Stokes Example

"Team Stokes"

Stokes Equation:

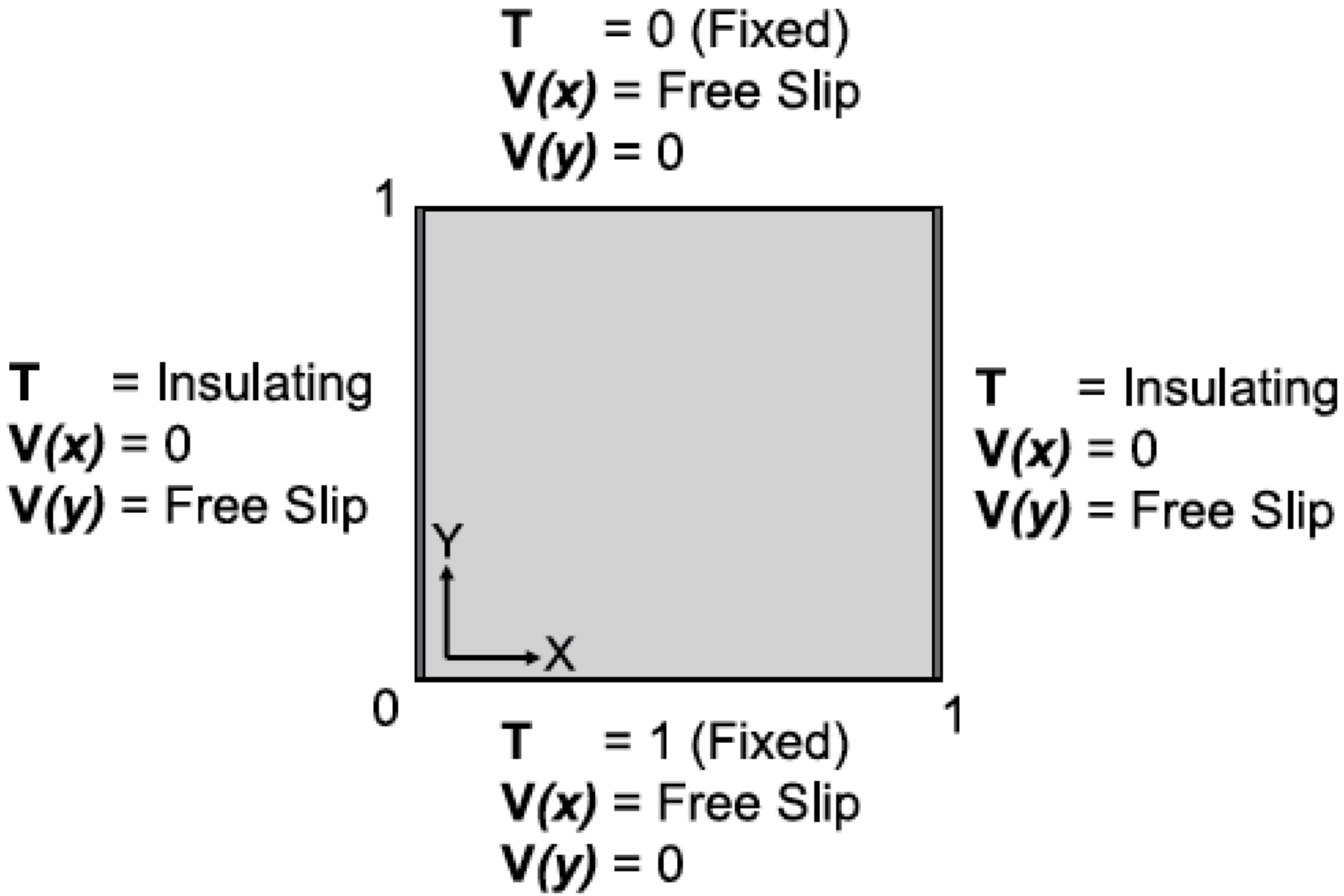
$$\nabla \cdot \left[\mu \left(\nabla \tilde{u} + \nabla \tilde{u}^T \right) \right] - \nabla p = RaT\hat{k}$$

Instantaneous balance (no inertia).

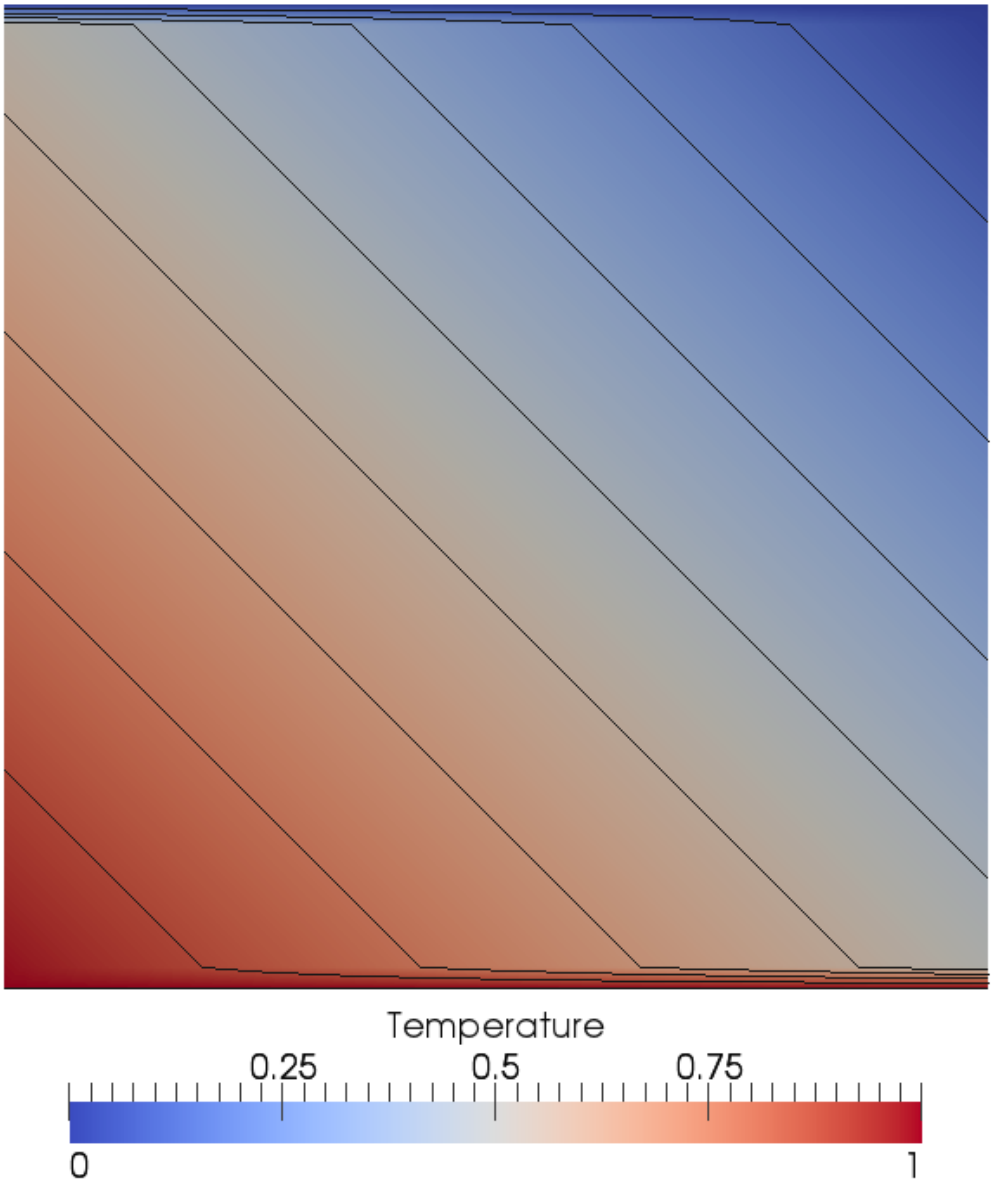
Example considered:
Stokes flow driven by thermal buoyancy.
2D square domain.

Conservation of mass and temperature advection-diffusion equations also solved.

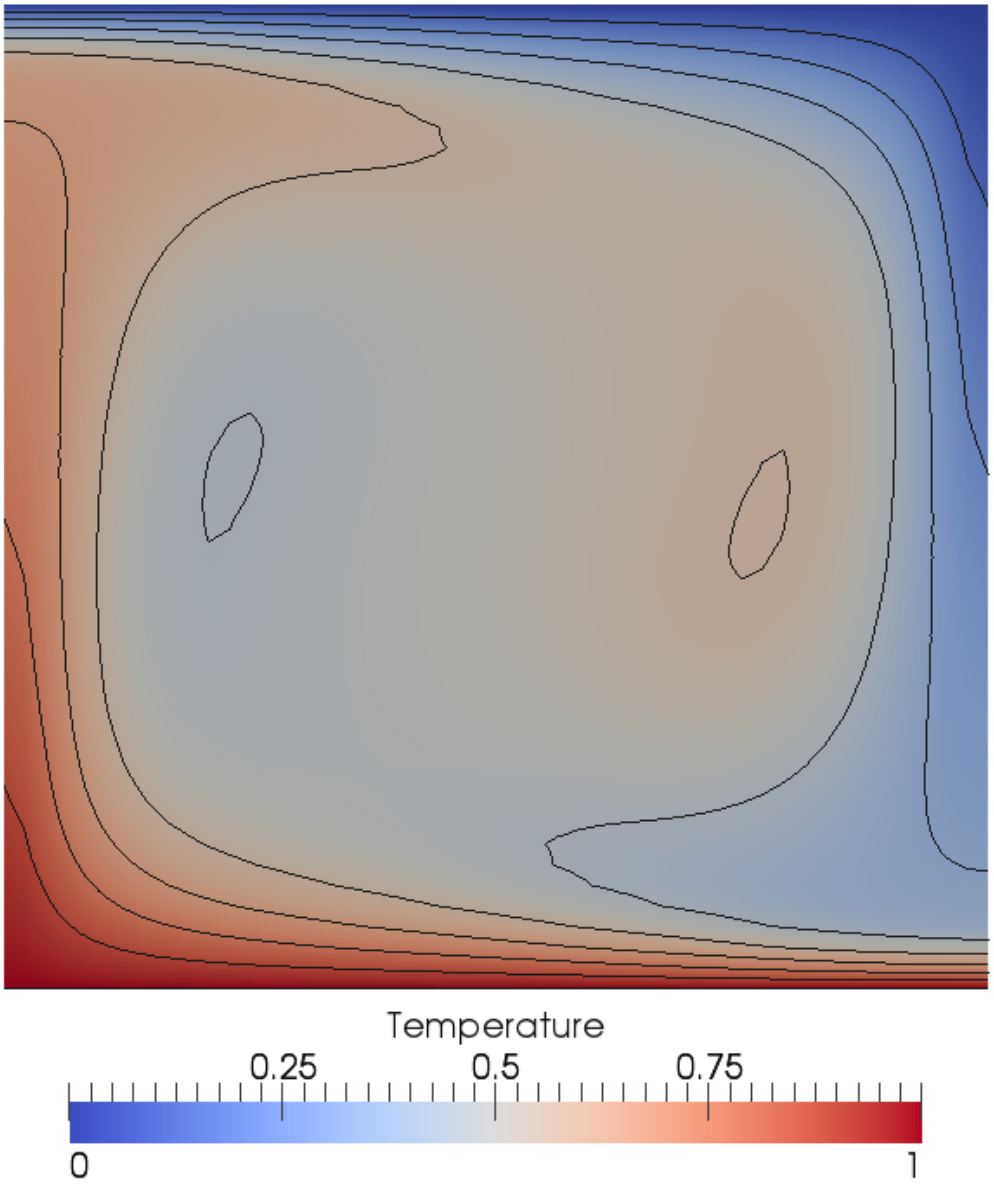
Setup


T = 0 (Fixed)
V(x) = Free Slip
V(y) = 0
1
T = Insulating
V(x) = 0
V(y) = Free Slip
T = Insulating
V(x) = 0
V(y) = Free Slip
Y
X
0
1
T = 1 (Fixed)
V(x) = Free Slip
V(y) = 0

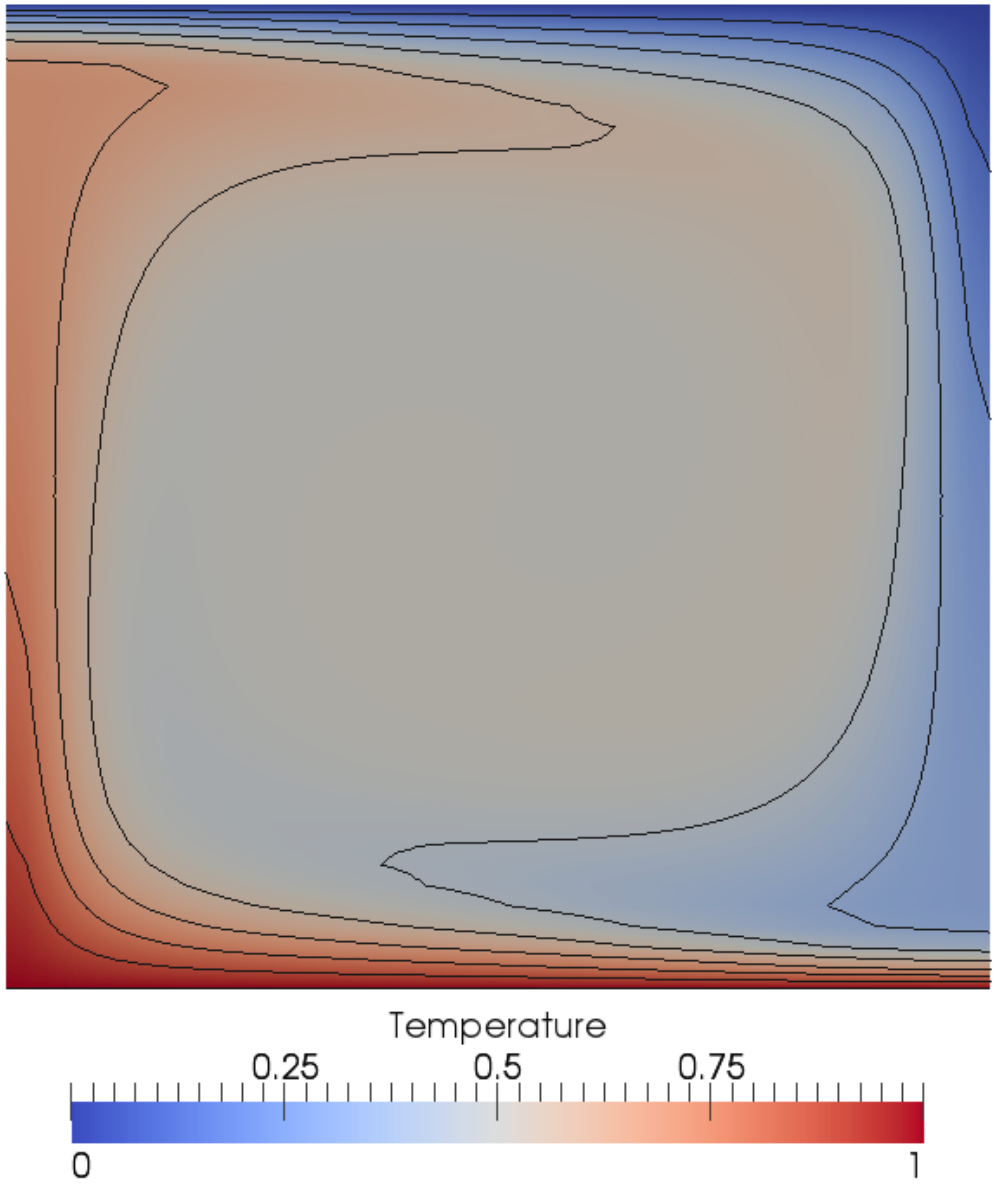
Initial condition



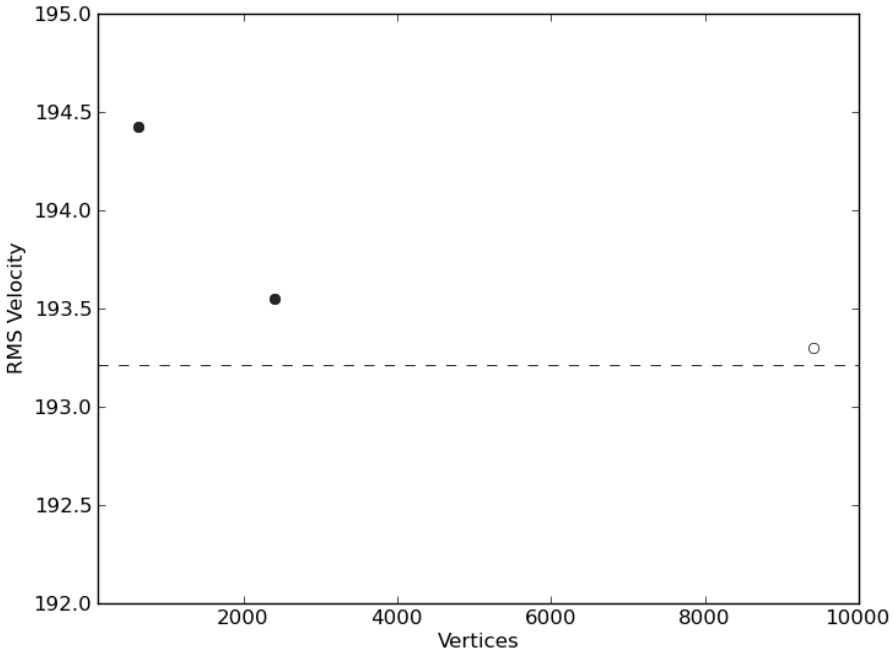
Intermediate:

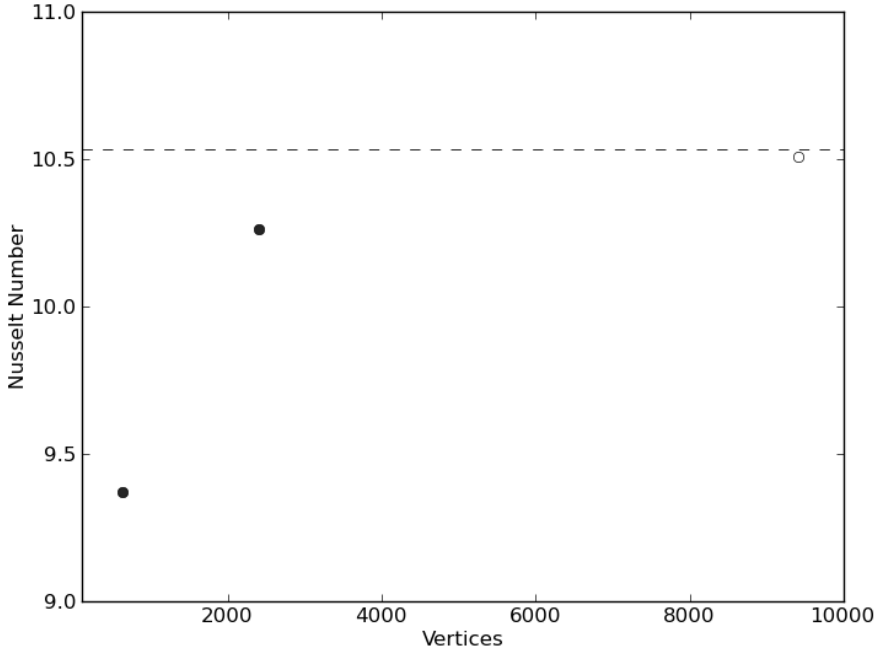


Approaching steady-state:



Diagnostics:





With increasing grid resolution, results converge towards benchmark solutions (dashed lines), as expected.