YARKOVSKY FOOTPRINTS IN THE EOS FAMILY

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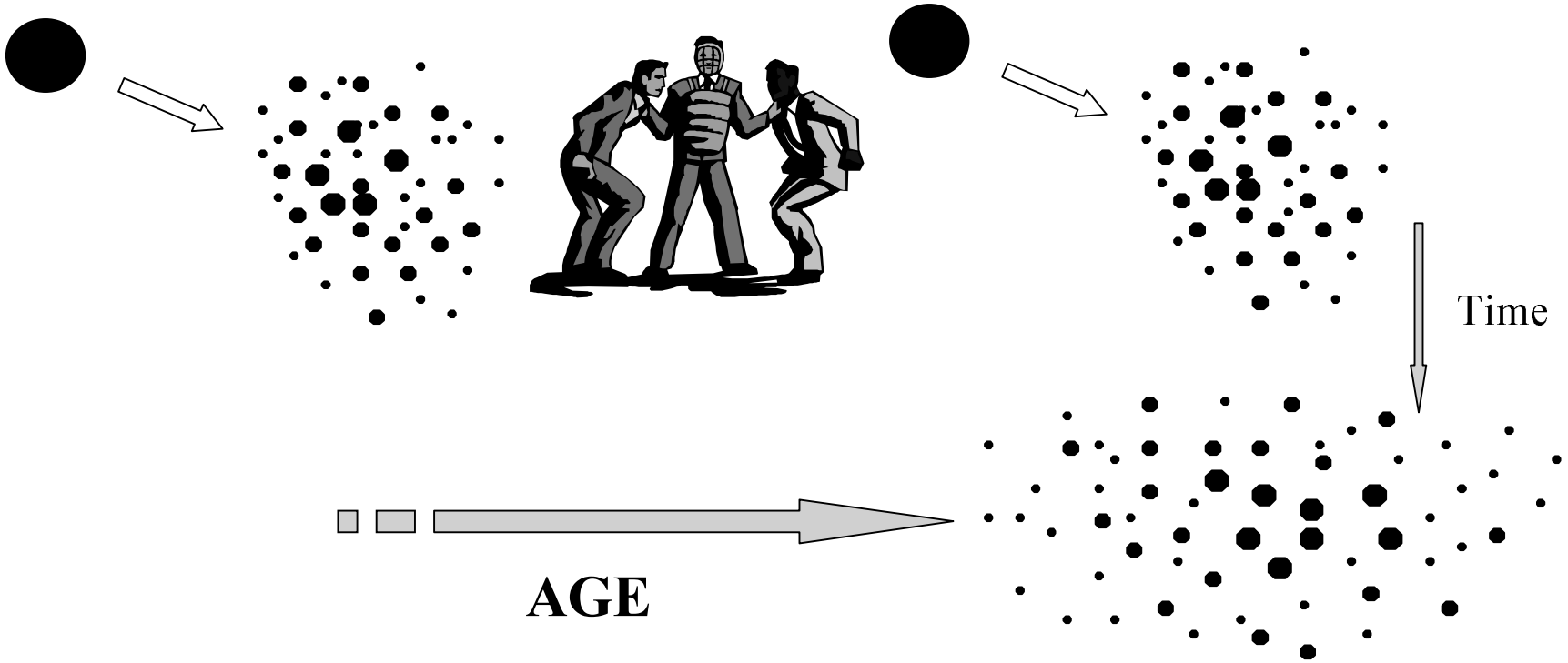
Classical vs extended model of the asteroid families:

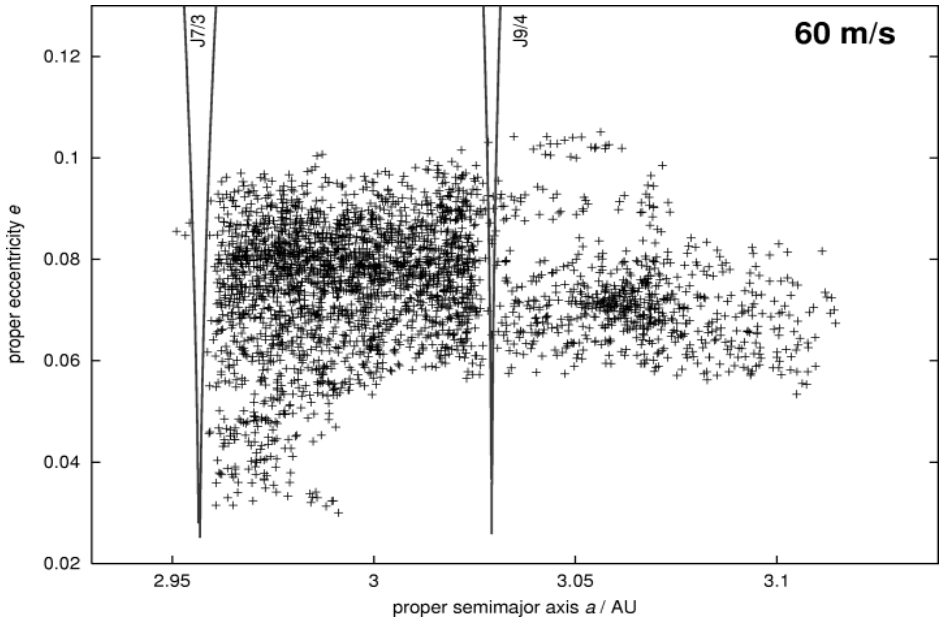


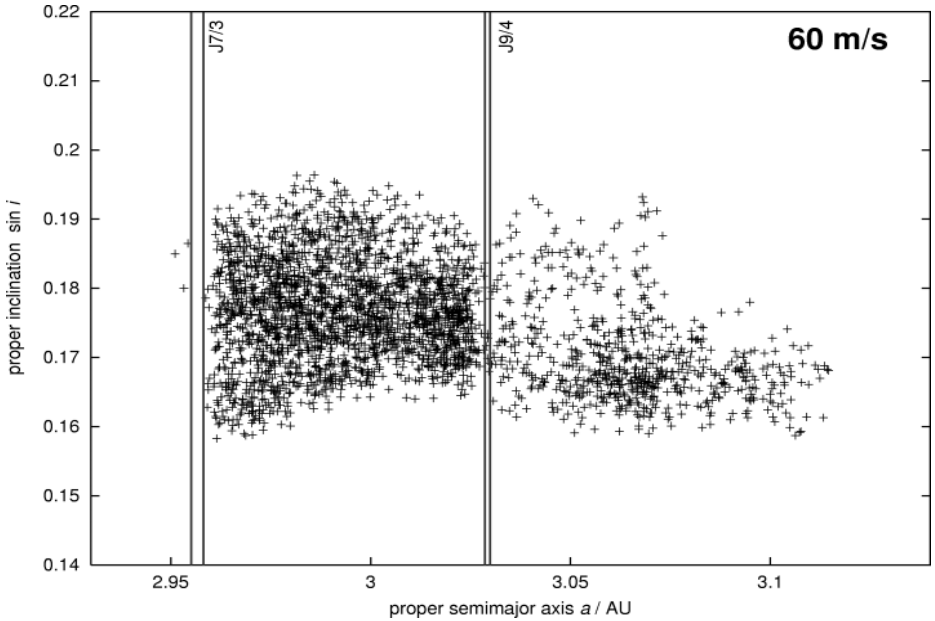
4 lines of evidence for the ongoing long-term evolution driven by the Yarkovsky effect in the Eos family:

- **Sharp boundary at the 7/3 resonance;**
- **Asymmetry wrt the 9/4 resonance and bodies inside the 9/4 resonance;**
- **Characteristic shape of the family in the a-H projection;**
- **Overabundance of asteroids in the z_1 secular resonance at low inclination and eccentricity.**

1. Sharp boundary at the 7/3 resonance

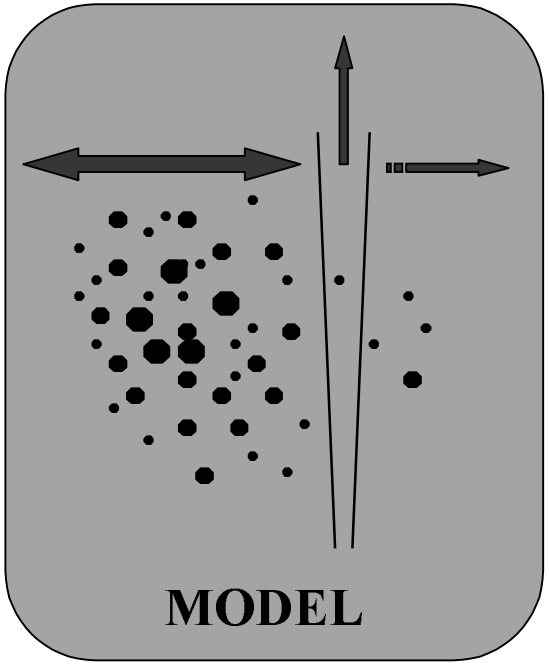
Eos @ 60m/s; 3028 asteroids





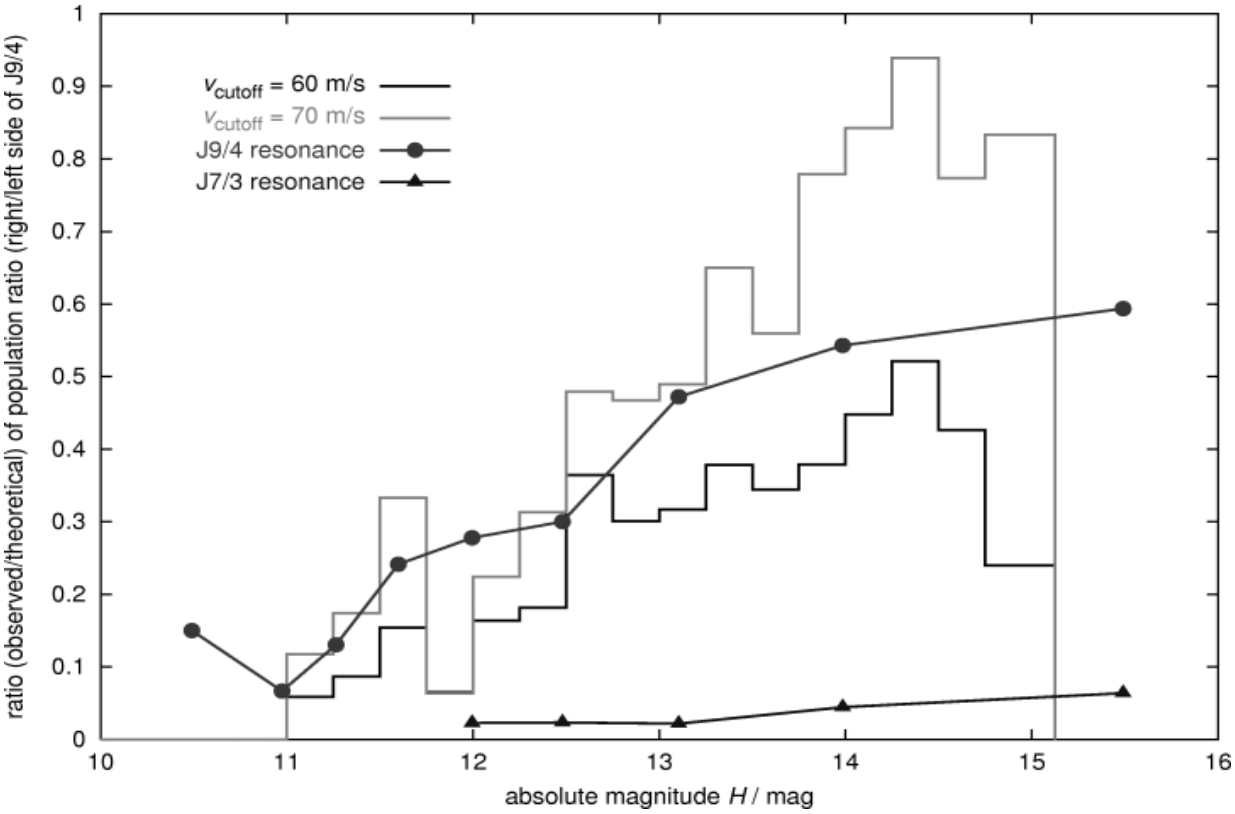
Eos family identified by the Hierarchical Clustering Method using the new database of proper elements for 106,000 numbered and multiopposition asteroids (data from AstDys, http://newton.dm.unipi.it by Knezevic and Milani)

2. Asymmetry wrt the 9/4 resonance and…

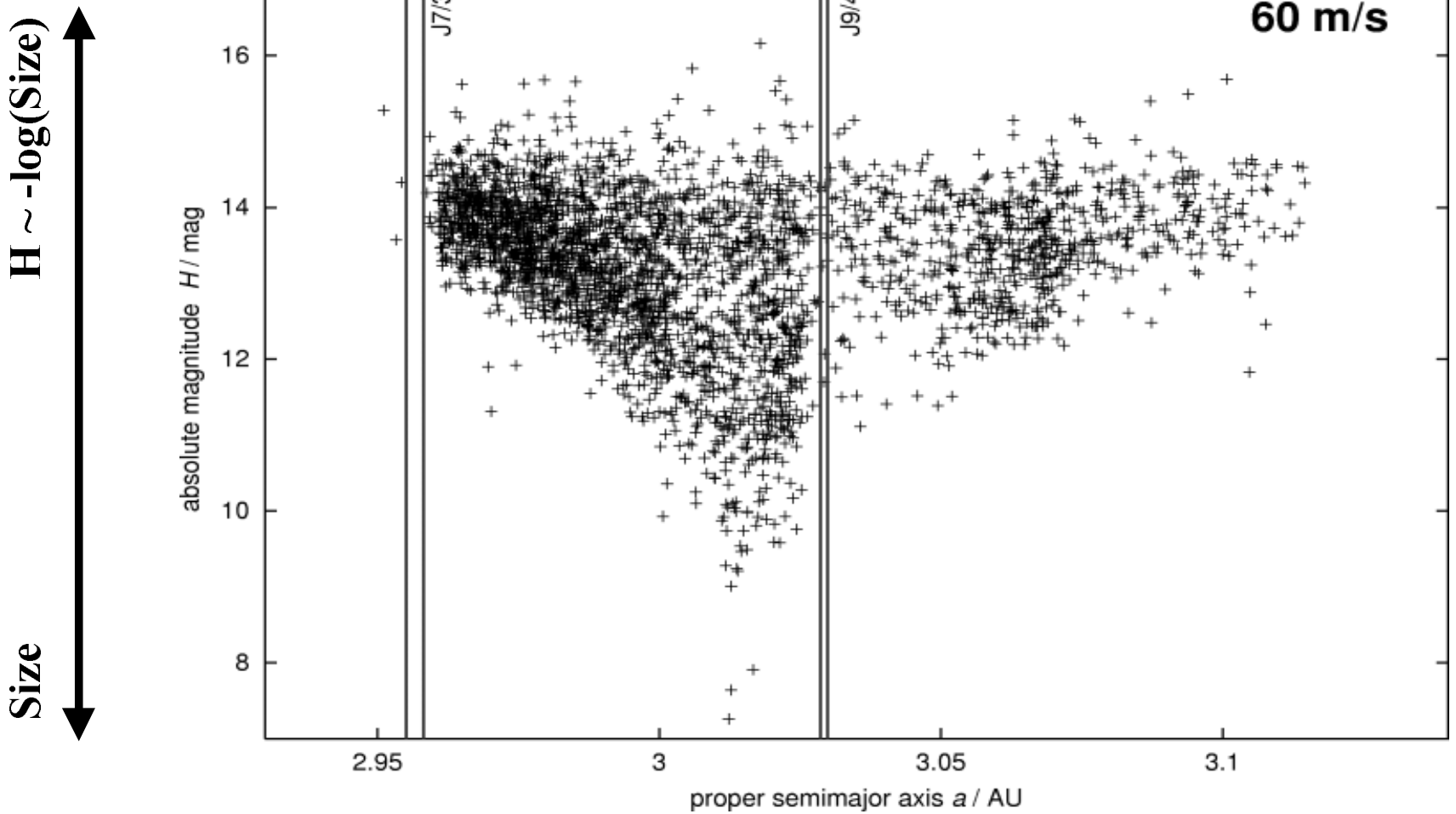


Our model assumes the bulk of family formed on the left side of the 9/4 resonance; the Yarkovsky effect constantly pushes new bodies TOWARDS the resonance…

the relative family population observed on the right side of the resonance matches the expected probability to CROSS the resonance for different values of H…



3. Characteristic shape in the a-H projection…



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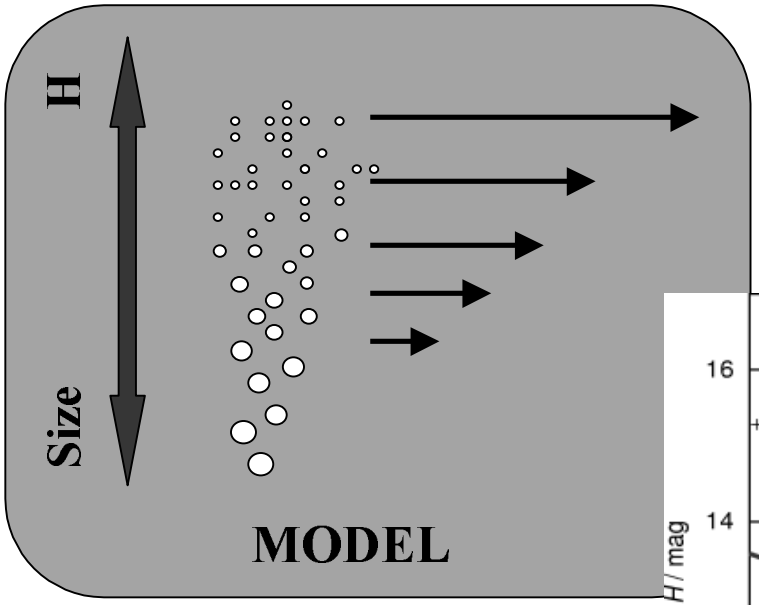
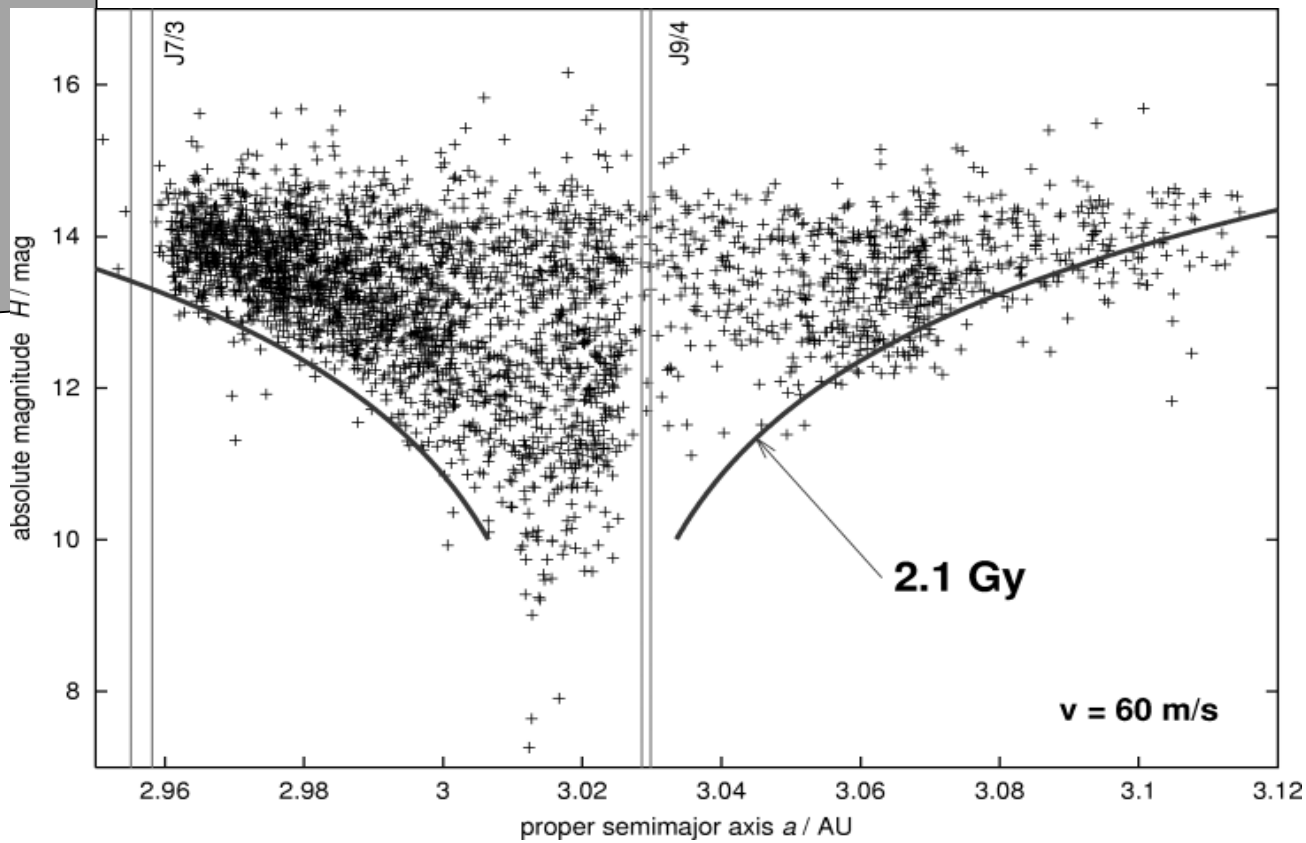


Our model well matches the family boundary for H>10; the conjectured age is ~ 2.1 Gy



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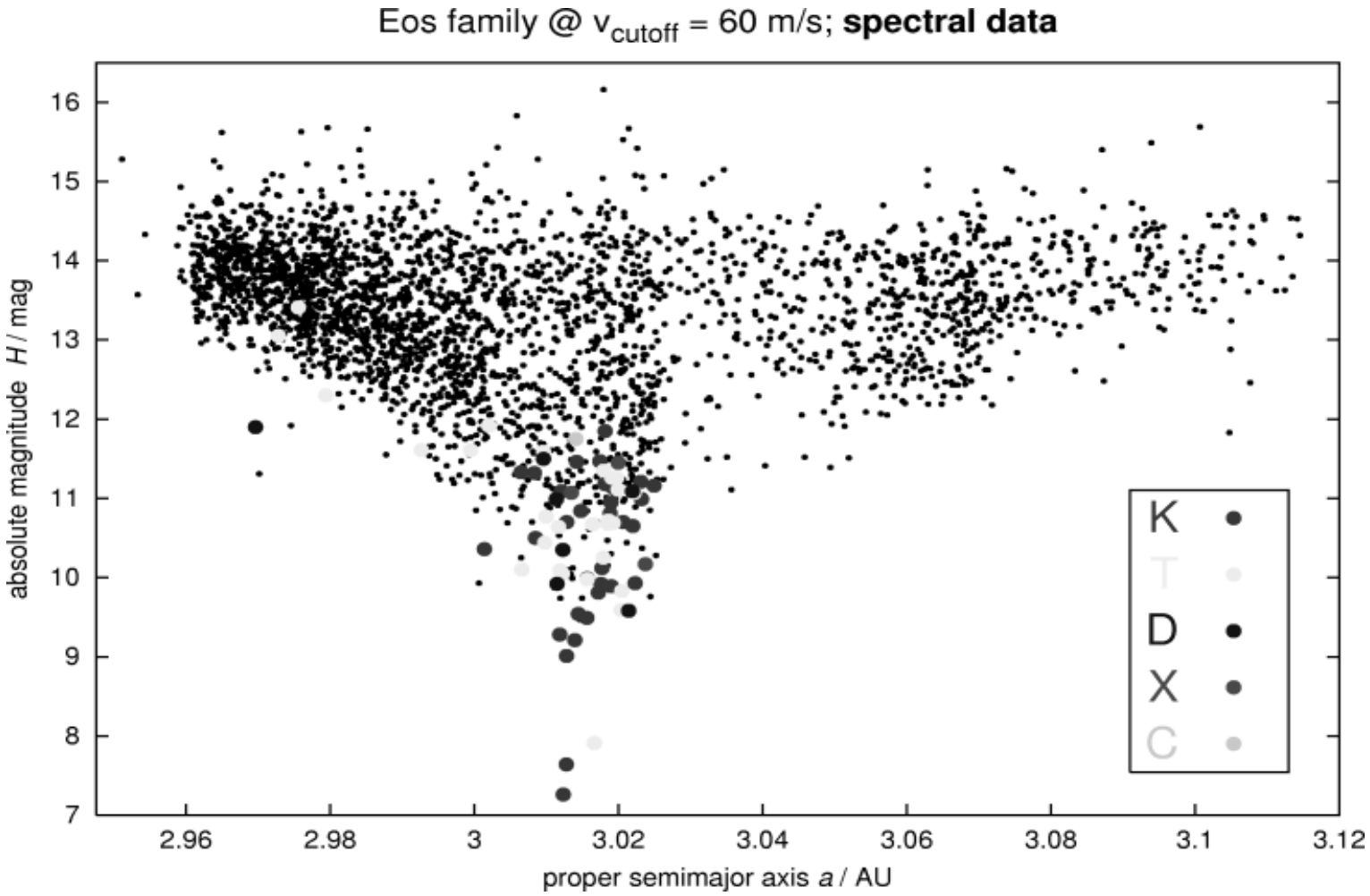

Sources: http://smass.mit.edu, http://pdssbn.astro.umd.edu/, Doressoundiram et al. (1998)

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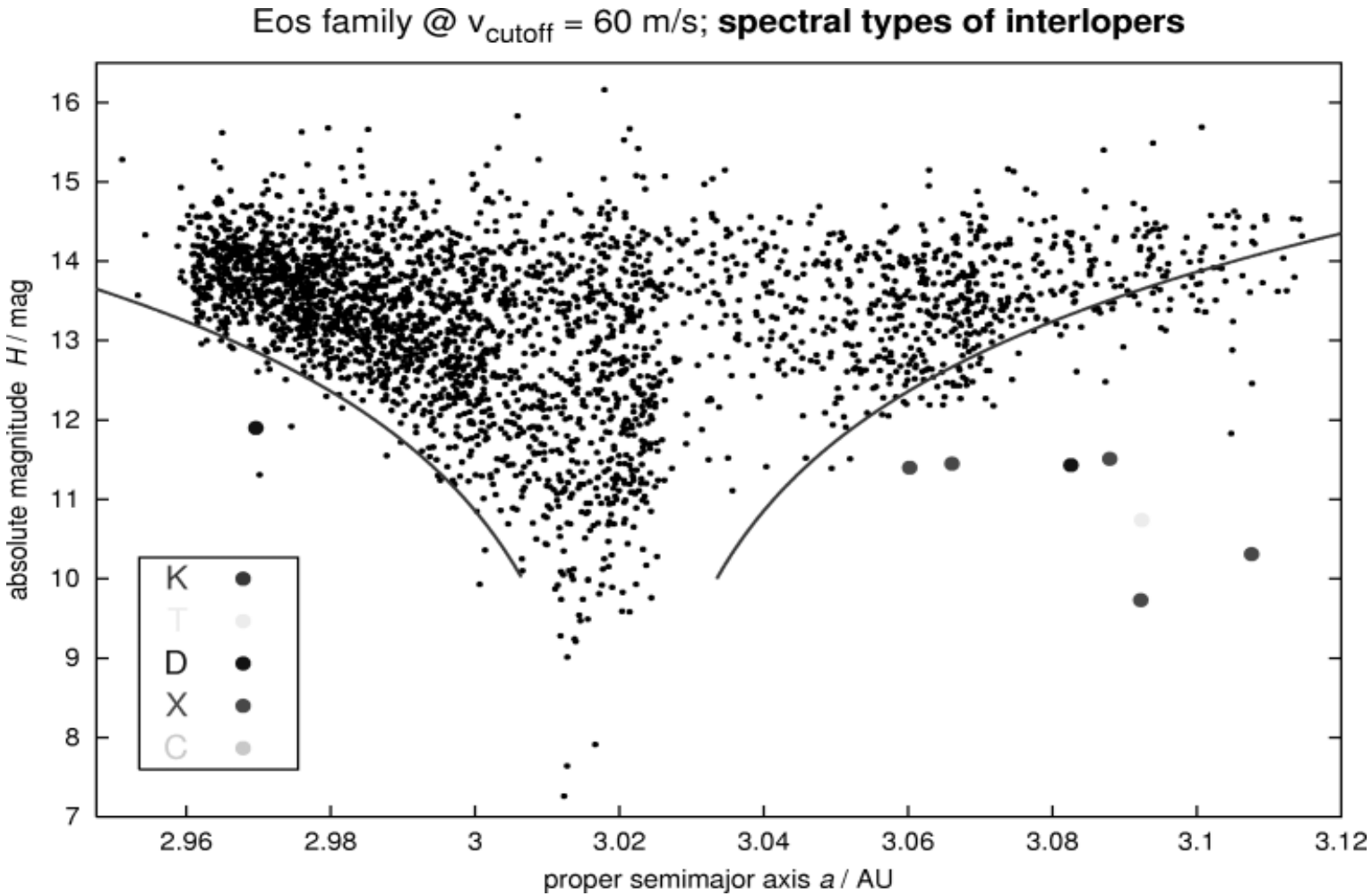
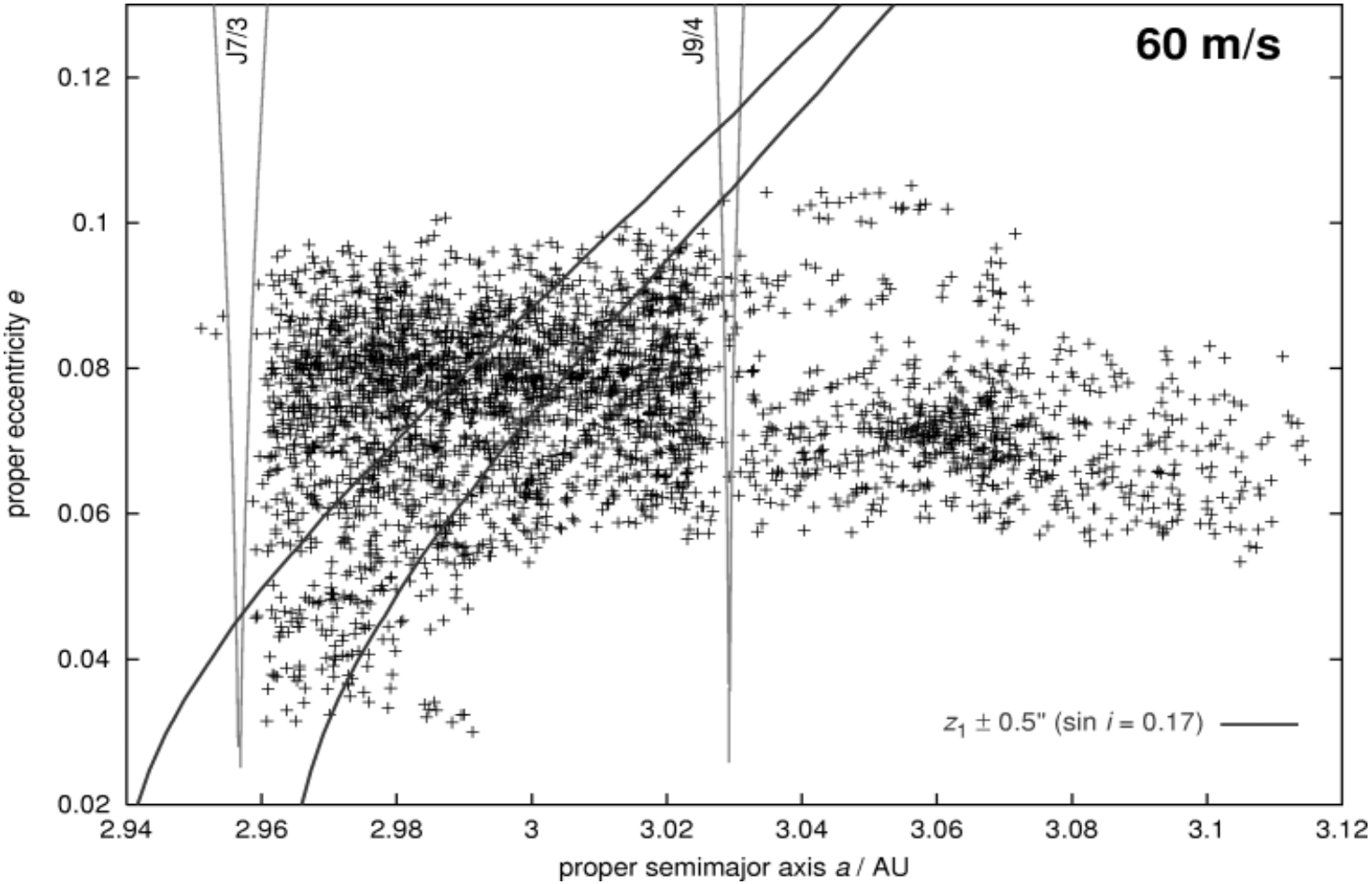


Observations: D. Lazzaro and A. Rivkin

4. Asteroids in the z_1 secular resonance…



Eos family is crossed by the secular resonance $z_1=g+s-g_6-s_6$; the family at small value of *e* and *I* seems to consist of bodies uniquely in this resonance.

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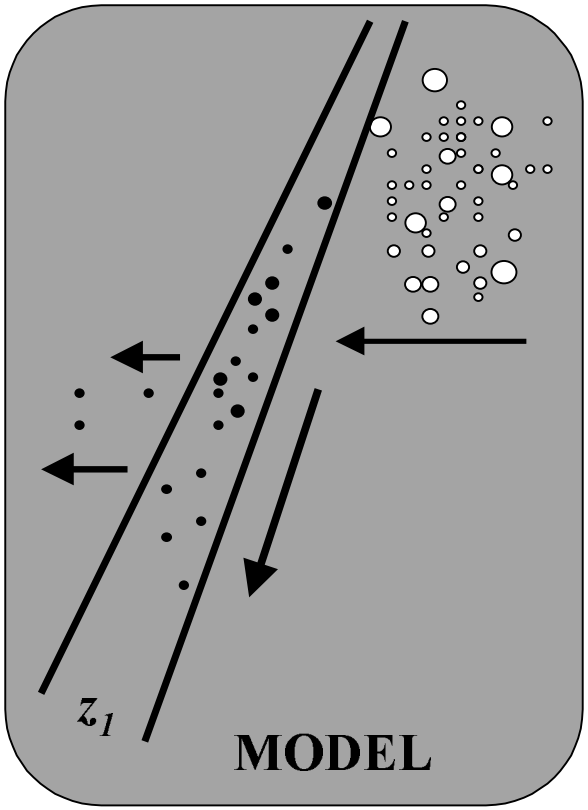
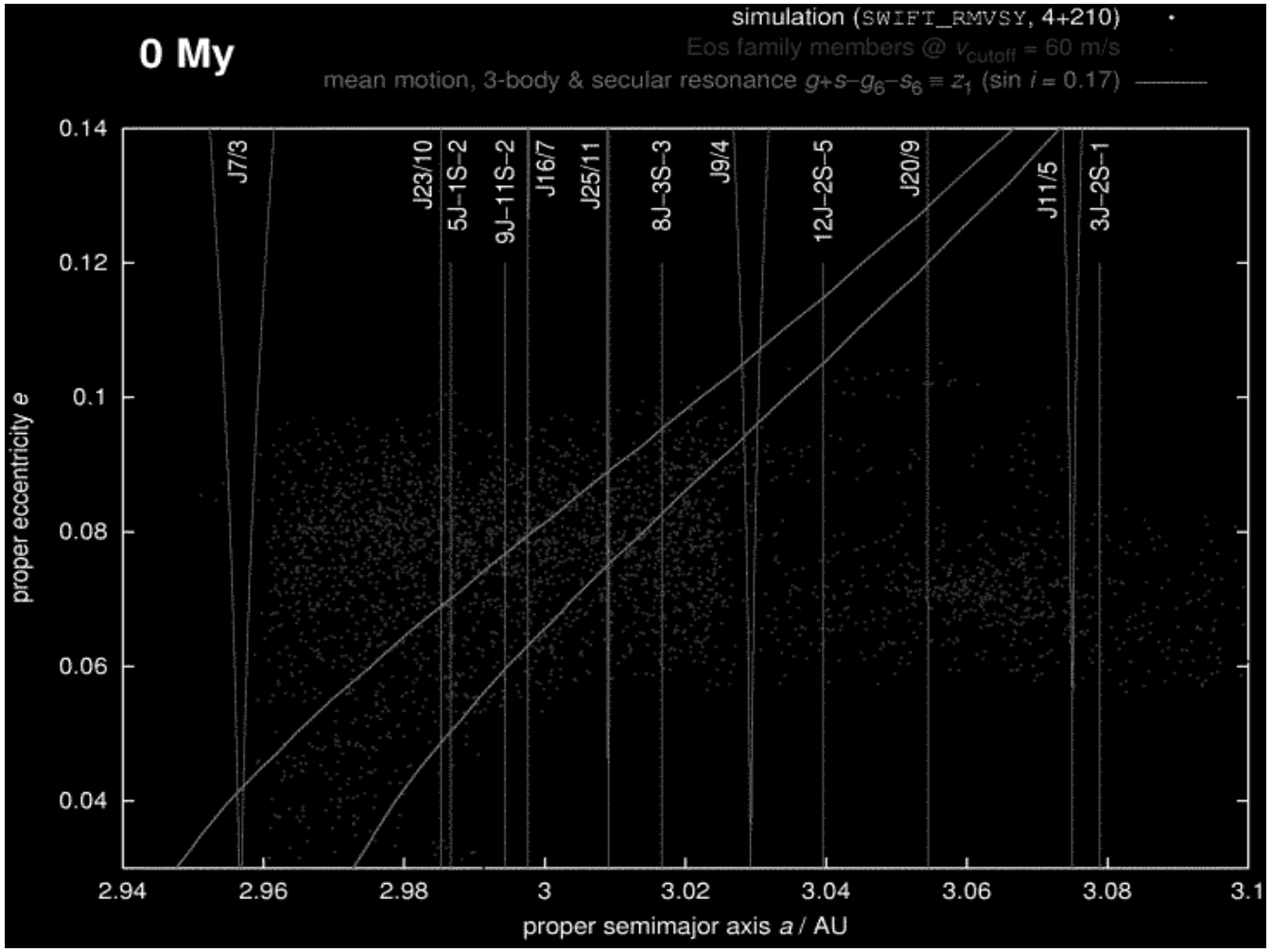
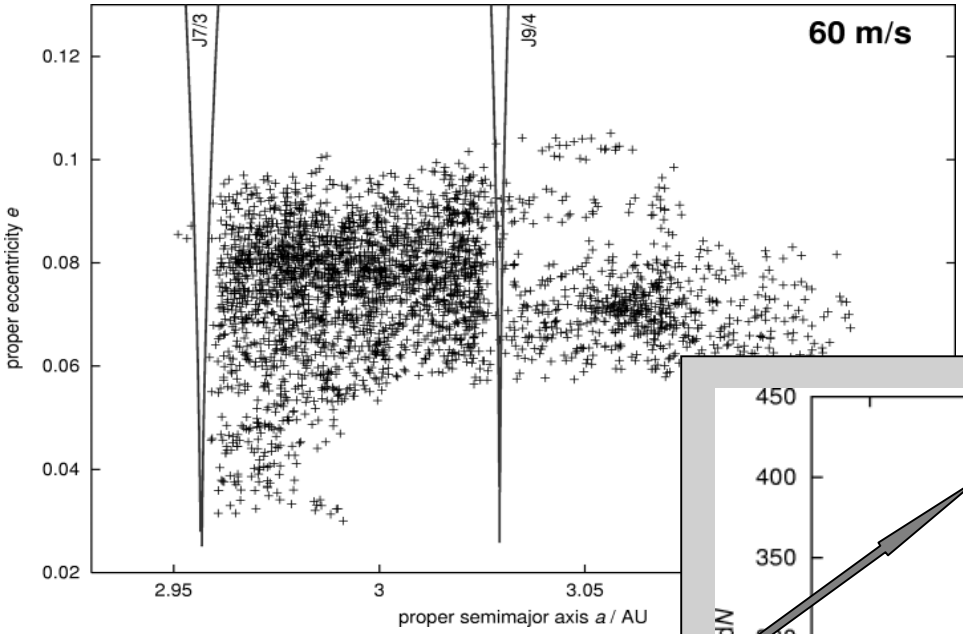




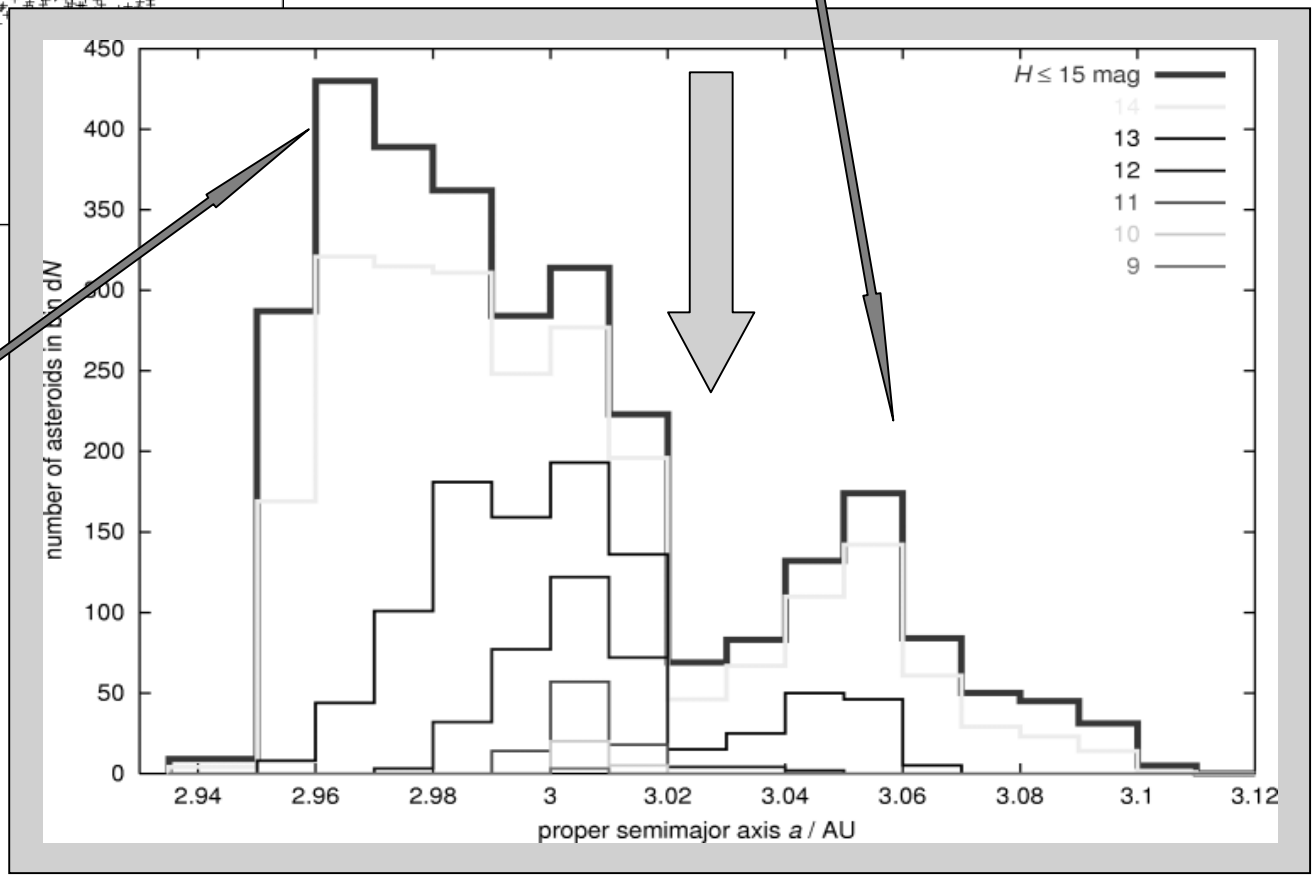
Numerical simulation confirms that Yarkovsky-drifting bodies are trapped by the z_1 resonance and form a stream out of the family…

2. Asymmetry wrt the 9/4 resonance and…

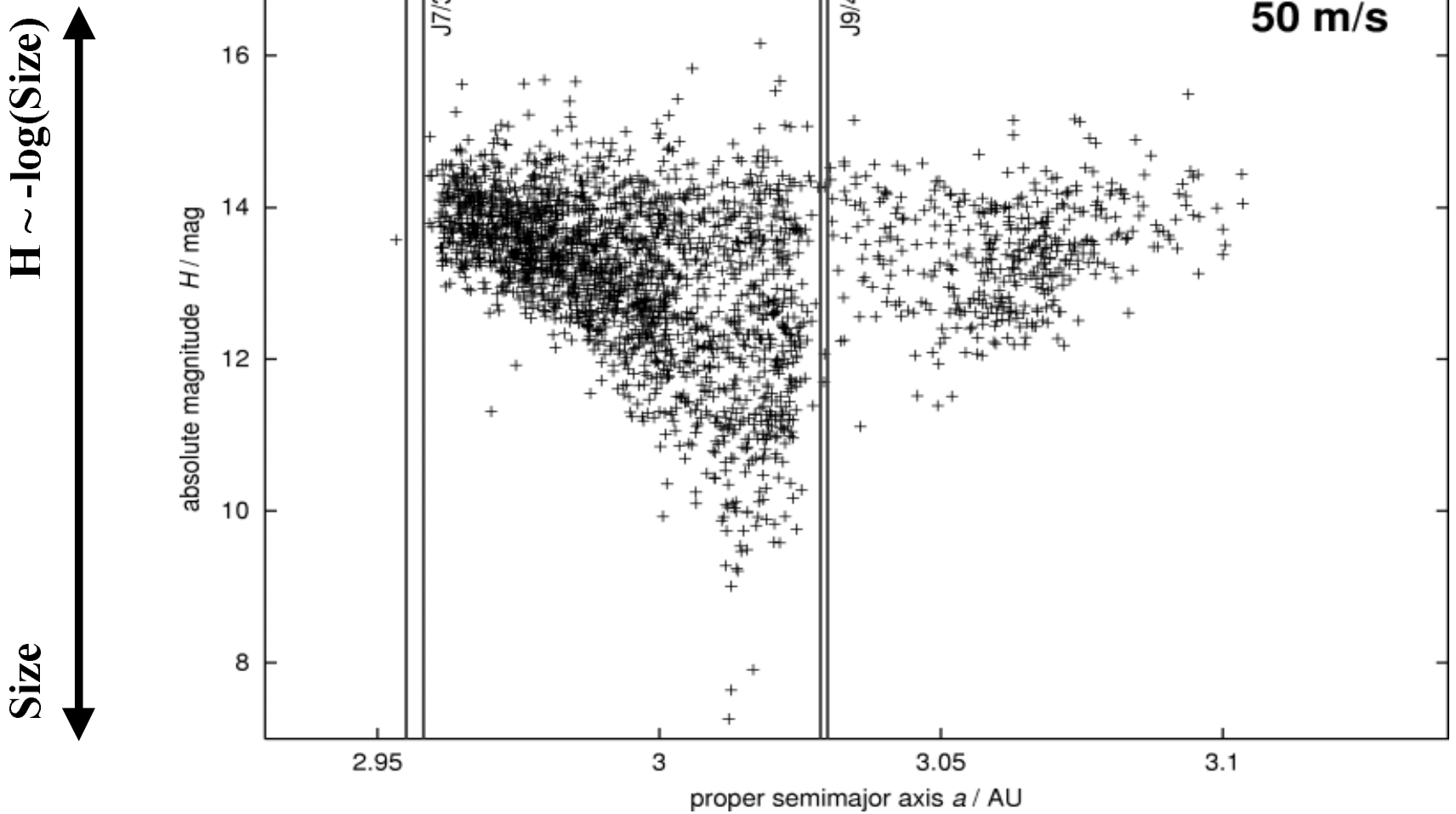


Significant deficiency of asteroids above the 9/4 resonance…

Asymmetry of the small asteroid distribution as compared to the larger asteroid distribution…



3. Characteristic shape in the a-H projection…



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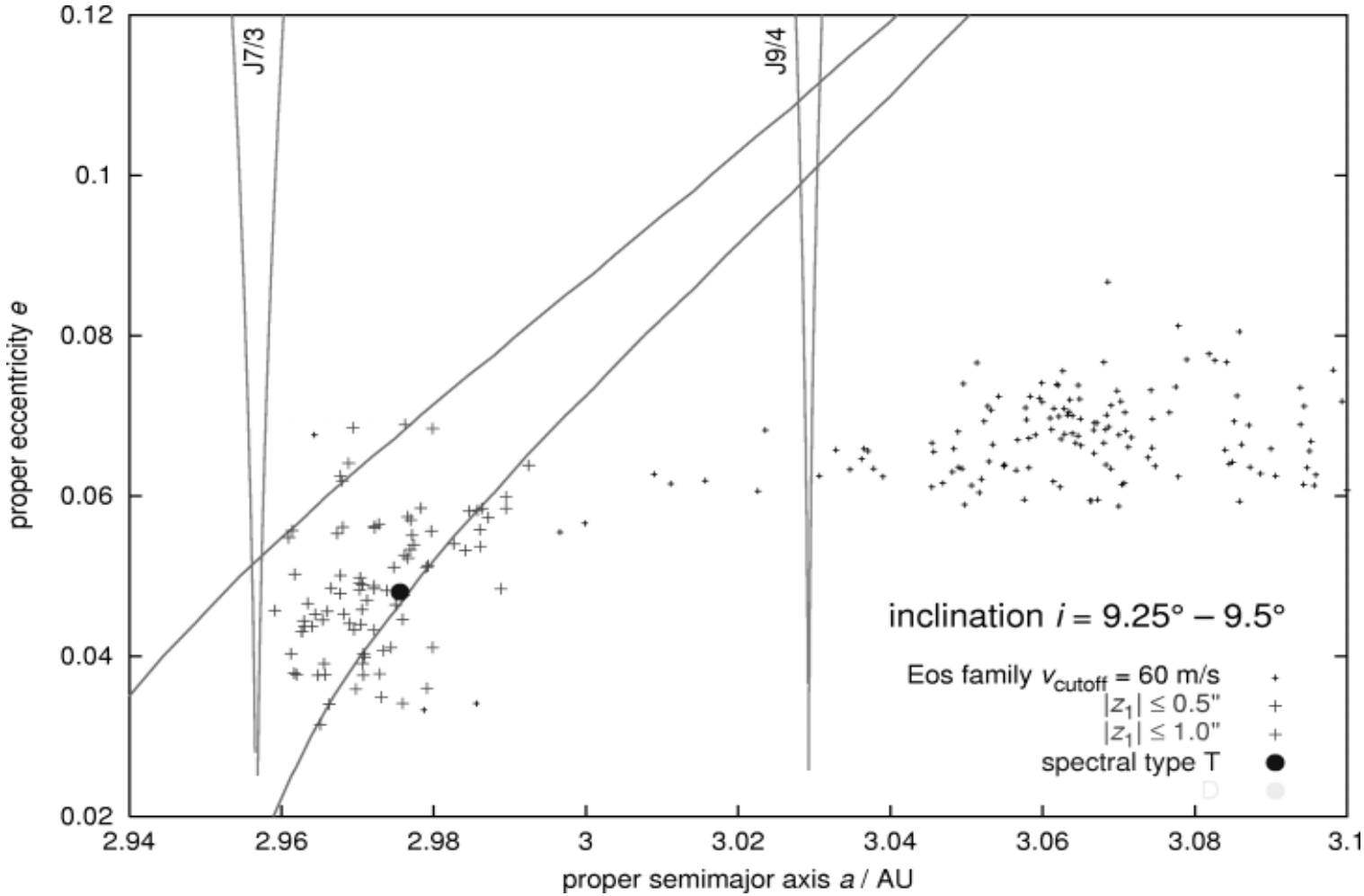

Observations: A. Rivkin

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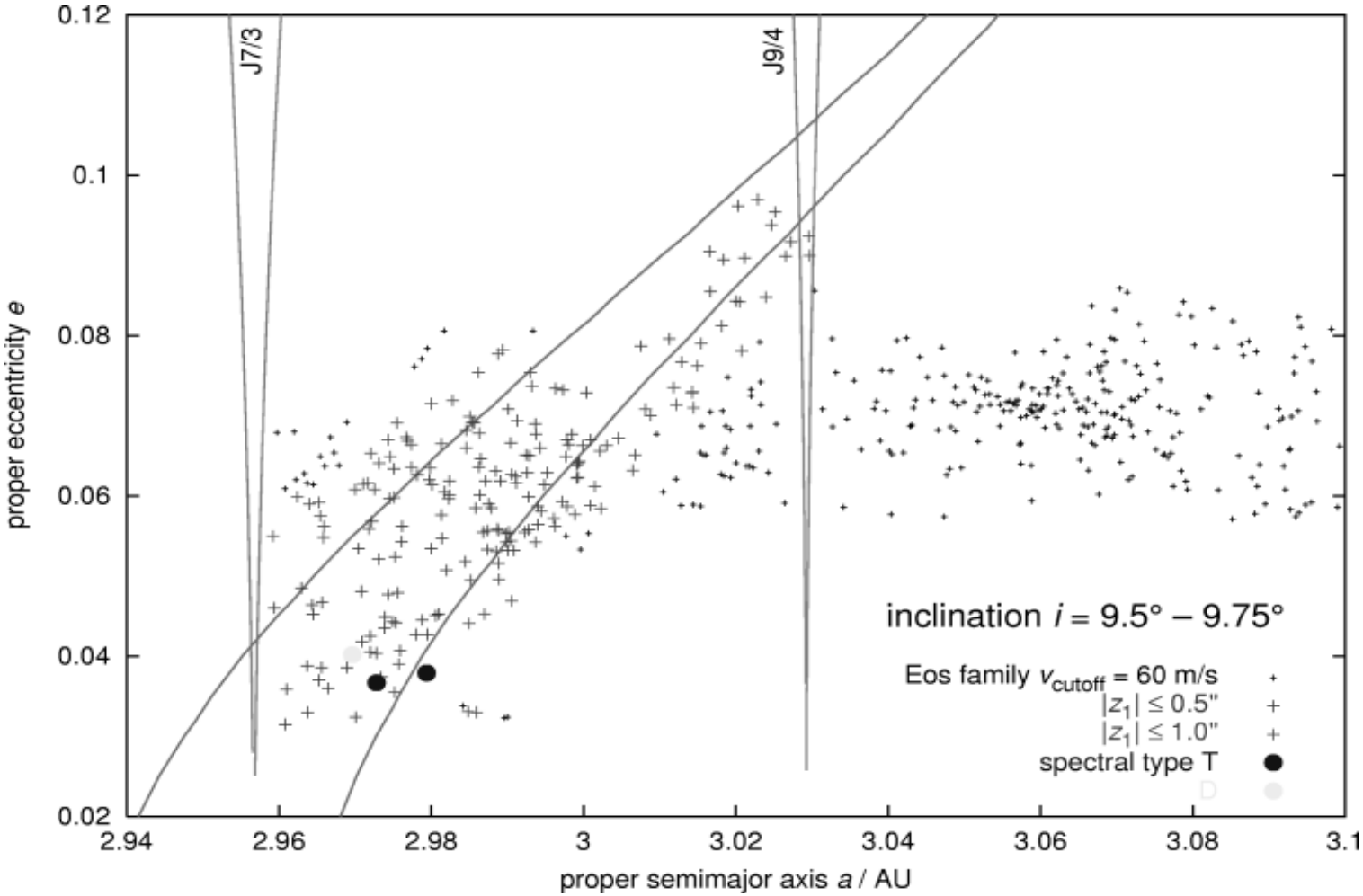
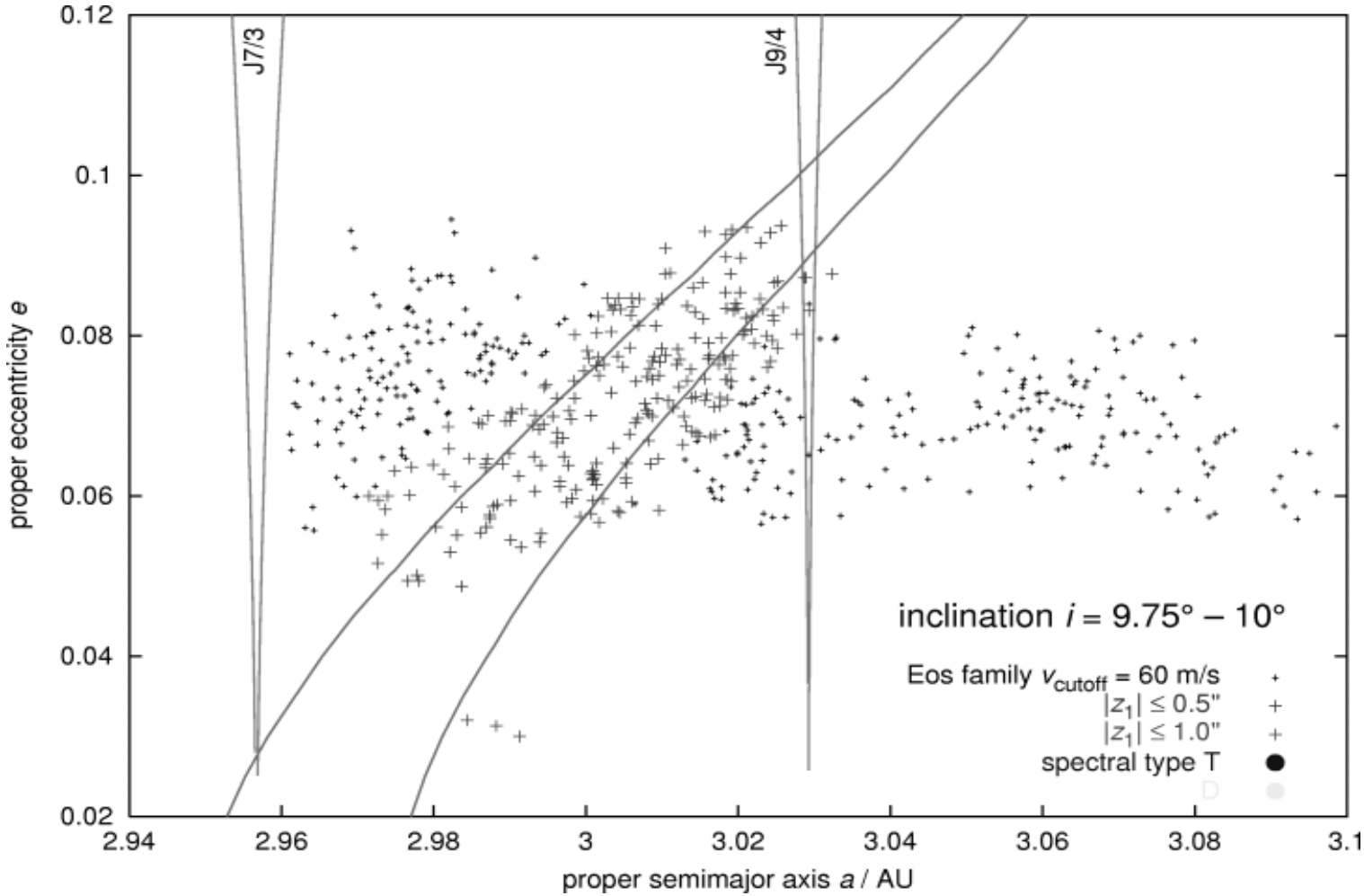


Observations: A. Rivkin

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