

Numerical Modeling of Protoplanetary Disks

Samuel Esparza, Sharmin Ashrafiki, Lorin Matthews PhD

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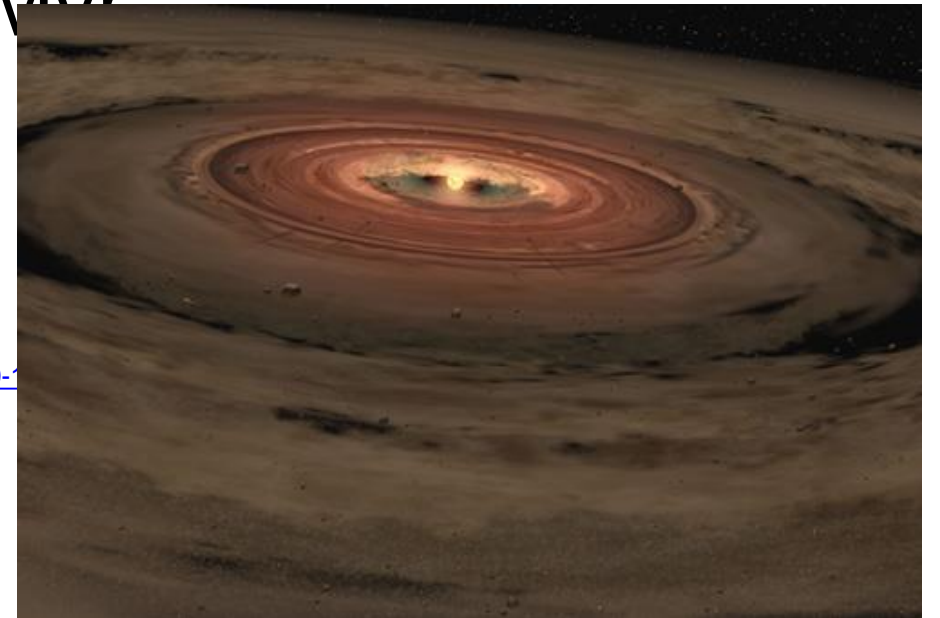
- Defining a Protoplanetary Disk
- What must you do to model a Protoplanetary Disk
- The basics of Modeling
- Specific Modeling Projects
 - Discrete Stochastic Charge radius vs charge
 - DSC current ratio vs Charge
- Conclusions

What is a protoplanetary disk?

- A large area in space filled with space dust
- Space dust collides with each other in a variety of ways
- Hit and stick, bounce, shear, roll
- Planets formed over a period of Myr

Armitage, P. J. (2011). Dynamics of Protoplanetary Disks.

Annual Review of Astronomy and Astrophysics, 49(1), 195–236. <https://doi.org/10.1146/annurev-astro-081710-1>

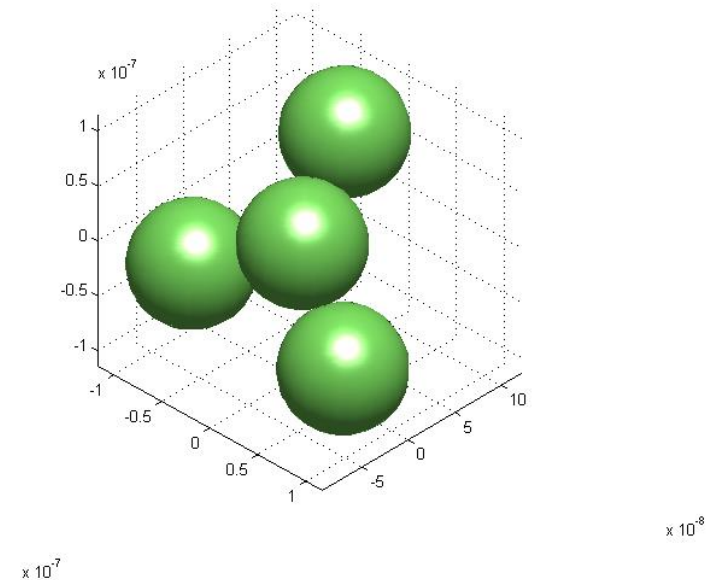
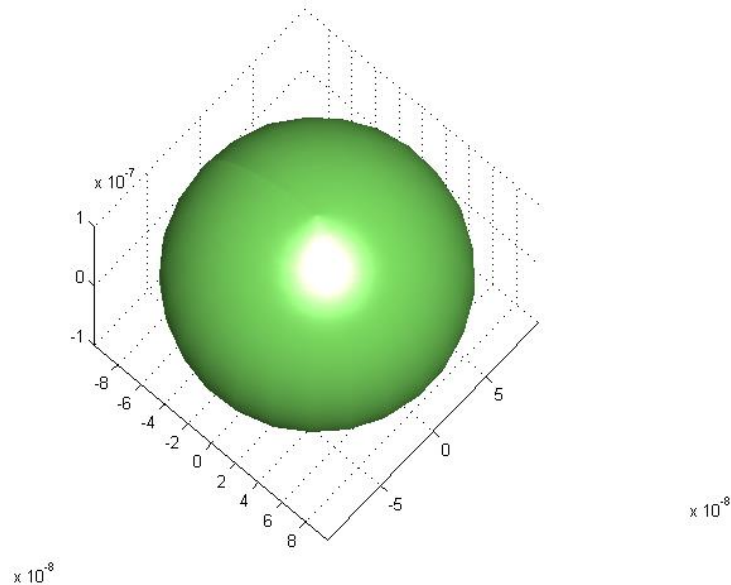


How do you model a protoplanetary disk?

- Matlab and Unix
- Creating Monomers
- Plotting collisions
- Building Aggregates
- Charging dust grains
- Plotting Aggregate models

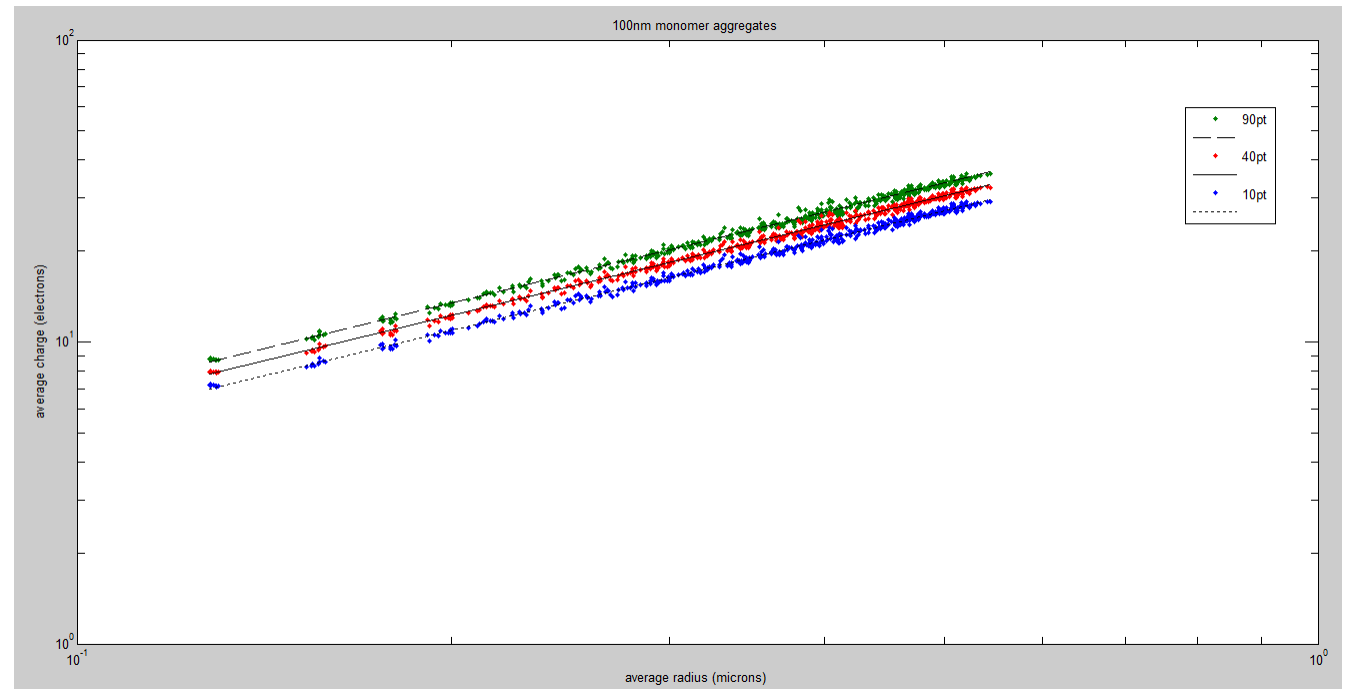
Basic Aggregate Modeling

- Aggregate construction
- Varied mass, radius and number of monomers (agg_par)
- How to view created aggregate



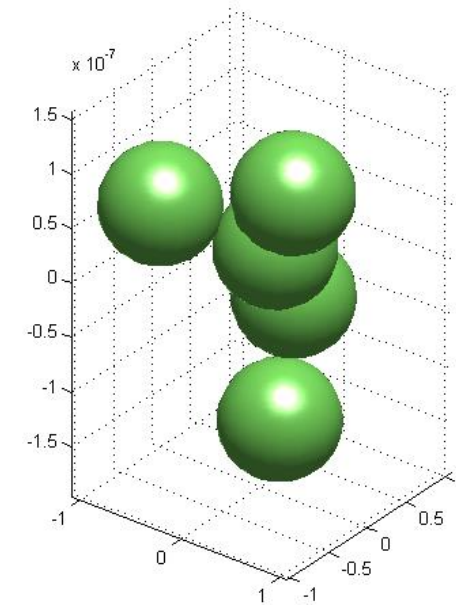
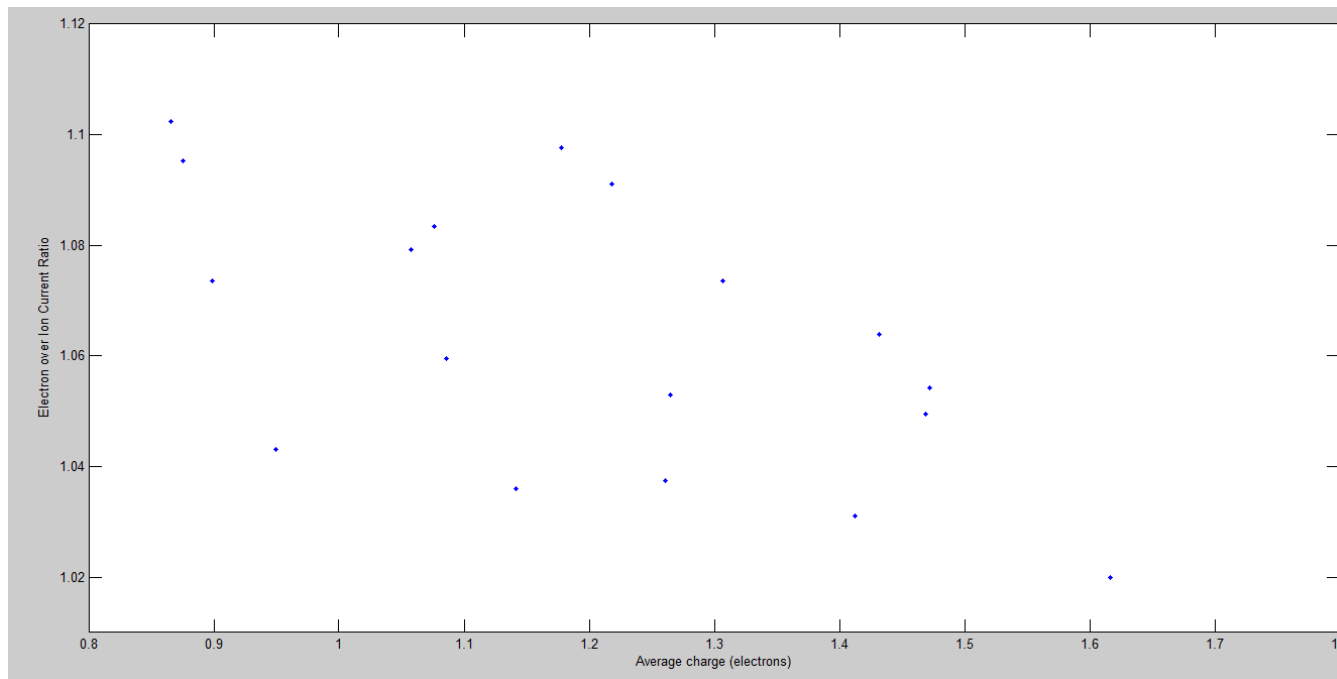
Specific Modeling

- Discrete Stochastic Charging
- Varying “points on a sphere”
- Charted average charge vs radius for different #points



Current vs charge

- Charged various aggregates
- Plotted Current ratio and average charge
- Collected data on aggregate with equilibrium charge



$\times 10^{-7}$

$\times 10^{-7}$

Conclusions

- The modeling of planet formation is widely multifaceted
- Modified code must align with all variables and functions
- Back up your data outside Kodiak

Works Cited



- Armitage, P. J. (2011). Dynamics of Protoplanetary Disks. Annual Review of Astronomy and Astrophysics, 49(1), 195–236. <https://doi.org/10.1146/annurev-astro-081710-102521>
- Challenges in planet formation -Morbidelli -2016 -Journal of Geophysical Research: Planets -Wiley Online Library. (n.d.). Retrieved July 7, 2017, from <http://onlinelibrary.wiley.com/doi/10.1002/2016JE005088/full>

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