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WP 5.9

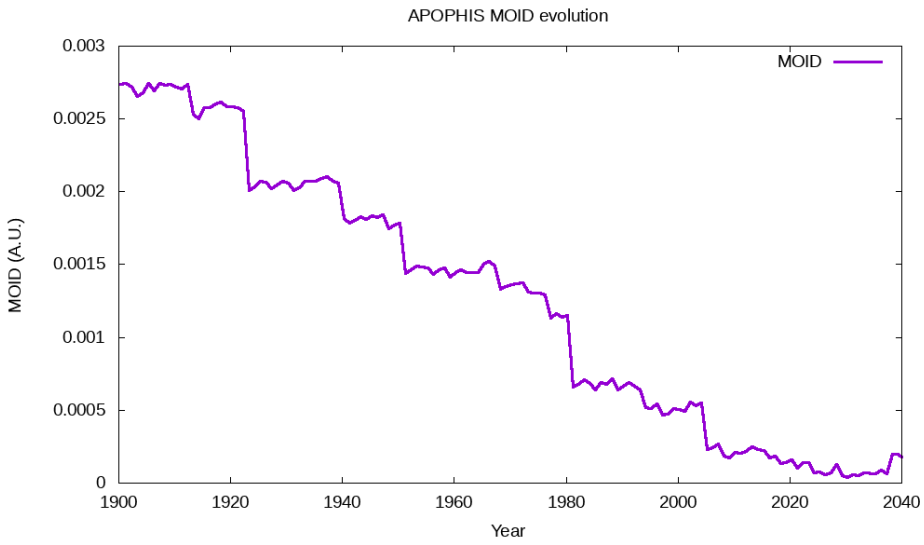
(Romanian Space Agency)

CASE STUDY
TOP100 Palermo scale (NEODys Risk)

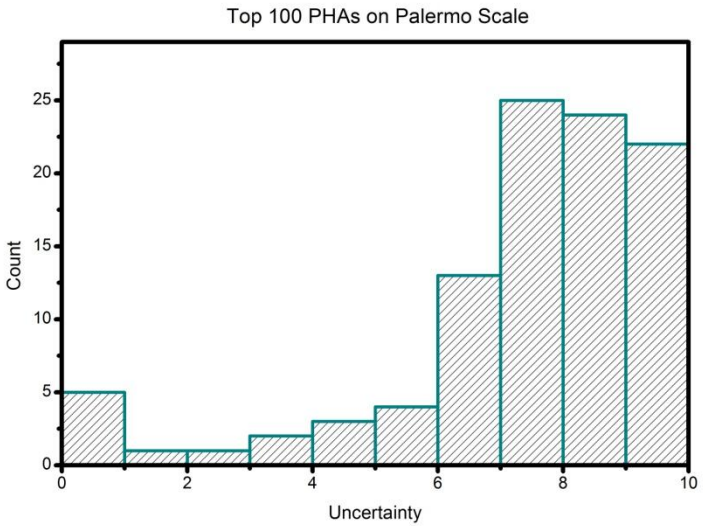
Designation	H	PS_{max} ▲	TS_{max}	Status	Camp. start	Camp. end	Notes
(29075) 1950DA	17.1	-1.36	n/a	Special			
(410777) 2009FD	22.1	-1.83	n/a	Special			
(101955) Bennu	20.6	-2.32	n/a	Special			
2017RH16	25.6	-2.36	0	Small			
2010RF12	28.4	-3.26	0	Possible recovery	2047-03-22	2047-03-25	Quite faint
1979XB	18.5	-3.28	0	Lost			
2000SG344	24.8	-3.63	0	Possible recovery	2028-04-10	2028-11-14	
(99942) Apophis	18.9	-3.67	0	Special			
2009JF1	27.1	-3.75	0	Small			
2006QV89	25.3	-3.79	0	Small			
2008UB7	23.9	-3.83	0	Lost			
2006JY26	28.3	-3.91	0	Small			
2008JL3	25.3	-3.95	0	Small			
2012QD8	23.1	-3.95	0	Lost			

MINIMAL ORBITAL INTERSECTION DISTANCE (MOID)

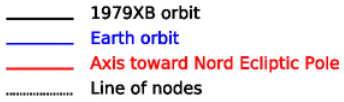
- MOID varies in time- MOID is depending on orbital elements quality (uncertainties)
- MOID depending on dynamical model
- MOID depending on method and algorithm of computation
- MOID varies in time



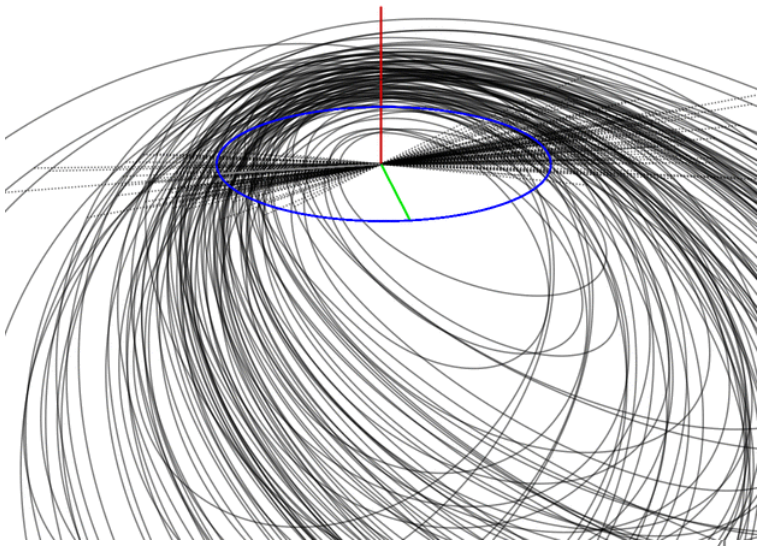
TOP100 Uncertainty



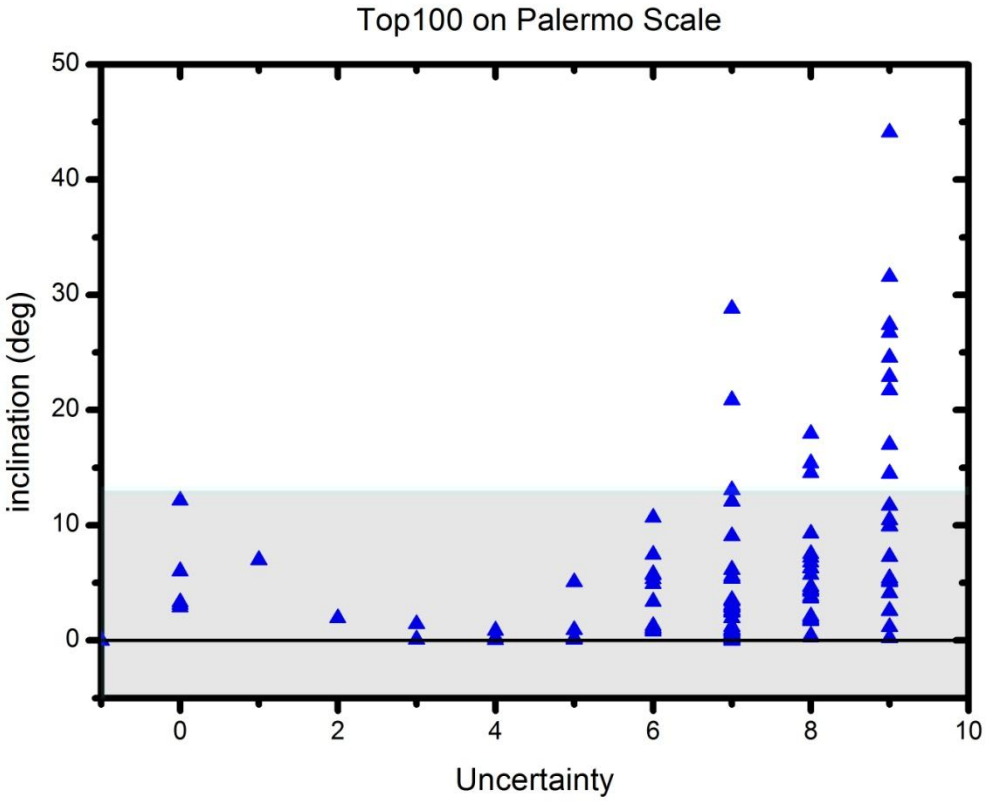
- Major part of the sample exhibits large uncertainty (0 – excellent, 9 very bad)
- Uncertainty usually due to small constraints of true anomaly



Investigation of 1997 XB using 100 clones exhibit large excursions in orbital elements.



Inclination vs uncertainty



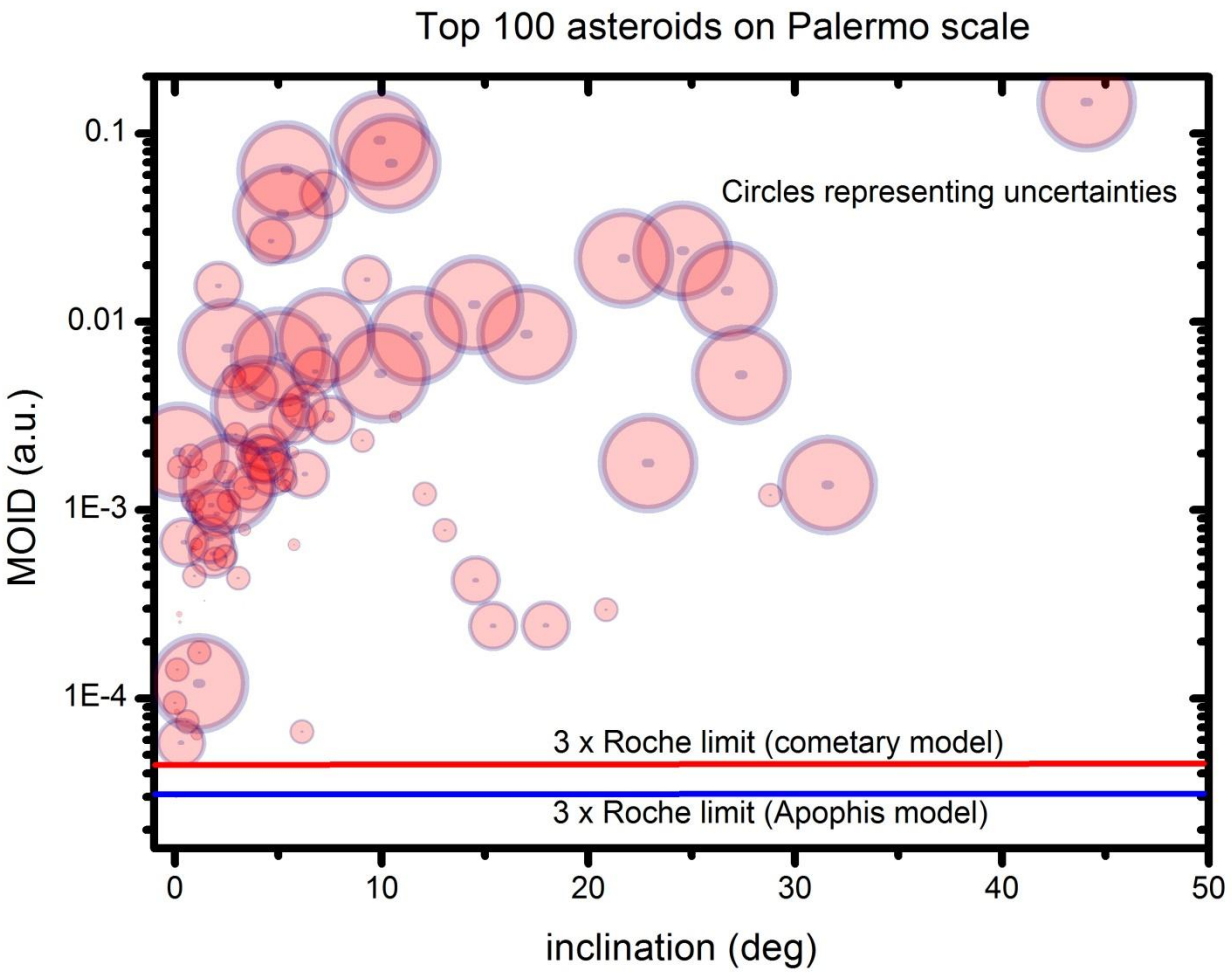
Top100 objects with i > 13° have orbits highly uncertain

Roche limit

- Disruption of a body due to the tidal forces of a major planet
- Best example: Shoemaker-Levy 9
- Roche limit is dependent on density and model

SL9 on Jupiter (credit: NASA, ESA)

MOID vs i (and Uncertainties)



Cometary model
$\rho = 500$ kg/m^3

Apophis model
$\rho = 2{,}600$ kg/m^3

Threshold suggestions

- MOID approach – Apophis–like MOID could be a basis of establishing a threshold (37,000 km).
- Roche limit – A 3xRoche limit (cometary model) could be a basis of threshold (53,000 km).
- Uncertainty of orbits is an important factor which should drive the choice.
- Asteroid with highly inclined orbits are less constrained.