

The background image is a high-resolution simulation of a protoplanetary disk. It features a central, bright yellow-orange star surrounded by a dense, multi-layered disk of gas and dust. The disk exhibits prominent spiral arms and concentric rings, suggesting the presence of protoplanets or vortices. The colors transition from bright yellow at the center to deep reds and oranges in the inner disk, and finally to dark browns and blacks in the outer regions. The overall scene is set against a black background speckled with distant stars.

Charles Abod
Jake Simon

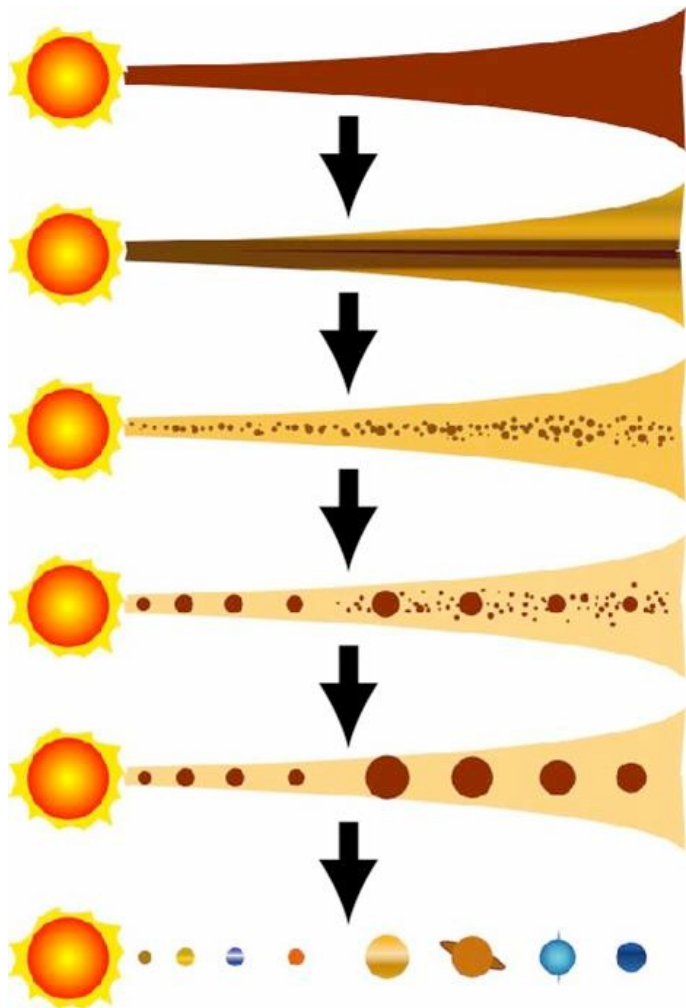
Simulating Planetesimal Formation with Varying Pressure Gradients

Motivation

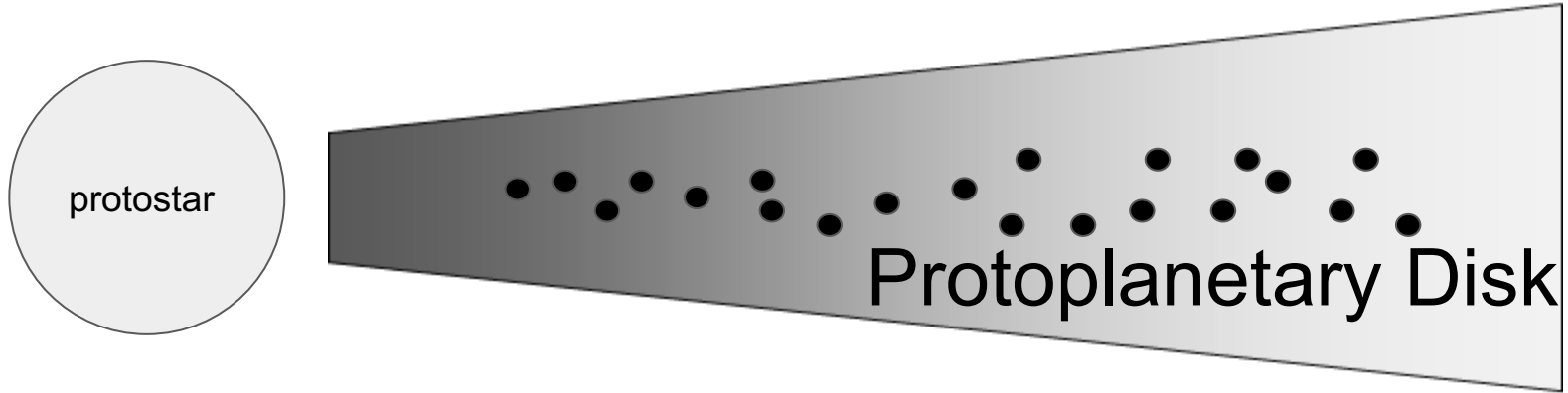
We want to
look here.

Initial planetesimal form

[For the experts]: This is where the streaming instability occurs
(see Johansen & Youdin)

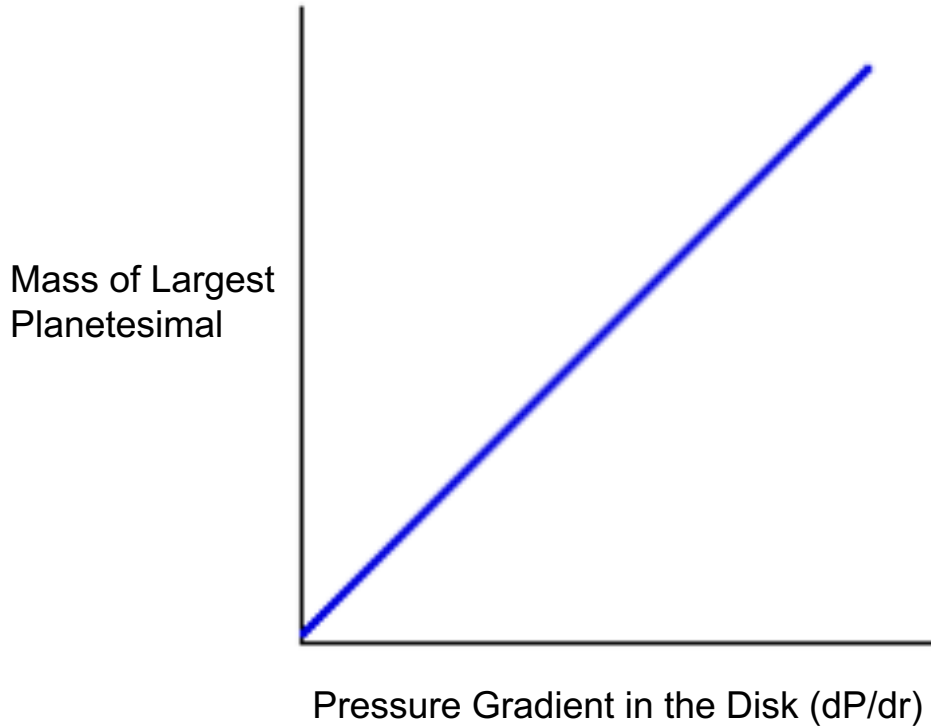


Extremely Detailed Diagram



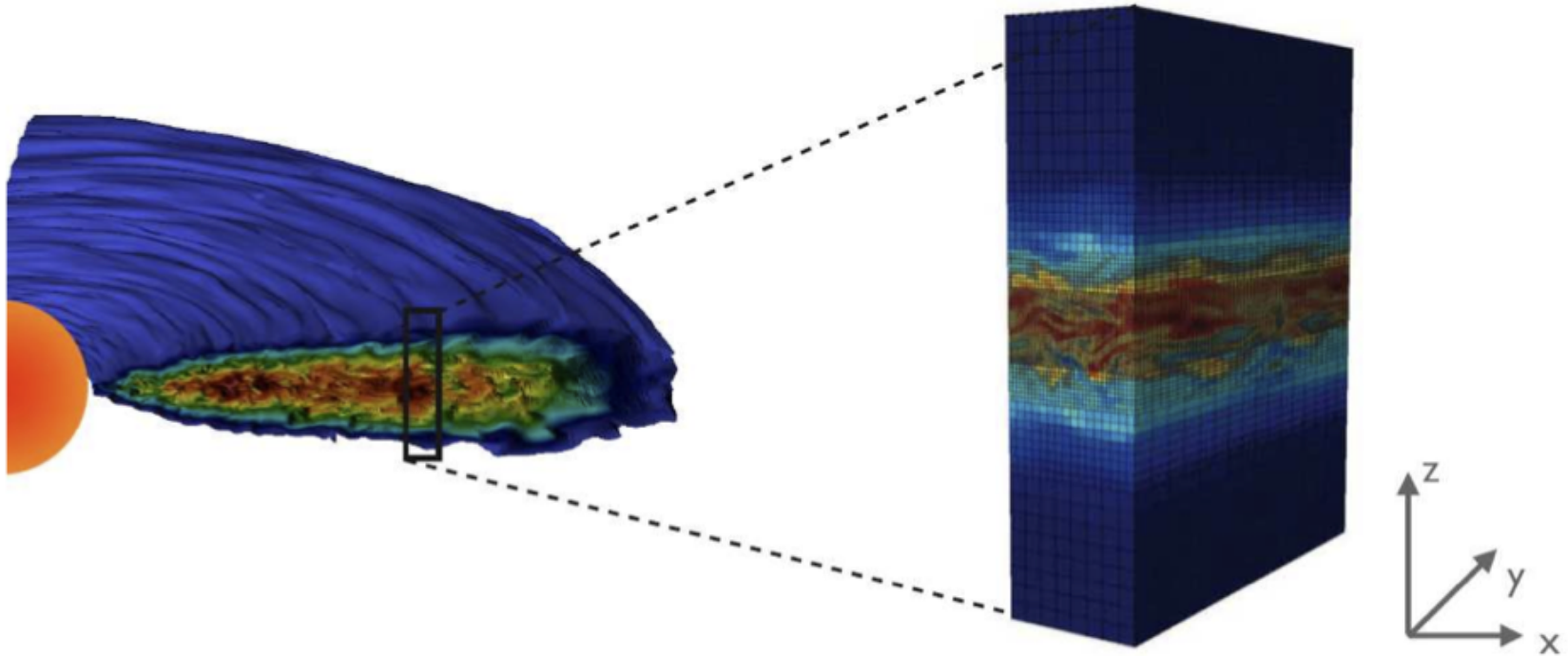
Pressure Gradient
(dP/dr) →

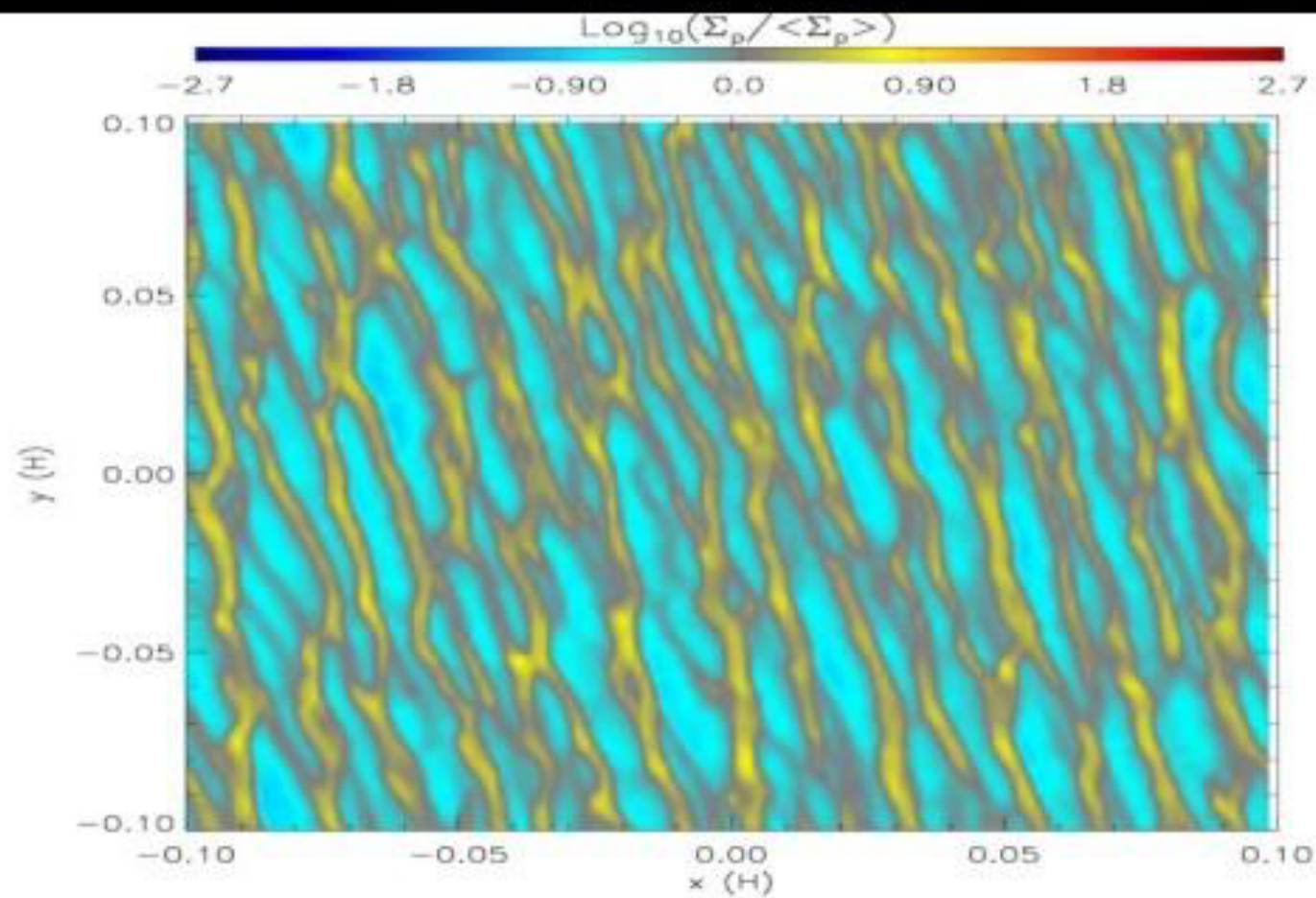
Claim by Taki, et al. (2016)



Method

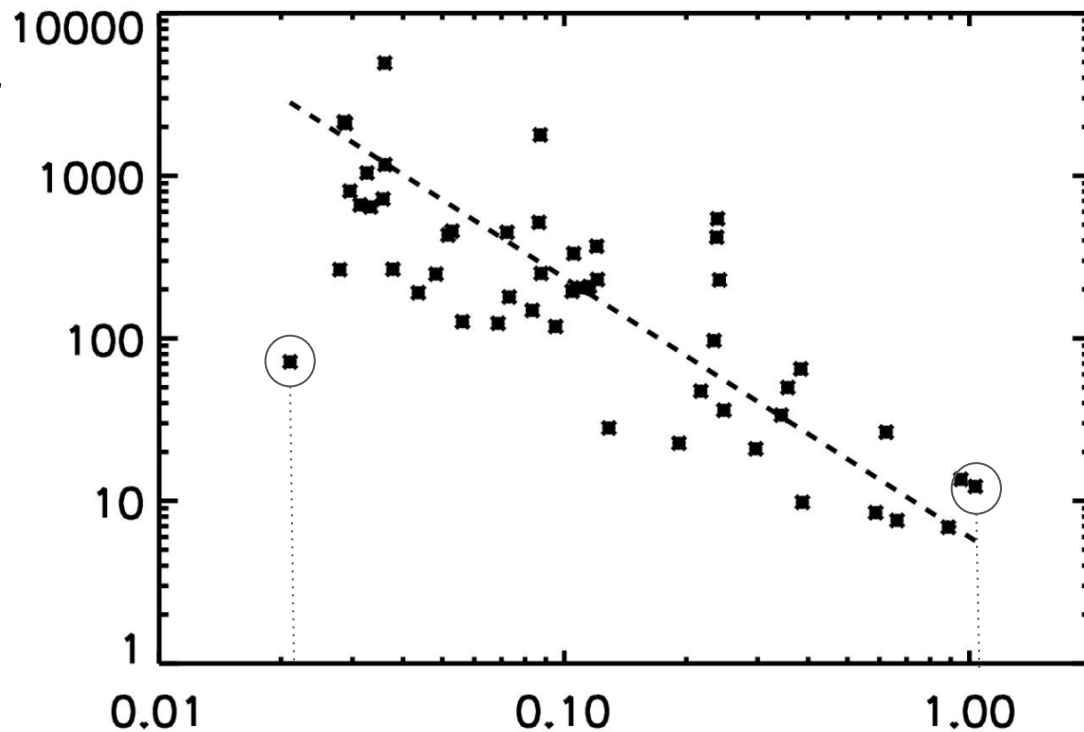
We use a shearing box to look at a small section of the disk





Differential Mass Distribution Plot

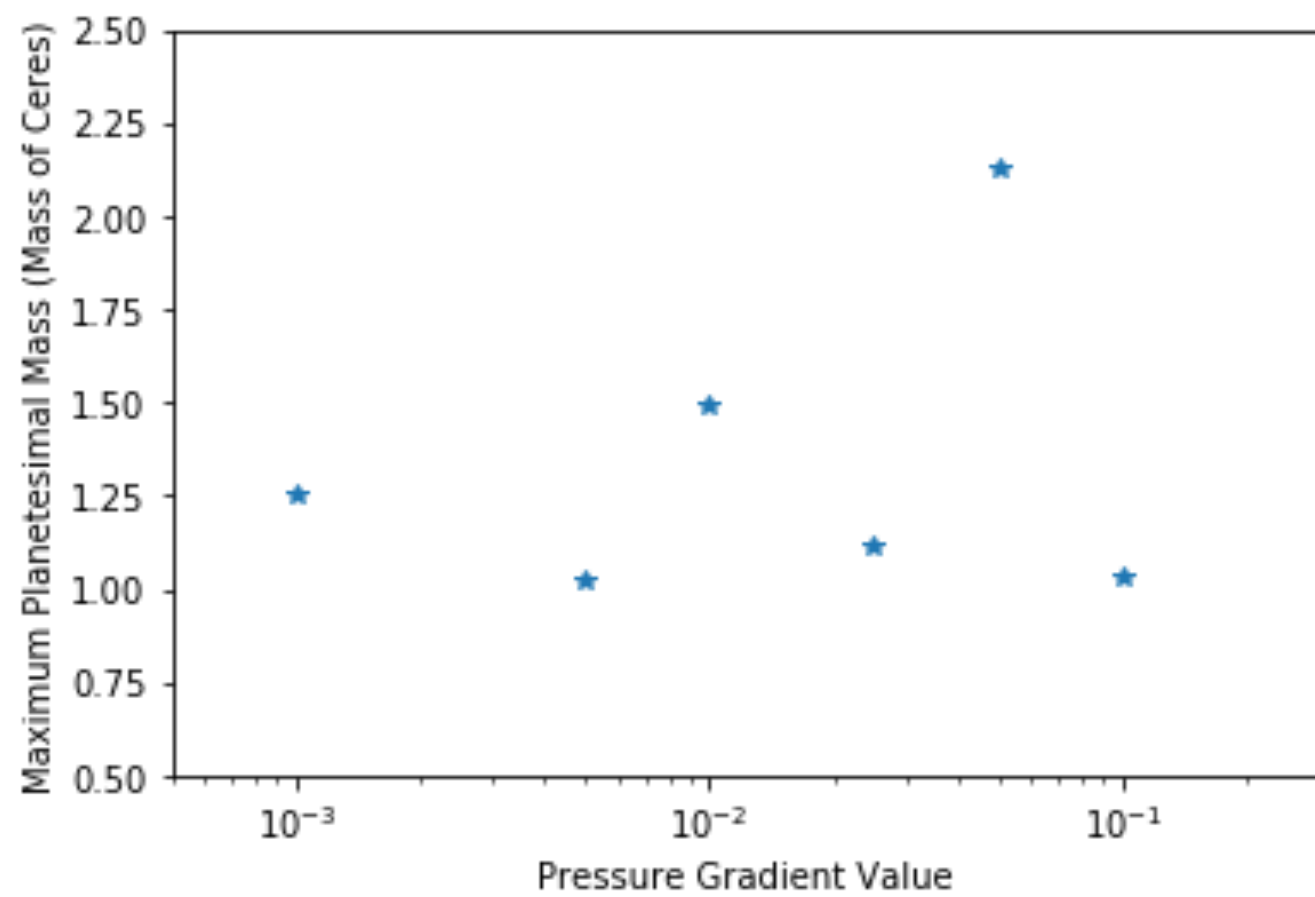
Frequency of
Planetesimal
Mass
(dn/dM_{Ceres})



Planetesimal Masses (M_{Ceres})



$M_{\text{Ceres}} = 9.4 \times 10^{20} \text{ kg}$



Conclusion

>Maximum planetesimal masses in a protoplanetary disk are not correlated with pressure gradient.

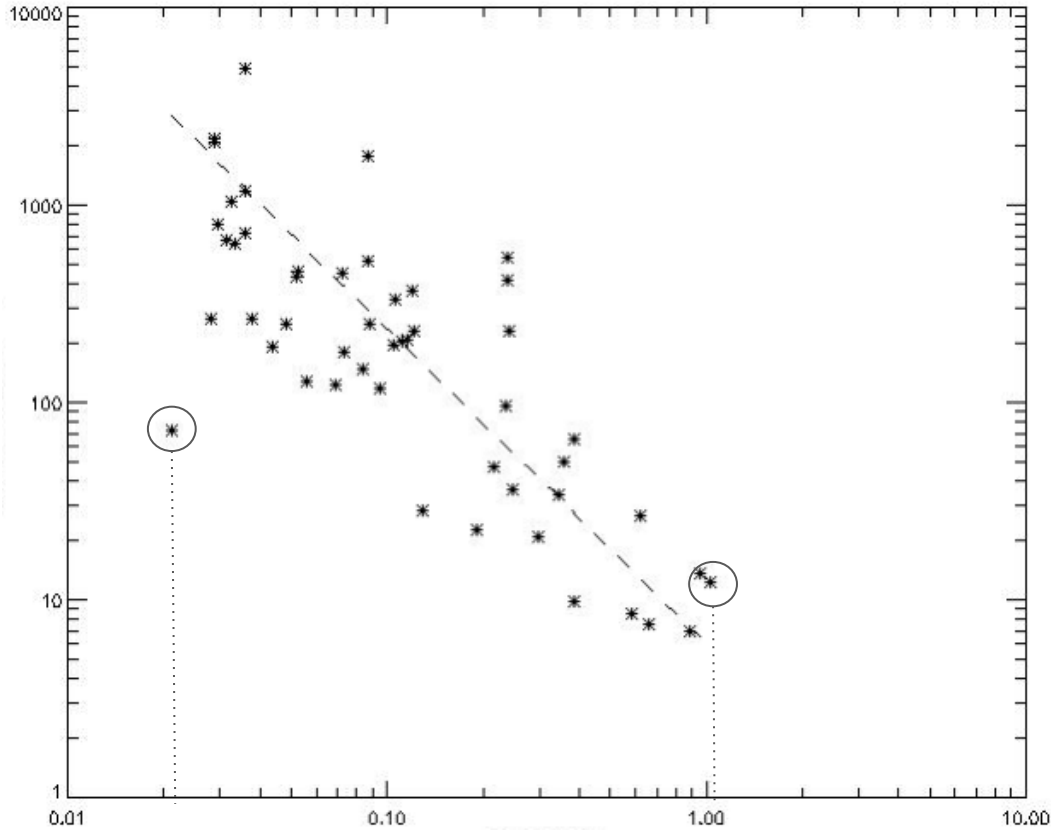
Follow-up inquiries:

- Determine why there is no correlation.
- Does slope and/or planetesimal mass change when varying other disk properties?

Extra Slides

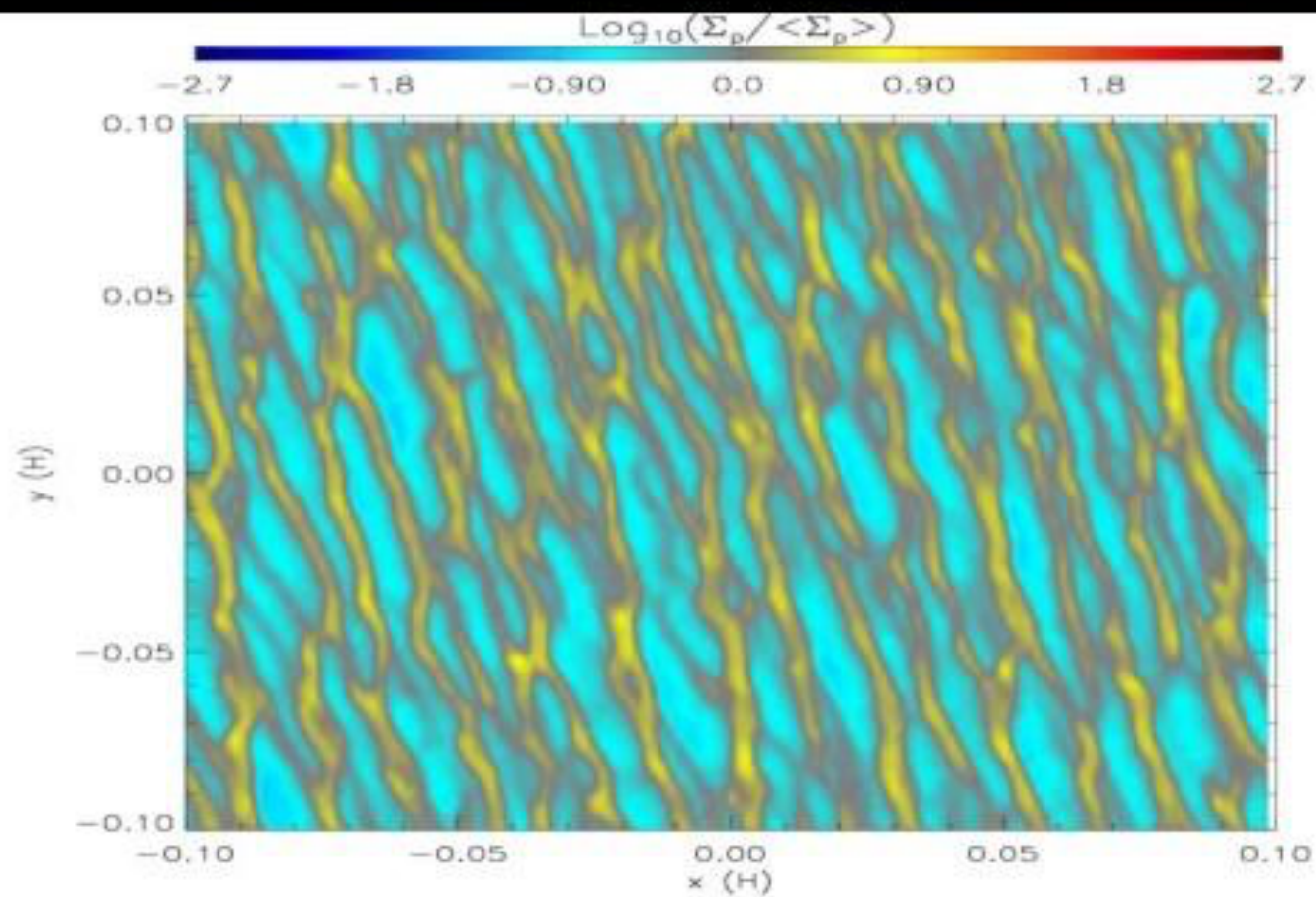
Differential Mass Distribution Plot

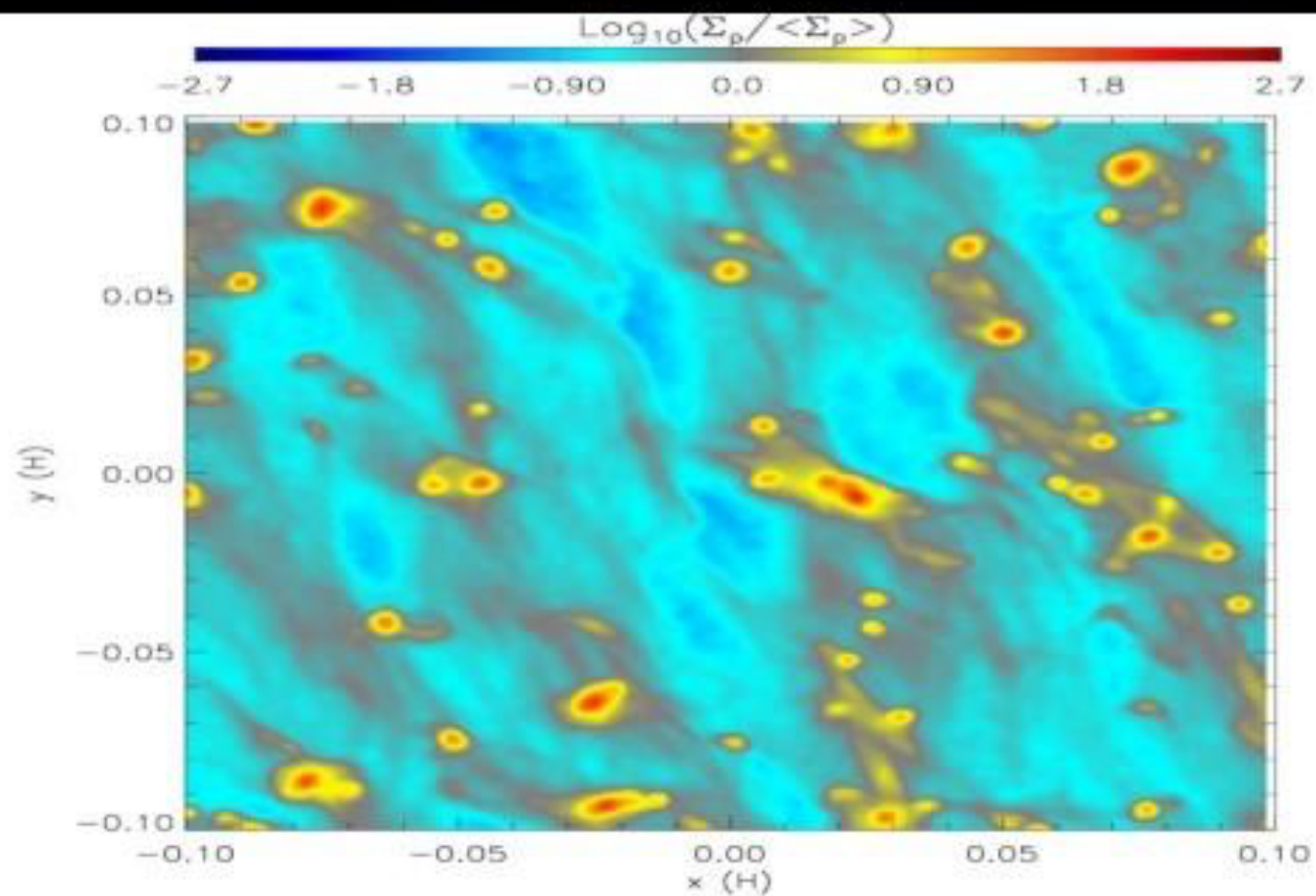
Frequency of
Planetesimal
Mass
(dn/dM_{Ceres})



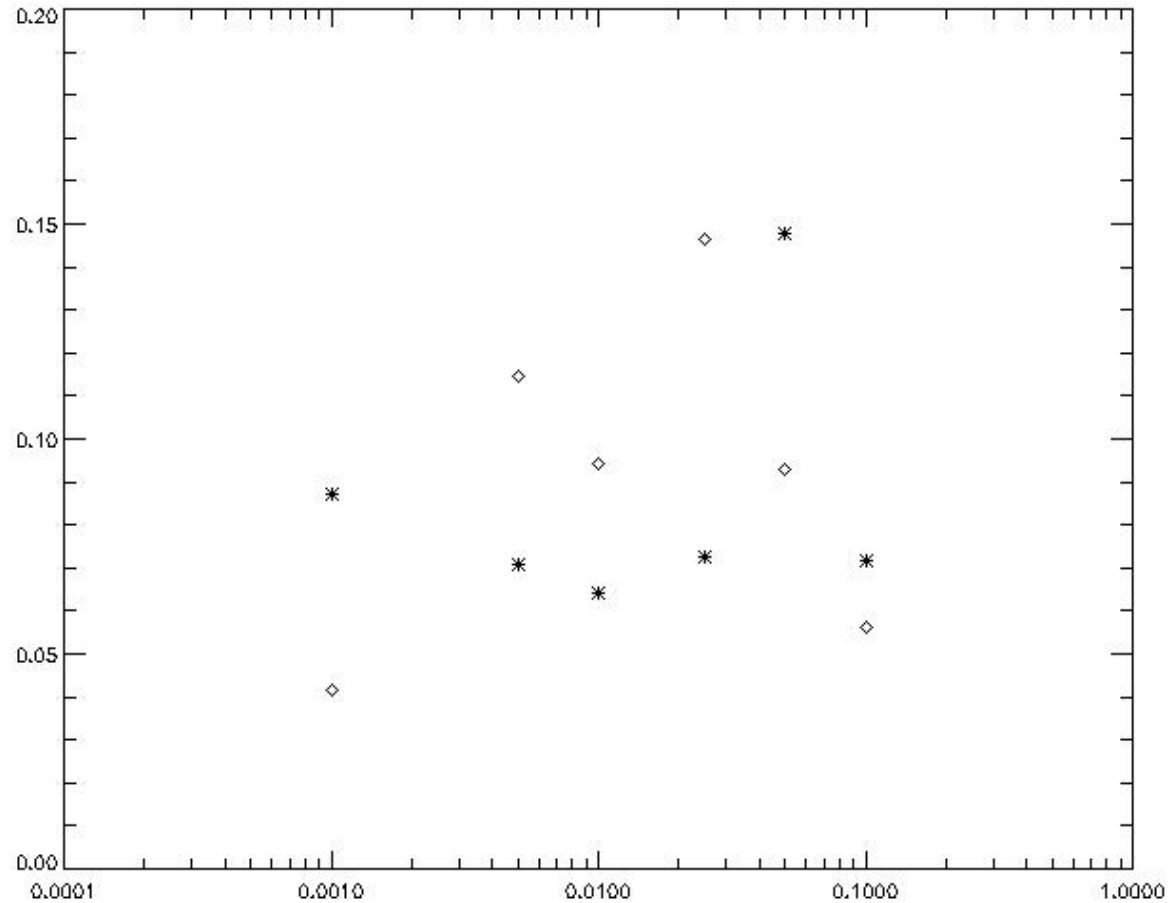
$M_{\text{Ceres}} = 9.4 \times 10^{20} \text{ kg}$

Planetesimal Masses (M_{Ceres})

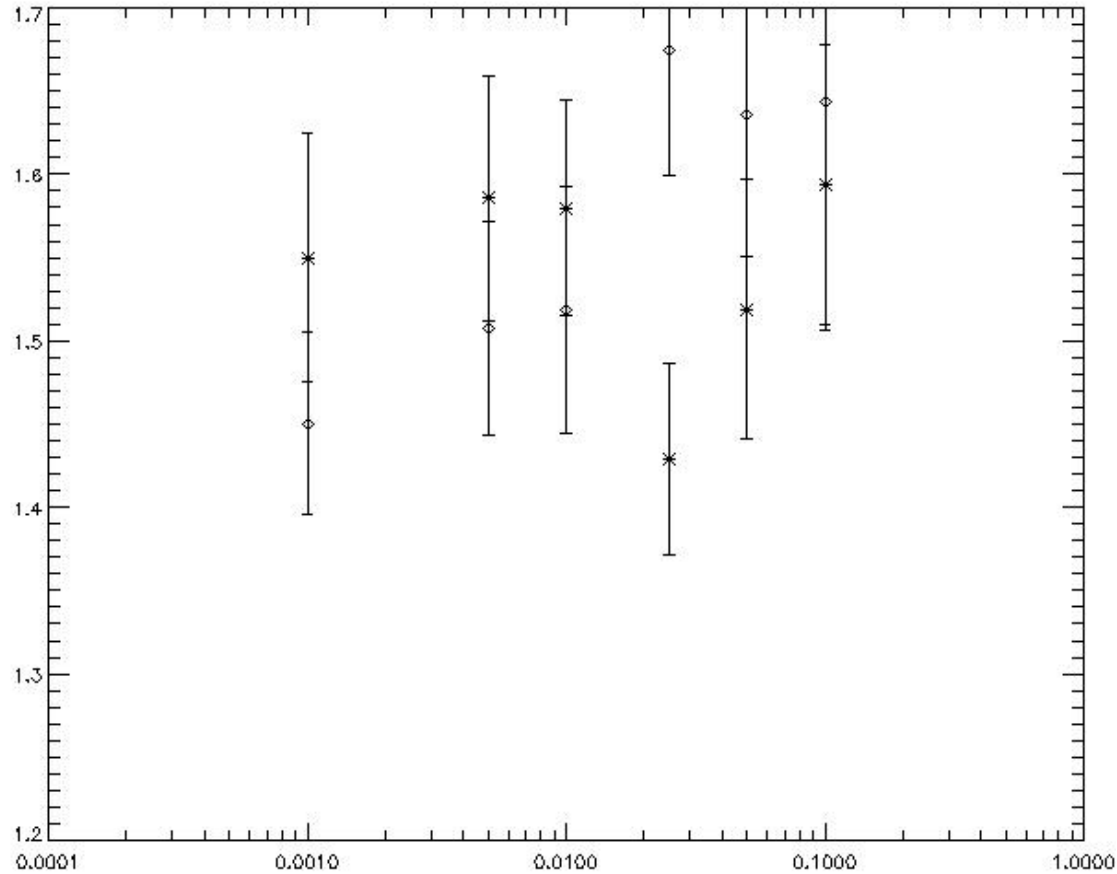




Maximum Mass with respect to Pressure Gradient



Slope Values with respect to Pressure Gradient



Minimum Mass with respect to Pressure Gradient

