University of Southern Queensland

Follow the dust: evolution of planetary systems

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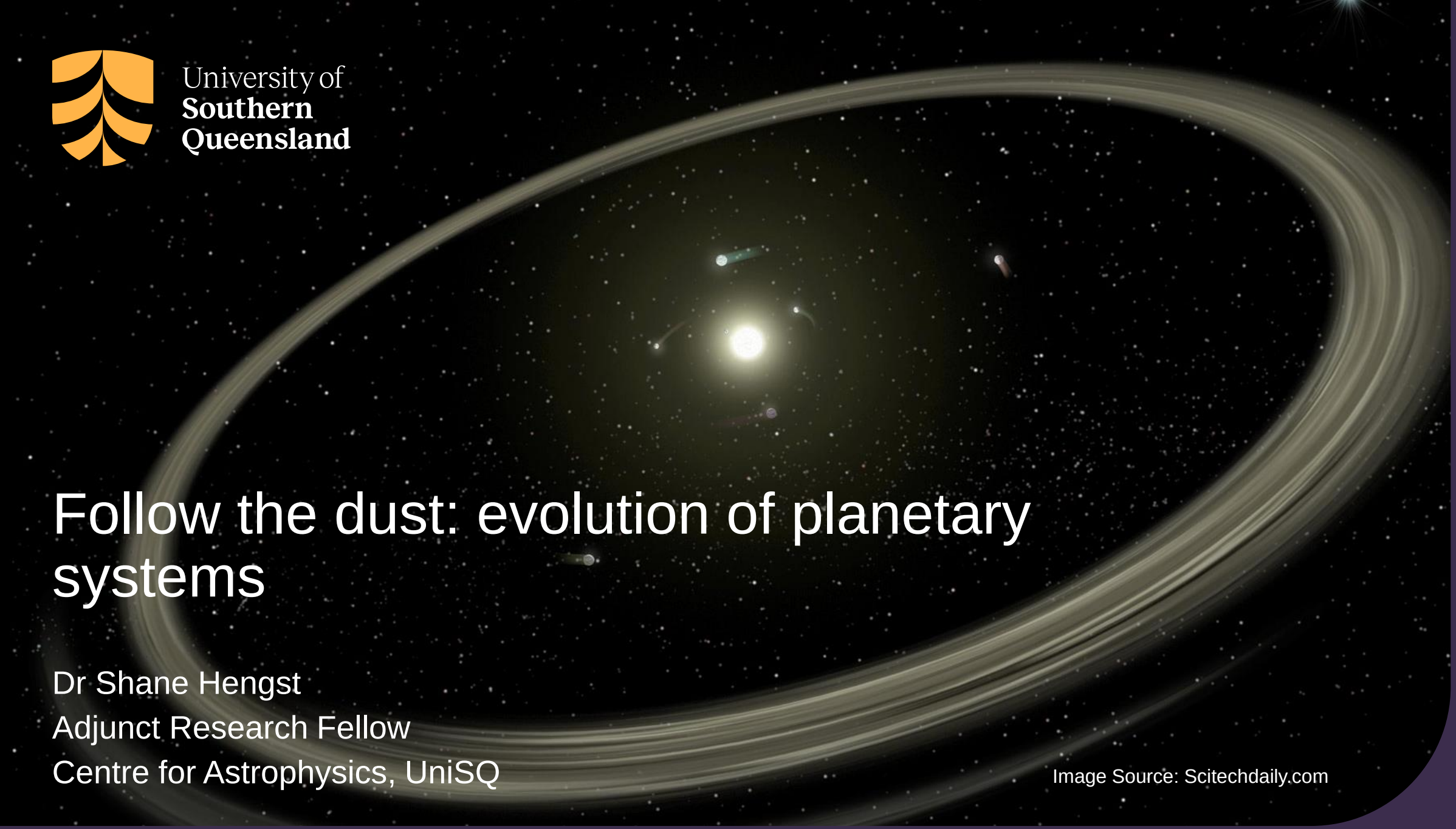


Image Source: Scitechdaily.com

Planetary system evolution

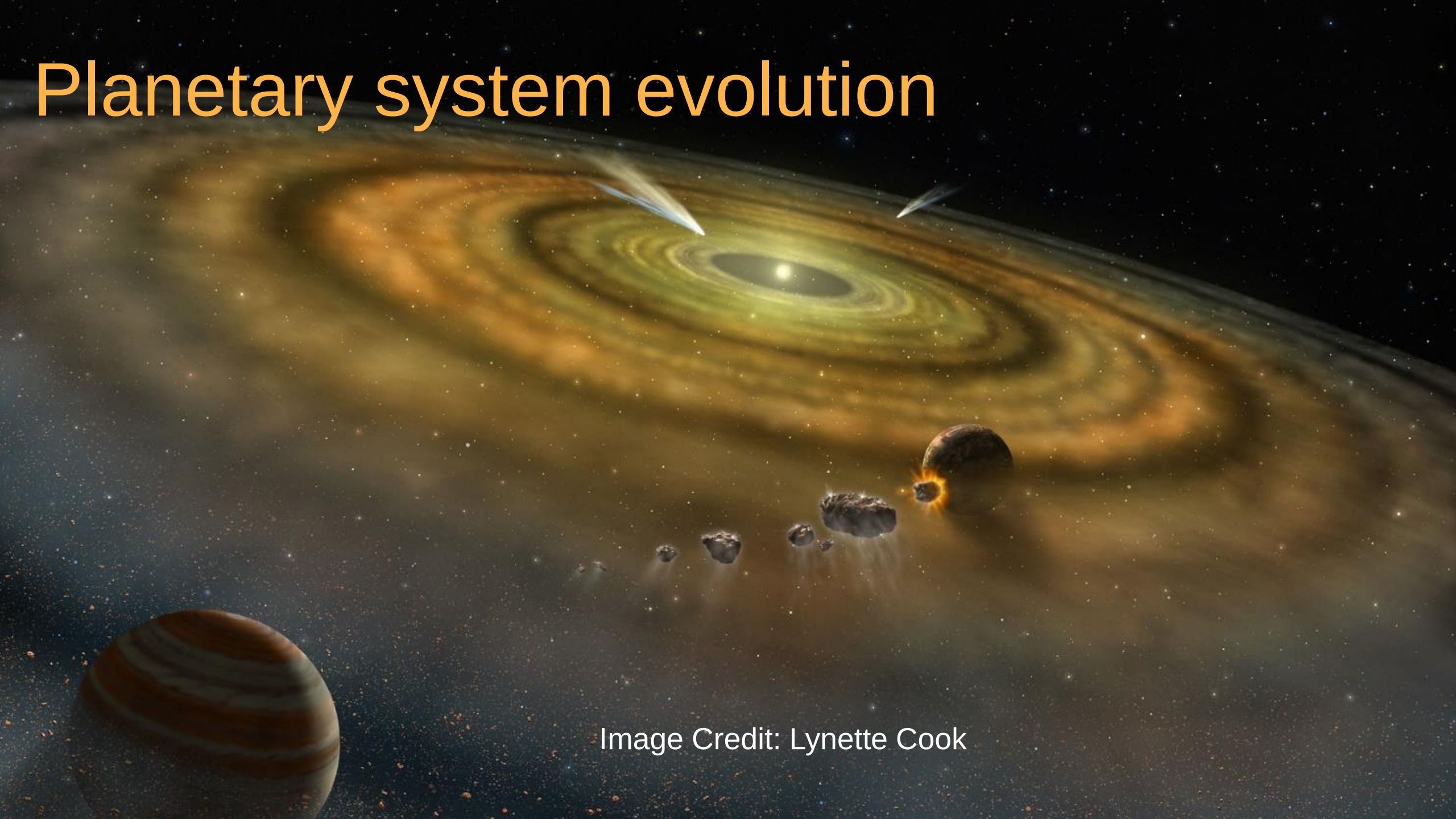
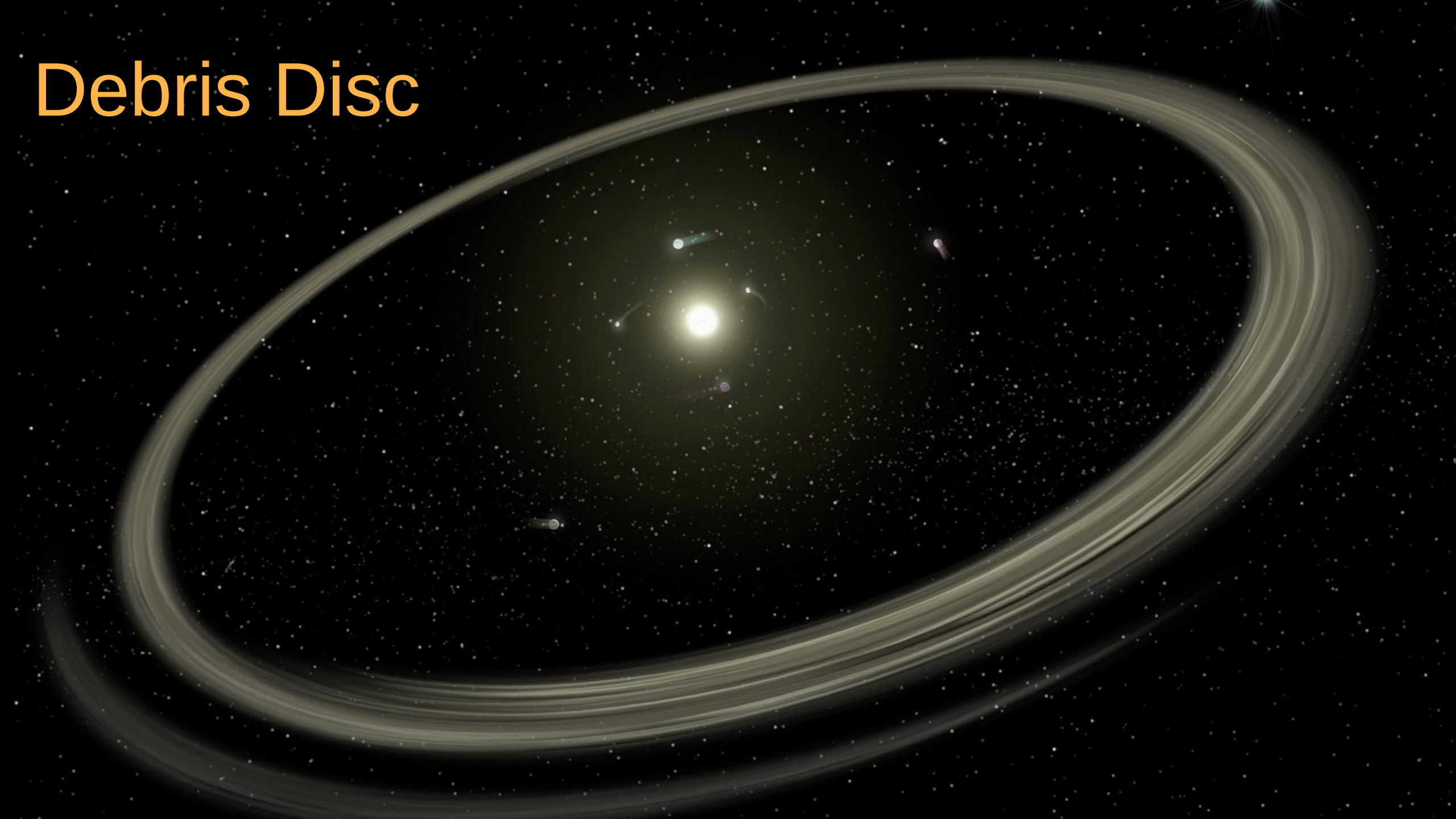


Image Credit: Lynette Cook

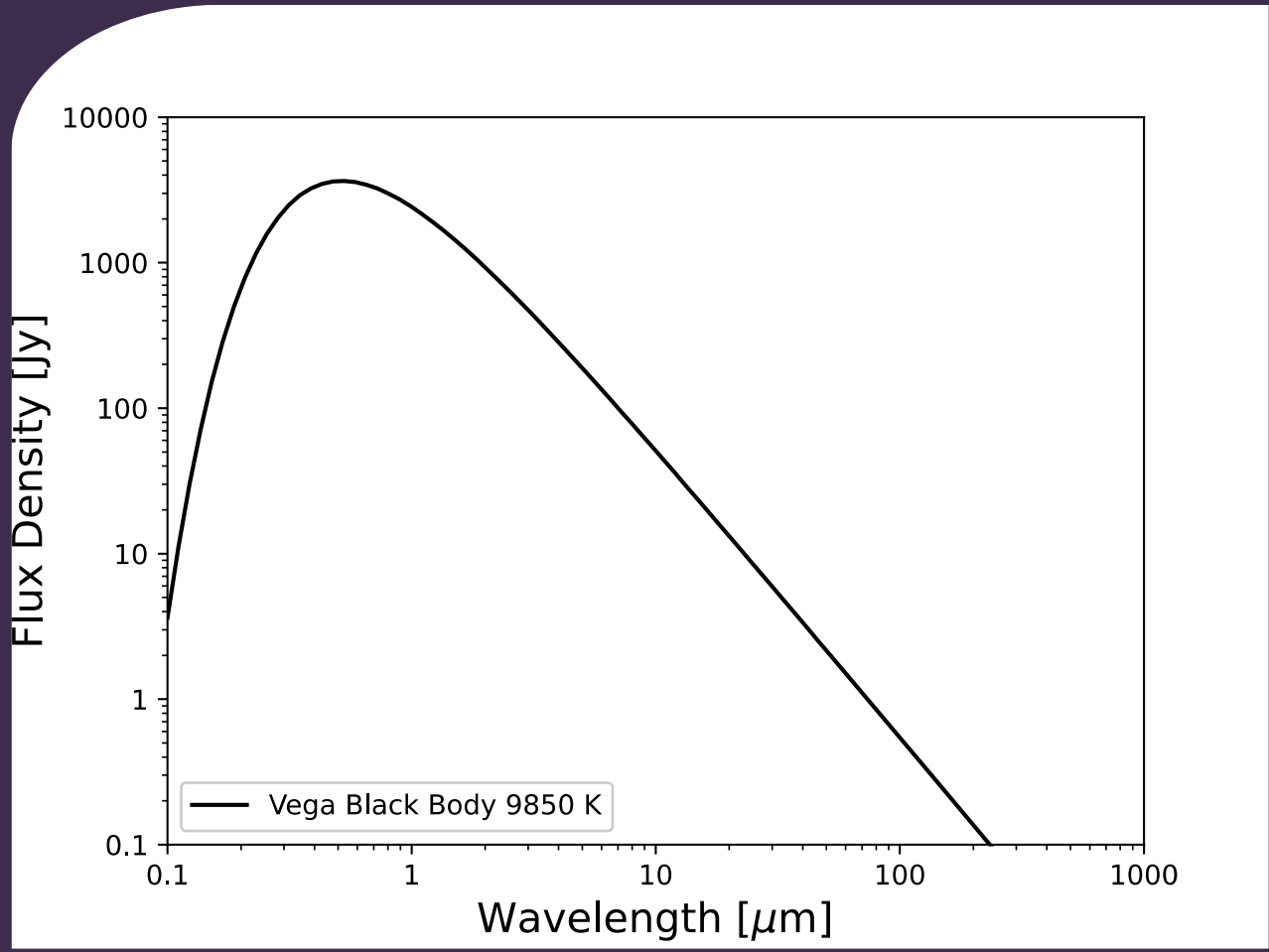
Debris Disc



First Detections from IRAS

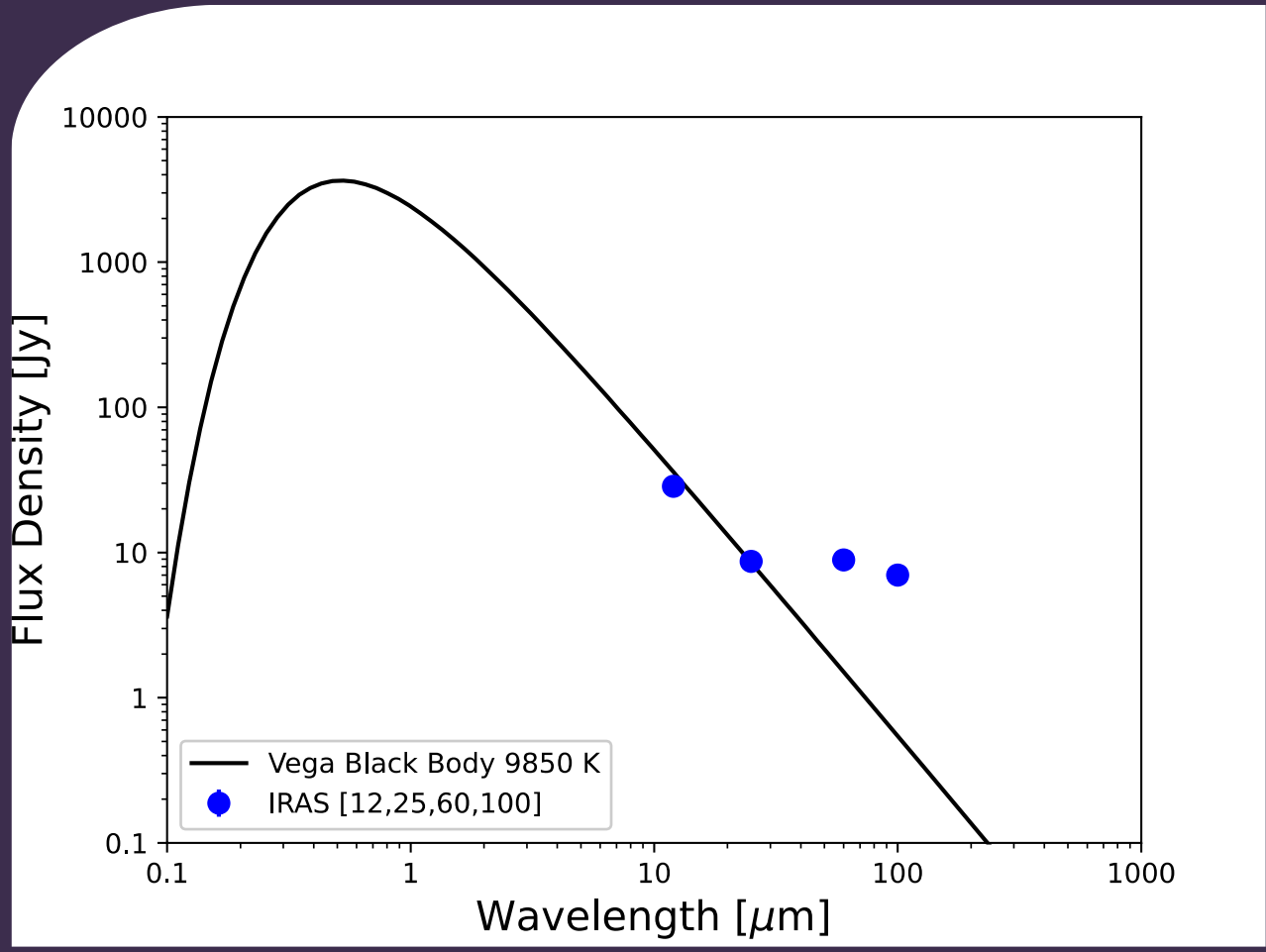
Neugebauer et al. (1984)

Vega Black Body Example

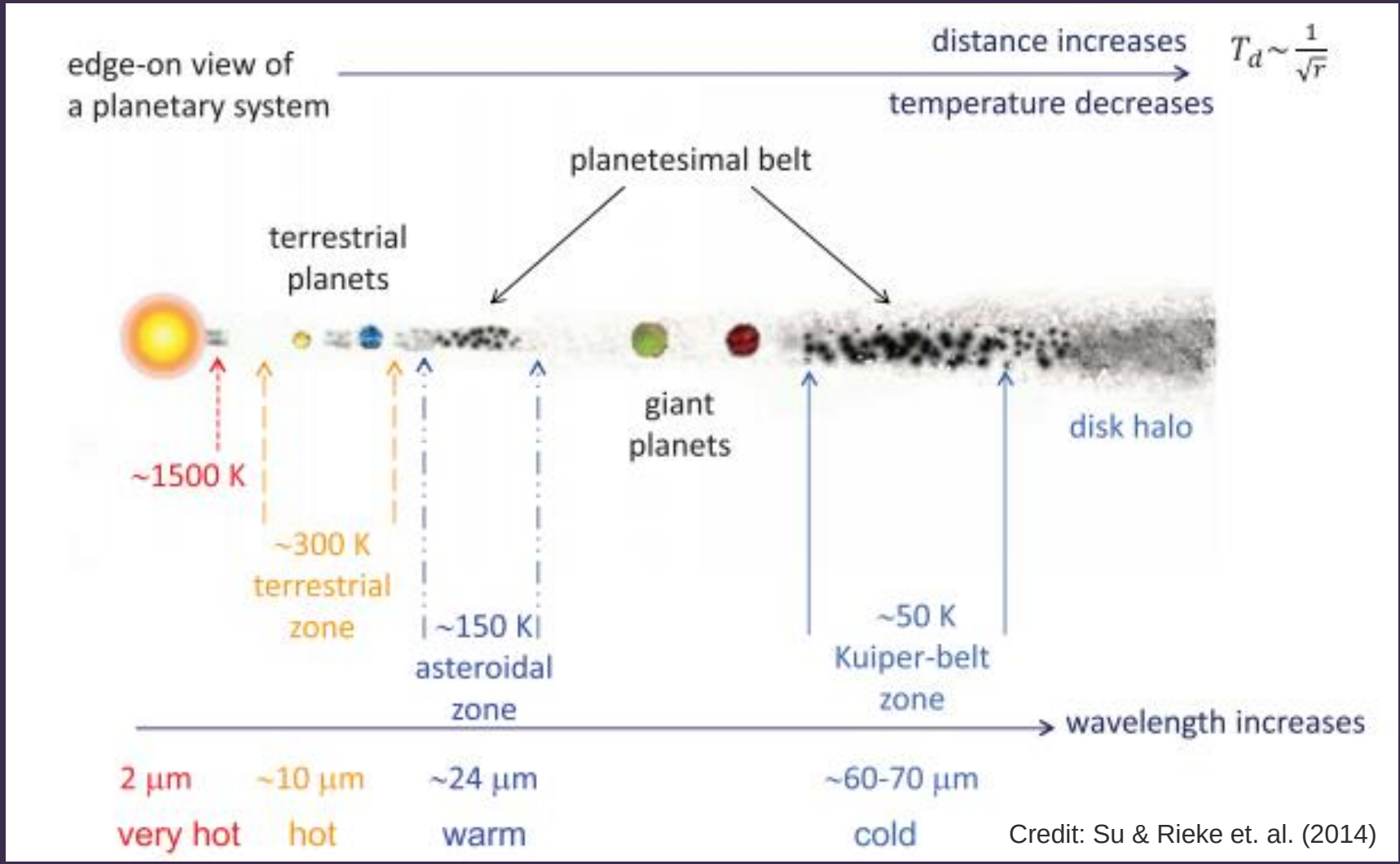


Extended Emission

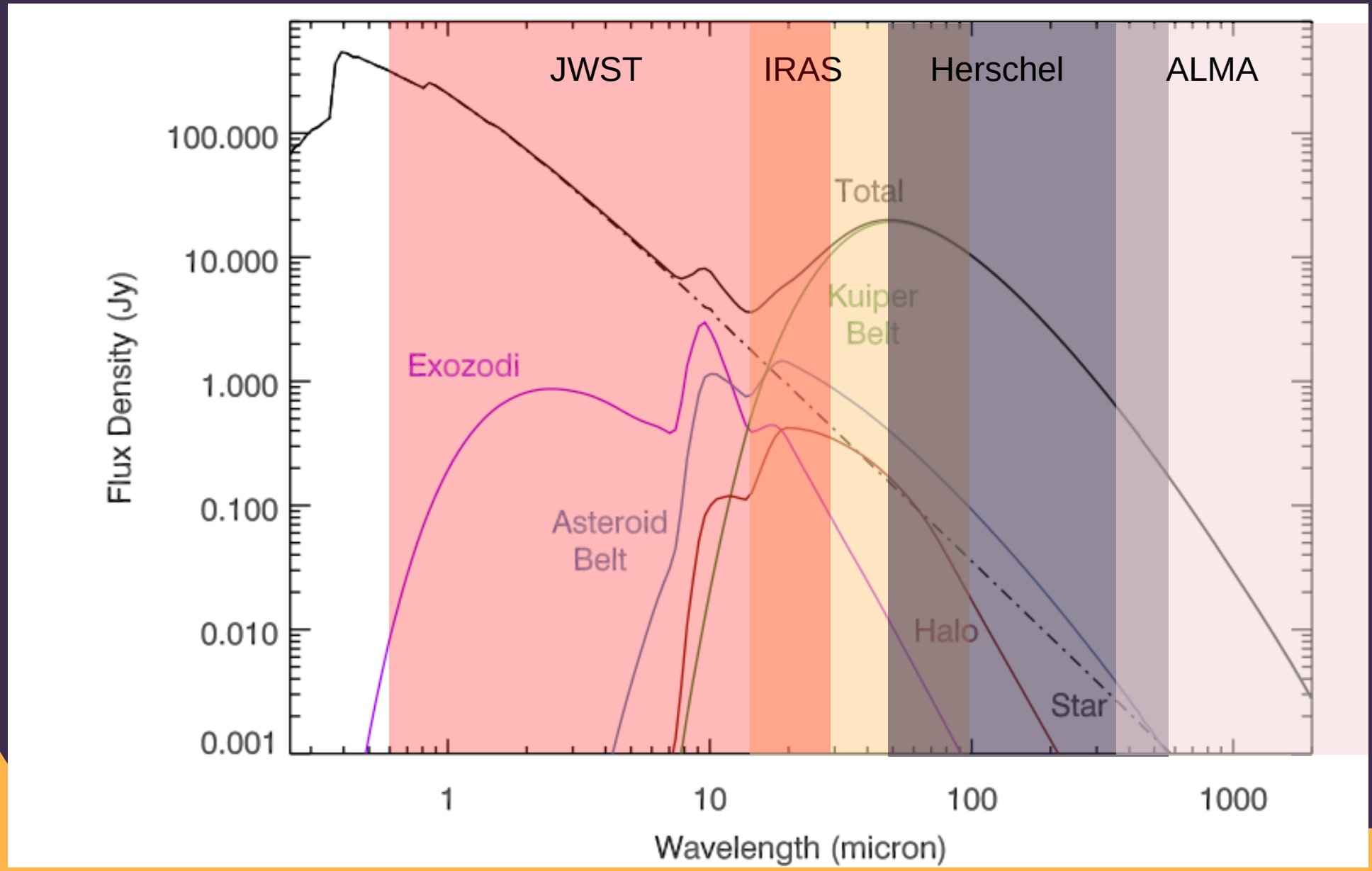
Aumann et al. (1984)



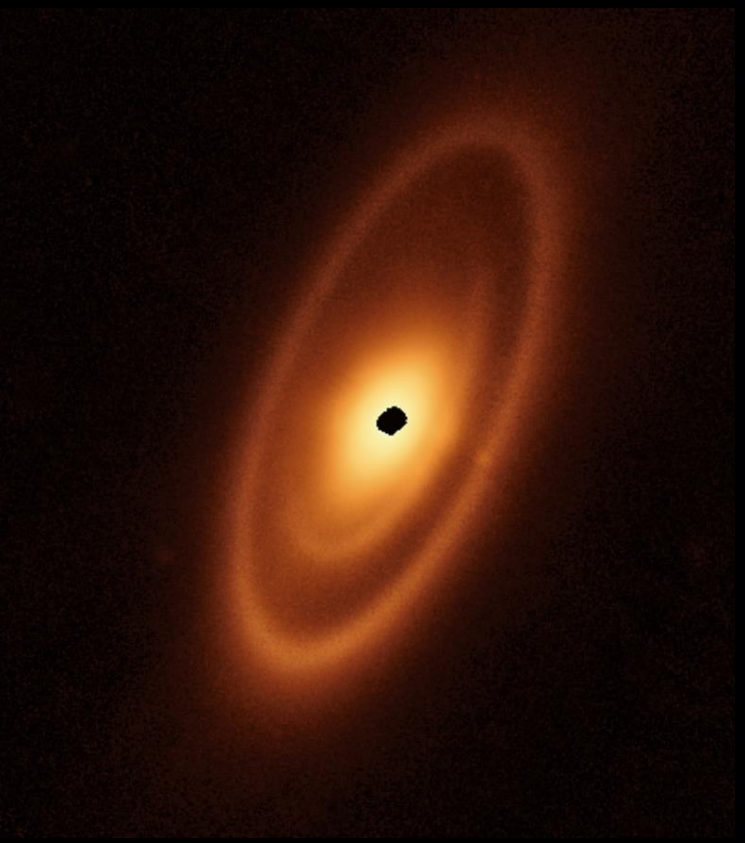
Where do we find dust?

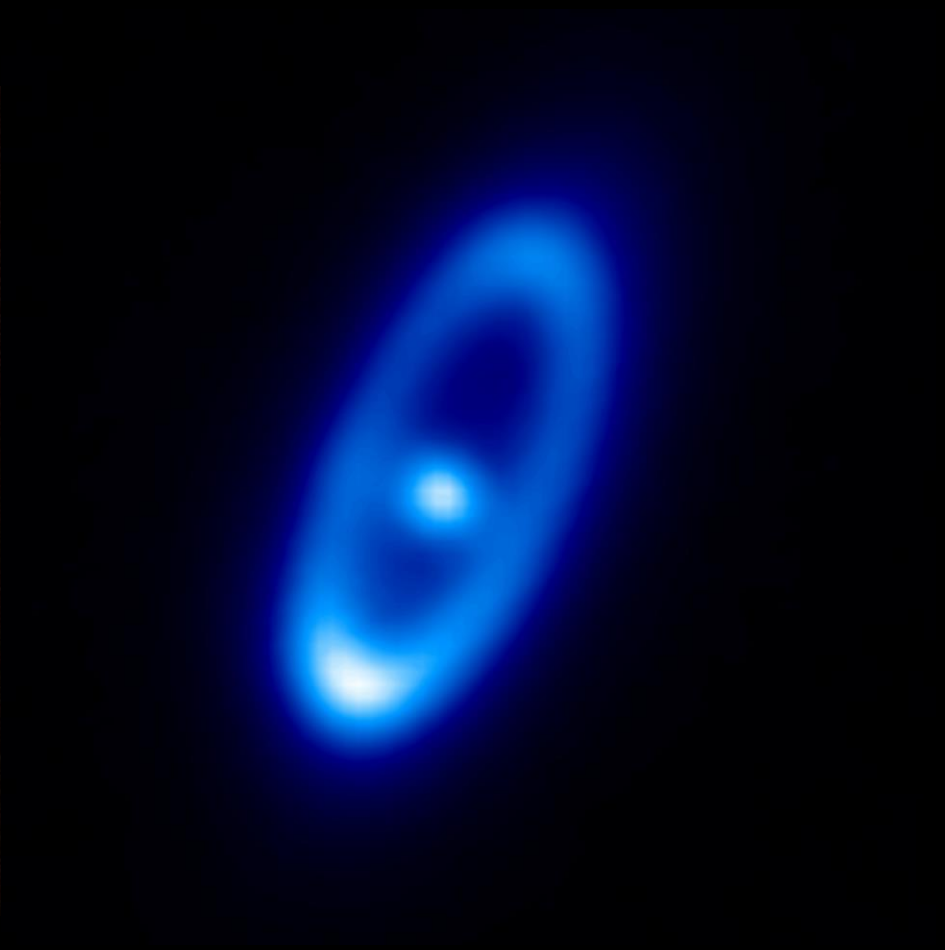


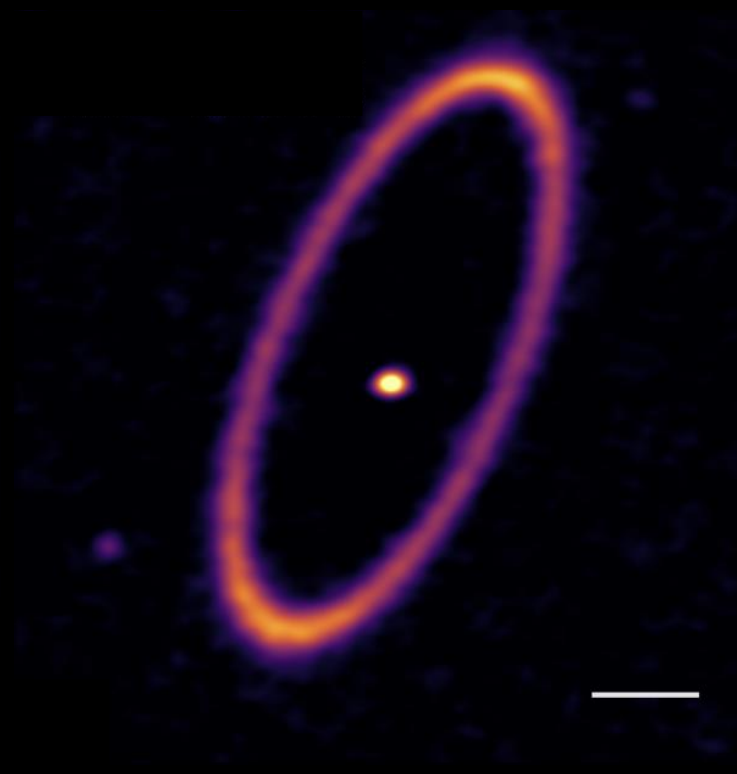
Credit: Su & Rieke et. al. (2014)


JWST
IRAS
Herschel
ALMA
100.000
10.000
1.000
0.100
0.010
0.001
Flux Density (Jy)
Total
Kuiper Belt
Exozodi
Asteroid Belt
Halo
Star
1
10
100
1000
Wavelength (micron)

Fomalhaut





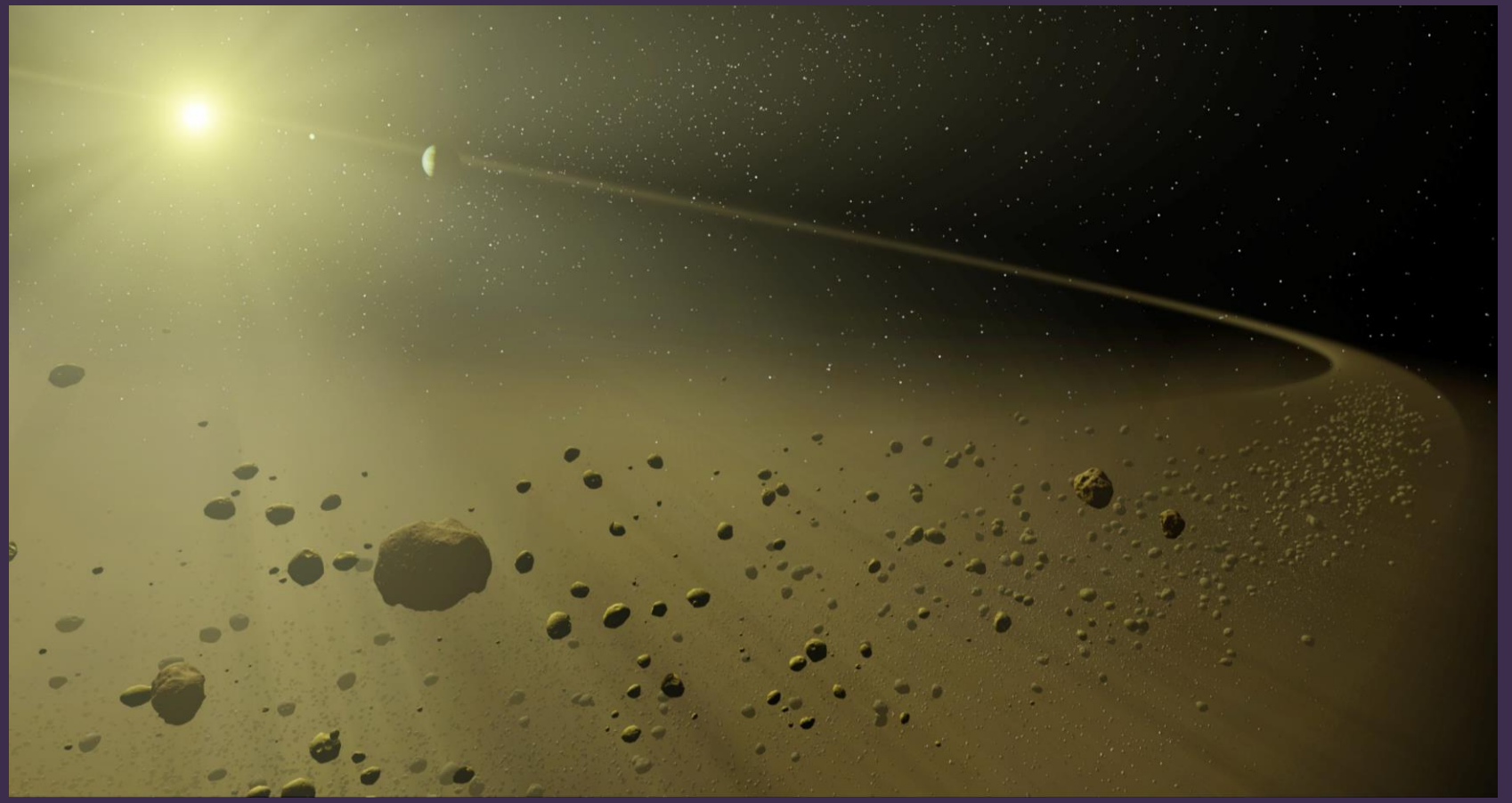


JWST

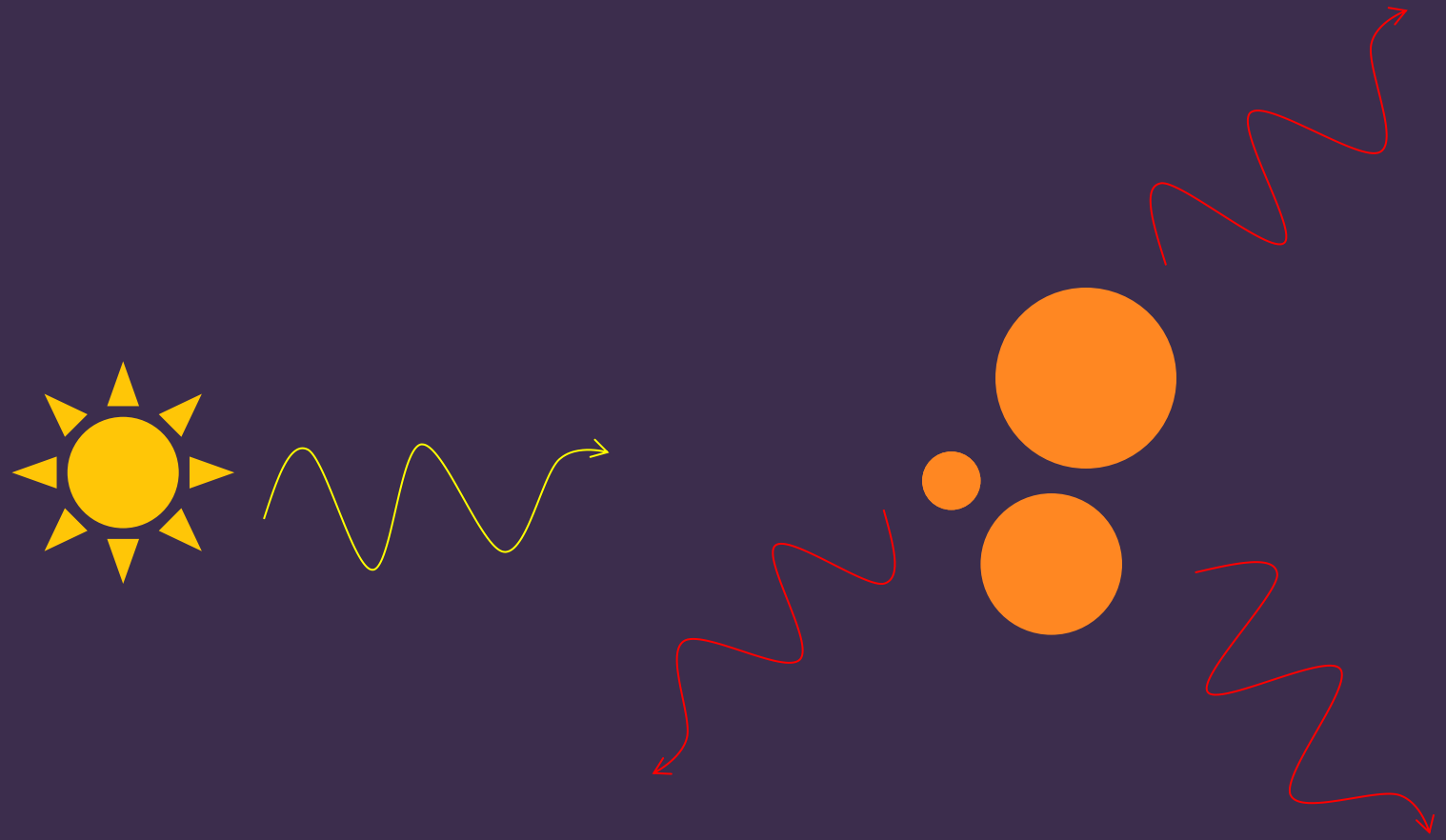
Herschel

ALMA

Modelling Grain Emission

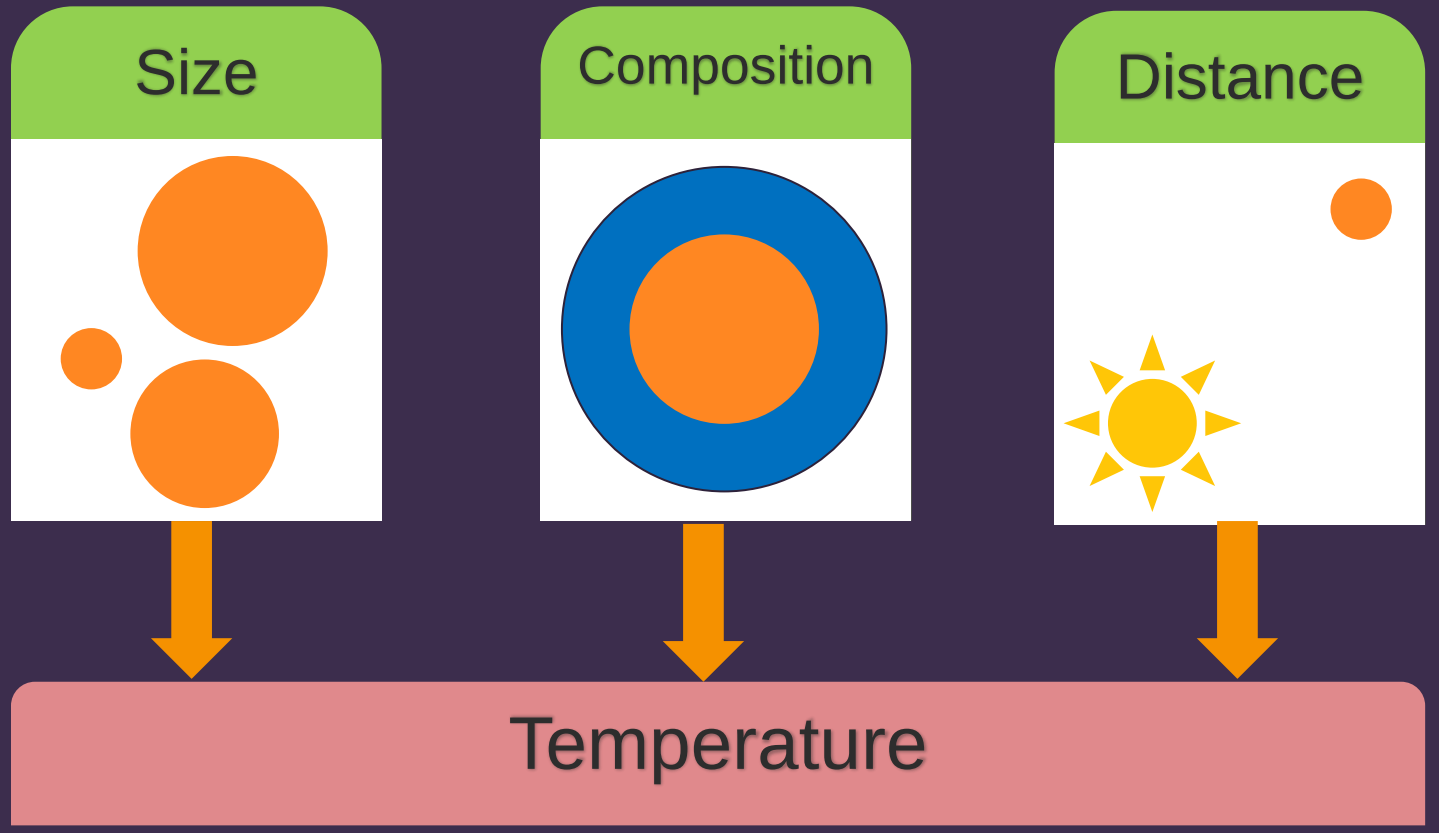


Radiative Transfer



Not to Scale

Conditions



Size

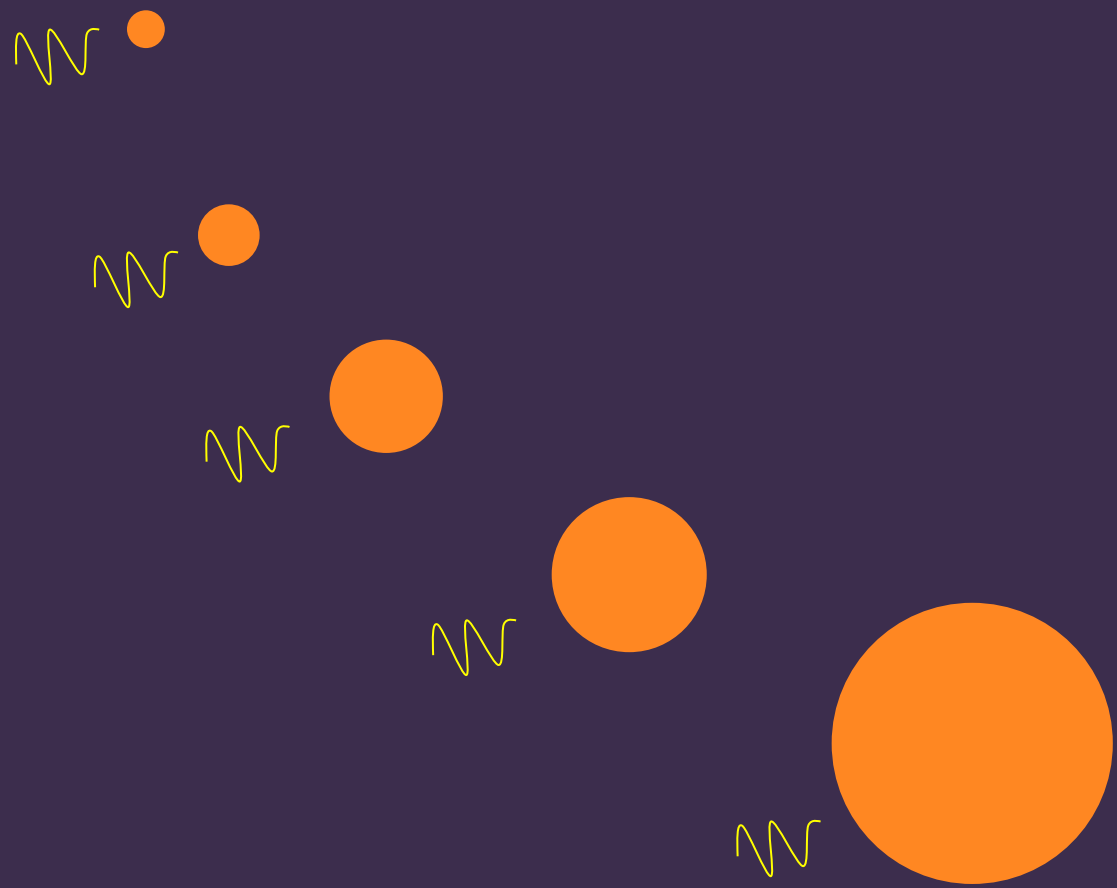
Wavelength of incoming stellar light

~

Size of grain

=

Higher temperature



Grain Composition

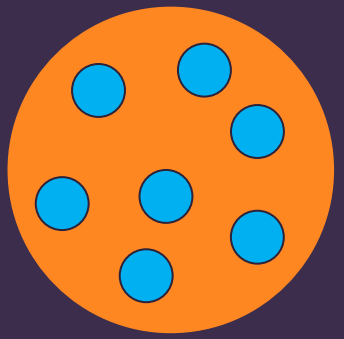
Astrosilicate
$MgFeSiO_4$
$\rho = 3.3\ g/cm^3$

Draine (2003)

Dirty Ice
Ice coated silicate
$\rho = 2.0\ g/cm^3$

Preibisch et al. (1993)

Inclusion Matrix Particle
$MgFeSiO_4 + H_2O$
e.g. Crystalline water ice
mixed in with Astrosilicate

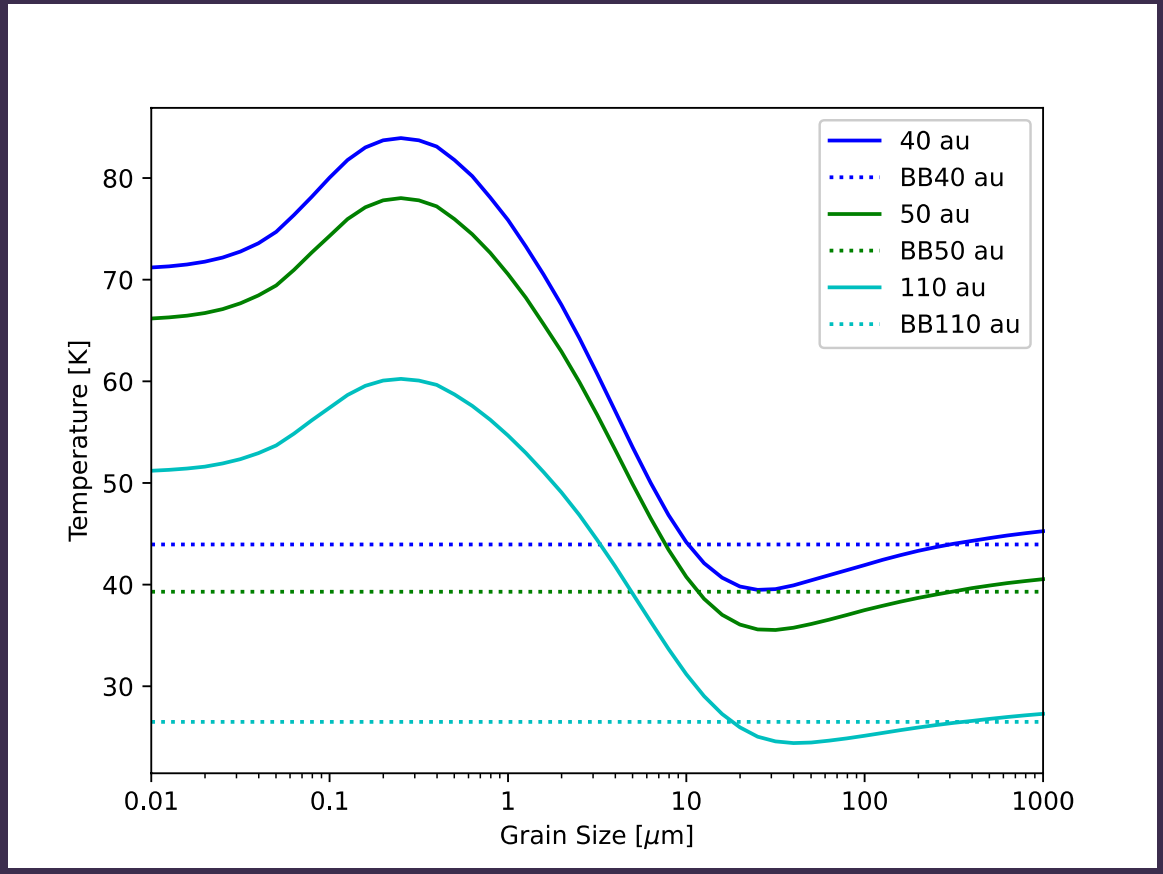


Warren & Brandt (2008)

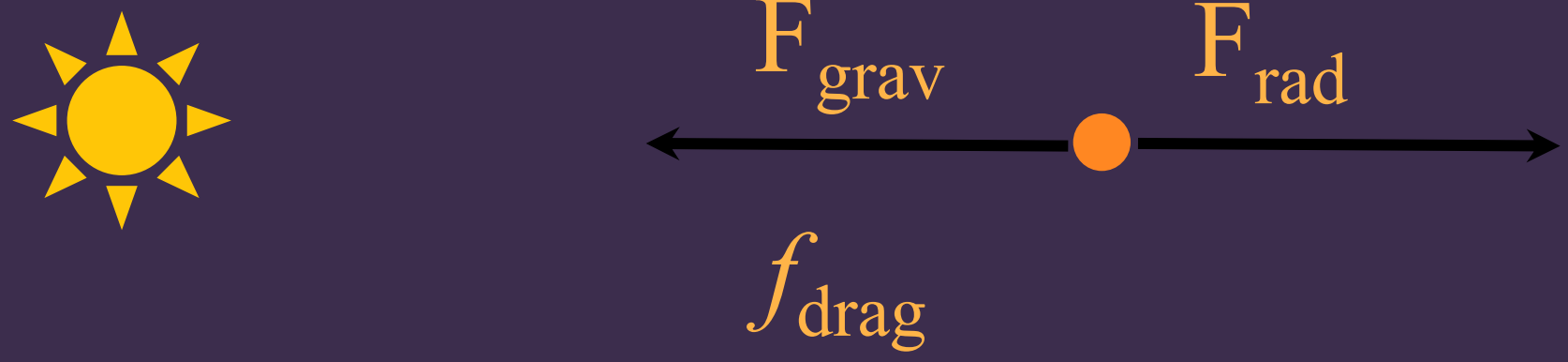
Distance – Planetesimals

NOT TO SCALE
Radial Dimension

Grain Temperature

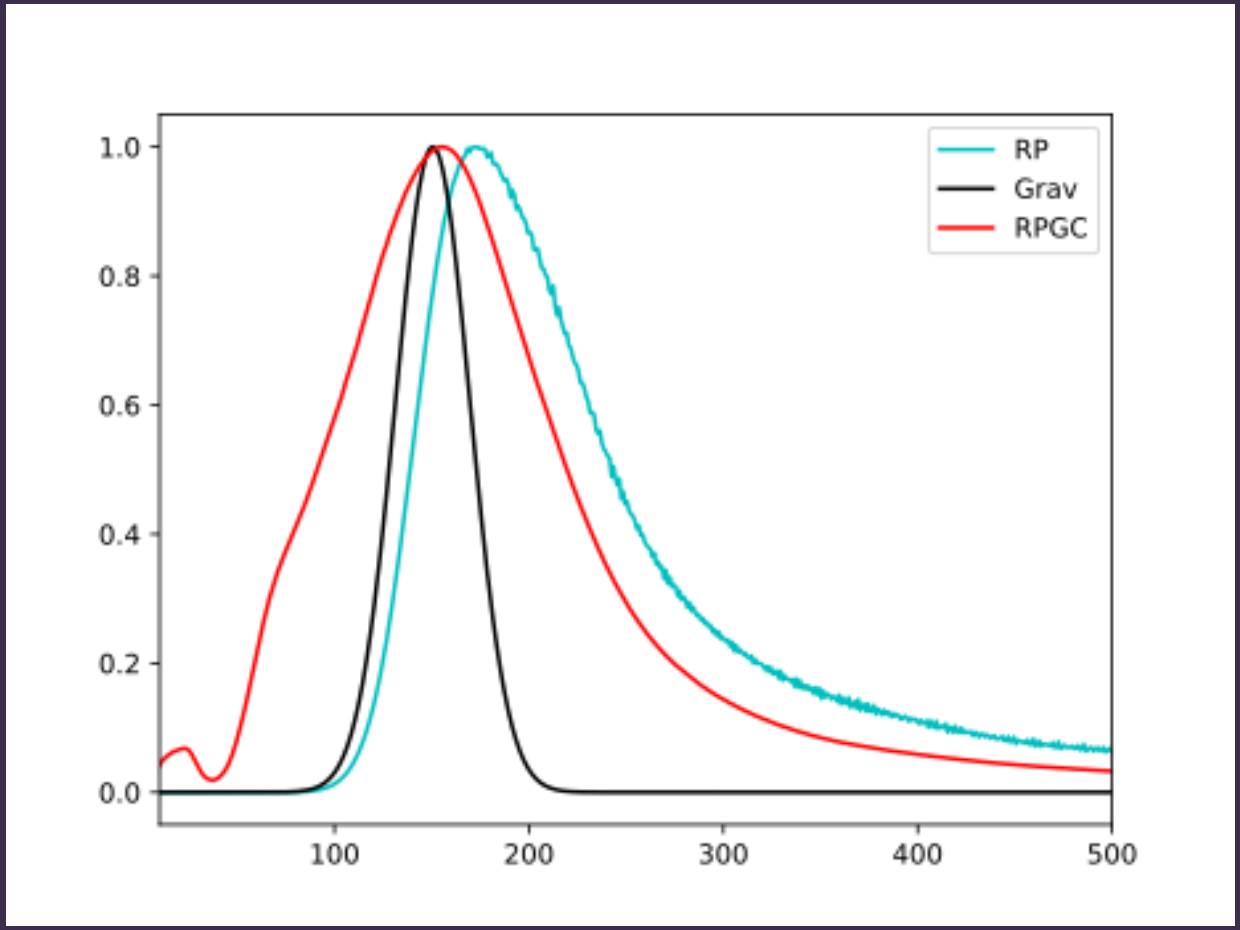


Grain forces

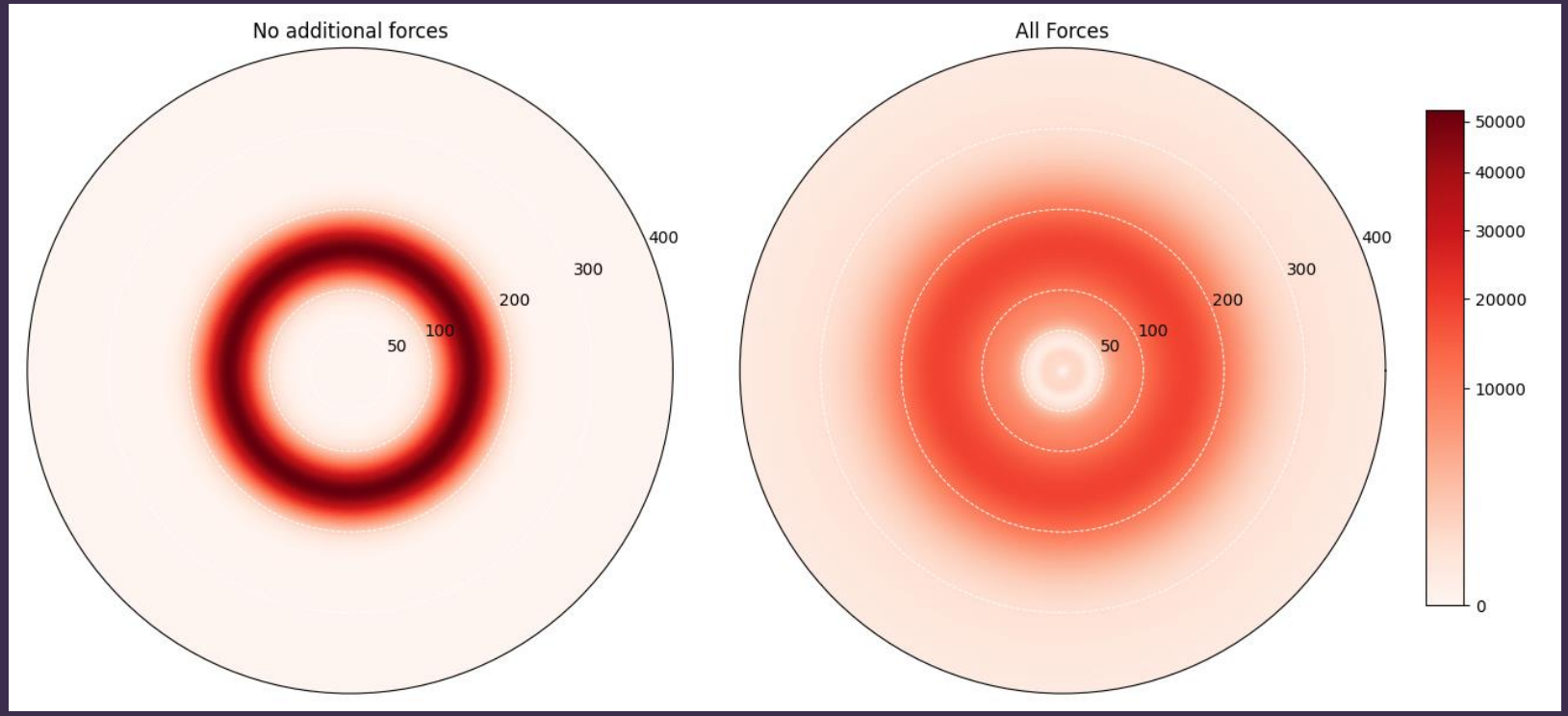


NOT TO SCALE

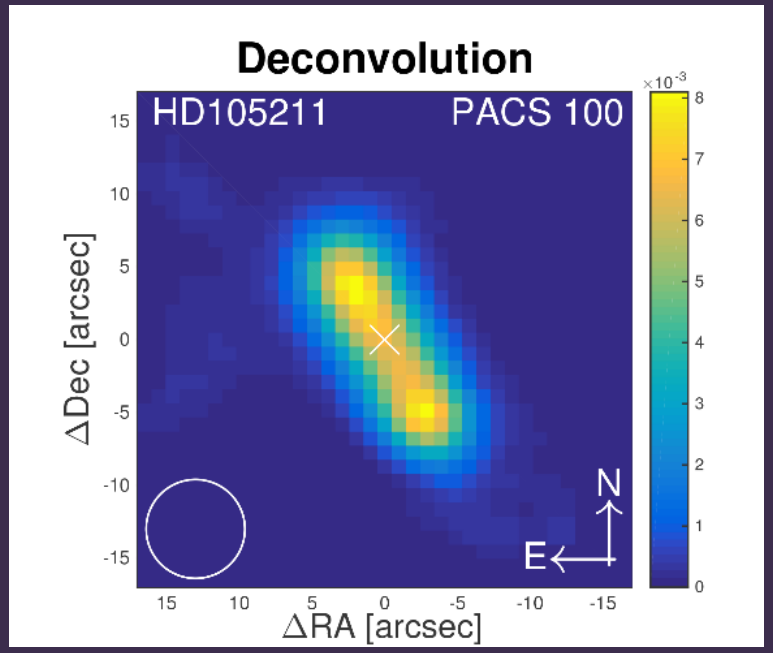
Radial Distribution



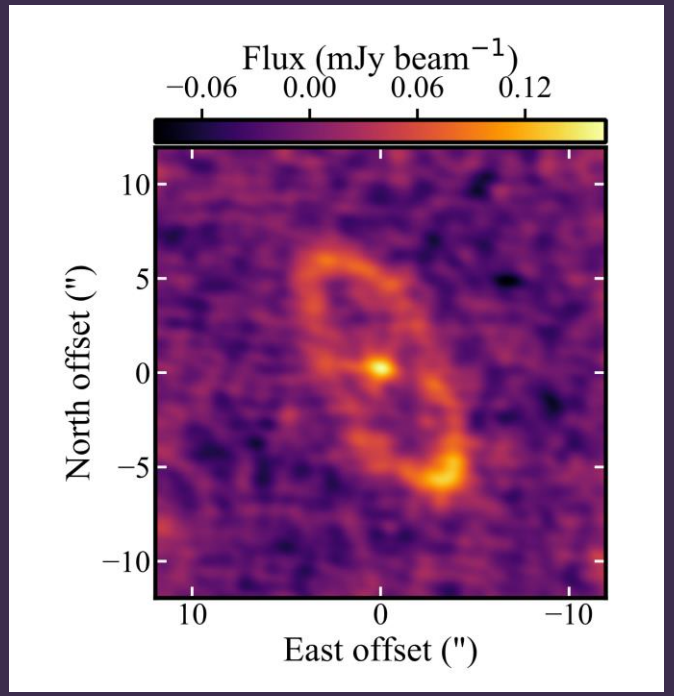
Radial Distribution



HD 105211



HERSCHEL: 100 microns



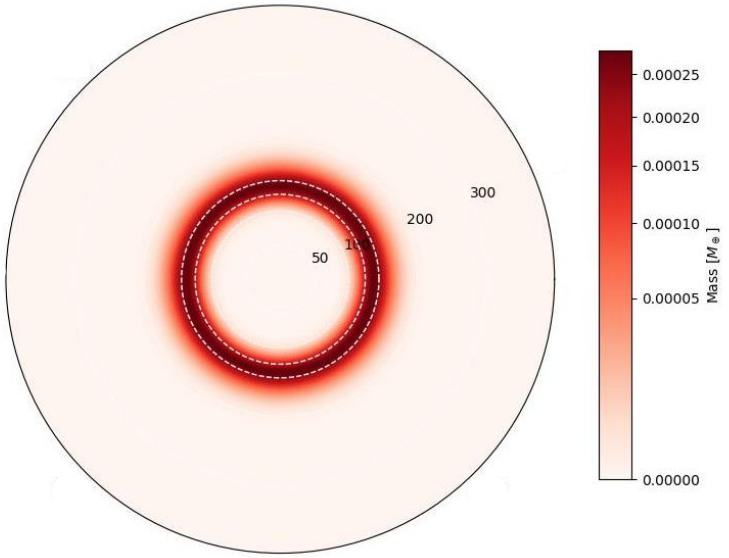
ALMA: 1338 microns

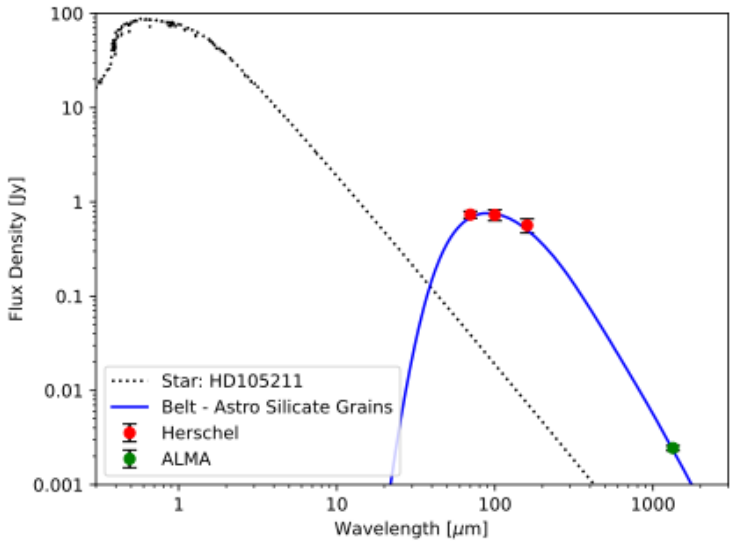
F2V Star

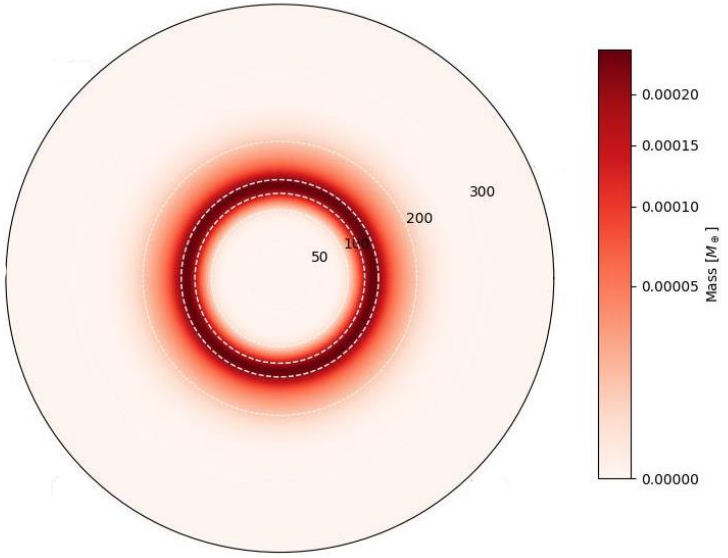
R_m ~134 au

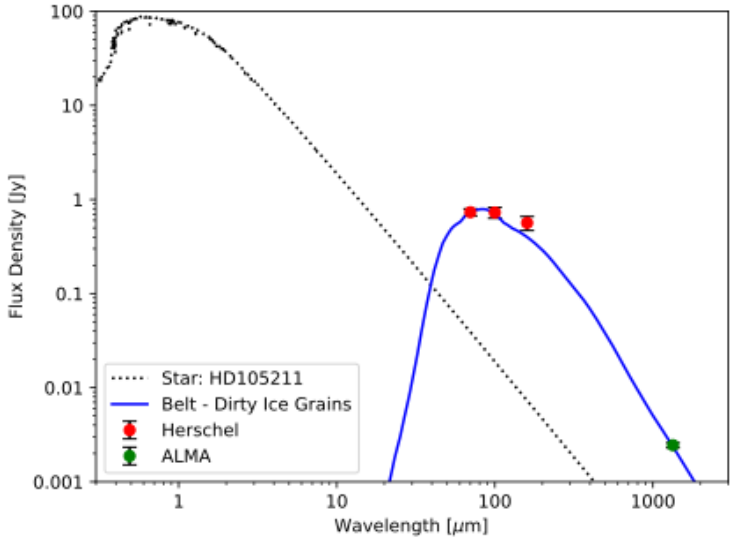
σ_r ~10 au

Initial Results

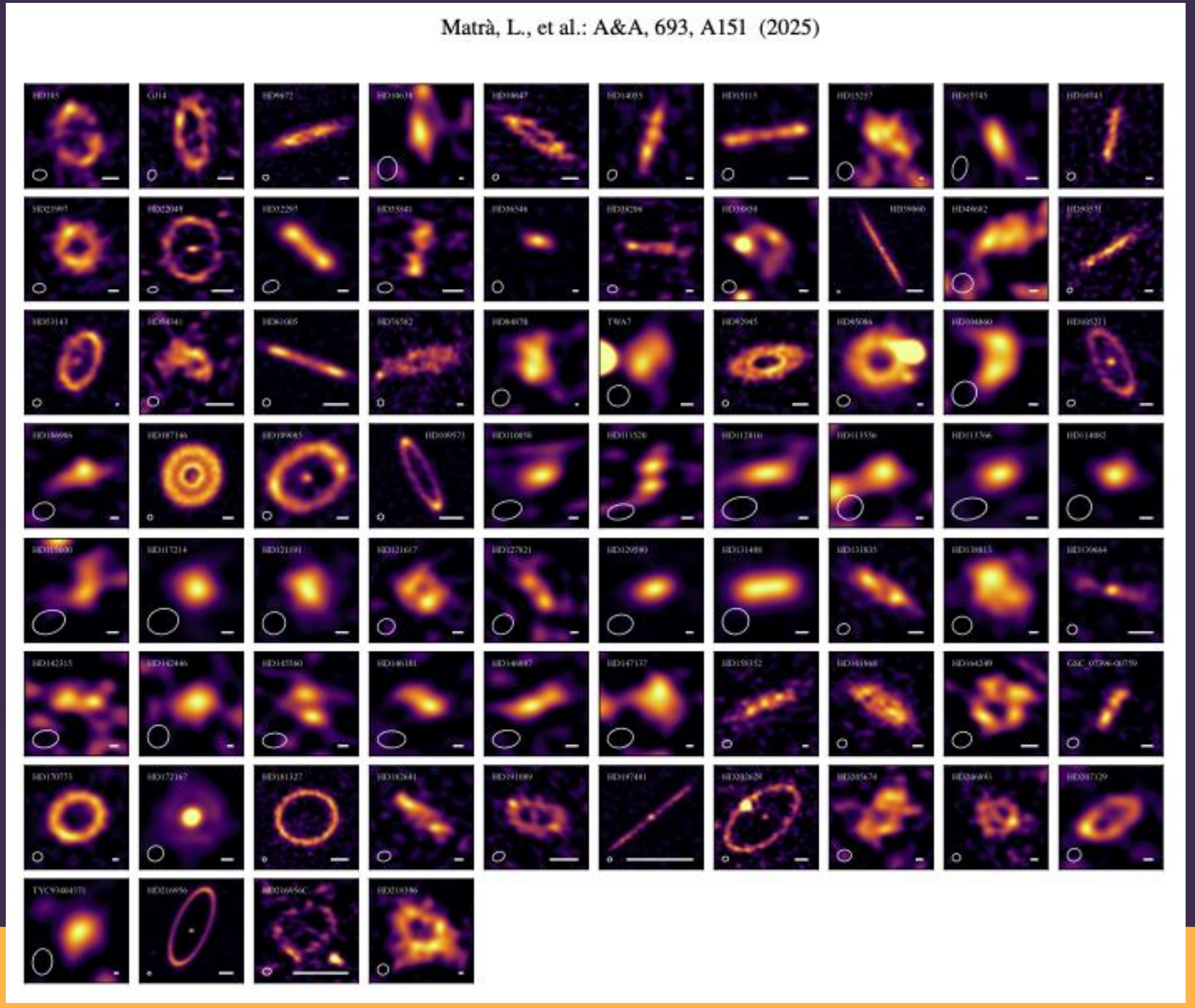








Next steps



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Thank you for your attention!

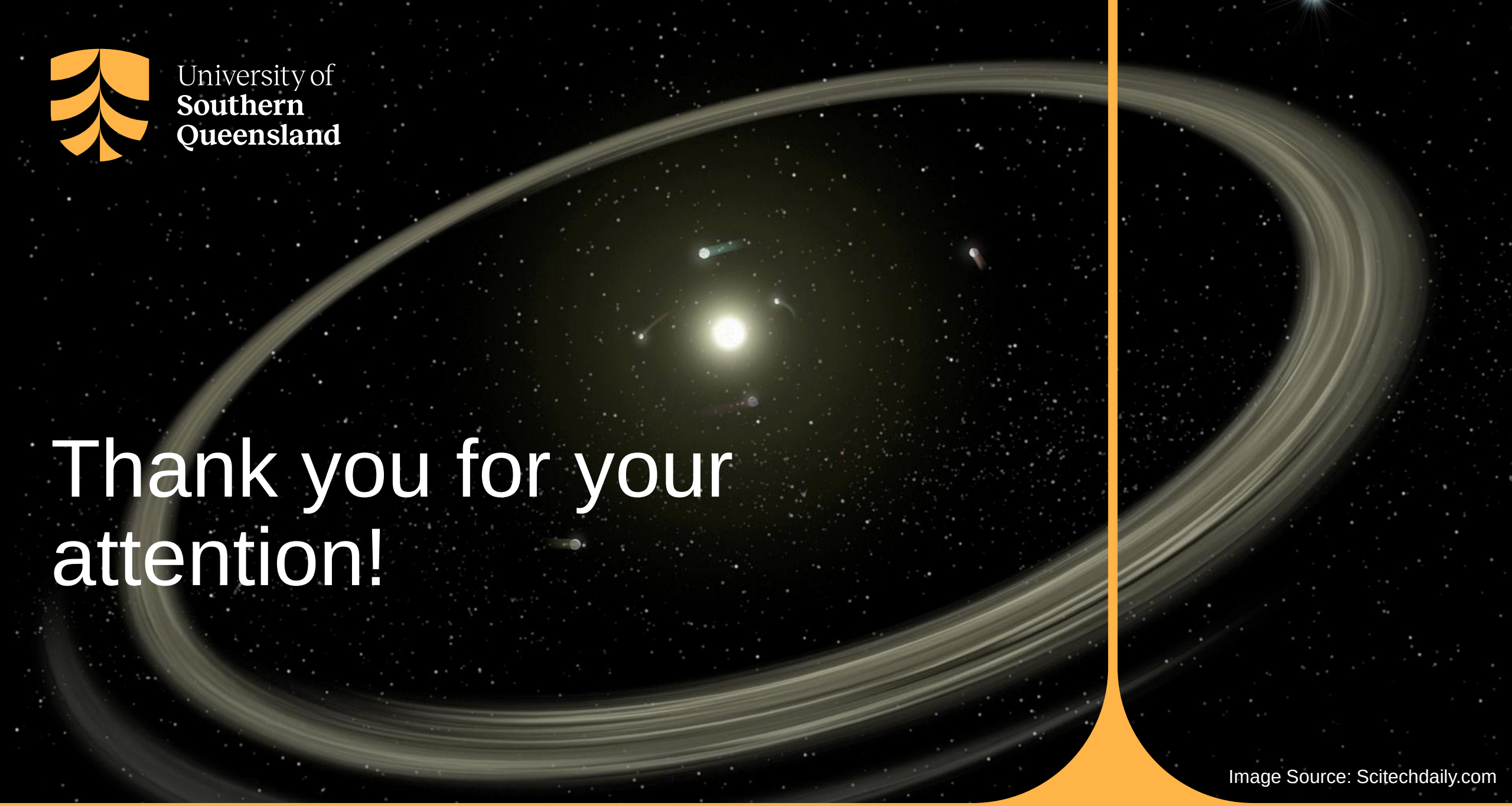

Image Source: Scitechdaily.com