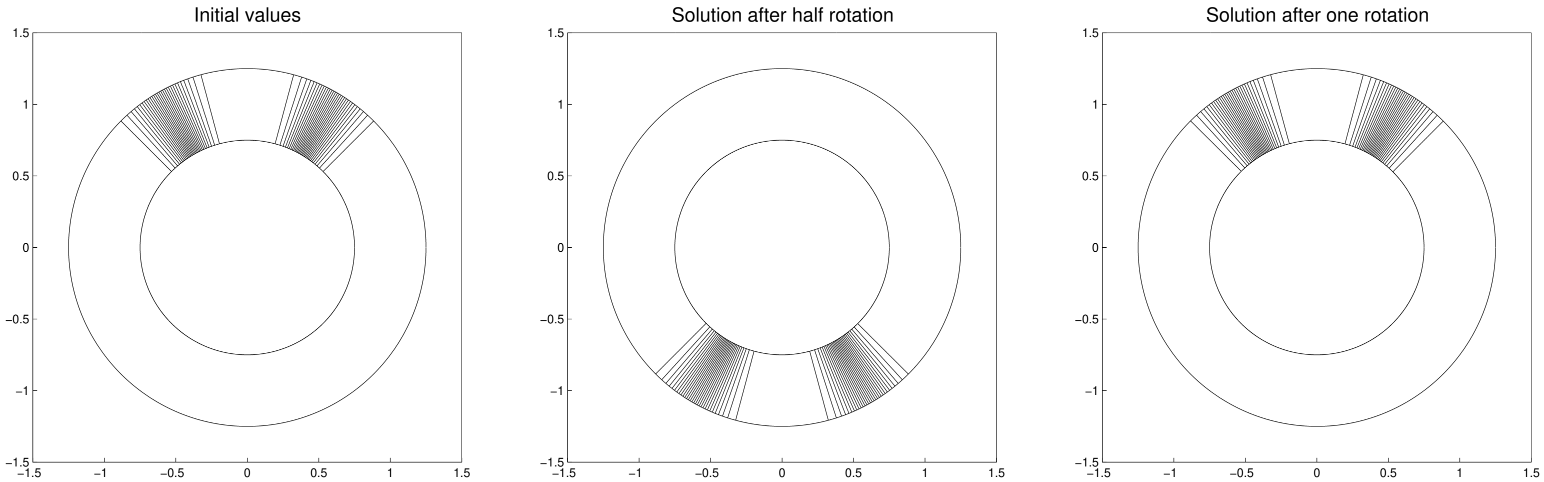
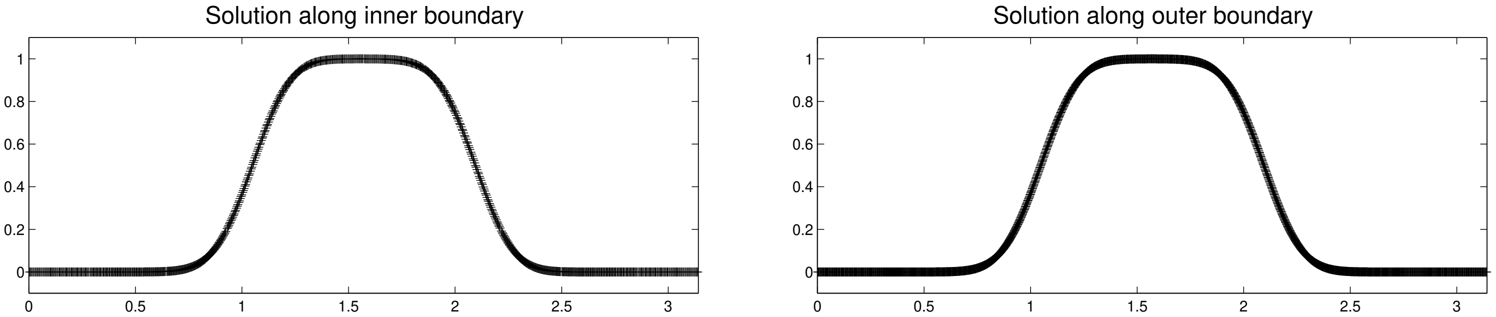
Advective Transport in an Annulus



Solution along the boundary after one rotation



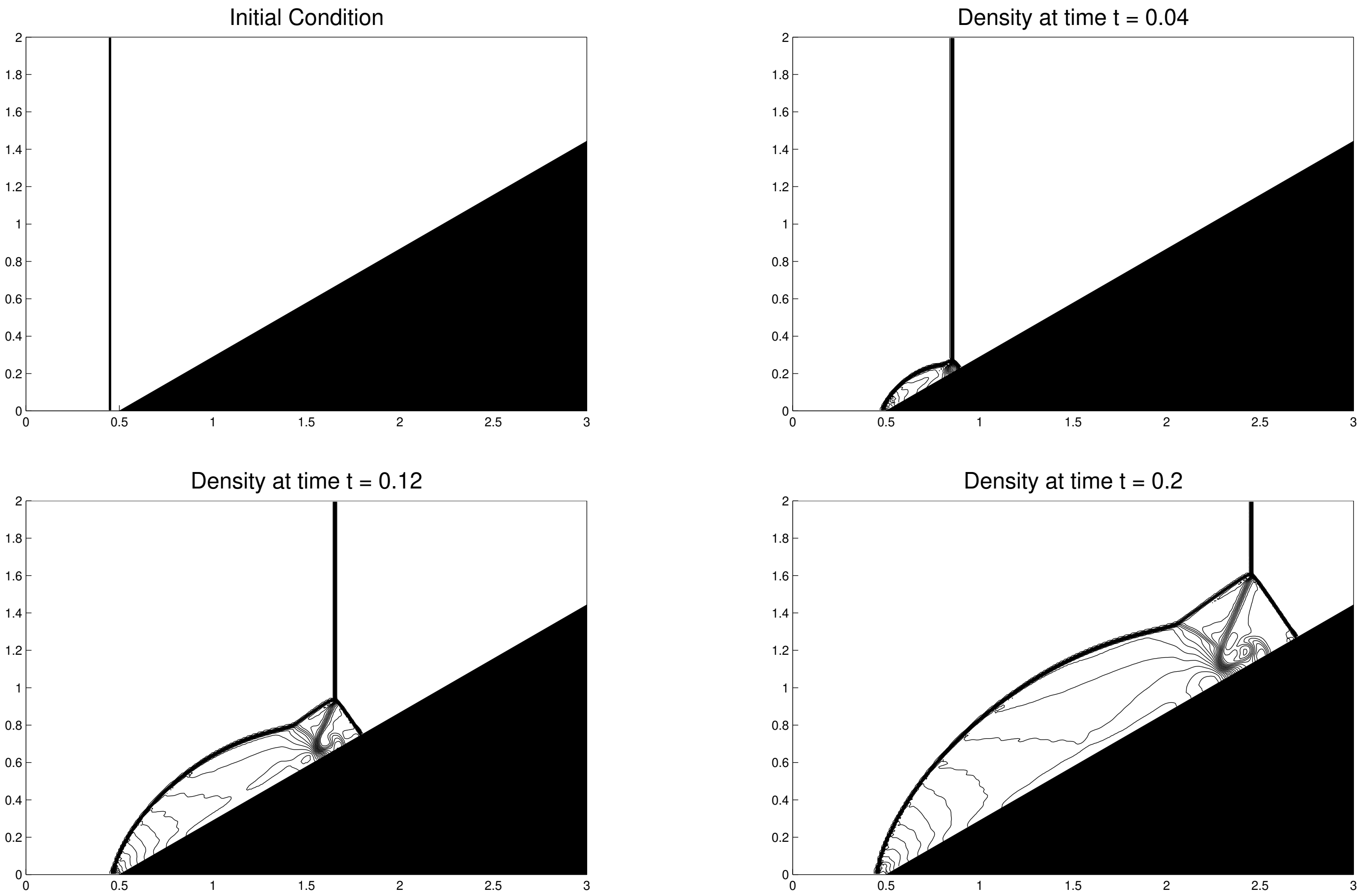
Experimental order of convergence for advection in an annulus

$$E_d = \frac{\sum_{i,j} |q(i,j) - qex(i,j)| \cdot Area(i,j)}{\sum_{i,j} |qex(i,j)| \cdot Area(i,j)} \tag{1}$$

$$E_b = \frac{\sum_{cut\ cells} |q(i,j) - qex(i,j)| \cdot length_b(i,j)}{\sum_{cut\ cells} |qex(i,j)| \cdot length_b(i,j)} \tag{2}$$

	domain	outer boundary	inner boundary
100×100	7.50839d-2	3.87471d-2	0.13909
200×200	2.03198d-2	1.01406d-2	4.01216d-2
EOC	**1.88**	**1.93**	**1.79**
400×400	5.14101d-3	2.56584d-3	1.02206d-2
EOC	**1.98**	**1.98**	**1.97**
800×800	1.29810d-3	6.45543d-4	2.56709d-3
EOC	**1.99**	**1.99**	**1.99**

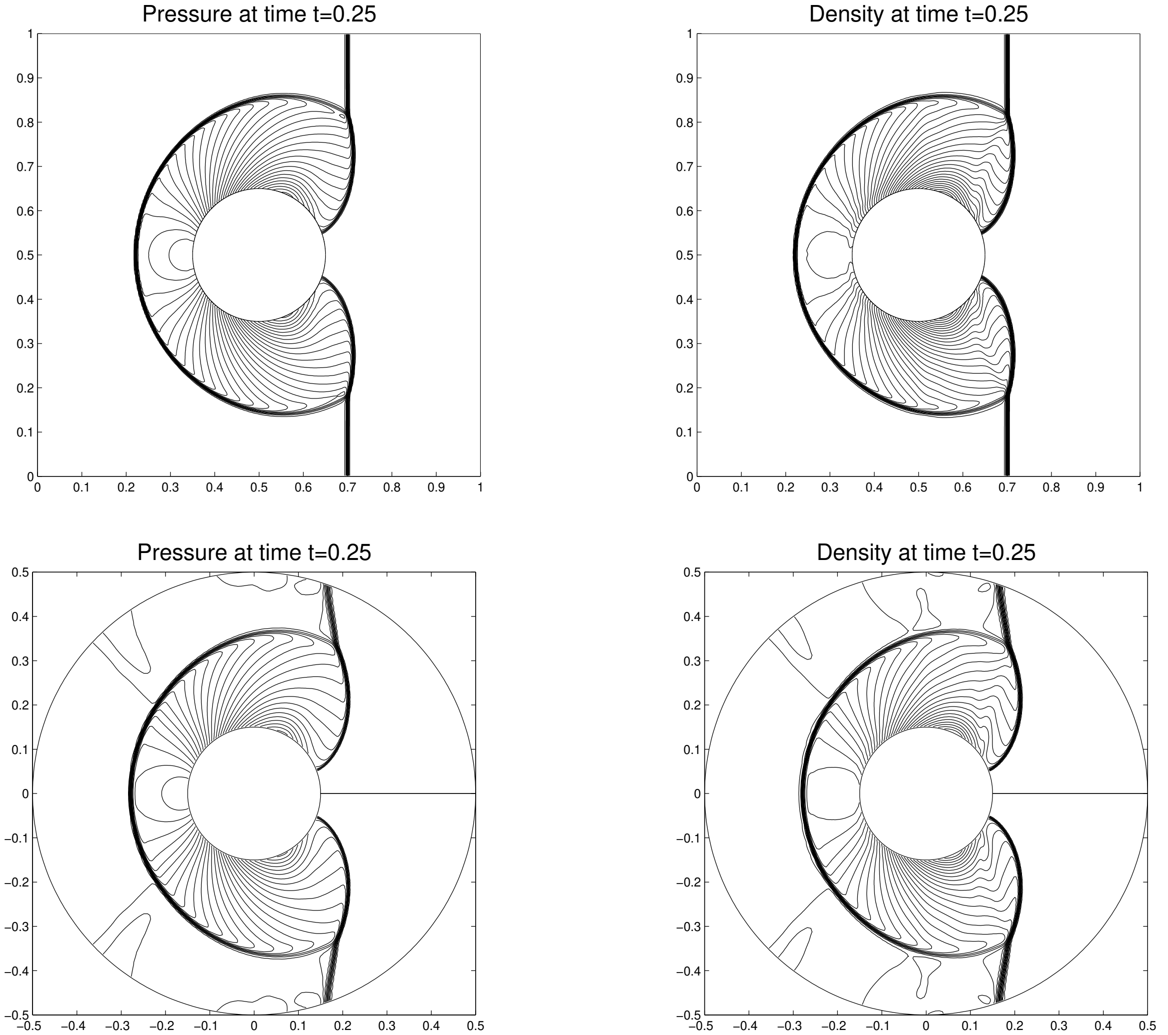
Reflection of a Mach 10 shock wave on a 30 degree wedge



Grid aligned method inside the computational domain
Rotated grid cut cell method at the boundary, $CFL \approx 0.9$.

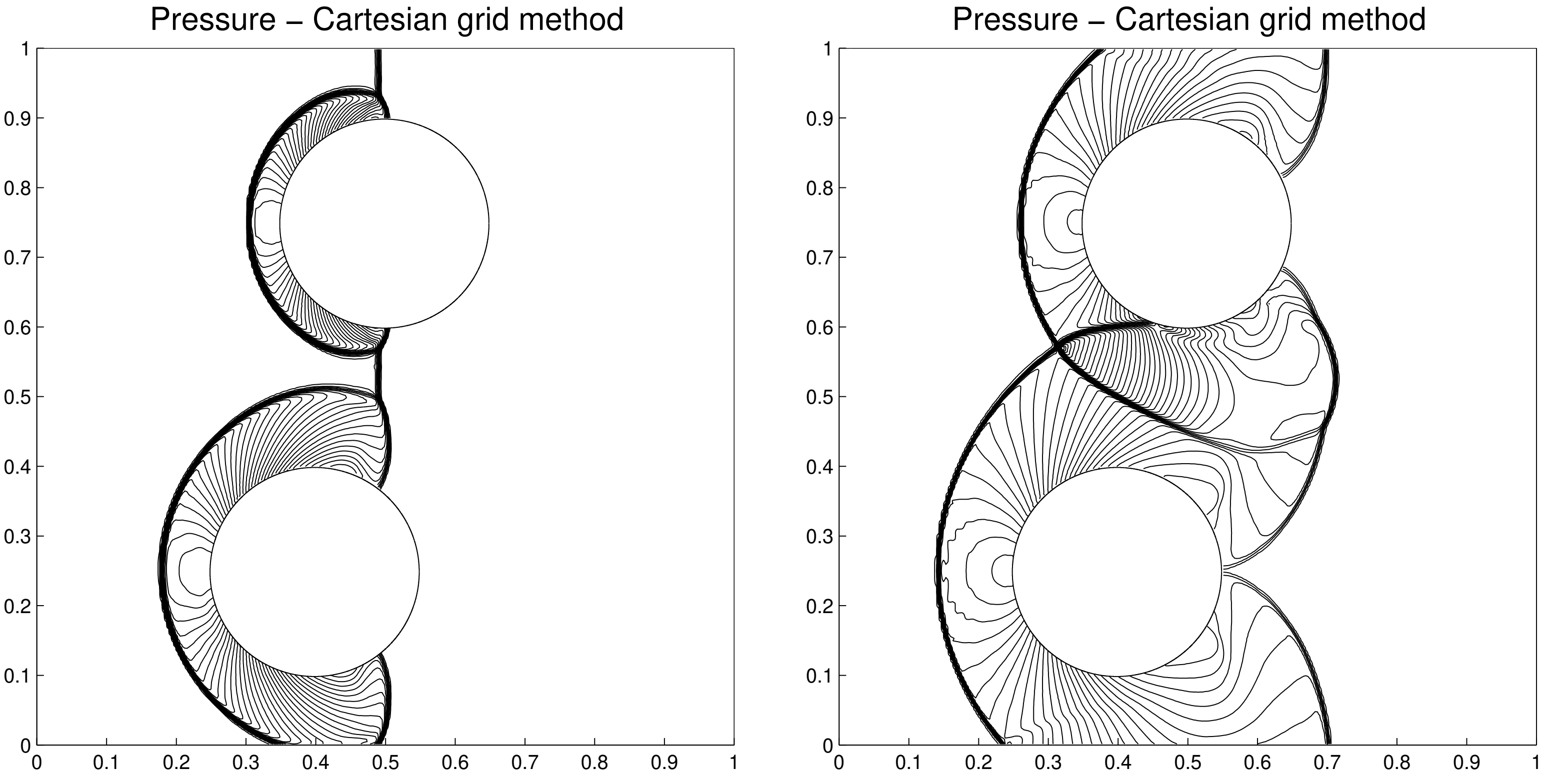
402 cut cells, size of smallest cut cell: $2.3 \cdot 10^{-5} \triangle x \triangle y$, $\triangle x = \triangle y = 0.001$.

Reflection of Mach 2 shock from a cylinder



Comparison of Cartesian grid (top) and curvilinear grid method.

Reflection of Mach 3 shock at two cylinders



Cartesian grid cut cell method on a mesh with 300×300 cells.