PROSPECTS FOR DETERMINING MASSES FOR ASTEROIDS

JAMES L. HILTON P. KENNETH SEIDELMANN
U.S. Naval Observatory
3450 Massachusetts Ave., NW
Washington, DC 20392
USA

AND

JAY MIDDOUR
Code8103
Naval Research Laboratory
4555 Overlook Ave., SW
Washington, DC 20375
USA

Abstract. Integrations of the orbits of 4538 asteroid with mean distances from 1.52 AU to 5.20 AU were made. The integrations started at 1 Jan. 1950 and ran through 1 Jan. 2030. Comparison of these integrations produced several thousand encounters of less than 0.05 AU for the larger asteroids (diameter greater than 200 km) and less than 0.01 AU for all asteroids. This database was then searched for encounters for which the deflection of one asteroid by another was large enough to make a determination of the mass with an uncertainty of 50% or less. A total of 460 such encounters were found between 1950 and 2015. For each individual encounter, the derived mass should have an uncertainty from 50% to less than 1%, depending on the amount deflection of the encounter and provided sufficient high precision observations are available. For the 254 encounters in the past, there are several opportunities, if the observations exist, to make determinations of the asteroid masses. For the 206 encounters in the future, a coordinated observing campaign would greatly enhance the knowledge of asteroid masses and densities. There are 11 encounters between smaller asteroids that should produce mass determinations. In addition, there are 17 asteroids that have encounters with more than one other asteroid and 16 instances of, at least temporary, resonances between pairs of asteroids.