Hands-on 1
A basic simulation

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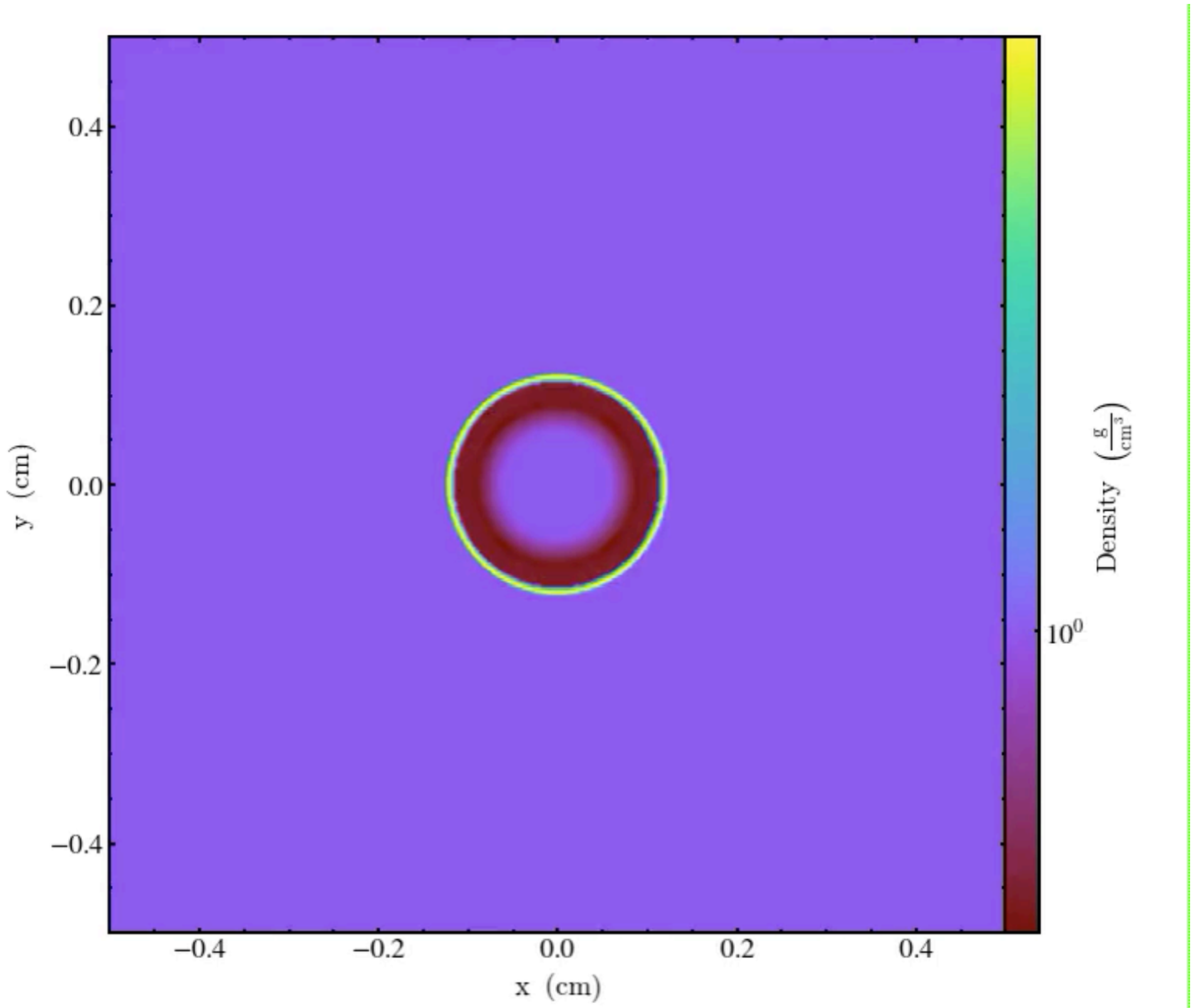
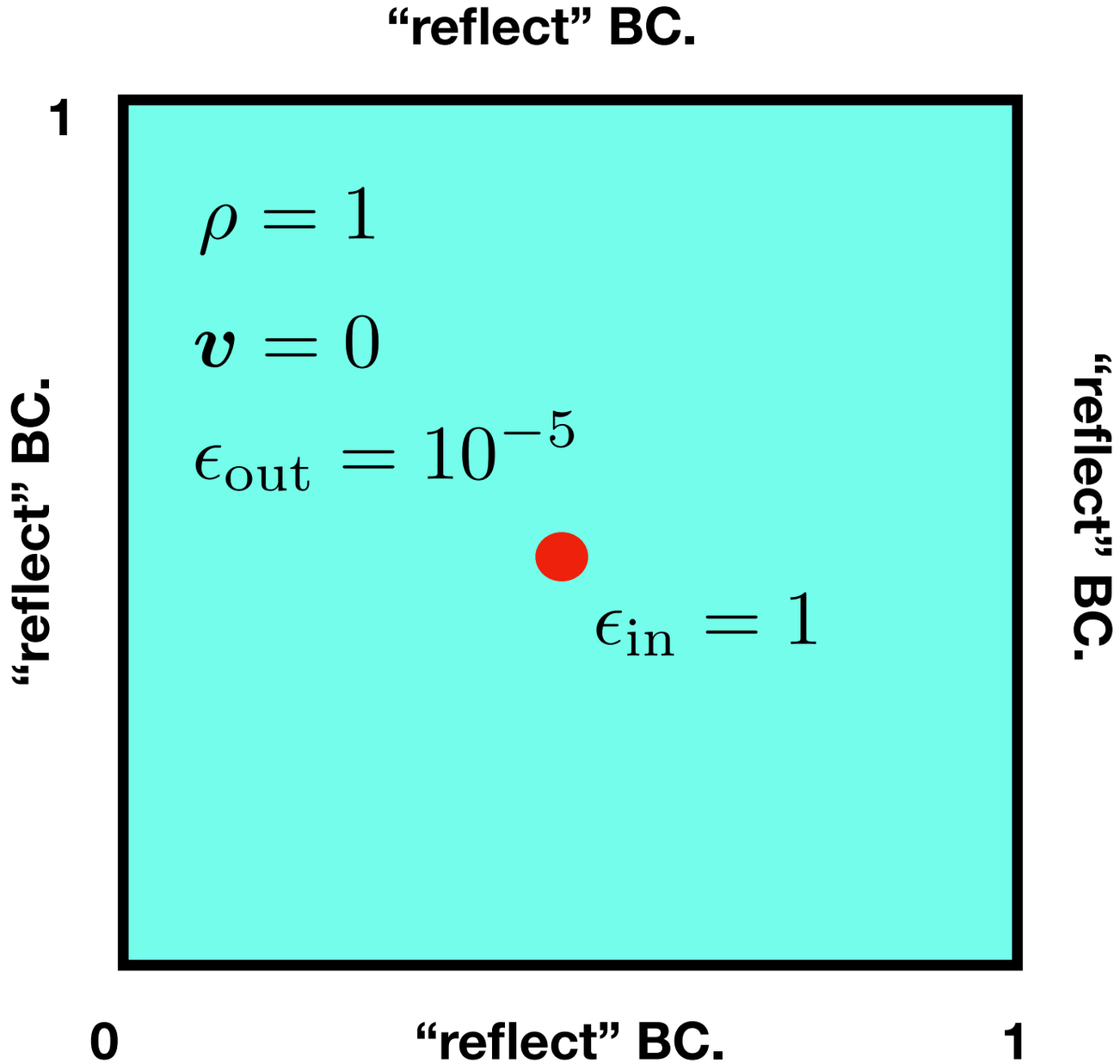
A simple explosion simulation



The initial condition



The prototype of future CICA Cluster

Connect to the CICA cluster

- Center for Informatics and Computational Astrophysics (CICA)
- CICA: The newly established center at NTHU
- Fomalhaut - The prototype machine of the CICA cluster.

Fomalhaut

- 1 head-node for login
- 2 Compute nodes with

  72 cores + 4 GPU cards

Fomalhaut

- https://github.com/kuochuanpan/fomalhaut/wiki

Fomalhaut

- Note that your IP will be banned if you failed to login for three times within 5 mins
- Please inform me your IP if got banned.

Connect to Fomalhaut

- Linux / Mac OS X / WSL

```
ssh -X account_name@fomalhaut.astr.nthu.edu.tw
```

Then type your password

- Windows

Google “Using SSH in Putty”. …. ^^”

Setup FLASH

```
cd FLASH4.6.1

./setup Template -2d -auto -maxblocks=4000

cd object

make -j4
```

Prepare your job related files

```
cd

mkdir -p runs/my_first_flash_sim

cd runs/my_first_flash_sim

cp ~/FLASH4.6.1/object/flash4 ./

cp ~/FLASH4.6.1/object/flash.par ./
```

Job script

```
#!/bin/bash -x
#PBS -N groupX
#PBS -l nodes=1:ppn=4
#PBS -l mem=8gb
#PBS -l walltime=1:00:00
#PBS -k oe
#PBS -j oe

n_proc=$(cat $PBS_NODEFILE | wc -l)

module load pgi/18.10
module load openmpi/3.1.4
module load hdf5-parallel/1.8.21

cd $PBS_O_WORKDIR

mpirun -np $n_proc ./flash4
```

Submit your job

```
qsub run.sh
```

- Useful commands

```
qsub

qstat

qdel  <job id>
```

- Interactive jobs

```
qsub -I -X -N name -l nodes=1:ppn=4,pmem=8gb,walltime=1:00:00
```

Visualize your simulation data

- Activate python environment for yt

```
conda activate yt
```

See the afternoon section for a yt tutorial

- Make a slice plot

```
yt plot -f density my_sim_hdf5_plt_cnt_0001
```

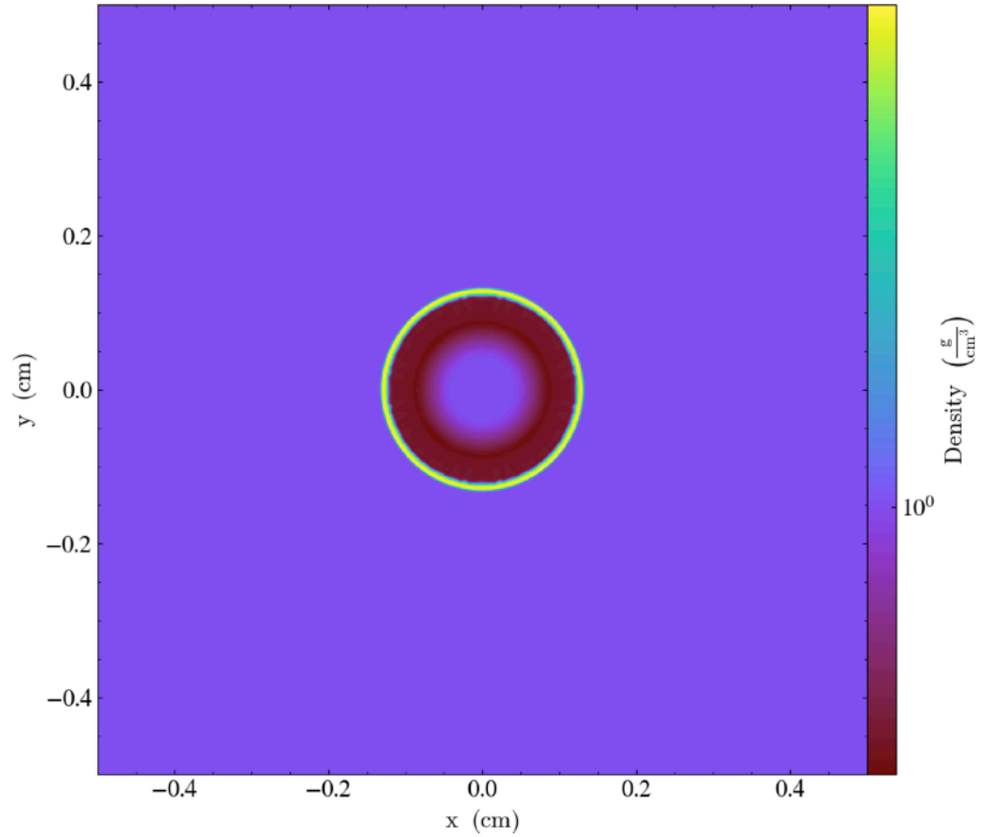
- Deactivate python environment

```
conda deactivate
```

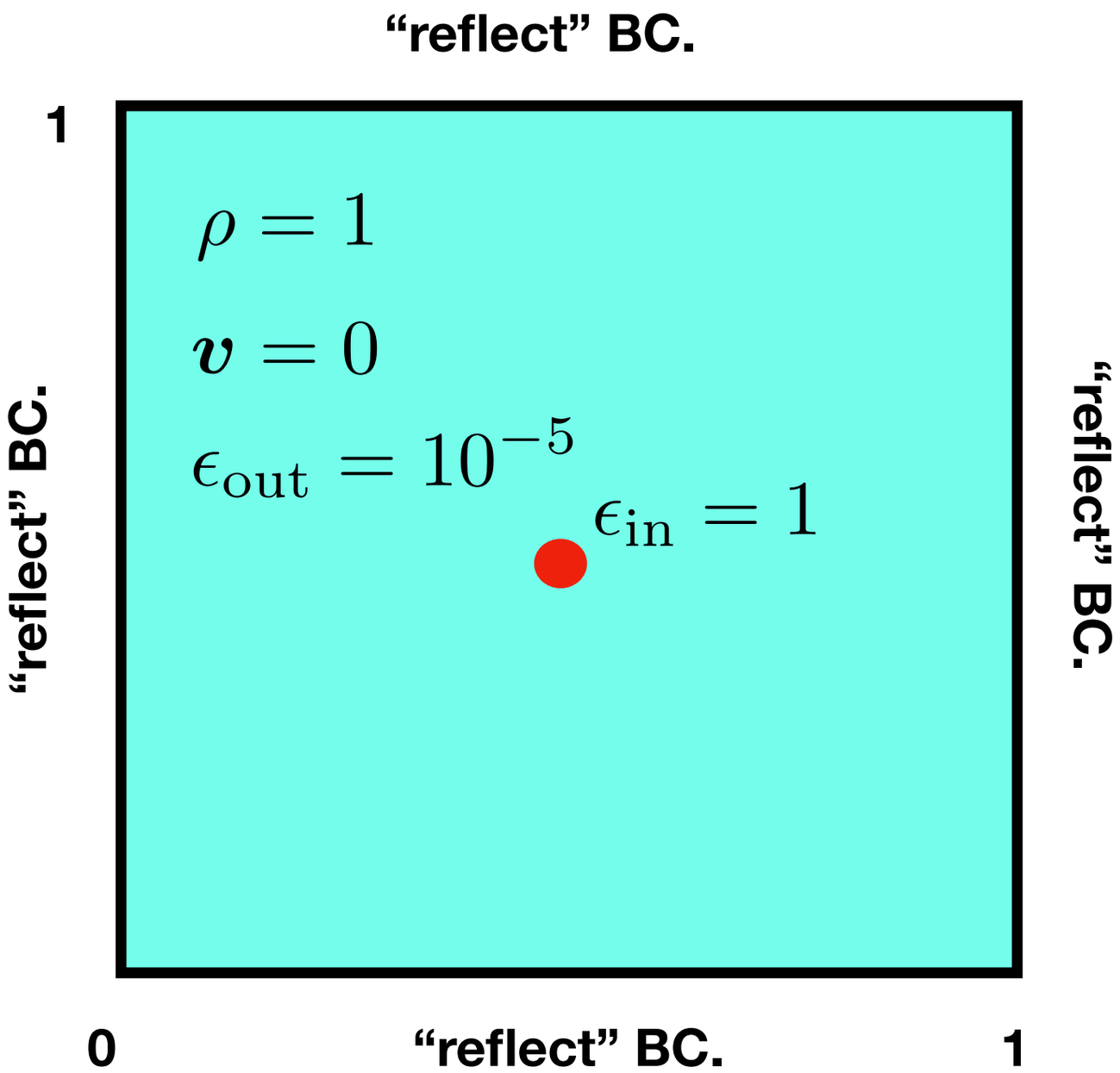
Visualize your simulation data

- See the result

```
animate frames/my_sim_hdf5_plt_cnt_0001_Slice_z_density.png
```

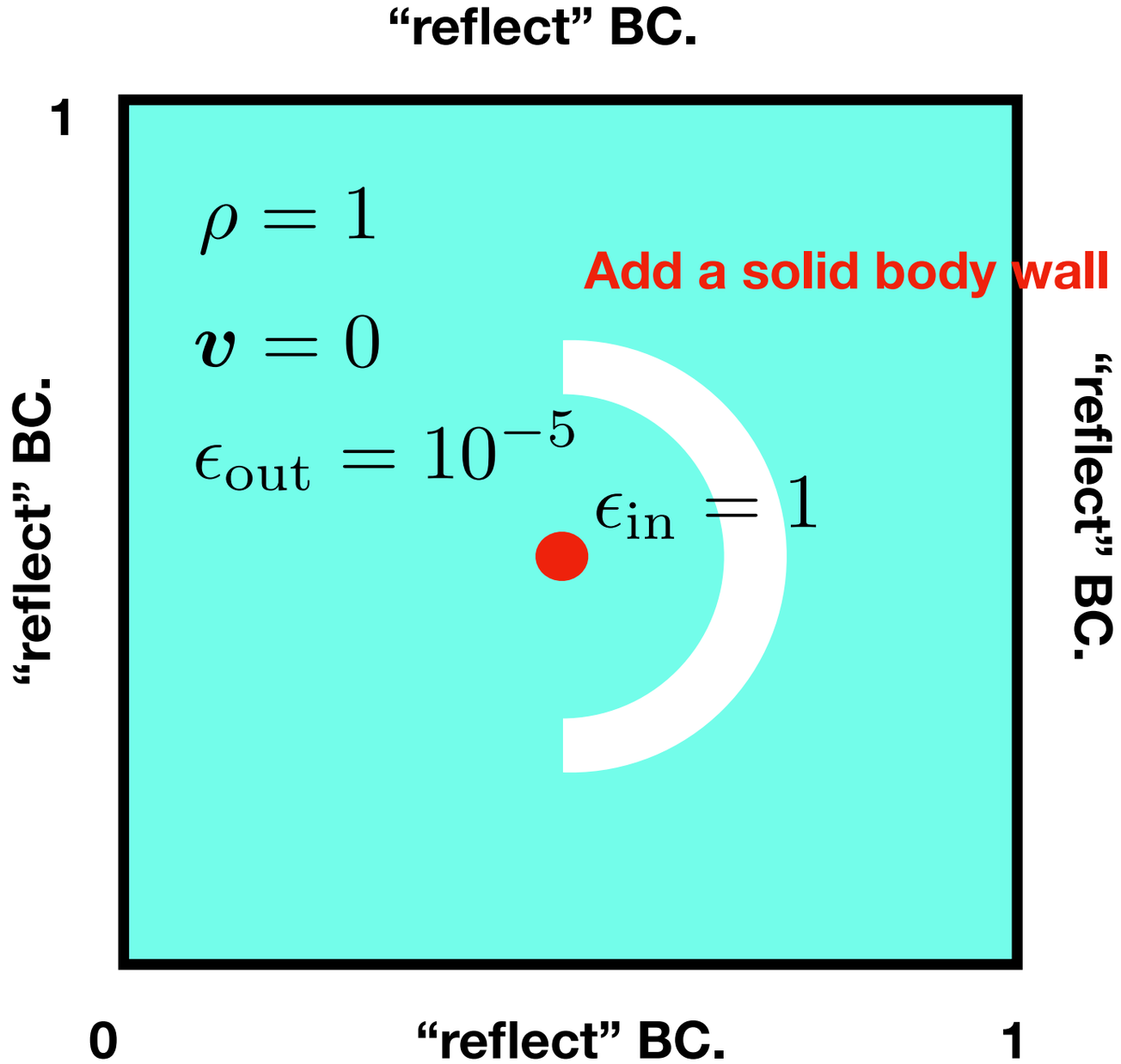


Exercise 1: Add runtime parameters



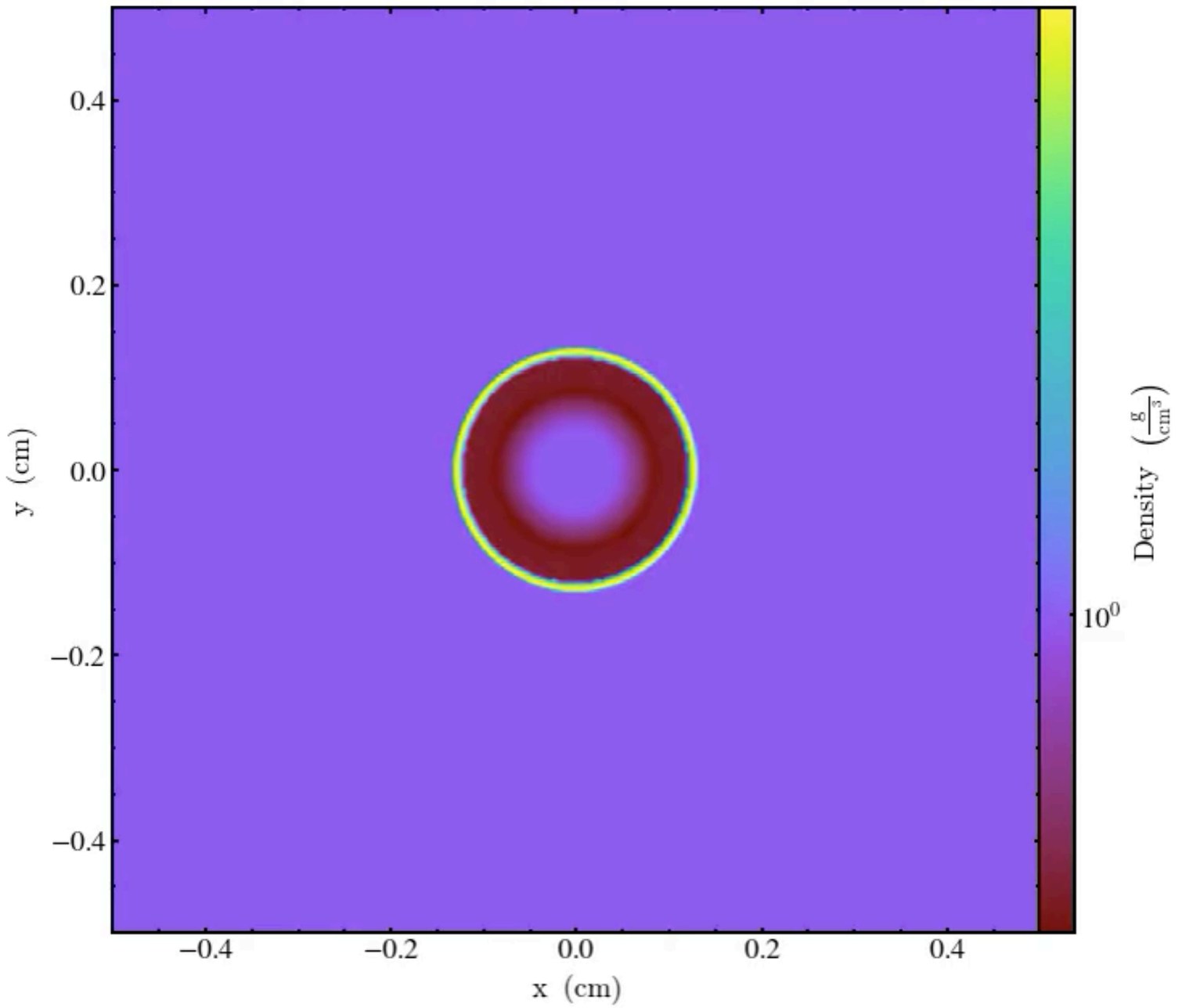
1. We only have one runtime parameter “sim_rho0”.
2. Change “sim_rho0” to “sim_rho_out”
3. Add four more runtime parameters to describe the explosion: “sim_r_explode”, “sim_rho_in”, “sim_e_out”, and “sim_e_in”

Exercise 2: Add a solid wall



1. In Config, add a new variable "VARIABLE BDRY"
2. Set positive values of solnData(BDRY_VAR, i,j,k) for boundary regions and negative values for fluid region.

Exercise 2: Add a solid wall



Exercise 3: Make your own simulation!

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