COMPARATIVE ANALYSIS OF THE COLOR CHARACTERISTICS OF VESTA'S AREAS AND HED METEORITES. L.F. Golubeva[1], L. A. McFadden[2], D.I. Shestopalov[1], L.O. Hasanova[1]. [1]Shemakha Astrophysical Observatory, Shemakha, Azerbaijan, AZ-3243 (land@azdata.net), [2]Department of Astronomy, University of Maryland, College Park, MD 20742-2421 (mcfadden@astro.umd.edu).

Previously we have compared the colors of surface features on Vesta's northern hemisphere with the colors of Vesta-like asteroids, also called vestoids [1]. As shown, vestoids studied in [1] avoid a region occupied by Vesta on a color R(0.673μm)/R(0.953 μm) – color R(0.673μm)/R(1.042 μm) plot, whether they are Vesta family members or not. In this work we use the same colors to compare 20 geologic units in the northern hemisphere of Vesta that were derived in [2] and 92 specimens of howardites, eucrites, and diogenites, whose reflectance spectra are available at the RELAB spectral library [3]. These unweathered meteorite specimens were selected in accordance with their spectral characteristics and author's explanatory notes to the measured spectra.

Figure 1 is, in fact, the color-color plot for Vesta's units from [2] supplemented with the data for HED meteorites. The first that strikes the eye is the compact color region of Vesta and the wide distribution of the meteorite colors. Furthermore, the Vesta color region more or less "crowns" the meteorite color distribution (i.e. the Vesta unit color R(0.673μm)/R(0.953 μm) is as rule less than that of HED meteorites).

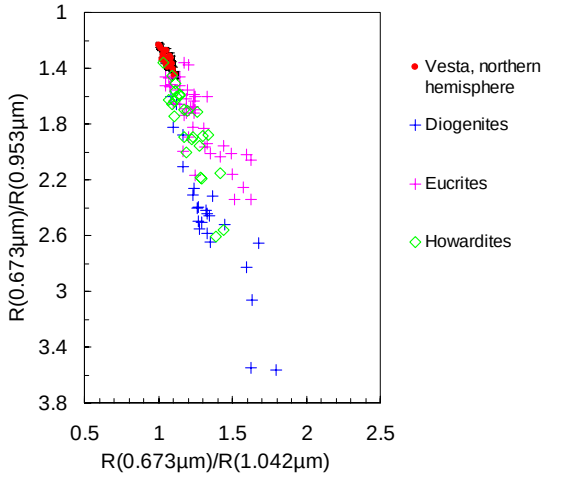

Fig.1

To study statistical properties of the data distributions we calculated so-called ellipses of the data scattering [4]. Each ellipse for the given dataset contours a probable error area for random quantities (i.e. the colors in our case) at specified confidence probability. Figure 2 shows ellipses of the data scattering, which confine probable variations of the colors for Vesta's units and HED meteorites at confidence probability ≥ 0.9. As is seen from this Figure, the Vesta ellipse lies within the eucritic and howarditic color ellipses and intersects the diogenitic color ellipse. So statistical properties of the meteorite samples studied do not prohibit natural occurrence of the HEDs with colors like Vesta's units. Seemingly, such specimens may be found in the future, nevertheless it is a wonder that none of about hundred specimens of HED examined here fell within the Vesta unit color ellipse (see Figure 3).

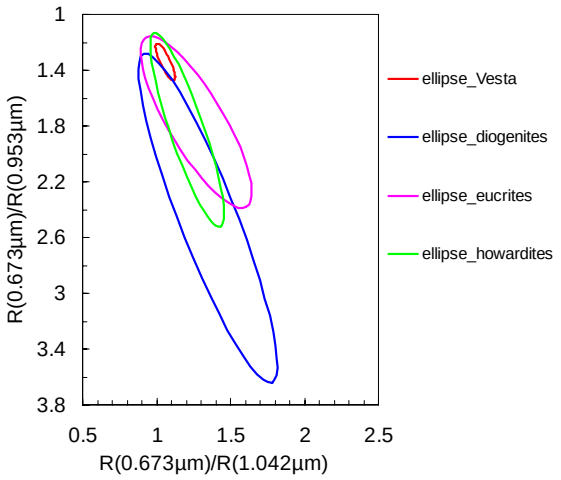

Fig.2

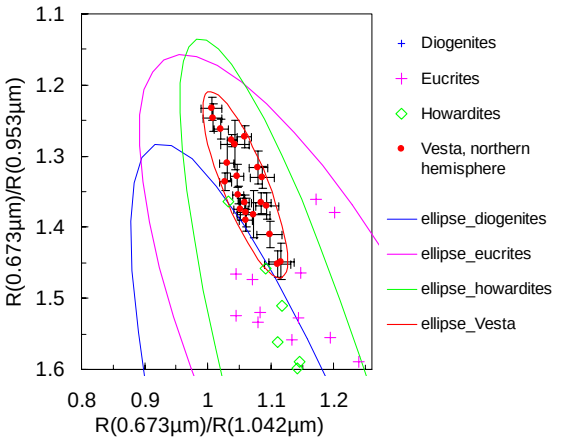

Fig.3

The statistical analysis does not disclose a cause of the noticeable differences between the colors of Vesta's units and HED meteorites examined here. Figure 4 is the same as Figure 1, but particle sizes of the meteorite specimens are marked by a circle dimension. The smallest circles correspond to the particles < 25 μm in size, and the largest circles correspond to the particles > 300 μm in size. Some tendency of decreasing color values with the particle

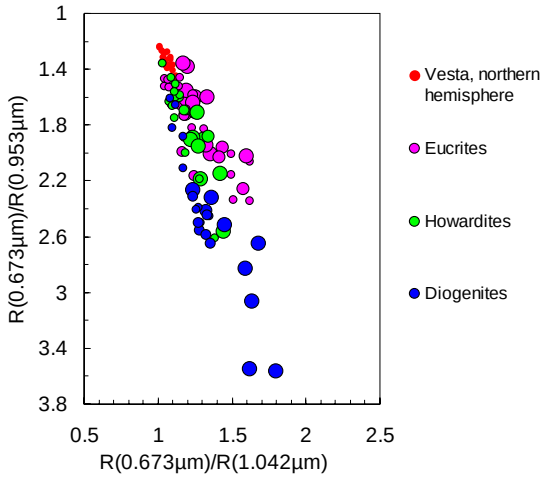

Fig.4

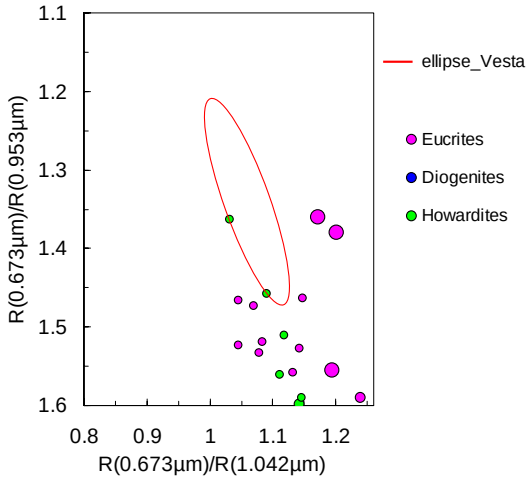

Fig.5

size decreasing is seen for diogenite and howardite specimens. But this conclusion is absolutely incorrect for eucrites.

As is seen from Figure 5, the meteorite specimens, the nearest to the Vesta color ellipse, have the fine particles (i.e. < 25 μm in size). They are howardites EET87503 and EET87513, which lie at the contour of the Vesta ellipse, and three eucrites (Y-792769, Y-793591, and Y-82082) located near the bottom of the ellipse. From this it follows that the Vesta unit regolith particles are apparently finer than those of above meteorite specimens. Similar conclusion about the fine particles of the Vesta surface material has been made in [5] from comparing the integral Vesta spectrum with spectra of howardites and eucrites. Numerical simulation of the color characteristics also supports this conclusion: a decrease in the particle size of the above meteorite specimens displaces meteorite points in Figure 5 into the Vesta color ellipse. At the same time, our first attempts to simulate the four point spectra of Vesta's units [2] decreasing grain size of these meteorite specimens and mixing their spectra were ineffective. Thus we suppose there is the second cause of the difference between the colors of the units on Vesta's northern hemisphere and HEDs examined, namely the difference in mineral and/or chemical compositions.

Acknowledgements: This research utilizes the spectra of HED meteorites measured with the NASA RELAB facility at Brown University.

References: [1] Golubeva L.F. et al. (2008) *Asteroids, Comets, Meteors, 2008*, Abstract # 8036. [2] Binzel R.P. et al. (1997) *Icarus*, *128*, 95–103. [3] *Brown University Keck/NASA Relab Spectra Catalog*. [4] Romanovskij V.I. Mathematical statistics. GONTI, 1938, 527 p. [5] Hiroi T. et al., (1994) *Meteoritics*, *29*, 394–396.