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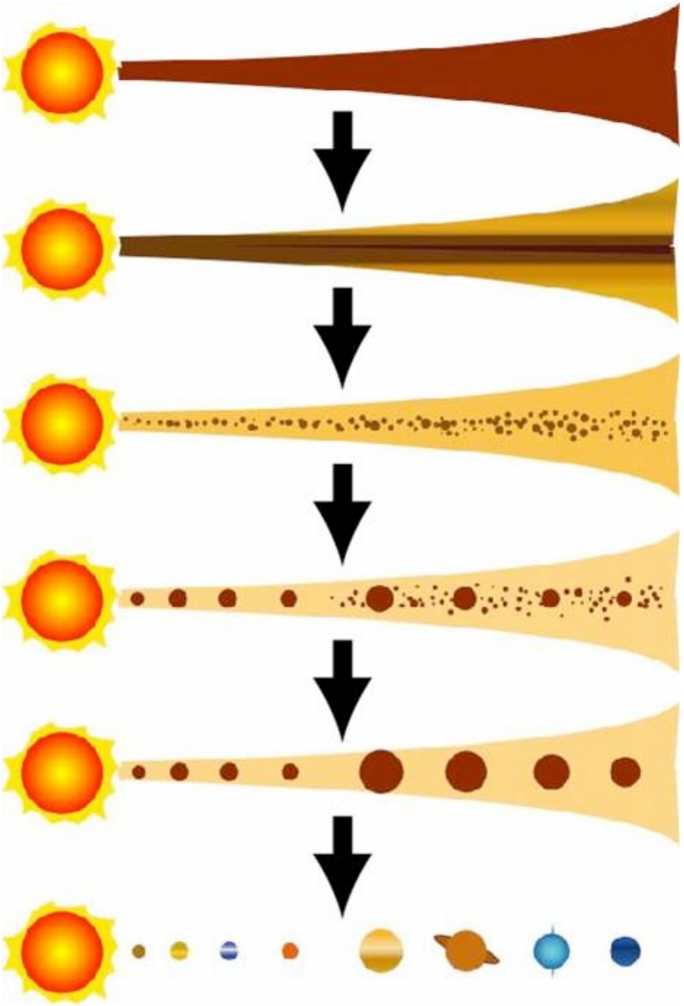
# Simulating Planetesimal Formation with Varying Pressure Gradients

# Motivation

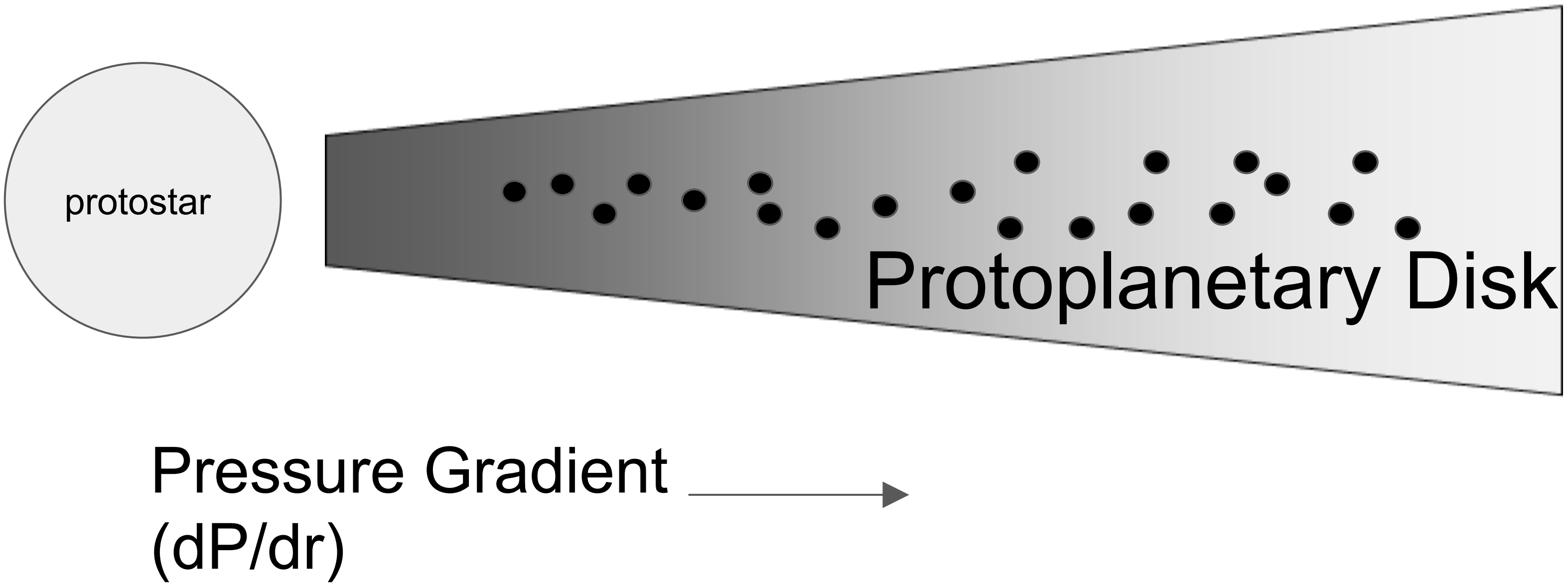


Initial planetesimal form

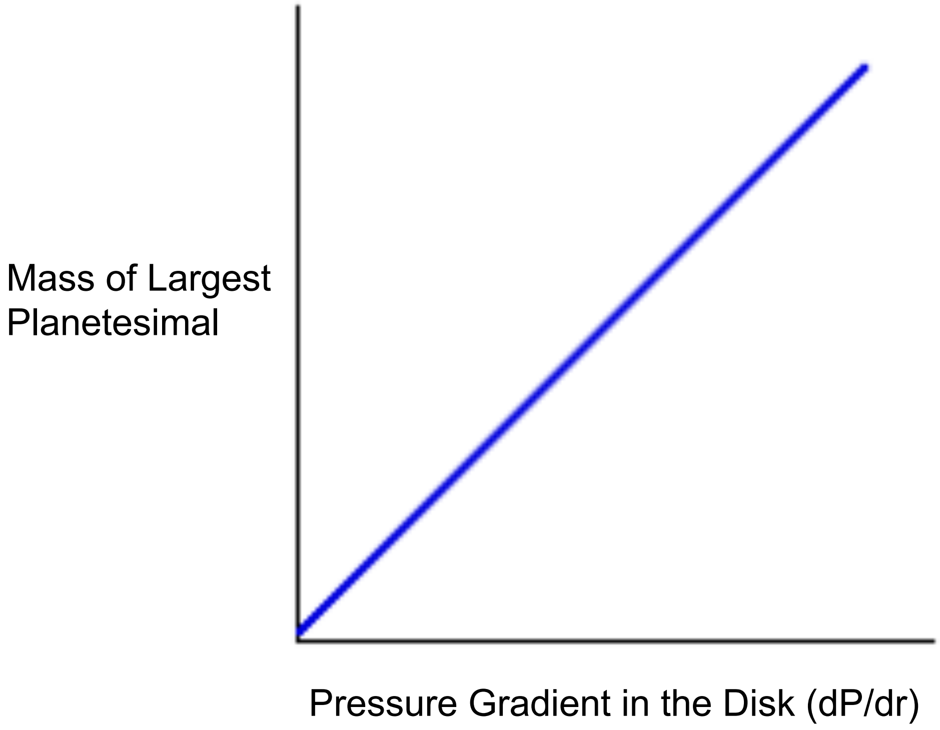
We want to look here.

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

# Extremely Detailed Diagram

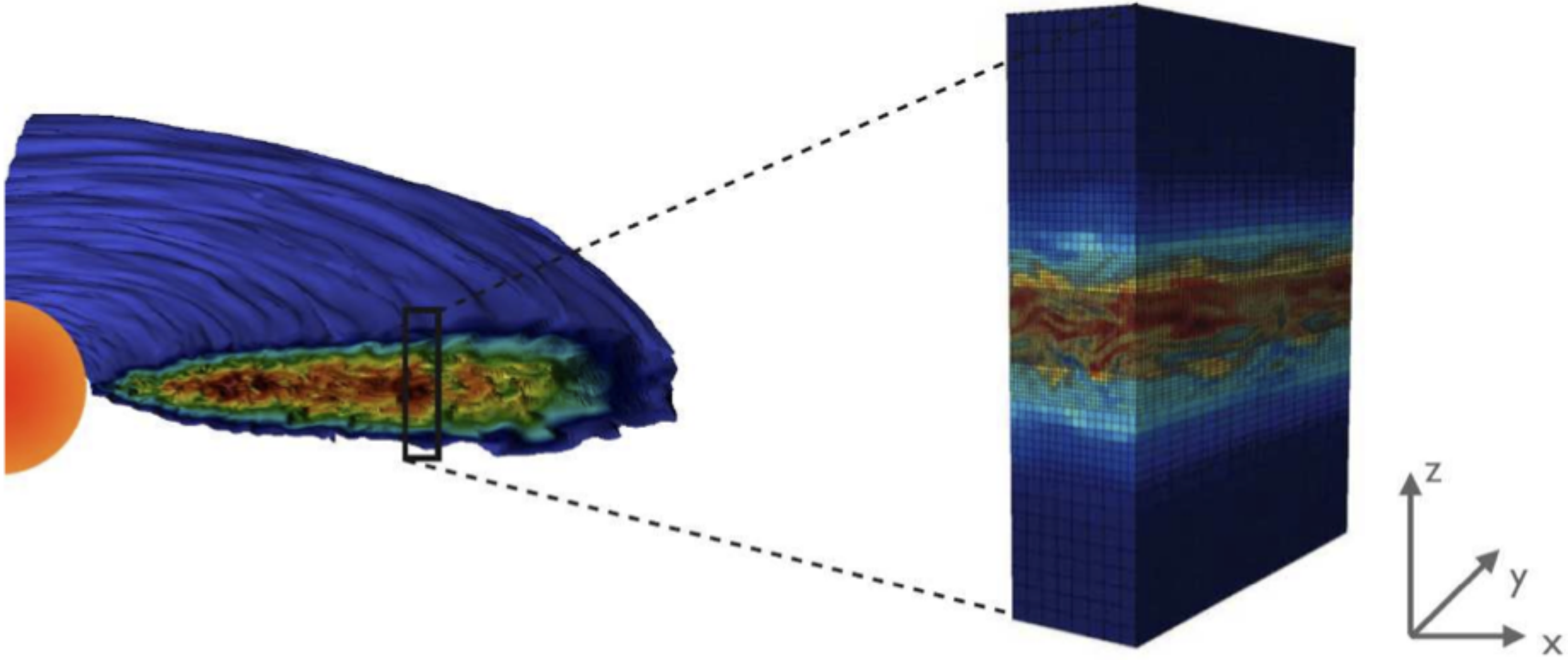


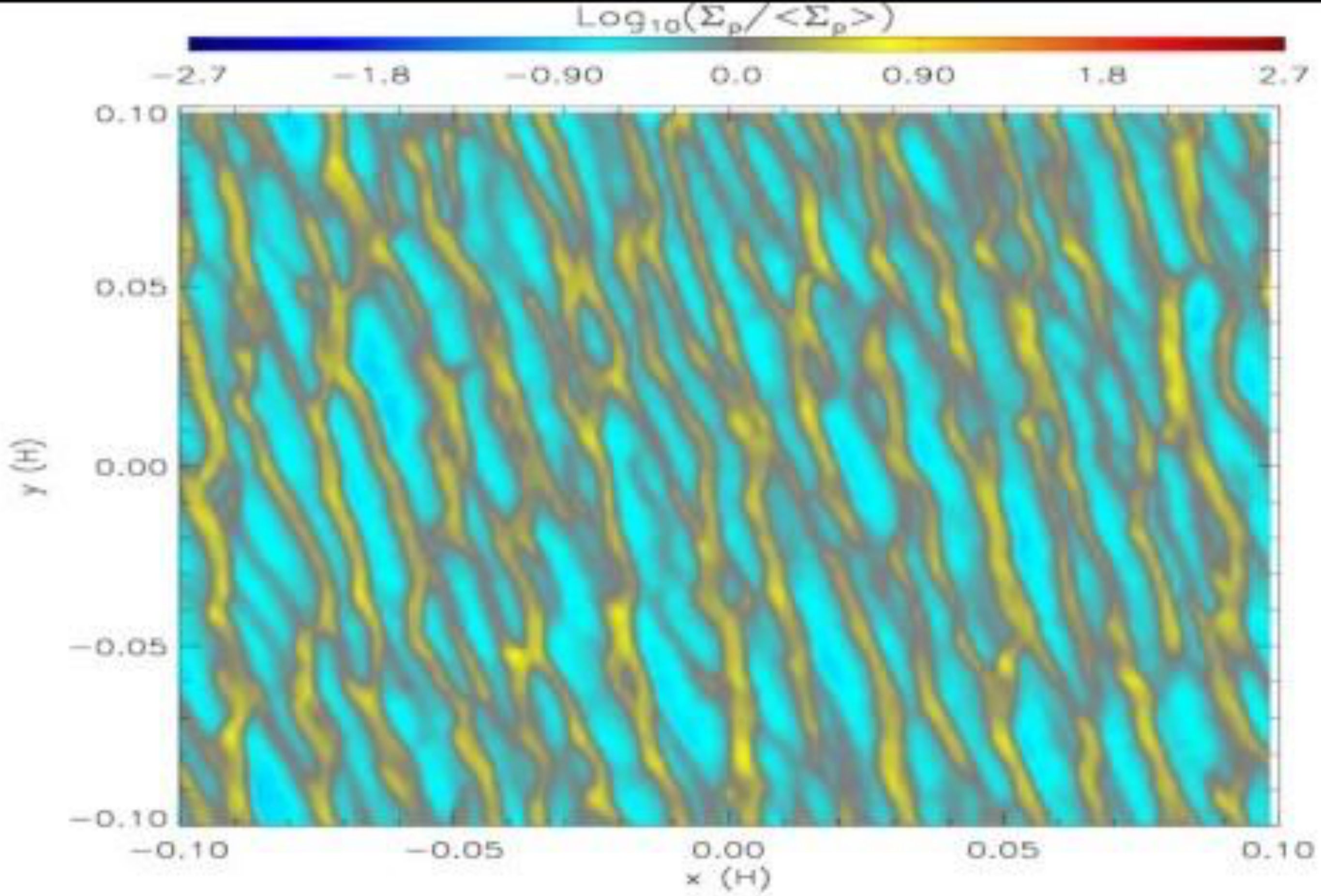
# Claim by Taki, et al. (2016)



# Method

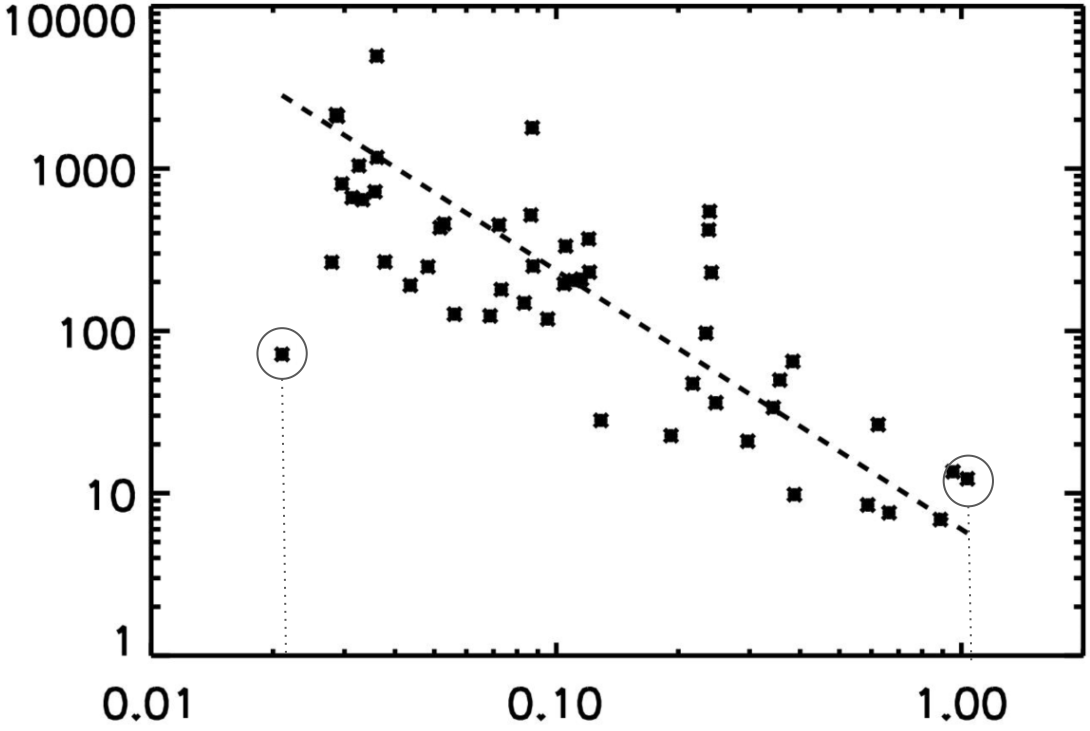
We use a shearing box to look at a small section of the disk




$\mathrm{Log}_{10}(\Sigma_p/<\Sigma_p>)$
−2.7 −1.8 −0.90 0.0 0.90 1.8 2.7
0.10
0.05
0.00
−0.05
−0.10
y (H)
−0.10 −0.05 0.00 0.05 0.10
x (H)

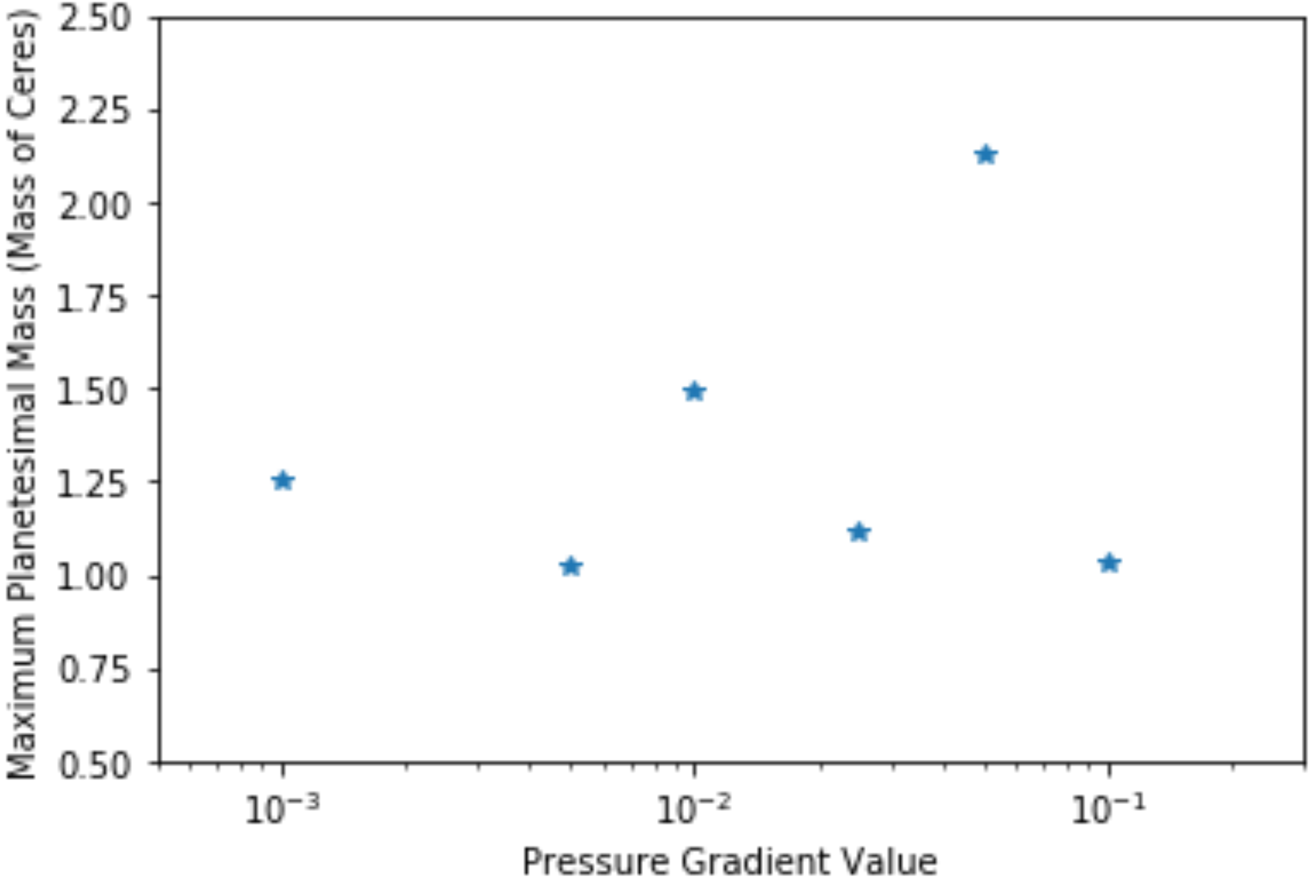
# Differential Mass Distribution Plot

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




Planetesimal Masses ($M_{Ceres}$)

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


Maximum Planetesimal Mass (Mass of Ceres)
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
$10^{-3}$
$10^{-2}$
$10^{-1}$
Pressure Gradient Value

# Conclusion

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

*Follow-up inquiries:*

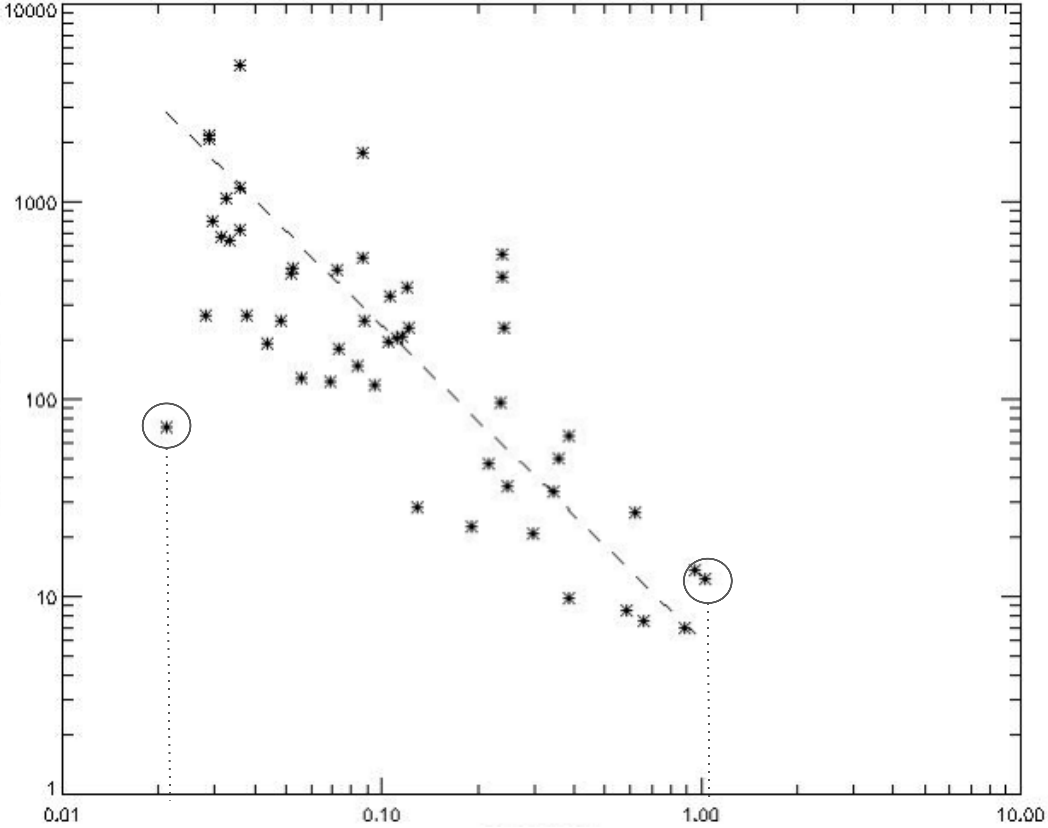
-Determine why there is no correlation.

-Does slope and/or planetesimal mass change when varying other disk properties?

# Extra Slides

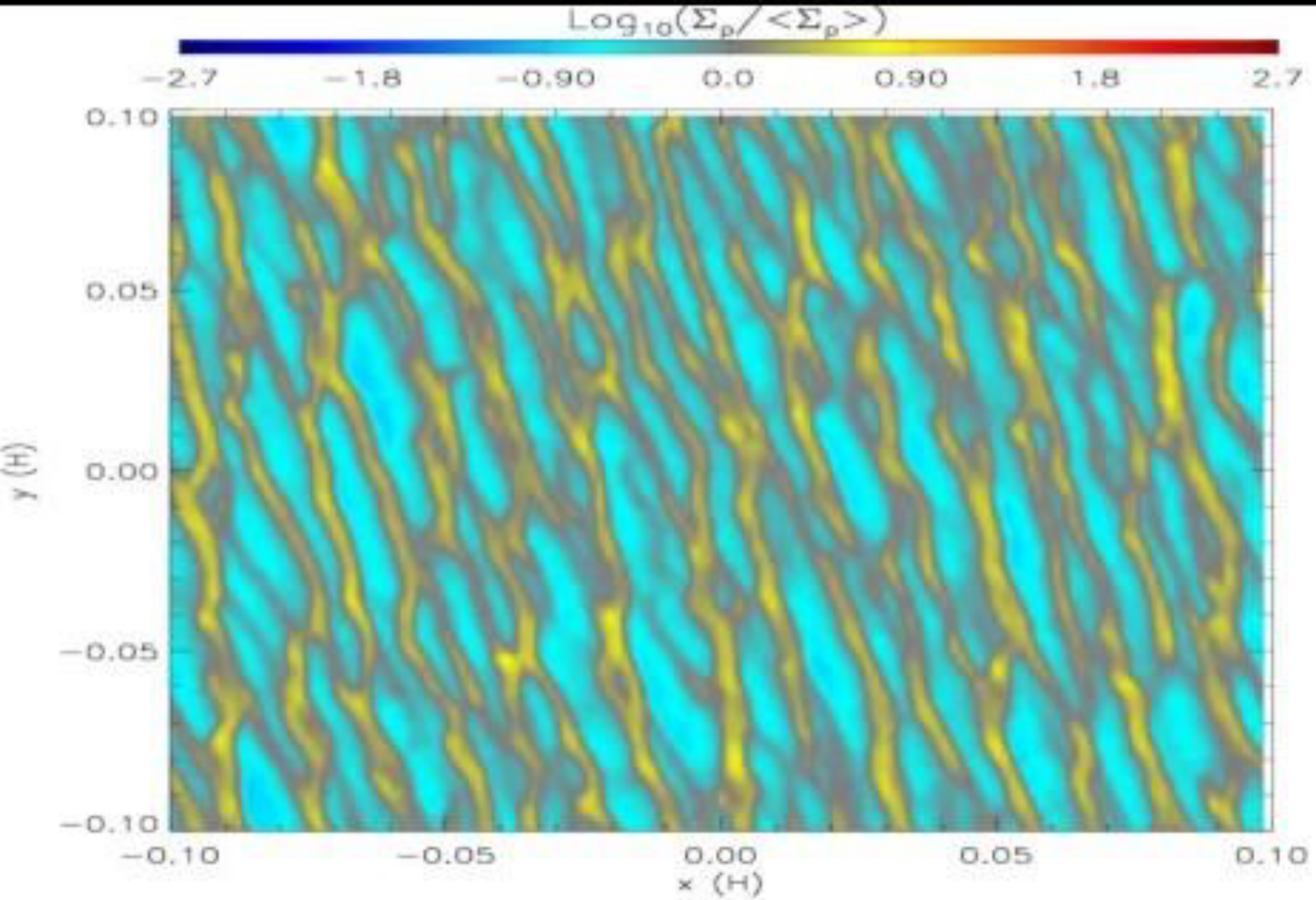
# Differential Mass Distribution Plot

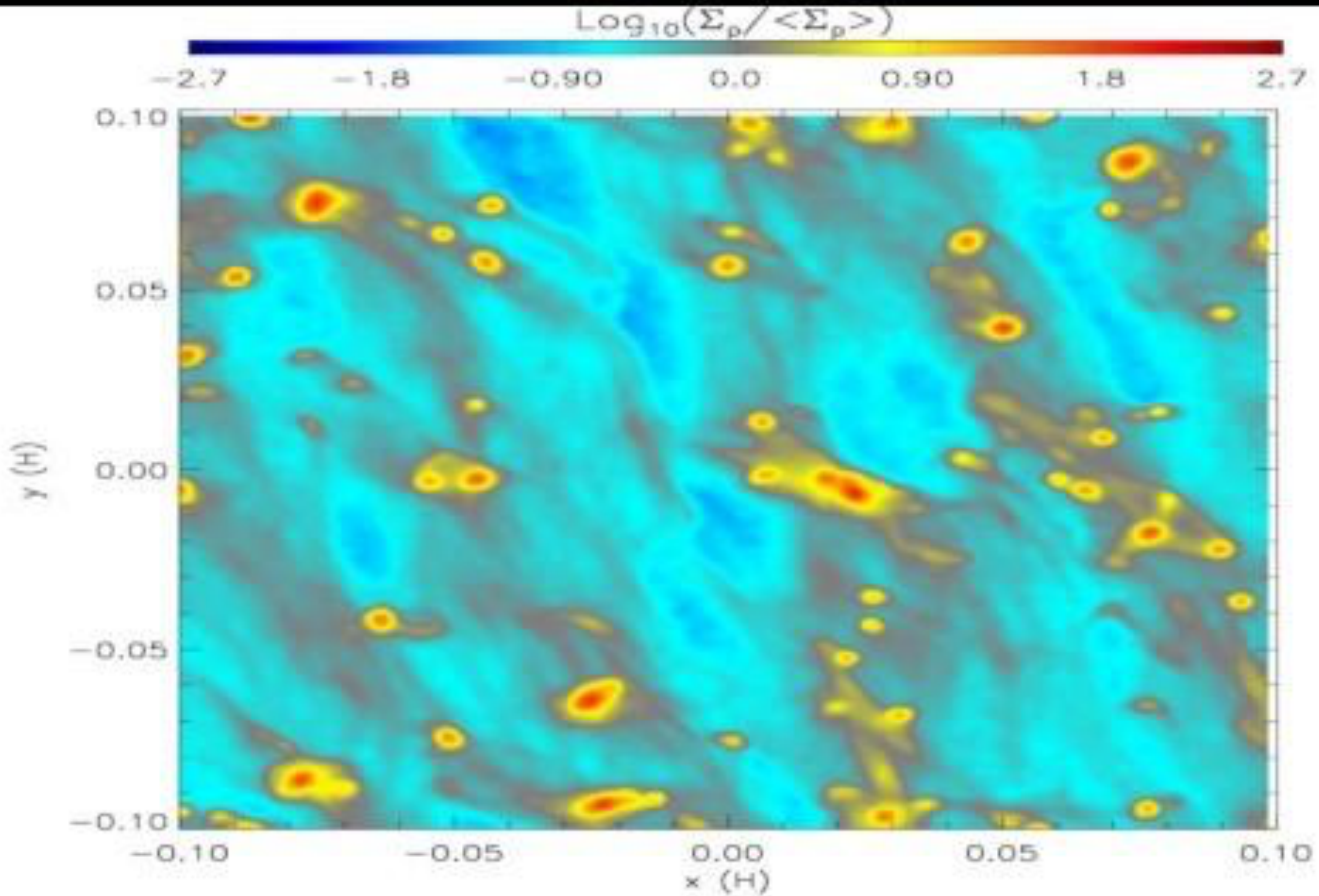
Frequency of Planetesimal Mass ($dn/dM_{Ceres}$)




Planetesimal Masses ($M_{Ceres}$)

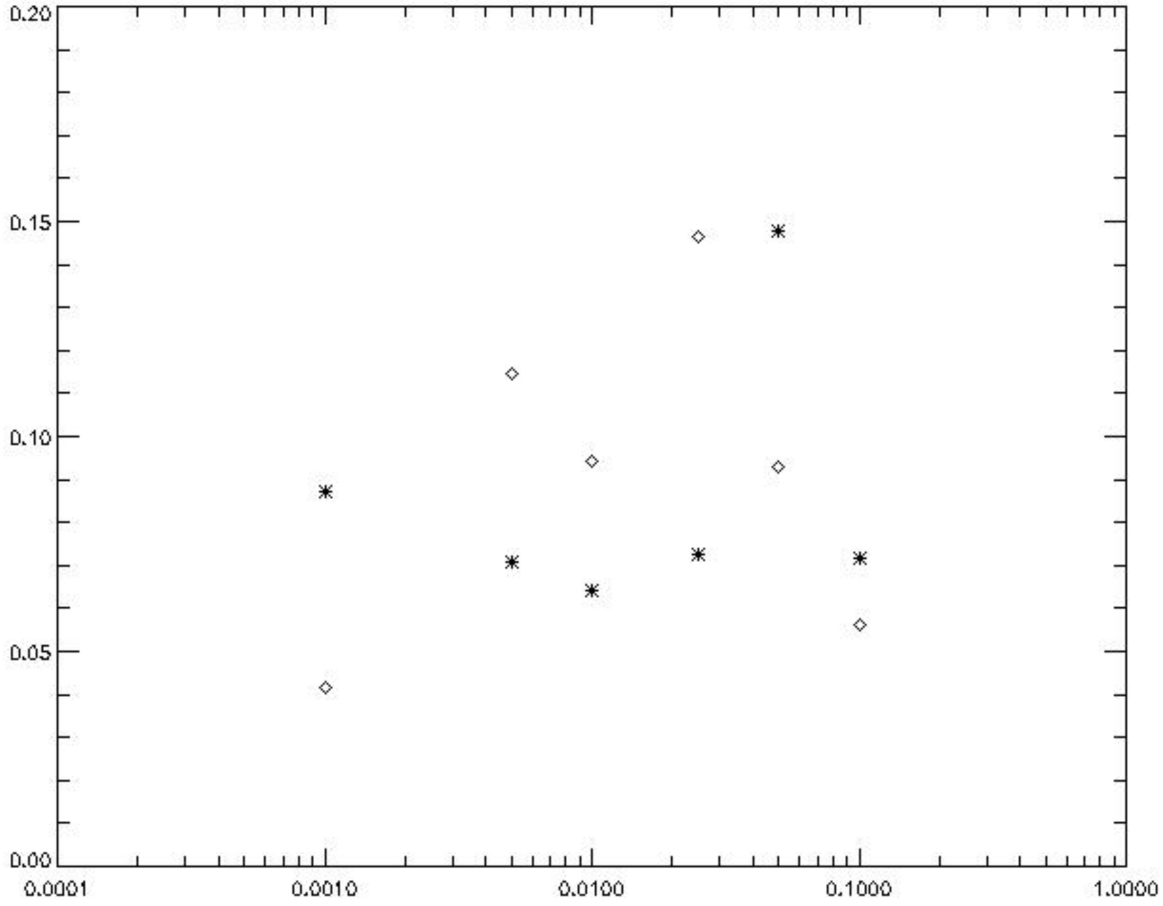
$M_{Ceres} = 9.4 \times 10^{20}$ kg


Log10(Σp/<Σp>)
−2.7
−1.8
−0.90
0.0
0.90
1.8
2.7
0.10
0.05
0.00
−0.05
−0.10
y (H)
−0.10
−0.05
0.00
0.05
0.10
x (H)

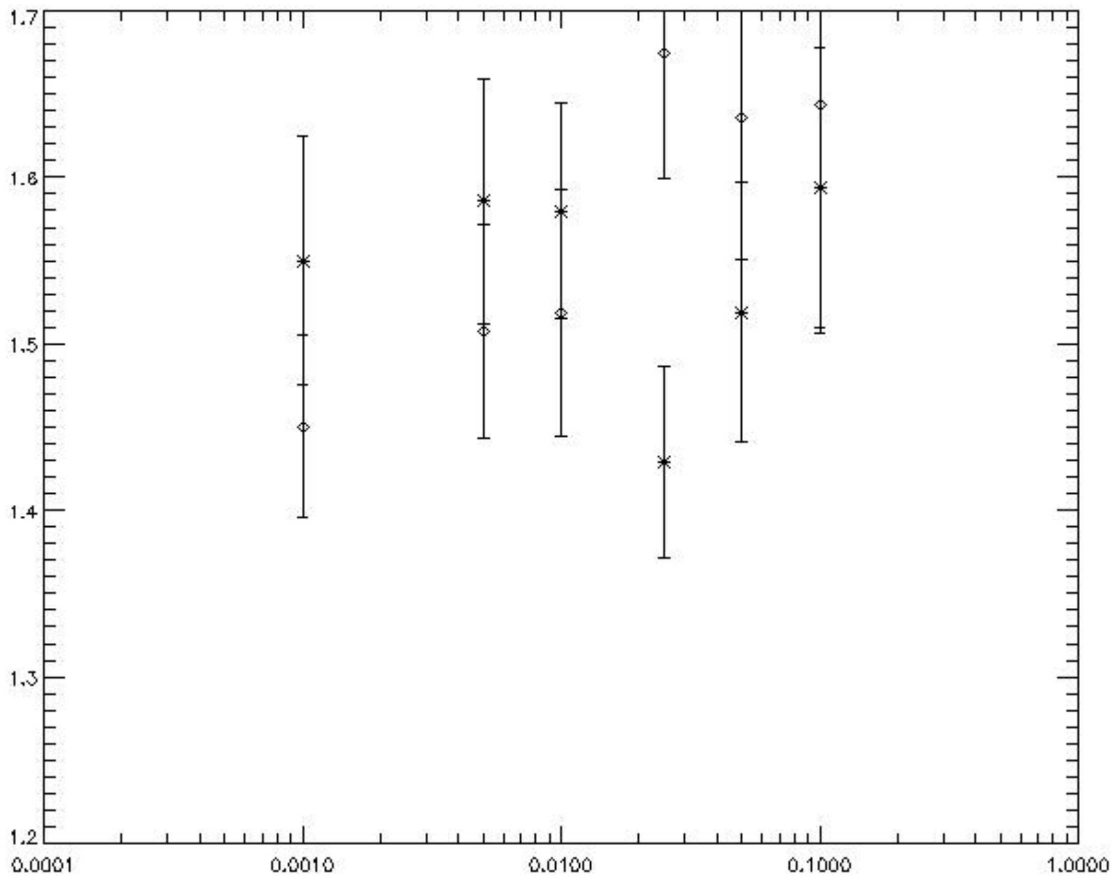


$Log_{10}(\Sigma_p/<\Sigma_p>)$
−2.7
−1.8
−0.90
0.0
0.90
1.8
2.7
0.10
0.05
0.00
−0.05
−0.10
y (H)
−0.10
−0.05
0.00
0.05
0.10
x (H)

# Maximum Mass with respect to Pressure Gradient



# Slope Values with respect to Pressure Gradient



# Minimum Mass with respect to Pressure Gradient