Graduate Course on Planet Formation
Assignment 2

Professor Hanno Rein

Due: 11am, Friday, November 6th

2D Planet Disk Interactions

Download the FARGO code `http://fargo.in2p3.fr`. You will use it to simulate a 2D protoplanetary disk with one embedded planet. Here, we only use the hydrodynamic part of FARGO (i.e. no MHD), we also don't need any of the parallelization features.

Read through the documentation and setup a simulation with a constant disk surface density and a disk thickness of 0.05. Turn on viscosity and set it to a value of 0.001. Choose a setup where the disk feels the planet, but the planet does not feel the disk (i.e. the planet's orbit is fixed). This makes the setup much simpler; for example, the surface density scales out.

Run multiple simulations with a resolution that allows you to finish the runs in a reasonable amount of time (don't worry too much about convergence). Place a planet with varying mass at an orbit at $r = 1$ and determine experimentally when the planet is massive enough to open a clean gap in the disk. To do that, you might want to plot the surface density profile after 100 orbits. Compare your experimental result to an analytic estimate for the mass required for gap opening.