

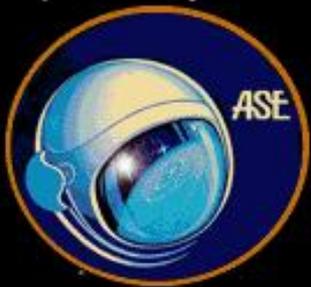


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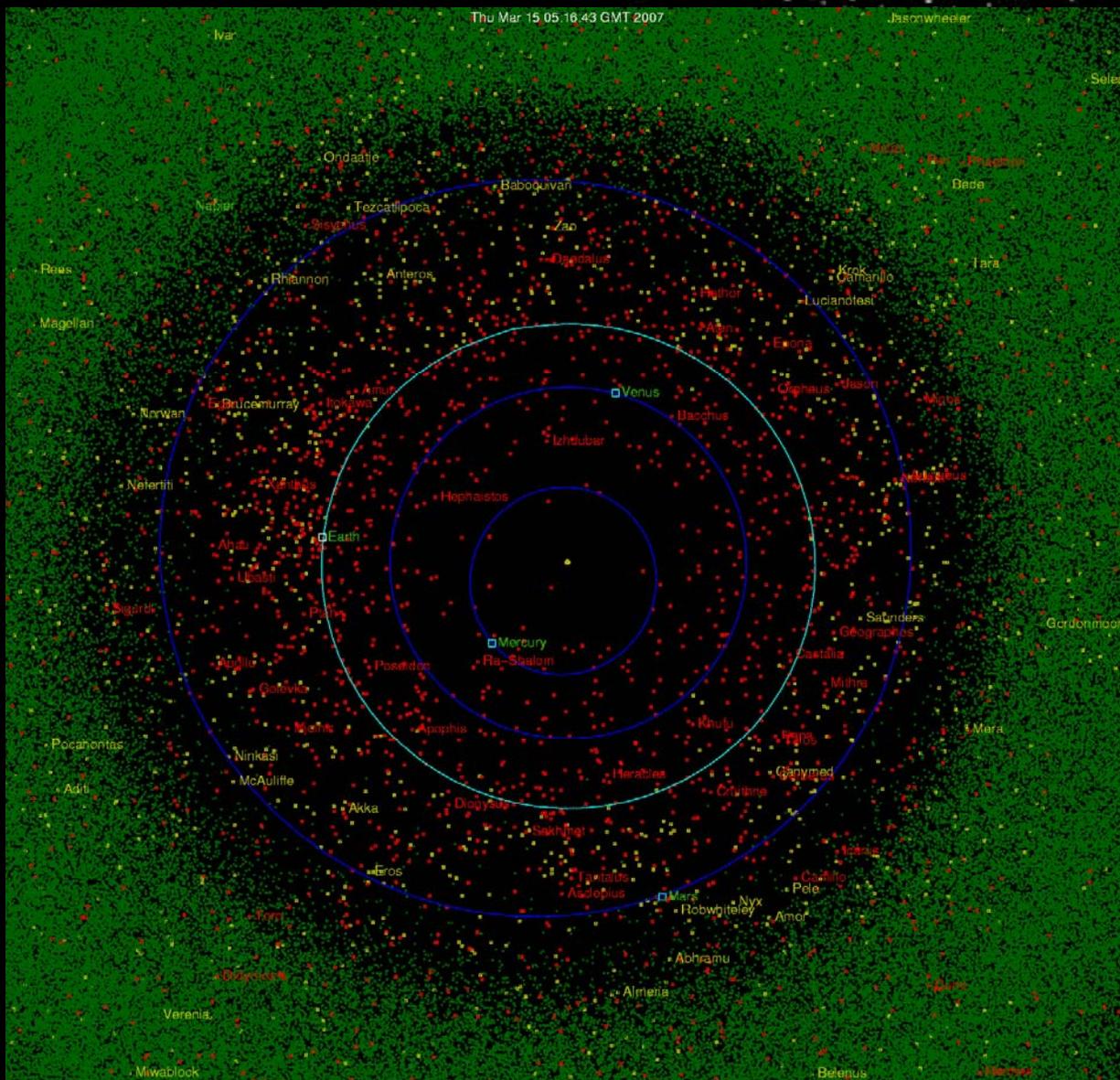
**National Defense University
Toward a Theory of Spacepower
26 April 2007**

Space and the Commonwealth of Mankind The NEO Challenge

**Rusty Schweickart
Chairman, NEO Committee,
Association of Space Explorers;
Chairman, B612 Foundation**



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2007

This map shows the positions of all known asteroids in the inner solar system. Red and Yellow objects are potentially hazardous to the Earth



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The Bottom Lines

1) Decisions re a NEO threat will likely have to be made within a decade

- Rapidly changing (knowledge) environment.

2) NEO challenge is intrinsically international

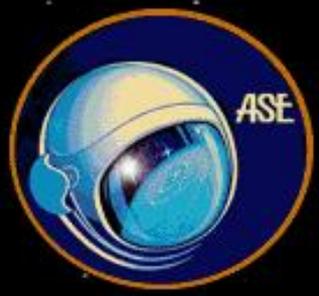
- Specific impact point unknown at decision time
- Deflection = shift of risk between nations

3) Deflection options; non-nuclear and nuclear

- The issue of precision (NASA missed it)
- Nuclear option needed only for near term, low probability event

4) World community must make key decisions

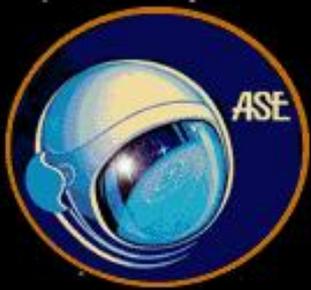
- ASE-NEO Workshops; draft UN/COPUOS instrument



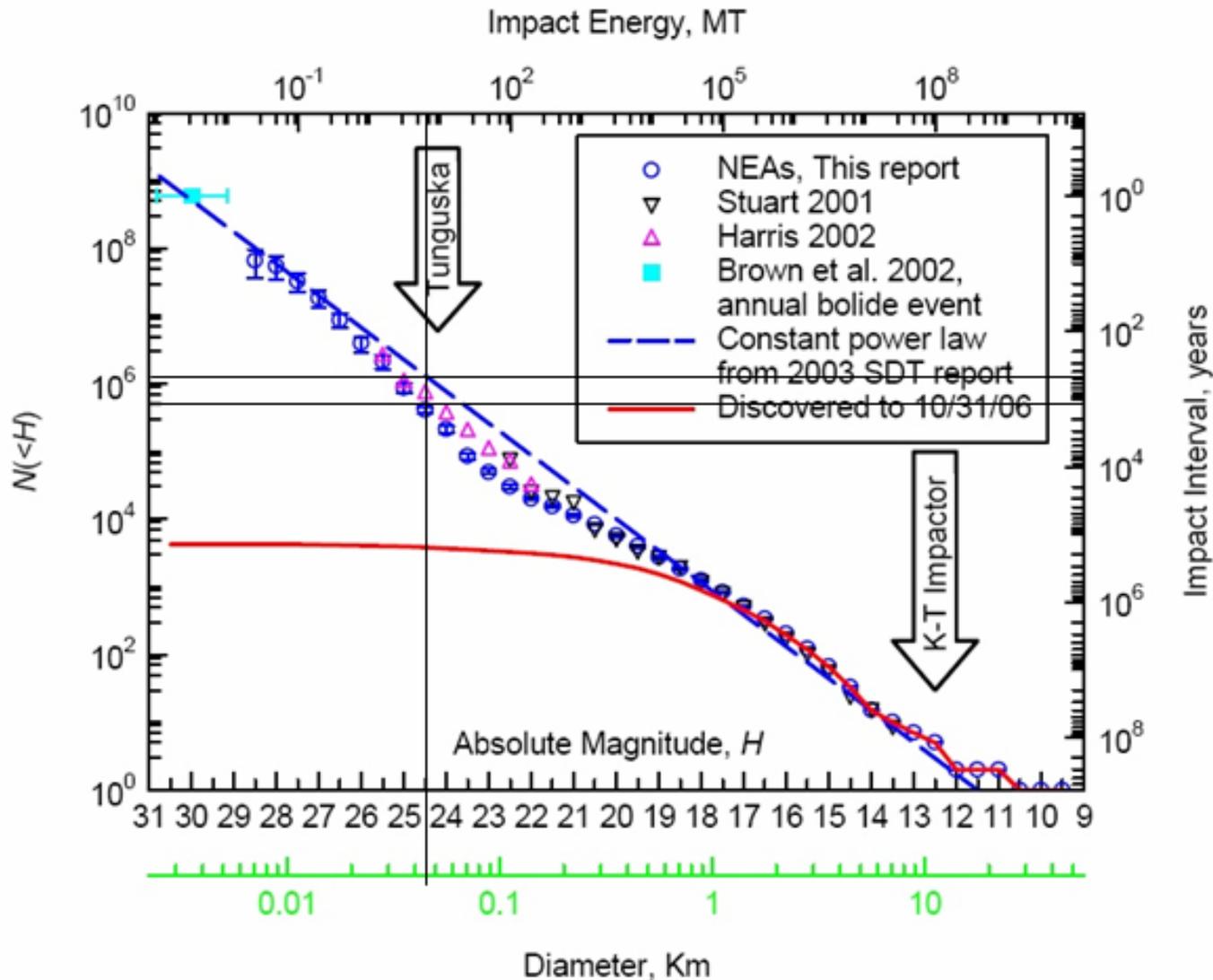
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The Three Components of Protection of the Earth from NEO Impacts

- ✓ Early Warning
- ✓ Proven Deflection Capability
- ✓ International Decision-making Protocol



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Early Warning

Spaceguard 1 & 2

(Comparable Numbers)

2007 2019

Target Population

1,000 25,000

71% completed

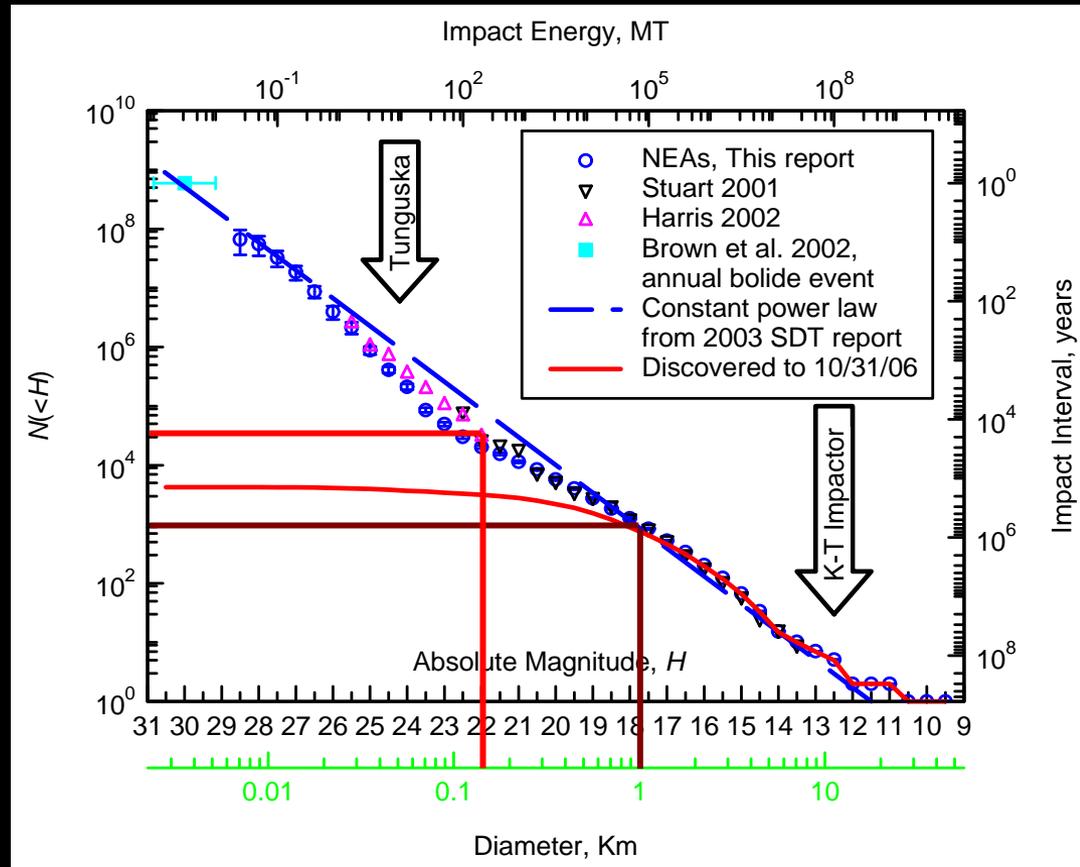
708 18,000

Total Discovered

4,640 116,000

Potential Impactors

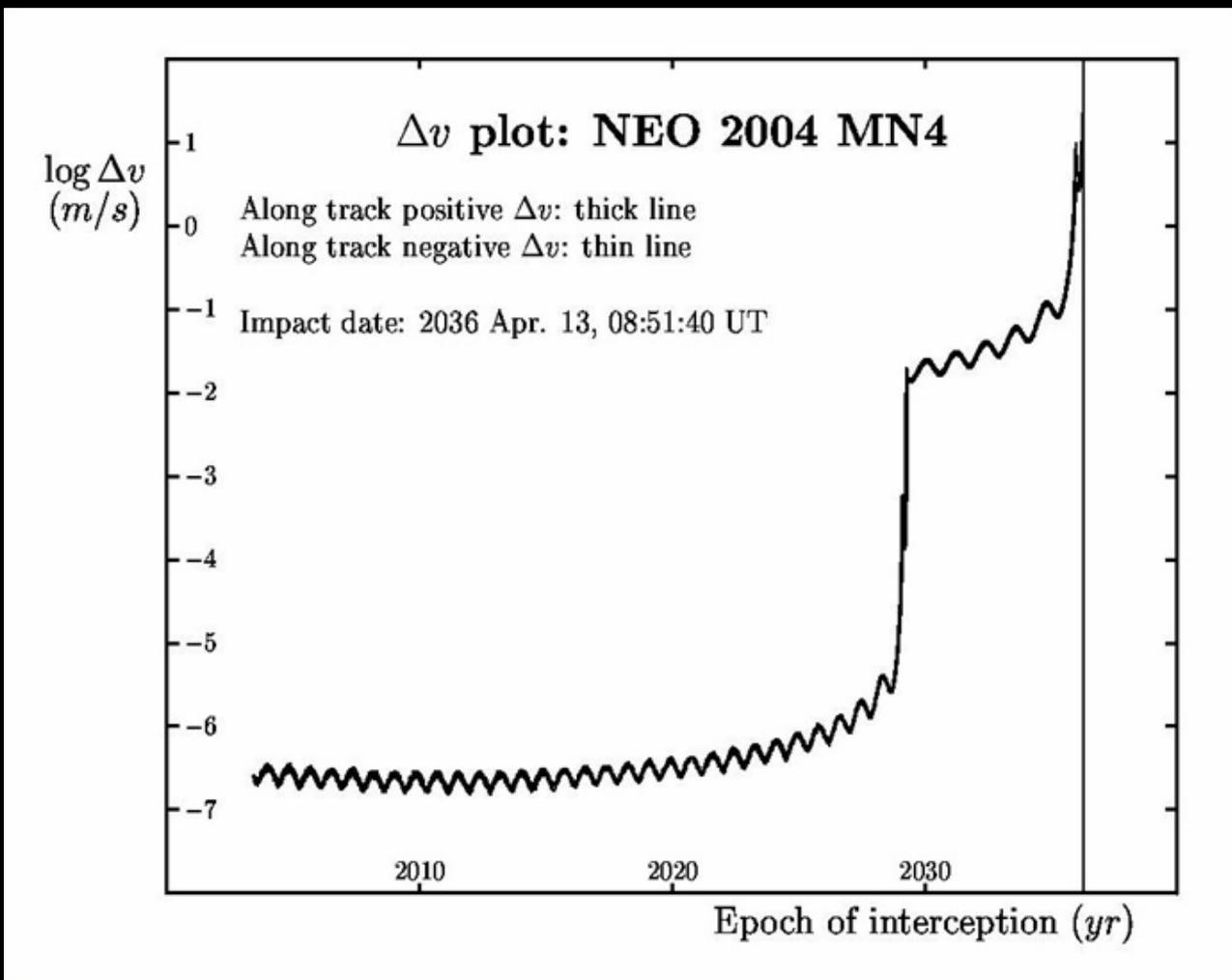
137 3,400





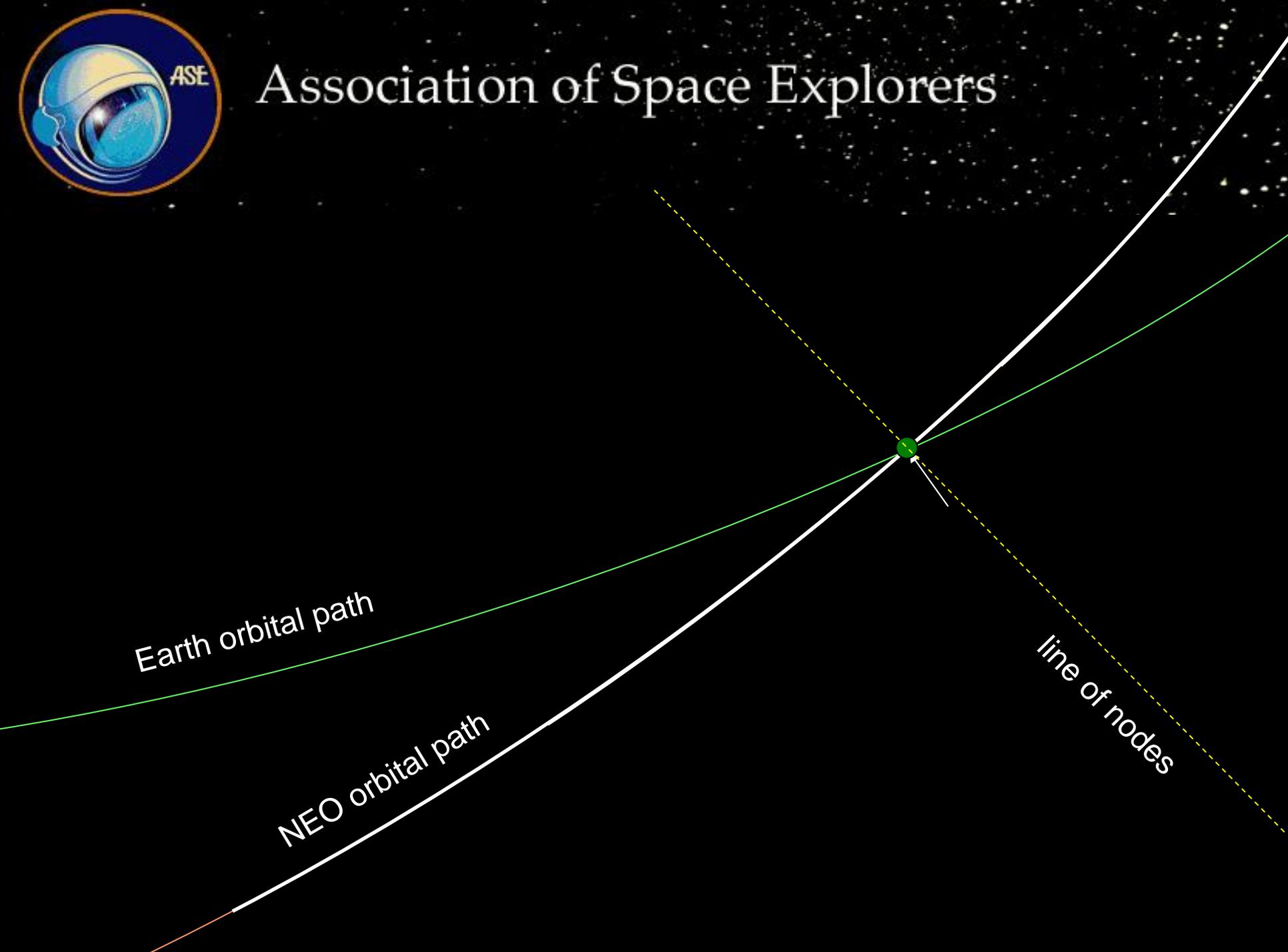
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Decision Time





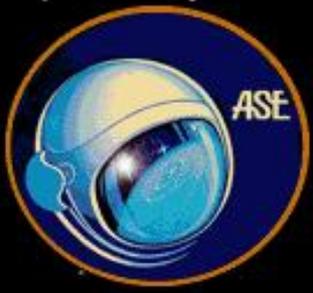
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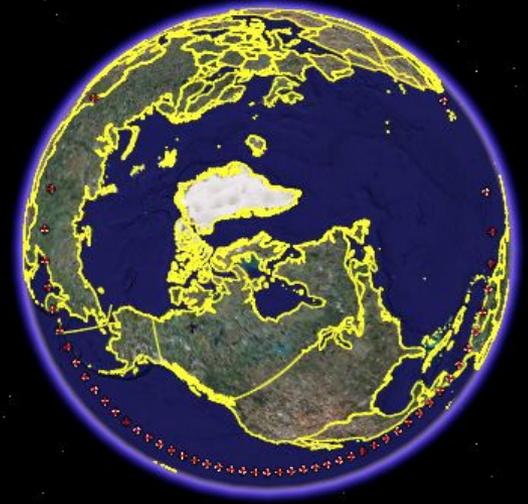
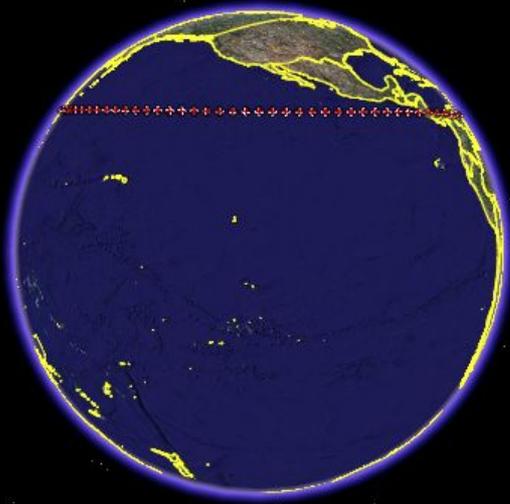
Earth orbital path

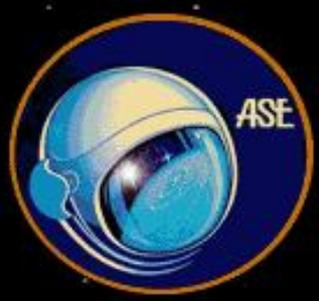
NEO orbital path

line of nodes



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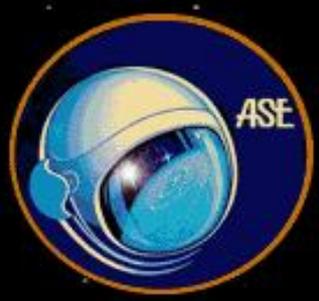




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2007 - Path of Risk for Apophis



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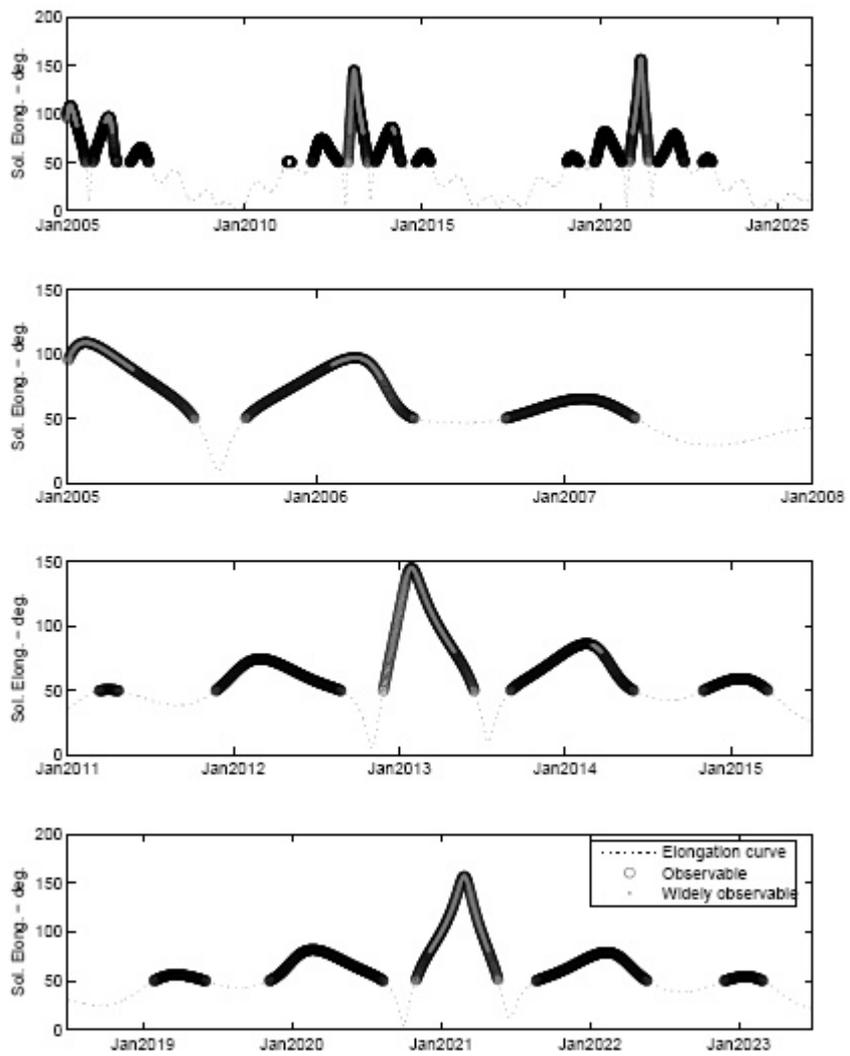
**2020 - Paths of Risk for NEOs of
Concern**



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Episodic Tracking

Potential Impact Detection





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Current Deflection Capability

Kinetic Impact

Pushes the asteroid via direct impact



Gravity Tractor

Pulls the asteroid using mutual gravity as a tow-rope

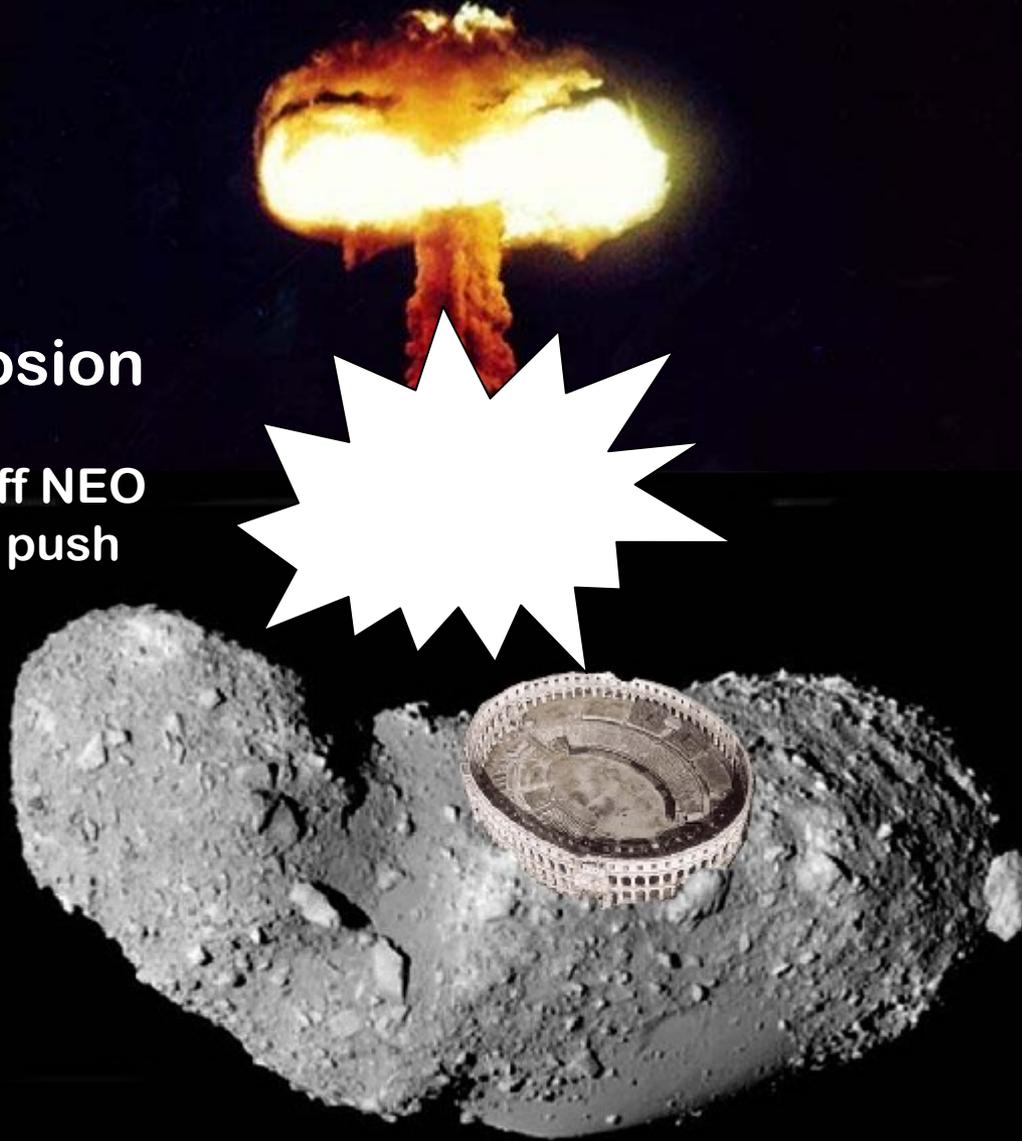




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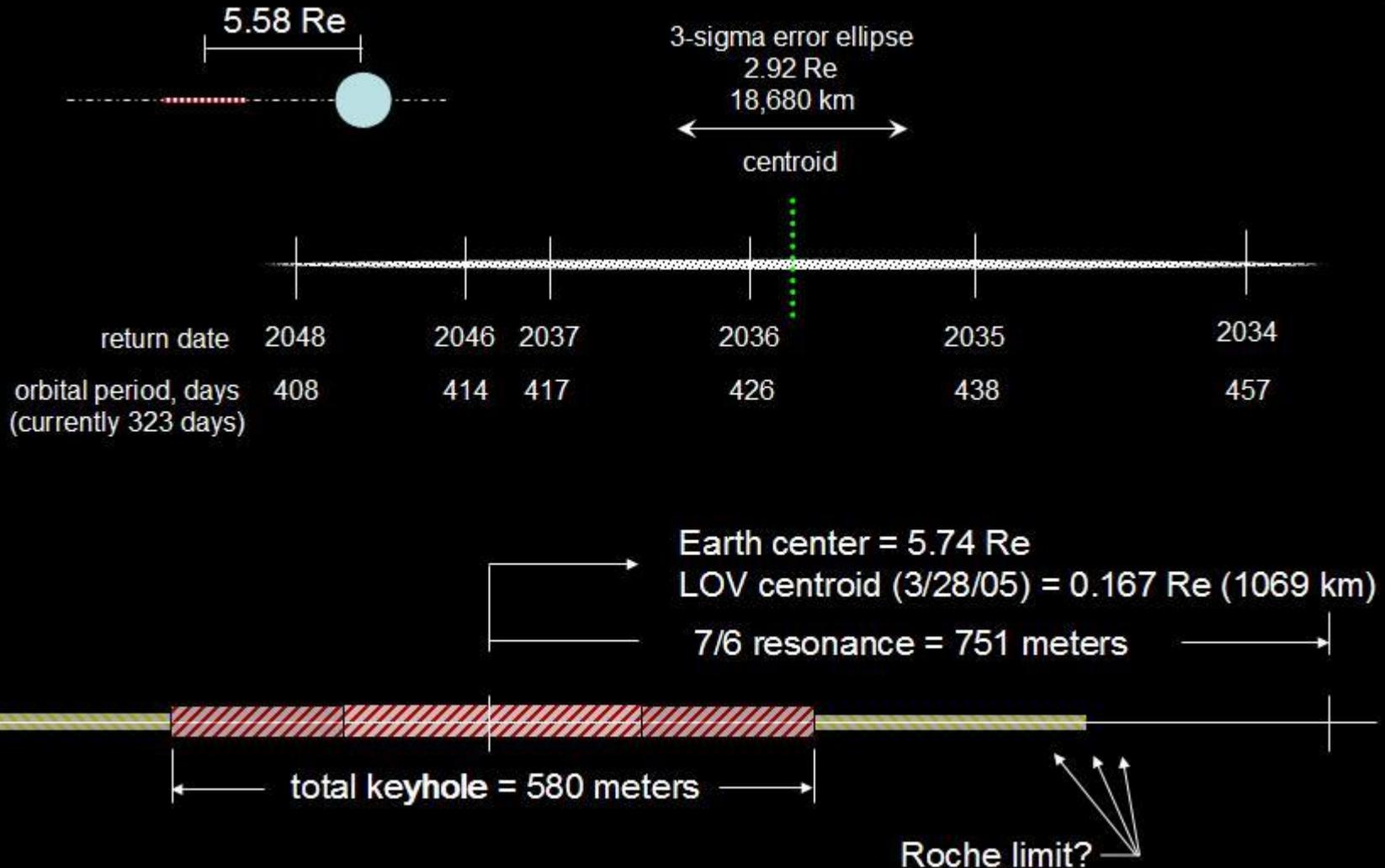
Nuclear Explosion

Explodes surface off NEO
to create impulsive push





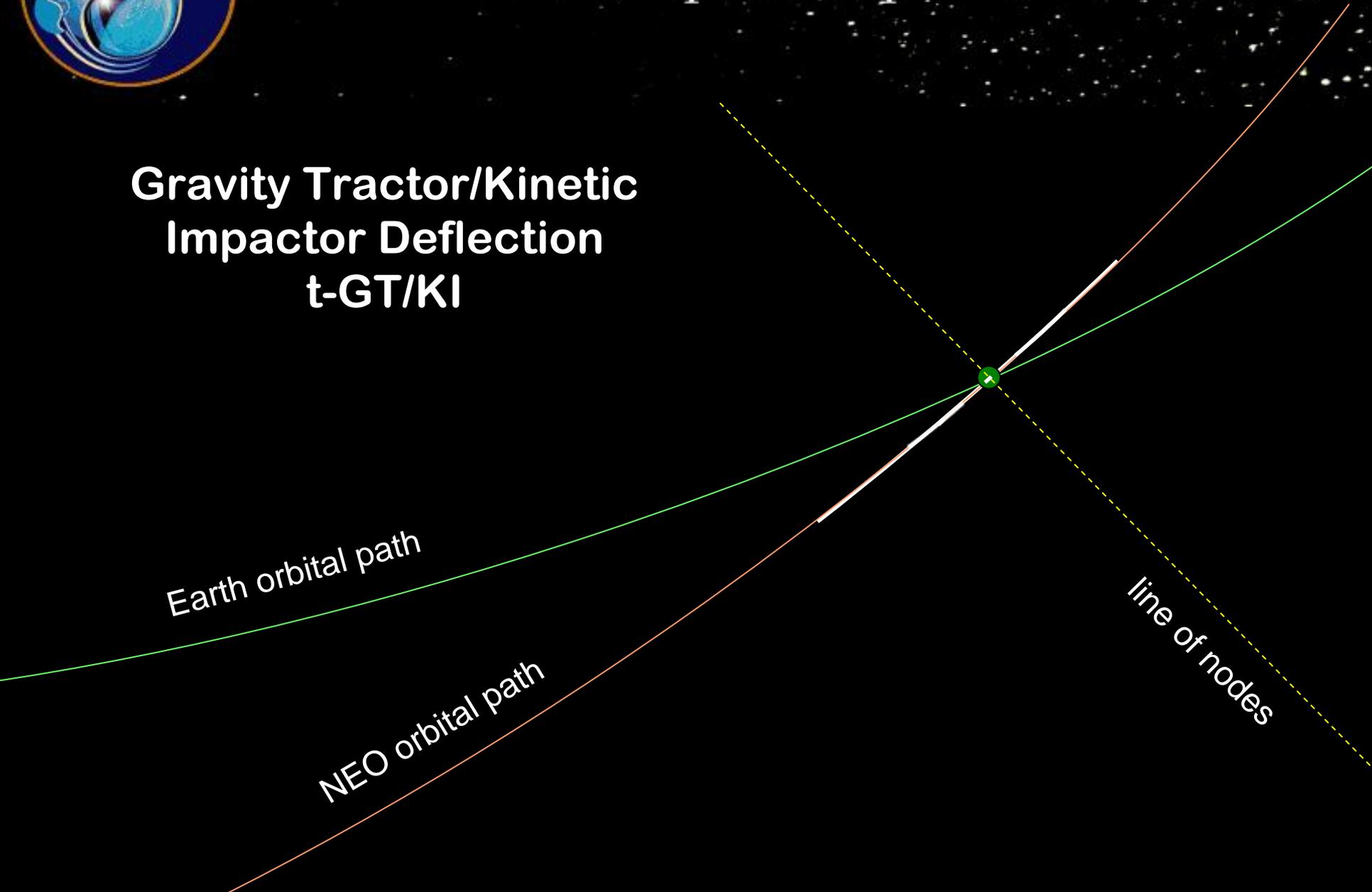
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Gravity Tractor/Kinetic Impactor Deflection t-GT/KI



Earth orbital path

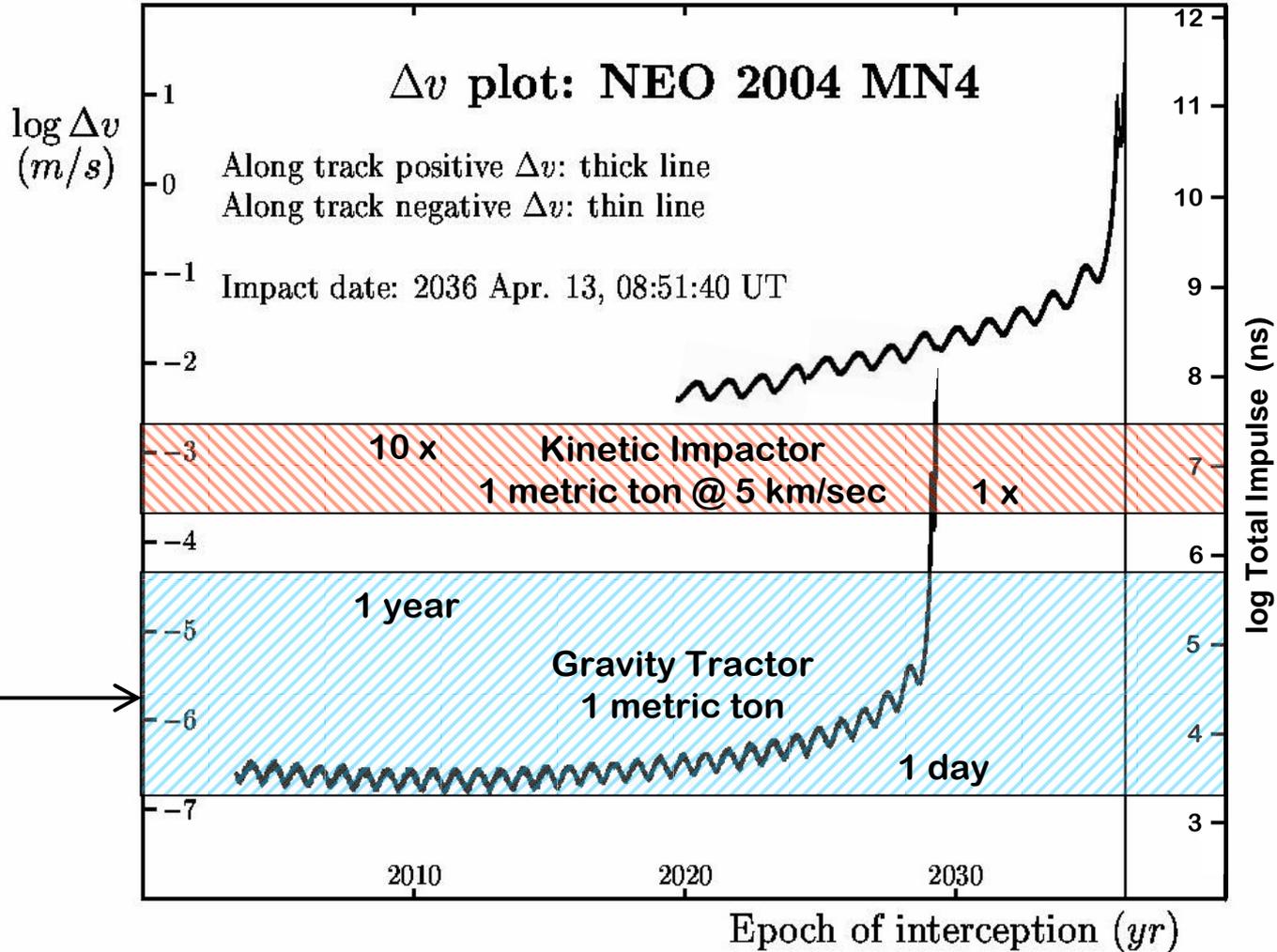
NEO orbital path

line of nodes



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Deflection Time





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**The ASE-NEO
Committee
addressing the UN
Committee on
Peaceful Uses of
Outer Space on the
NEO impact threat**

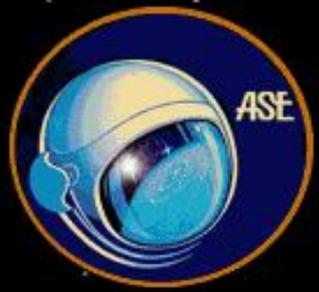
February, 2006



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The ASE takes the position that...

- 1. The United Nations is the appropriate forum for decision making**
- 2. An adopted treaty or protocol specifying the decision process should be in place as soon as possible**
- 3. The information on NEOs provided by member states must support this negotiated decision process**



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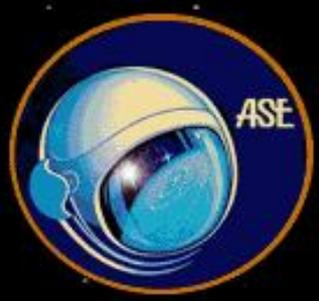
International Decision-Making ASE Next Steps..

Bring together a group of world diplomatic and legal experts in a series of 4 workshops to identify, develop, and ponder the many issues associated with a pending NEO impact. (First workshop scheduled for 9-12 May, 2007, Strasbourg, France)

Generate, as a workshop product, a draft United Nations Treaty (Protocol, Convention, ...) on NEO Deflection.

Deliver this draft treaty to the United Nations Committee on Peaceful Uses of Outer Space in their spring session in 2009, for further deliberation, debate, and (hopefully) adoption.

Organizing and conducting these international workshops will cost the ASE \$250K which we are in the process of raising. Of this we have ~\$180K, enough to cover the first year's cost.



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The End

Q&A