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ESO/VLT/SPHERE Survey of D>100km Asteroids (2017-2019): First Results

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Abstract

The vast majority of the geological constraints (i.e., internal structure via the density, cratering history) for main belt asteroids have so far been obtained via dedicated interplanetary missions (e.g., Rosetta, DAWN). The high angular resolution of SPHERE/ZIMPOL (one pixel represents 3.6 x 3.6 mas on sky), the new-generation visible adaptive-optics camera at ESO/VLT, implies that such science objective can now be investigated from the ground for a large fraction of D≥100 km main-belt asteroids (most of these bodies possess an angular diameter around opposition larger than 100 mas). The sharp images acquired by this instrument can be used to constrain accurately the shape and thus volume of these bodies (hence density when combined with mass estimates) and to characterize the distribution and topography of D≥30 km craters across their surfaces.

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 4 semesters from April 1st, 2017 till March 30, 2019) 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 a summary of the results obtained after one year of observations.