Seeking diversity in the spectra of the Polana and Eulalia families

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We present the preliminary results from a survey of two inner Main Belt asteroid families. The target families are both large, old, low-albedo families inside 2.5 au and both span nearly the entire inner Main Belt. The Eulalia and New Polana families are large families that overlap each other very closely in orbital-element space, share similar low albedos and similar visible spectra [1]. Therefore, many of the standard dynamical tools or observational data in visible wavelengths have not been able to differentiate family membership for a large number of bodies that dynamically could belong to either family [1,2].

Determining membership is important because otherwise understanding the sizes, extents, histories, and particularly the current NEO delivery from each family is nearly impossible. The proposed parent asteroids of each family, (142) Polana and (495) Eulalia, are spectrally distinct in the near-IR wavelengths. We thus surveyed 30 targets in these wavelengths at the NASA Infrared Telescope Facility to determine if we could distinguish family membership.

We sought and succeeded in observing targets from three distinct groups: those that dynamically could only belong to the New Polana family, those that could only belong to the Eulalia family, and those that dynamically could belong to either. The dominant spectral signature that is found is one more similar to that of (142) Polana. This held for all of the observed groups, even those that appeared dynamically to be members of only the Eulalia family. We discuss possible reasons for these findings, implications for the history and properties of these two families, and implications for the delivery of km-sized primitive NEOs.

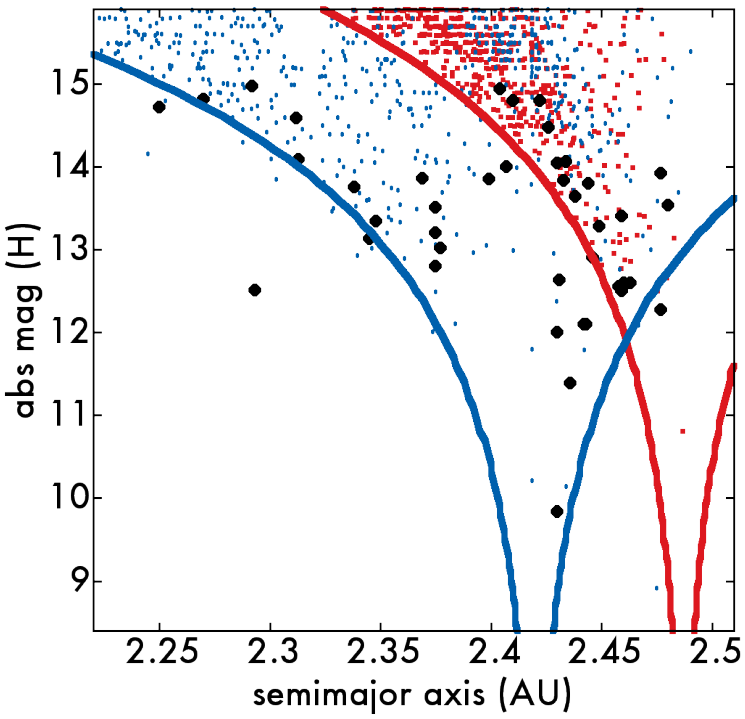

Figure: The absolute magnitude (H) of the observed targets are plotted as a function of their semimajor axis as black circles. The proposed Eulalia family members are red dots within the red boundaries and the proposed Polana families are blue dots within the blue boundaries.

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References: [1] Walsh et al. 2013, [2] Cellino et al. 2001.