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Introduction: We are carrying out the DECam Ecliptic Exploration Project (DEEP), an NOAO/NOIRLab Survey program to characterize the trans-Neptunian region of our Solar System. We have been allocated 46.5 nights with the Dark Energy Camera (DECam) on the CTIO Blanco 4-meter telescope, with observations made in the time period 2019—2023. We have observed some 120 square degrees with a cadence and footprint that is designed to recover trans-Neptunian objects (TNOs) across the epochs of our survey. A summary of our survey science goals and design is presented in [1]. Figure 1 shows the comparison of DEEP to other TNO surveys.

Methods: Each pointing is observed for four continuous hours in a series of 100 two-minute exposures, using the VR filter [2]. We use digital tracking to combine each image stack in post-processing. A survey simulator [3] is used to characterize our survey and its results.

Results: In [4] we present our results at the single-exposure depth (around VR~23). We find that the distribution of lightcurve amplitudes among 50—100 km-sized TNOs is remarkably broad, suggesting a large fraction of contact binary TNOs.

In [5] we present our results from our first digital tracking experiment. We reach VR~26.4 (50% detection threshold) over 39 deg^2 and have detected 1444 objects in this subset of our data. We measure the size distribution of TNOs larger than approximately 15 km, and find good agreement with the result from [7], though with 500 times as many objects.

In [6] we present our first results of linking across multiple epochs for TNOs detected through digital tracking. This technique will become increasingly important as we process the remaining DEEP data, and will produce orbits for thousands of faint TNOs.

Forthcoming results: The results presented in papers [4]—[6] correspond generally to just one of our four patches on the sky, and just data from 2019, as a testbed for software development. We are presently processing the remaining data (in total, about six times as much data as is presented here). Future analysis includes measuring the size distribution of TNOs as a function of dynamical class

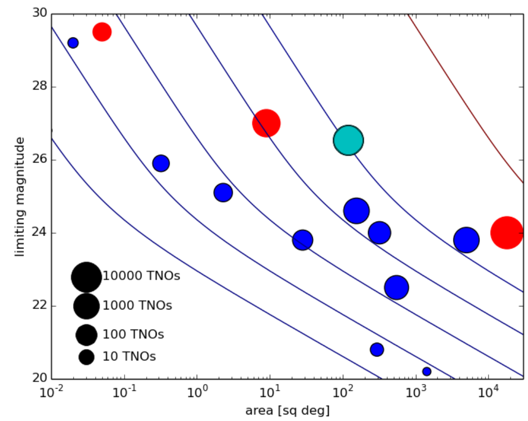

Figure 1: Survey summary figure (limiting magnitude and survey area) for a number of TNO surveys. DEEP is the cyan circle. Blue circles indicate published results, whereas red indicate forthcoming results (from top left to lower right: JWST, LSST Deep Drilling Fields, LSST Wide Fast Deep). The symbol size indicates the number of TNOs discovered (or expected). The contour lines represent the logarithm of expected yields (after [7]), from 1 (lower left) to 100,000 (upper right), assuming pointings on the ecliptic (which not all surveys are).

Non-TNO DEEP science: The DEEP cadence and data are conducive to a wide range of other science investigations. Strauss et al. [this conference] present first results for asteroid science from this project.

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References: [1] Trilling et al., submitted [2] Trujillo et al., submitted [3] Bernardinelli et al., submitted [4] Strauss et al., submitted [5] Napier et al., submitted [6] Smotherman et al., submitted [7] Bernstein et al. 2004, AJ, 128, 1364