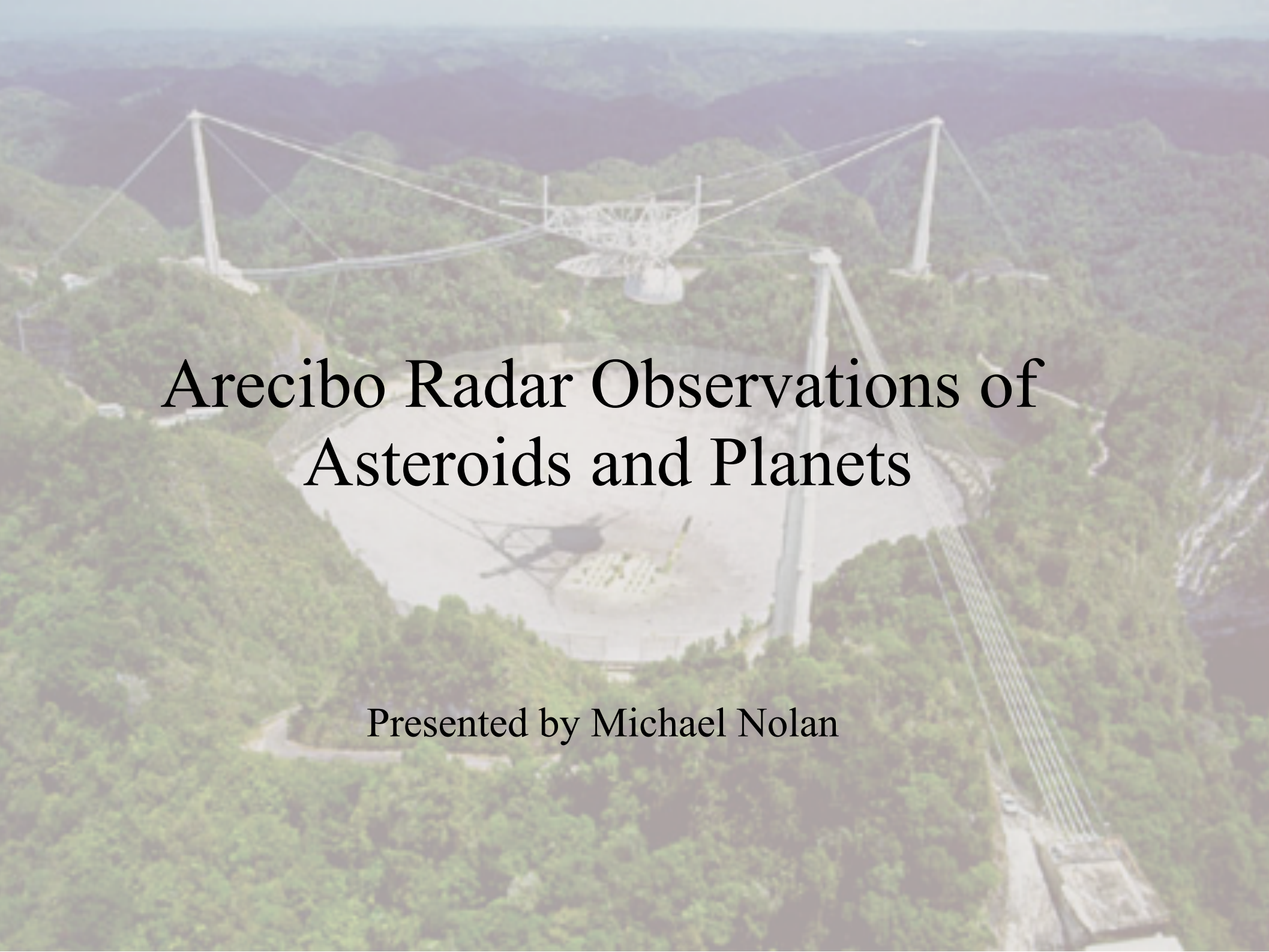


Arecibo Radar Observations of Asteroids and Planets

Presented by Michael Nolan

Ice at the Poles of Mercury

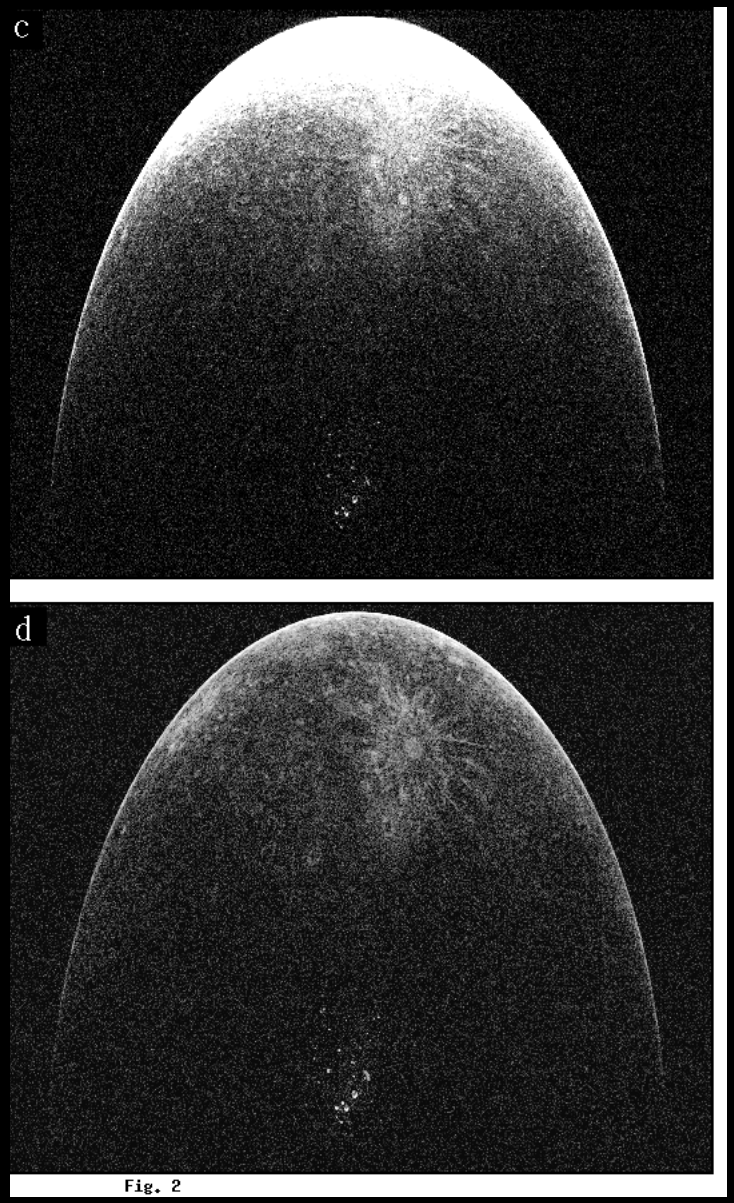
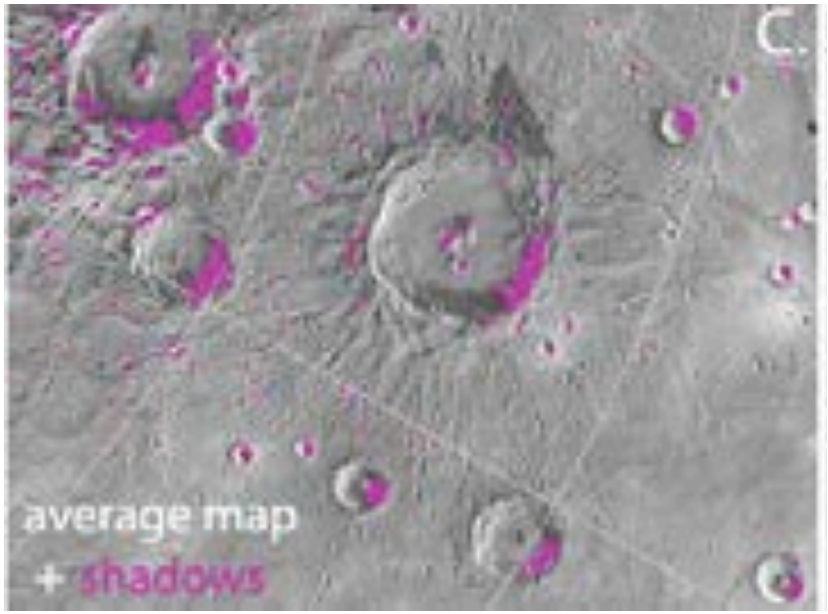


Fig. 2

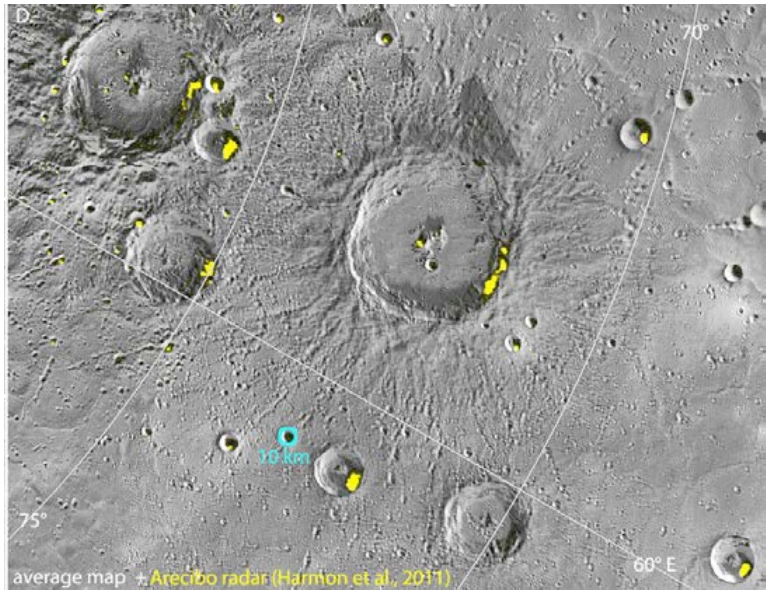
Ice in Craters on Mercury

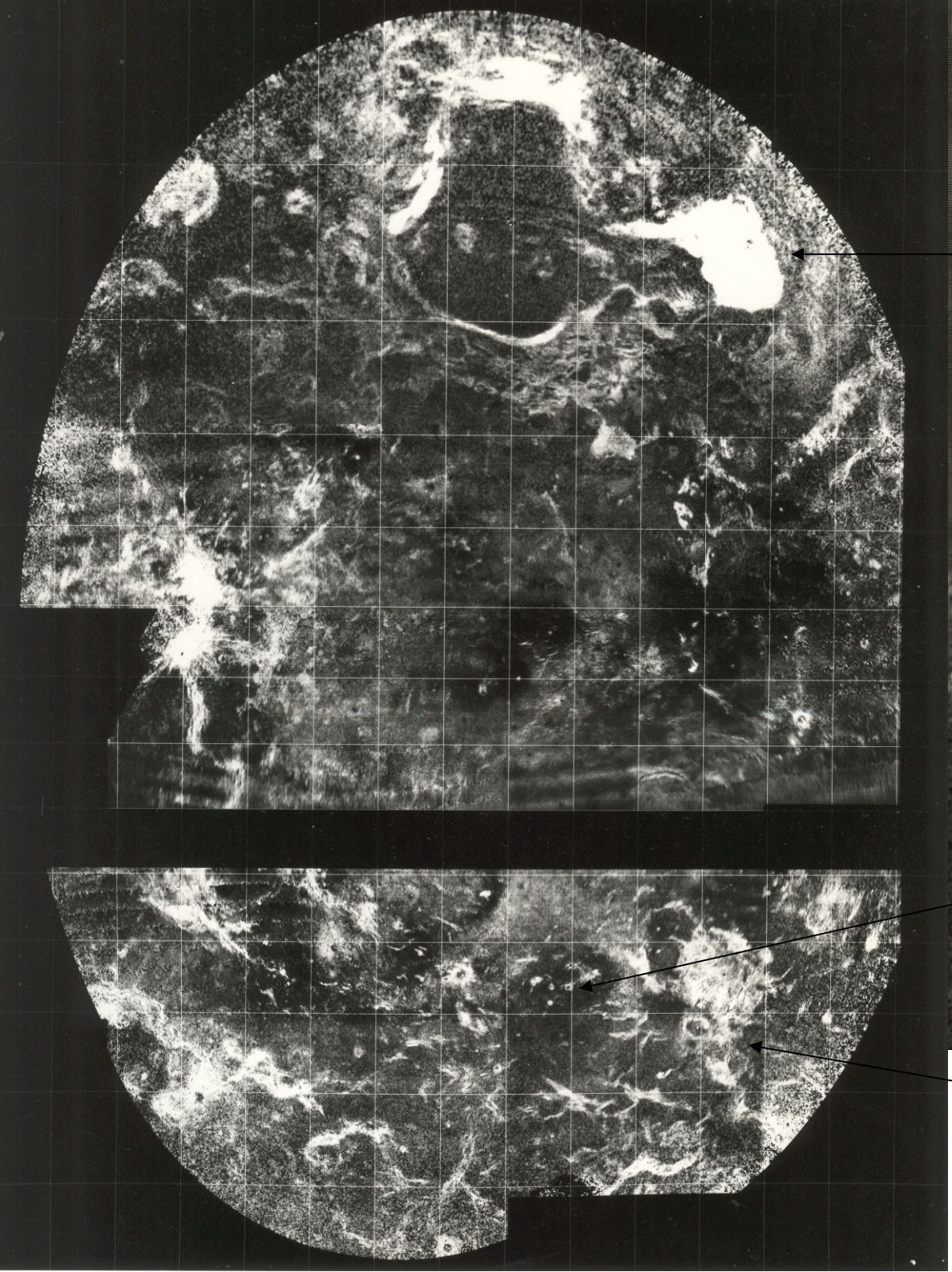
Shaded regions (Messenger)

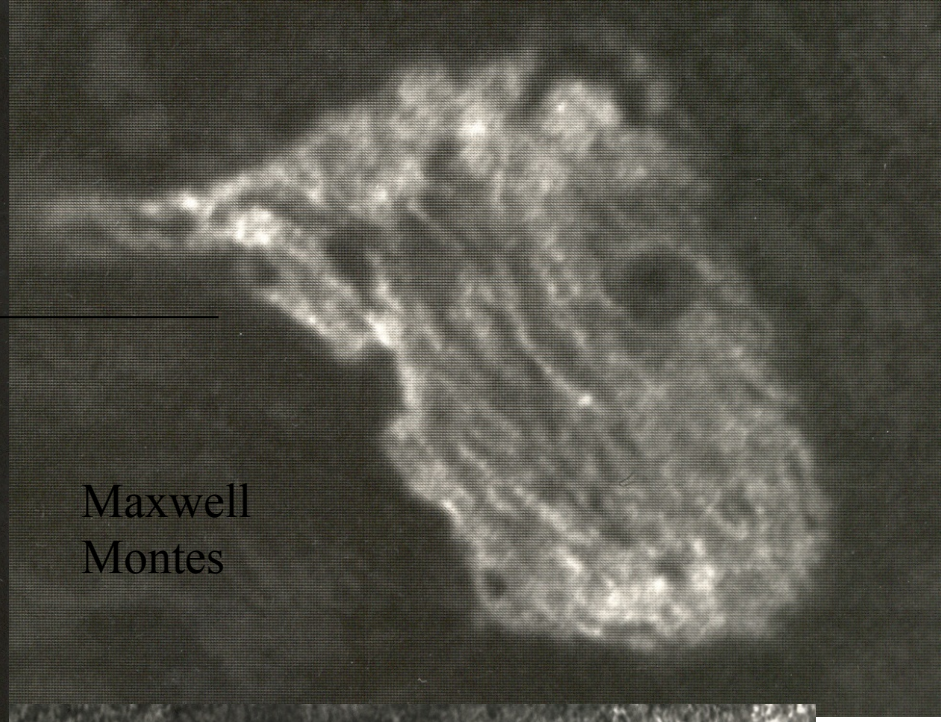
- From Chabot et al. (LPSC 2012)

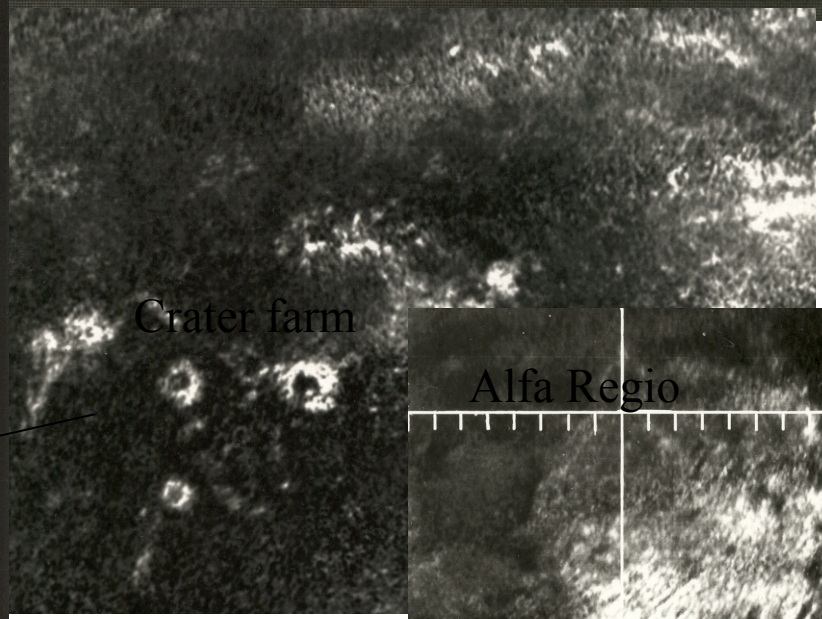


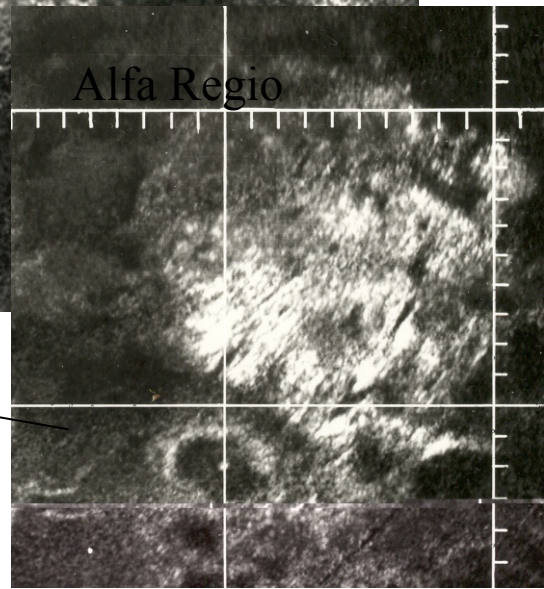
Radar-Bright features











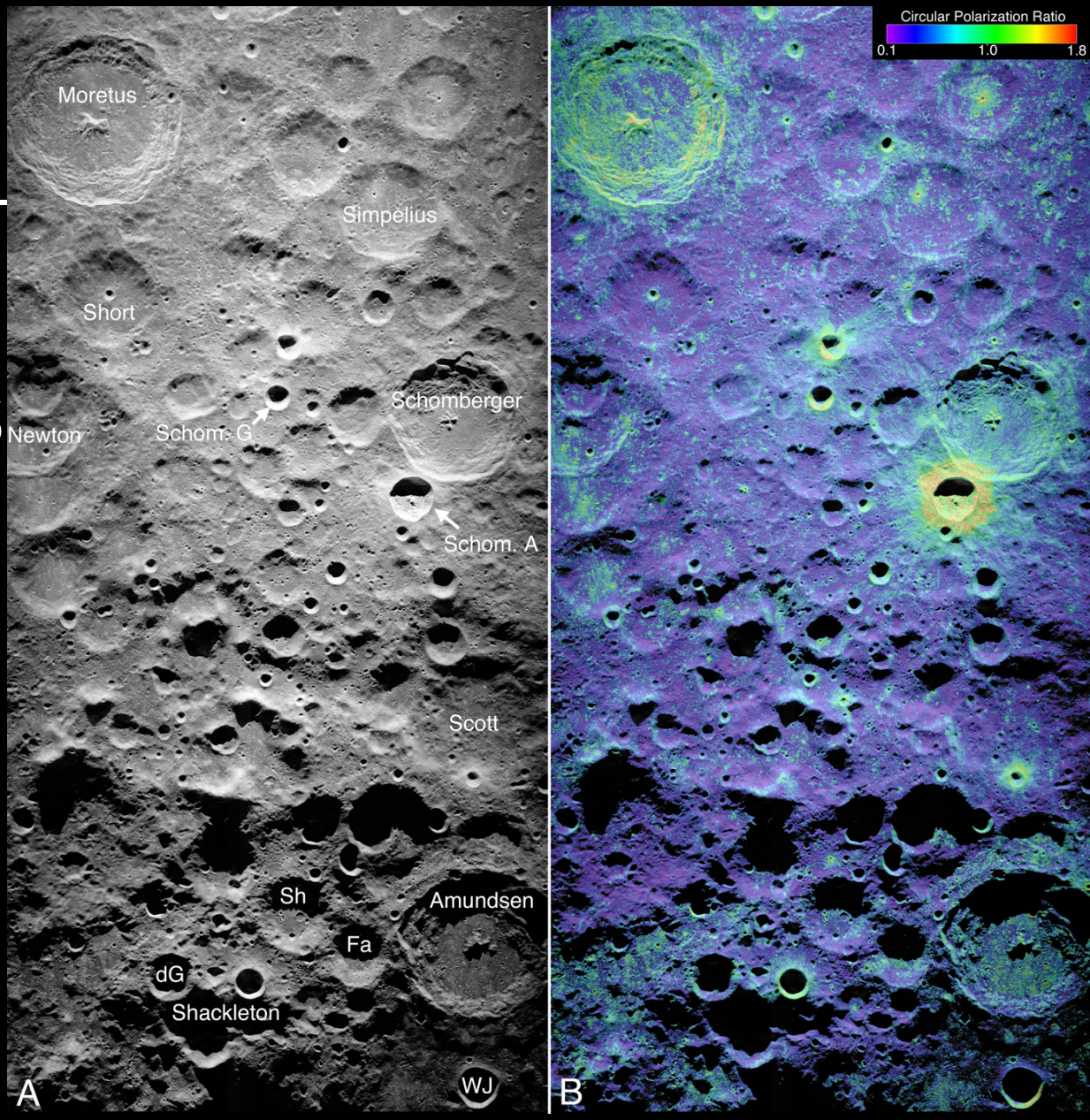
VENUS

1975-77

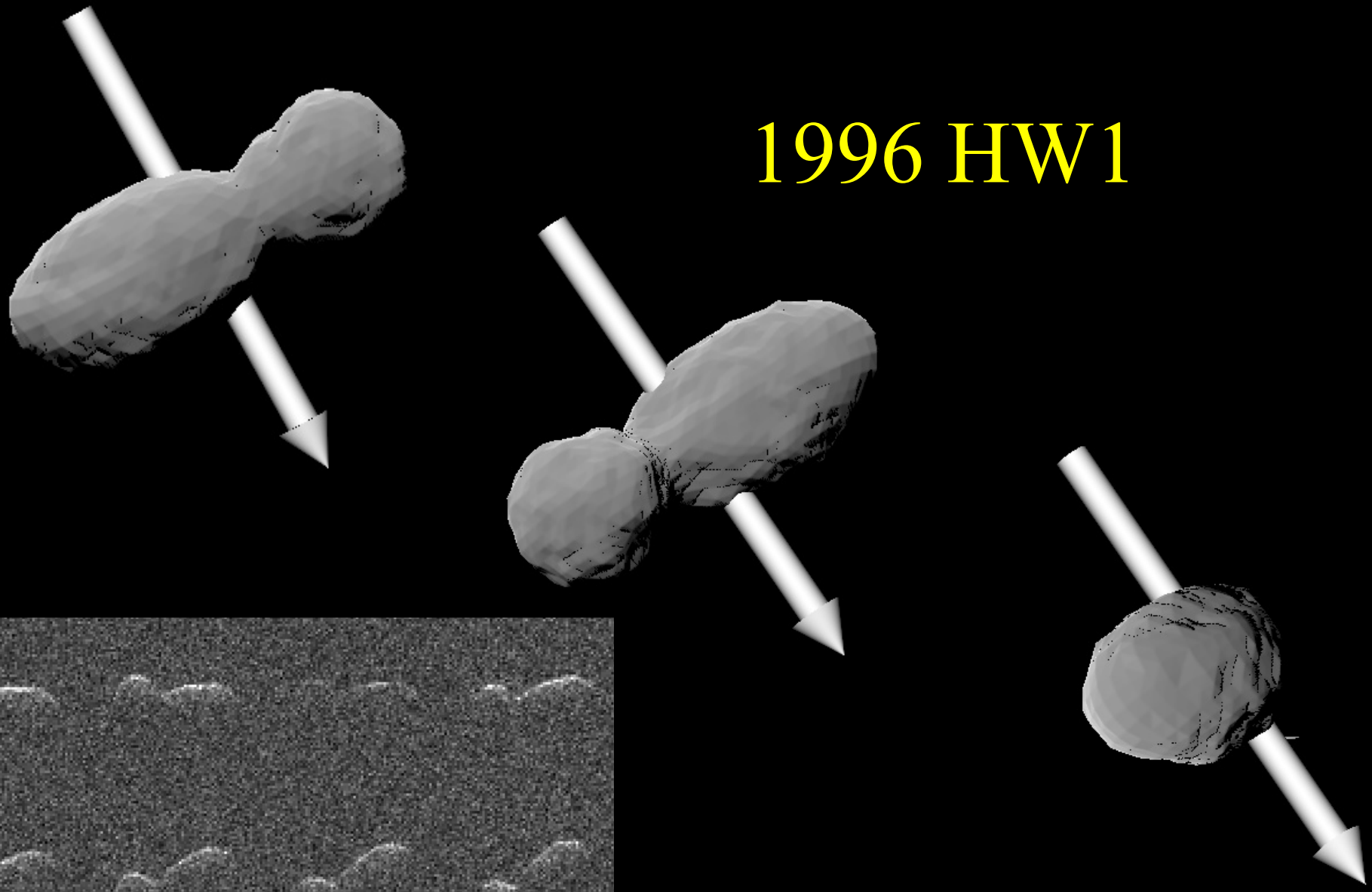
Moon

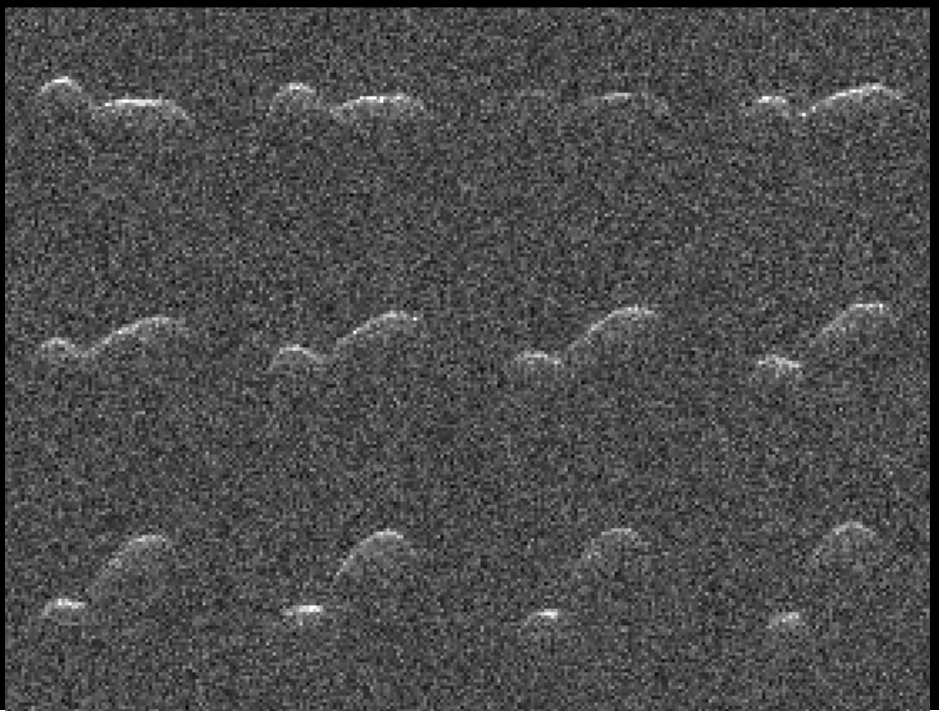
Imaging of the Moon at 15-m resolution.

Subsurface imaging using multiple wavelenghts (12.6 and 70-cm)



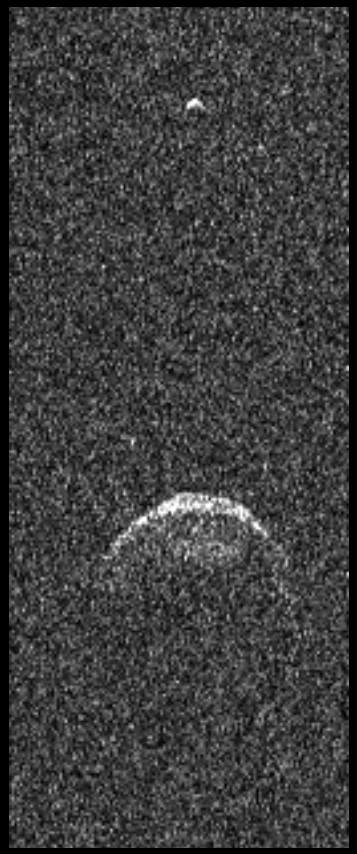
1996 HW1

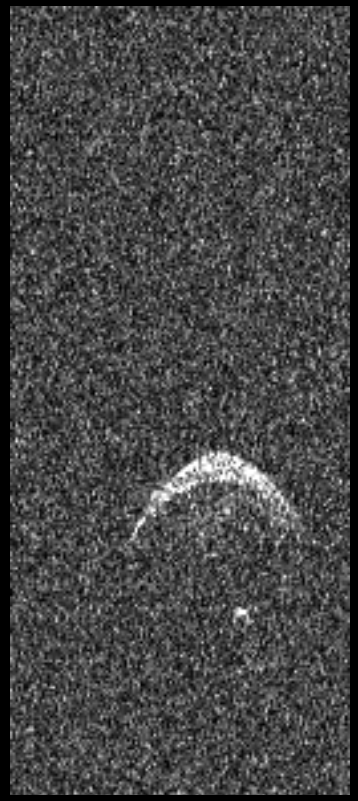




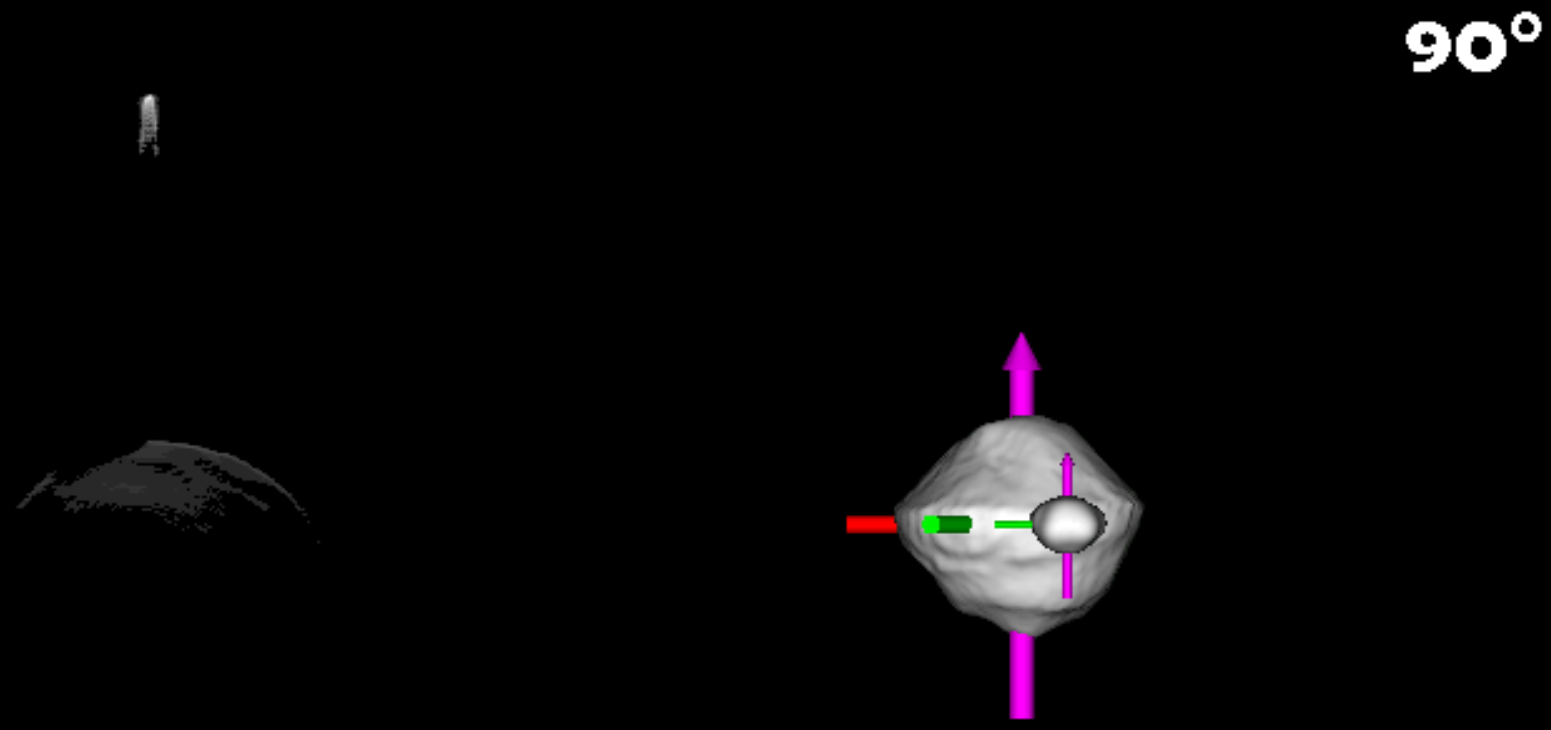
2003 YT1

May 2 May 3

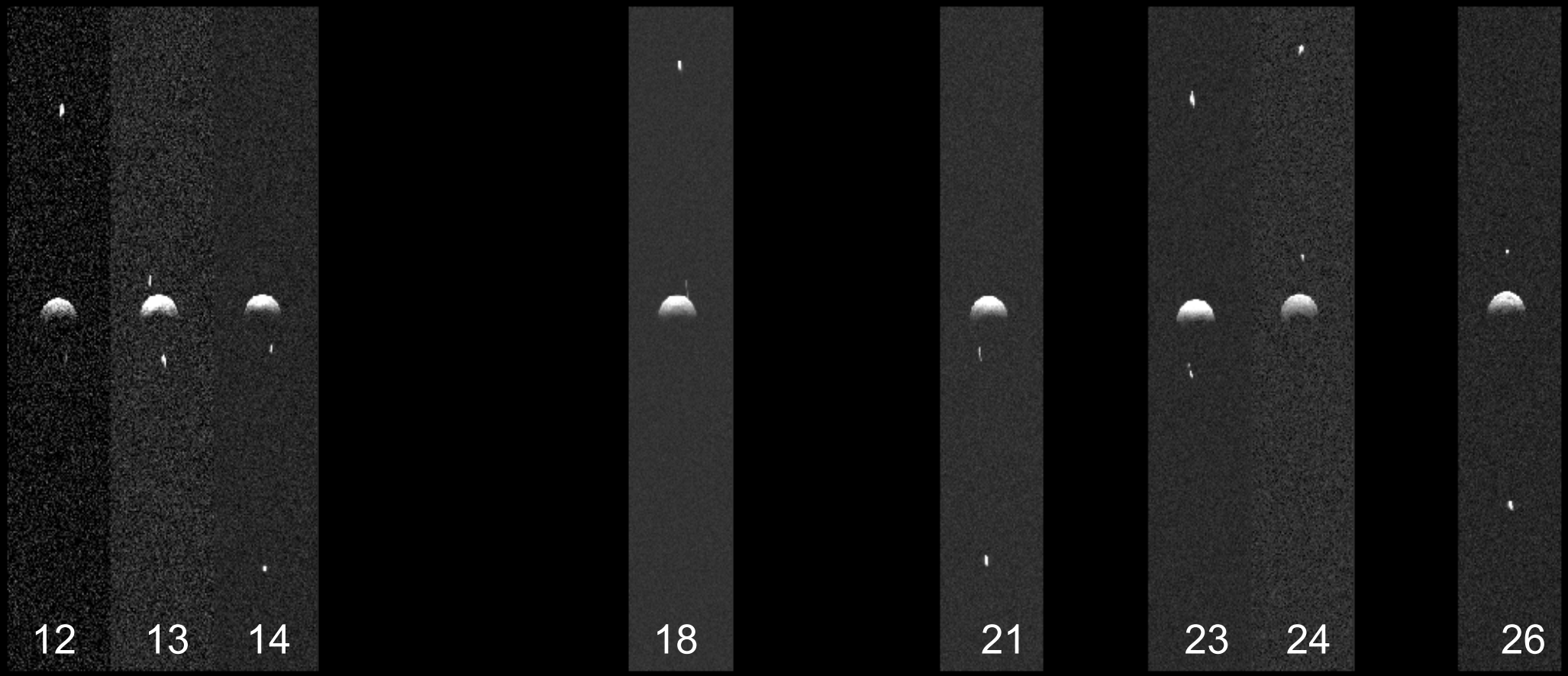




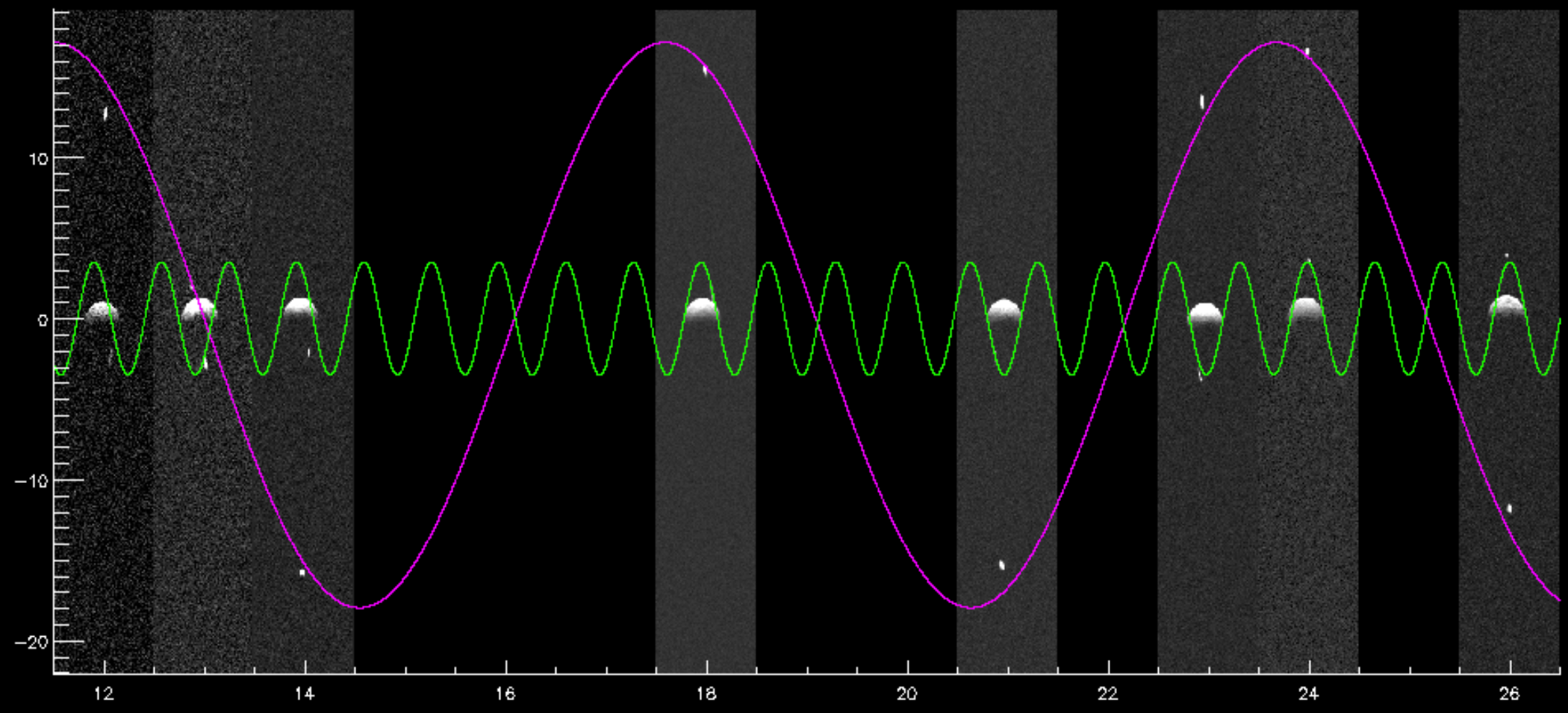
1999 KW4 viewed in orbit plane



2001 SN_{263}



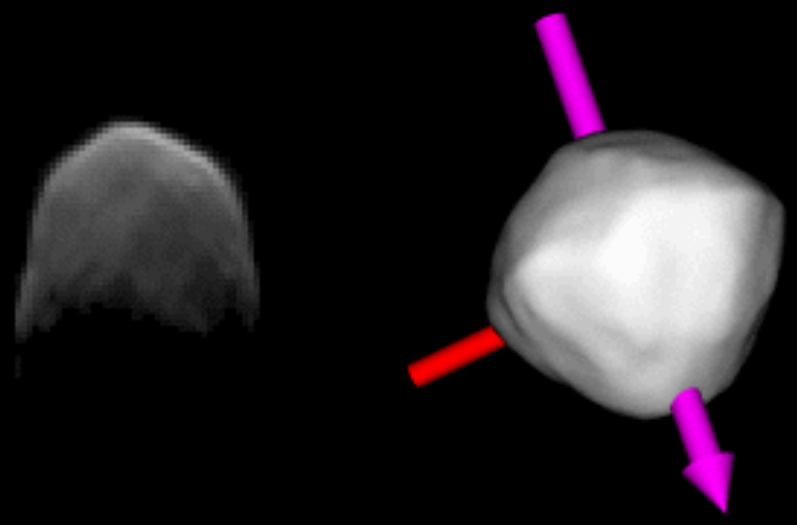
2001 SN_{263}

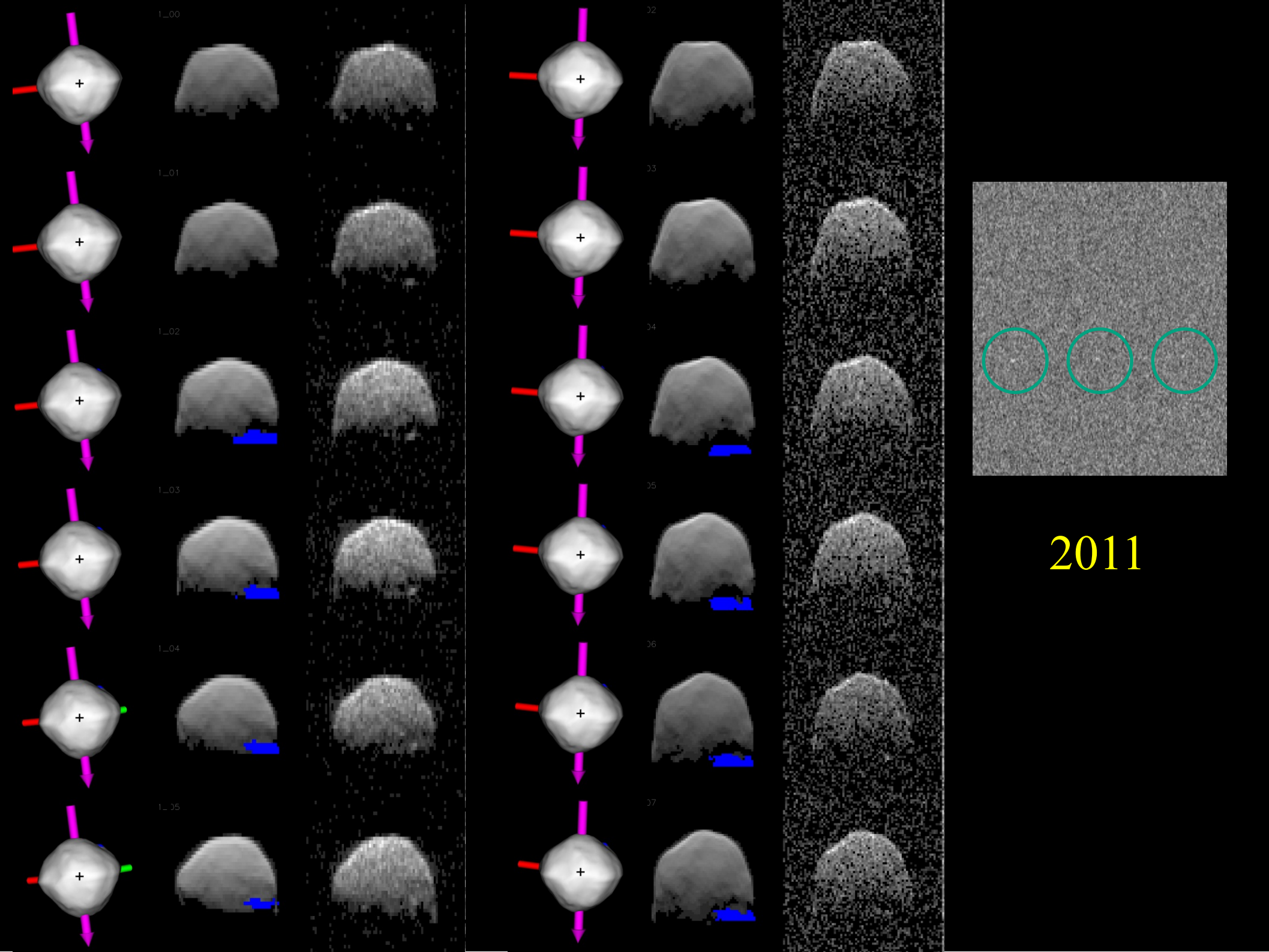


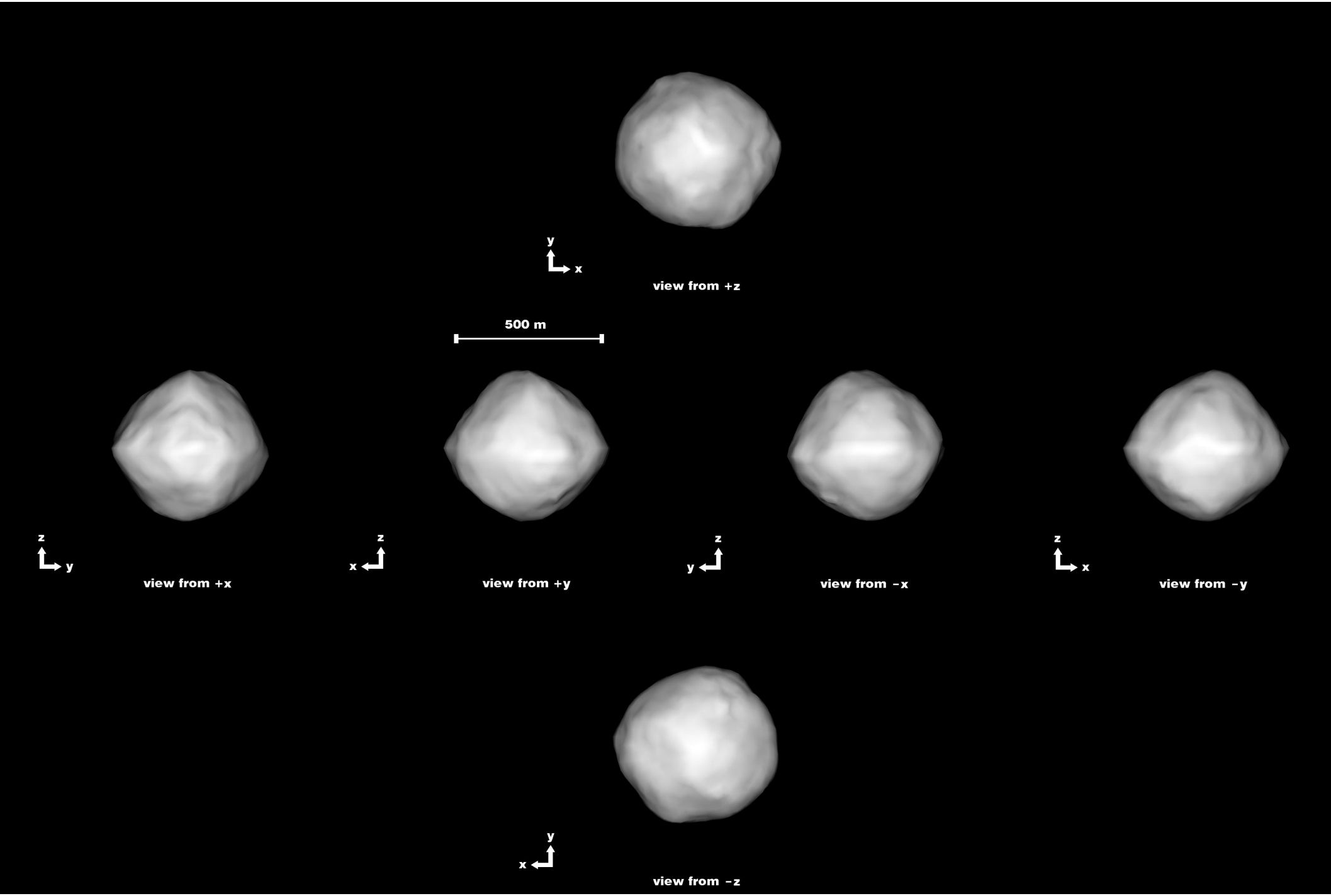
Observations of Bennu, the OSIRIS-REx Mission Target

Radar imaging and lightcurves in 1999 and 2005

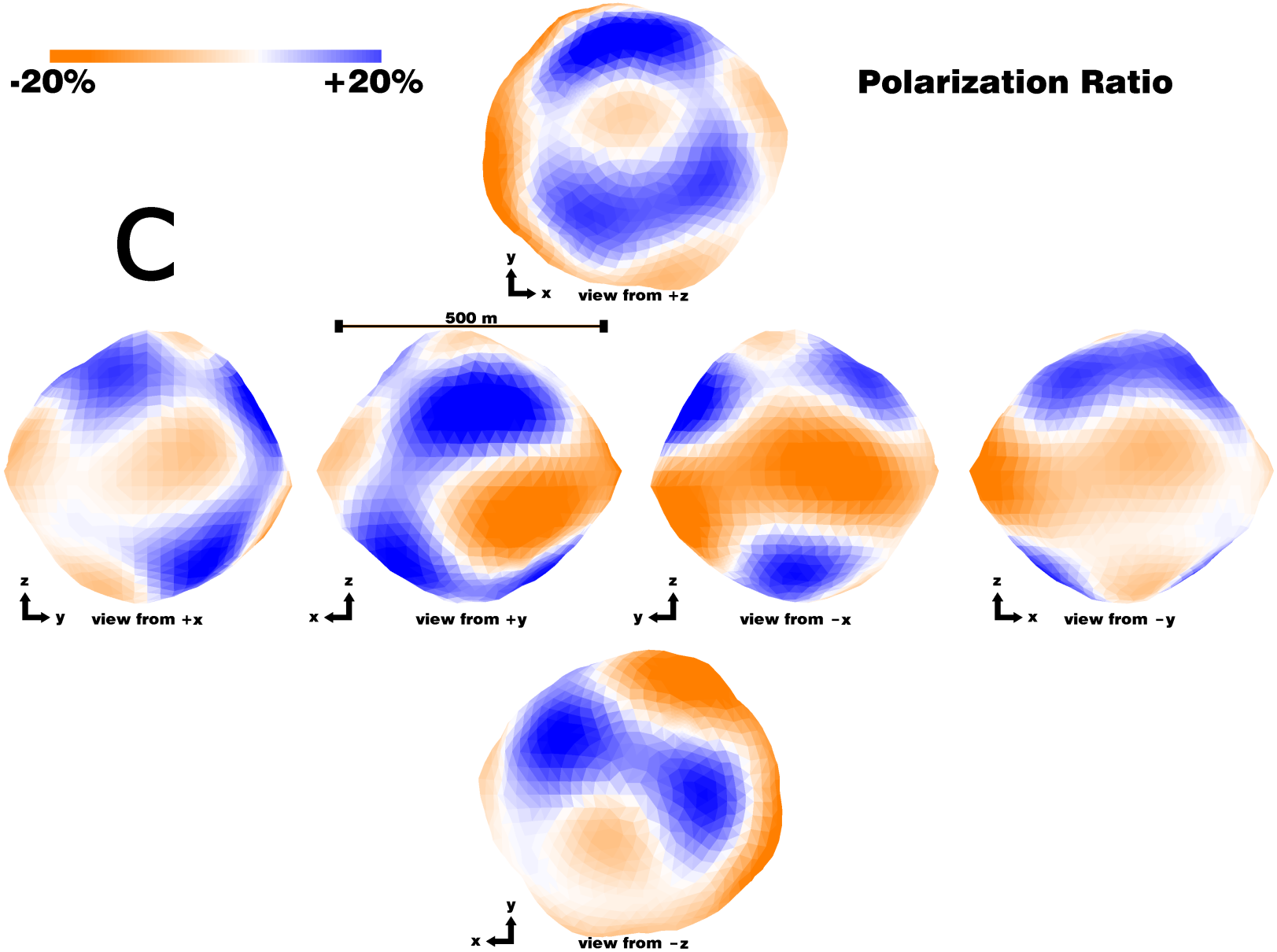
1999 was a better apparition but the 2005 radar data were higher resolution and the lightcurves were better sampled.




2011


y
x
view from +z
500 m
z
y
view from +x
z
x
view from +y
z
y
view from −x
z
x
view from −y
y
x
view from −z

Scattering properties



2005 YU55, or, How are Arecibo and Goldstone Complementary

22 April 2010
Arecibo

7 November 2011
Goldstone

Bistatic Observations:

The main Arecibo and Goldstone systems need of order a few seconds to switch between transmitting and receiving, making observations of very close targets difficult.

Bistatic observations, where the transmitting and receiving stations are separate, allow continuous observation, eliminating this difficulty, and potentially increasing resolution.

Having multiple potential receiving sites adds flexibility.

Array Transmitters and Receivers

The resolution is occasionally useful for determining spin rates and observations of Venus and some asteroids, but total collecting area is the main criterion for radar sensitivity.

Array transmitters are routine in (e.g.) satellite and terrestrial radar systems. They are in principle usable for planetary radar, but phasing the signals is challenging, as it can't be done "after the fact" as with standard interferometry.