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USING THE GAIA ASTROMETRIC GRID TO REFINE NEO ORBITS

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ABSTRACT

Most newly discovered NEOs have poorly known orbits (U≥4) and so are challenging to recover at subsequent apparitions (Galache et al., 2015). As ~40% of these have MOID < 0.05 AU they form a large population of potential impactors, even though most do not have D > 140 m. Most do have D > 20 m and so could produce Chelyabinsk-sized or larger events. Standard solutions to this problem are: (1) to observe as many as possible with radar, but this typically requires an approach within 0.05 – 0.1 AU on the discovery apparition; (2) to track the NEO for as long an arc on the sky as possible, but as these NEOs are found at V = 20 – 21 and then fade, this is challenging. The ESA Gaia satellite has led to a new astrometric grid of ~1 billion stars over the whole sky down to V ~ 21 with an accuracy orders of magnitude better than existing catalogs at this faint level. We have investigated how much the Gaia astrometric grid can improve NEO orbit determination and the types of signal-to-noise, and so telescope aperture, that is needed to take advantage of this new knowledge.