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Numerically Integrated Orbits of the Major  
Saturnian Satellites fit to Earthbased  
Observations

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PAPER PRESENTED BY

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We have fit numerically integrated orbits of the eight major satellites of Saturn to all available astrometric and meridian circle observations for the period of 1971 to 1992. The integration was carried out in cartesian coordinates in the J2000 system. The force model included the gravitational effects of the oblate primary, the mutual perturbations of the satellites, and perturbations due to Jupiter and the Sun. Values of the gravitational parameters of the Saturnian system, e.g. planet and satellite masses, were taken from Campbell, et. al, 1989, only the epoch state vectors of the satellites were adjusted to obtain orbits which fit the observations. All astrometric data was processed in the form of satellite relative positions which were weighted according to observer and opposition to reflect the varying data quality. The RMS of the postfit residuals ranged from 0.12 seconds of arc for the highest quality data to 0.50 seconds for the lower quality data. Recent meridian observations of Titan and Iapetus were included to provide additional information on their mean motions. When processing the meridian data, corrections to the absolute position of the Saturn were taken into account. The RMS of the meridian residuals was about 0.25 seconds of arc.

This work represents the first phase of the development of satellite ephemerides to support the Cassini mission to Saturn.

References: Campbell, J K, et. al (1989) The Astronomical Journal.

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