Hazards from asteroid impacts and the Space Situational Awareness programme

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ESLAB 51, ESTEC/NL Dec 2017

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NEO = Near-Earth object – an asteroid with a perihelion < 1.3 au

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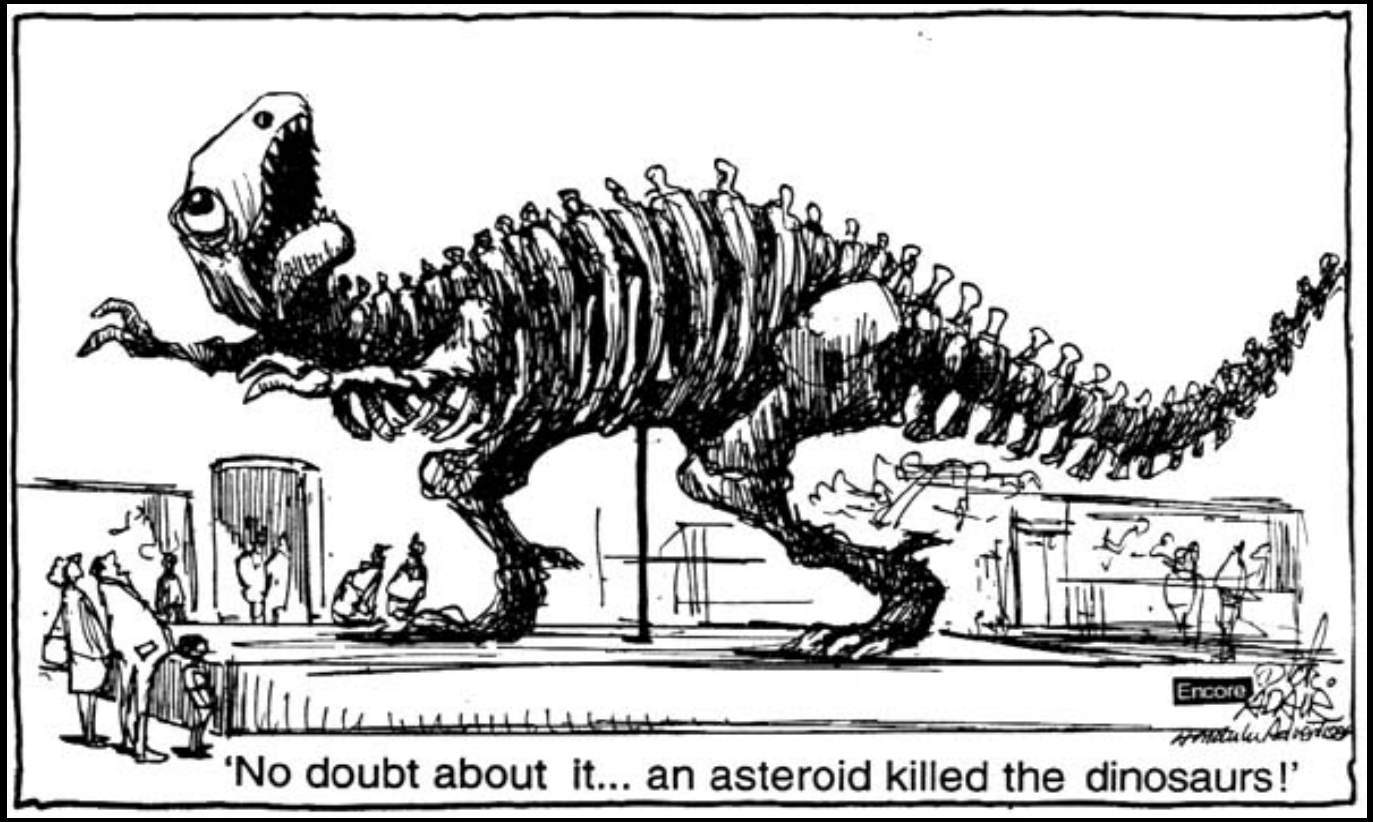
What are asteroids?

Image c MPS/UPD/LAM/IAA/RSSD/INTA/UPM/DASP/IDA

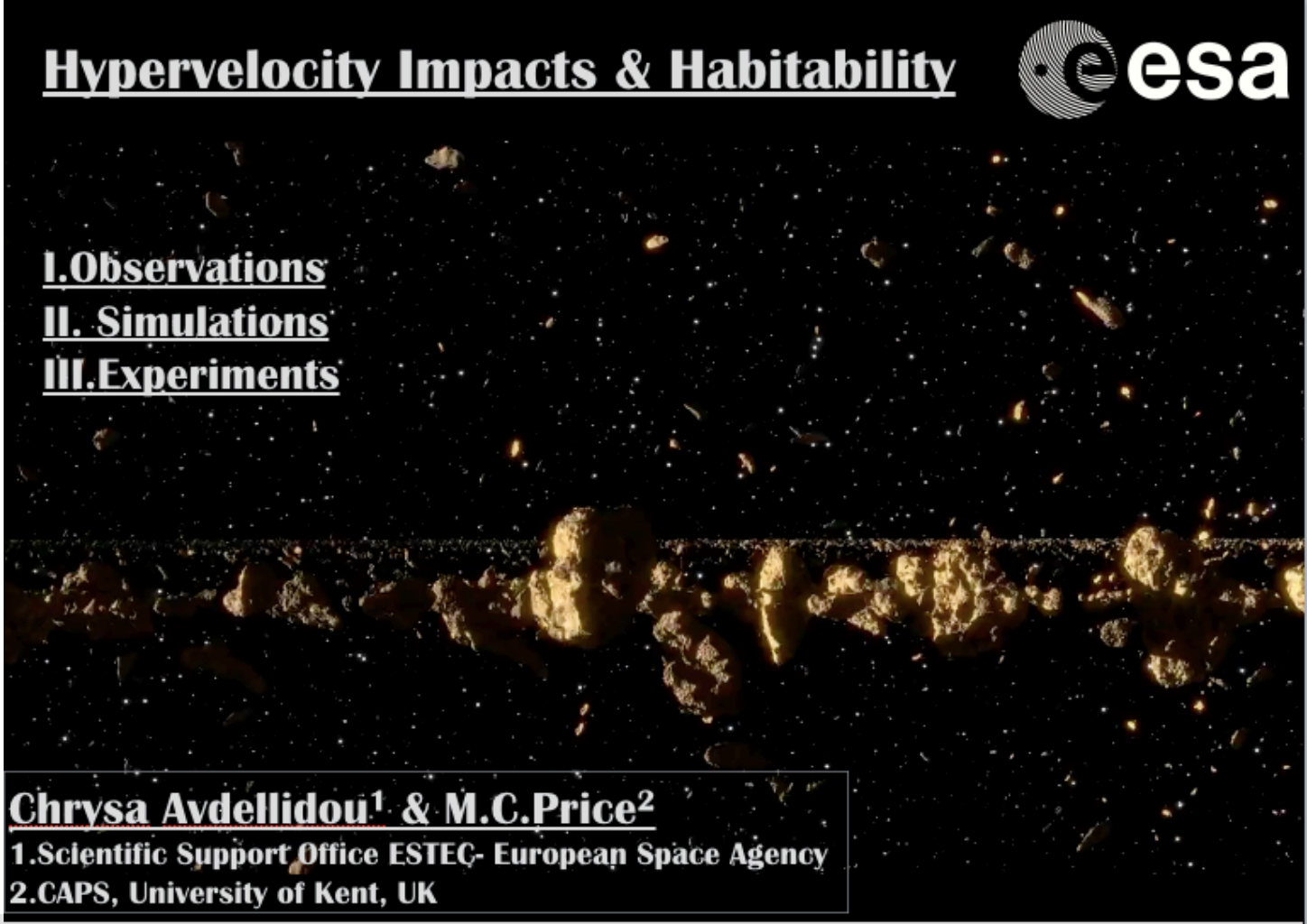
Do they hit? Influence on life?



Cartoon von Dick Adair, Honolulu Advertiser, 10 Okt 2002

Relevance of impacts for habitability – see Avdellidou's talk also refer to : De Sanctis; Delbo (this session)

Hypervelocity Impacts & Habitability



I.Observations
II. Simulations
III.Experiments

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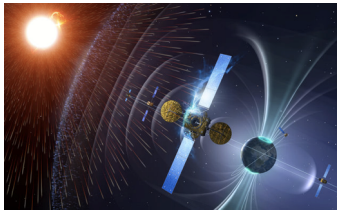
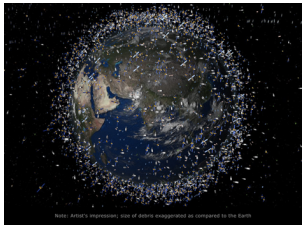
ESA's Space Situational Awareness programme

- **Provides a service to customers: governments, disaster management, scientists, information for media (via ESA Communications) about the situation of natural and artificial objects in space; addresses how this affects our assets. This will allow us to better protect our satellites and our planet.**
- **Funding 2013-2016 ('Phase 2'): ca. 50 Mio Euro. 2017-2019 ca. 90 Mio Euro.**



Space Weather segment

Near-Earth object segment



Surveillance and Tracking segment (man-made objects)

Mission statement

ESA's SSA-NEO segment shall be aware of the situation in space related to natural objects in our solar system. In particular, it shall provide warnings of potentially impacting objects. It shall prepare for mitigation of the resulting risk.

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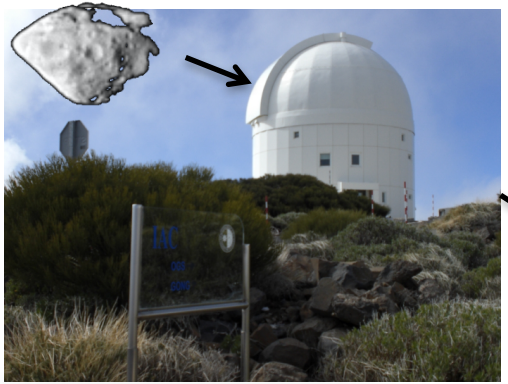
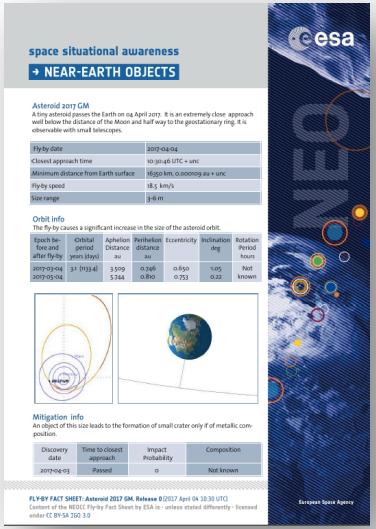
ESA's SSA-NEO segment





Current number of NEAs in risk list: **647**

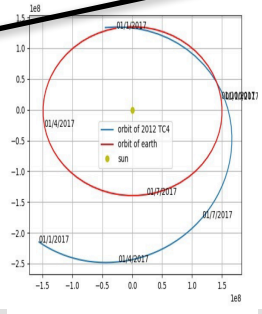
The Risk List is a catalogue of all objects for which a non-zero impact probability has been detected. Each entry contains details on the highest-probability impact event for the specific object, including its date, time and probability. In most cases, the size presented in the table is estimated indirectly from the absolute magnitude, and flagged with an asterisk to denote its large uncertainty. When a better measurement is available in the literature, it replaces the estimated value.

Last update: 2017-09-14 03:35 UTC

Risk List

Object Name	Size [m]	Date/Time	IP	PS	TS	Vel. [km/s]	In list since [days]	IT	PP	OV
2010RF12	9.0*	2095-09-05 23:47	1/16	-3.26	0	12.29	2520			
2006JY26	9.0*	2074-05-03 01:00	1/86	-3.91	0	11.57	4085			
2012TC4	19.0*	2050-10-12 22:42	1/1145	-3.93	0	12.92	1802			
2005QS44	46.0*	2071-09-16 00:26	1/2096	-3.63	0	11.26	6129			
2009JF1	16.0*	2022-05-06 08:12	1/4464	-3.75	0	26.41	2992			
2006QV89	37.0*	2019-09-09 07:03	1/11428	-3.79	0	12.32	3971			
2008UB7	71.0*	2060-10-31 18:26	1/36101	-3.83	0	21.57	3196			
2012QD8	100.0*	2047-03-08 23:18	1/188679	-3.95	0	23.58	1804			
99942 Apophis	375.0	2068-04-12 15:13	1/531914	-3.67	0	12.62	4416			
1979XB	860.0*	2113-12-14 18:07	1/1.84E6	-3.28	0	26.04	13727			

Download as CSV file | Download as Excel file



Note: The Minor Planet Center is *not* part of the segment!

Orbits, physical properties, and more….

http://neo.ssa.esa.int

Search for Asteroids | **Summary** | Orbit Properties | Physical Properties

99942 Apophis

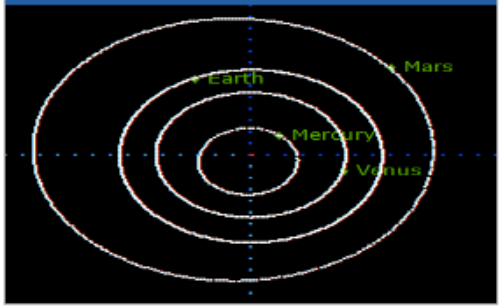
Orbital Properties		
Orbit type	Aten	
Perihelion (q)	0.746	au
Aphelion (Q)	1.099	au
Eccentricty (e)	0.192	-
Inclination (i)	3.3	deg
Orbit period (P)	323.7	days
Earth MOID	0.00056	au

Next Earth close approach		
Date	2021/03/06	
Nominal distance (from Earth center)	0.11265	au
	16852454	km
Maximum Brightness	15.5	-

Risk
Object is in risk list
Object is not in priority list

Physical Properties		
Absolute Magnitude (H)	18.9	-
Diameter (d)	375.0	m
Taxonomic type	S/Sq	
Rotation period (T)	30.560	h

Orbit Visualization



Discovery Information	
Discovery Date	2004-06-19
Observatory	Kitt Peak

Summary and conclusions

- Since 2009, ESA has been building up a so-called SSA-NEO segment
- Observations, orbit computations, creation of ‘risk list’ with possible Earth impactors, set up information flow to e.g. emergency response agencies
- Provides databases which can be a valuable resource for data mining to understand distribution and composition of asteroids in our own solar system
- Link to extra-solar objects? The first one was discovered just a few weeks ago!

Credit: ESO/M. Kornmesser

http://neo.ssa.esa.int