Geophysical Research Abstracts, Vol. 7, 06906, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06906

Spins and shapes of potentially hazardous asteroids

J. Torppa(1), K. Aksnes(2), Z. Dai(2), T. Grav(3), G. Hahn(4), T. Laakso(1), C-I. Lagerkvist(5), K. Muinonen(1), J. Näränen(6), H. Rickman(5) and J. Virtanen(1)

(1) University of Helsinki, Finland (2) University of Oslo, Norway (3) University of Hawaii, USA (4) Deutschen Zentrum für Luft- und Raumfahrt (DLR), Germany (5) University of Uppsala, Sweden (6) Nordic Optical Telescope (NOT), La Palma, Spain

Asteroids whose orbits lie close to that of the Earth (called near-Earth objects) are a threat to our planet. Though none of the known asteroids are currently on a collision course with the Earth, there is a class called potentially hazardous asteroids (PHA's) whose orbits may in a few tens of years be perturbed to make a collision possible. In such case, we should have thorough knowledge of the physical properties of these objects because, unlike most other natural disasters, such a hazard is in principle avoidable. Thus in the fall of 2003, a group of asteroid and comet researchers from the Nordic countries set started an observing program called Nordic NEON (Nordic Near-Earth Object Network). Both photometric and astrometric observations of PHA's have been carried out since April 2004. Photometry is used for determining the spin state and shape of PHA's and astrometry for computing more accurate orbits.

We use methods developed in the University of Helsinki for analysing both kinds of data. Spin state and convex shape solution are obtained using the convex inversion method [1] and information of the nonconvex shape features are obtained with the spherical harmonics method (Muinonen and Torppa, in preparation). For initial period estimation only a few nights of observations is usually enough, while pole and shape determination requires more abundant data. Previously observed photometric data exists for 35 PHA's, but only an approximate period is known for most of these. Properties of well over 500 PHA's are totally unknown.

So far we have carried out about 9 nights of photometric observations yielding period estimates for 5 new PHA's, and improved spin and shape solution for 4 targets. The periods of the targets observed so far divide into two categories: those with a period of only few hours and those with a period over ten hours. However, no further conclu-

sions can be drawn from this division yet, the sample of observed asteroids being so small.

Orbit computation is carried out using the techniques of statistical orbital ranging [2] and volume-of-varation sampling [3]. During the course of the program, three near-Earth objects have been recovered, while improved orbits have been obtained for 35 objects.

In this EGU General Assembly 2005 I will concentrate the photometric part of the program.

References:

[1] M. Kaasalainen, J. Torppa and K. Muinonen, Icarus 153 (2001) 37.

[2] J. Virtanen, K. Muinonen, and E. Bowell, Icarus 154 (2001) 412.

[3] K. Muinonen, J. Virtanen, M. Granvik, and T. Laakso, MNRAS (2004), submitted.