



First Mars Express Science Conference

Mapping Phobos Using Mars Express HRSC / SRC Images

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24 FEB 2005

HRSC Co-I Team

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Mars Express Potential

- Updating the current Viking-based Phobos global control network, the geoid model, the rotational model with forced librations, the orbital model with secular acceleration, the digital terrain/image models and cartographic map products using the new Mars Express HRSC/SRC images has begun. The global control network will be increased from 320 to over 3,000 points allowing a high higher degree and order harmonic expansion to be used to define global shape. The generation of the global control network will include solving for the Phobos orbit and rotational state. The images already indicate that a 12 – 13 km orbit position correction is needed. Determining whether years of HRSC/SRC observation, giving complete orbital coverage. Both the combination of improved shape model (moments of inertia) and higher spatial resolution from the HRSC/SRC images over Viking r this is due to secular acceleration will require a few will enable the amplitude of forced rotational libration, about 0.9 deg, to be determined more precisely as well. Combining all of these results will allow high-resolution digital terrain models (DTM's) and digital image models (DIM's) to be produced, useful for future sample return missions such as the Russian GRUNT mission.

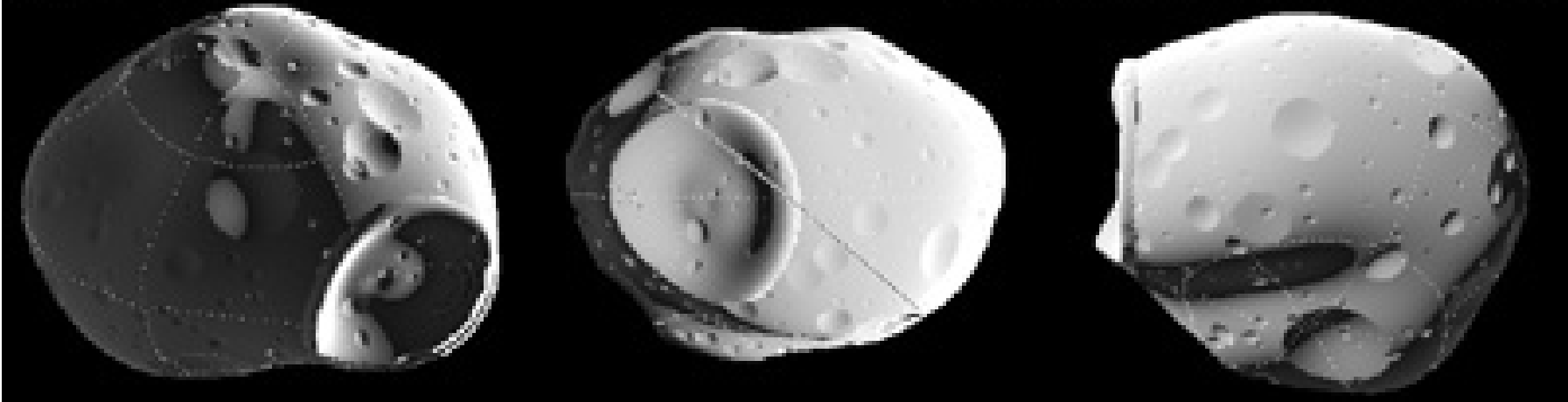




Coordinate the Exploration of Phobos

ORBIT: 265

ENCOUNTER: 2004 MAR 27 09:06:41



**** MEX ***** SUN ****

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SCET - UTC	HR:MN	KM	DEG	DEG	DEG	DEG	DEG
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2005 NOV 21 23:51:18	-1:16	402.	41.8	260.8	-12.0	16.4	117.0
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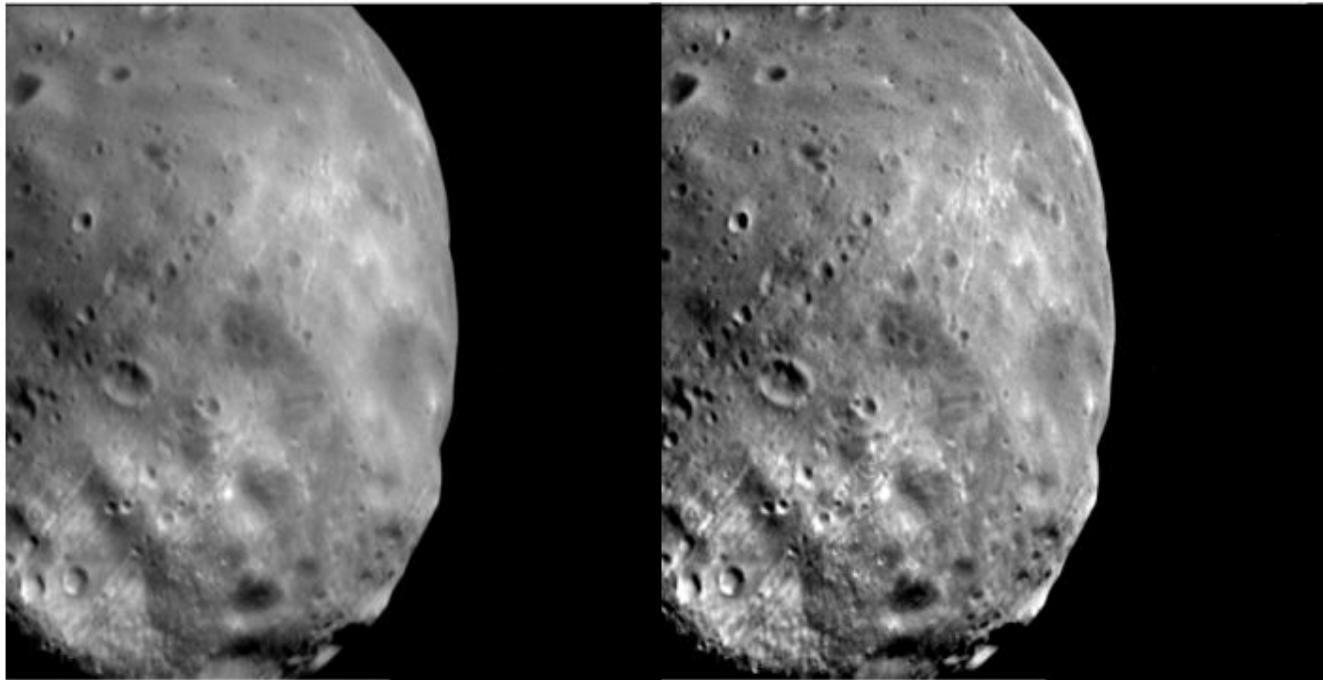
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Processing Phobos Images

Photoshop / Filter / Sharpen / Unsharp Mask



STRETCHED

UNSHARP MASKED

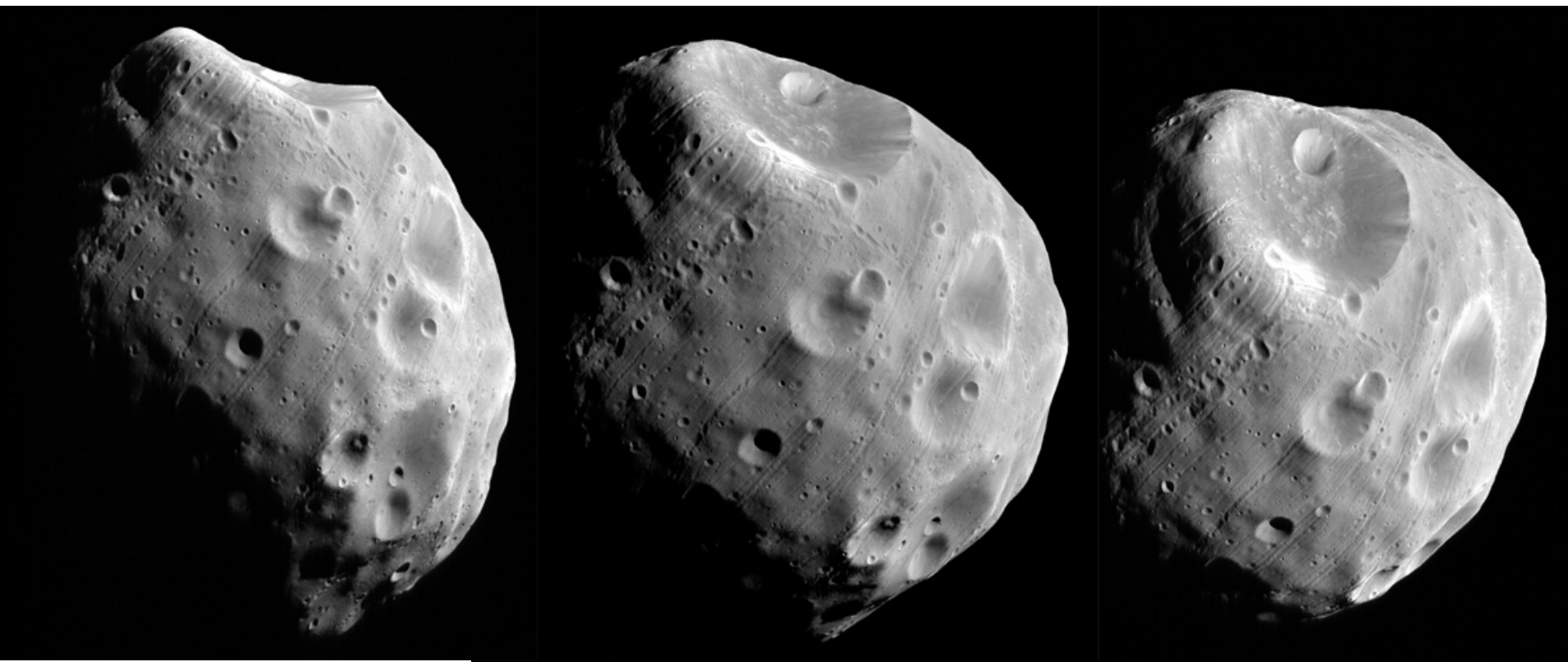




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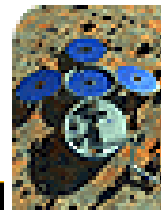
STEREO IMAGES OF PHOBOS



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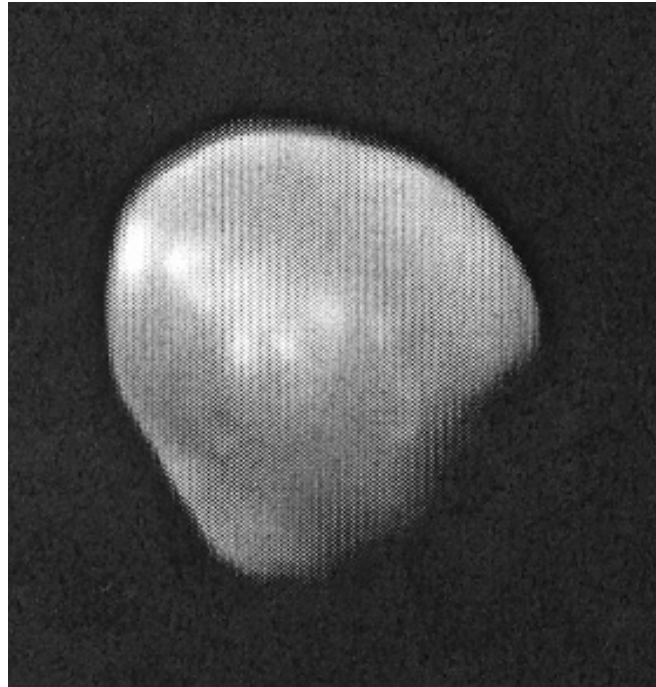




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DEIMOS IMAGE



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SECULAR ACCELERATION

- **Phobos is Ahead of its Predicted Orbital Position from Earth-based, Mariner 9, Viking Orbiter, and Phobos 88 Data**
 - **MGS MOC (Imaging of Phobos and Shadow) and MOLA (Ranging and Shadow IR) see Increased Secular Rate During Last 6 Years**
 - **MER Rovers see 11-12 km Orbital Advance during Solar Transit Images**
 - **HRSC / SRC see 11-12 km Orbital Advance from Direct Imaging**
- **Mars Express Goal**
 - **Image Phobos Over Long Time Period (many years), to Observe Secular Acceleration and Predict Remaining Orbital Lifetime (~50 M Years)**
 - **Periodic Star Images for Precision Pointing**

