FARGO3D / RADMC3D Tutorial (Bormio 2020)

1 FARGO3D

1.1 Standard fargo setup

1. Compile the standard setup with `make SETUP=fargo` and run the fargo3d executable with `./fargo3d setups/fargo/fargo.par`. You may use the utilities provided in `plot_fargo.py` as a starting point. Compilation with `make view` enables live plotting with matplotlib during the simulation run.
   The default configuration simulates planet-disk interaction with a Jupiter-mass planet.

2. Now try to change the planet mass to e.g. $5M_{\rm jup}$ and $30M_{\rm earth}$ and see what happens (edit planets/jupiter.cfg). You can also add another planet and activate migration.

3. What happens if you modify the aspect ratio?

4. Is angular momentum conserved in the simulation?

1.2 Multifluid setup

1. Now switch to the `fargo_multifluid` setup. It includes three different dust species with Stokes numbers of 0.1, 1 and 10 (see `fargo_multifluid.par`). How does the dynamics change with the Stokes number?

2. What happens if you switch of dust feedback (in `condinit.c`)?

2 RADMC3D

2.1 Simple dust envelope and disk

1. After `radmc3d` and `radmc3dPy` have been installed go to `examples/run_simple_1` and look at `problem_setup.py`.

2. Generate the input files and execute the command `radmc3d mctherm`. You should then find the dust temperatures in the file `dust_temperature.dat`

3. Now run `problem_plotexamples.py` to generate an example image and SED

4. Try the same with the setup `run_ppdisk_simple_2`. Generate multiple images at different wavelengths.

5. Compute SEDs for the same setup face-on and edge-on.

2.2 Synthetic image based on a model with FARGO3D

2.2.1 Opacities

1. Run `example_run.py` in the `opac/dust_continuum/bohrenhuffman_python` folder
2. Implement a function that creates an opacity file for a given dust size. Hint: useful functions are in `makedustopac.py`.

2.2.2 Postprocess FARGO3D outputs

1. Have a look at the file `run_radmcmodel.py` and `radmcmodel.py`.
2. Postprocess outputs with the given files. Test different inclinations and check if the dust settling correction works.
   In case the simulations did not run, different outputs of `FARGO3D` are provided in the repository.
3. Convolve the image with a beam.