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- Planetary Defense – Recent Progress & Plans
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Radar Astrometry and Physical Characterization

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ABSTRACT

Planetary Radar can provide both orbit improvement and physical (size and shape) characterization of near-Earth asteroids and comets. The orbital improvement is most dramatic shortly after discovery, as radar directly measures the two elements of phase space, distance and radial velocity, that are least-well determined by single-apparition plane-of-sky optical measurements. It can also be used in the daytime and in any weather. It does require a relatively close pass by the Earth to be effective, and with only two facilities currently operating, not all objects are reachable due to limits in declination coverage and sensitivity. It might be possible to include a southern-hemisphere radar system in the “square-kilometer array”, for which prototypes are under construction in South Africa and Australia, but this is not currently part of the design of those systems.

Radar imaging has given us our best understanding of the wide variety of shapes of near-Earth objects, observing tens of objects per year. This technique improves our understanding of the population of NEOs, but, as only a few percent of objects are imageable by radar, it cannot be counted on to determine the shape of any particular hazardous object.

The best imaging *resolution* of radar is being steadily improved (see presentation by Busch et al.), but the *sensitivity* is limited by the availability of large telescopes and high-power amplifiers, and there are no significant improvements expected in the near future.

The number of objects observed by radar has increased dramatically in the last few years, driven largely by increased funding for the Arecibo and Goldstone radar programs by NASA.