THE DISTRIBUTION OF BASALTIC ASTEROIDS IN THE MAIN BELT. N. A. Moskovitz[1], R. Jedicke[1], E. J. Gaidos[2], M. Willman[1], [1]Institute for Astronomy, 2680 Woodlawn Drive, Honolulu, HI 96822, nmosko@ifa.hawaii.edu [2]Department of Geology and Geophysics, University of Hawaii, 1680 East-West Road, Honolulu, HI 96822

Introduction: In the early Solar System, protoplanetary bodies were heated by the decay of short-lived radioactive isotopes (SLRs) such as ^{26}Al and ^{60}Fe [1]. Bodies that accreted quickly enough to incorporate high abundances of SLRs reached the solidus temperature of silicates and began melting, thus producing basaltic melt product [2]. At face value, basaltic material should be common throughout the Main Belt: isotopic analyses suggest that iron and basaltic meteorites are fragments from at least 60 differentiated parent bodies [3,4] and mineralogical analyses suggest that many asteroid families represent differentiated bodies [5,6,7,8,9]. However, only three basaltic asteroids [10,11,12,13] other than Vesta and the dynamically associated Vestoids [14,15] have been spectroscopically confirmed.

Basaltic Asteroid Survey: To provide insight on these issues we have designed a survey to constrain the basaltic asteroid inventory of the Main Belt [16]. The targets for this survey were selected as asteroids whose SDSS Moving Object Catalog [17] photometric colors were commensurate with a basaltic spectrum. A subset of these candidates were confirmed as V-type asteroids based on spectroscopic observations with the Keck II, University of Hawaii 2.2m and IRTF telescopes. These observations show that our prediction of V-type asteroids from SDSS colors is ~90% accurate.

Of particular interest is the identification of 15 basaltic candidates beyond the 3:1 mean motion resonance with Jupiter (a > 2.5 AU). These objects are most likely non-Vestian in origin [13,18,19] and therefore represent new differentiated parent bodies.

Distributions of Basaltic Asteroids: The results of this survey were used to calculate unbiased size-frequency and semi-major axis distributions of basaltic asteroids throughout the Main Belt. These distributions, in addition to an estimate for the total mass of basaltic material, suggest that Vesta was the predominant contributor to the basaltic asteroid inventory of the Main Belt, with other partially/fully differentiated bodies contributing smaller amounts.

The differential absolute magnitude distribution, *N(H)*, for basaltic asteroids outside of the Vestoid family (defined by HCM simulations [20]) is roughly uniform up H=15 and shows an abundance of small objects for H>15 (Fig. 1). The shape of this distribution is unlike any other population of small bodies in the Solar System [21]. We interpret this result as evidence that Yarkovsky and other dynamical effects caused a preferential migration of small Vesta fragements out of the Vestoid dynamical family and have subsequently populated most of the inner Main Belt (a<2.5 AU) and to a lesser extent orbits beyond the 3:1 resonance. This inference is supported by the results of detailed dynamical simulations [13,19] which show that it is feasible for Vesta fragments to achieve orbits with values of Δv [22] that are much larger than predicted by HCM family definitions [24] and SPH simulations of family forming impacts [23].

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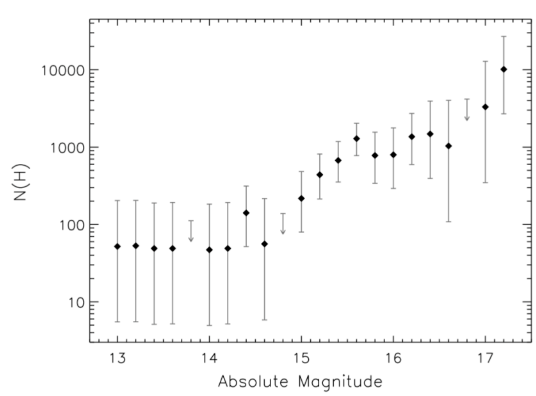

Figure 1 Differential absolute magnitude distribution of non-Vestoid basaltic asteroids.