Variability of Kuiper Belt binaries

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The variability of small bodies provides information about their shape, interesting surface features, and rotation of that object. For bright or close objects these are relatively straightforward measurements to obtain with meter-class telescopes, however for moderately sized (d~100-200km) objects in the Kuiper Belt (KBOs) these observations are telescope-time intensive. Sparse sampling can adequately quantify variability, including the amplitude and period, with a small number of observations. Therefore, we are attempting to pre-sample the variability characteristics of KBOs before attempting to collect full lightcurves. We have chosen to focus on the ~50 identified Kuiper Belt binaries (KBBs) because variability studies of these systems has the added benefits of constraining physical properties and orbital evolution.

We have obtained variability measurements (resolved and unresolved) using new observations from the Magellan telescopes and archival data from HST. To date ~40% of the KBB population has been probed. Objects with the largest variations include 26308 (1998SM165), 2003QY90, (88611) Teharonhiqwako/Sawiskera and 200 1QG298. Some of the larger KBBs, 2003UB313, 2004DW and (50000) Quaoar, do not show large amplitude variation, although the sample size is still small. With our current HST program for binary orbits we will add sparse variability sampling for ~23 additional binaries.

Among the near earth asteroid population it has been found that fast rotating objects with low amplitude lightcurves are indicative of binaries and among the main belt asteroids there are numerous synchronous systems. Both of these observations provide important clues to the formation and evolution of binaries in these small body populations. It remains to be seen whether any similar trends will be observed in the Kuiper Belt.