What have we learned about the inner solar system dust?

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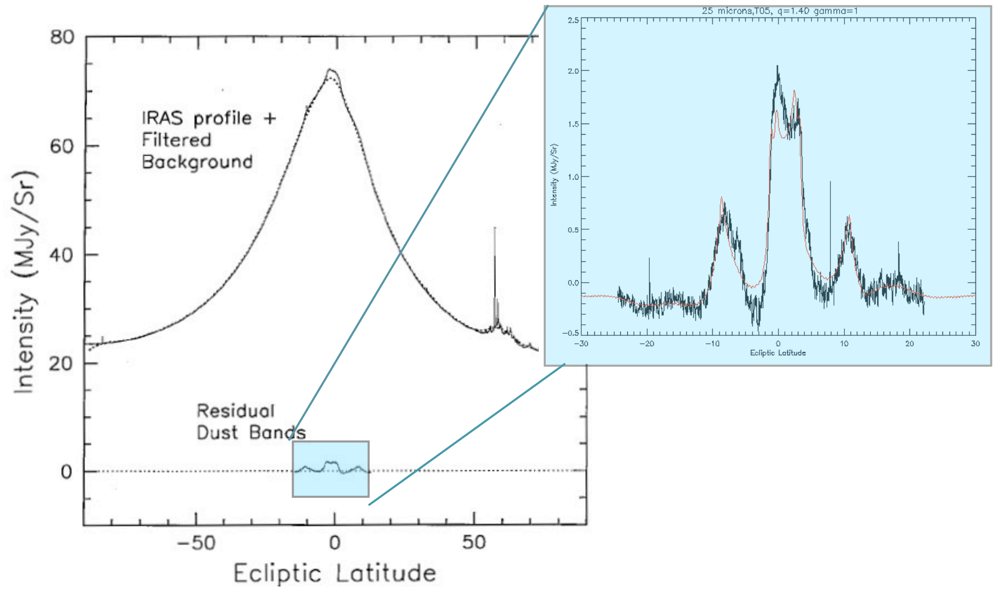
Questions I

- What is the origin of interplanetary dust in the solar system?
  -asteroidal or cometary?
- What is the composition of the inner solar system dust?
  -we have samples of IDP's, can we relate these to known sources?

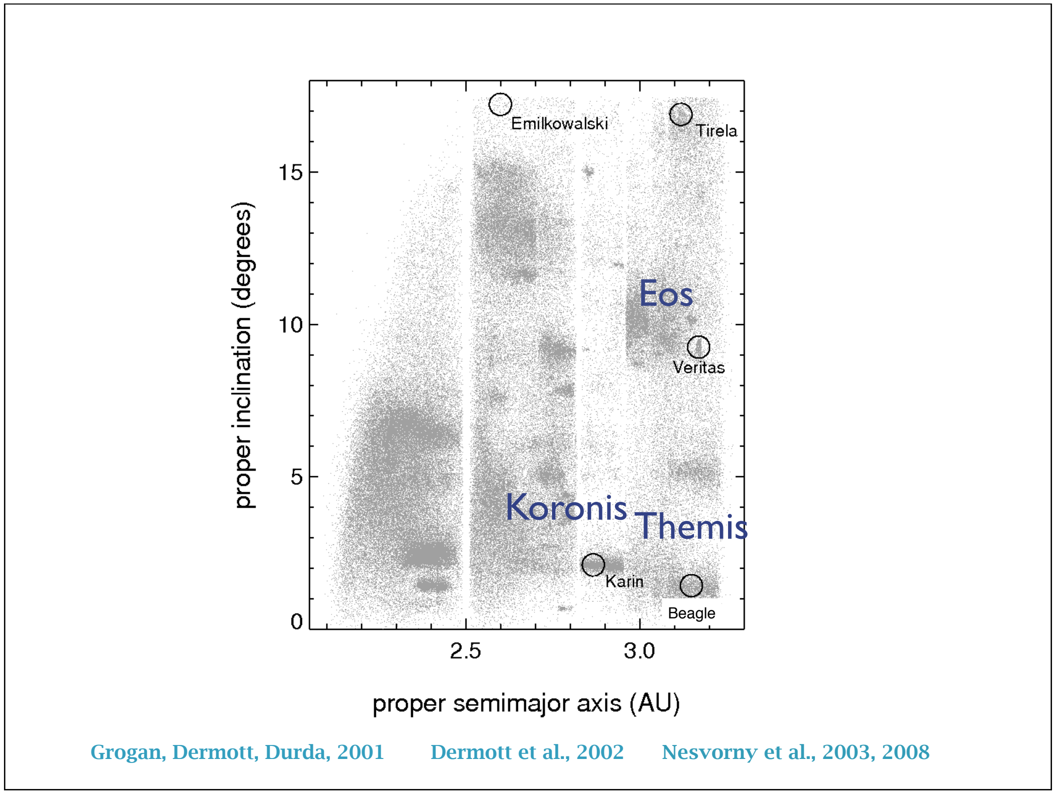
Questions II

- How does interplanetary dust interact with the inner planets?
  -resonant trapping, pericenter glow
  -distinction between asteroidal and cometary orbits
- How does the solar system dust cloud relate to exoplanetary systems?
  -P-R drag, collisional evolution

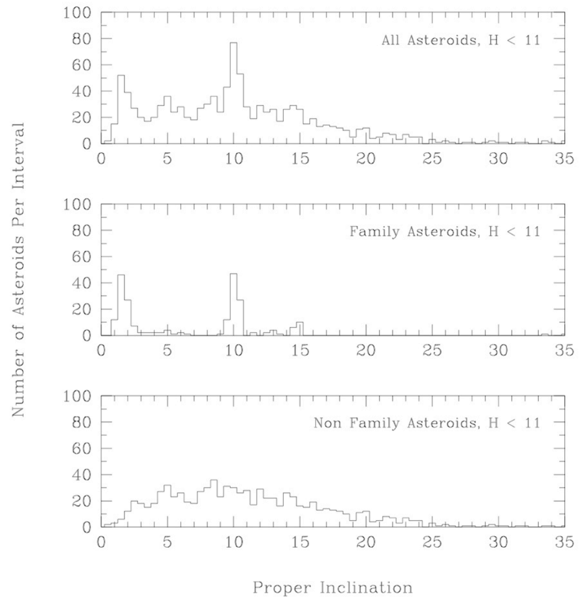
Structure in the zodiacal cloud I



known to be asteroidal, come in pairs
dust that makes up these bands is the small end of a size distribution that extends up to observable asteroids



asteroid families first, new plot, with many more,ploting asteroids as points
discuss hiryama, old, largest famlies
3 sources
why not more sources, since so many families...coadded



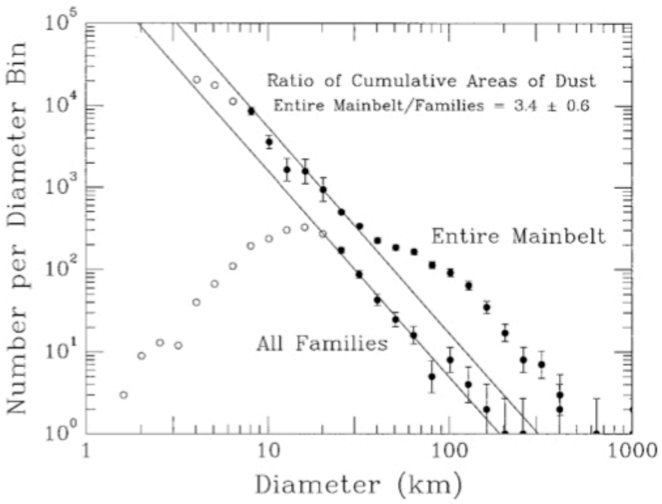
Kortenkamp and Dermott, 1998

Size-Distribution

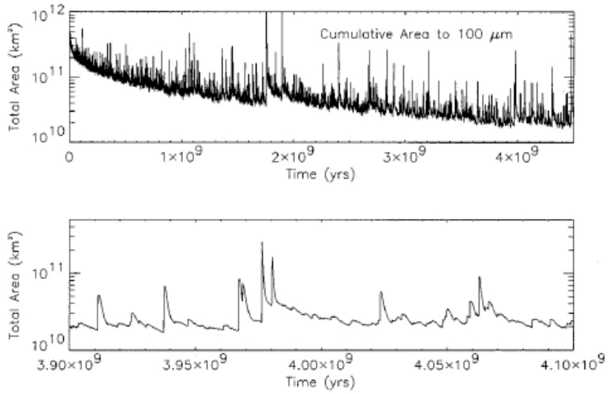
$$N(D) = \frac{1}{3(q-1)}\left(\frac{D_0}{D}\right)^{3(q-1)}$$

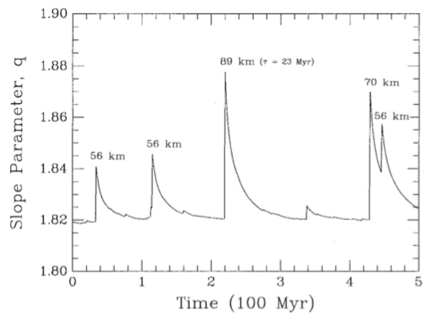
$D_0 \approx D_{equiv} / 1.2$

Dohnanyi Distribution→ q=1.83



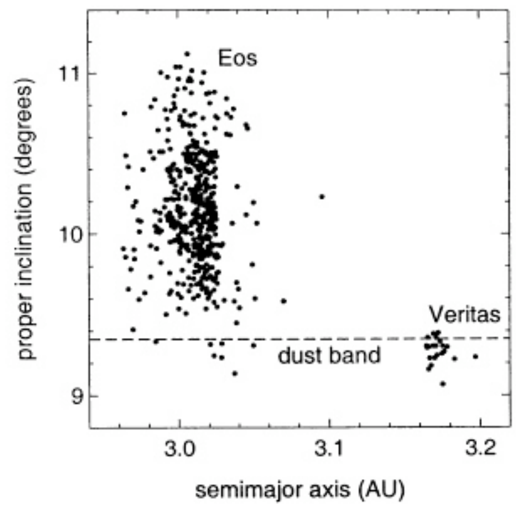
Durda and Dermott , 1997



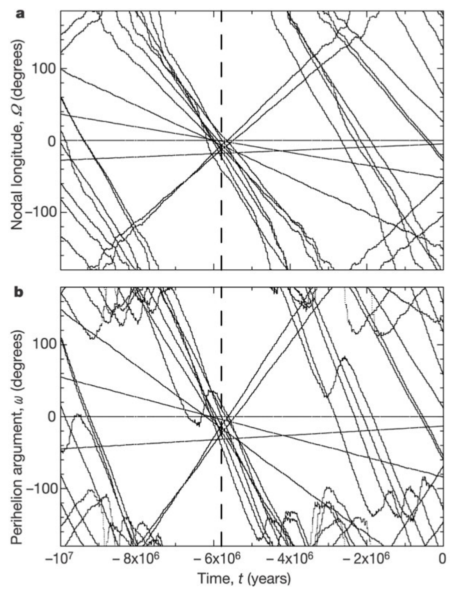


assumed $q_{disruption}$ =1.9

Grogan, Dermott, Durda, 2001 Durda and Dermott , 1997



Grogan, Dermott, Durda, 2001   Dermott et al., 2002

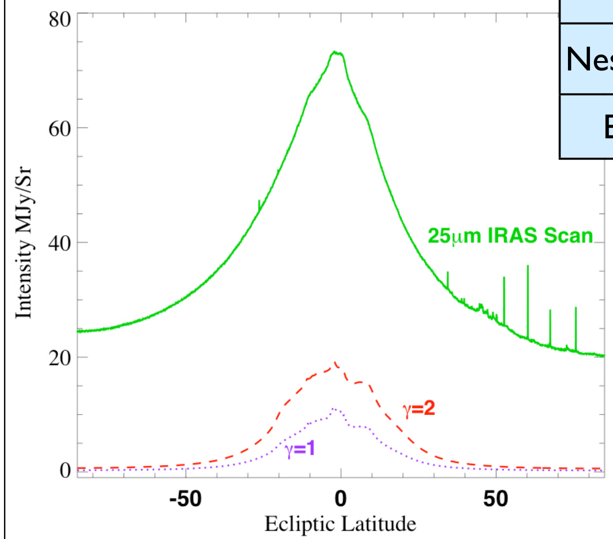


Karin
5.8 ± 0.2 Myr

Nesvorny et al., 2002

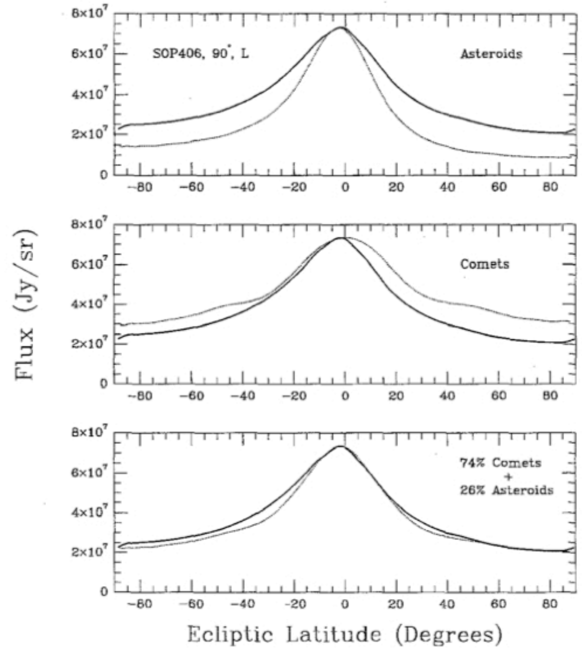
Family	Inclination	Precursor Diameter	Age
Karin	2.11°	~27 km	5.8 ± 0.2 Myr
Veritas	9.35°	~140 km	8.3 ± 0.5 Myr
Beagle	1.34°	20-62 km	≤ 10 Myr
Emilkowalski	17.22°	~10 km	220 ± 30 kyr

Nesvorny et al., 2003, 2006, 2008

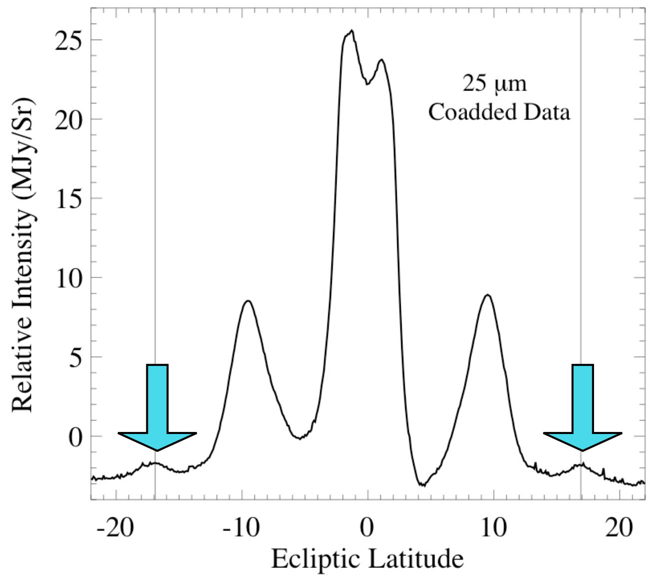


Author	Total Asteroidal Percentage	Within ±10° of Ecliptic
Grogan	< 30%	----
Nesvorný	5-9%	9-15%
Espy	6-13%	13-24%

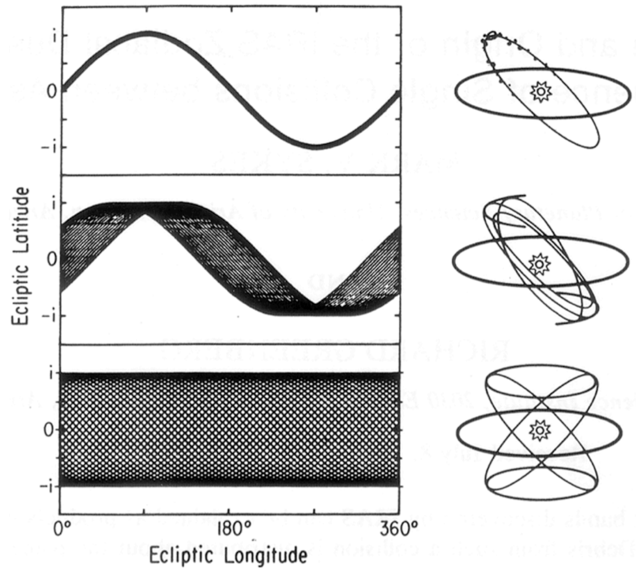
Grogan et al., 2001 Nesvorny et al., 2006 Espy et al., 2006, 2010



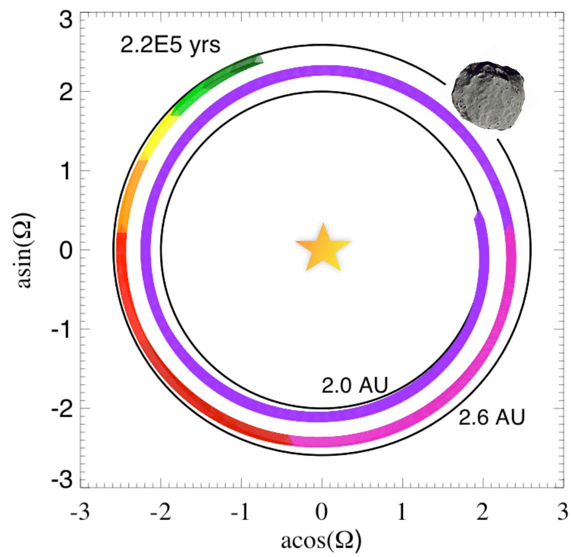
Liou et al., 1995



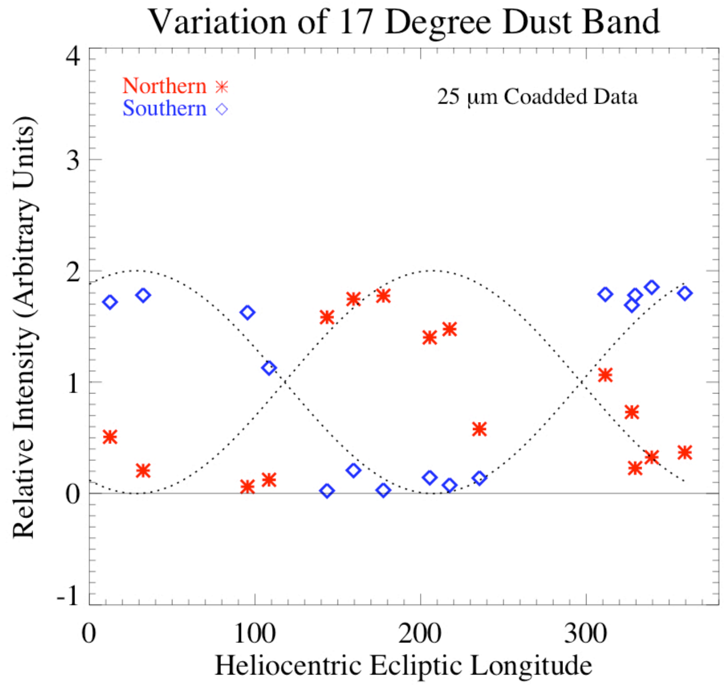
Espy et al., 2009



Sykes and Greenberg, 1986



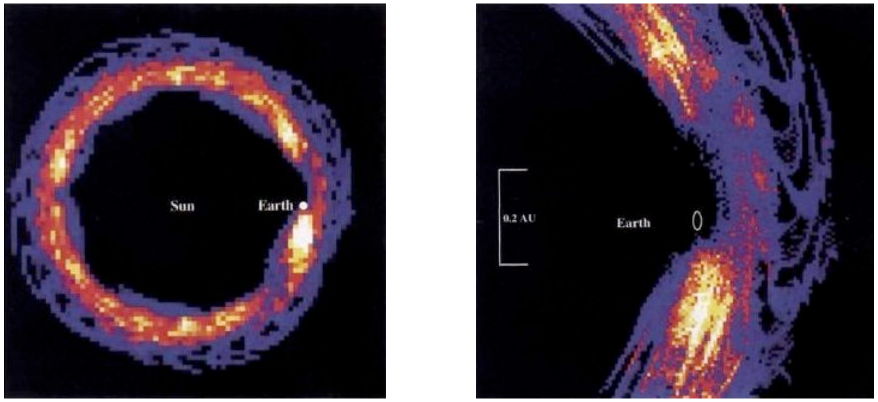
Espy et al., 2010



Espy et al., 2010

Structure in the zodiacal cloud II

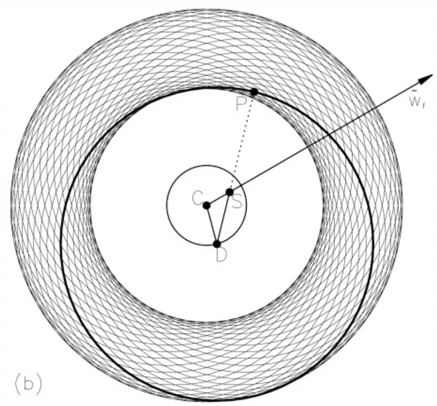
Earth's Resonant Ring



Dermott et al., 1994

Structure in the zodiacal cloud II

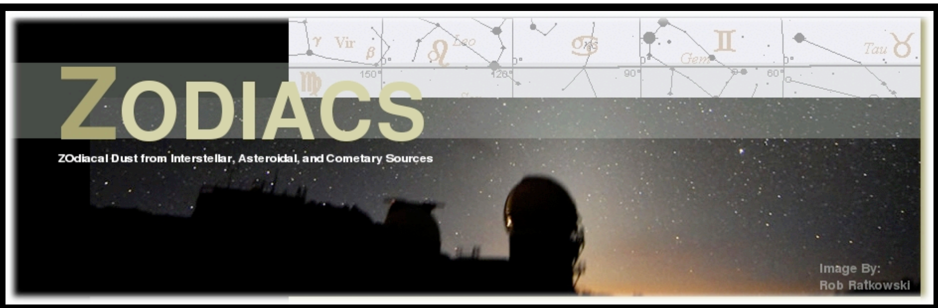
Pericenter Glow



Dermott et al., 1984   Wyatt et al., 1999

Summary

- The dust bands are young. Partial dust bands are very young and give a size distribution at disruption and a unique source
- Asteroidal dust is significant but not a dominant source of dust— need a cometary source
- Planetary perturbations will force asymmetries on dust in the inner and outer solar system



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