MTH 499 CSUMS Presentation 1: The Brown Dwarf Desert

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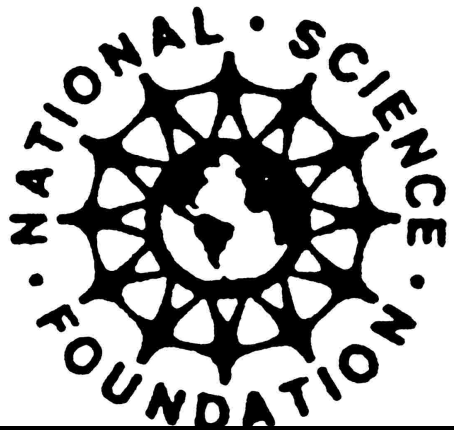

- Research Topic: The Brown Dwarf Desert
- Field Generator Update
- Significance

- Draw two random masses from the IMF
- Determine the core mass, M
- Assume a Bonnor-Ebert (BE) sphere
- Generate Gaussian perturbation spectra cubes
- Superimpose BE spheres on cubes
- Determine binary angular momentum, J
- Draw a random eccentricity
- Calculate orbital semimajor axis
- Calculate orbital period

- IMF = initial mass function
- IMF describes the frequency that stars with particular masses are formed
- Randomly select two stars from the IMF
- Redraw if we do not get a brown dwarf and a main sequence

- Call the two star masses m_1 and m_2
- Core = gas cloud from which the stars condensed
- The core mass, M, is related to m_1 and m_2
- $M = \frac{m_1+m_2}{\epsilon_*}$
- ϵ_* is star formation efficiency
- Some mass is expelled during the formation process

- Describes gas pressure balance with gravitation
- Density distribution determined by this model
- Core is critically stable about when $\chi = \frac{p_c}{p_{edge}} = 14$
- Simulation uses $\chi = 10$ as a good approximation

- My original task
- Generates three cubes of sides of 128 cells
- Cubes correspond to x, y, and z components
- Generator assigns random angular momenta
- Generator recurrence should not be an issue

- Assigns angular momenta to the core
- Net angular momenta tends to result
- Large scale eddies responsible

- Consider ϵ_J, angular momentum efficiency
- Parameter fixed by ϵ_*
- $J\epsilon_J = J_{binary}$

- How circular is the orbit?
- Used to help calculate orbital characteristics

- Found with previously calculated or generated data
- Semimajor axis provides measure of orbital separation
- Orbital period provides additional important information

- Period
- Semimajor axis
- Eccentricity
- Binary mass ratio
- Binary mass total
- Core mass
- Core specific angular momentum
- Core Mach number

- Test the code
- Compare to old results by examining CDFs
- Restructure IMF to use Rosin-Rammler form
- Conduct primary simulations
- Analyze the results
- Write paper

- I am being challenged with new material.
- The project is progressing well.