The Origin of the Kuiper Belt High-Inclination Population

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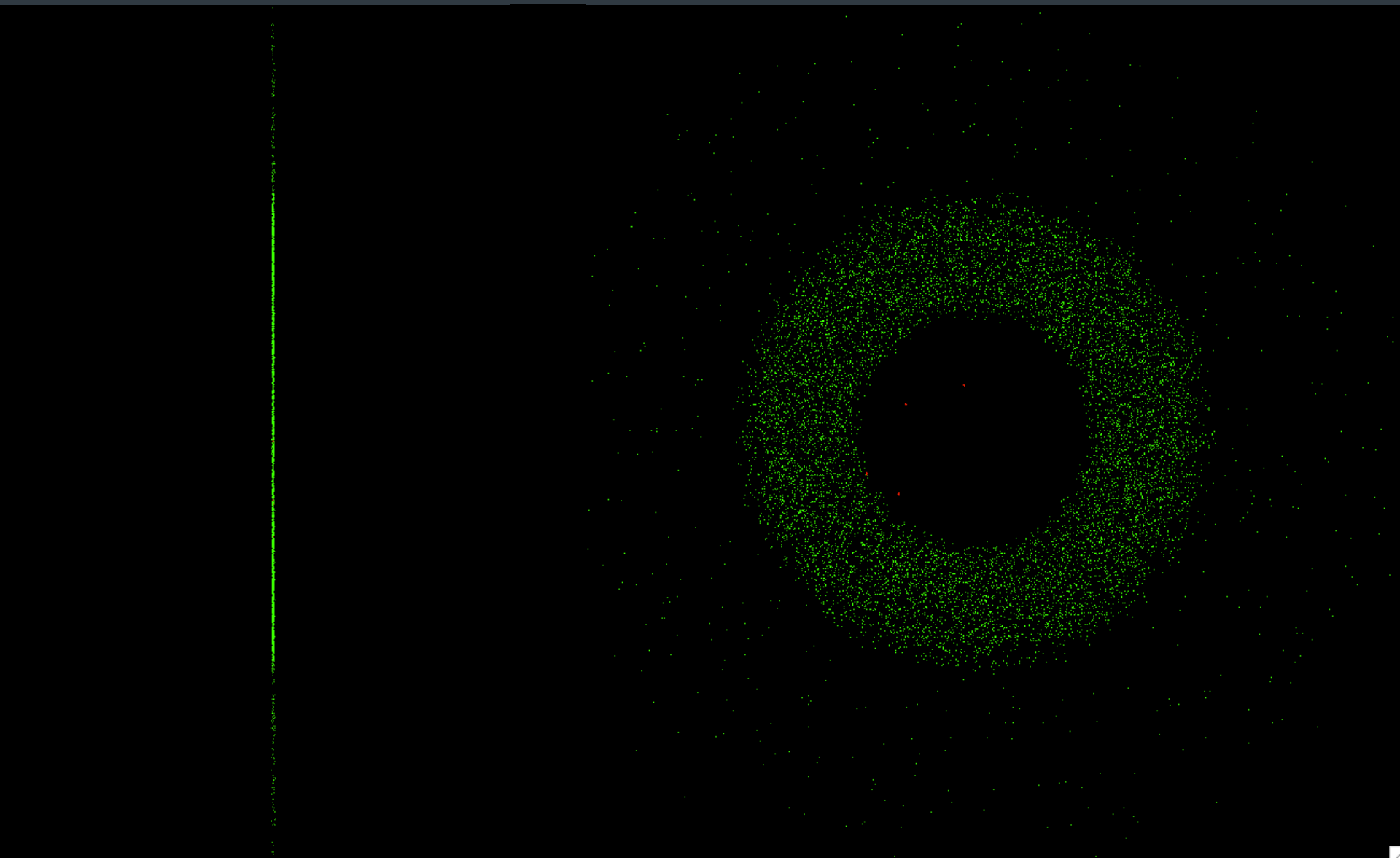
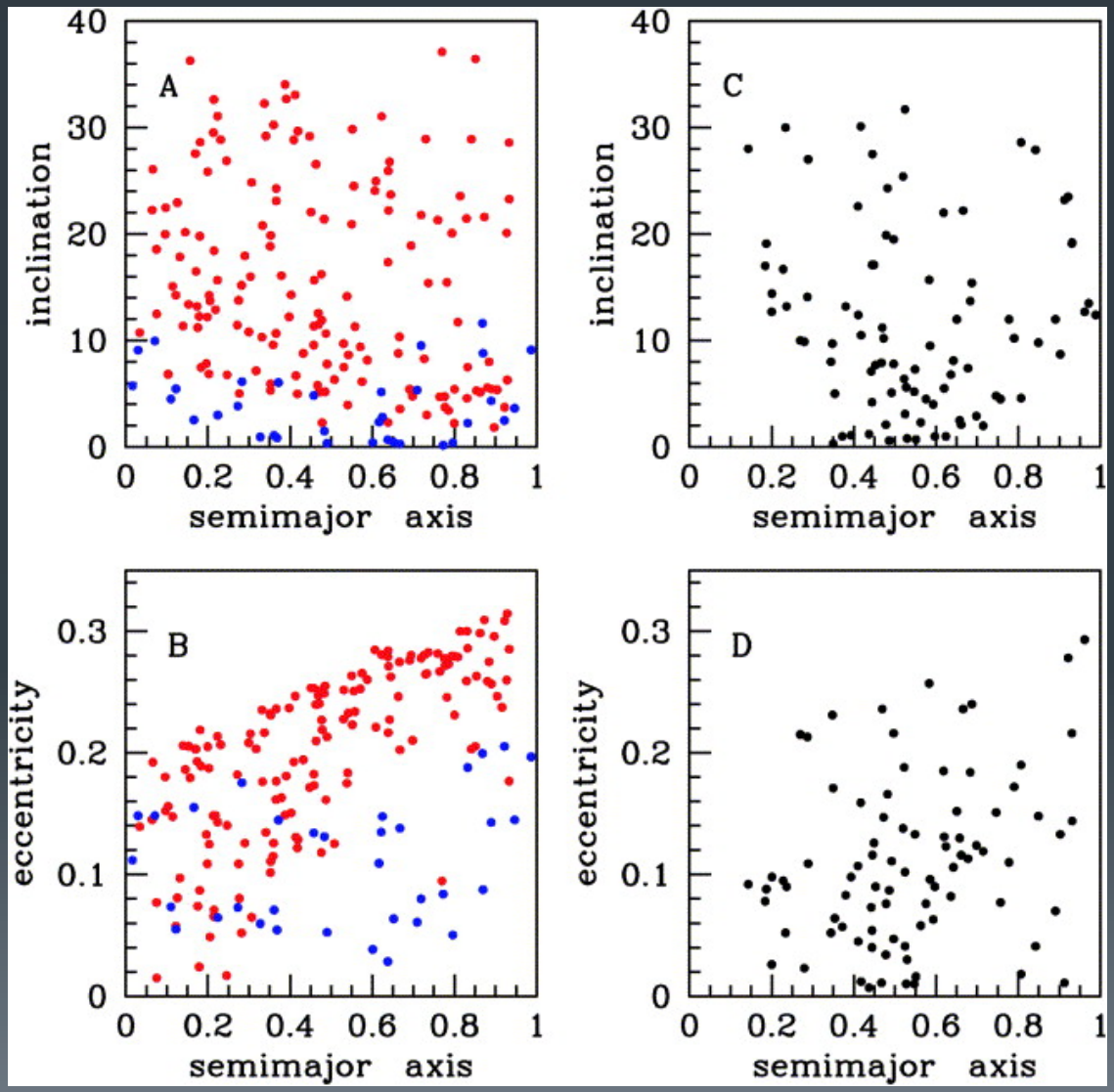
With help from Rodney S. Gomes

The Setup



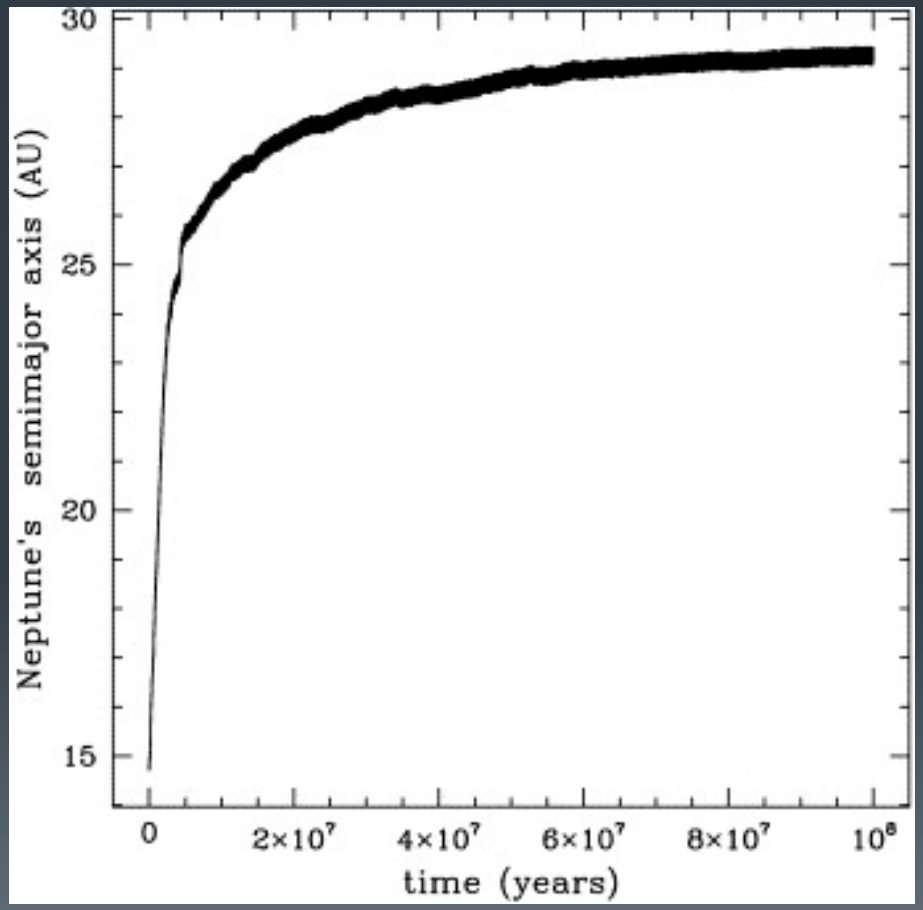
Classical Belt Distribution



- “Hot” population from the inner disk.
- “Cold” population from the outer disk.
- Semimajor axis between the 2:3 resonance at ~ 40 AU
- And the 1:2 resonance at ~ 50 AU
- 10^8 yrs

Gomes, 2003

Resonance Sweeping



- Neptune's migration causes resonances to sweep across the disk.
- Planetesimals get caught up in them, have their orbital elements adjusted, then are left behind.
- If they exit at high eccentricity, they are likely to have another close approach.

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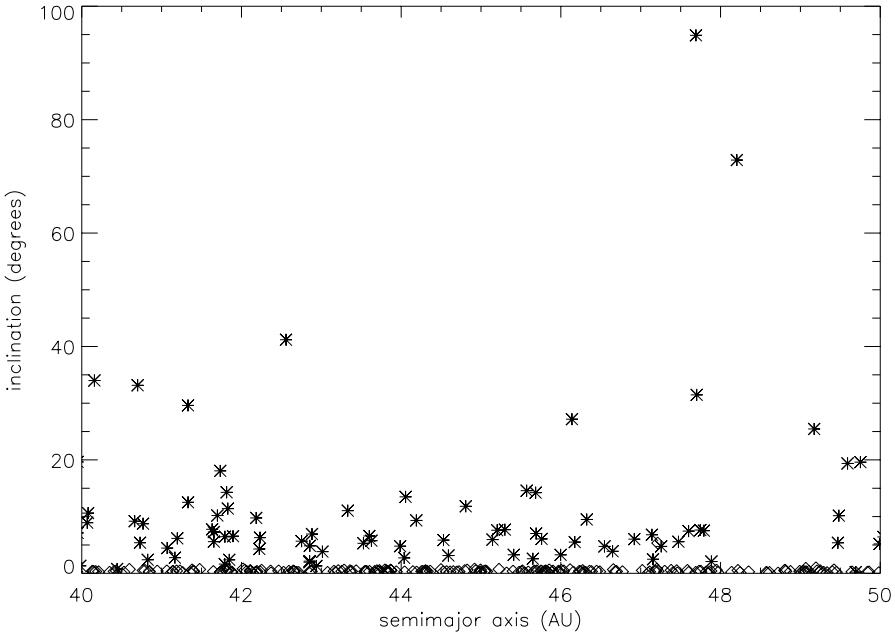
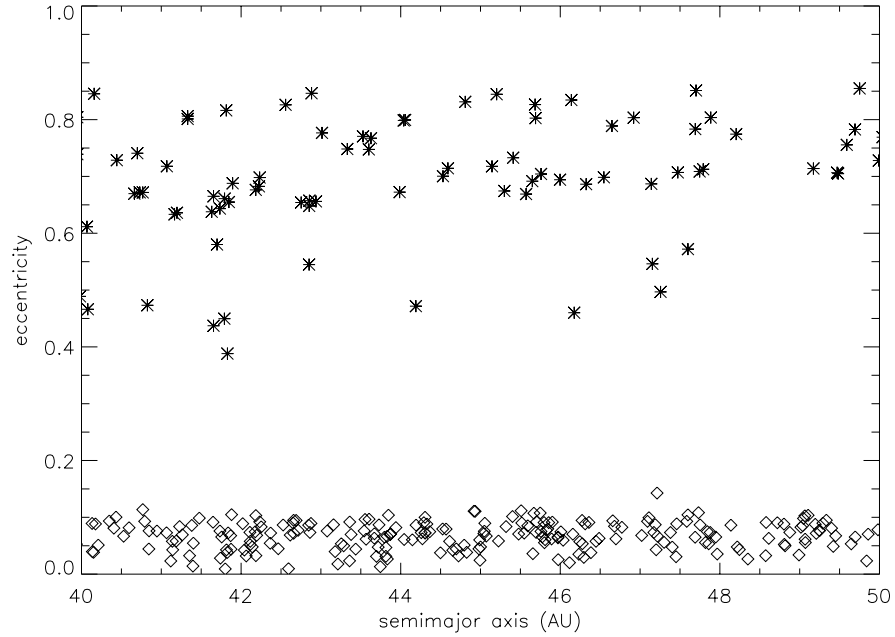
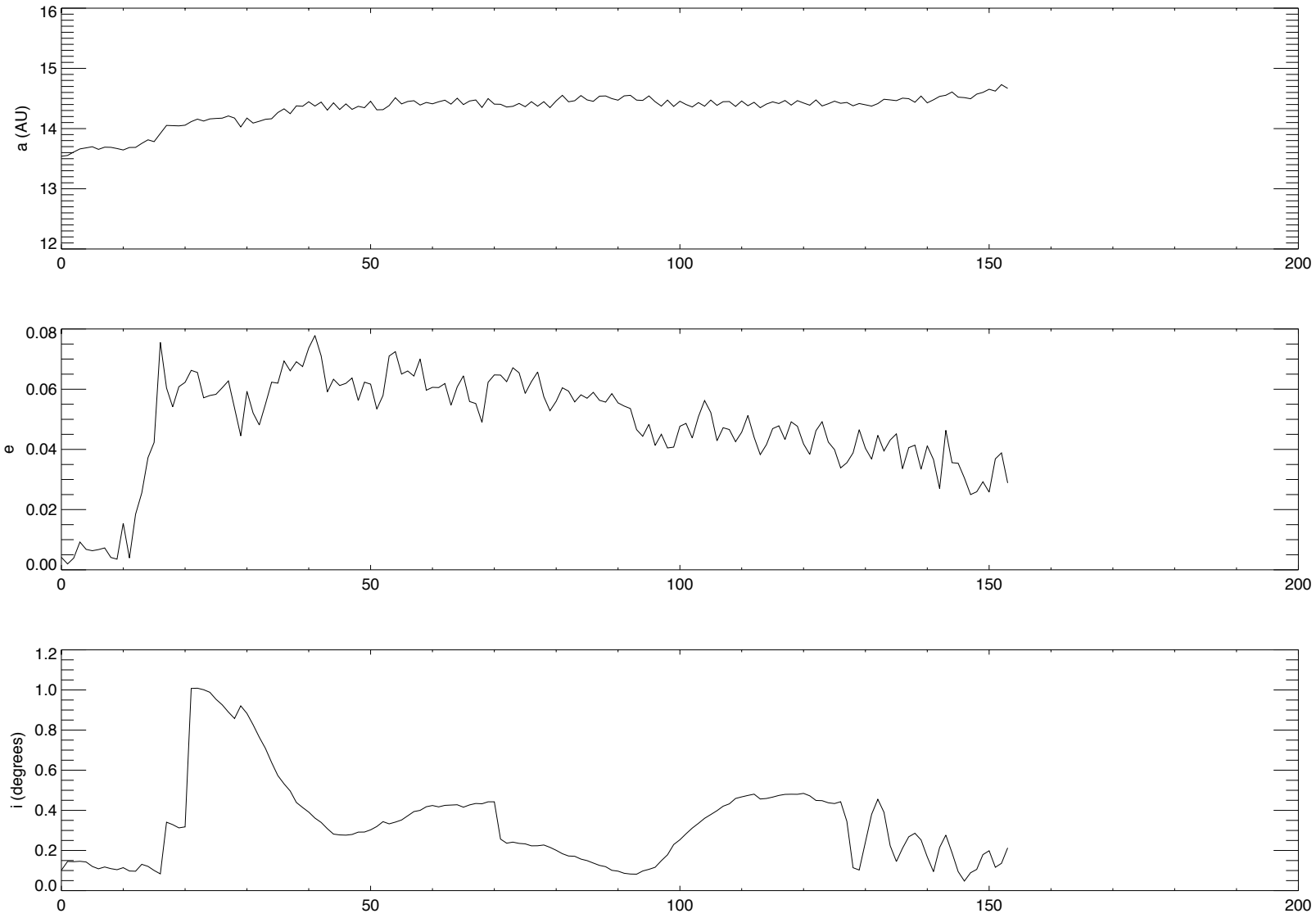


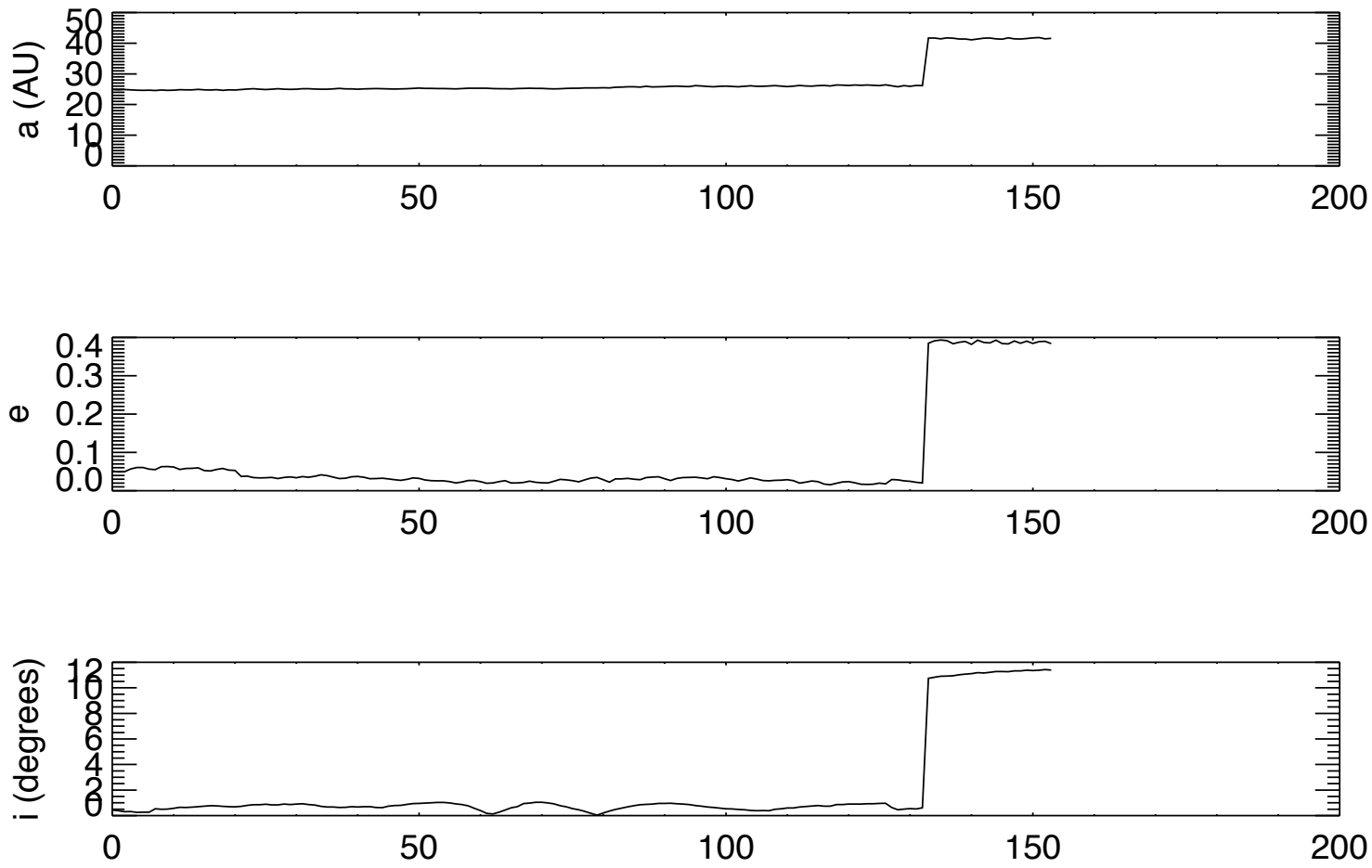


- 10^6 yrs
- Scattered objects yet to be stabilized.
- Neptune still at 15 AU
- Inner to outer boundary at 26 AU

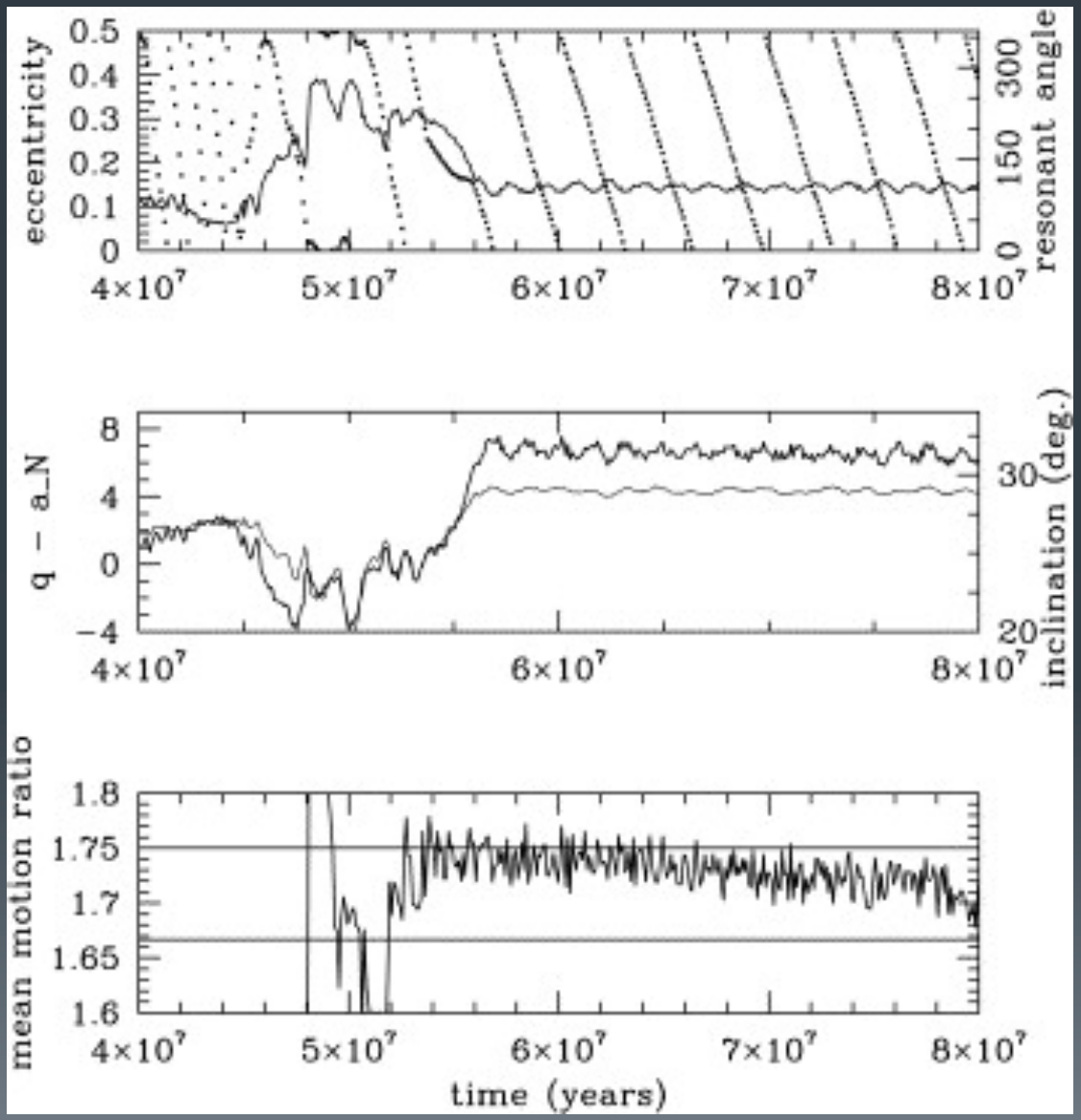
Neptune


a (AU)
16
15
14
13
12
0
50
100
150
200
e
0.08
0.06
0.04
0.02
0.00
0
50
100
150
200
i (degrees)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
50
100
150
200

Mysterious event



Kozai Mechanism?



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