**Mineralogical Characterization of Baptistina Asteroid Family.** V. Reddy[1], M. J. Gaffey[1], J. M. Carvano[2], D. Lazzaro[2], Thais Mothé Diniz[3], [1]Department of Space Studies University of North Dakota, Grand Forks, ND58202 (reddy@space.edu), [2]Observatório Nacional (COAA), rua Gal. José Cristino 77, São Cristóvão, CEP20921-400 Rio de Janeiro RJ, Brazil, [3]Observatório do Valongo, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil

**Introduction:** Asteroid families are assumed to be the remnants of catastrophic collisions among asteroids and are identified as clusters in orbit element space. The Baptistina Asteroid Family (BAF), at the inner border of the Main Belt (~2.25 AU), was identified only recently in the work by [1]. [2] considering the spread in semi-major axis of the BAF members and making assumptions about the albedo of the family, computed the age of the family to be 160+30/-20 Myr ago. According to the authors, this age would set it as the "most likely source of the Chicxulub impactor that produced the Cretaceous/Tertiary (K/T) mass extinction event 65 Mys ago." Moreover, the C- and X-type colors of (298) Baptistina and most of the family members, would be compatible with a parent body ~170 km in diameter and with a CM2 cabonaceous chondrite-like composition, similar to that of a fossil meteorite found in K/T boundary sediments [3].

However, a mineralogical analysis of (298) Baptistina showed the presence of a well-resolved absorption band at 1.0 ± 0.01 μm and a weaker band at 2.0 ± 0.2 μm [4]. Based on these absorption bands [4] determined that the surface composition of (298) Baptistina is similar to that of S-type asteroids, including olivine with minor orthorpyroxene. According to these authors, the derived mineralogy of the asteroid is incompatible with C/X type and with a CM2 assemblage. Further confirming this result, [5] derived a visible geometric albedo for (298) Baptistina of 0.347. This albedo, derived from mid-infrared observations, rules out any possibility of the asteroid being linked to a CM2 carbonaceous chondrites which have an average albedo of ~0.04 [6].

**Observations and Data Reduction:** To understand the true nature of the BAF and verify the link between its member asteroids we performed a detailed mineralogical analysis of 16 BAF members using NIR spectroscopy. Near-IR (0.7-2.5 μm) spectral observations of BAF members were conducted using the low-resolution SpeX instrument in prism mode [7] on the NASA IRTF, Mauna Kea, Hawai'i between February 2008 and November 2009. The data was reduced using Spextools [8] and SpecPR and the spectral band parameters were extracted using SpecPR.

**Results:** Detailed mineralogical analysis was performed for 16 members on the BAF. Composition of these asteroids ranges from ordinary chondrites, primitive achondrites, basaltic achondrites, carbonaceous chondrites and a low-albedo, possibly organic-rich object.

*(298) Baptistina and S(IV) asteroids***.** (298) Baptistina (Fig. 1) plots in the S(IV) region of the S-asteroid subtypes plot (Fig. 2) close to the olivine-pyroxene mixing line. [9] note that LL-chondrites fall in this region of the S(IV) region on Figure 2. The olivine (0.70) and pyroxene (0.30) percent for Baptistina are within the olivine/pyroxene ratios for LL-chondrite olivine (0.60-0.70) and pyroxene (0.40-0.30) [9]. This value is consistent with olivine/pyroxene ratio of 0.80:0.20±0.10 first reported by [4]. The Fa and Fs content for Baptistina ($Fa_{29}$ and $Fs_{24}$) are also consistent with LL chondrites, which have Fa range between $Fa_{27-33}$ and Fs range between $Fs_{23-27}$ [9]. Along with (298) Baptistina three other asteroids from the BAF can be classified as S(IV) subtypes, (1126) Otero, (1365) Henyey, and (2545) Verbiest. Mineralogies of three of them (Otero, Henyey, and Baptistina) are consistent with LL chondrites and mineralogy of (2545) Verbiest is consistent with an L-chondrite (i.e. low olivine, high pyroxene and low Fe content).

*S(III) Asteroids.* Three asteroids (Fig. 3) fall under the S(III) subtype on Fig. 2. These are (3260) Vizbor, (6266) Letzel, and (13154) Petermrva. These three objects have higher high-Ca pyroxene than the S(IV) asteroids which causes their band parameters to be offset from the olivine-orthopyroxene mixing line. Mineralogical analysis of the three S(III) subtypes reveals a decrease in olivine content and an increase in pyroxene compared to the S(IV) subtypes. The olivine percent ranges from 0.60-0.64 and the pyroxene from 0.36-0.40. The mineralogy, mineral abundance and chemistry of the the S(III) and S(IV) subtypes in BAF strongly support the argument that a majority of them are consistent with the background S-asteroid population, namely the Flora clan.

*S(VII) and Basaltic Asteroids.* Two BAF members (13480) Potapov and (24245) Ezratty plot in the S(VII) zone of Fig. 2 and (4375) Kiyomori plots in the basaltic achondrite region (rectangle box). Potapov has deeper bands compared (51% and 39%) to Kiyomori (13 % and 11%). Using equations from [10], Kiyomori has a mean pyroxene chemistry of $Fs_{42}En_{49}Wo_{9}$ and Potapov has $Fs_{29}En_{67}Wo_{4}$. This suggests that Kiyomori has a pyroxene chemistry that is more Fe-rich than Potapov (gray triangle) and it plots in the cumulate eucrite region (black diamond) of the pyroxene quadrilateral plot (Fig. 3). In contrast, Potapov's mean pyroxene chemistry suggests a more diogenite-like assemblage. The spectrum of (24245) Ezratty shows two shallow absorption features superimposed on a red slope. Using equations from [10] we have estimated the mean pyroxene chemistry of Ezratty as $Fs_{33}En_{61}Wo_{6}$. This chemistry plots (square symbol) between the cumulate eucrites and diogenites on the pyroxene quadrilateral. Using Ezratty's slope of 14.85%/1μm and band I and II depths of 4 % and 5% we estimate the metal content on Ezratty's surface to be >80%. Based on the pyroxene chemistry, metal content and spectral similarities, we suggest mesosiderites as the most probable meteorite analogs for Ezratty.

*Single Band Asteroid.* Five BAF members display only a single absorption feature at ~1μm (Fig. 8) with no indication of a band at 2μm within our detection limit. The most obvious reason for the lack of a second absorption band could be large atmospheric residuals beyond 1.4 μm. The band centers and morphology of these asteroids do not match those of single band minerals like olivine and Type A clinopyroxene. We suggest three possible analogs for these single band asteroids; a) carbonaceous chondrites, b) ureilites, and c) metal + silicate mixtures.

These results are preliminary and further analysis is currently ongoing. Final results will be presented at the conference.

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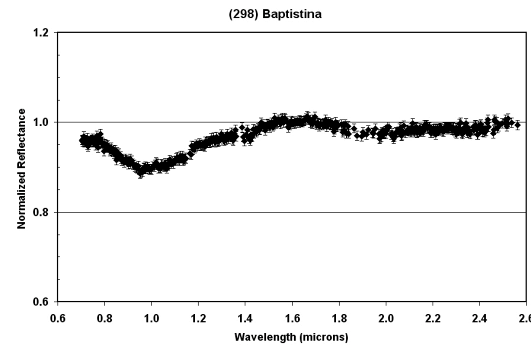


Fig. 1. Near-IR spectrum of (298) Baptistina from the SpeX instrument on the NASA IRTF.

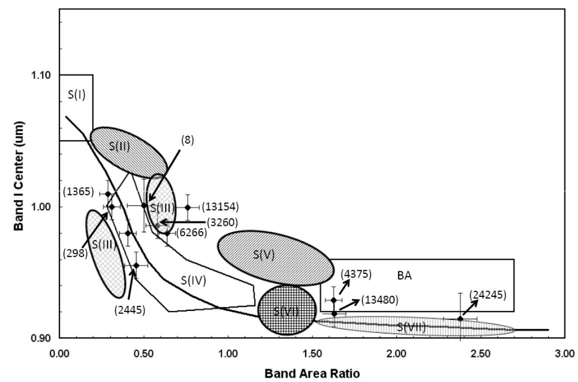


Fig. 2. Gaffey S-asteroid subtype plot showing members of BAF.

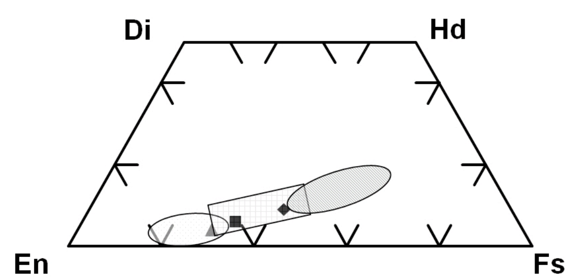


Fig. 3. Pyroxene quarilaterla plot showing the four end members enstatite (En), ferrosillite (Fs), diopside (Di) and hiddenbergite (Hd). The three zones in the bottom (from L to right) and for diogenites, cumulate eucrites, and basaltic eucrites. The three asteroids Potapov (triangle), Ezratty (square) and Kiyomori (diamond) plot in these zones suggesting their affinity to HED meteorites.