

Possible equilibrium figures of asteroids with the HST/FGS

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While a large variety of shapes exist among solar system bodies, some smaller ones (satellites, asteroids, etc.) could be in hydrostatic equilibrium. Large bodies where gravity is dominant should relax to their equilibrium state, so that knowledge of their shape and rotation period can reveal their bulk density [e.g. 1 Sheppard], but this is true only if the composition and compressibility or density gradient is known. Similarly, re-accumulated rubble-pile asteroids - being cohesionless - were thought to have such figures of equilibrium [2], but it has been shown that friction can sustain enough strain in the body bulk to allow large deviations from this equilibrium shape [3]. Here we revisit the original idea of Farinella et al.: from a selection of possible candidates we try to assess if some asteroids do have figures of equilibrium. To this effect we need to test three parameters: shape, density and angular momentum. We report on high angular resolution observation performed with the HST Fine Guidance Sensor (FGS) interferometer. These observations combined with topographic models of the bodies from lightcurve data enable us to derive the size and hence the bulk density of the bodies. This will pave the way to our understanding of the condition of formation, or processes that could lead some bodies to have shapes that follow an effective equipotential surface. In particular it will help to test if, and under what conditions, the sculpting of asteroid shapes can be acquired directly during gravitational re-accumulation [4].

[1] Sheppard S.C., Jewitt, D.C. (2002) AJ 124, 1757. [2] Farinella P., Paolicchi, P., Tedesco, E. F., Zappalà, V. (1981). Icarus 46, 114. [3] Holsapple K.A. (2001). Icarus 154, 432. [4] Tanga. P., Delbo M., Hestroffer D., Michel P., Richardson D.C. (2007) EPSC 2007, 19-24 August, Potsdam, Germany.