

# A SEARCH FOR SPECTRO-DYNAMICAL ASTEROID FAMILIES

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Dynamical asteroid families are normally identified as concentrations of objects in proper orbital element space. These clusters are believed to result from the collisional disruptions of once larger parent bodies. If an asteroid family contains the remnants from such a collision, then the members of that family should be genetically related, and their range of compositions should make cosmochemical, as well as petrological sense. In particular, if a differentiated parent body was disrupted, the resulting family may contain fragments from different lithologic layers within the parent. Recent studies have tested the genetic reality of dynamical asteroid families through analyses based on spectral reflectance colors and taxonomic classifications of family members (eg Bus 1999, MIT PhD thesis, Ivezić et al. 2002, AJ 124:2943, Mothe-Diniz et al. 2005, Icarus 174:54). These studies generally revealed moderate-to-high levels of spectral homogeneity among the members of each family, implying little variation in composition across the interiors of the parent bodies. Given this result, Bus (1999) proposed a method of searching for spectro-dynamical asteroid families that combines both orbital elements and spectral parameters in the cluster analysis. The first application of this method focused on asteroid families with semi-major axes between 2.7 and 2.8 AU, and utilized visible-wavelength spectra for 465 asteroids obtained during the SMASSII survey (Bus and Binzel 2002, Icarus 158:106). From this initial study, a total of 19 spectro-dynamical clusters were identified within this central region of the main belt. In the effort described here, the search for spectro-dynamical families is expanded to cover the entire main belt, utilizing data for 2,074 asteroids taken during three major spectroscopic surveys: the first and second phases of the Small Mainbelt Asteroid Spectroscopic Survey (SMASS, Xu et al. 1995, Icarus 115:1, Bus and Binzel 2002), and the Small Solar System Objects Spectroscopic Survey (S3OS2, Lazzaro et al. 2004, Icarus 172:179). By including spectral parameters derived from these data in the cluster analysis, boundaries of known families can be more accurately determined, close or overlapping families in orbital element space can be separated, interlopers can be identified, and older, more diffuse families that might otherwise be missed can now be recognized. I will discuss the algorithms used in searching for spectro-dynamical families, and will present some of the results obtained thus far.