LA TERRA COME BERSAGLIO COSMICO

Il pericolo potenziale dell'impatto di asteroidi o comete con il nostro pianeta

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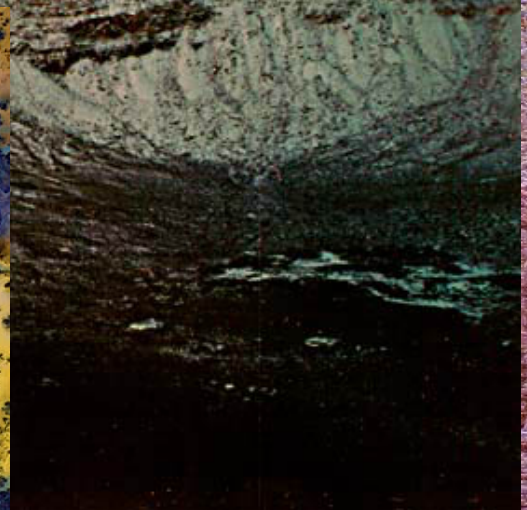
"Universus 2006" – XXV Edizione – "Pianeta Terra, i grandi rischi per l'umanità"
Aula Magna – Liceo Scientifico di Montecorvino Rovella – 25-26-27 Maggio 2006

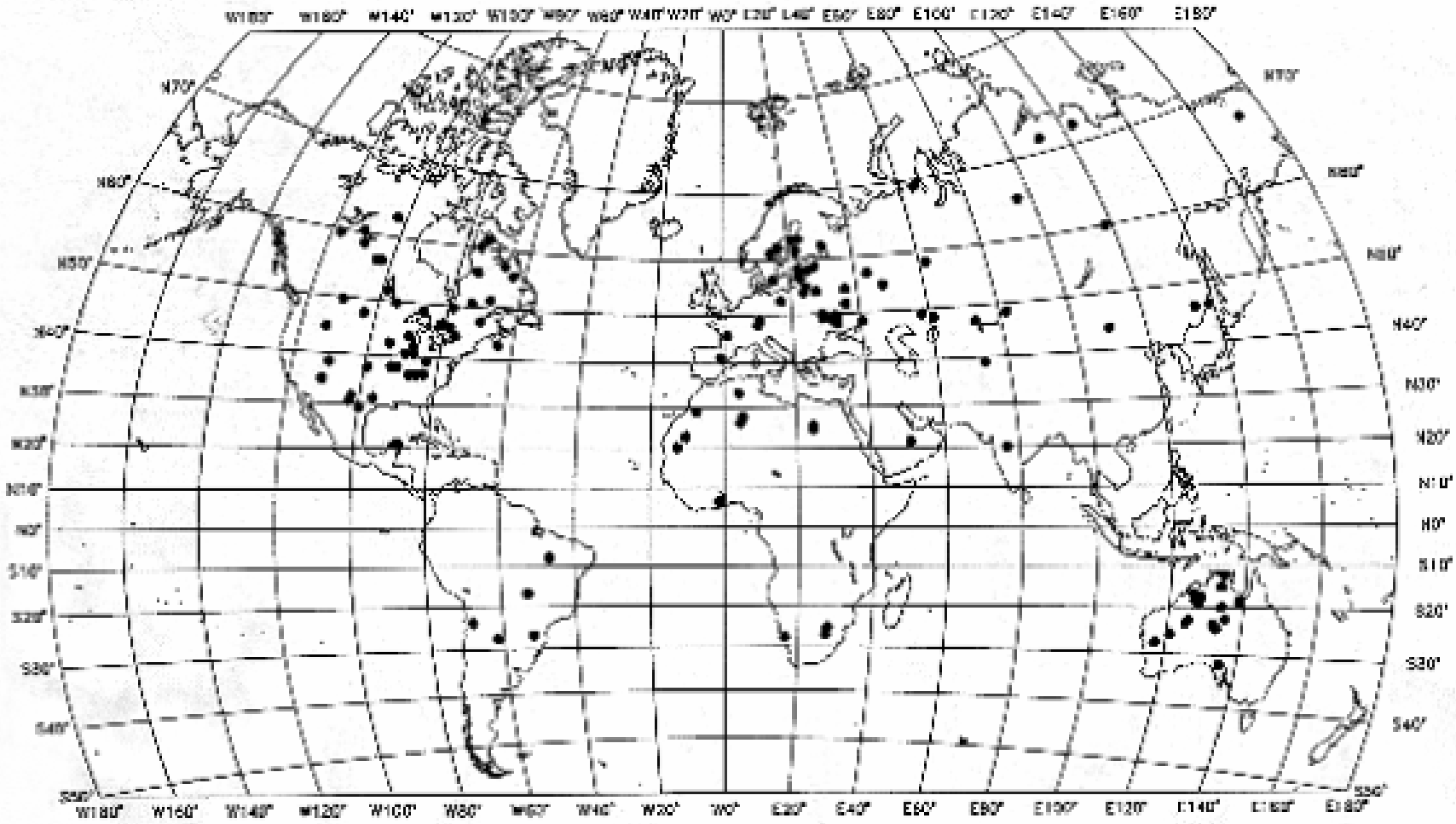


IMPACT CRATERS

COMPILED BY THE GEOPHYSICS DIVISION

GEOLOGICAL SURVEY OF CANADA, ENERGY, MINES AND RESOURCES

30-DEC-91



EQUATORIAL SCALE 1:150 000 000 ECHELLE EQUATORIAL

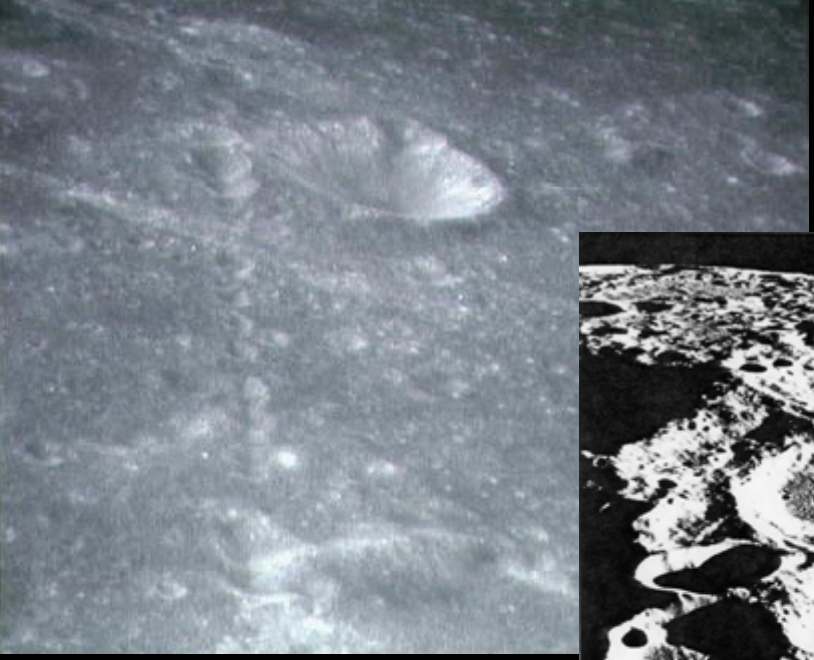
0 3000 6000 9000 12000 15000

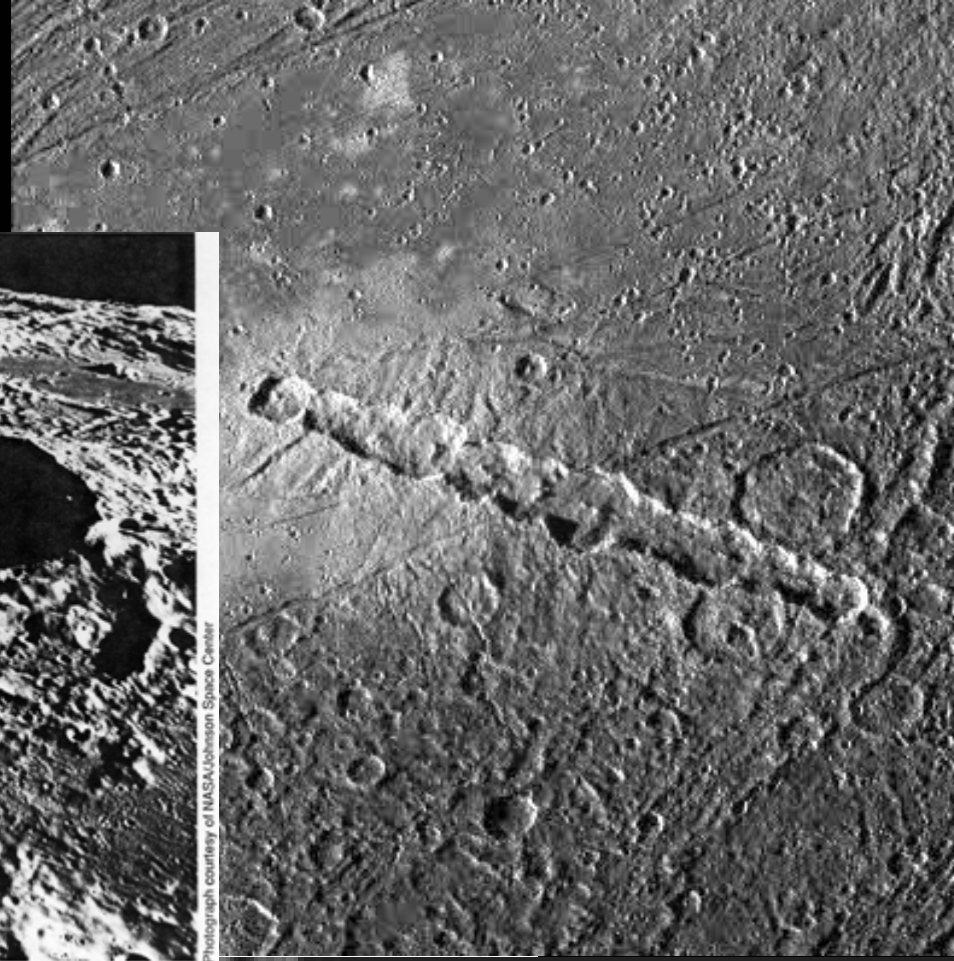
KILOMETRES

VAN DER GRINTEN PROJECTION

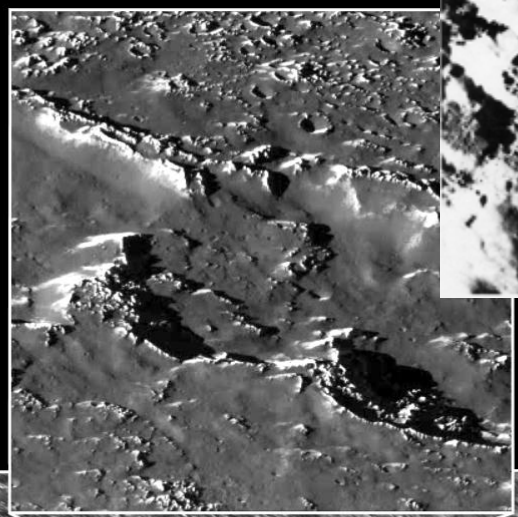
PROJECTION VAN DER GRINTEN

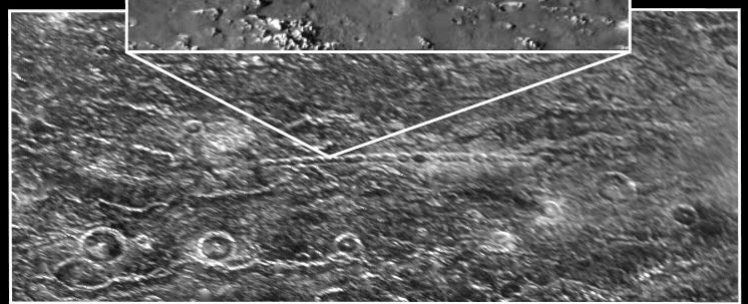
CENTRAL MERIDIAN 0° MERIDIEN CENTRAL 0°



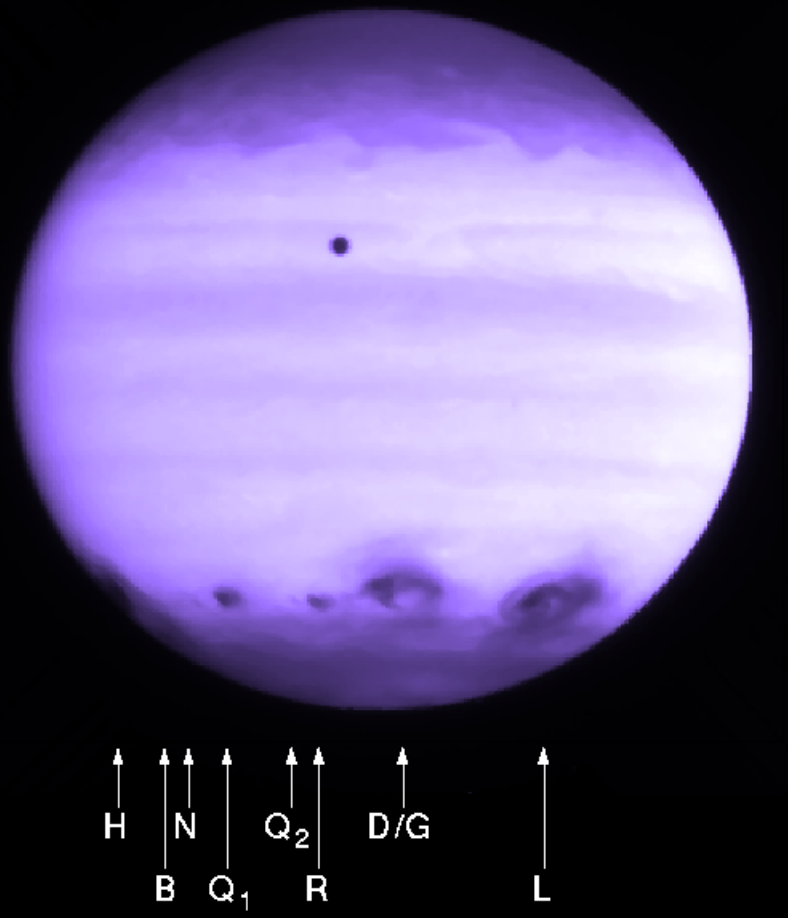



Photograph courtesy of NASA/Johnson Space Center

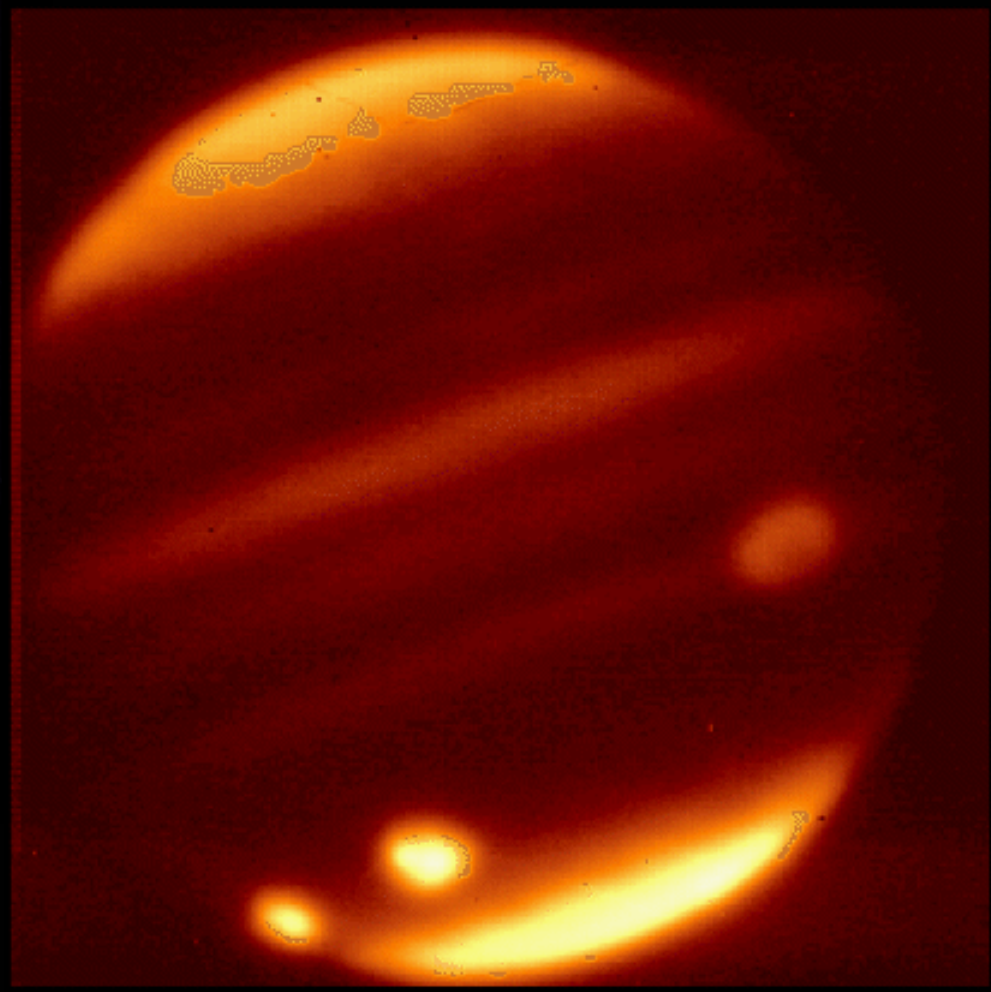




Jupiter in Ultraviolet

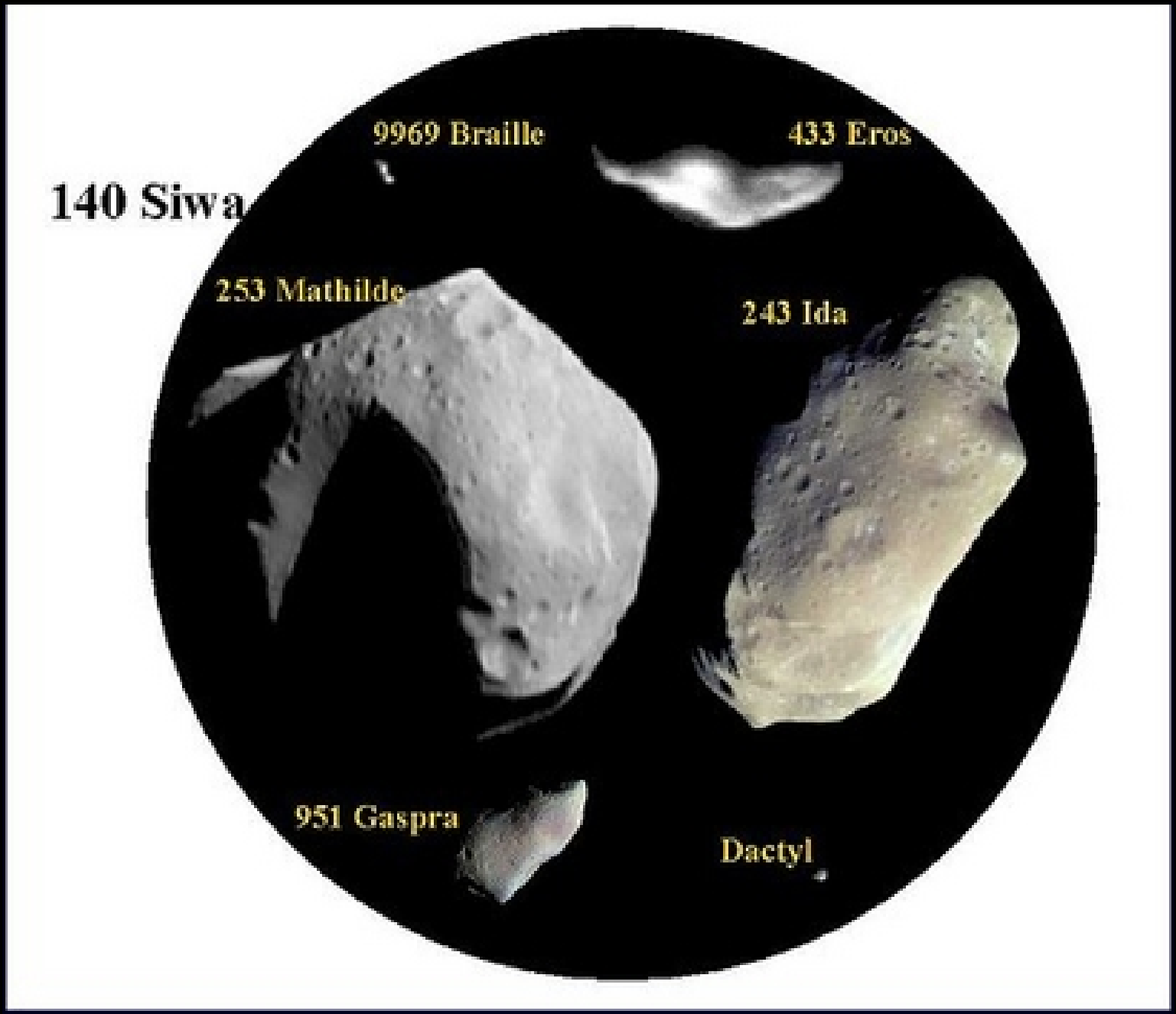


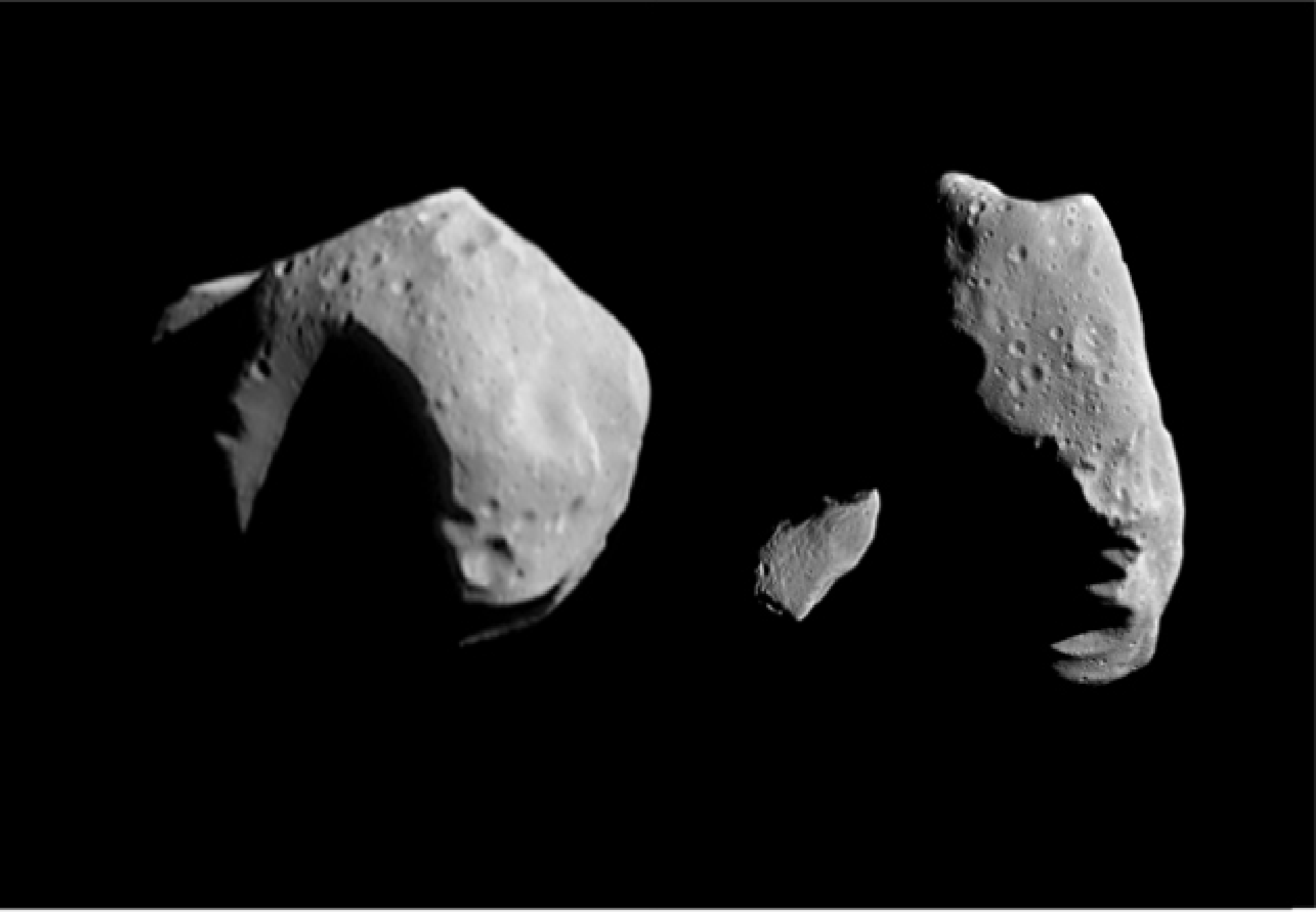
Hubble Space Telescope
Wide Field Planetary Camera 2



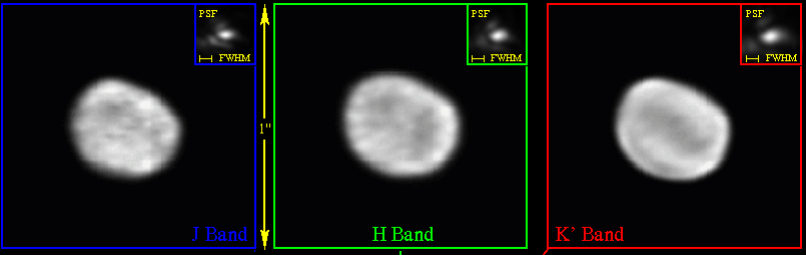
ASTEROIDI, COMETE & TNO

- ASTEROIDI REGISTRATI: ~ 340.000
- ASTEROIDI CON ORBITA NOTA: ~ 120.000
- NEA CATALOGATI: ~ 3800 (~ 850 ≥ 1 km)
- NUOVI ASTEROIDI SCOPERTI: ~ 5000 al mese
- ASTEROIDI DELLA FASCIA PRINCIPALE [Ø ≥ 1 km]: 1.200.000 ± 500.000
- NEA [Ø ≥ 1 km]: 900 - 1200
- TNO [Ø ≥ 100 km]: ~ 35.000
- COMETE NELLA NUBE DI OORT: ~ 1.000.000.000.000
- COMETE IN VIAGGIO VERSO IL SISTEMA SOLARE "INTERNO" IN OGNI MOMENTO: ~ 400


140 Siwa
9969 Braille
433 Eros
253 Mathilde
243 Ida
951 Gaspra
Dactyl



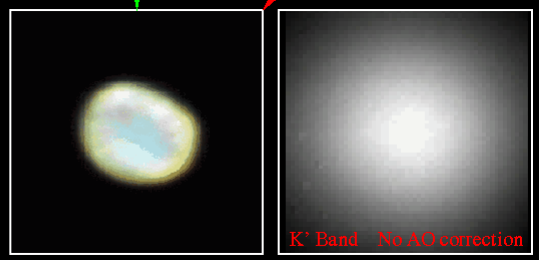
Mathilde Gaspra Ida

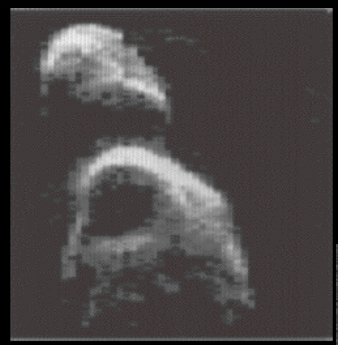


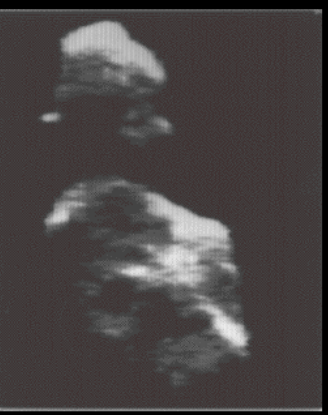
Vesta, Keck AO first light
resolution ~ 50 mas
integration times:
J=3x2sec, H=3x2sec, K'=12x2sec
(with ND3 in all cases)

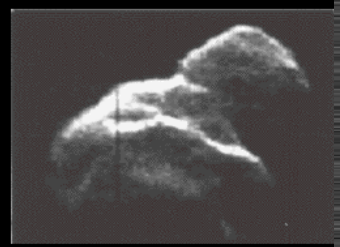
Images deconvolved with maximum likelihood algorithm

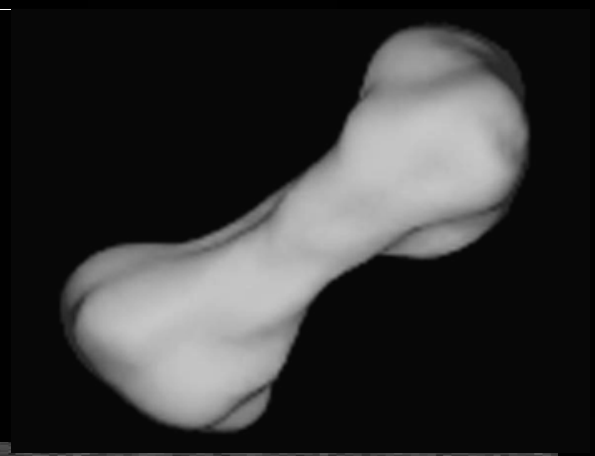
(Obtained on Keck II Telescope with Keck AO and KCam on 02/06/1999)





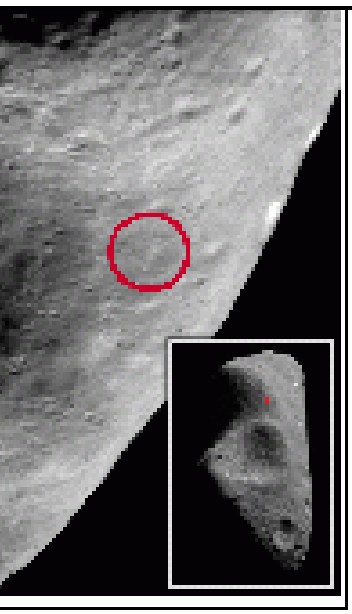


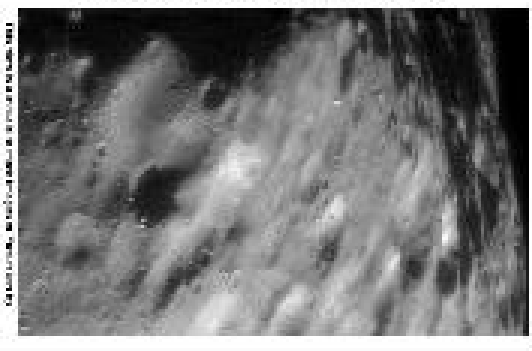




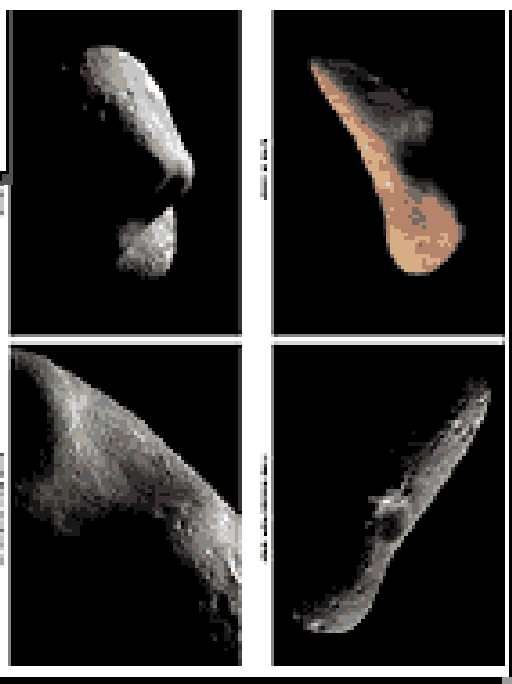

Discovery Is NEAR

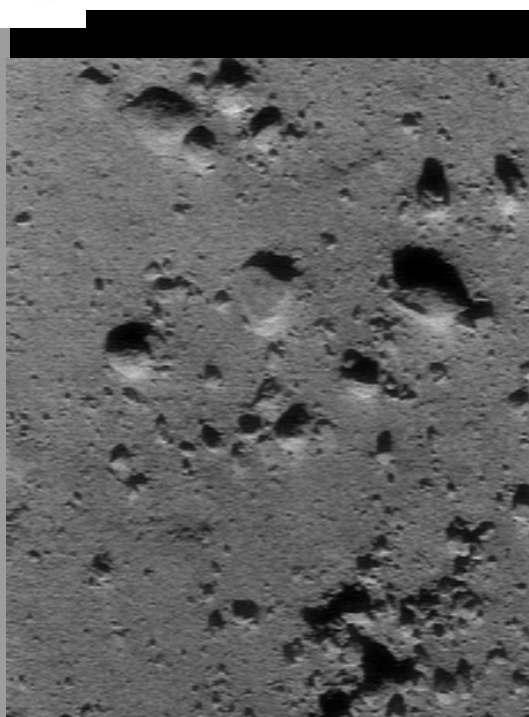
Discovery Is NEAR

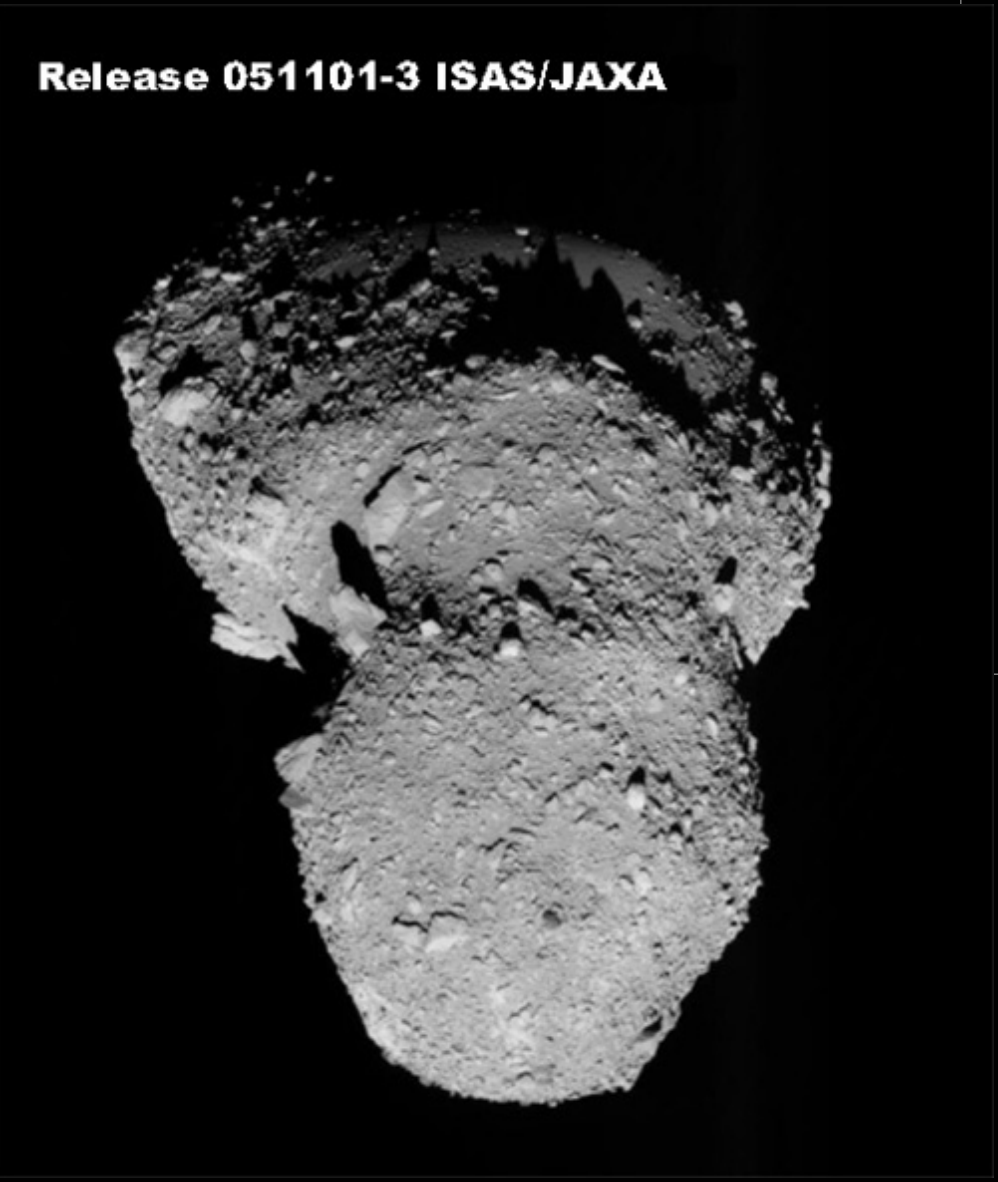





Discovery Is NEAR



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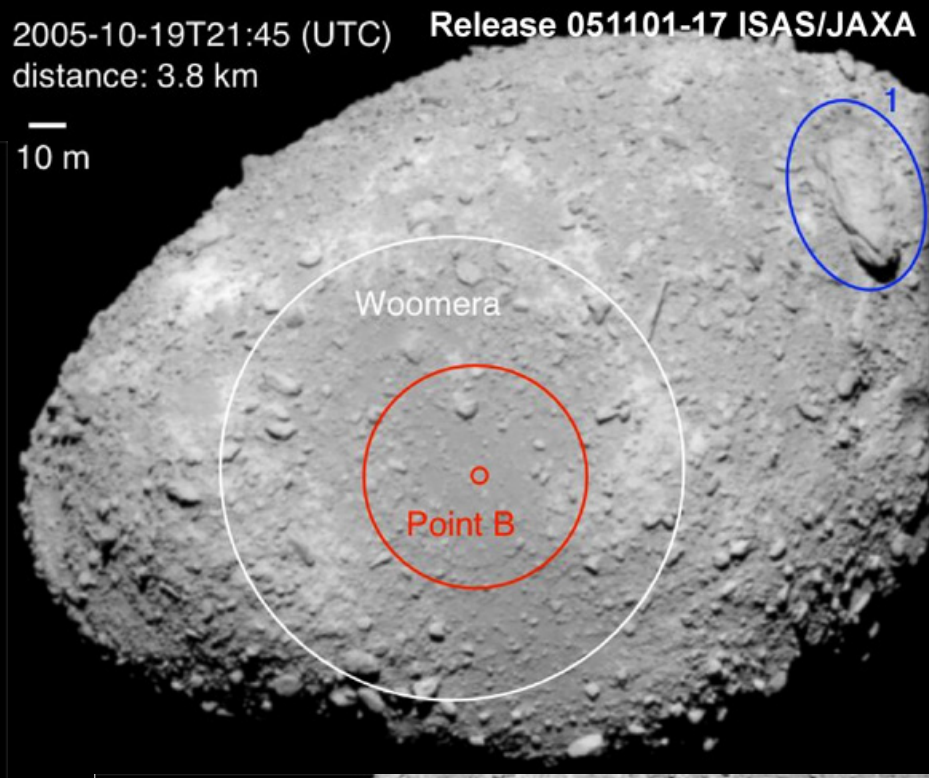
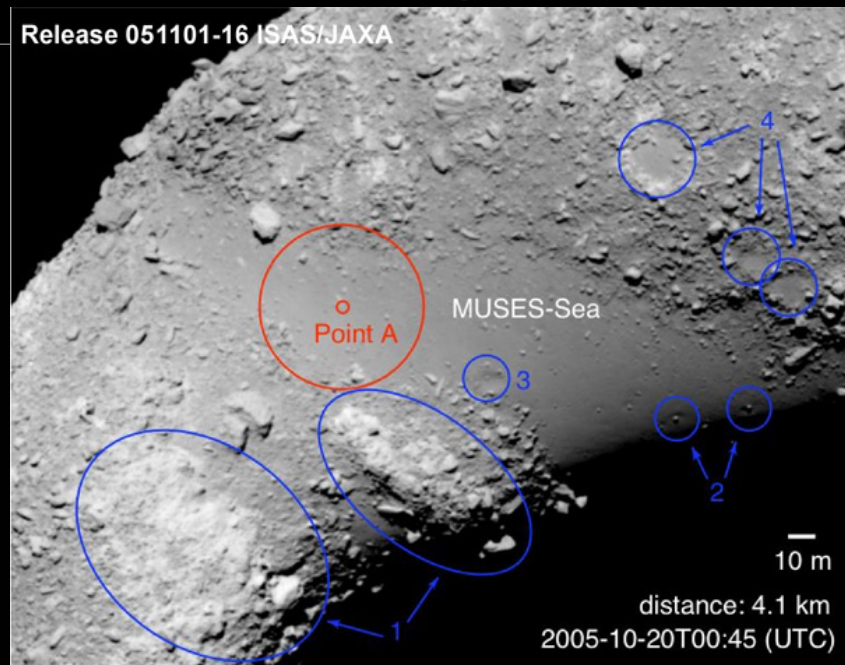
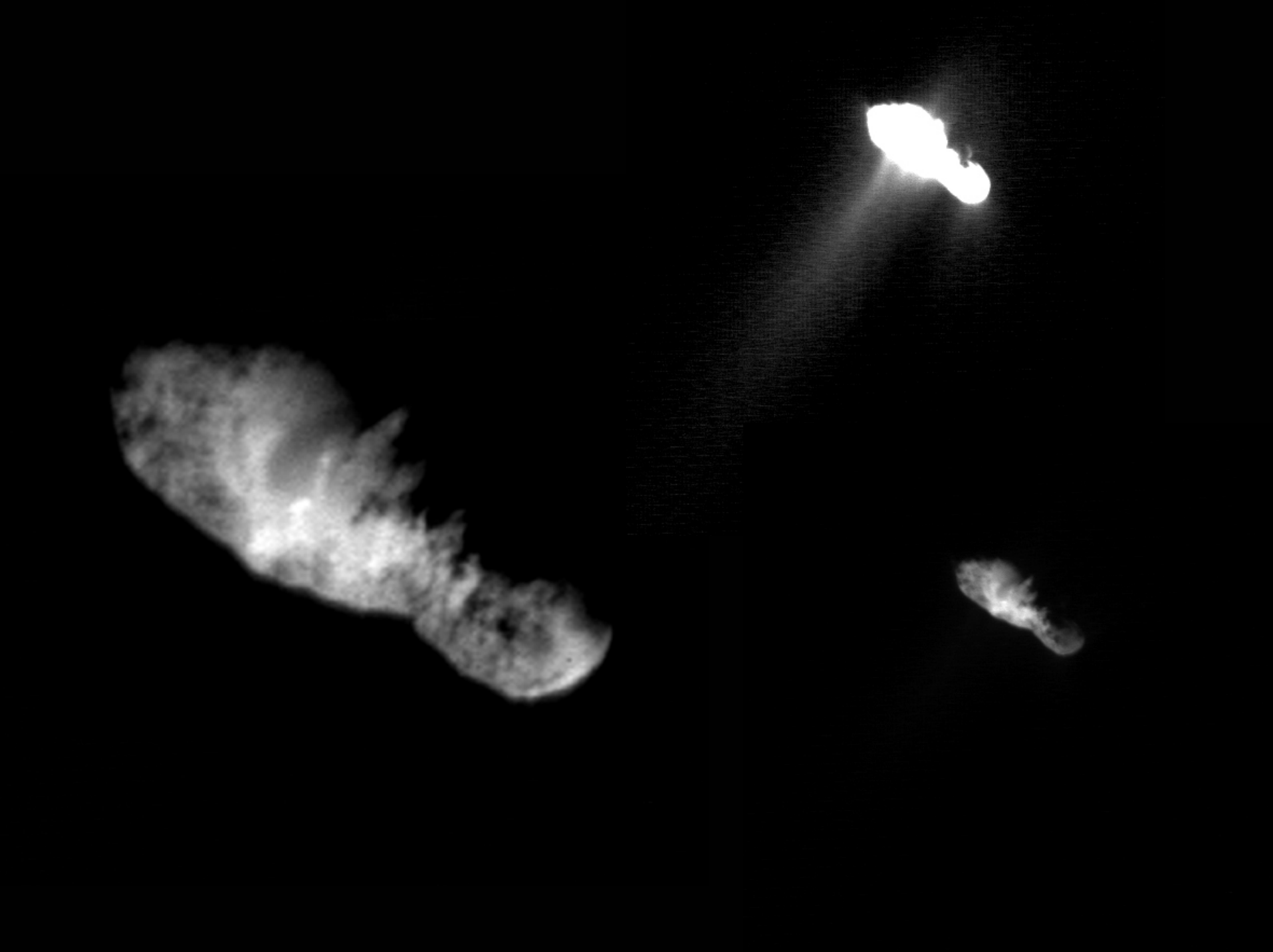
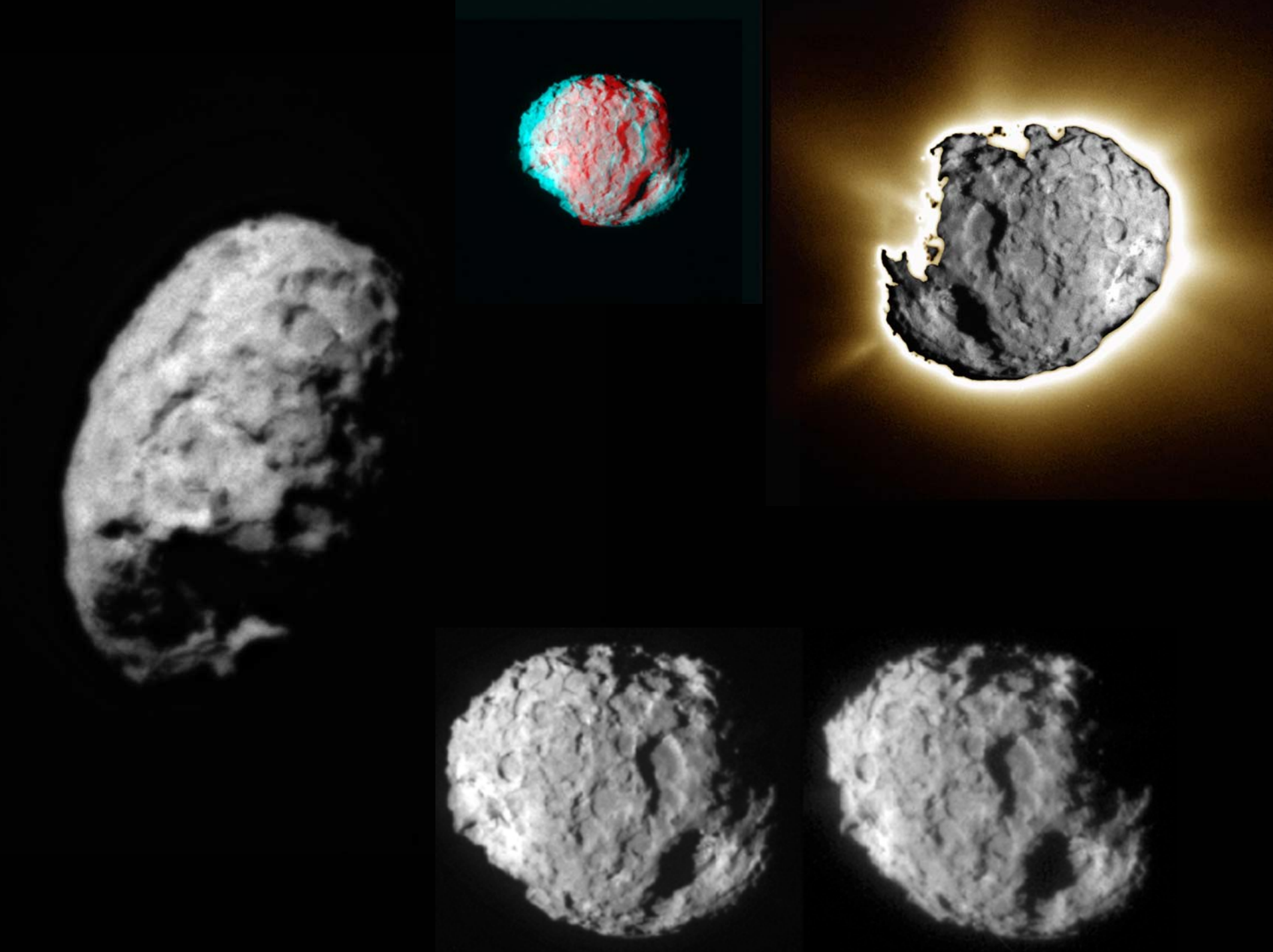
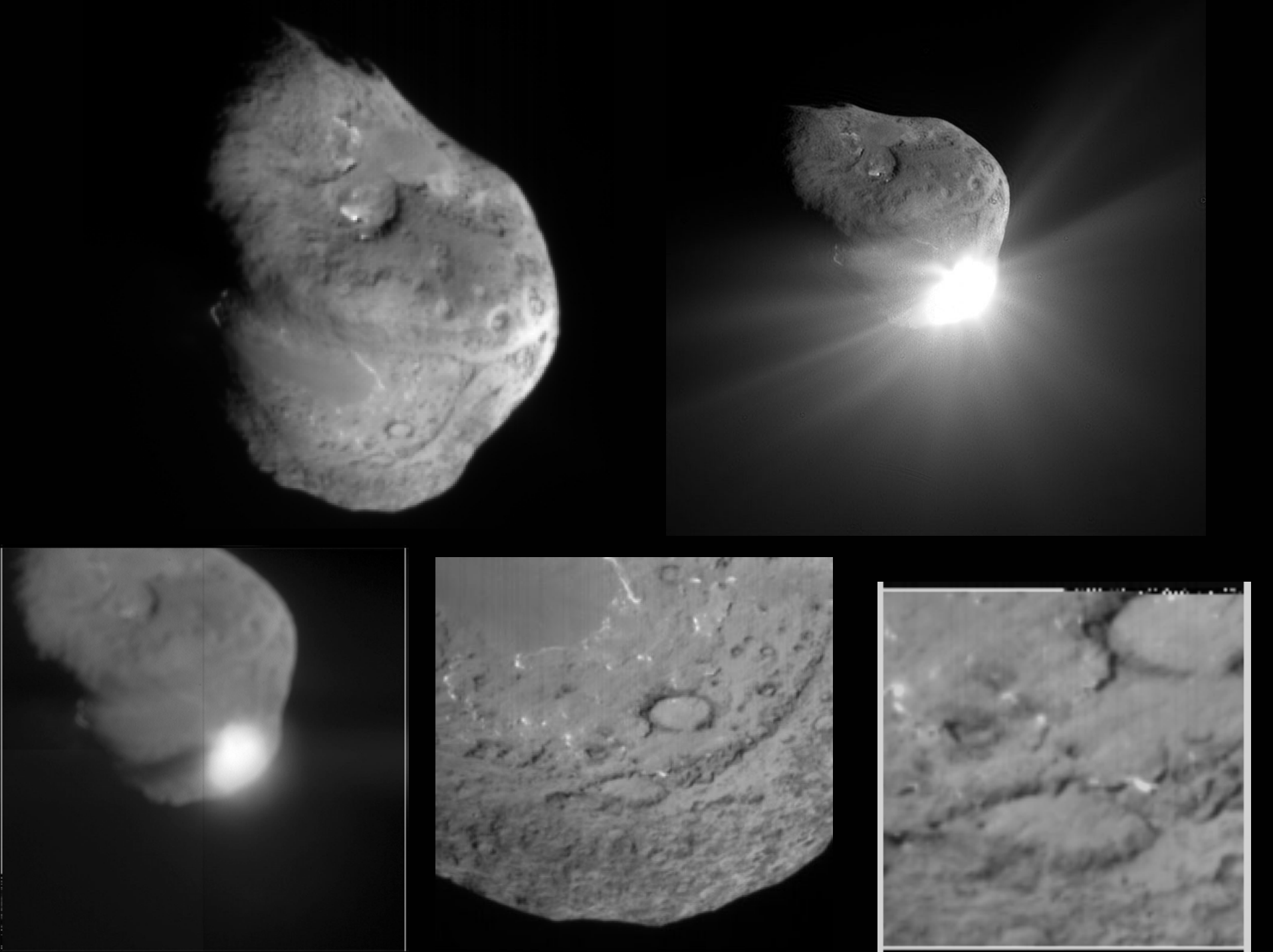

2005-10-19T21:45 (UTC)
distance: 3.8 km
10 m
Release 051101-17 ISAS/JAXA
1
Woomera
Point B


Release 051101-16 ISAS/JAXA
4
Point A
MUSES-Sea
3
2
1
10 m
distance: 4.1 km
2005-10-20T00:45 (UTC)

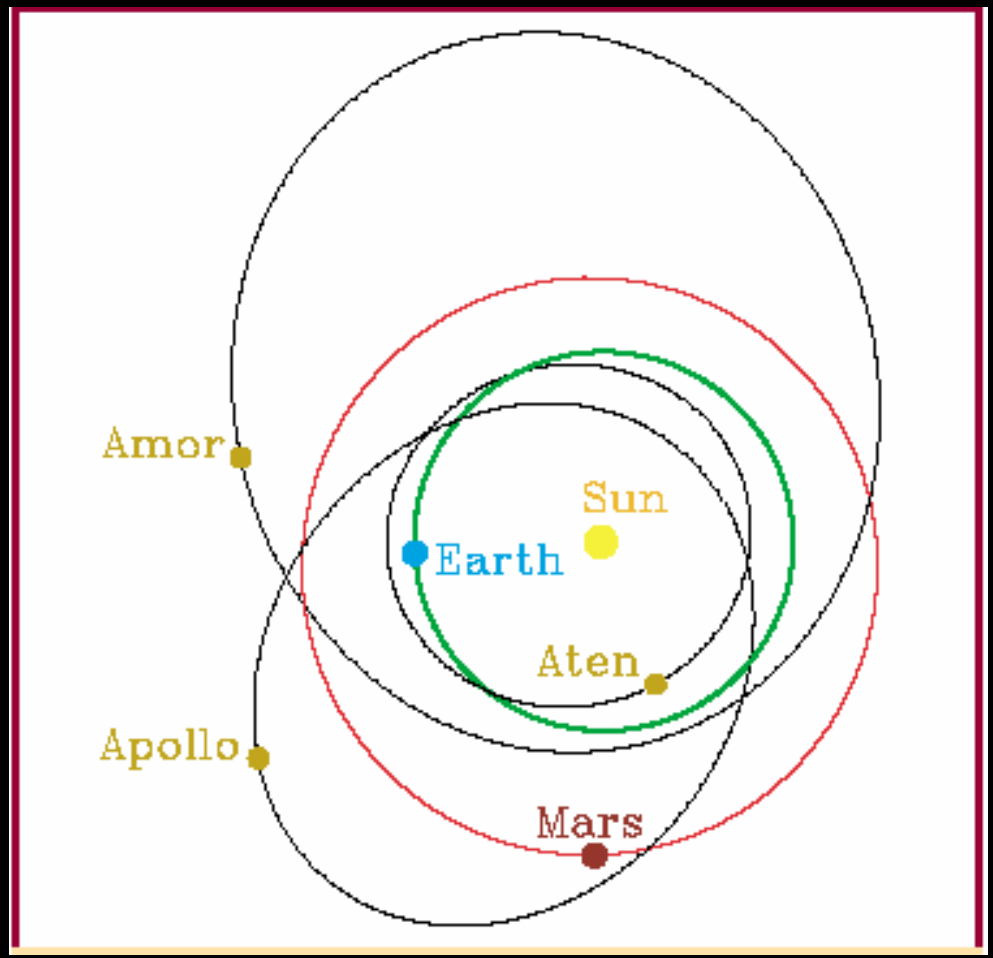

HMC COMPOSITE IMAGE
COMET HALLEY
HALLEY MULTICOLOUR CAMERA
13-MAR-1986
IMAGE #3416 - 25 600 km
IMAGE #3444 - 10 000 km
IMAGE #3461 - 13 400 km
IMAGE #3475 - 9 600 km
IMAGE #3491 - 5 200 km
IMAGE #3496 - 3 900 km
Copyright MPAE 1986
MAX-PLANCK-INSTITUT FUER AERONOMIE







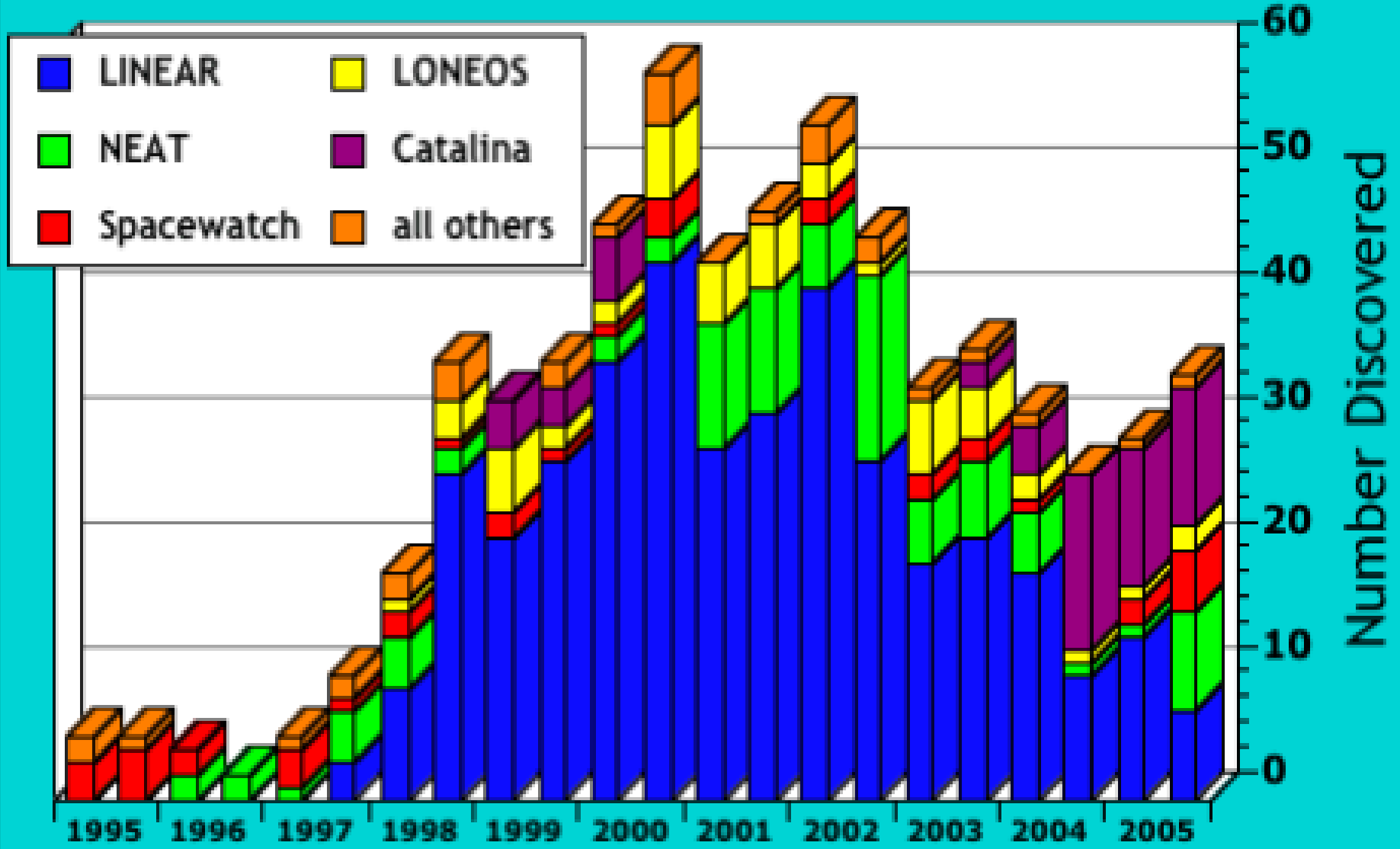
NEAR EARTH ASTEROIDS (NEA)



- **P**otentially **H**azardous **A**steroids (PHA): gli asteroidi che possono transitare a meno 0,05 UA ≅ 7,5 milioni di km dalla Terra e con un diametro maggiore di circa 150 m sono definiti potenzialmente pericolosi. Attualmente se ne conoscono poco meno di 800.

Near-Earth Asteroid Discoveries

Large Asteroids (kilometer sized and larger)

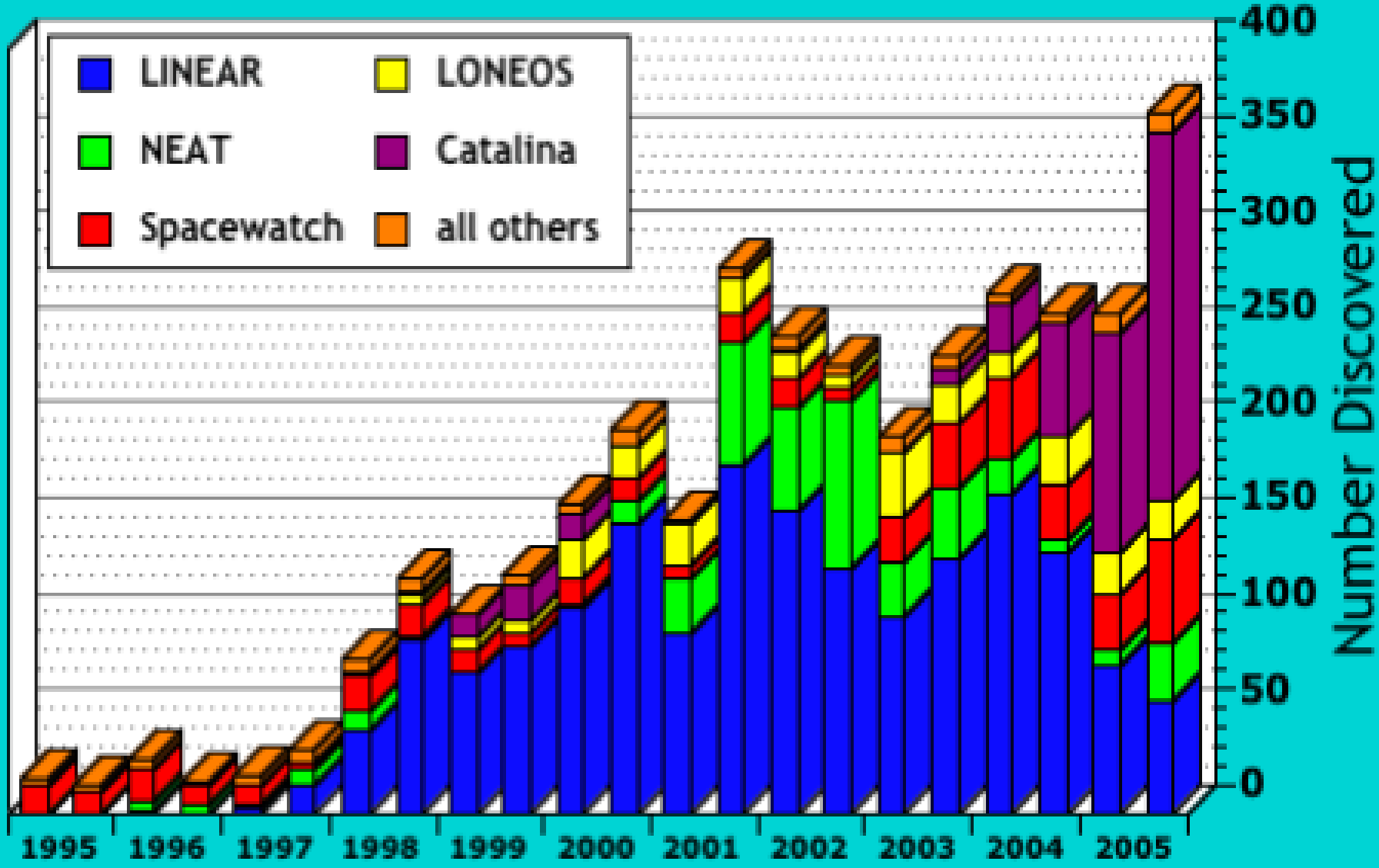


Half Year Intervals

20 January 2006
Alan B. Chamberlin (JPL)

Near-Earth Asteroid Discoveries

All Asteroids

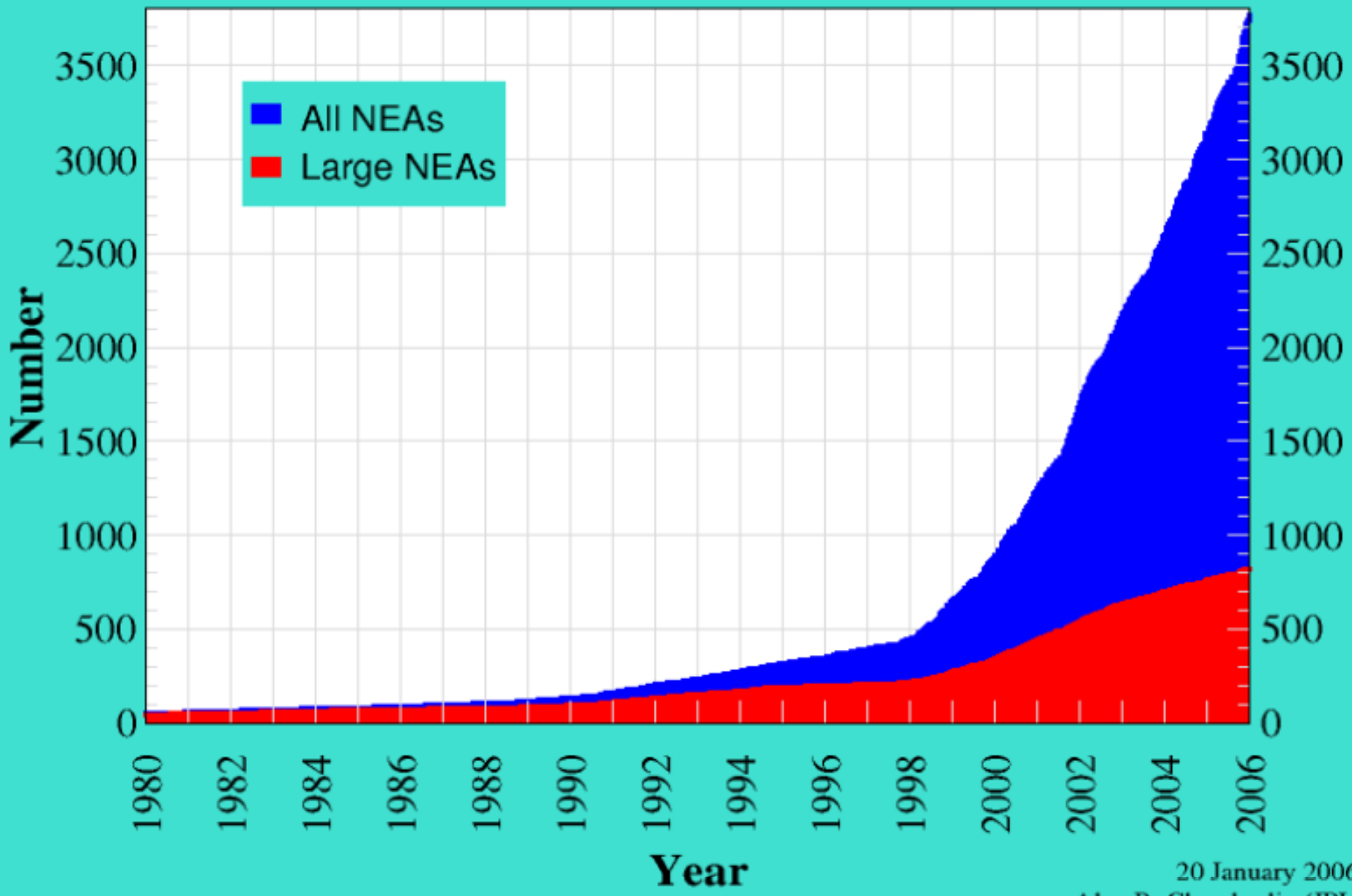


Half Year Intervals

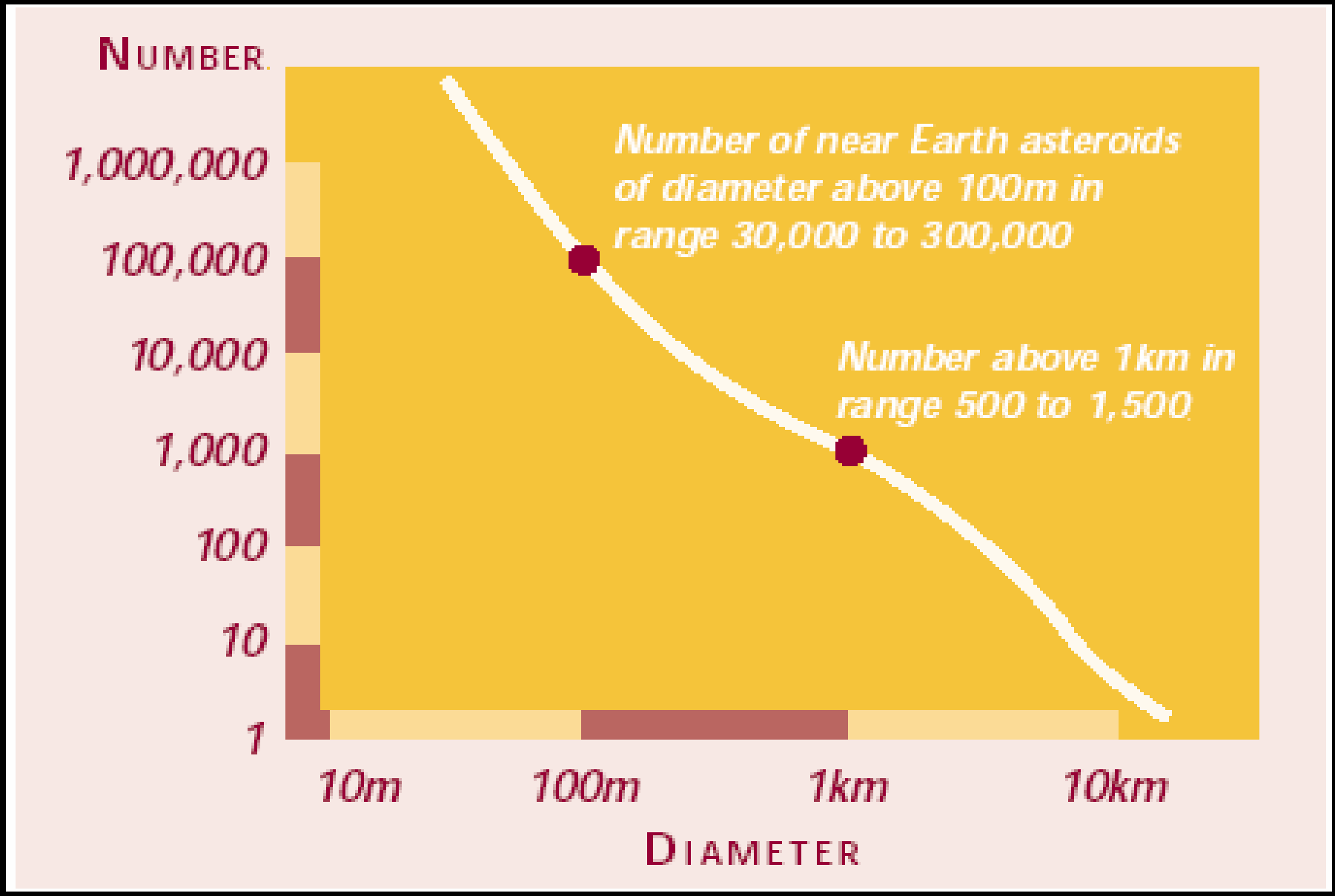
20 January 2006
Alan B. Chamberlin (JPL)

Known Near-Earth Asteroids

1980-Jan through 2005-Dec



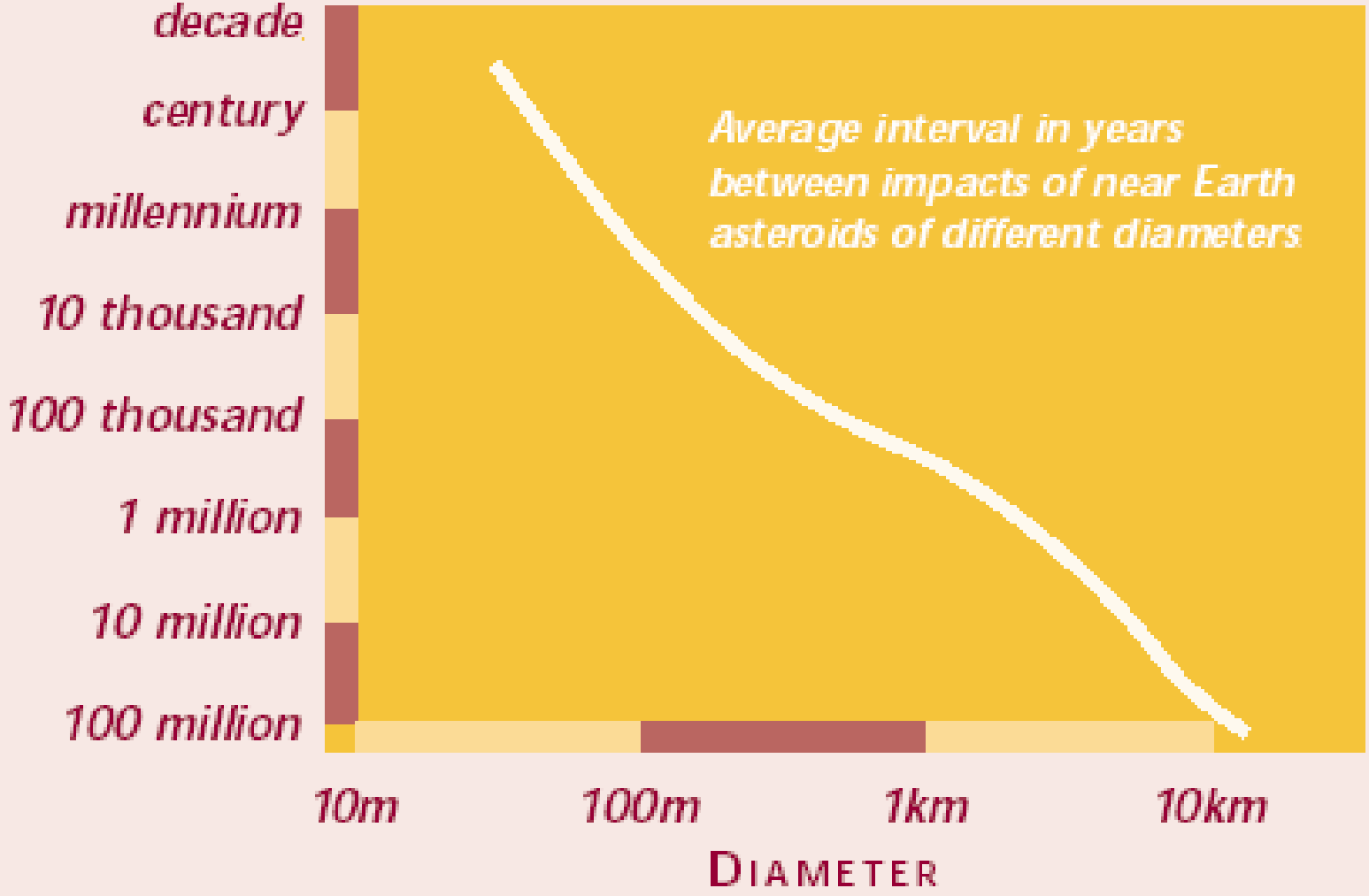
20 January 2006
Alan B. Chamberlin (JPL)


NUMBER
1,000,000
100,000
10,000
1,000
100
10
1
Number of near Earth asteroids of diameter above 100m in range 30,000 to 300,000
Number above 1km in range 500 to 1,500
10m
100m
1km
10km
DIAMETER

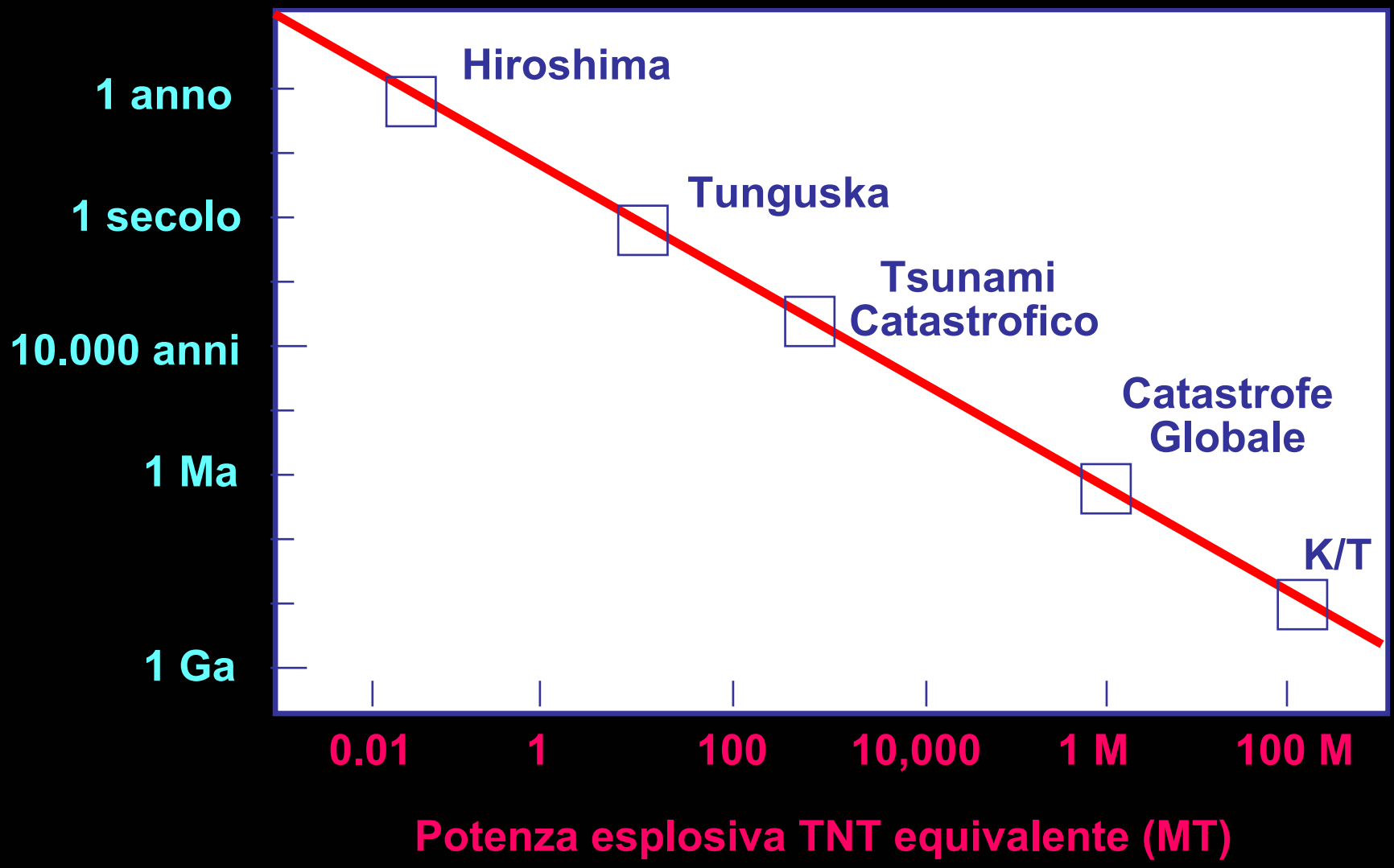
Civilization Threatening Impact

Mass Extinction Impact

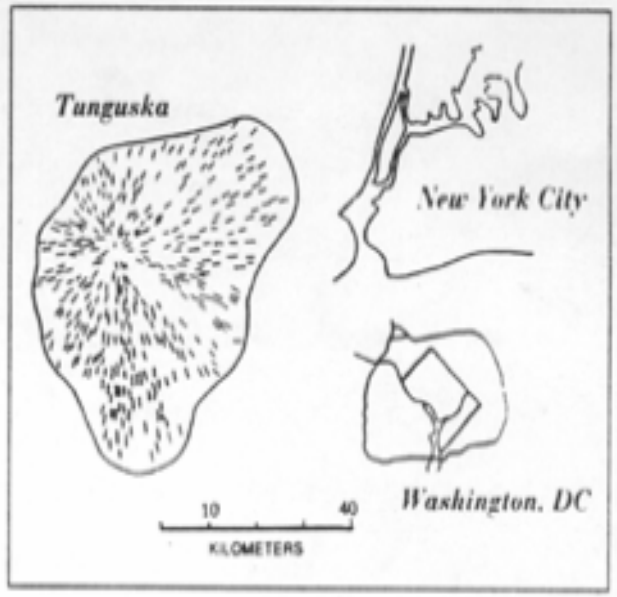
Earth Sterilizing Impact


decade
century
millennium
10 thousand
100 thousand
1 million
10 million
100 million
Average interval in years between impacts of near Earth asteroids of different diameters
10m
100m
1km
10km
DIAMETER

FREQUENZA


1 anno
1 secolo
10.000 anni
1 Ma
1 Ga
Hiroshima
Tunguska
Tsunami
Catastrofico
Catastrofe
Globale
K/T
0.01
1
100
10,000
1 M
100 M
Potenza esplosiva TNT equivalente (MT)

Photograph courtesy of the Smithsonian Institution



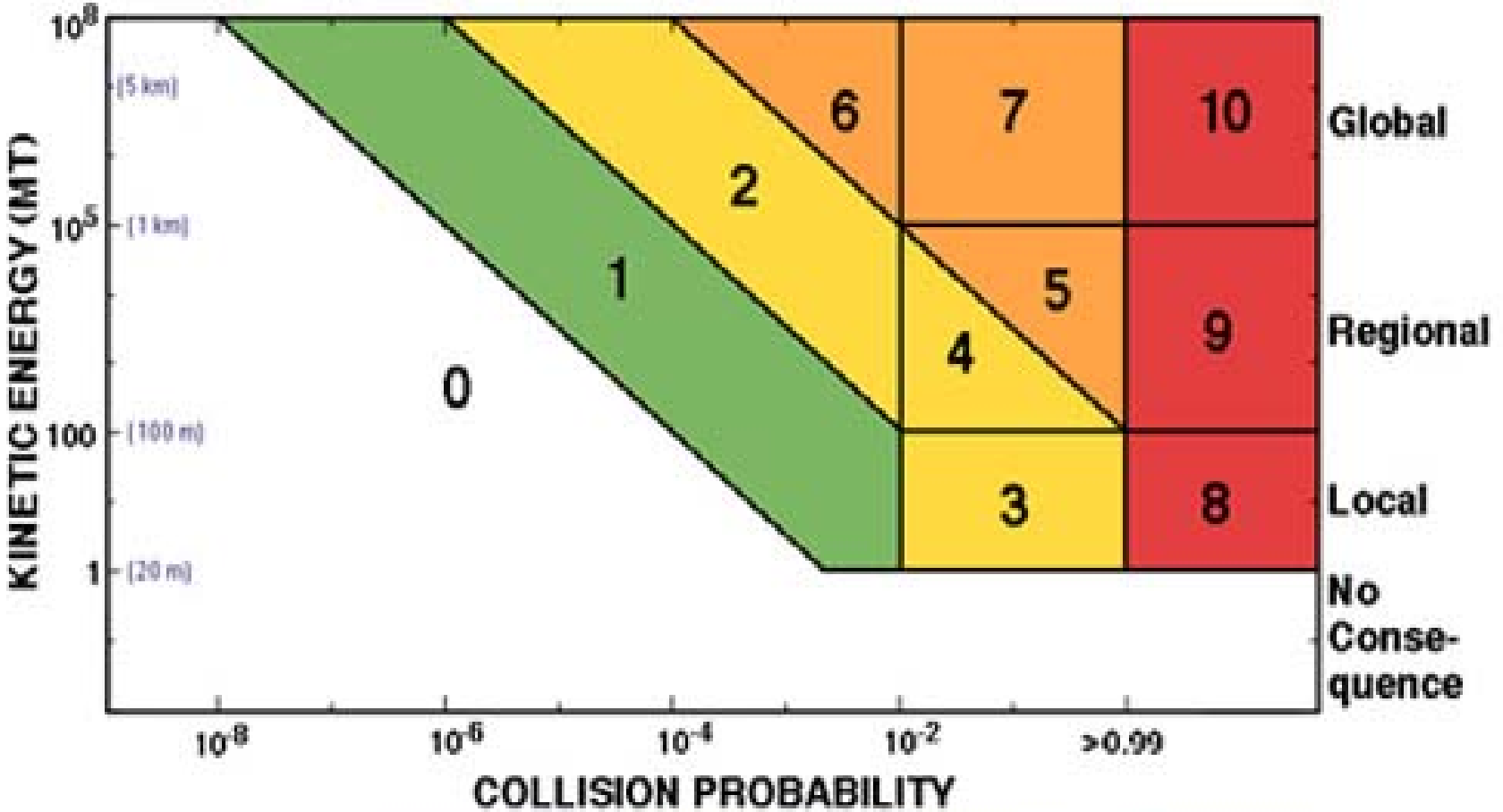
Art courtesy of John Pike

Tunguska in perspective

Type of event	Diameter of impactor	Average fatalities per impact	Typical interval (years)
High atmospheric break-up	<50m	close to zero	frequent
Tunguska-like events	50m to 300m	5,000	250
Large sub-global event	300m to 1.5km	500,000	25,000
Low global effect threshold	>600m	1.5 billion	70,000
Nominal global effect threshold	>1.5km	1.5 billion	500,000
High global effect threshold	>5km	1.5 billion	6 million
Rare K/T scale events (of type associated with extinction of dinosaurs)	>10km	6 billion	100 million

ESTIMATED FATALITIES *for a wide variety of different impact scenarios (after Chapman & Morrison, 1994, Nature* ***367****, 33)*

The Torino Scale



Events having no likely consequences.

Events meriting careful monitoring.

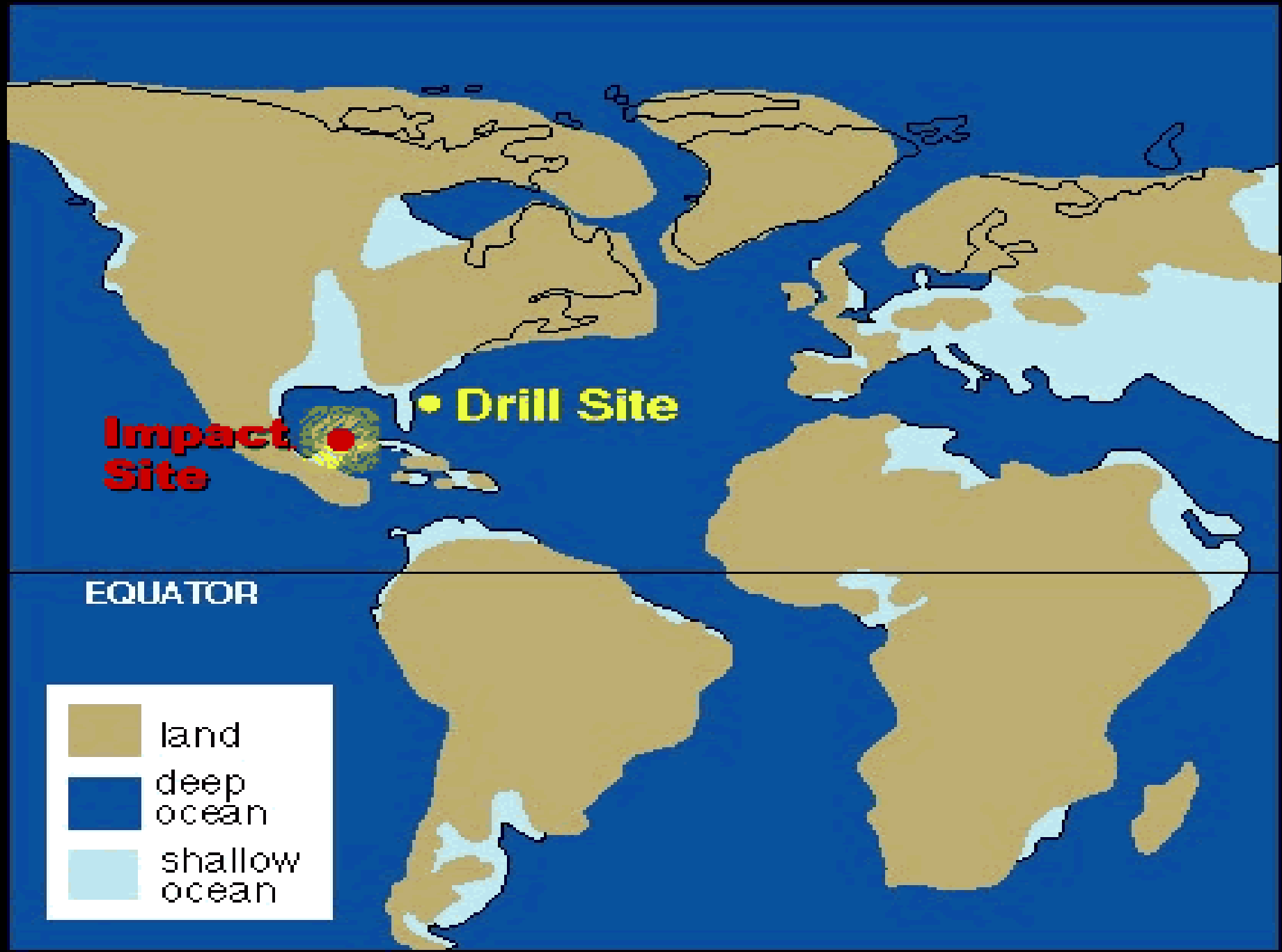
Events meriting concern.

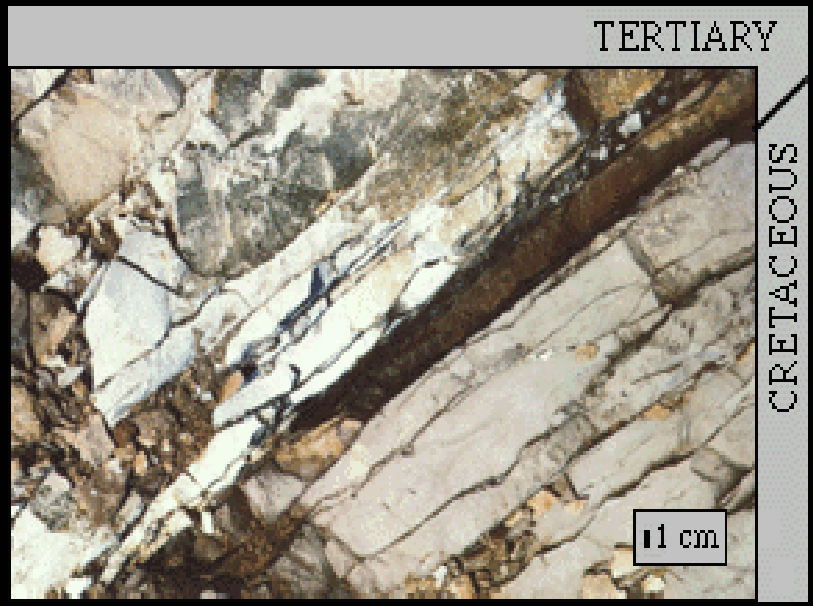
Threatening events.

Certain collisions.

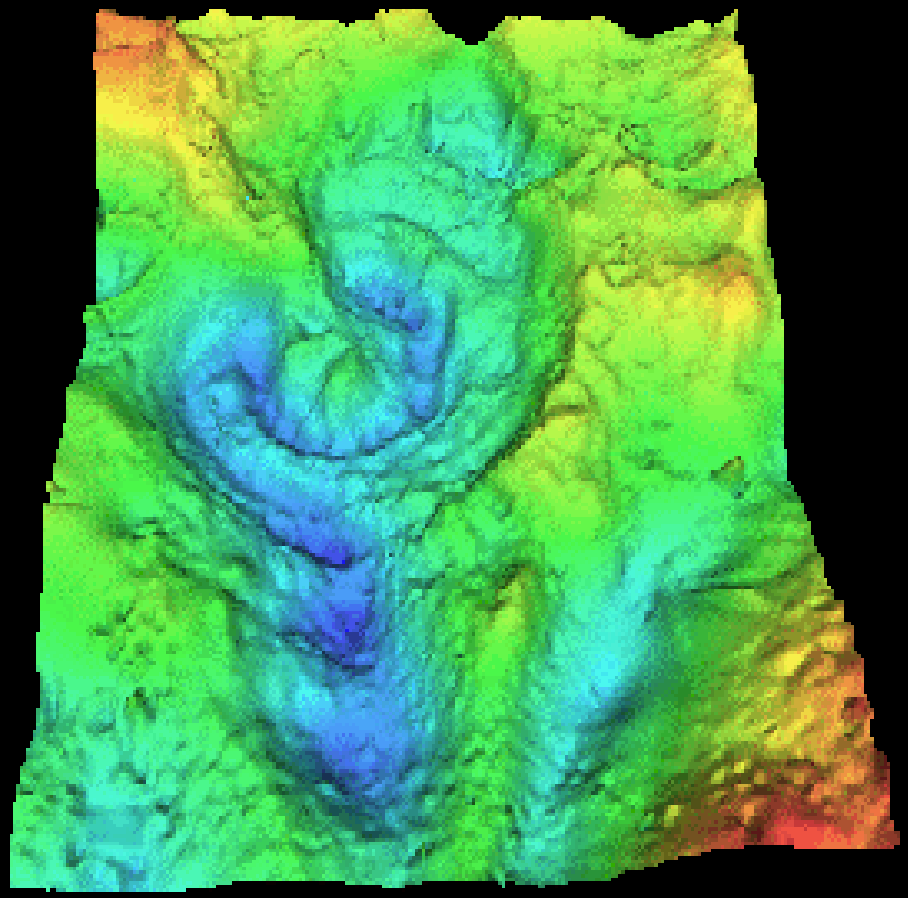
LE ESTINZIONI DI MASSA

- PRECAMBRIANO
- VENDIANO
- CAMBRIANO
- ORDOVINCIANO
- DEVONIANO
- PERMIANO
- CRETACEO/TERZIARIO
- OLOCENE


Drill Site
Impact Site
EQUATOR
land
deep ocean
shallow ocean

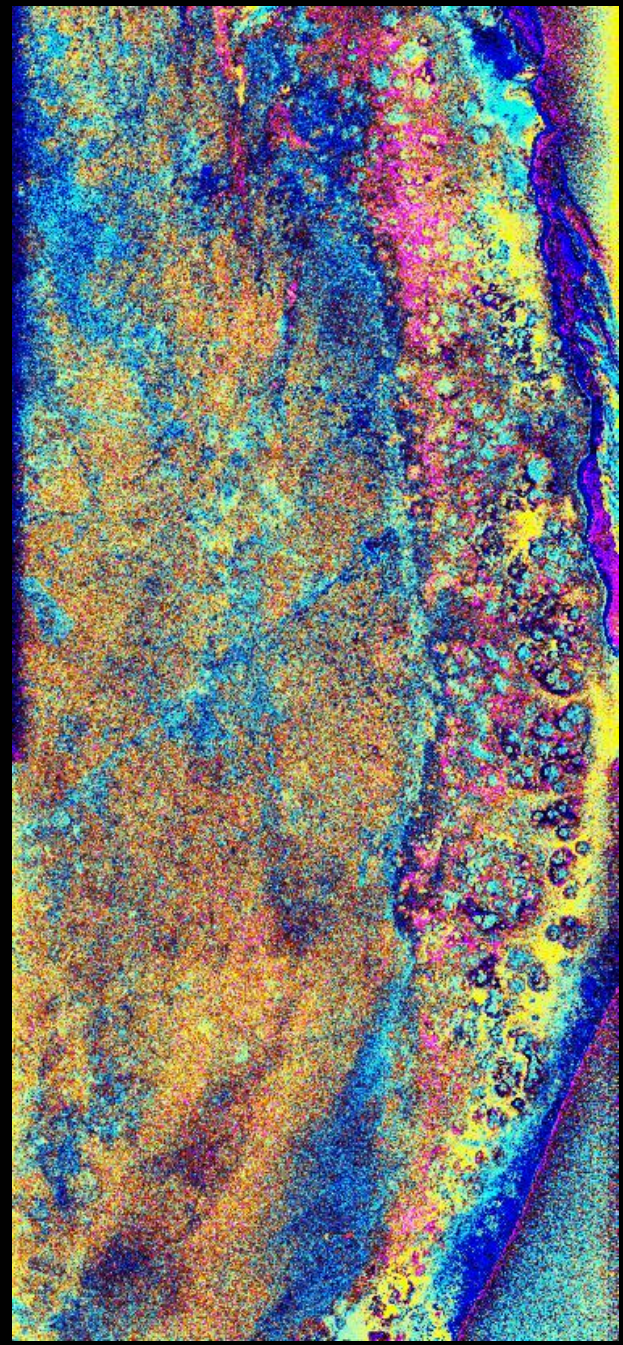


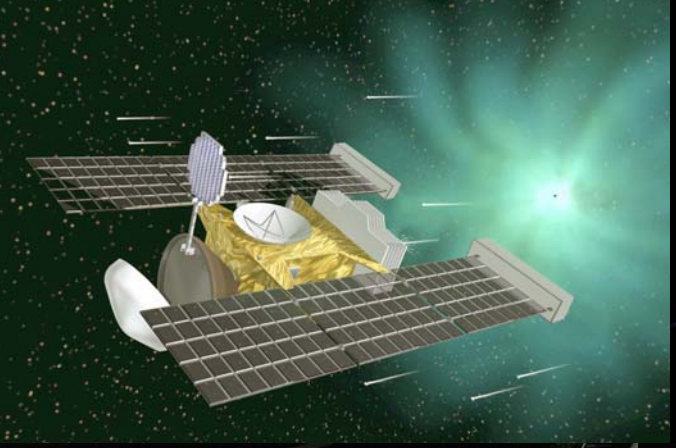
Il confine stratigrafico K-T

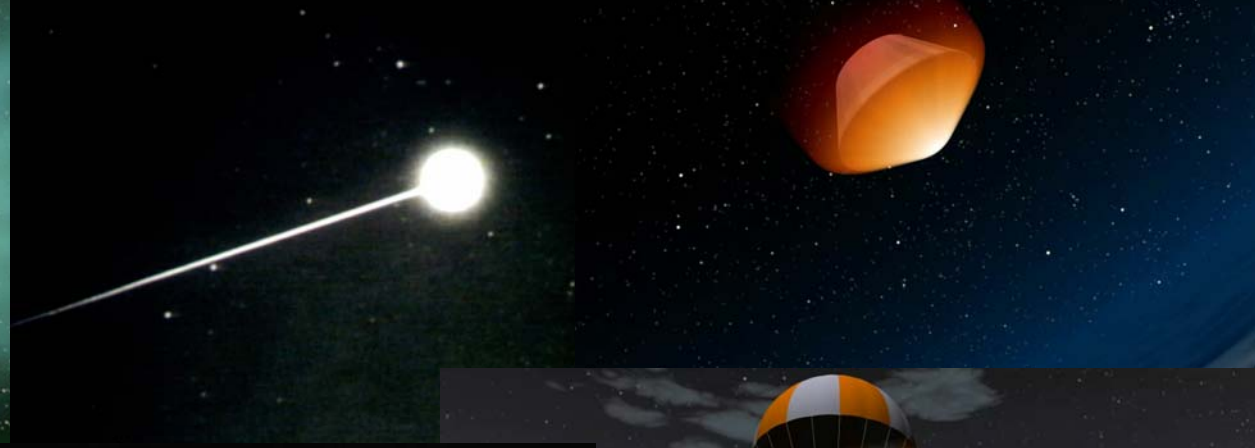


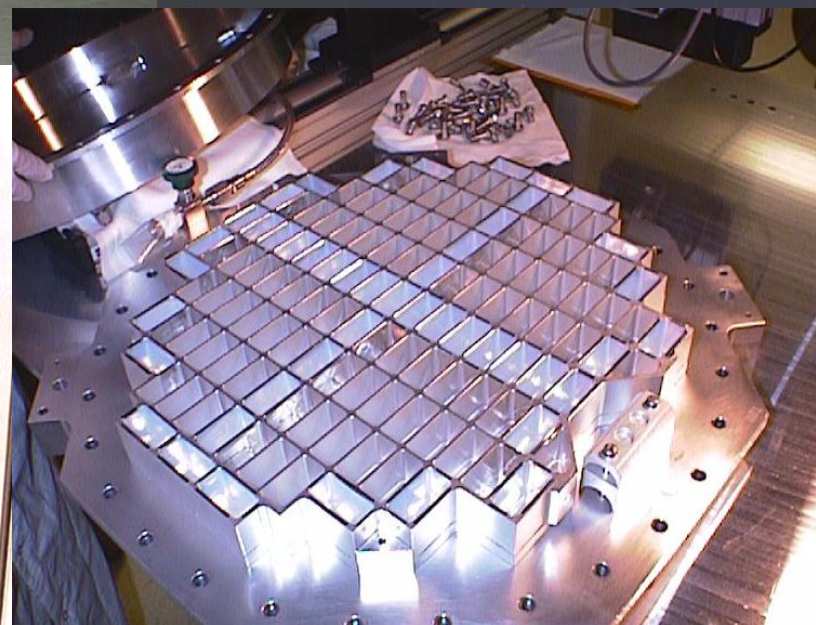
Chicxulub, Yucatan (Messico)


Cenote Ring
170 km diameter

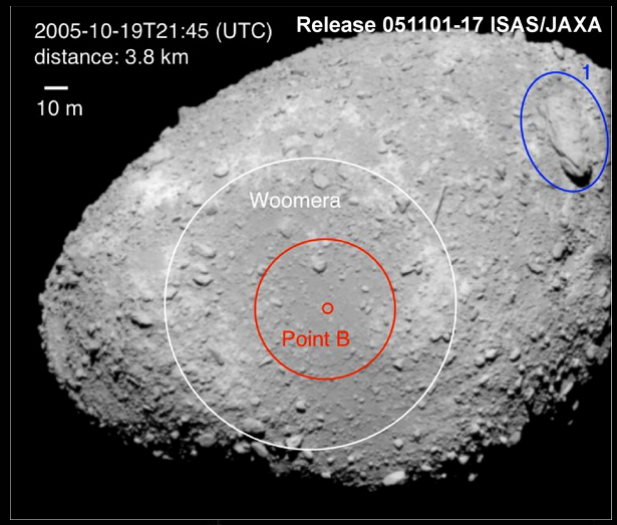









A.Ikeshita /MEF /ISAS


2005-10-19T21:45 (UTC)
distance: 3.8 km
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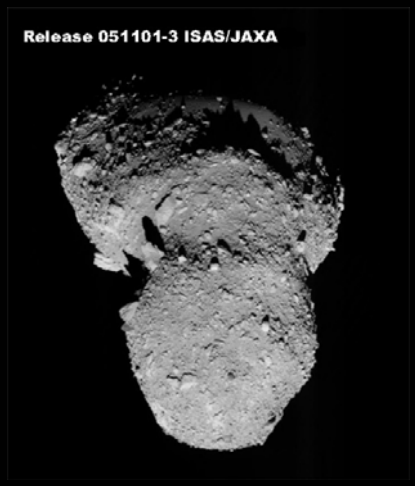
Release 051101-17 ISAS/JAXA
1
Woomera
Point B


Release 051101-3 ISAS/JAXA


A.Ikeshita /MEF /ISAS