Simultaneous positional observations of the system of faint satellites of Jupiter

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Historically, astrometry of the faint satellites of Jupiter has necessarily required the acquisition of the absolute celestial position of a single object (very rarely two or even three), determined relative to the nearby faint stars by a two-tier method of astrometric bootstrapping, due to the facts a) that these bodies are spread over 5 degrees of sky; and b) that they are very faint (mag $14 < V < 21$). The progression towards a fully-operational state of two high-precision instruments, the astrometric Schmidt telescope on the Calern Plateau (TESCA) and an automated microdensitometer (MAMA), has prompted us to launch the first systematic program for the acquisition of simultaneous positional measures of these bodies *considered as a system.*

Without such measures, the orbit of each body in the system must be considered as an isolated problem. Simultaneous observations, however, permit the determination of intersatellitary positions of each object *relative to the others*, positions that can take advantage of the real accuracy of the measurement and reduction systems, unaffected by the enormous external errors introduced by the reference star positions. We can hope for relative positions with accuracy < 0.05 arcsec, compared to absolute positions rarely better than 0.5 arcsec.

The first plates were taken during the 1987-88 opposition, but we are still searching for the optimum technique. The two principal problems are a) that Jupiter itself is in the center of the field; and b) that one wants the satellites to be as near point-like as possible, given that they move relative to Jupiter and to one another. Current efforts are described.

Even at equal accuracy of absolute and relative positions, one knows from parameter sensitivity studies, confirmed in practice by Voyager ephemeris development experience and by purely astronomical studies, that the relative positions can be used to constrain a system of orbits more efficiently than is possible with the absolute positions, resulting in better orbits for all of the objects concerned. Thus, this new series will provide an important new resource for studies of the jovian system.