

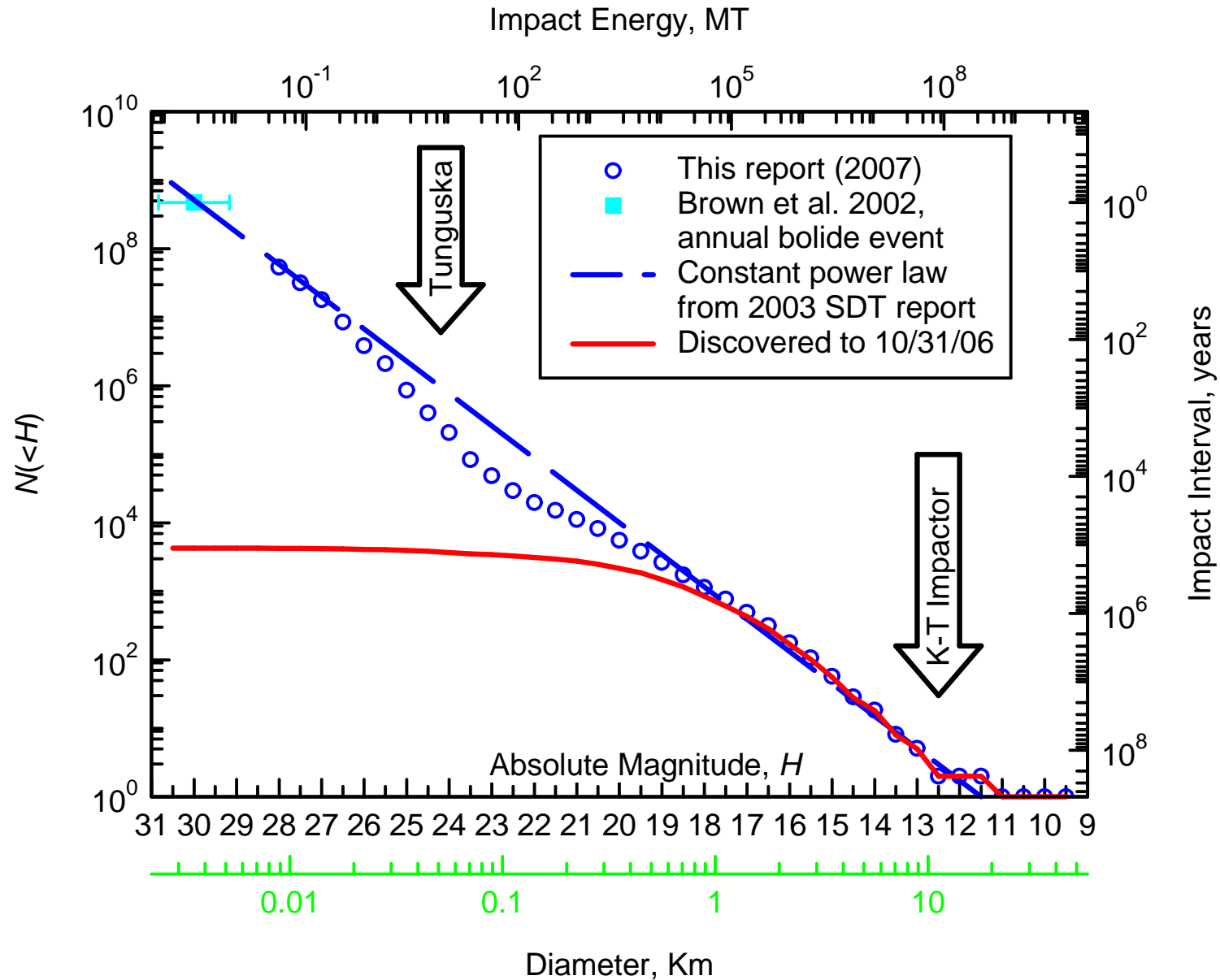
NEO Population

Alan W. Harris

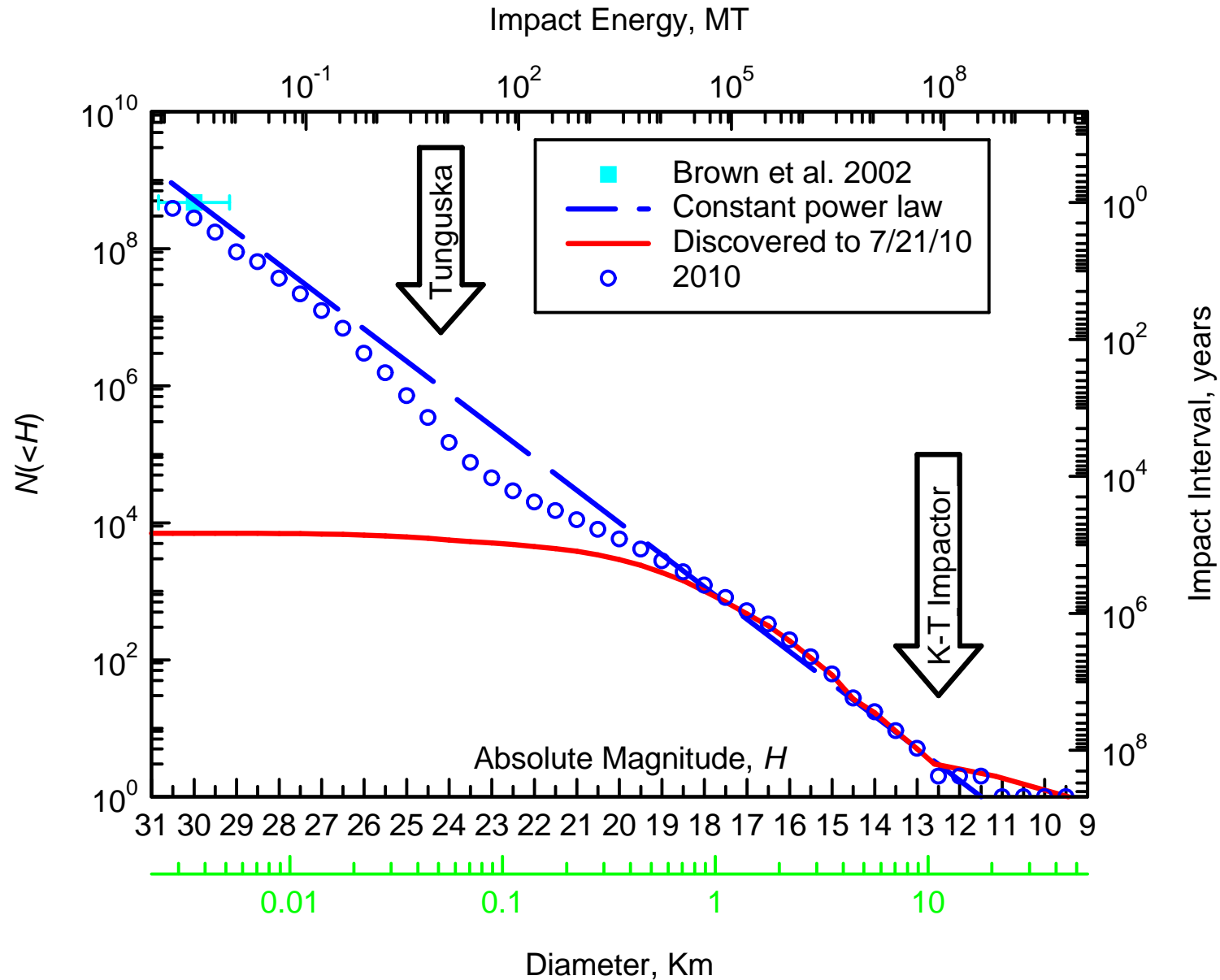
Consultant to NASA/JPL NEO Program Office

TARGET NEO Workshop
George Washington University
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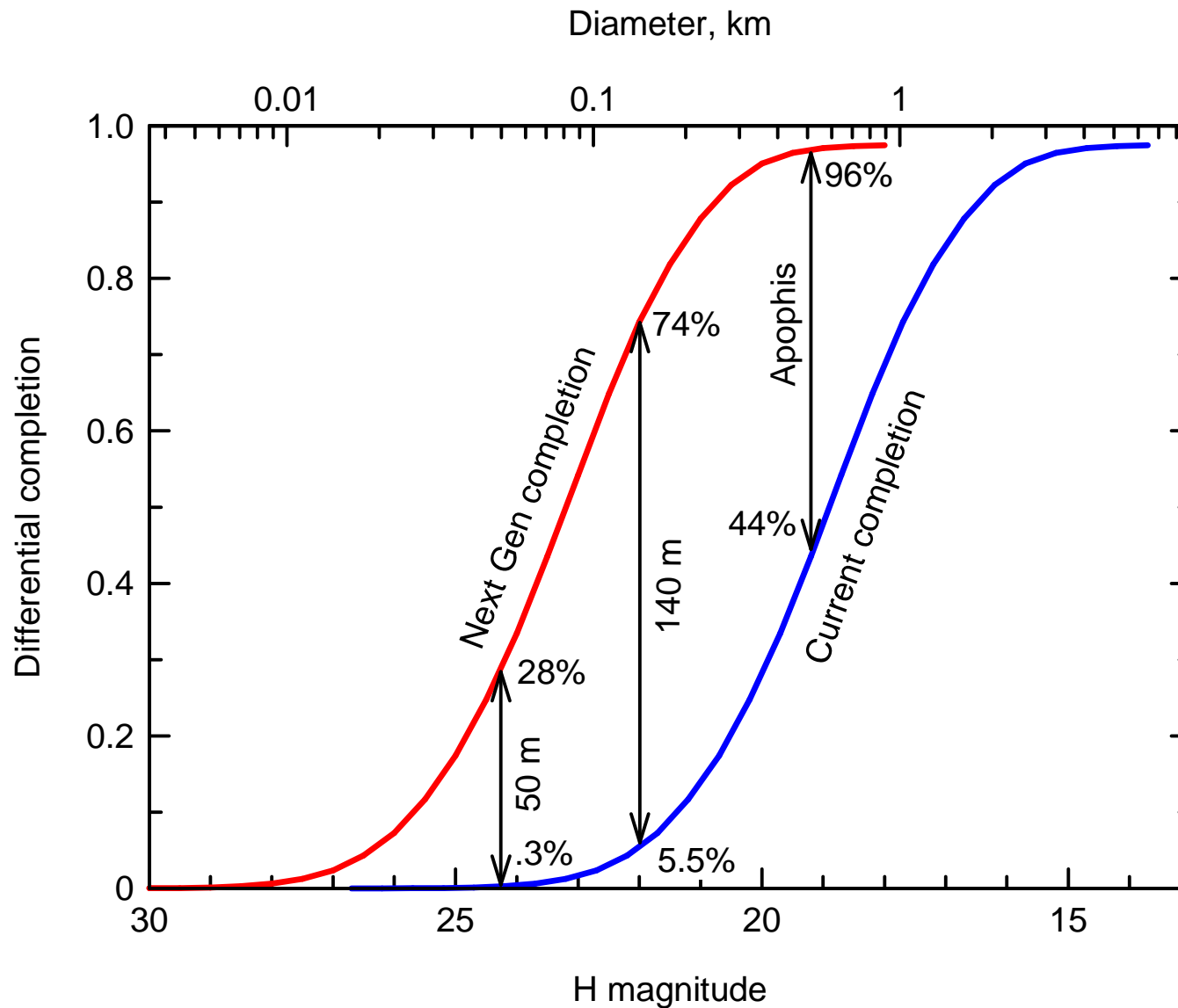
NEO Population Estimate, 2006



NEO Population Estimate, 2010



Differential completion of Survey



In the course of the next generation survey, we can expect to discover:

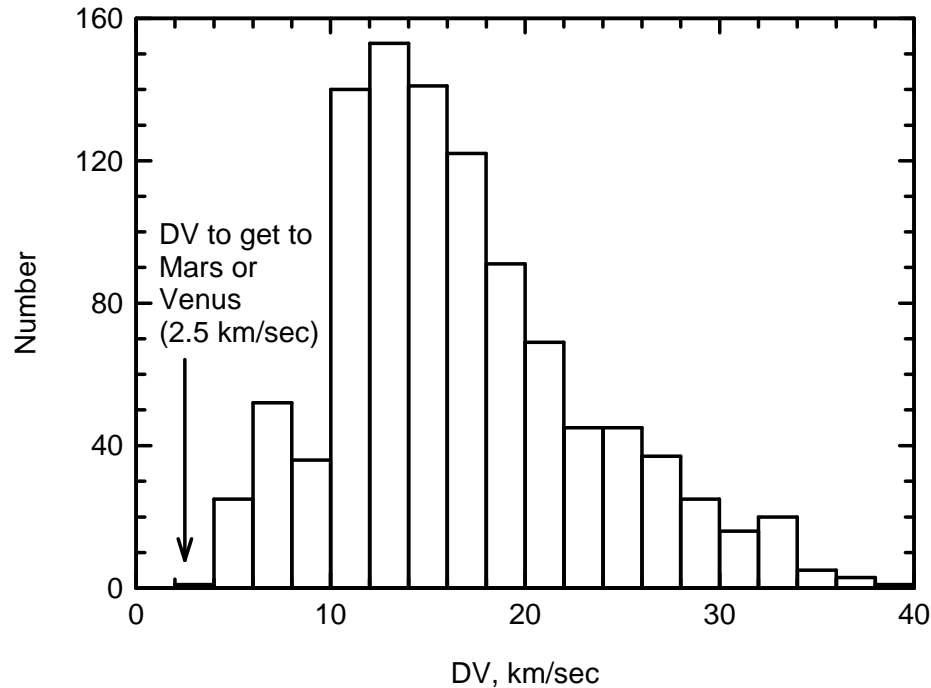
2x as many Apophis sized objects

13x as many ~140 m diameter objects

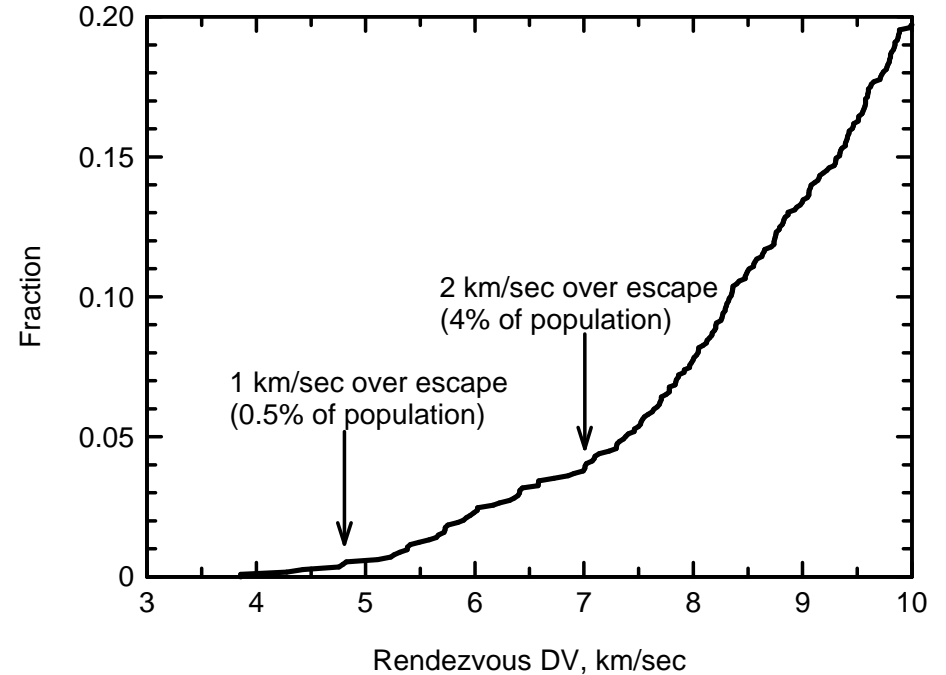
100x as many Tunguska sized objects

Minimum DV to rendezvous

Rendezvous DV distribution of PHAs



Fraction of 1137 PHAs H < 22.0 (D > 140 m) vs. rendezvous DV



- Only a few percent have low DV
- Only a small fraction of those have orbits that allow short trip time
- Short trip time requires more than the minimum DV

How many targets are there?

Diameter	Currently known*	Next gen. survey	Total out there
~Apophis	0	2 x 0	2 x 0
~150 m	2	25	30
~100 m	5	125	200
~50 m	5	500	1500

*Adamo et al. (2010) Asteroid destinations accessible for human exploration: A preliminary survey in mid-2009. *J. Spacecraft & Rockets* 47, 994-1002.

Caveats:

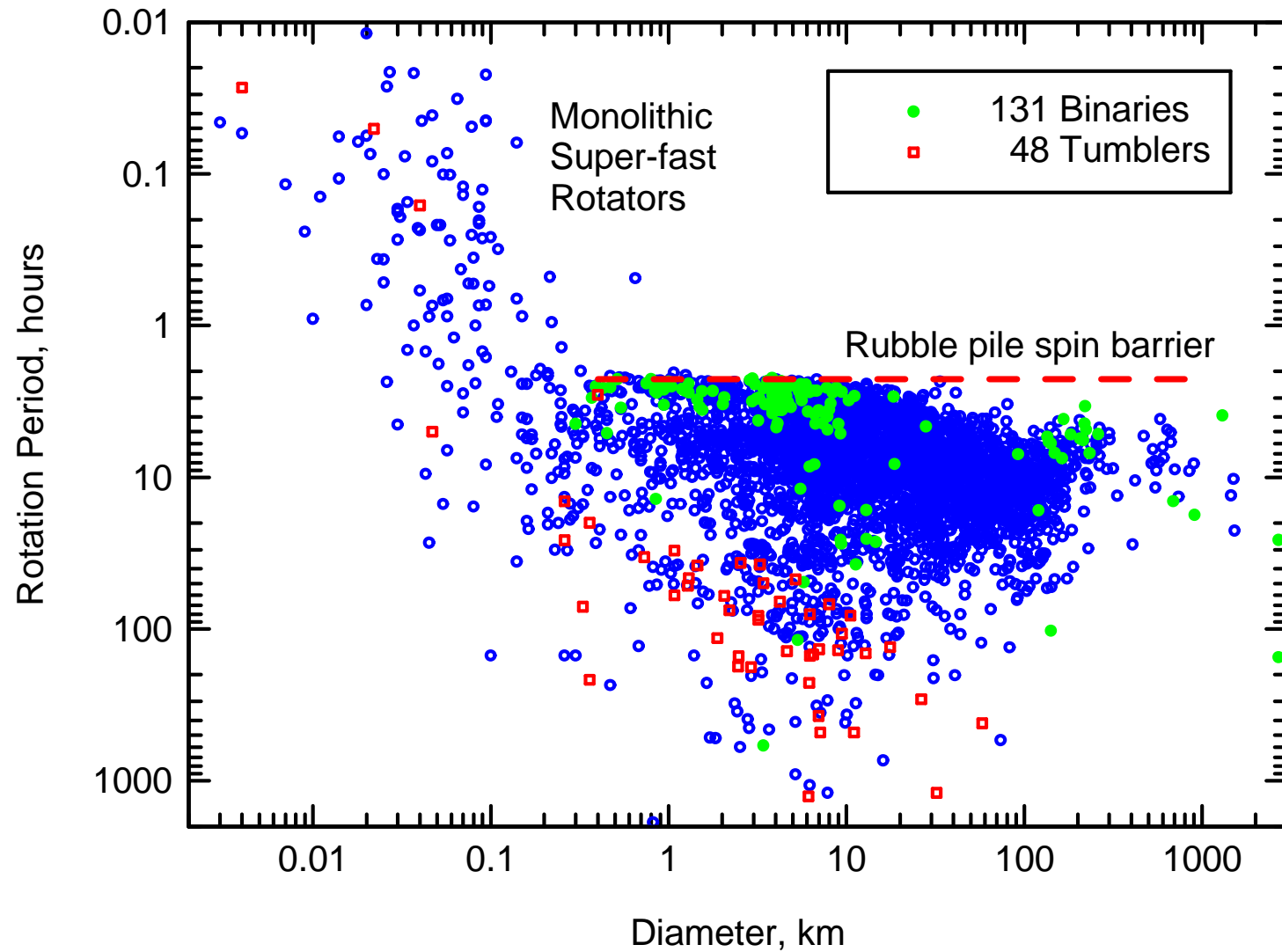
Several of known $D < 50$ m may be space junk or lunar ejecta.

Most of $D < 100$ m are lost, will be hard to keep track of even by next gen. surveys.

Most of $D < 150$ m are likely to be super-fast rotators

Asteroid Spin Periods vs. Diameter

Rotation Period vs. Diameter, 2010, 3643 Asteroids



Conclusions

- We are unlikely to find anything as large as Apophis that we can get to easily.
- Most of even the largest targets (known or to be found) are super-fast rotators.
- Most currently “known” objects $D < 100$ m are lost; even next gen. surveys will have trouble keeping track of them.
- Really small objects ($D < 30$ m) may be lunar ejecta or space junk.