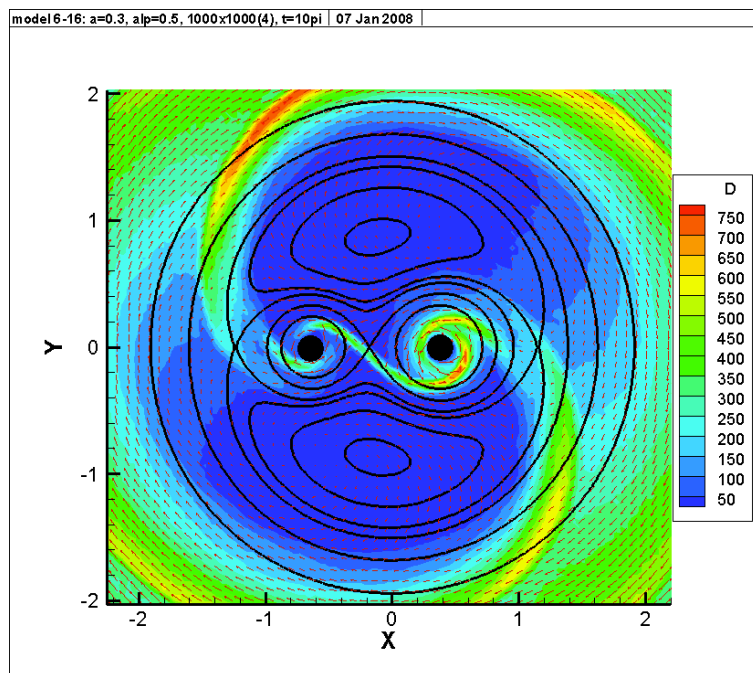


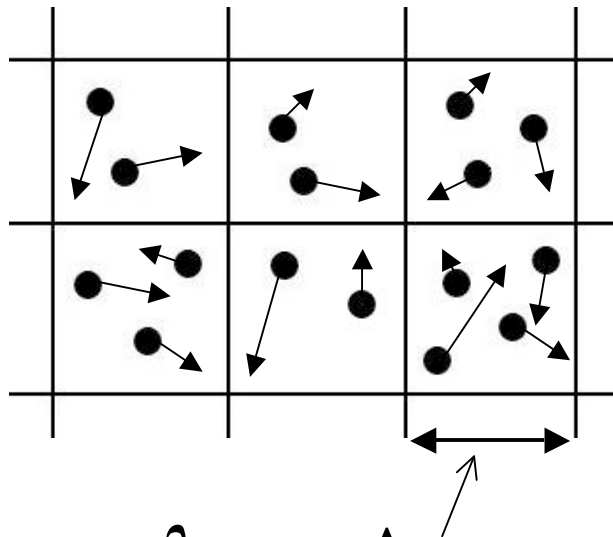
Numerical Simulation of the Accretion Flow from Circumbinary Disc by the Molecular Hydrodynamics



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Molecular Hydrodynamics (MH)

Cells and particles



$$\lambda = a \Delta$$

Dilute gas: DSMC

Continuum: **MH**

Particle method

each particle is collection of molecules

Motion & collision

A mean free path of particles is fixed to about a cell size.

“Simulated molecules”

The roles of a cell

- 1) To select collision pair
cf.) SPH: neighboring list
- 2) To calculate
macroscopic variables

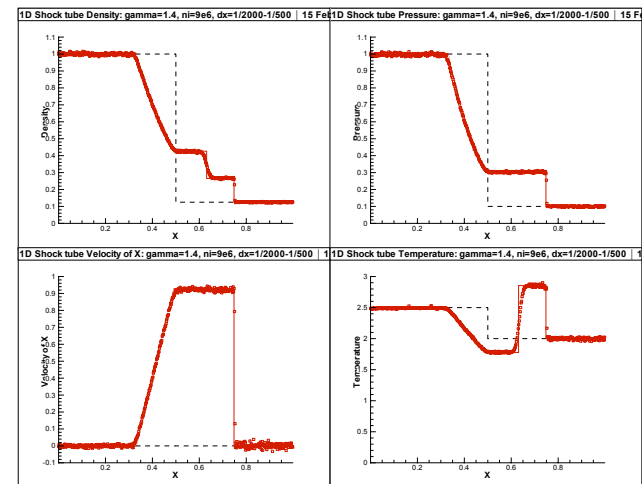
Characteristics of the MH

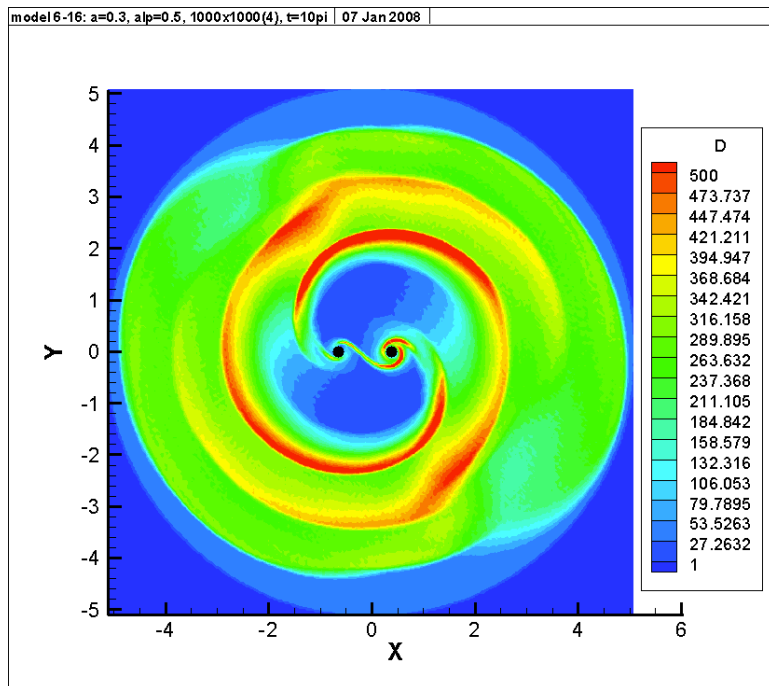
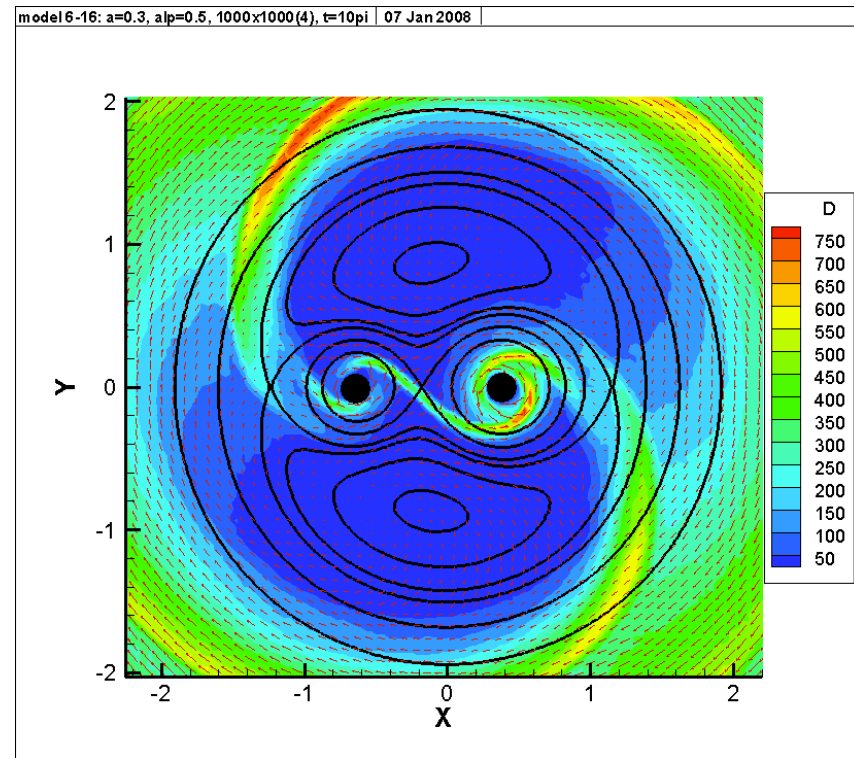
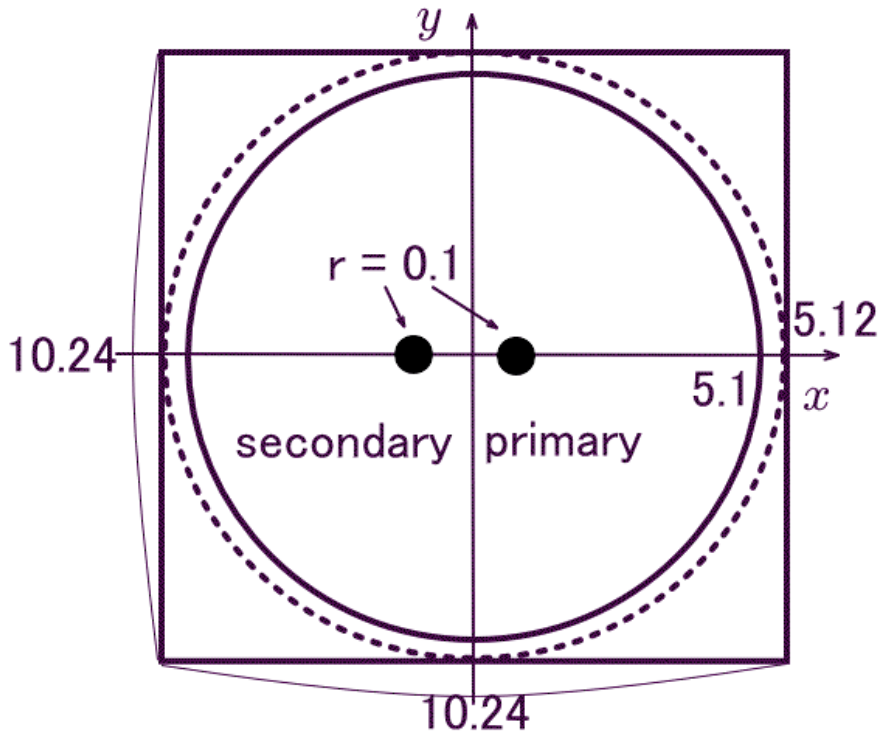
- Advantages
 - **Unconditionally stable**
 - Not restricted by the CFL condition
 - Simple code
 - Positivity
(pressure, density...etc. ≥ 0)
 - $M=\infty$ ☉
 - Vacuum region ☉
 - Numerical viscosity is automatically included

Robust

- Disadvantage
 - fluctuation
 - Many particles are needed

1D Shock tube





Mass ratio: 0.6

Sound speed: 0.25, isothermal
1000 x 1000

$\Delta t = 0.5 \Delta x$

$\lambda = 0.3 \Delta x$

5 rotational periods

Density distribution

A pair of spiral shocks appeared