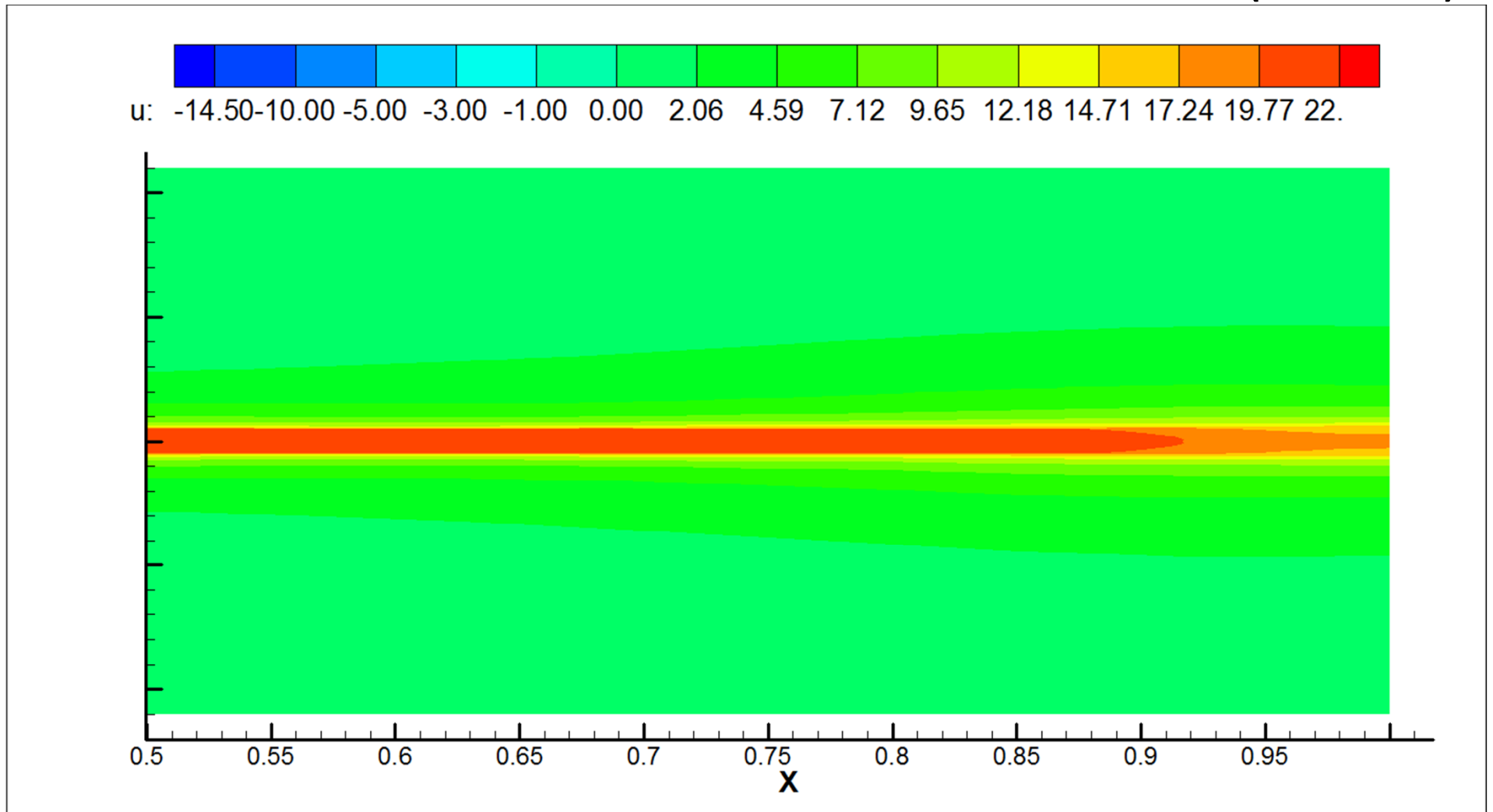
# Snap Shots (Mercury - Air)

VOF( t = 0.411 s)



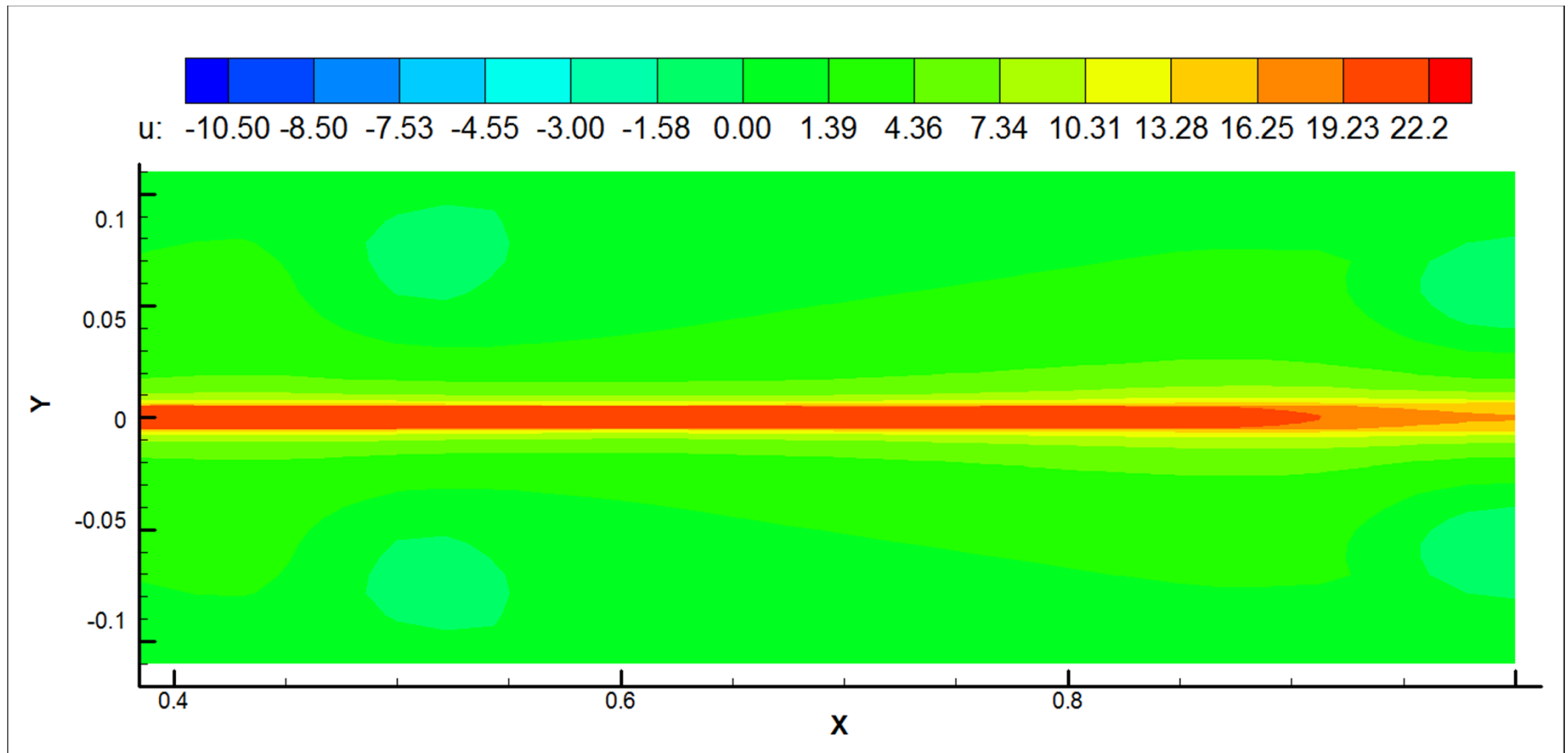
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.461 s)



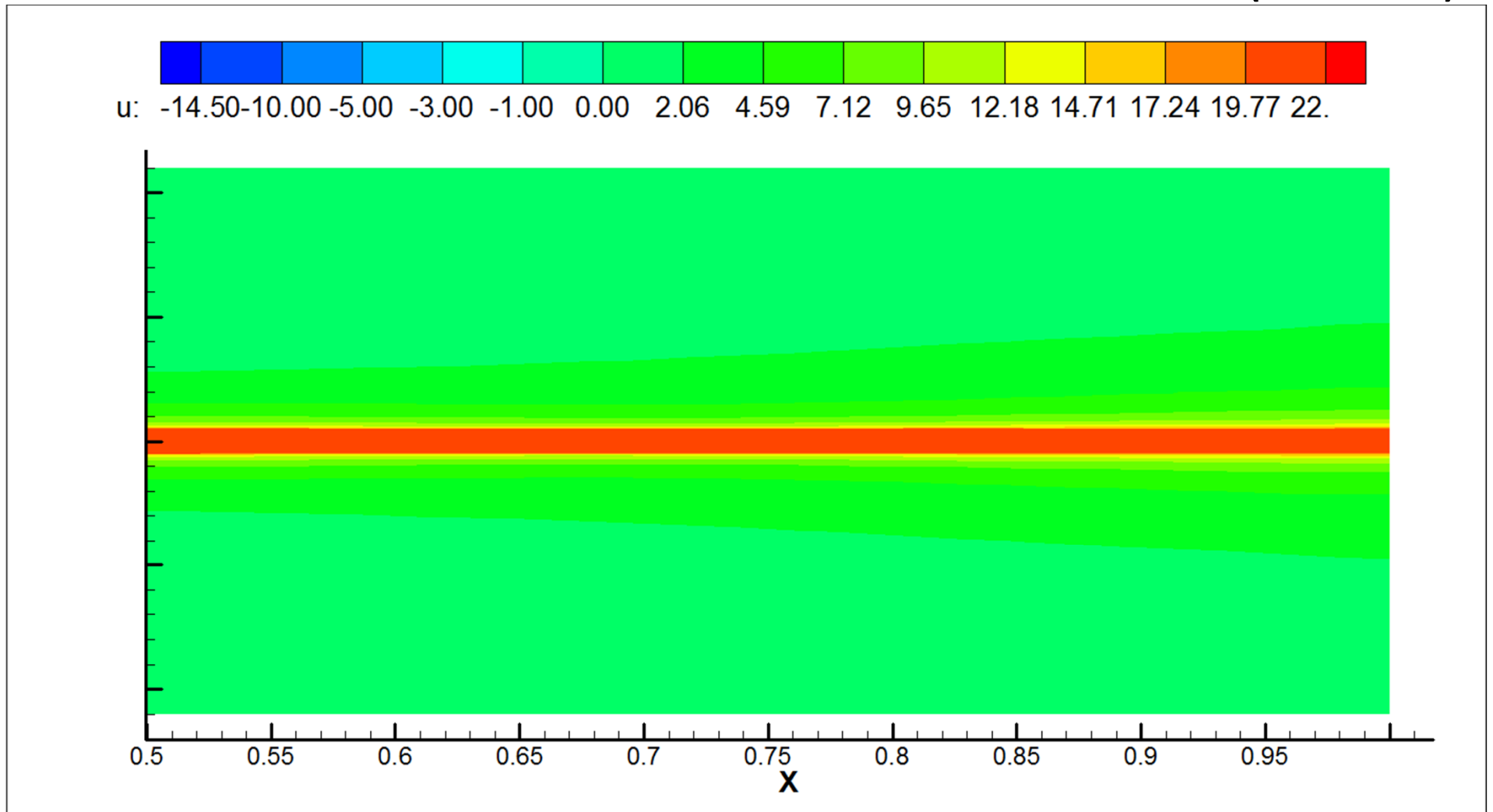
# Snap Shots (Mercury - Air)

VOF( t = 0.461 s)



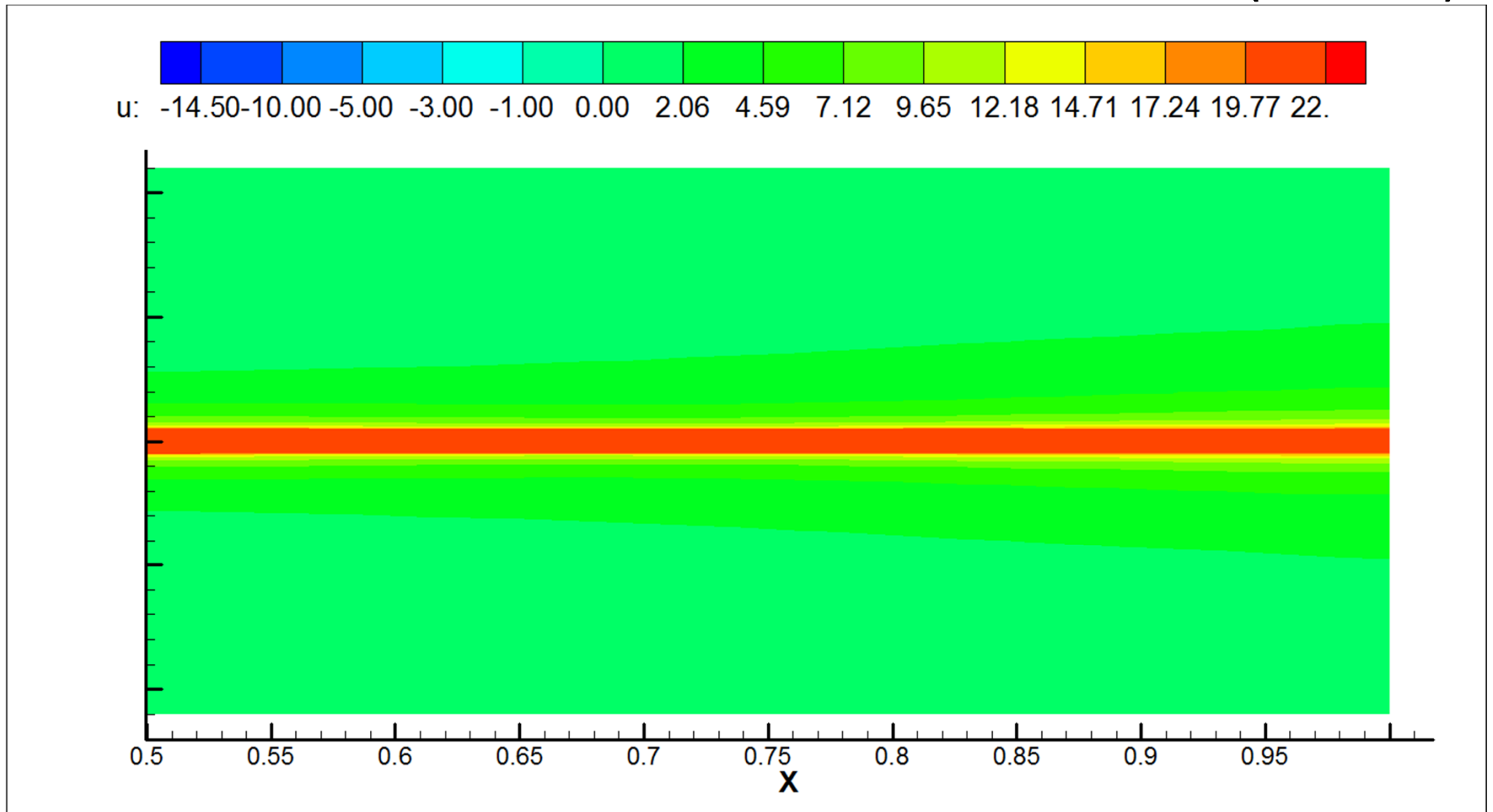
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.511 s)



# Snap Shots (Mercury - Air)

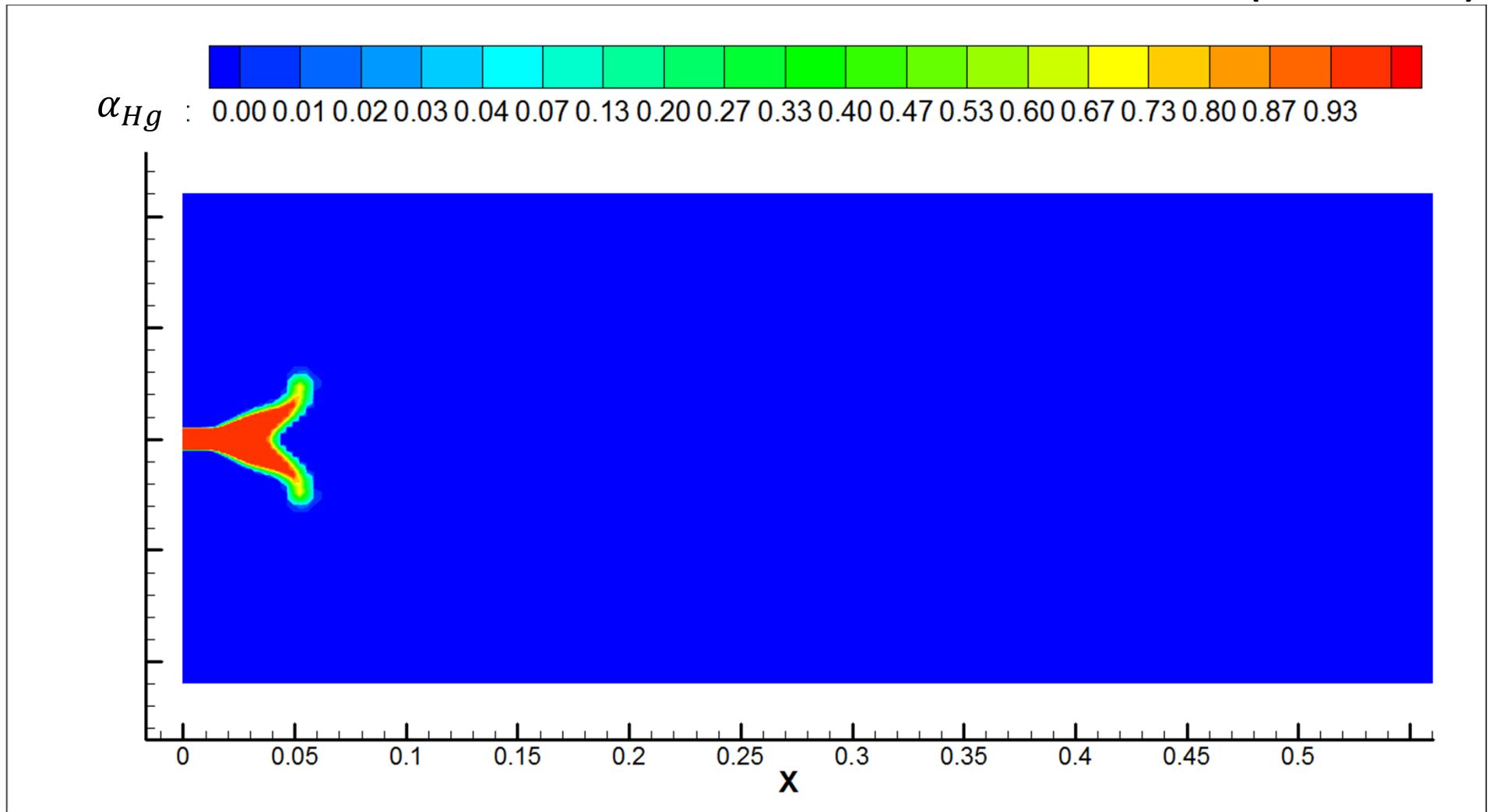
CLSVOF( t = 0.511 s)





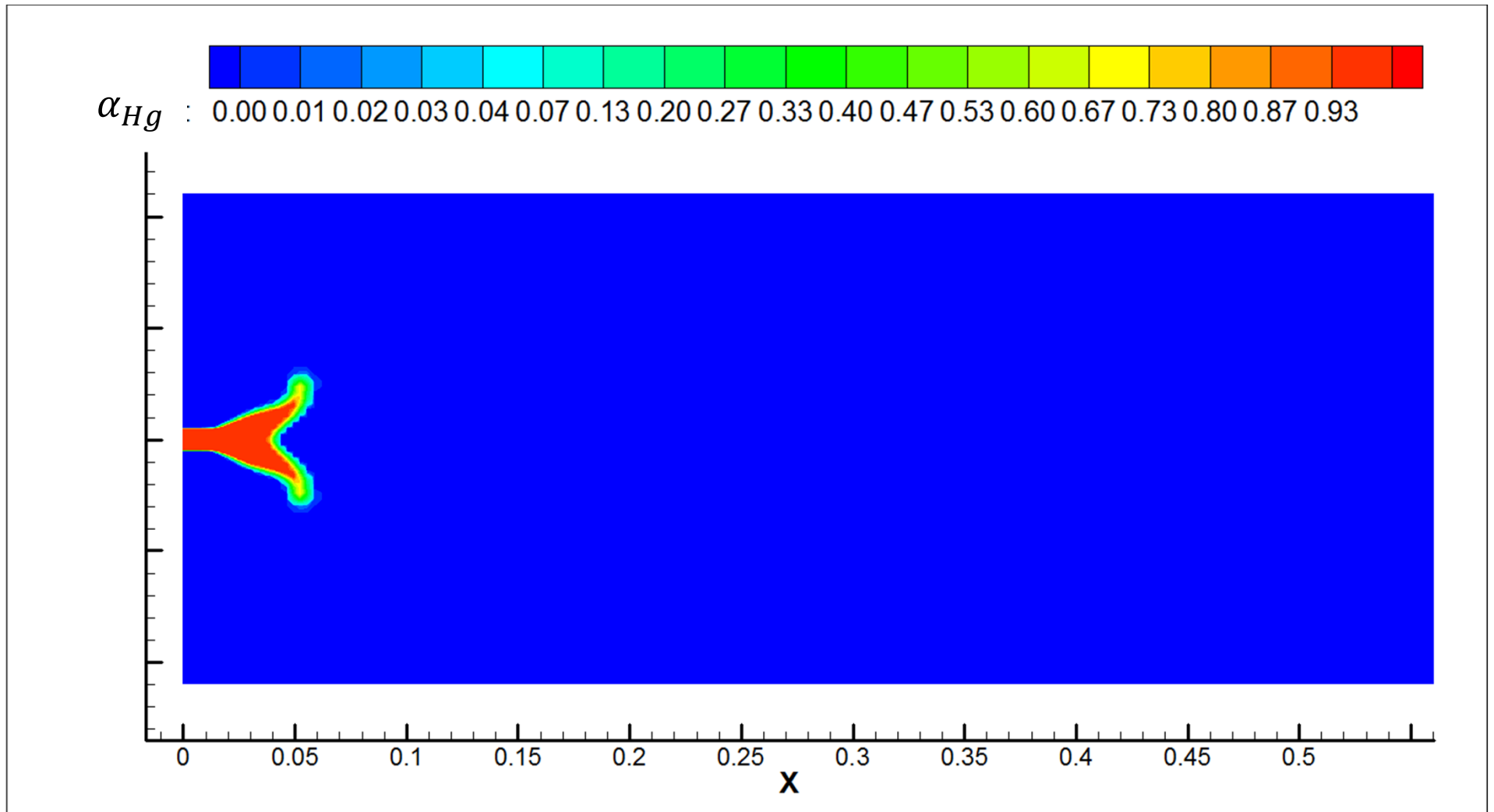
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0161 s)



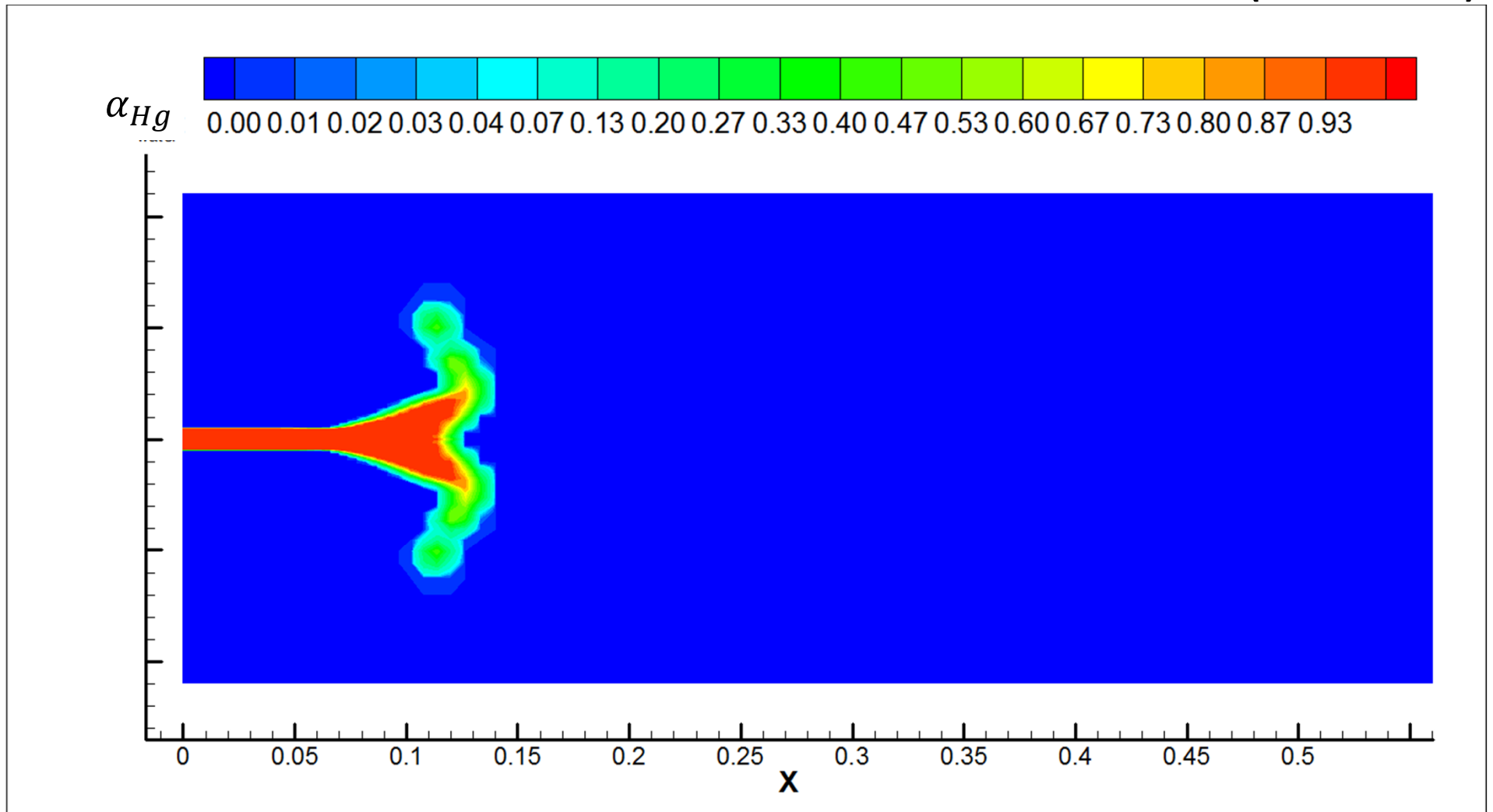
# Snap Shots (Mercury - Air)

VOF( t = 0.0161 s)



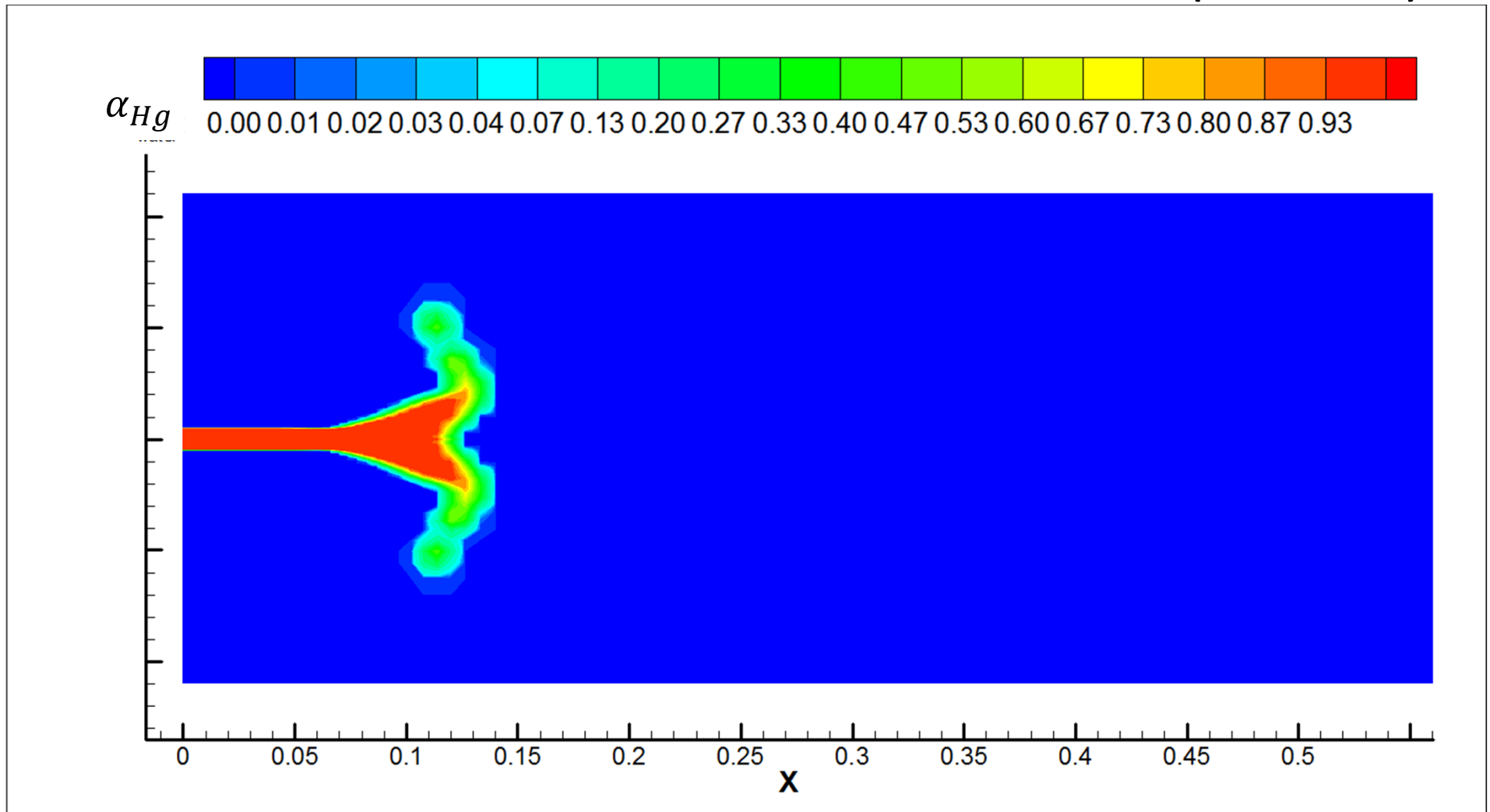
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0611 s)



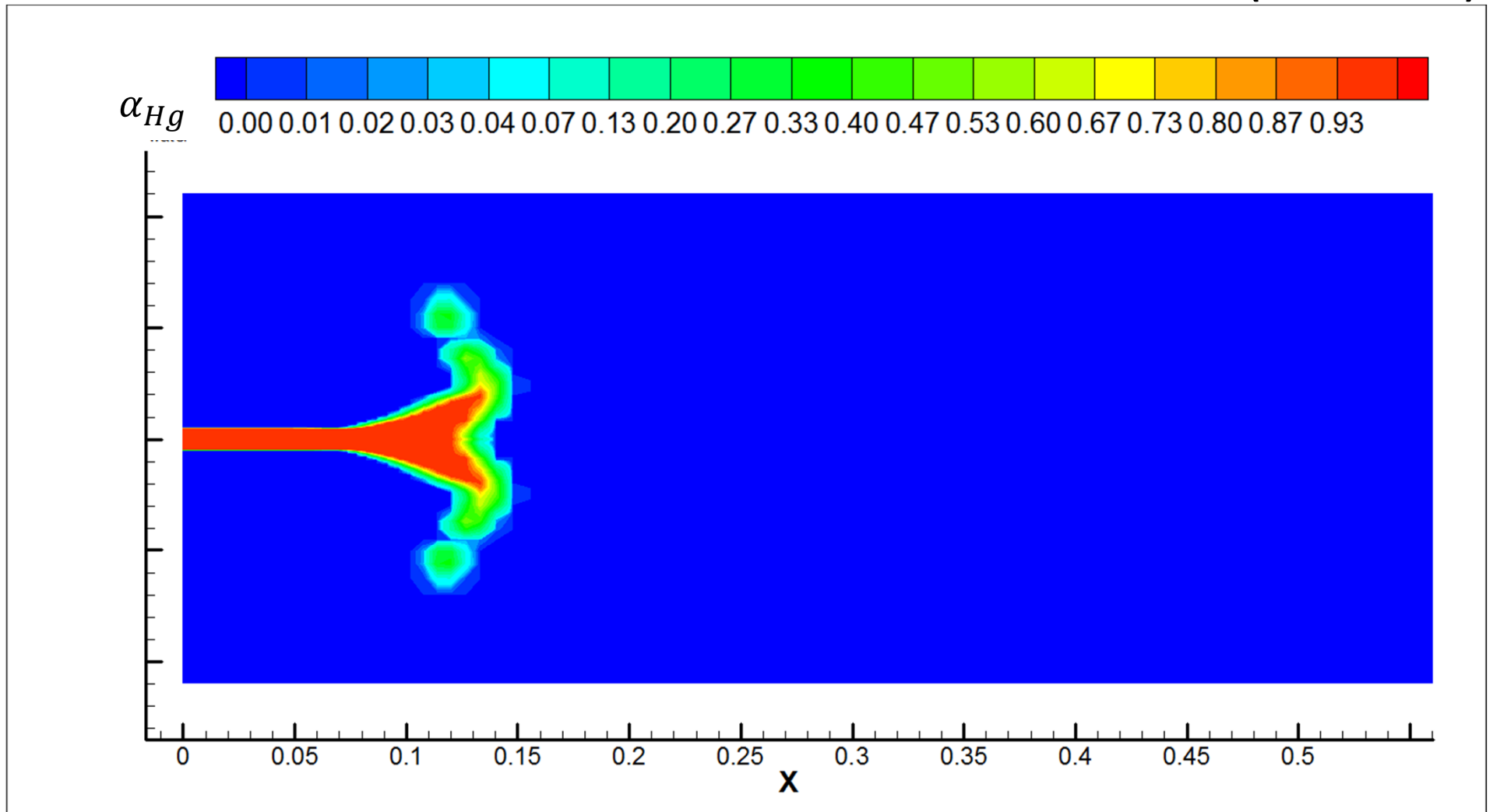
# Snap Shots (Mercury - Air)

VOF( t = 0.0611 s)



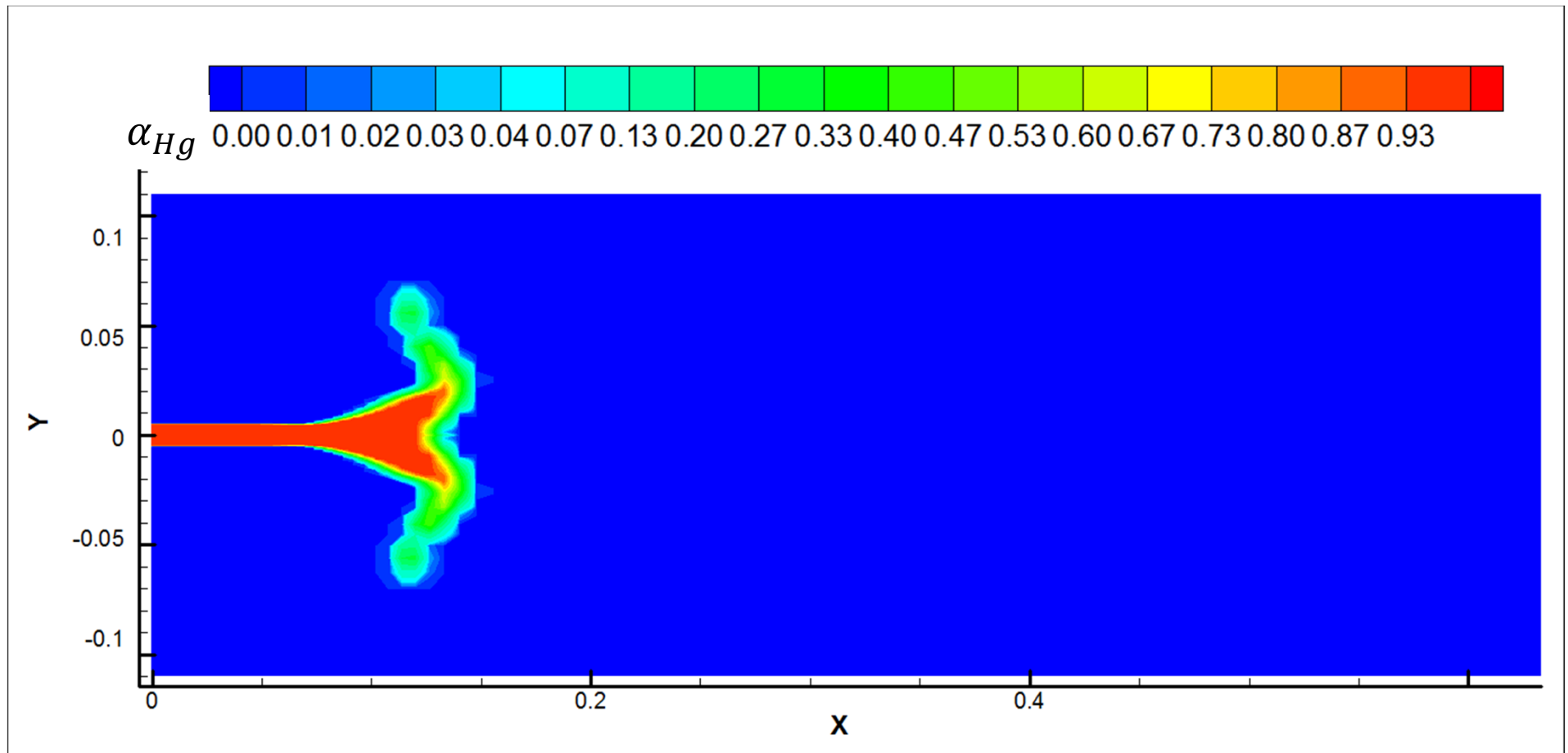
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0661 s)



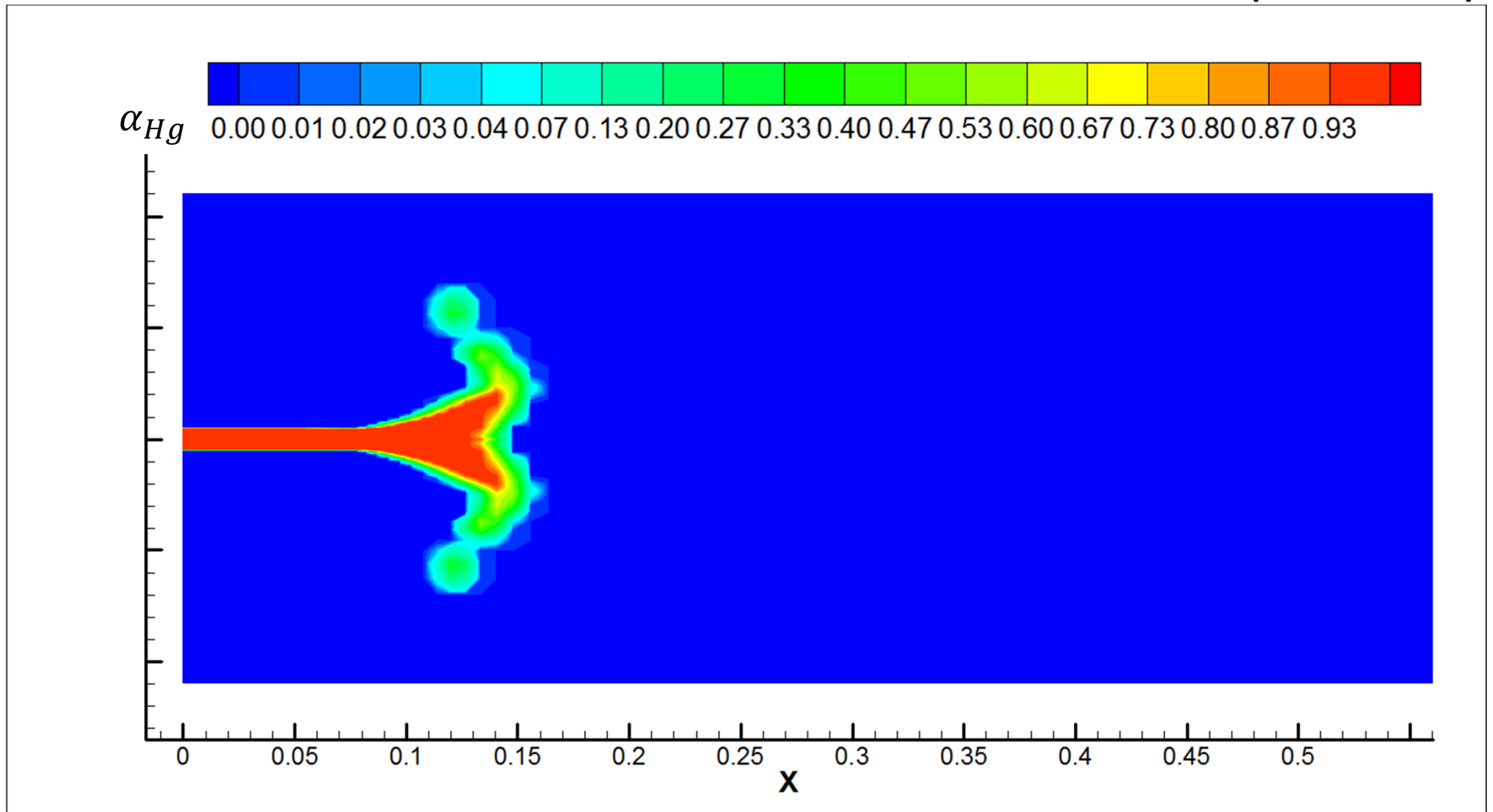
# Snap Shots (Mercury - Air)

VOF( t = 0.0661 s)



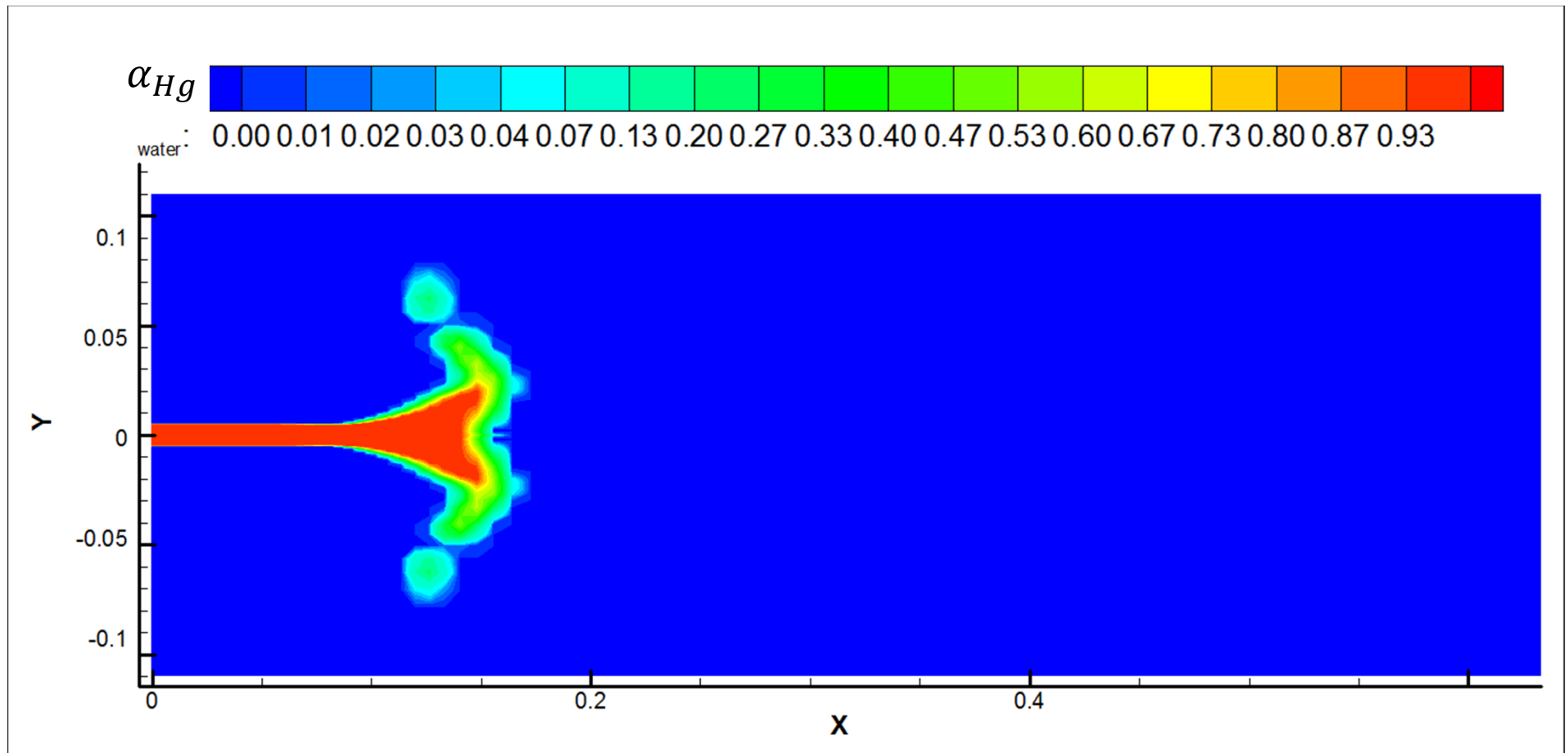
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0711 s)



# Snap Shots (Mercury - Air)

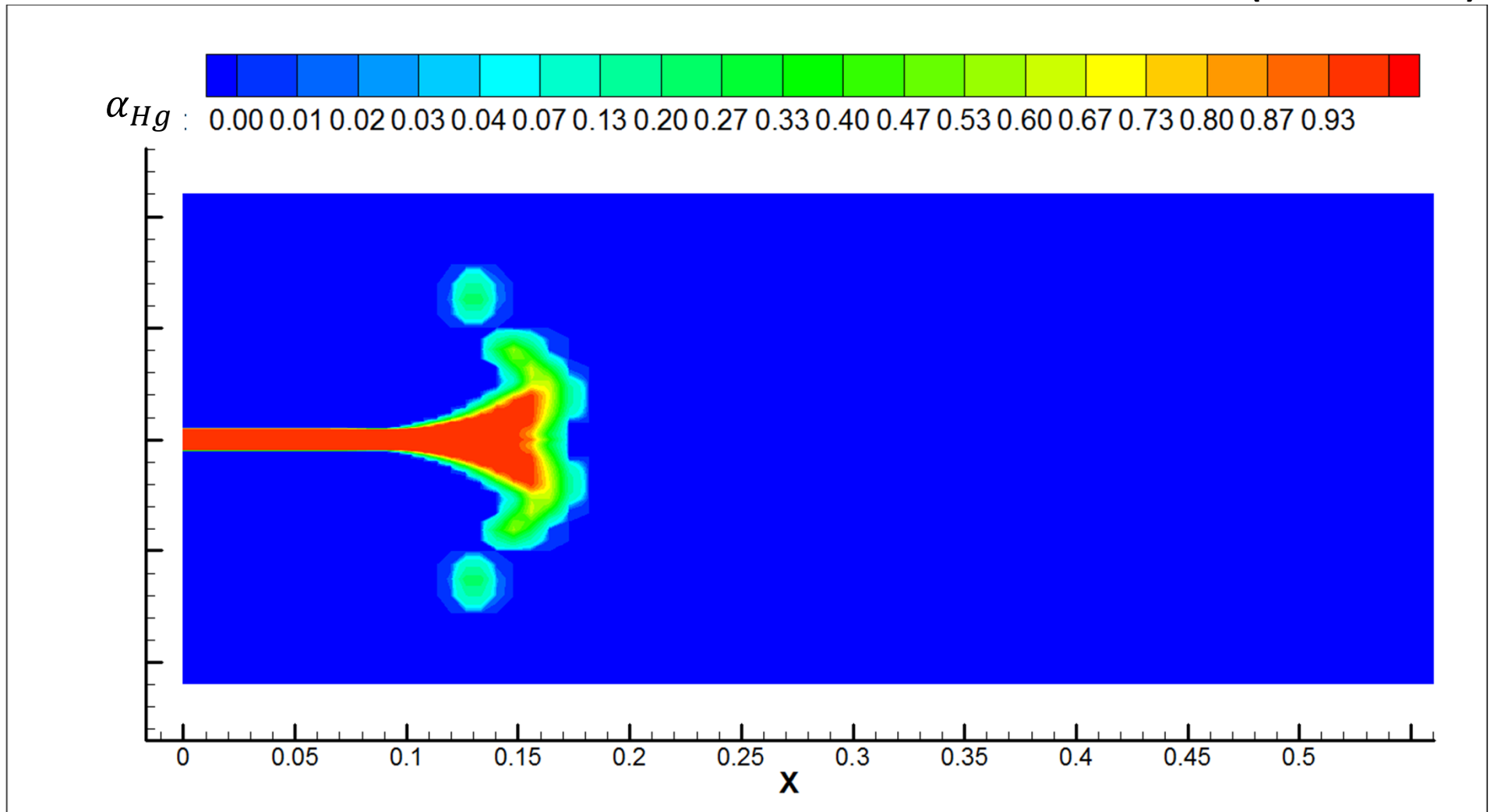
VOF( t = 0.0711 s)





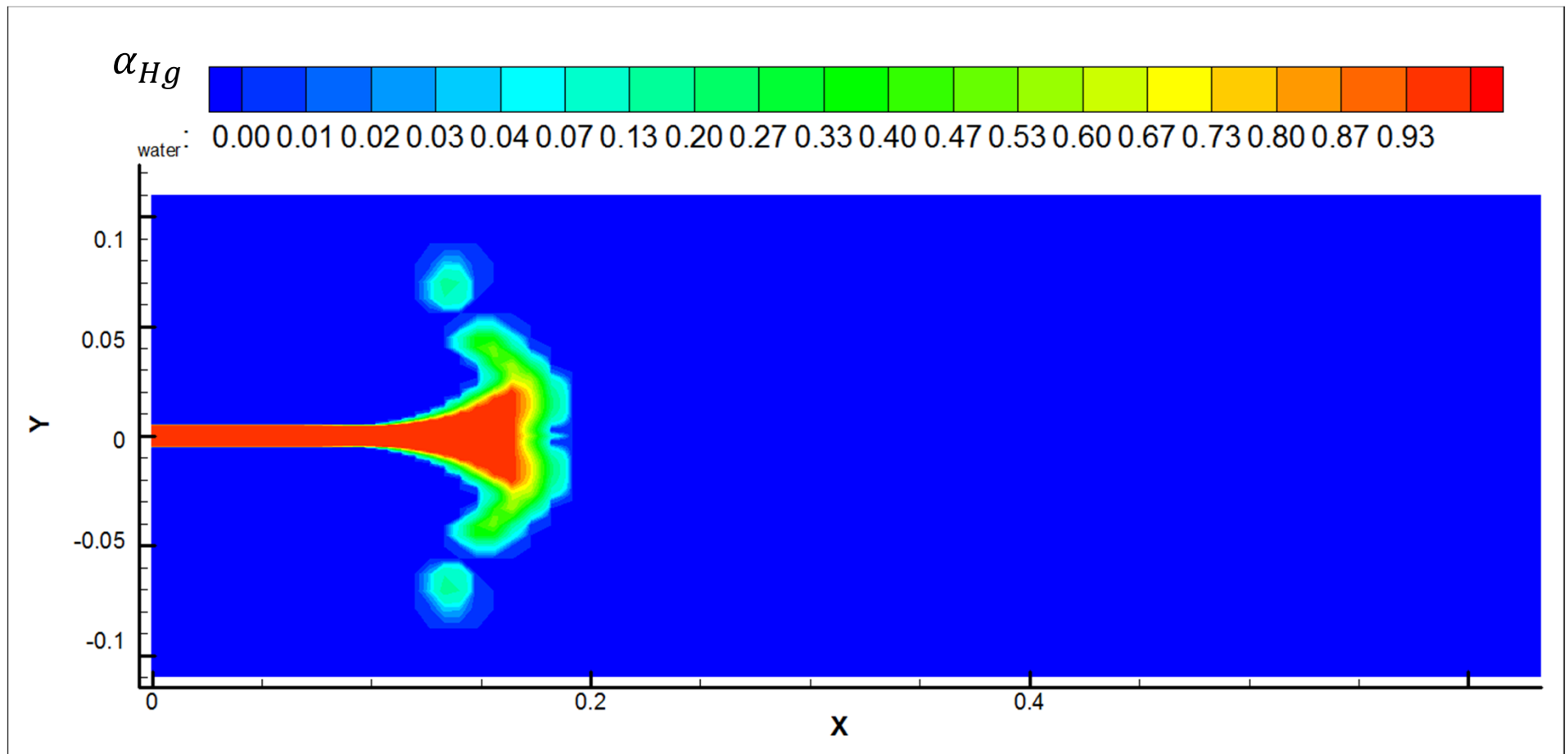
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0811 s)



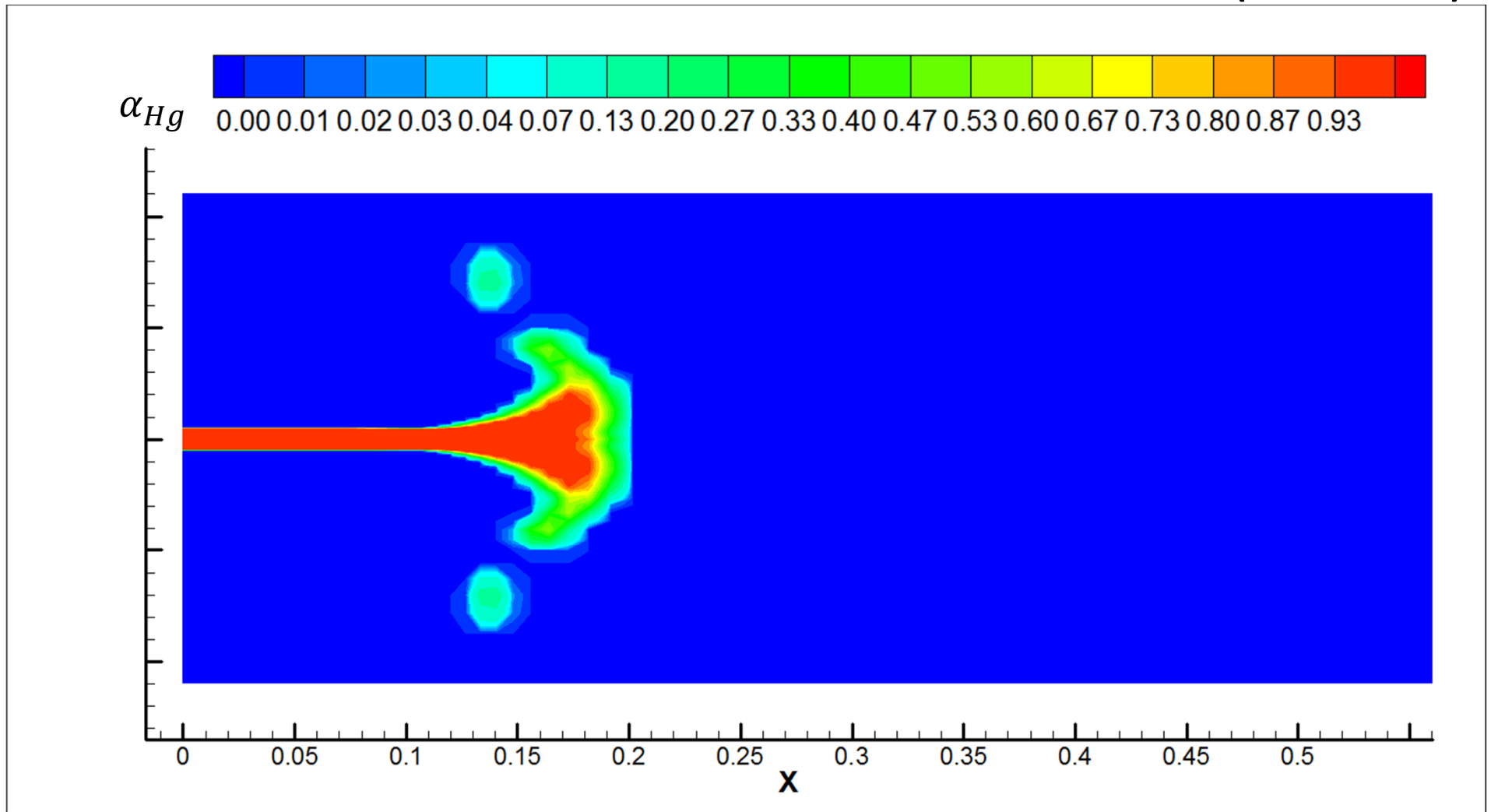
# Snap Shots (Mercury - Air)

VOF( t = 0.0811 s)



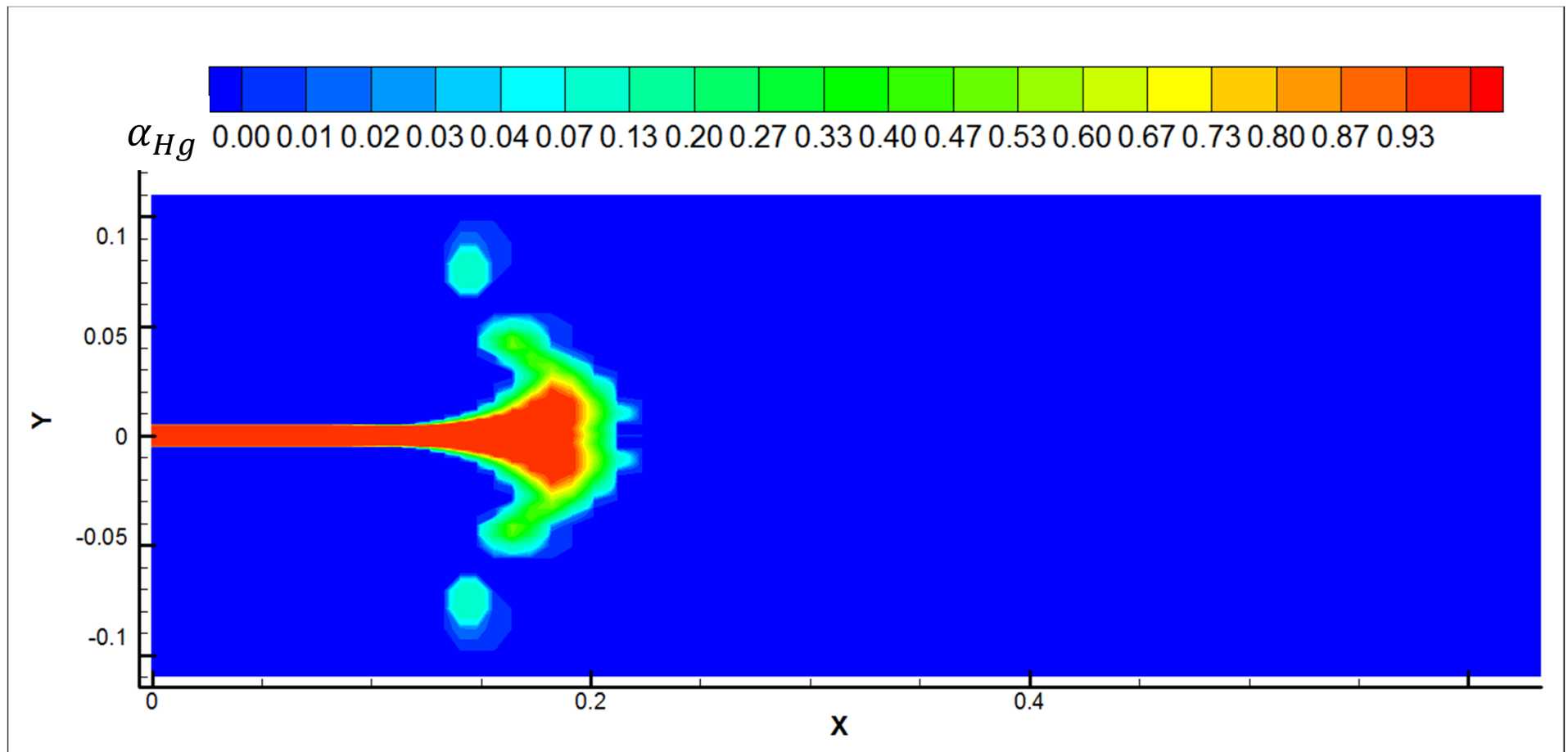
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0911 s)



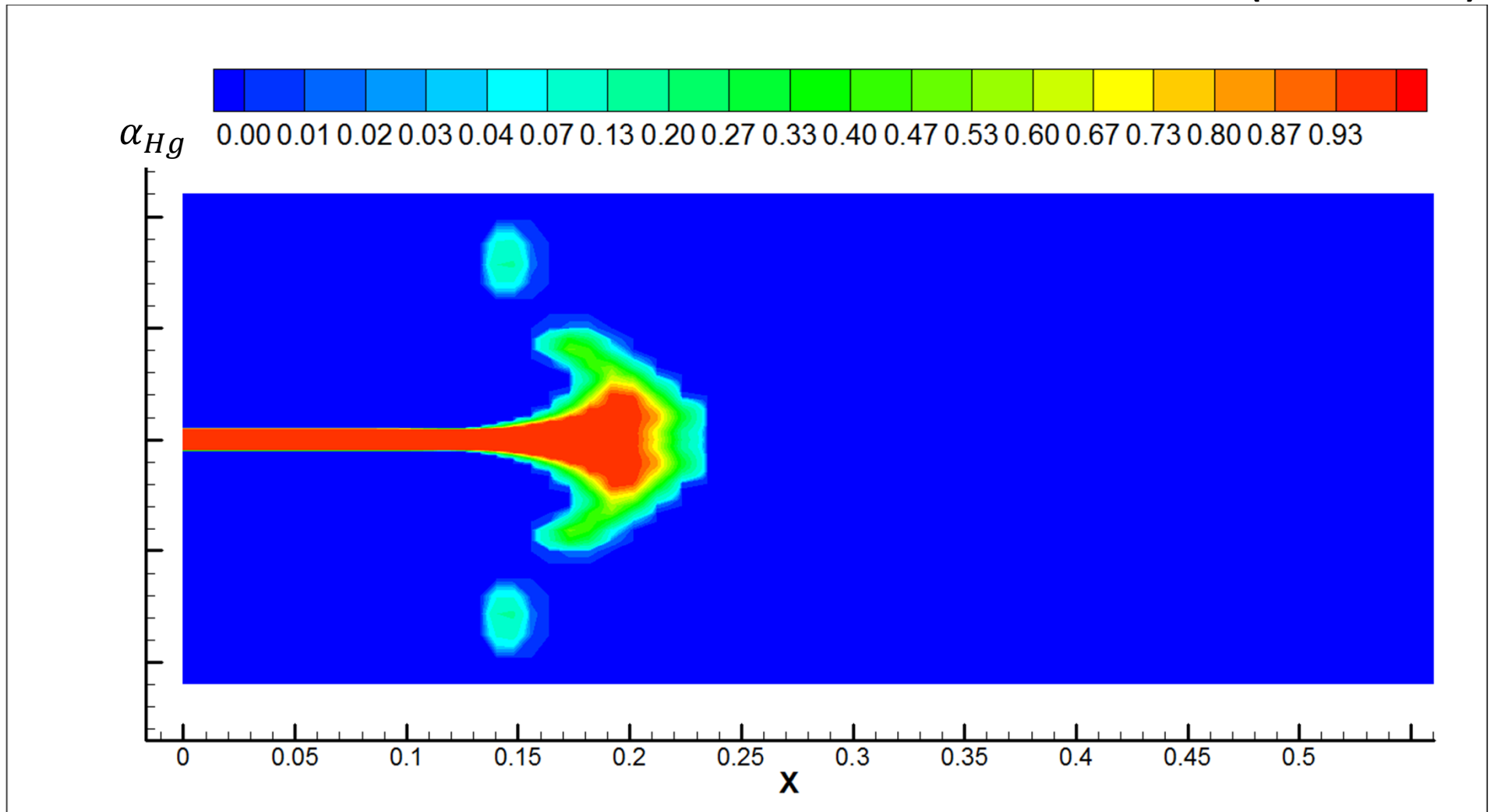
# Snap Shots (Mercury - Air)

VOF( t = 0.0911 s)



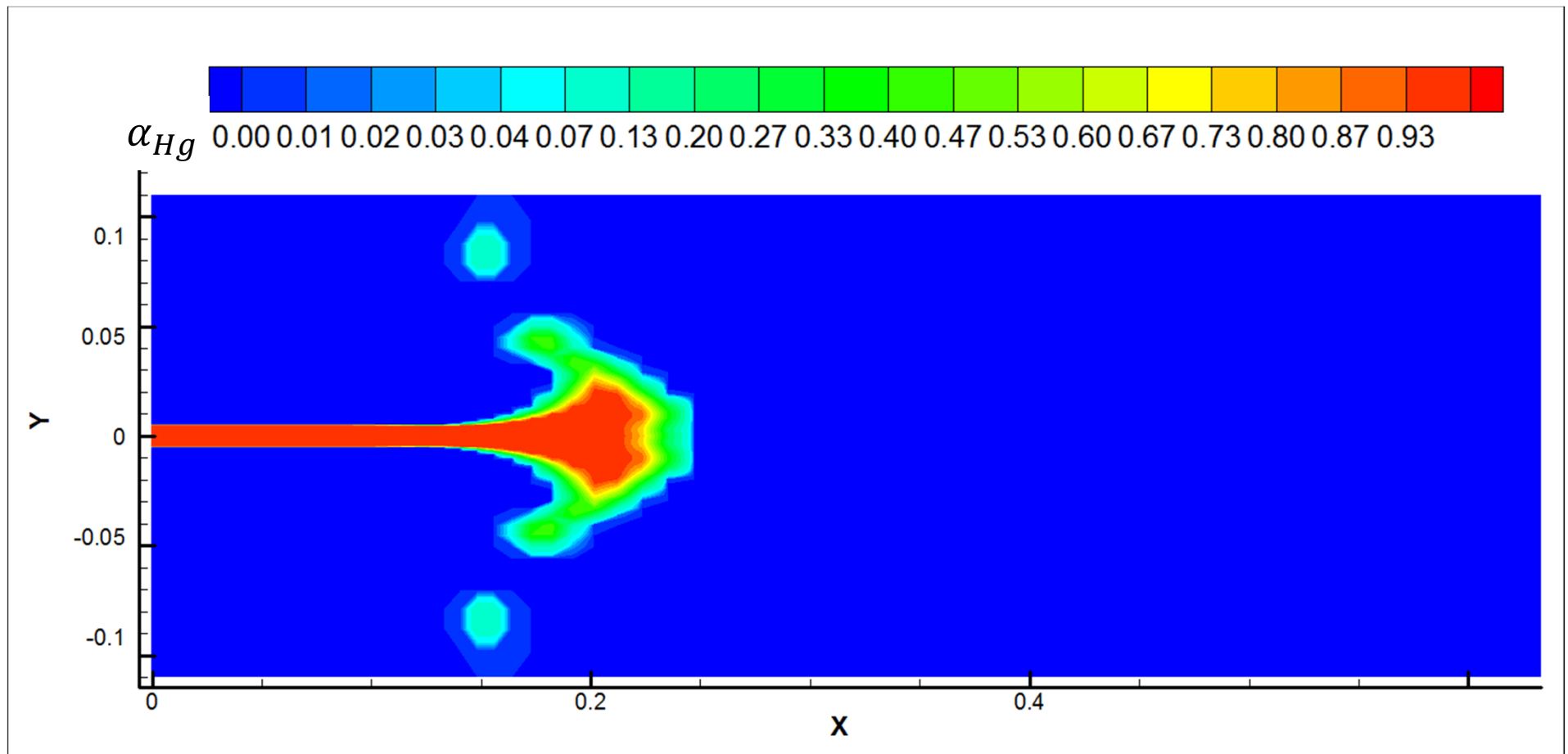
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.0101 s)



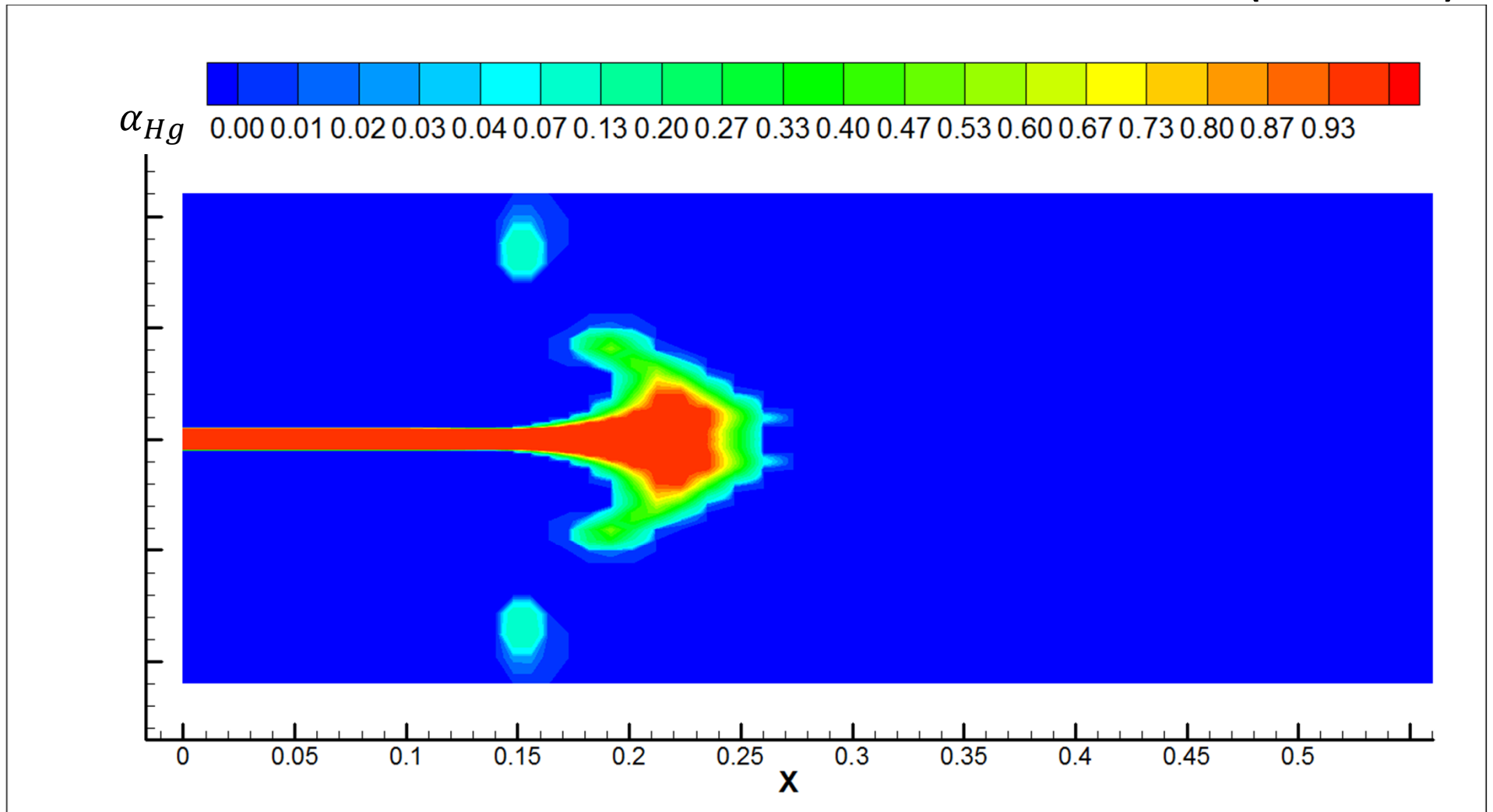
# Snap Shots (Mercury - Air)

VOF( t = 0.0101 s)



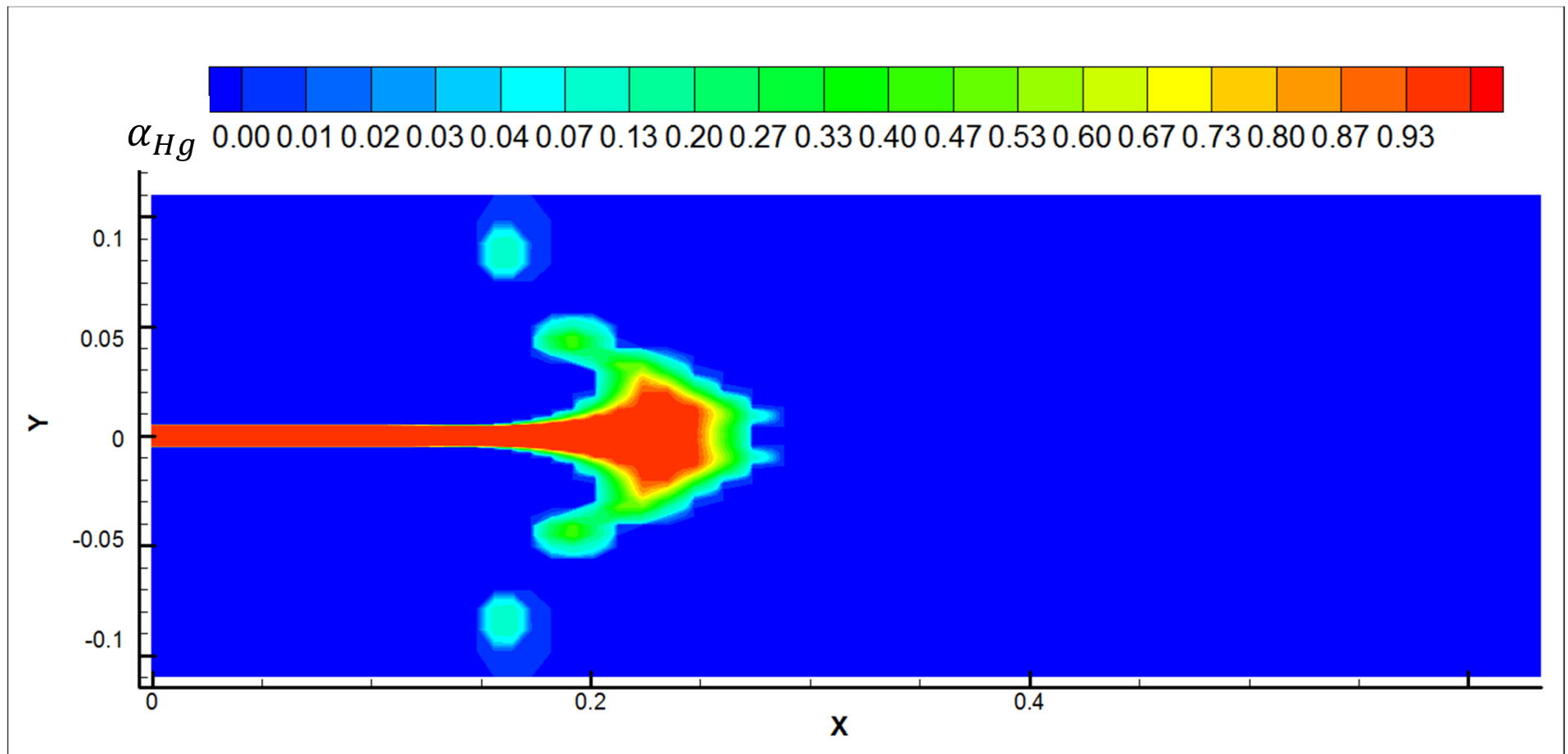
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.111 s)



# Snap Shots (Mercury - Air)

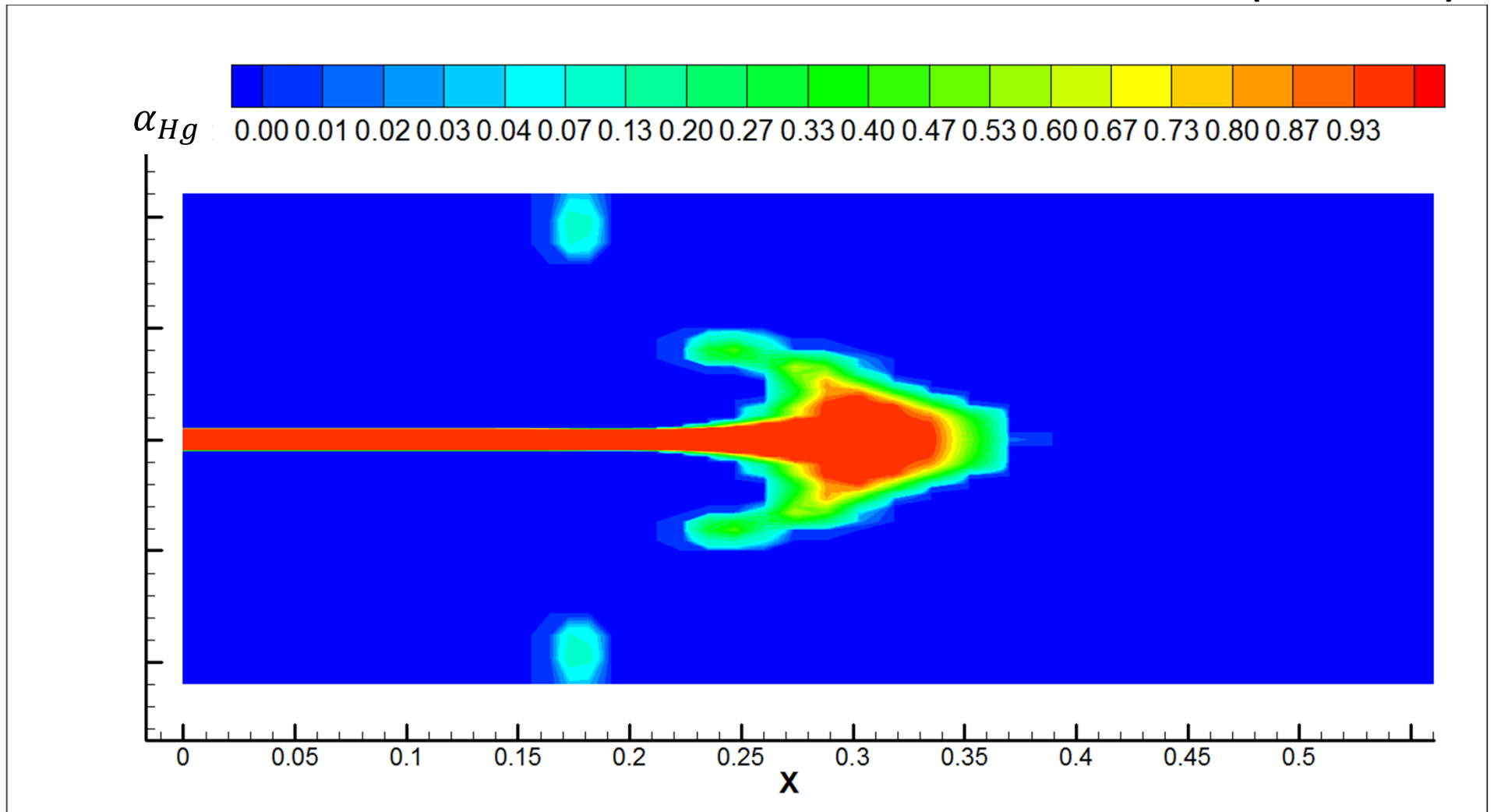
VOF( t = 0.111 s)





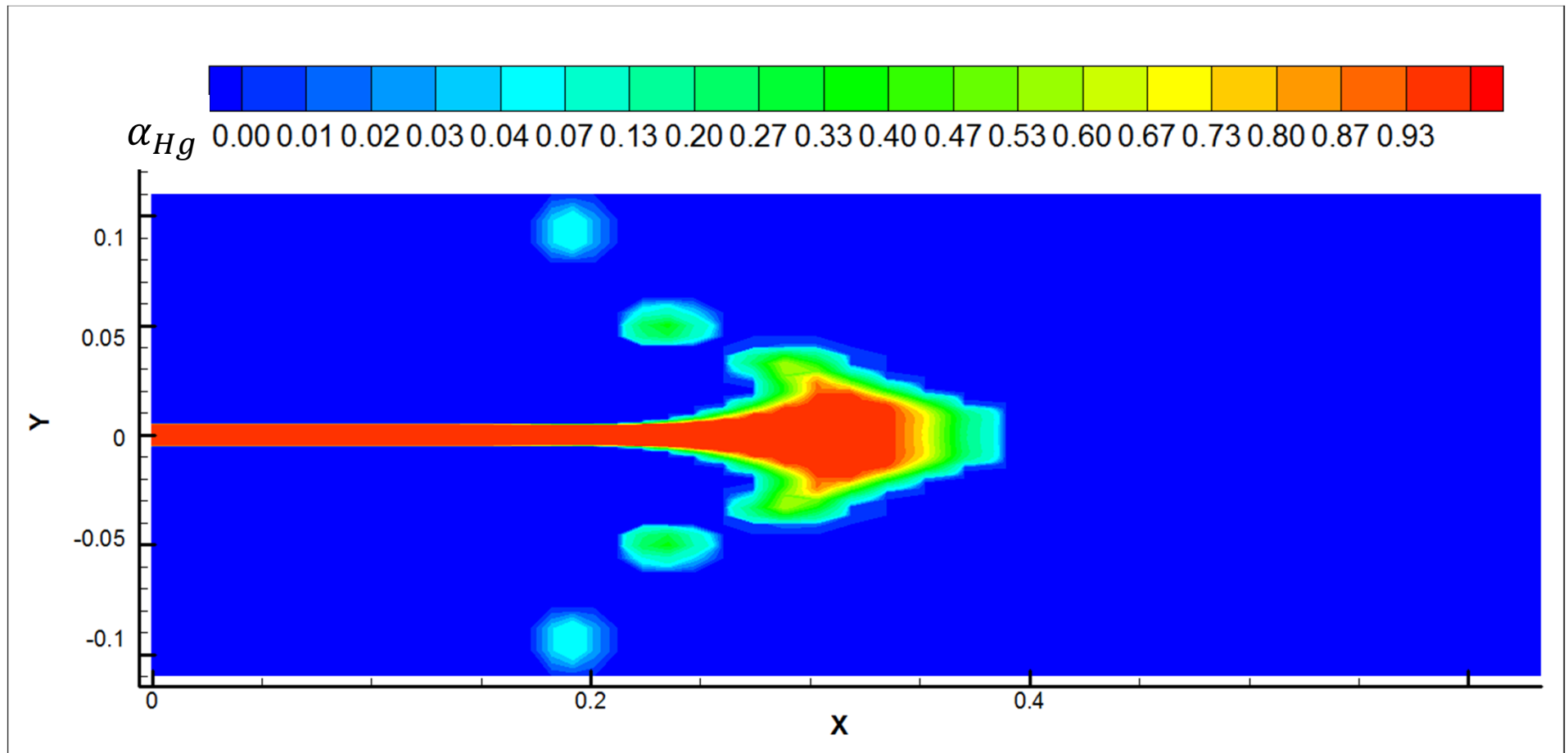
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.141 s)



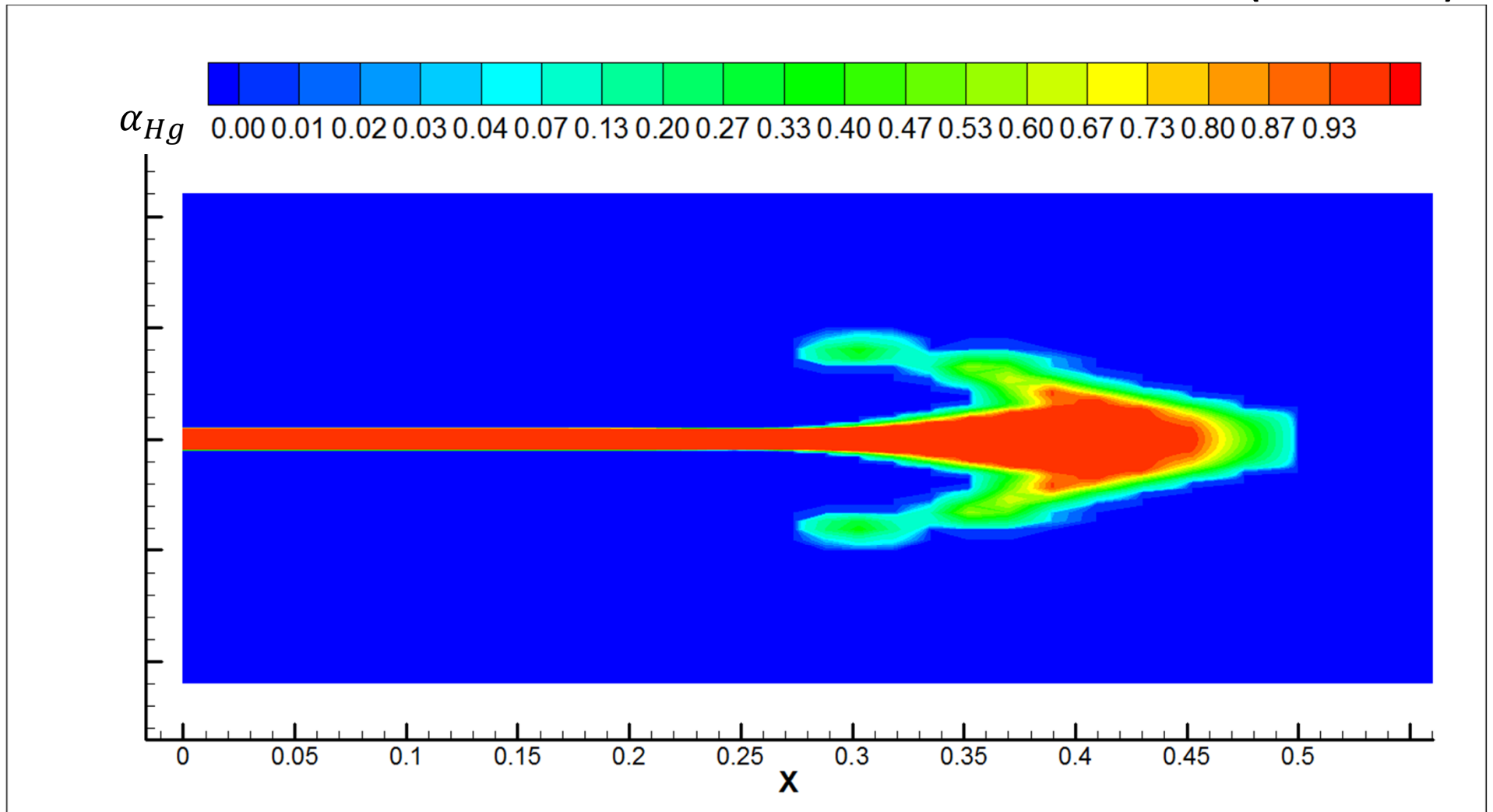
# Snap Shots (Mercury - Air)

VOF( t = 0.141 s)



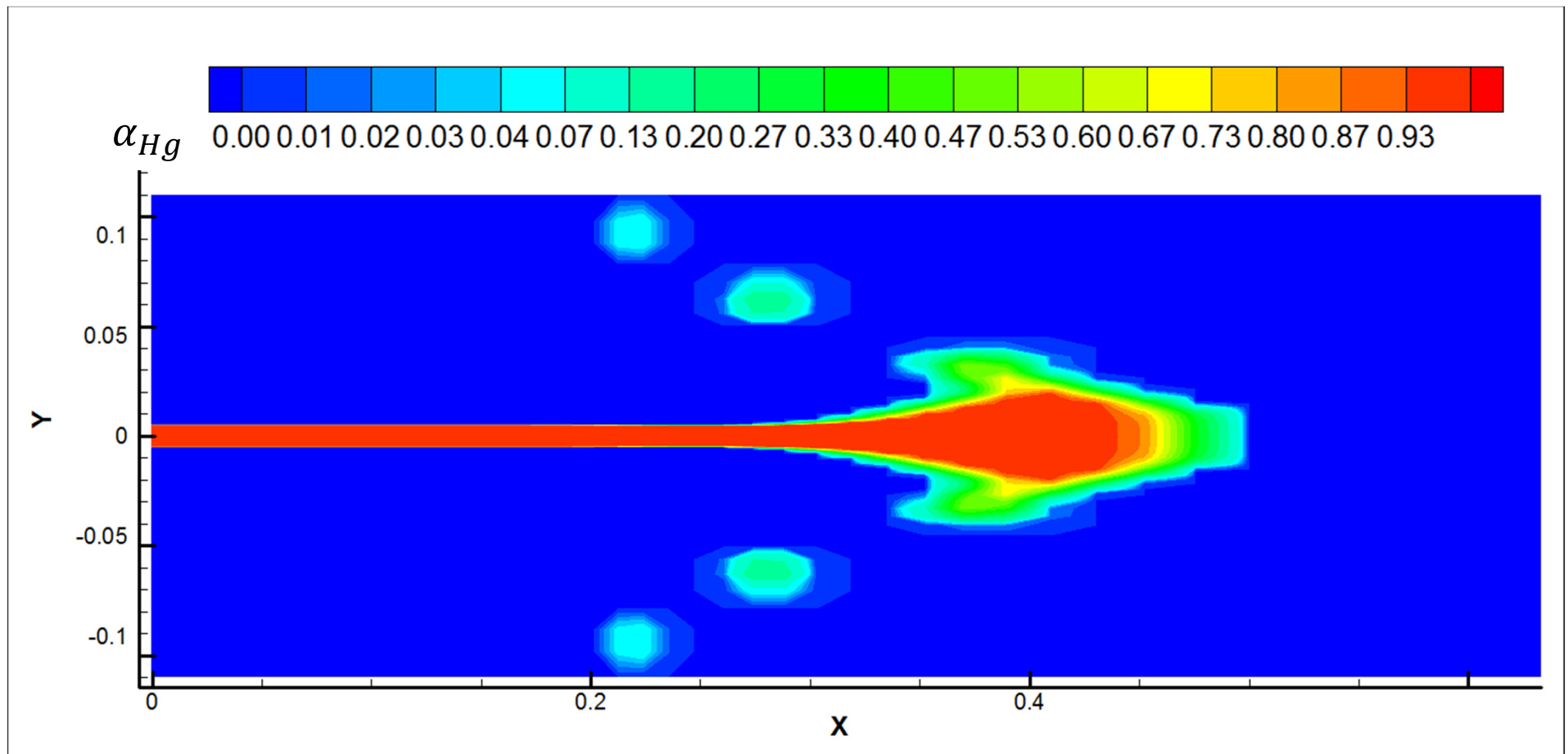
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.171 s)



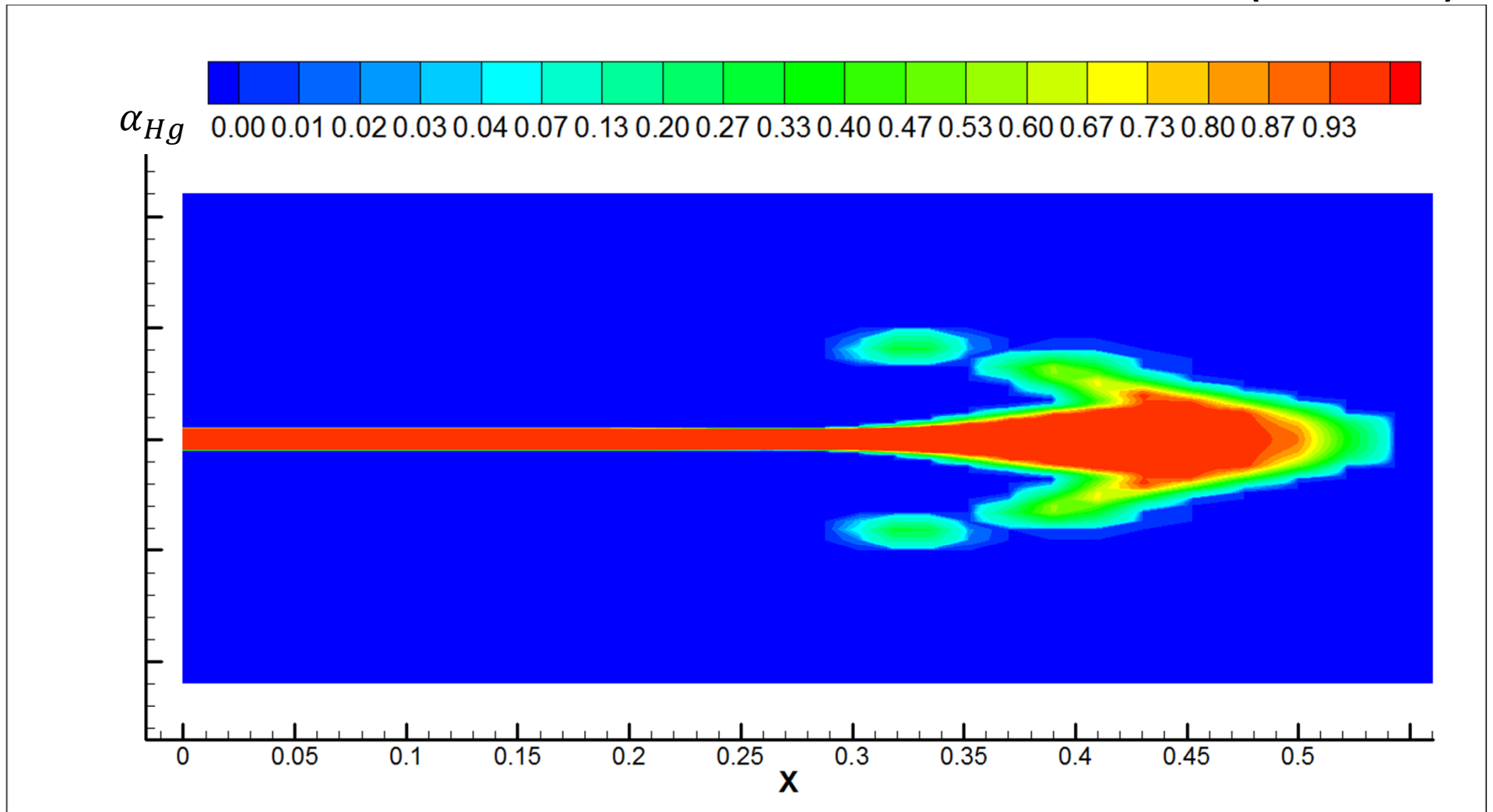
# Snap Shots (Mercury - Air)

VOF( t = 0.171 s)



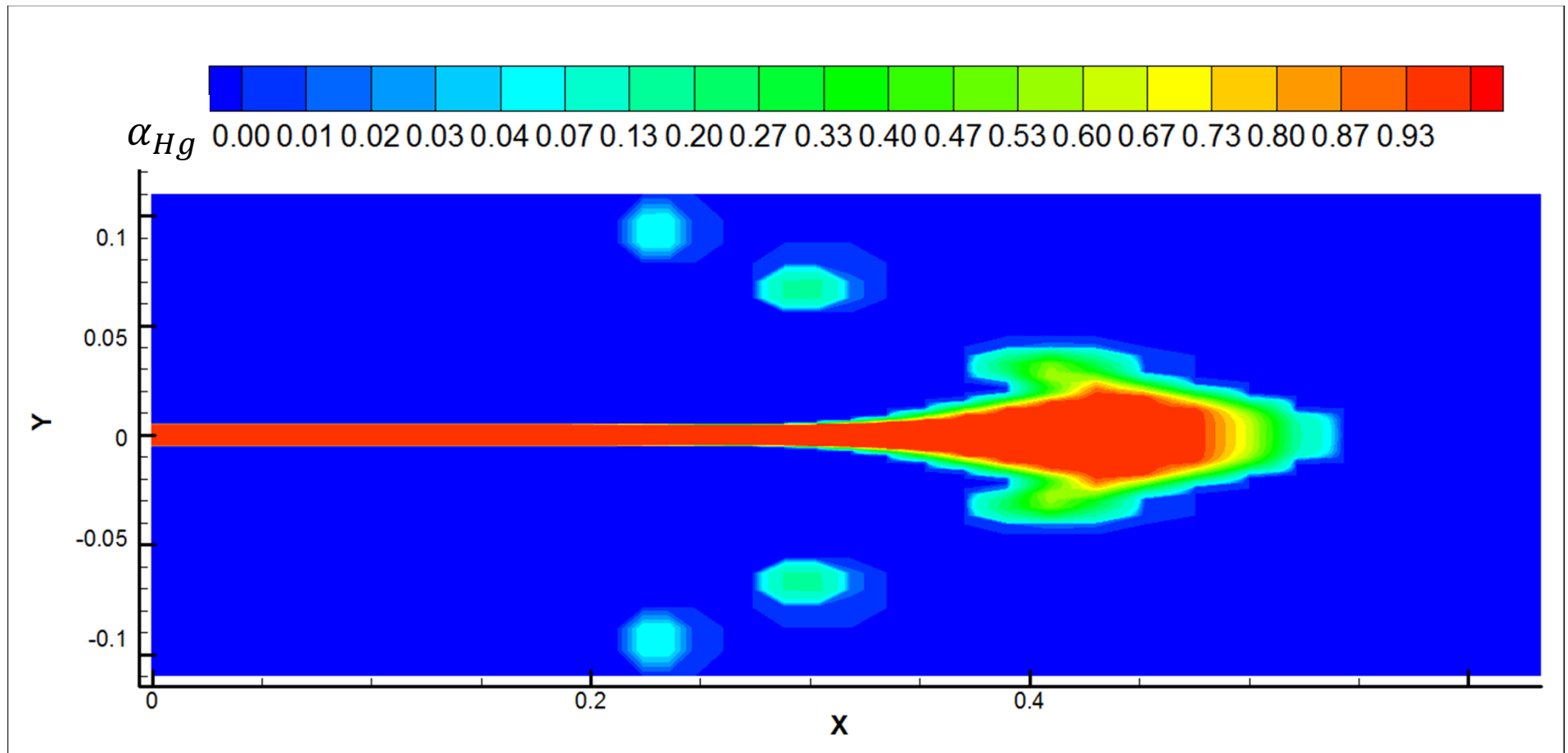
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.181 s)



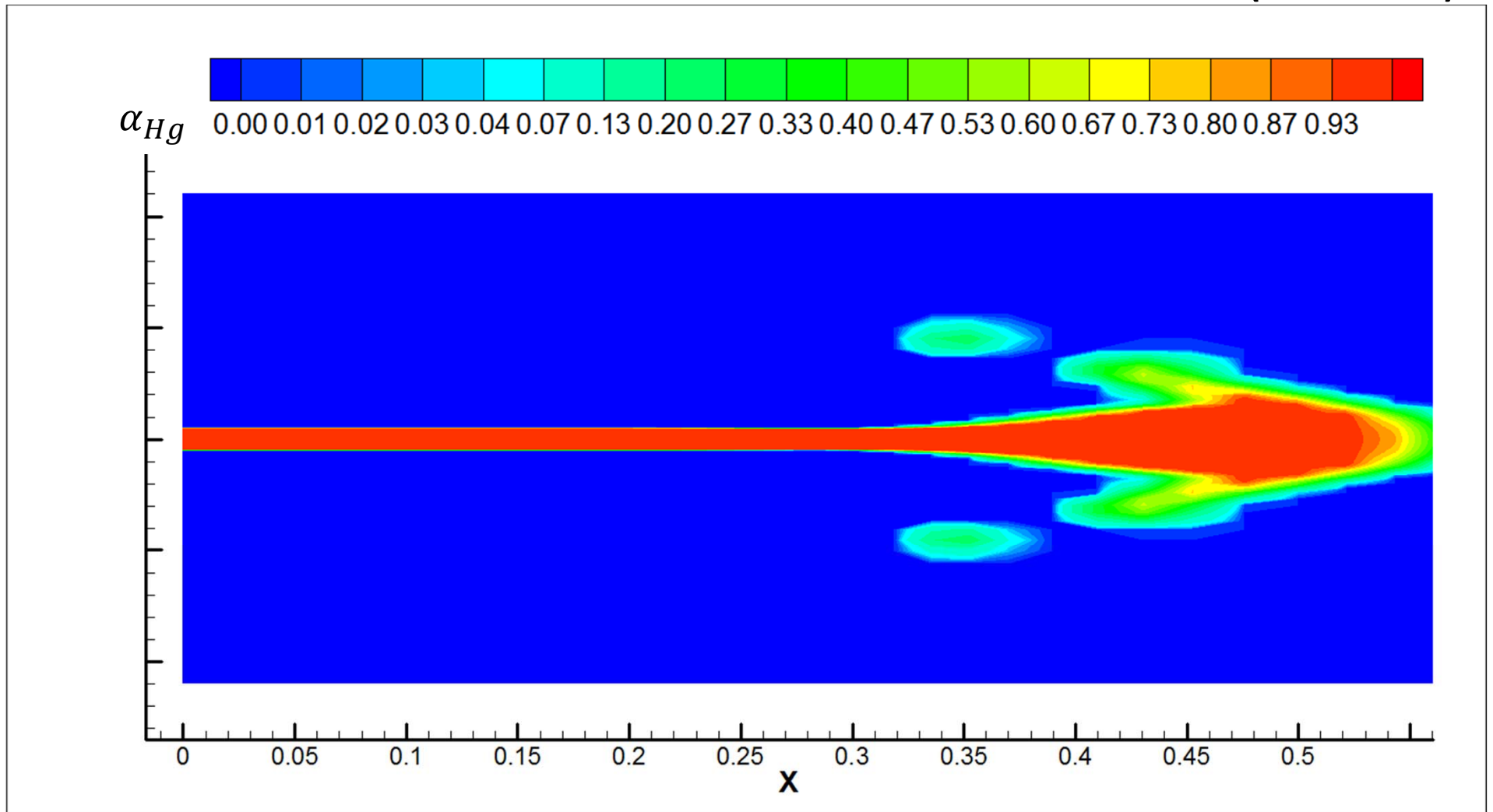
# Snap Shots (Mercury - Air)

VOF( t = 0.181 s)



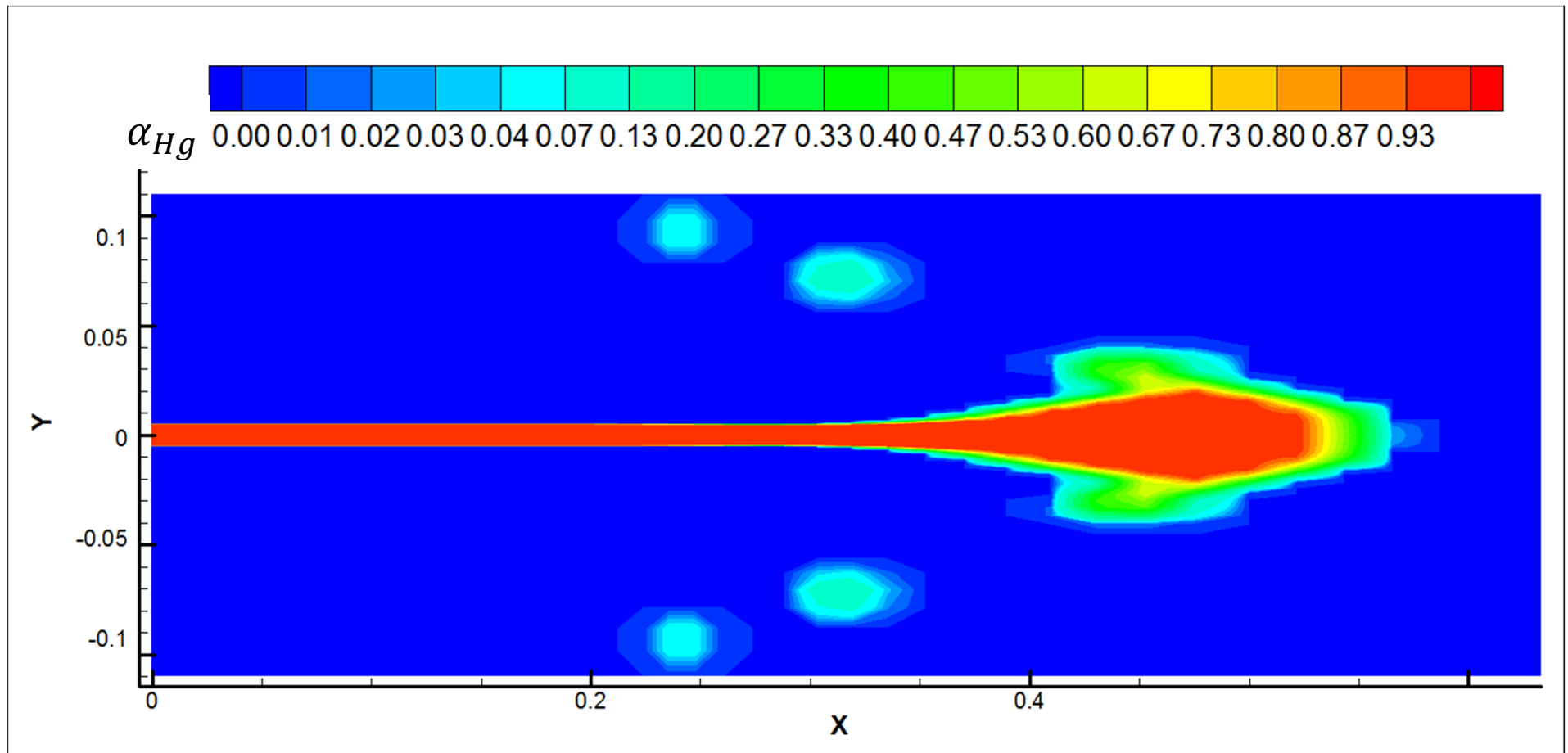
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.191 s)



# Snap Shots (Mercury - Air)

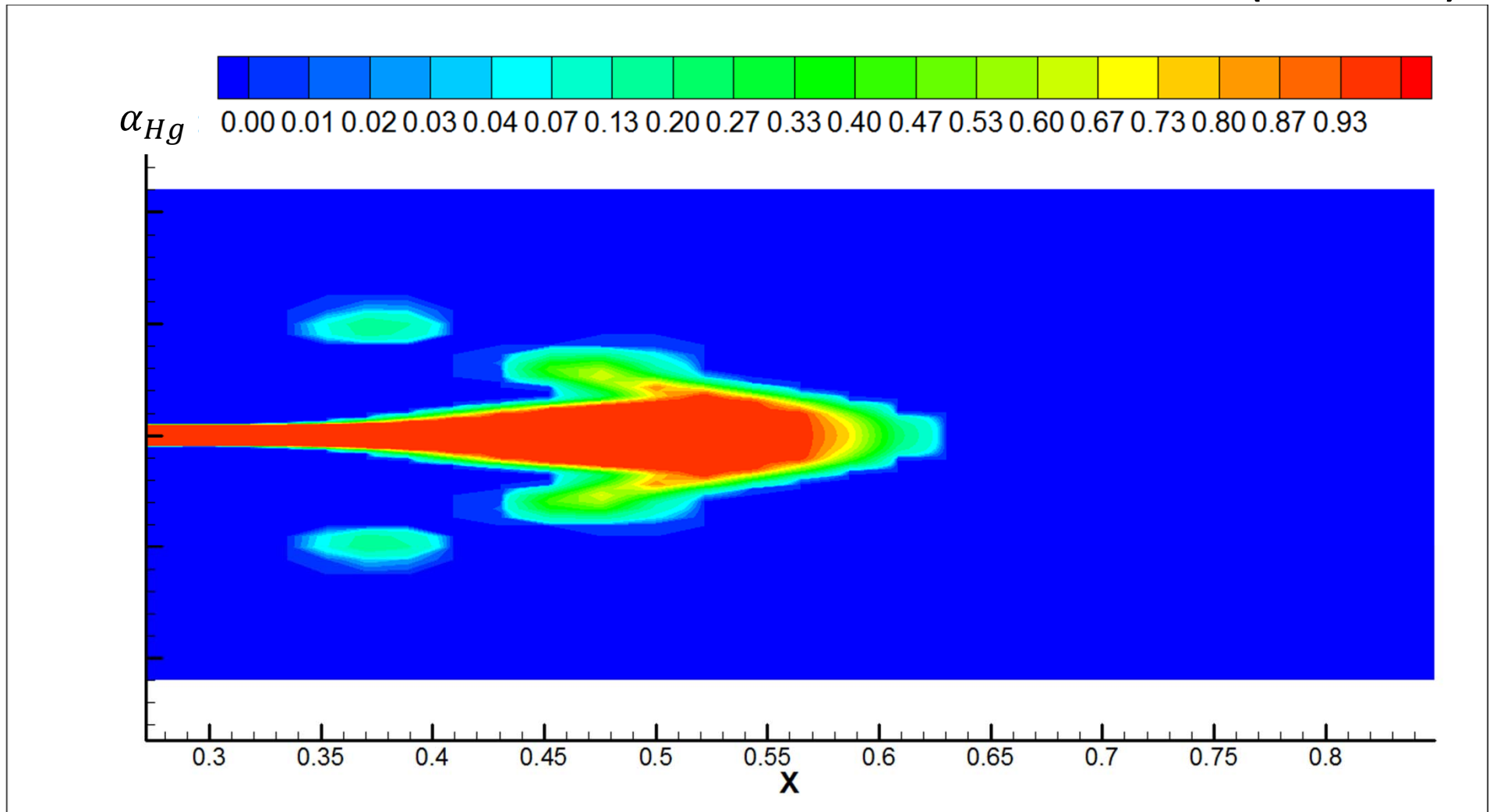
VOF( t = 0.191 s)





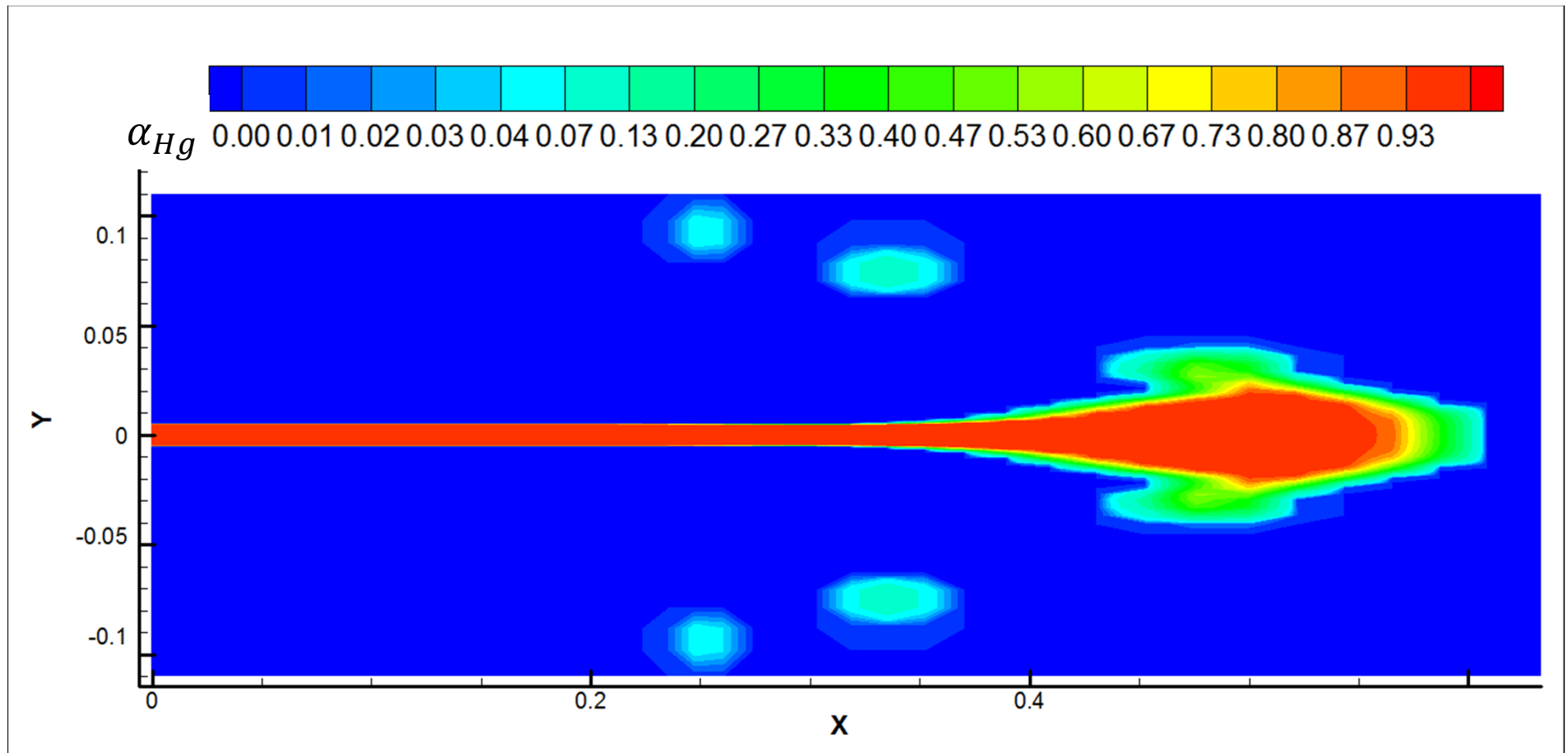
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.201 s)



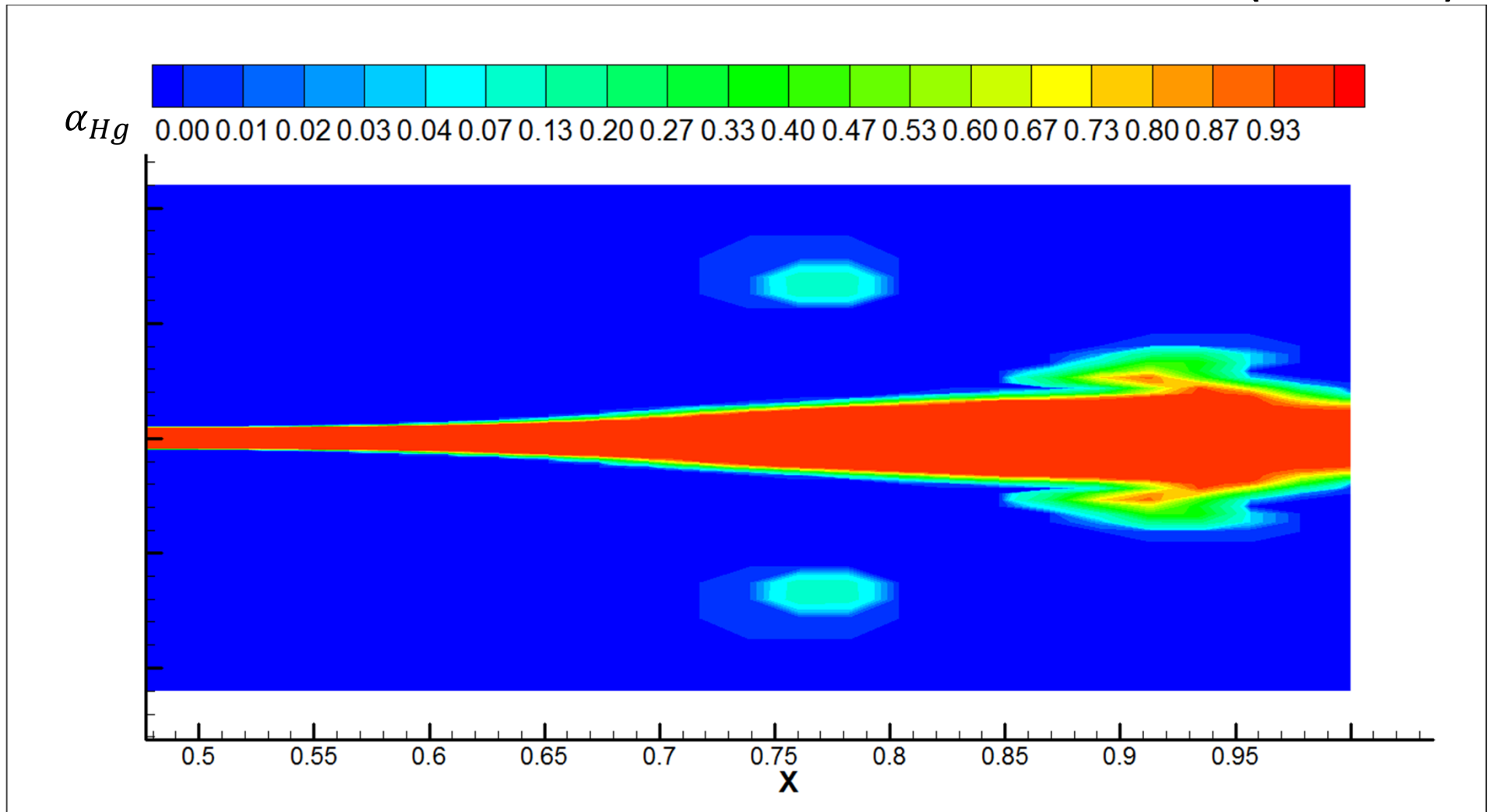
# Snap Shots (Mercury - Air)

VOF( t = 0.201 s)



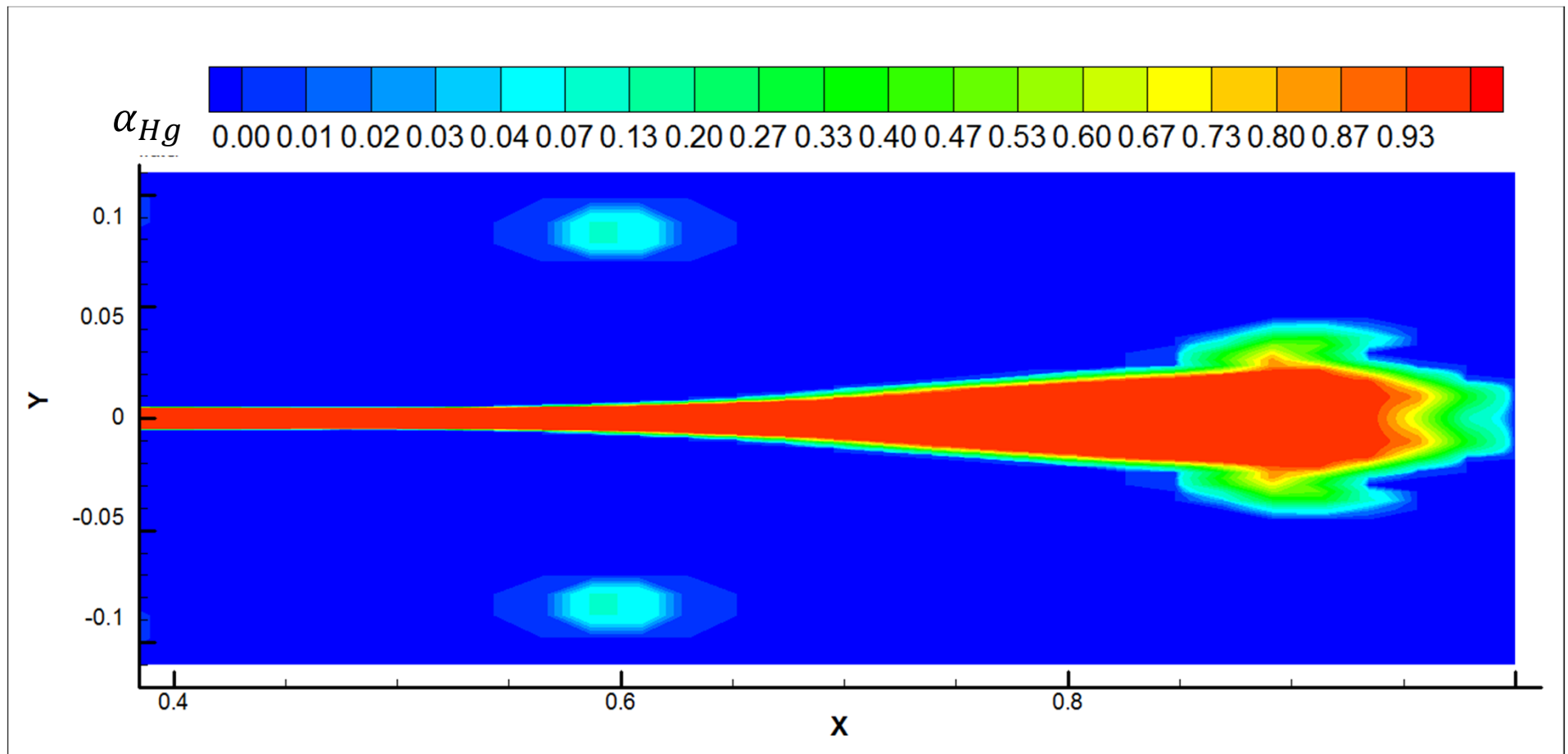
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.311 s)



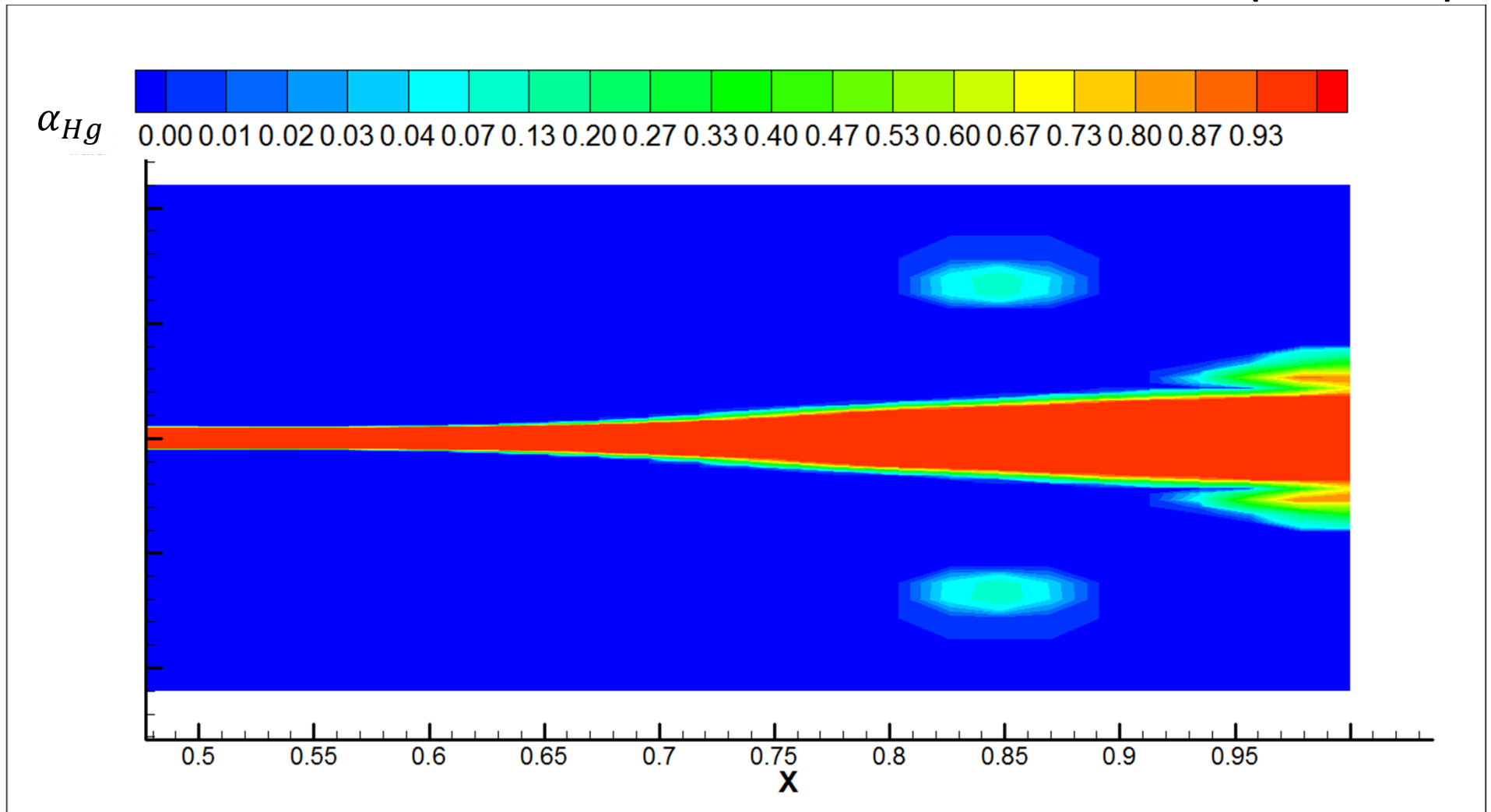
# Snap Shots (Mercury - Air)

VOF( t = 0.311 s)



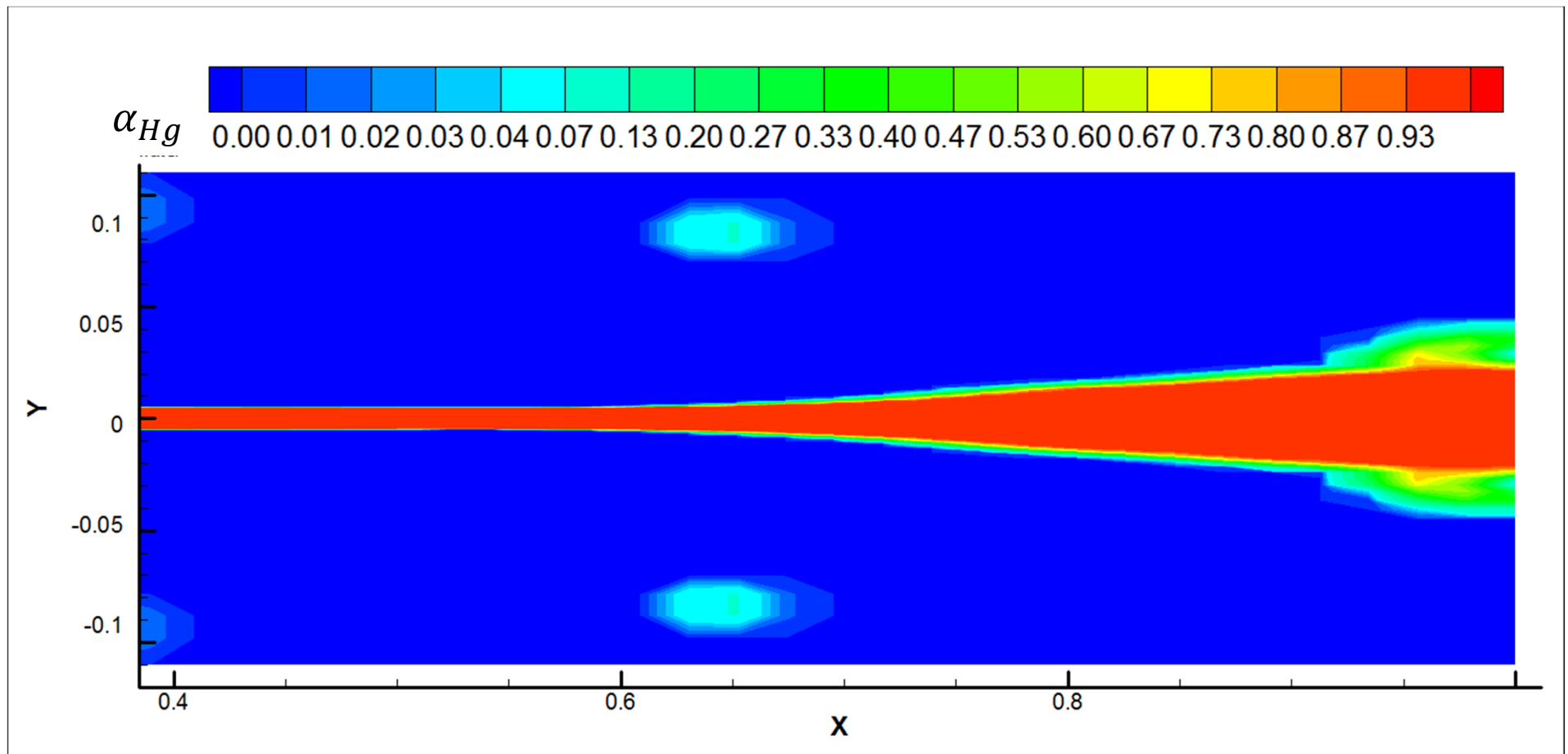
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.331 s)



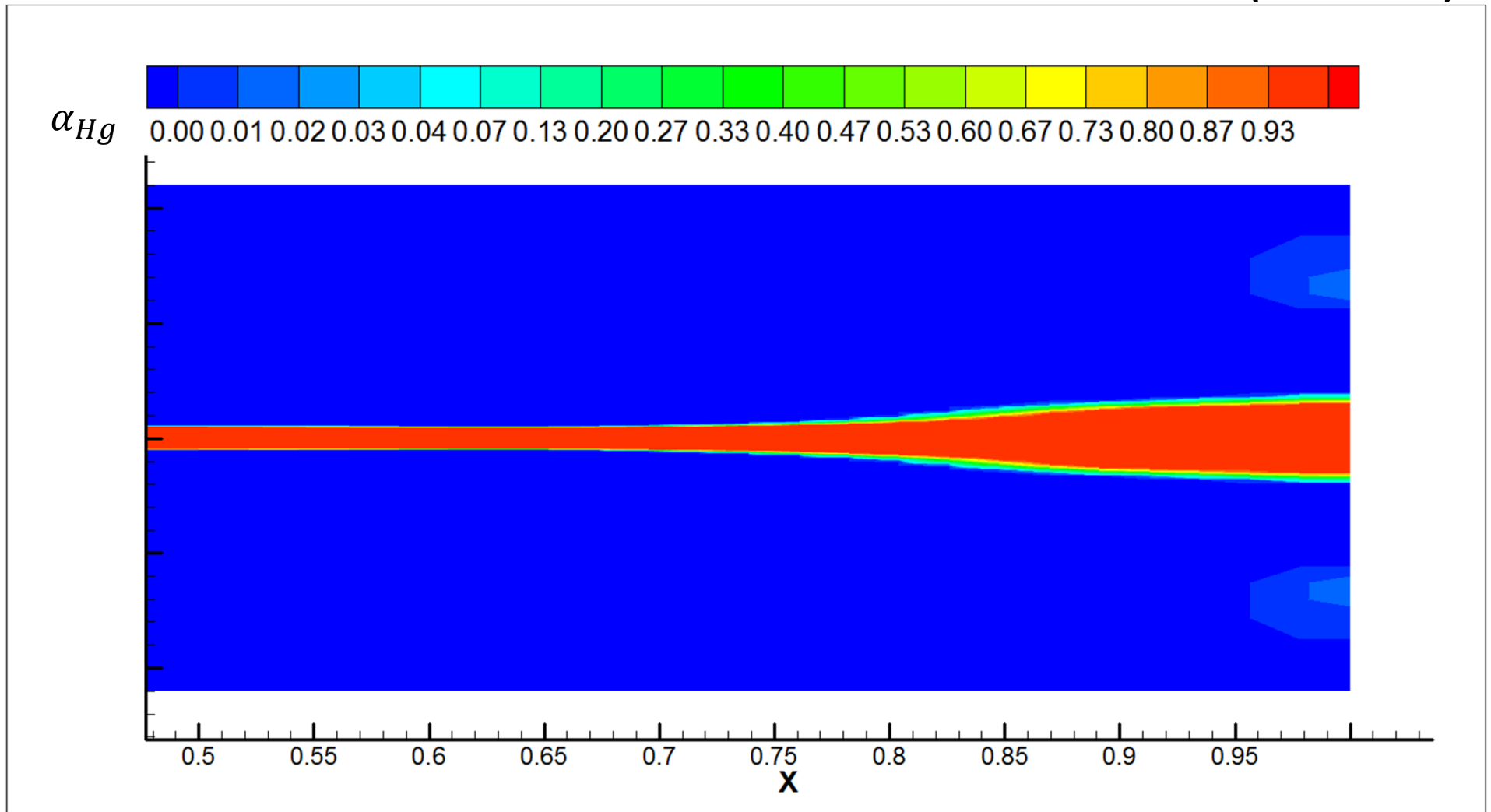
# Snap Shots (Mercury - Air)

VOF( t = 0.331 s)



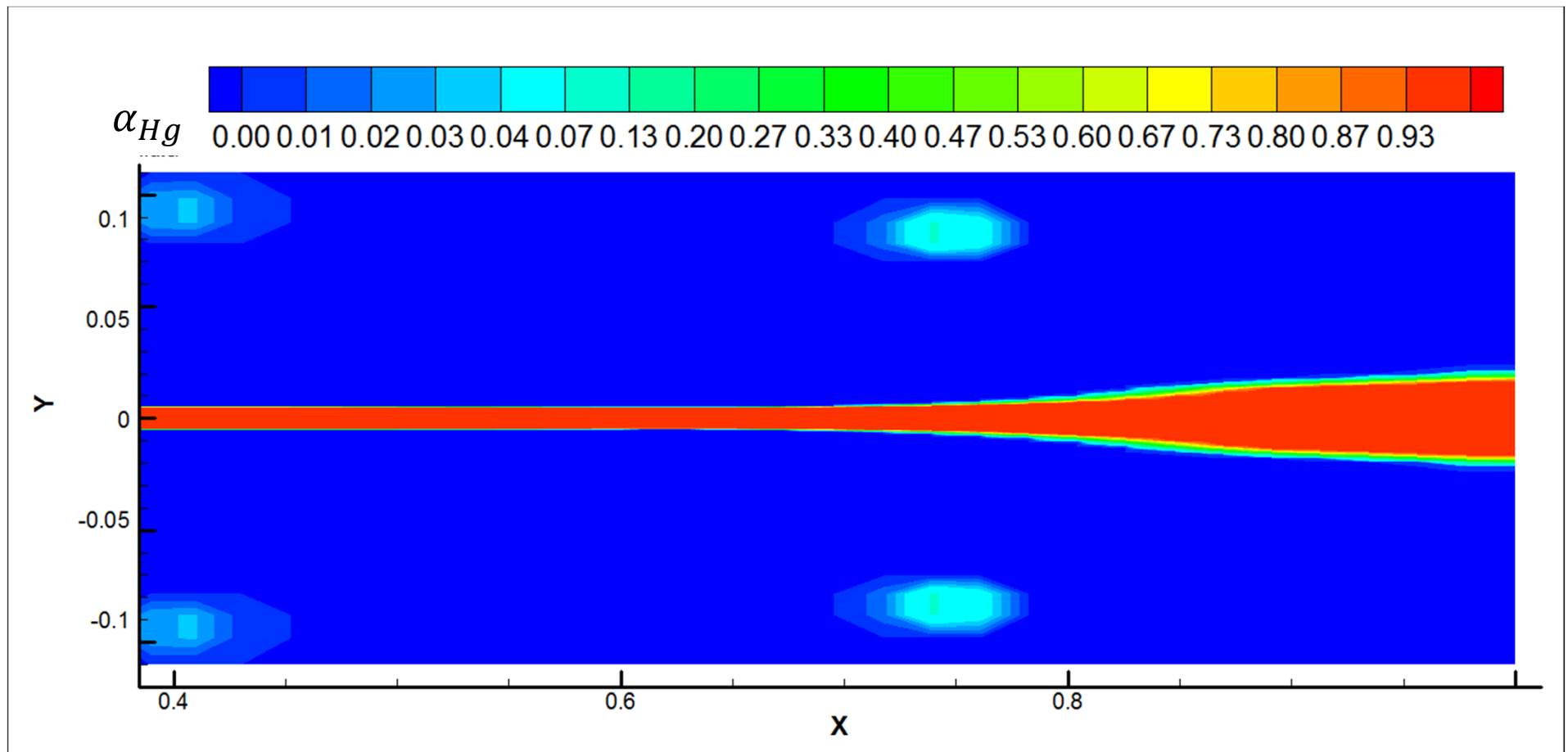
# Snap Shots (Mercury - Air)

CLSVOF( t = 0.371 s)



# Snap Shots (Mercury - Air)

VOF( t = 0.371 s)



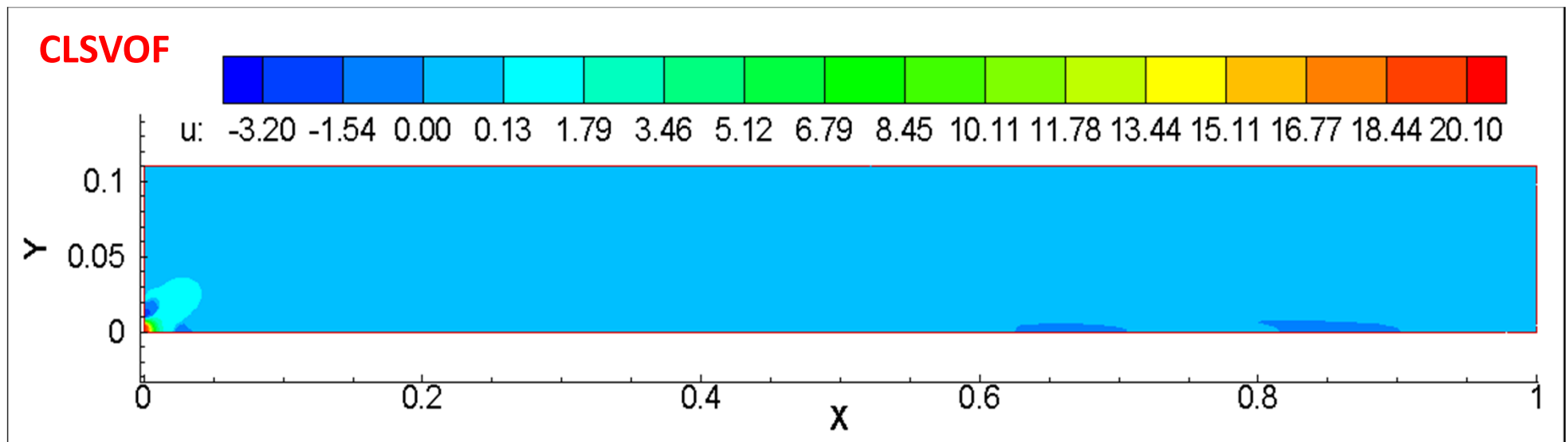
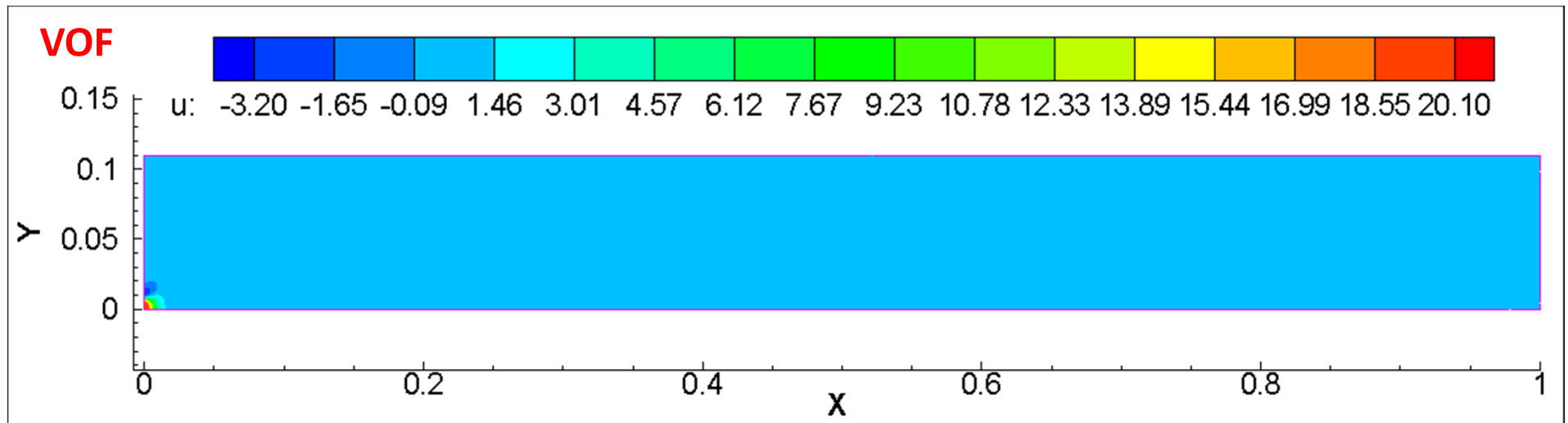


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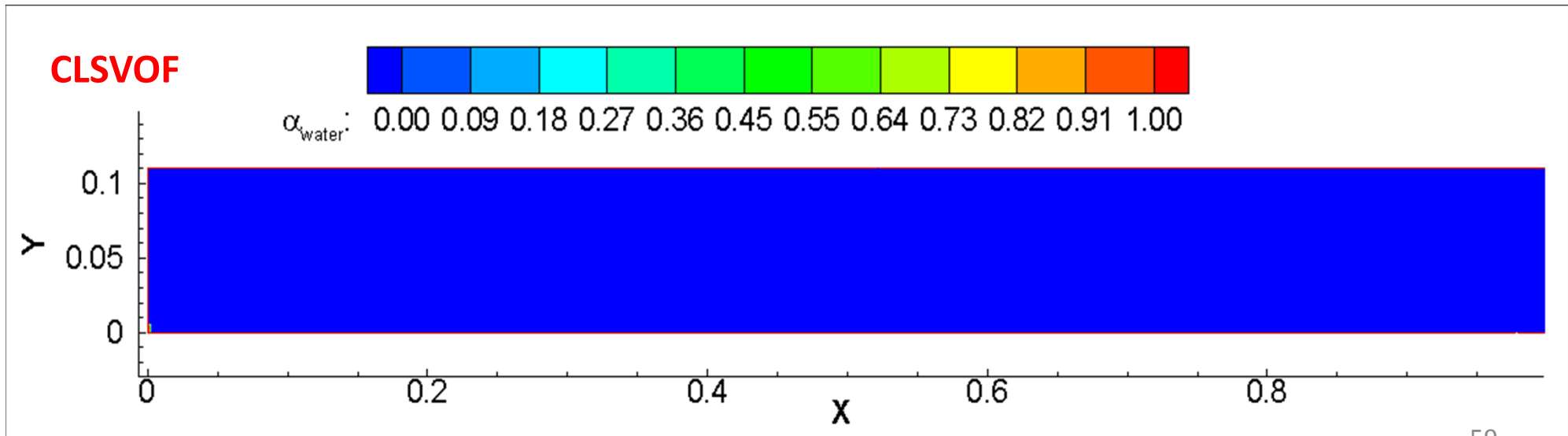
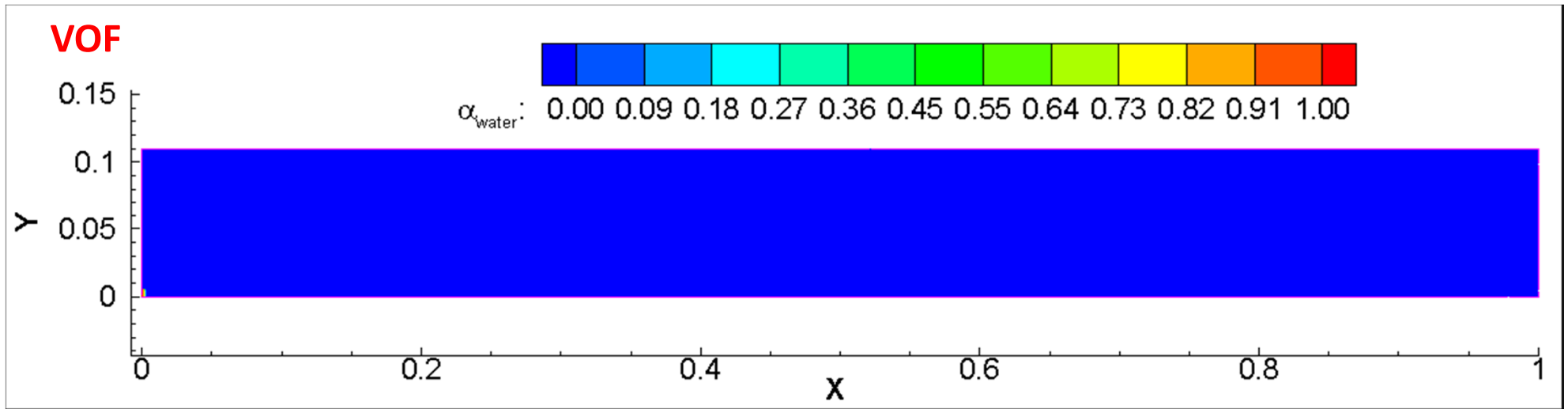
# Axial Velocity Contour (Water - Air )

[click to watch the movie]



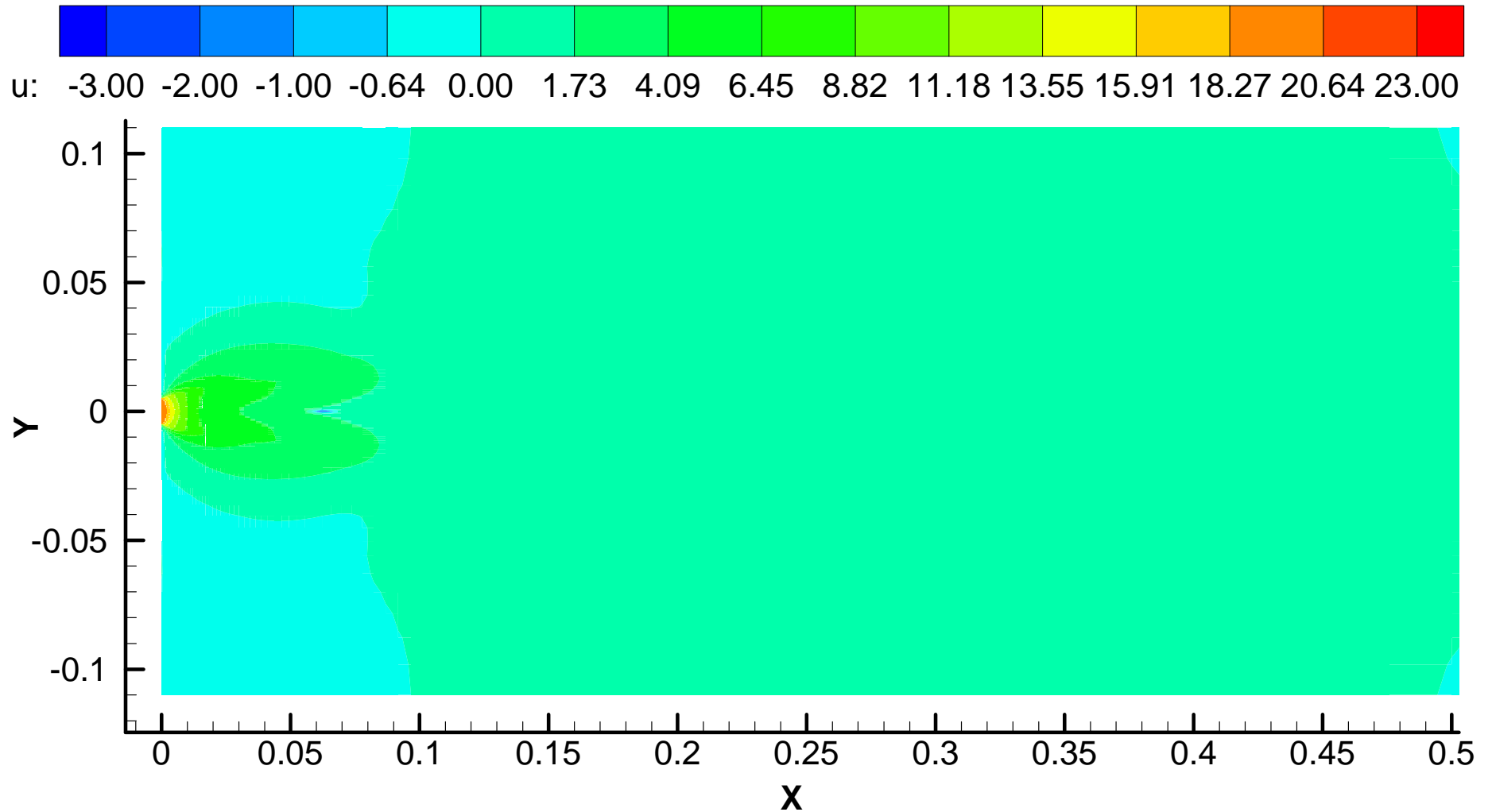
# Volume Fraction Of Water (Water - Air )

[click to watch the movie]



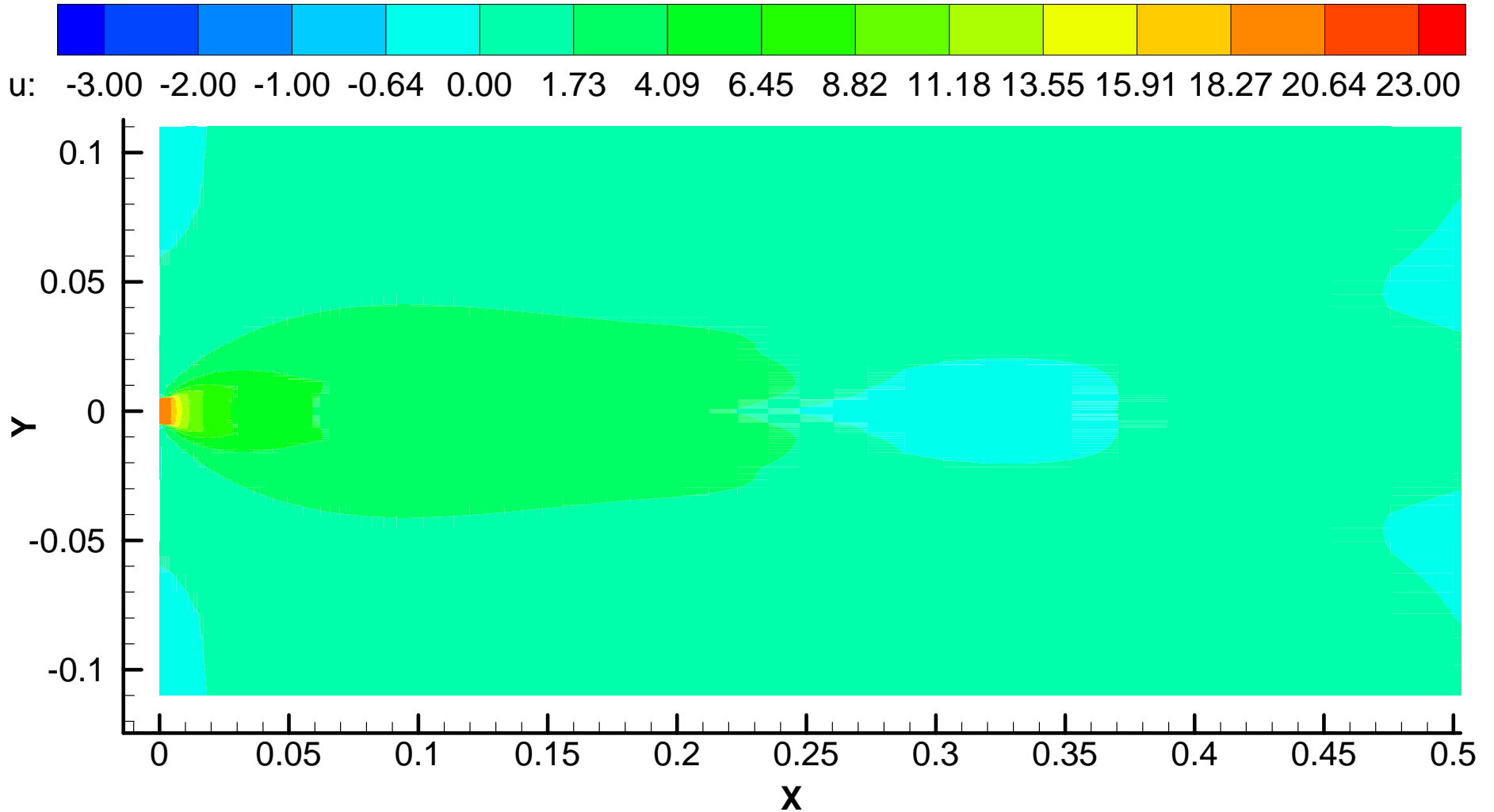
# Snap Shots (Water - Air)

CLSVOF( t = 0.0161 s)



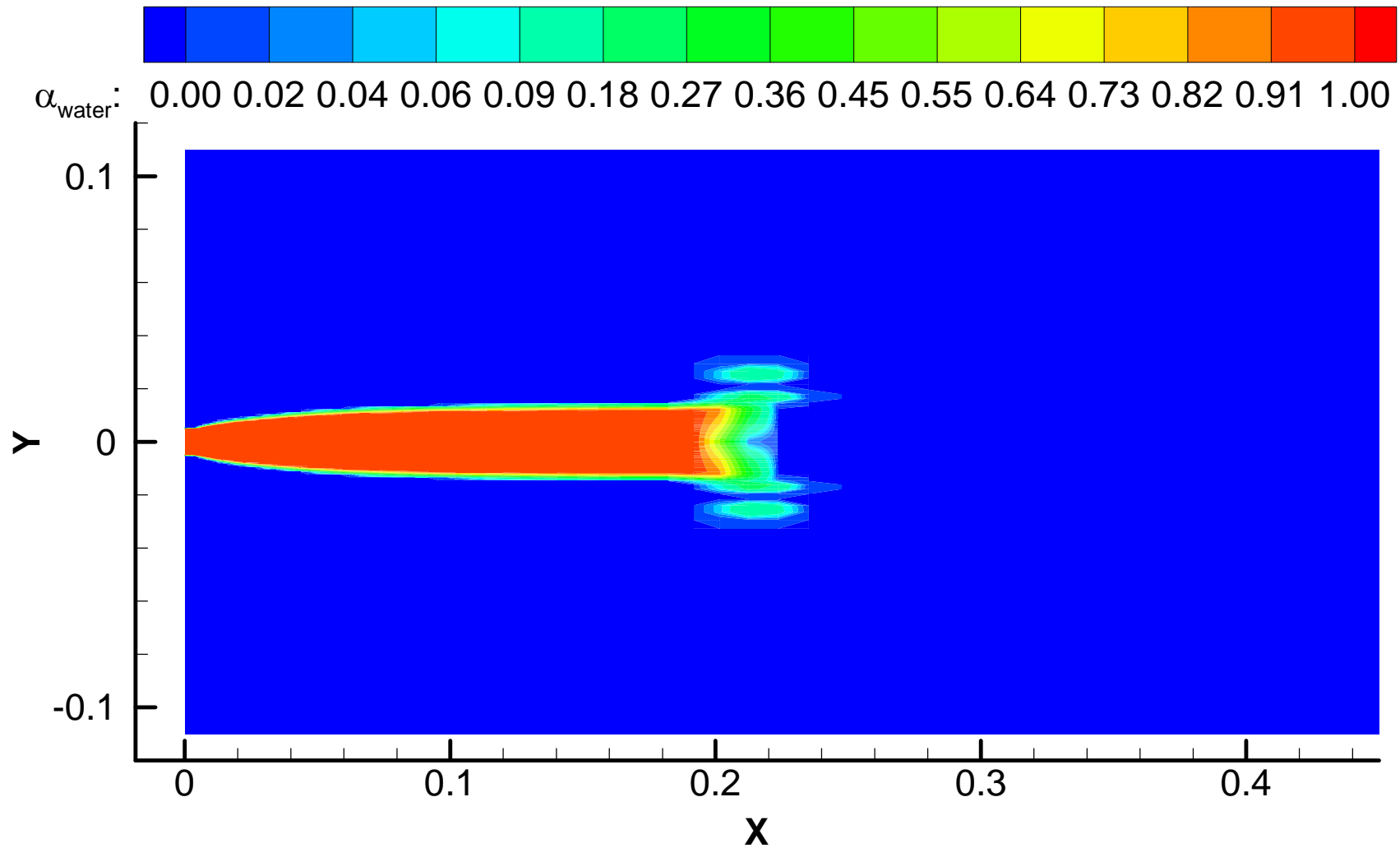
# Snap Shots (Water - Air)

CLSVOF( t = 0.0611 s)



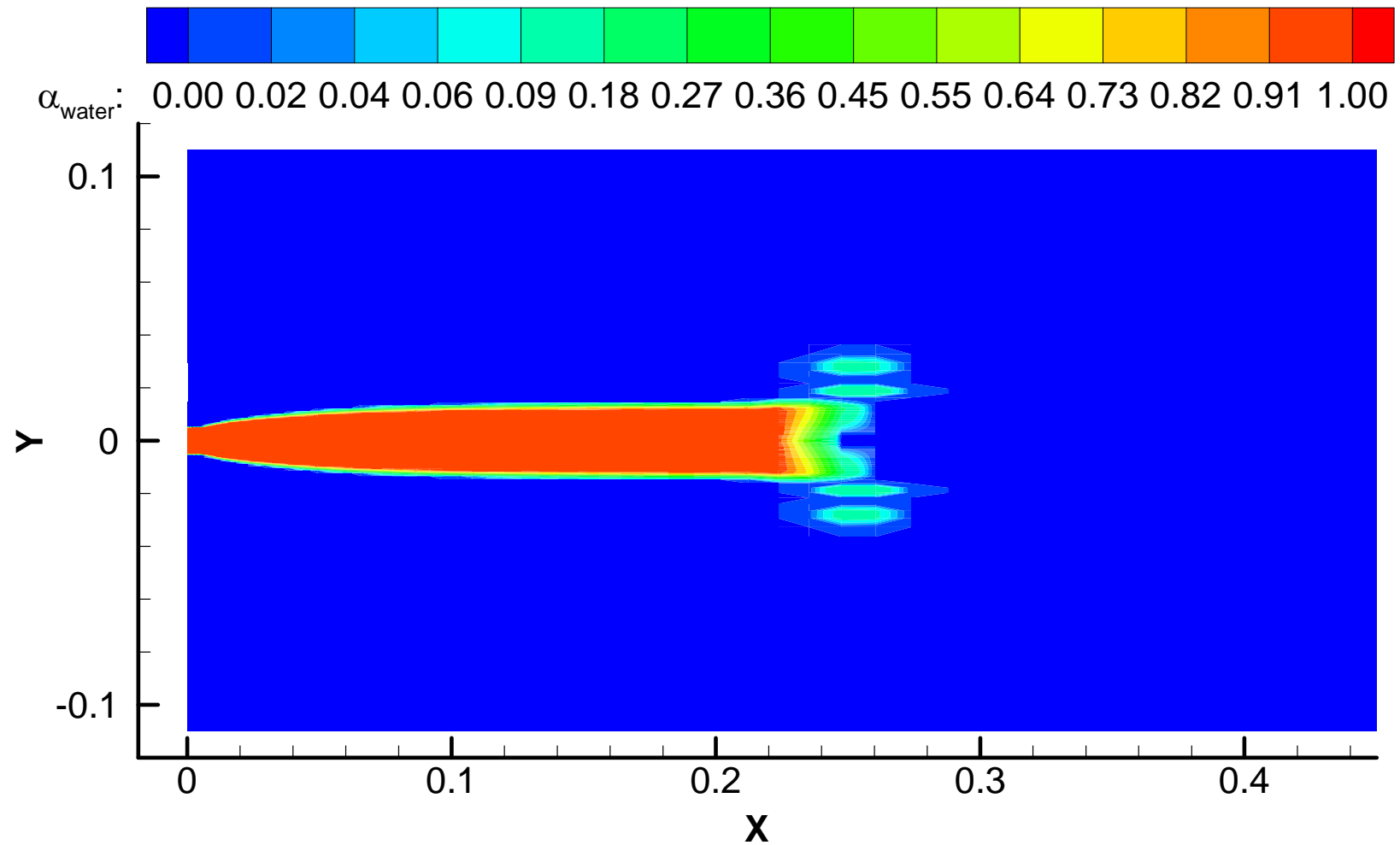
# Snap Shots (Water - Air)

CLSVOF( t = 0.0611 s)



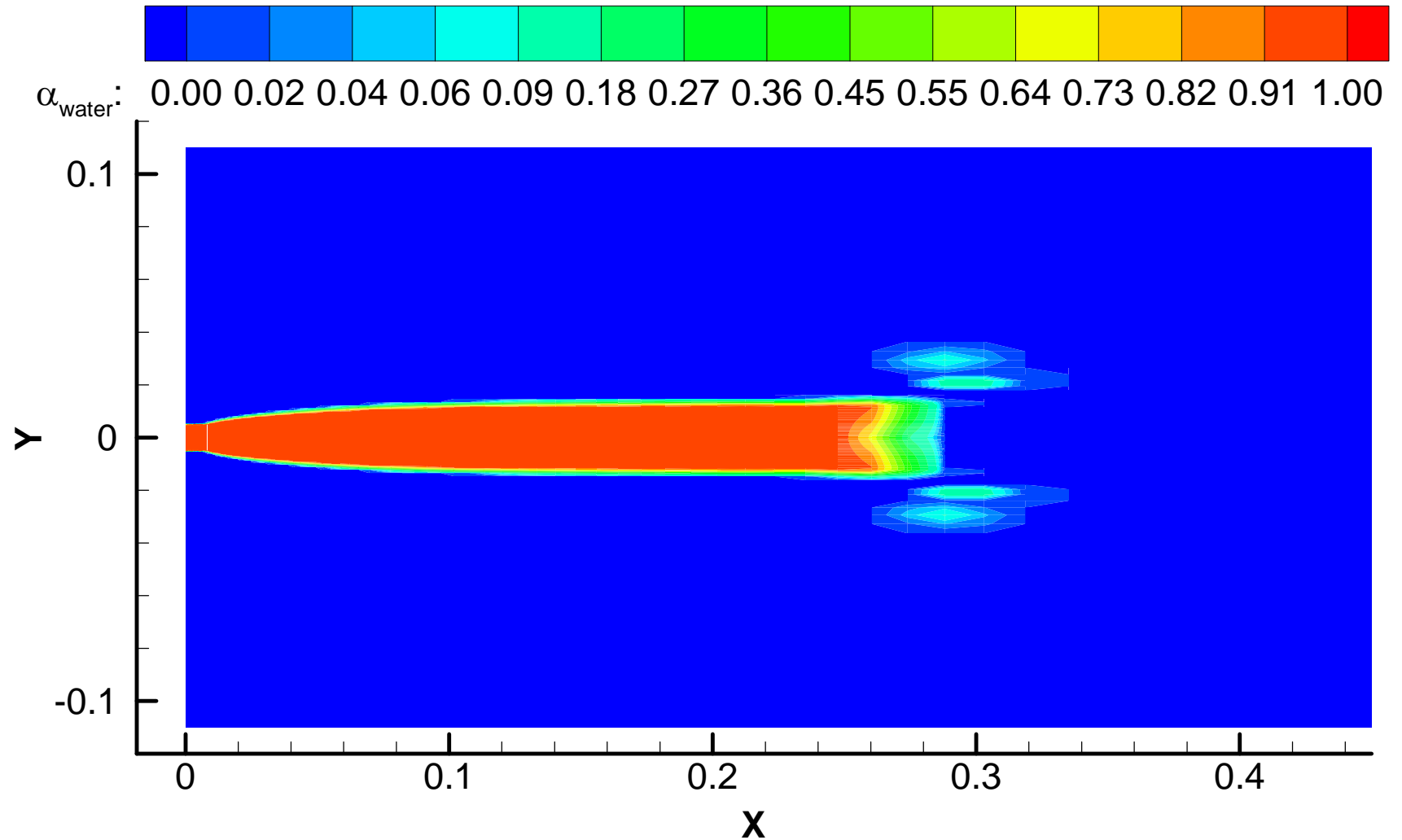
# Snap Shots (Water - Air)

CLSVOF( t = 0.0711 s)



# Snap Shots (Water - Air)

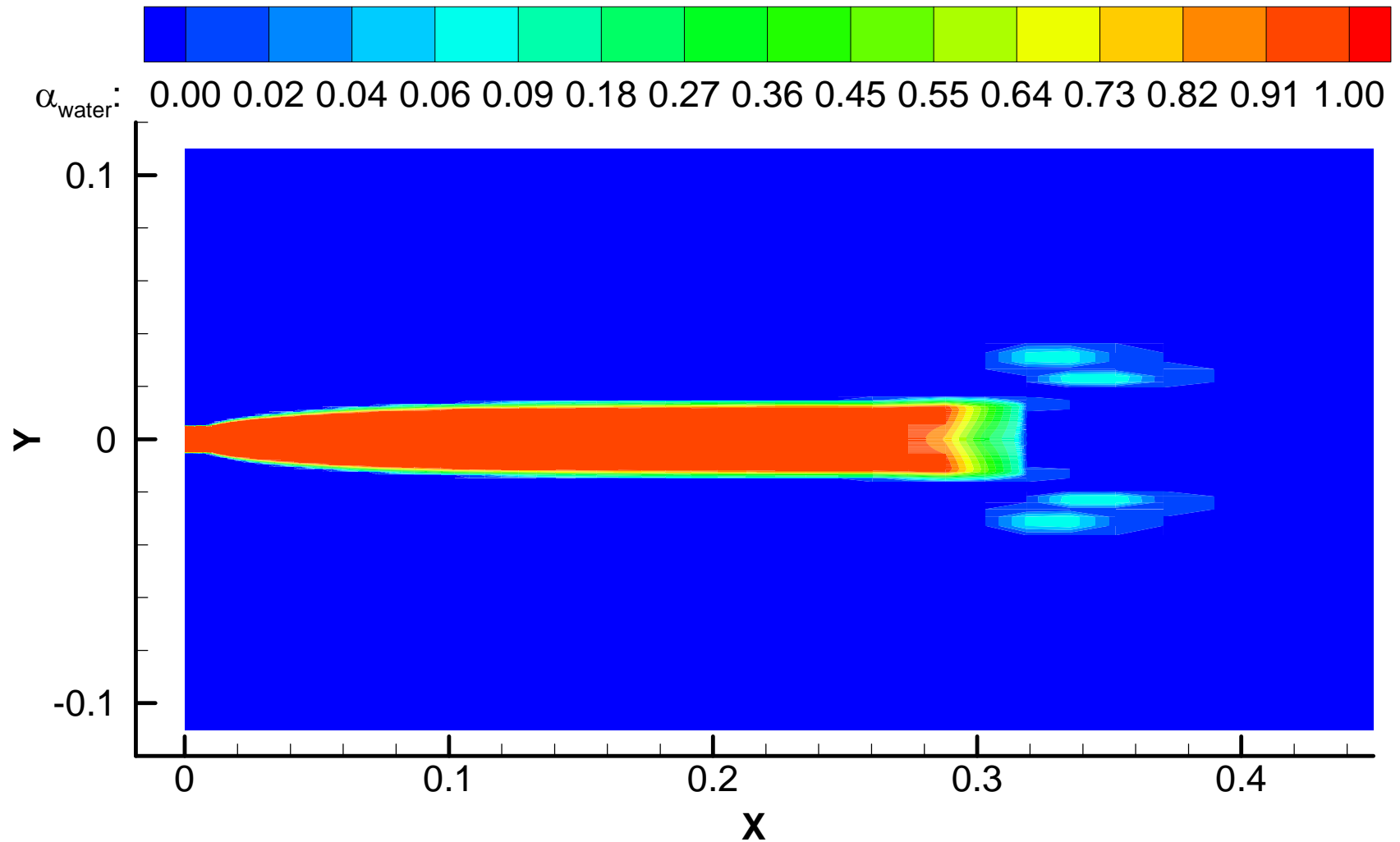
CLSVOF( t = 0.0811 s)





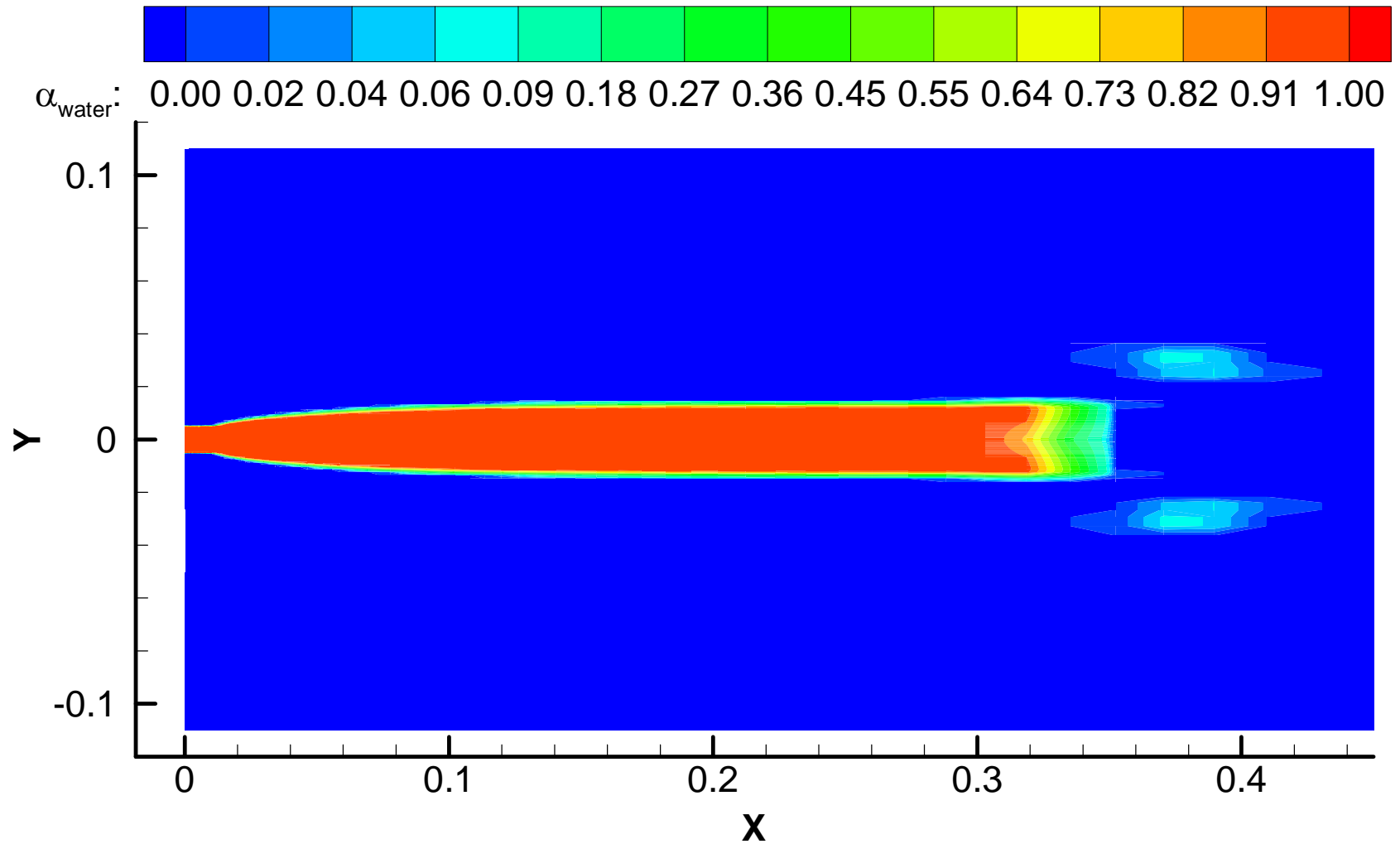
# Snap Shots (Water - Air)

CLSVOF( t = 0.0911 s)



# Snap Shots (Water - Air)

CLSVOF( t = 0.0101 s)



# Snap Shots (Water - Air)

CLSVOF( t = 0.111 s)

