VLT/SPHERE imaging survey of the largest main-belt asteroids: Final results and synthesis

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Résumé

Until recently, only three large main belt asteroids, Ceres, Vesta and Lutetia, had been imaged with a high level of detail, as they were visited by the space missions Dawn and Rosetta of NASA and the European Space Agency, respectively. The previously small number of detailed observations of asteroids meant that, until now, key characteristics such as their 3D shape or density had remained largely unknown. Between 2017 and 2019, we have been filling this gap by conducting a high-angular-resolution imaging survey of 42 large main-belt asteroids with VLT/SPHERE (ESO large programme), sampling the main compositional classes. These observations have allowed to cast some light on the following fundamental questions:
– What is the diversity in shape among large asteroids and are the shapes close to equilibrium?
– How do large impacts affect asteroid shape?
– What is the bulk density of large asteroids and is there a relationship with their surface composition? Is there any evidence of differentiation among those bodies?
– Is the density of those bodies that are predicted to be implanted bodies from the outer Solar System (P/D-types) compatible with that of small (D $\leq$ 300 km) trans-Neptunian objects?
– What physical properties drive the formation of companions around large asteroids? In this talk, I will present an overview of the main results obtained from this survey.

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