Sizes, binaries, and sheer numbers. The LSST's revolution of outer Solar System, small body science.

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Thanks to Ernst de Mooij

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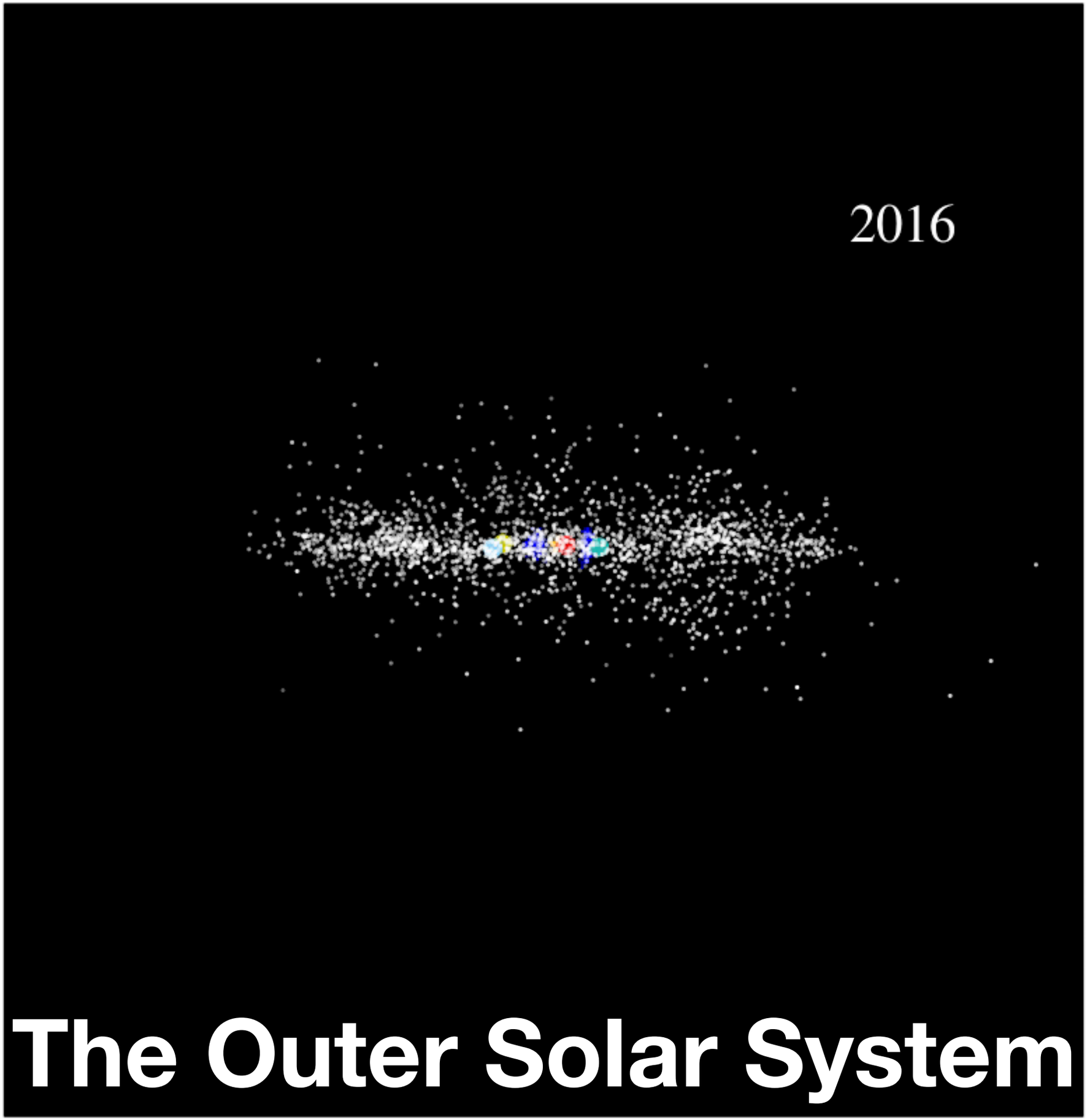
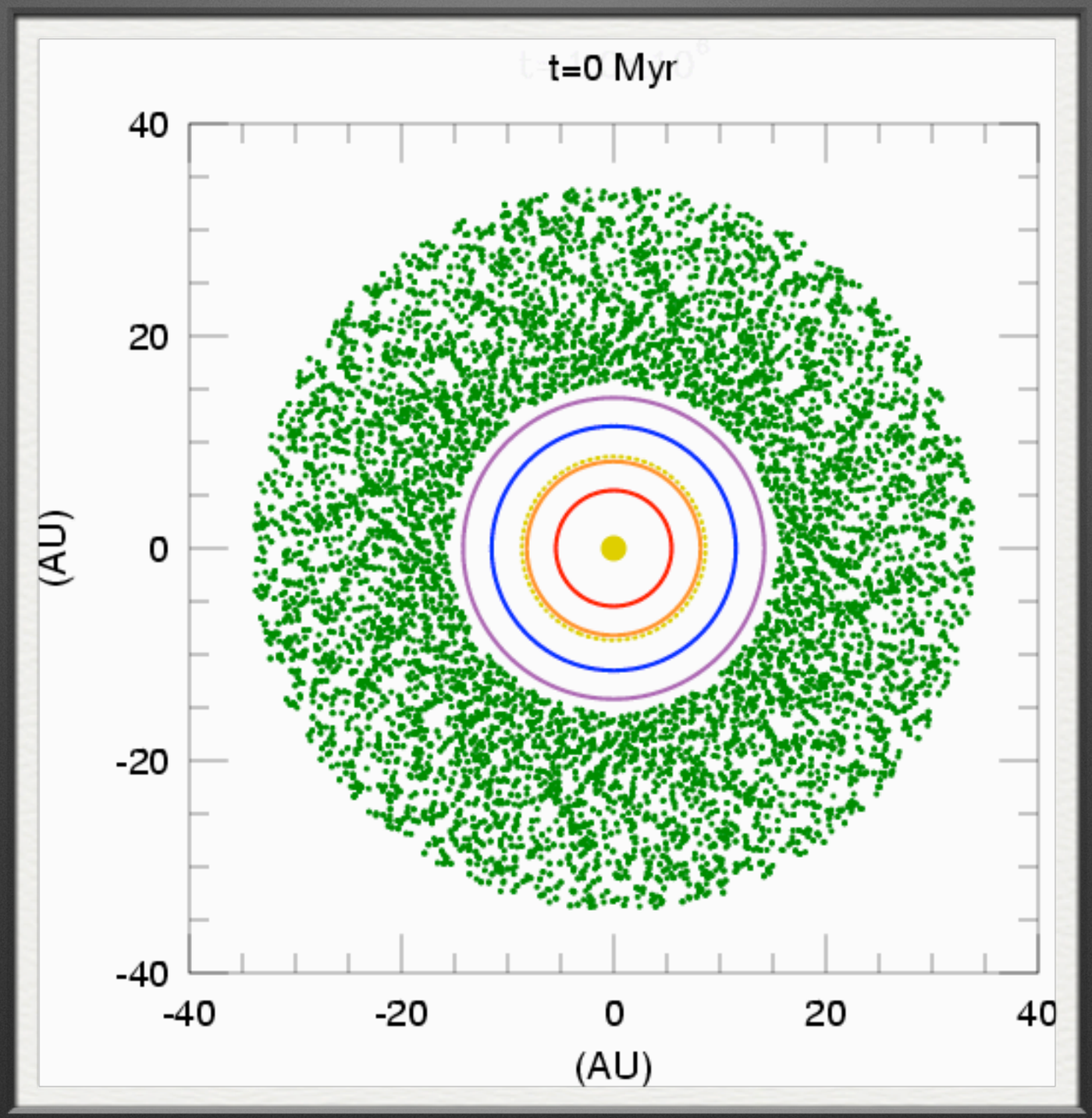


The Outer Solar System

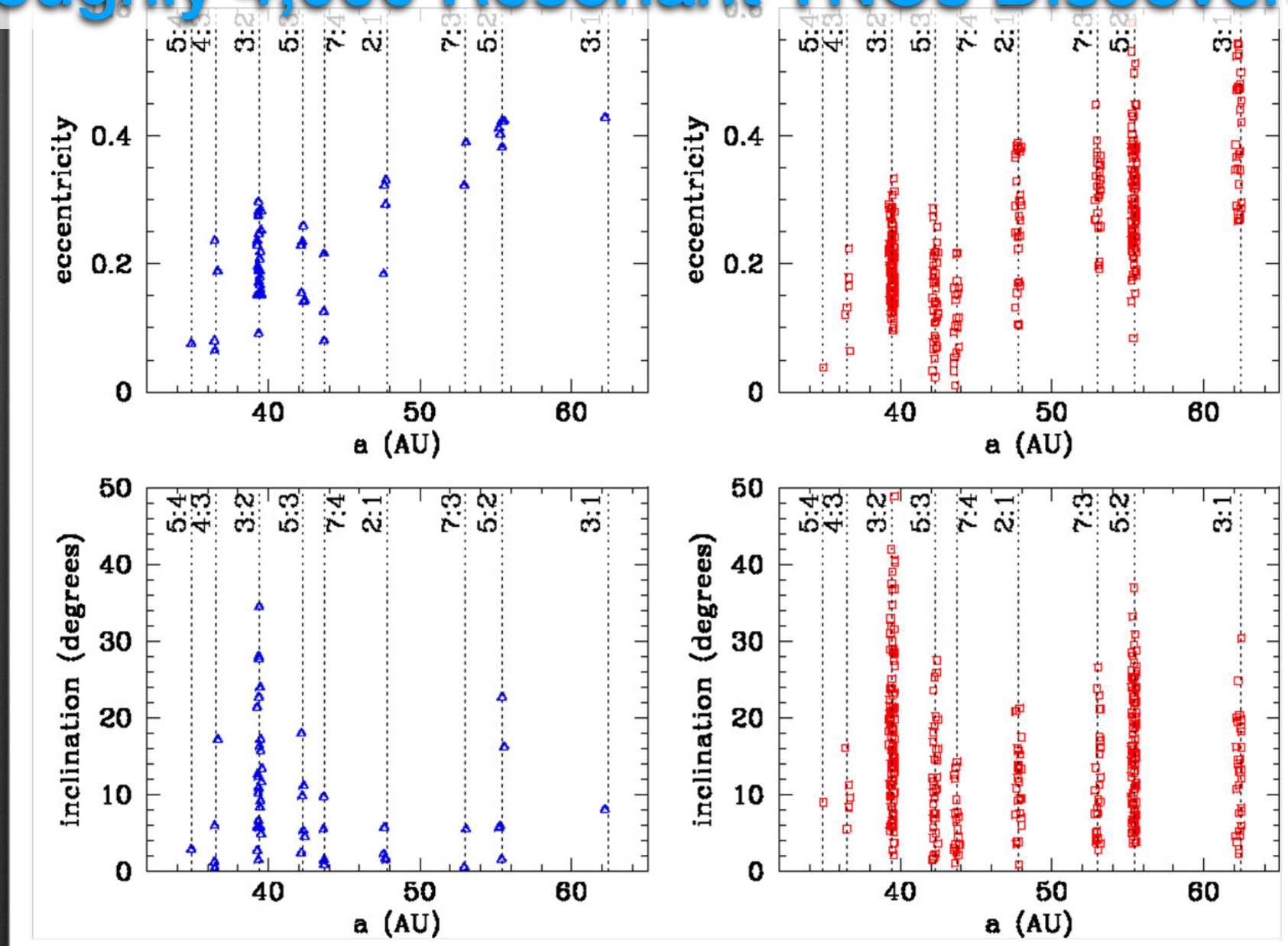
The Explosive Early Solar System



Courtesy of Rodney Gomes

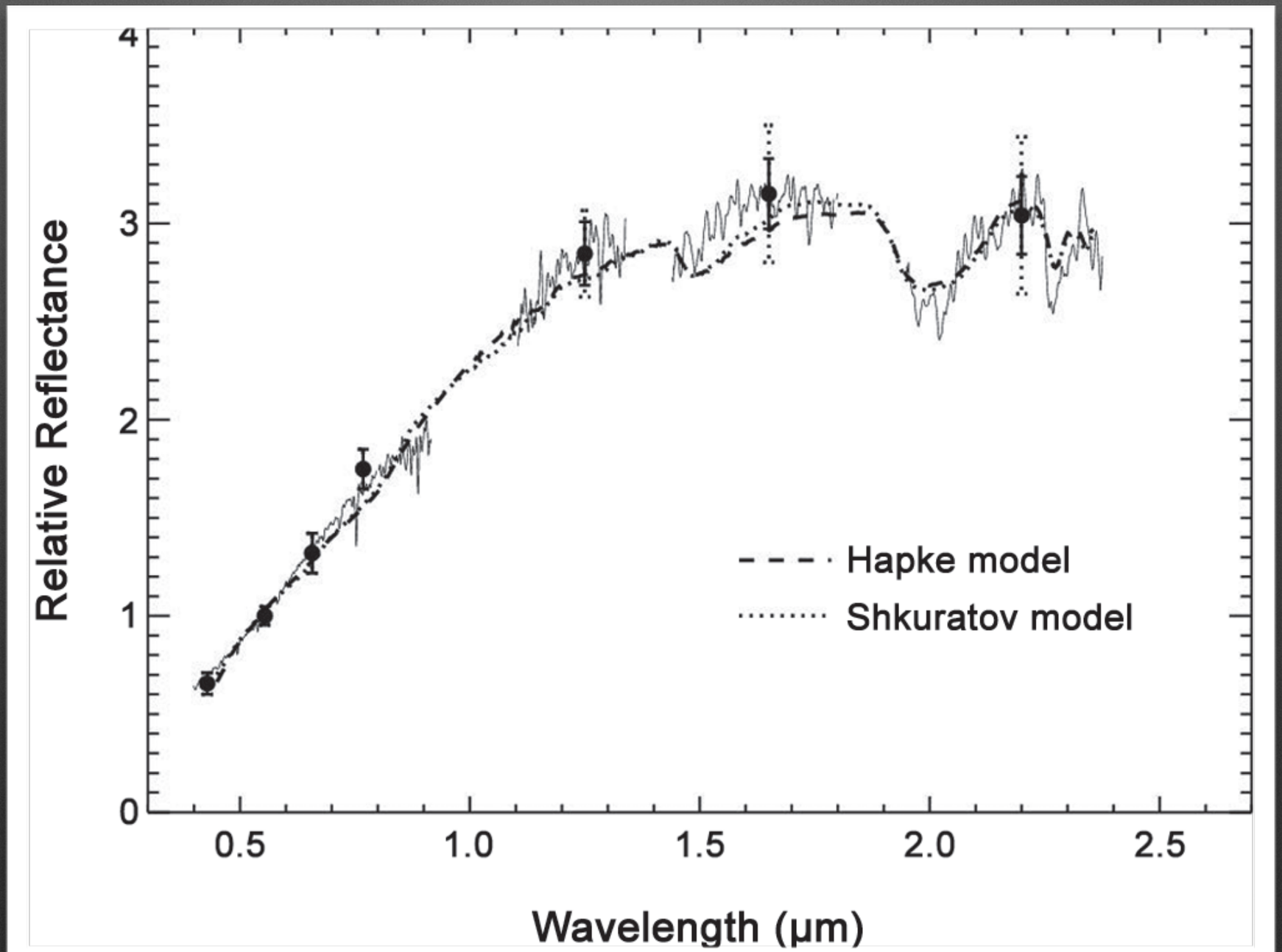
Orbital Structure

Roughly 4,000 Resonant TNOs Discovered



Gladman et al. (2012)

TNO Colours

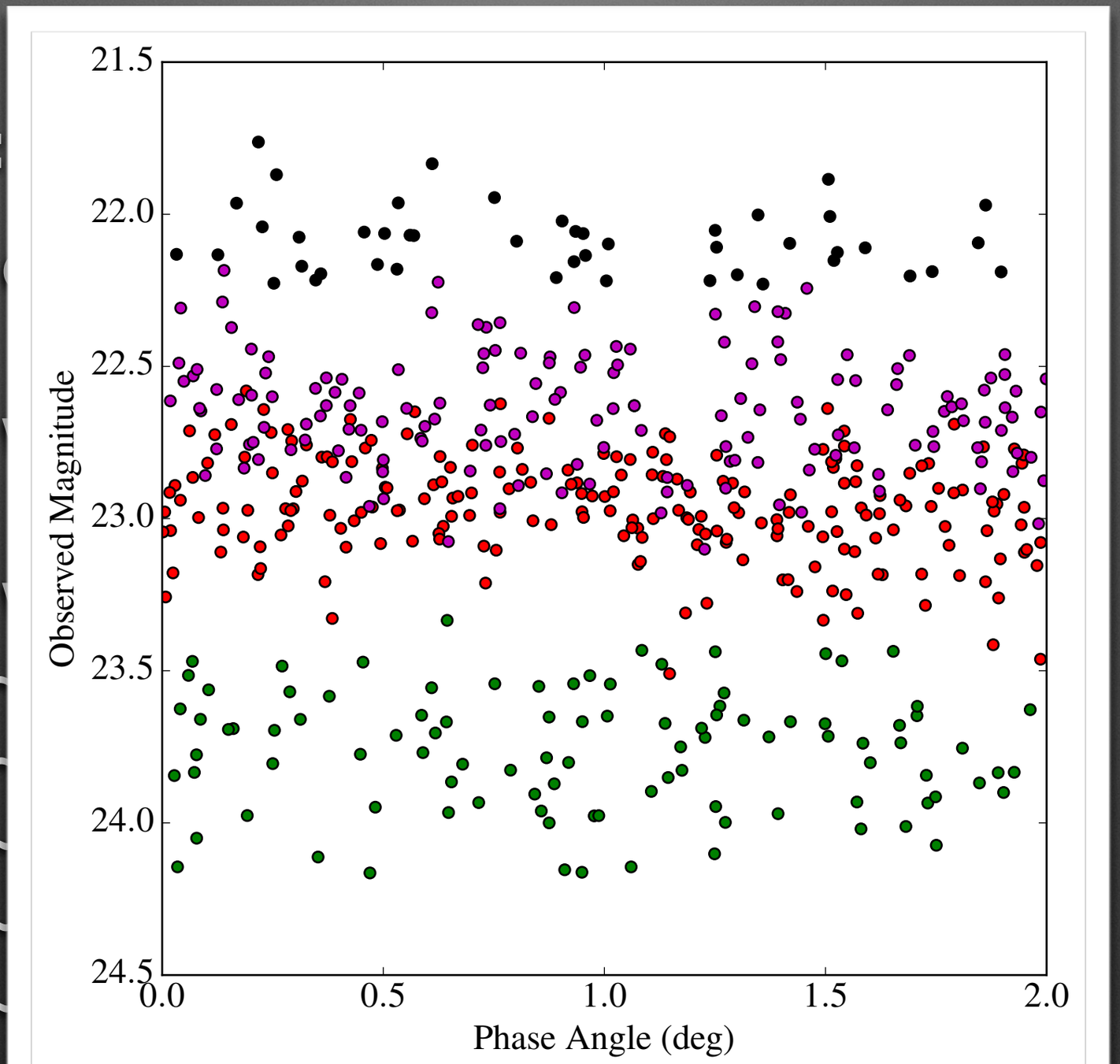


Barucci et al. (2008)

TNO Colours

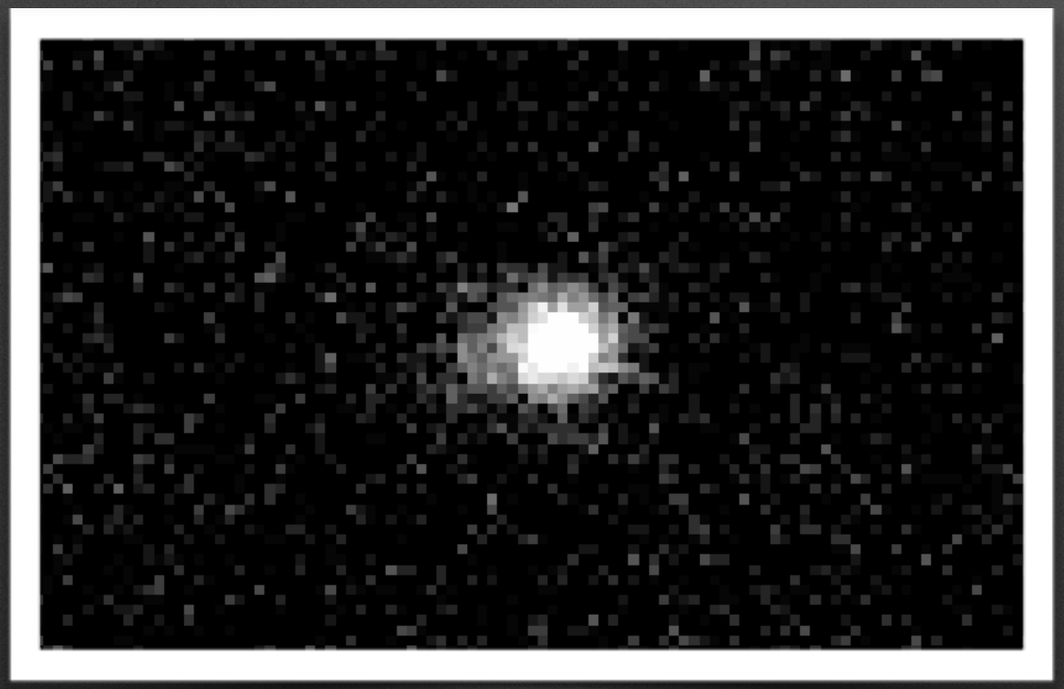
The Facts:

- Number
- Number
- Number
  - (u-r)~
  - (g-r)~
  - (r-i) ~
  - (r-z)~
  - (r-y)~

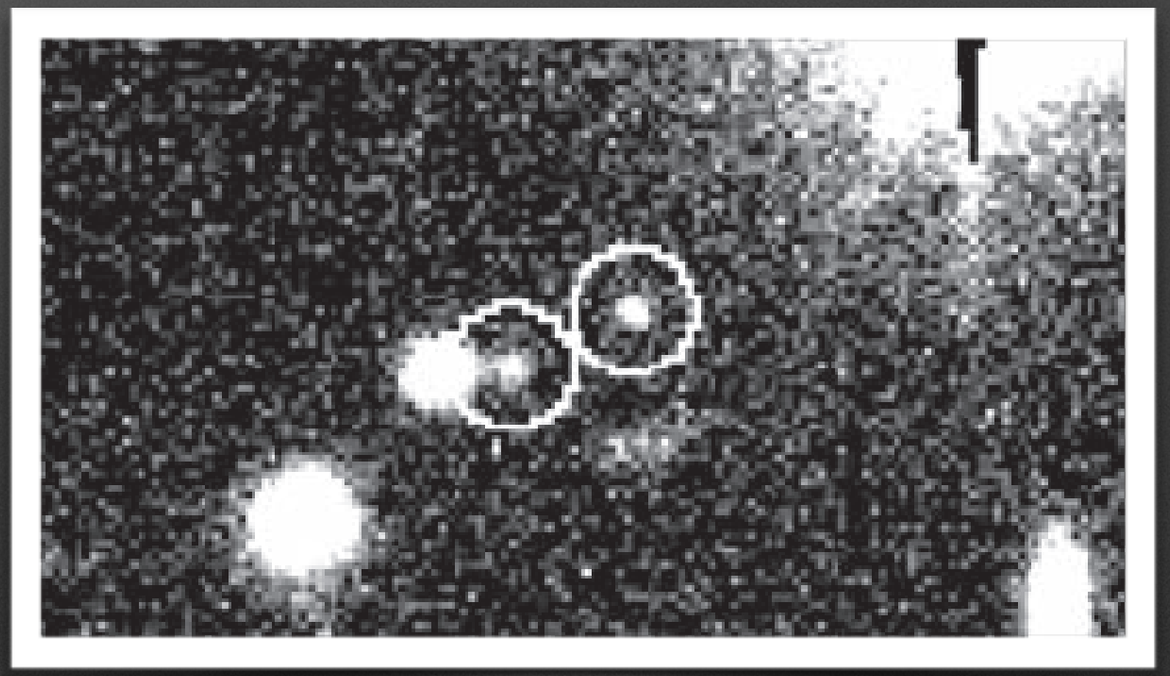


Binary TNOs

- Dynamically cold binary TNOs have avoided violent scattering (Parker and Kavelaars, 2010)
  - LSST will discover >600 widely separated binaries
- Collisional evolution has been minimal (Nesvorny, 2011)
  - ~300 will have full orbital characterization
- Components have formed coevally (Benecchi et al. 2008)

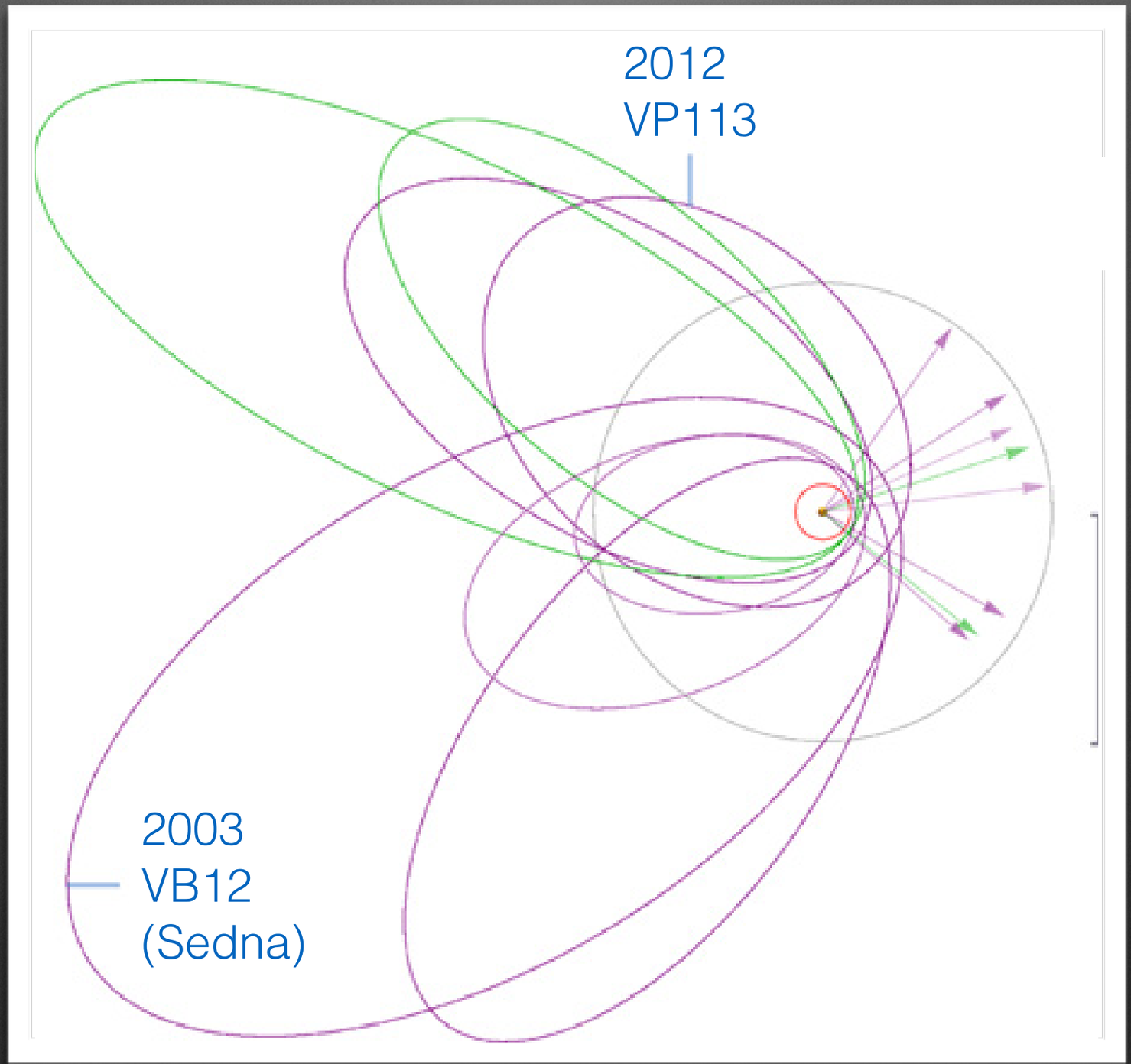


Fraser, Col-OSSOS



Petit et al (2008)

Sednas and Occultations



Sednas and Occultations

Known “Sednas”

- 1 with H=1.6
- 3 with H<3
- all detections with a<500 AU
- roughly uniform semi-major axis distribution
- comparable with excited TNO size distribution

H	a limit	f Obs	f pop a>500	n LSST
1.6	1000	0.03	0.3	~0
0	1000	0.08	0.3	~1

Sednas and Occultations

1000 AU Example:

- rate of motion is 0.14”/hr
- apparent angular with of a Sedna-sized object is 1.3 milli-arcseconds
- geometric occultation
- occultation duration 33s
- sensitive to D>800 km