Three-micron survey of Jupiter Trojan asteroids

M. Brown[1]

[1]Caltech, Pasadena, CA, USA

The Jupiter Trojans, orbiting at the transition between the inner and outer solar system and co-orbiting with the dominant solar system planet, are critical to understanding the formation and dynamical evolution of this critical region of the solar system. One important clue to their formation location should be their composition, but little about this composition is known: the Trojans are spectrally featureless up to 2.5 microns, with either slightly-red or red visible spectral slopes and less steep near-infrared slopes. This bifurcation into two separate spectral classes could be an important clue into the formation location (or locations) of these objects, but, again, with little other spectral information known it is difficult to use this constraint appropriately.

Longer wavelength reflectance spectroscopy has the potential to solve this dilemma. Many ices and organic rich materials have their much stronger fundamental absorptions in the 2.8–4 microns region, making this spectral region sensitive to much smaller amounts of these materials. Hydrated silicates, too, have clearly distinguishing features at these wavelengths. We have thus begun a Keck Observatory/NIRSPEC 2.8–4 micron survey of Jupiter Trojans designed to detect these fundamental absorption features. Our goal is to collect a sample of approximately a dozen asteroids in each of the slightly red and red spectral classes. We will compare the inferred compositions both to the outer main-belt asteroids, which have been extensively surveyed in this region, as well as to our knowledge of compositions of small Kuiper-belt objects which, intriguingly, also come in two color classes.

We will present the first results from our survey and discuss the implications for the compositions of these objects and the chemical and dynamical evolution of this middle region of the solar system.