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ANALYSIS OF BROADBAND COLOR CHARACTERISTICS AND SPECTRAL DISTRIBUTION OF ASTEROIDS WITH SMALL PERIHELION DISTANCES

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Introduction

In the course of evolution, most of near-Earth objects NEO reach orbits with small perihelion distances up to q < 0.1 AU. The purpose of this study is to analyze the genetic relationships of asteroids with small perihelion distances with meteor showers by broadband color characteristics based on modern optical observations with various color filters. Changes in asteroids in the vicinity of the Sun play a significant role in the formation of physical properties, size distribution and dynamic characteristics of near-Earth objects [1]. Near Sun asteroids can reach equilibrium temperatures sufficient to change the surface due to thermal breaks, drying out and decomposition of hydrated silicates. When an asteroid moves near the Sun, it is exposed to very strong tidal and thermal influences, and also interacts with the solar atmosphere at relatively small heliocentric distances [2].

Methods

The impact of solar radiation should noticeably change the surface of the asteroid and, probably, lead to its disintegration into parts or complete destruction. These interactions of asteroids with the Sun should have a significant impact on the formation of physical properties, size distribution and dynamic behavior of near-Earth objects. The study of the parameters of such objects can be carried out only based on an analysis of meteor showers and genetically related near-Earth asteroids. For this, the use of two-color diagrams as a way to determine the excess of color is found to be the most efficient [3].

Two-color diagrams were plotted for the brightness maxima of meteoroids. The averaged positions (AP) of the groups, the root-mean-square distances of meteoroids from the AP, and the maximum distances to the AP were determined. The quantitative and qualitative parameters of the color characteristics of meteoroids with small perihelion distances and their spectral distribution were obtained.

Results

It was found that the spectral parameters of meteoroids depend on the dynamics and chemical composition of the objects. But at the same time, the chemical characteristics of asteroids and comets may differ due to significantly different orbital parameters and affect the color indices indirectly. This is explained by the fact that the amount of emission of volatiles corresponds to the frequency and intensity of heating for objects with small perihelion distances up to q < 0.1 AU when they move around the Sun. There is also a relationship between the color parameters and the magnitude, and no dependence on the speed of the meteoroid was found. There is a hypothesis according to which these phenomena are explained by Purkinje shift. In works [4, 5], to test the hypothesis, together with visual and photometric observations, measurements were also carried out with green and blue, red and blue filters [6]. Our studies confirmed the conclusion that Purkinje shift can only to a certain extent explain the relationship between color characteristics and the magnitude of meteoroids

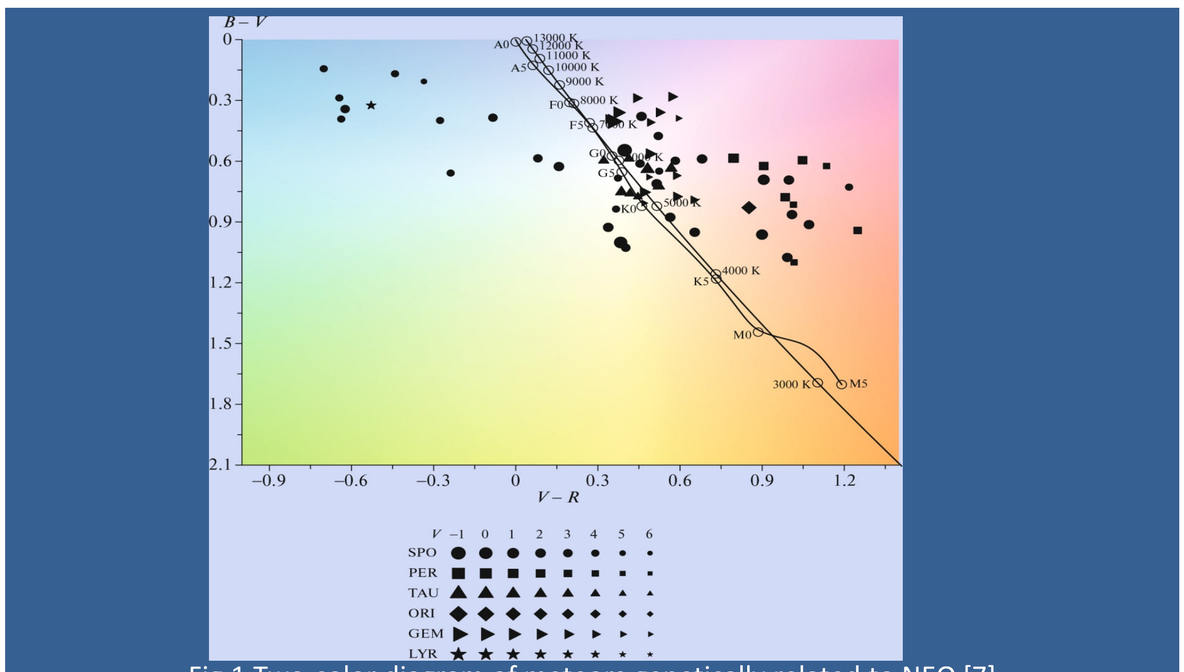

Fig.1 Two-color diagram of meteors genetically related to NEO [7]

Conclusion

As a result of this work, the analysis of astrophysical properties of asteroids with small perihelion distances up to q < 0.1 AU was carried out, spectral and color characteristics were investigated [8]. In this case, one of the selective properties of meteoroids can be the structural features of the distribution of meteoroids on a two-color diagram. For meteoroids with different group and brightness characteristics, polychromy and spectral parameters were determined using photometric estimation. Further research should be directed towards the development of polychromy methods and spectral studies free from subjective judgments [9]. This can be achieved by constructing model color indices using digital databases of meteoroids, which makes it possible to detect the emission lines most significant for color formation and to perform a comparative analysis of color characteristics with the corresponding spectral lines [10].

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