Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11122, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11122
EGU General Assembly 2008

Direct measurement of the mass of Phobos with the Radio-Science Experiment MaRS onbord Mars-Express

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In the past, the mass of the Mars moon Phobos has been estimated several times based on radio tracking data during close flybys by Viking, Phobos-2 and the MGS spacecraft. The derived GM values (gravity constant times mass) of the moon Phobos vary considerably between 0.585x10^{-3} km^3/s^2 and 0.85x10^{-3} km^3/s^2. Only the earliest estimates (Christensen, Tolson, Williams, Kolyuka) resulted from observations in close s/c flyby conditions. The most recent estimates have been computed from a large data base of mostly MGS tracking data which were all taken at very distant encounters with Phobos.

We achieve a new estimate of the Phobos mass based on tracking data from the flyby of the Mars Express spacecraft at a distance of 460 km on 23^{rd} March 2006.

This approach distance to Phobos was so far the only allowed and successfully conducted experiment for a mass determination by the radio science experiment MaRS in the prime and extended phase of the Mars Express mission.

The estimate of the Phobos mass and the analyzing method will be presented.