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VLT/SPHERE Survey of D>100 km Asteroids: An overview of current results

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Abstract

To make substantial progress in our understanding of the shape, internal compositional structure (i.e., density) and surface topography of large main belt asteroids, we are carrying out an imaging survey via an ESO Large program entirely performed in service mode with seeing constraints <0.8"(152h in total; PI: P. Vernazza; ID: 199.C-0074; the observations are spread over 5 semesters from April 1st, 2017 till September 30, 2019; see [1] for more information) of a statistically significant fraction of all D>100 km main-belt asteroids (~35 out of ~200 asteroids; our survey covers the major compositional classes) at high angular-resolution with VLT/SPHERE throughout their rotation (typically 6 epochs per target).

Here, we will present an overview of the results obtained after 2.5 years of observations. So far, every target has challenged current knowledge, with for instance the linkage between an observed impact crater and a small collisional family [1], the homogeneous internal structure of Daphne [2], the revision of Psyche's association with iron meteorites [3], the heavily cratered surface of Pallas (Marsset et al., in prep), the extremely smooth and relaxed shape of Hygeia while it is the progenitor of one of the largest known asteroid families (Vernazza et al., submitted), to name a few.

We will also present a review of the techniques employed to reach our science objectives (3D reconstruction & deconvolution of the reduced images). In particular, the 3D reconstruction algorithm MPCD (e.g., [4]) developed in the framework of the Rosetta space mission has been successfully adapted to our VLT/SPHERE data whereas our deconvolution algorithm has successfully passed the test in the case of (4) Vesta [5] although some residual artifacts imply that the technique can still be improved.

References

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