Dynamical and physical studies of the Pluto system

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The study of binaries in our solar system started with the discovery of Charon. This discovery led to a fundamental increase in our knowledge of Pluto as well as Charon. As the oldest known case of a binary object, the most is known about it and yet it is amazing that the pace of discovery in this system continues. The discovery of two new satellites, Nix and Hydra, makes further discoveries possible about this distant system.

We have two active programs based on Hubble Space Telescope observations that strive to further refine our knowledge of the orbital motion of this perturbed 4-body system, determine the rotational states of Nix and Hydra, and obtain photometric and spectral data on their surface compositions. One program is to look back into past observations of the Pluto system with a particular emphasis on Cycle 2 observations taken with the pre-Co-Star aberrated WFPC/PC images. These observations will extend the observational astrometric arc by more than a decade and will vastly improve our knowledge of their orbital motions. New observations were taken in Cycle 15 – a total of 19 visits – to collect lightcurve and spectral data. These observations will also improve the orbits and help refine the masses of Nix and Hydra but will also constrain their rotational properties and determine broad spectral colors from 0.4-1.4 microns.

We will present results from our ongoing work on these data. Substantial work has been completed on the perturbed motion and we can provide fundamental refinements on their orbital elements that will permit further dynamical studies. The perturbed motion will be presented along with error analysis that constrains the interpretation of the work. We will also present an update on new astrometry from the Cycle 15 observations along with discussions of the measurements made possible in a multi-body system based on our experience with these data.