PROPERTIES OF 4 ASTEROIDS FROM KECK ADAPTIVE OPTICS. A. R. Conrad[1], W. J. Merline[2], J. D. Drummond[3], B. Carry[4], C. Dumas[4], P. M. Tamblyn[2], C. R. Chapman[2], R. D. Campbell[1], R. W. Goodrich[1], [1]W.M. Keck Observatory, 65-1120 Mamalahoa Highway, Kamuela, HI, 96743, [2]Southwest Research Institute, 1050 Walnut Street, Ste 300, Boulder, CO 80302, [3]Starfire Optical Range, Directed Energy Directorate, Air Force Research Laboratory, Kirtland AFB, NM 87117, [4]ESO Very Large Telescope (VLT), European Southern Observatory, Alonso de Cordova 3107, Vitacura Casilla 19001, Santiago 19, Chile.

Introduction: We present imaging data on 4 larger asteroids, taken with adaptive optics (AO) on large telescopes, with high spatial and rotational resolution. The resulting shapes can be compared with previous shape models derived from inversion of lightcurve data, and the agreement is generally good.

The orbit of a satellite discovered orbiting one of these [1] (see figure 3), taken together with volume estimates determined from shape measurements, will yield an exceptionally accurate density for that object.

Resolved Asteroid Program: The physical and statistical study of asteroids requires accurate knowledge of their shape, size, and pole position. Improved size permits improved estimates of albedo, in turn allowing better interpretation of surface composition. In those cases where we have an estimate of the mass, e.g. from the presence of a satellite, uncertainty in an asteroid's volume is the overwhelming uncertainty in attempts to derive its density [2]. Of course, density is the single most critical observable having a bearing on bulk composition, porosity, and internal structure [2,3].

Direct, accurate, measurements of asteroid shapes, sizes, and poles are now possible for larger asteroids, which can be well resolved using AO on large ground-based telescopes [4,5,6].

511 Davida: Figure 1 compares our Keck AO observations of 511 Davida with the lightcurve model. Nearly pole-on AO images of Davida [4] reveal a facet and two promontories; seen in relief and confirmed by the rotation rate. Lightcurve inversion [7] correlates well, but shows a shallower A promontory and a steeper N promontory.

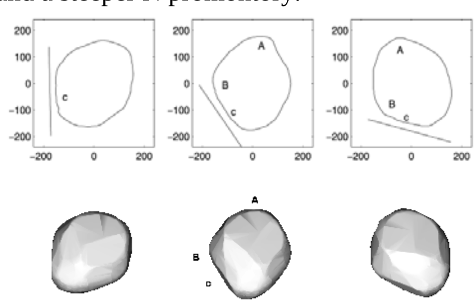

Figure 1. Davida depictions from AO (top) and lightcurve inversion (bottom).

52 Europa: Figure 2a compares our Keck AO observations of 52 Europa with the lightcurve model. The two results agree broadly in that no striking edge features (like Promontory A on Davida) are visible in either depiction

15 Eunomia: Figure 2b compares our Keck AO observations of 15 Eunomia with the lightcurve model. These preliminary results reveal a shape that broadly agrees with the lightcurve model. Like Davida, Eunomia shows shape irregularities that are visible in the unprocessed, non-deconvolved data shown here.

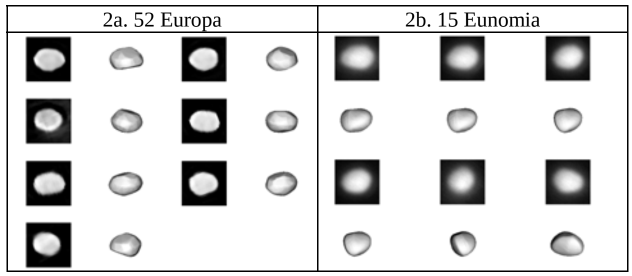

Figure 2. Depiction of 52 Europa (black background) for the 7 epochs observed with Keck AO on January 20, 2005 versus lightcurve inversion (left-hand panel); and December 15, 2007, AO observations of 15 Eunomia (black background) compared with lightcurve models (right-hand panel)

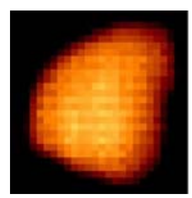

Figure 3. This image from Keck AO shows the unusual shape of large C-type asteroid 41 Daphne (see Merline, et al., presented separately). The presence of a satellite discovered during our observation will allow an accurate density measurement.

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