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Photometry of Pluto-Charon Mutual Events and Hirayama Family Asteroids

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Strategy

During the years of 1985-1990, nature provided earth-bound astronomers with a once-per-century opportunity to observe occultation and transit phenomena between Pluto and its satellite, Charon. Ground-based observations of these events are now being used to derive physical parameters for the Pluto-Charon system to a precision that is unlikely to be improved upon until *in situ* spacecraft observations are obtained. This program supports analysis of photometry observations from McDonald Observatory, a critical location in the International Pluto Campaign network. Knowledge of the diameters, masses, densities, and compositions derived from these observations will augment our understanding of Pluto's origin and its context within the problem of solar system formation.

A second task researches the evolutionary processes which have occurred in the asteroid belt by measuring the physical properties of specific Hirayama family members. Photoelectric lightcurve observations of Koronis and Themis family members are being used to investigate the individual catastrophic collision events which formed each family. By comparing these properties with results of laboratory and numerical experiments, the outcomes of catastrophic disruptions and collisional evolution may be more precisely determined.

Progress and Accomplishments

During 1990, observations were obtained for 4 mutual events before the season ended. Reduction and analysis of 1985-1990 photometry has provided evidence for a bright south polar cap on Pluto and a possible color difference between the poles and the equator.

New lightcurve observations have been obtained for Galileo target 951 Gaspra as well as Cassini target 66 Maja. Nine asteroids in the Koronis and Themis families plus Trojan and Hilda asteroids plus other targets of opportunity were also observed.

Projected Accomplishments

Emphasis in this year is shifting from observations to final analysis and publication of the large accumulated data sets. A preliminary least squares map for Pluto will be completed and additional mapping techniques will be investigated. Models for the long-term insolation on Pluto and the seasonal deposition of methane frost on its surfaced are being developed for a

physical interpretation of the maps. For asteroids, models for the collisional environment of 951 Gaspra are being developed before the Galileo encounter. Code for deriving pole orientations for Koronis family asteroids is being developed to investigate a possible preferential spin vector alignment.

Publications

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