

Peculiar polarization and shape properties of Barbarian asteroids: A campaign for their physical characterization

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A few years ago, asteroid polarimetry allowed to discover a class of asteroids exhibiting peculiar phase polarization curves, collectively called “Barbarians” (a dozen are known) from the prototype of this class, the asteroid (234) Barbara. All such objects belong to the taxonomic classes L, Ld, and K, all related to the general S-complex. The anomalous polarization has been tentatively interpreted in terms of high-albedo, spinel-rich Calcium-Aluminum inclusions (CAI) which could be abundant on the surfaces of some of these asteroids, according to their spectral reflectance properties and to analogies with CO3/CV3 meteorites. Such CAIs are thought to be among the oldest mineral assemblages ever found in the Solar System. Barbarians' surfaces could therefore be rich in this very ancient material and bring information on the early phases of planetary formation.

However, the “Barbarian” polarimetric properties are not found among all known L-class asteroids. Therefore, we cannot be sure that composition is the only and one responsible of the wide negative polarization branch. On the other hand, it was also suggested that a peculiar distribution of incidence/diffusion angles, resulting from the presence of large concavities on the object surface, could play a role in the polarimetric behaviour.

Based on such motivations, we are running a systematic campaign for shape determination at the C2PU telescope of the Observatoire de la Côte d'Azur (Calern site) and several other sites in the world. By using photometric inversion techniques we hope to obtain indications on the presence of concavities. We will present the first results and the project perspectives opened by the forthcoming availability of the polarimeter built by Torino observatory at C2PU, for the so-called Calern Asteroid Polarimetric Survey (CAPS).