STEADY 2D Convection - Diffusion

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November 1, 2025

1 STEADY 2D - Convection - Diffusion

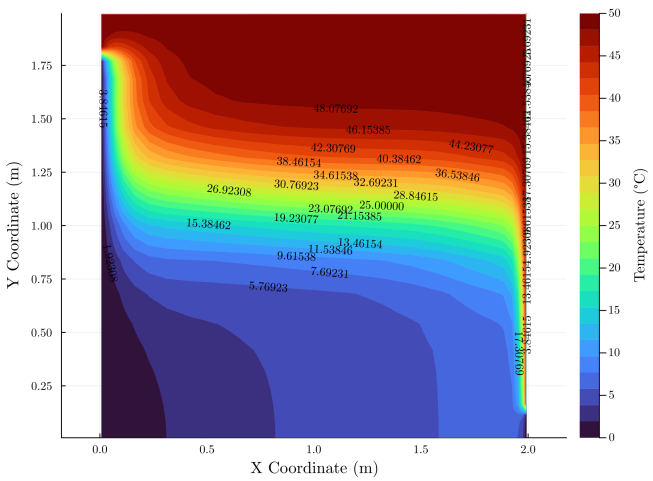
The two-dimensional transport equation for temperature reads

$$\frac{\delta}{\delta x}(\rho UT) + \frac{\delta}{\delta y}(\rho VT) = \frac{\delta}{\delta x}(\gamma \frac{\delta T}{\delta x}) + \frac{\delta}{\delta y}(\gamma \frac{\delta T}{\delta Y}) + S$$

where

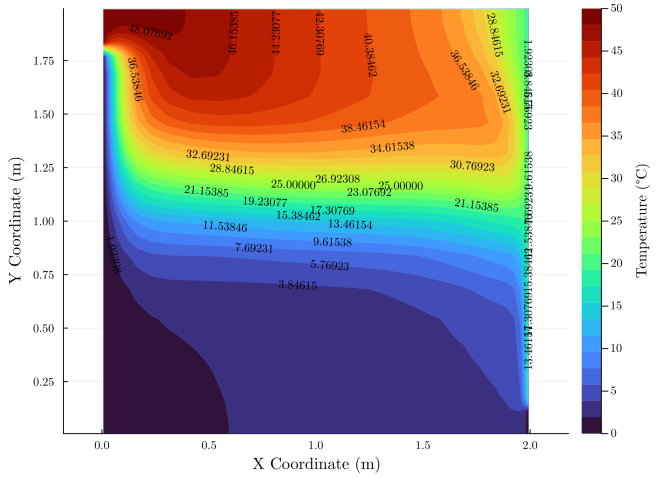
$$\gamma = \frac{\rho}{C_p}$$

Temperature Distribution



2 Simulation result with error tolerance of error < 0.0001

Temperature Distribution



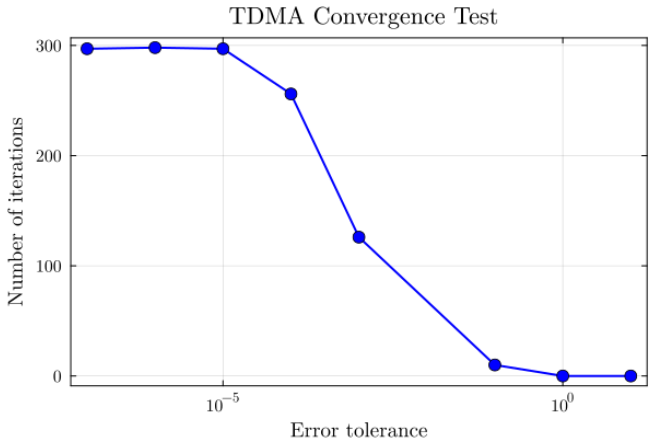
3 Sensitivity to Boundary Condition

At East Boundary , except at outlet Temperature is fixed at 50 degree The Dirichlet conditon [T = 50 degree C]is applied at East Boundary except at the outlets which was previously set to [T = 20 degree C]

4 Sensitivity to Convergence

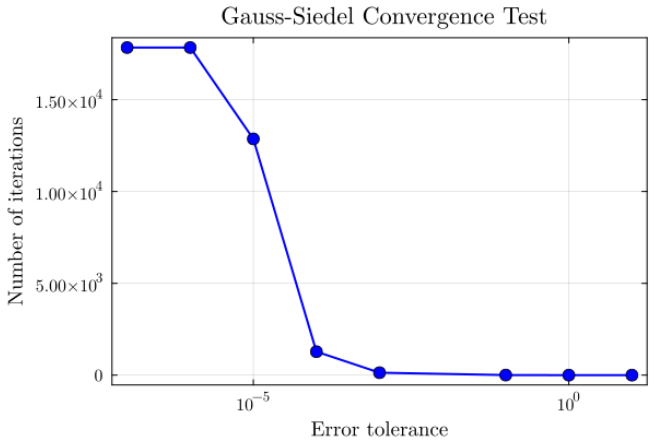
4.1 TDMA Convergence Test

tolerance Value	10.0	1.0	0.1	0.001	0.0001	1.0e-5	1
counter	nil	nil	10.0	126.0	256.0	297.0	



4.2 Gauss-Siedel Convergence Test

tolerance Value	10.0	1.0	0.1	0.001	0.0001	1.0e-5	1.
Counter	nil	nil	4	133	1277	12865	17



Comments : TDMA converges much faster for error tolerance 1e-7 297 iteration are performed for solution to converge , but for Gauss Siedel 17840 iteration are performed for same error tolerance