The STEREO search for IEOs. C. I. Fuentes[1], M. M. Knight[2], D. E. Trilling[2] [1]Northern Arizona University, Arizona, USA (cesar.i.fuentes@nau.edu), [2]Lowell Observatory, Arizona, USA.

Introduction: IEOs (inner Earth objects or interior Earth objects) are a near Earth small body population that may carry significant impact threat. This population spends all of its time inside the orbit of the Earth, giving ground-based telescopes a small window of opportunity to observe only a fraction of them. Very little is known about the IEO population, and only a small number (~10) of IEOs are known at present. We introduce STEREO (Solar TErrestrial RElations Observatory) and its 5 years of archival data as our best chance of studying the IEO population and discovering possible impactor threats to Earth.

We are currently carrying out the search for IEOs in a subset of the STEREO archive using a pipeline developed for the search of outer Solar System objects [1]. STEREO is sensitive to IEOs that are not visible from the Earth and hence samples a part of the IEO population that has not been discovered yet. We compare our results with the detection expectations, based on the current number of known IEOs which is heavily biased by the orbital distribution of the 8 objects discovered so far [2,3,4]. The preliminary results and their implications on the IEO population are presented in this poster.

Search: Studying the orbital distribution of IEOs from the ground is very difficult due to their positions close to the Sun. A better approach is to use data from NASA's STEREO mission to search for IEOs. STEREO consists of twin spacecraft, one ahead of the Earth's orbit (STEREO-A) and one behind the Earth's orbit (STEREO-B) which view the Sun-Earth line using a suite of telescopes. Each spacecraft moves away from the Earth at a rate of ~22.5^{o} year^{-1}. Our search for IEOs utilizes the Heliospheric Imager 1 instruments on each spacecraft (HI1A and HI1B). The HI1s are centered 13.98^{o} from the Sun along the Earth-Sun line with a square field of view 20^{o} wide, a resolution of 70 arcsec/pixel, and a bandpass of 630—730 nm [5]. Images are taken every 40 minutes, providing a nearly continuous view of the inner solar system since early 2007. The nominal visual limiting magnitude of HI1 is ~13, although the sensitivity varies somewhat with solar elongation, and asteroids fainter than 13 can be seen near the outer edges.

We are conducting the archival search using the same pipeline developed for data from the Hubble Space Telescope [1]. This pipeline allows us to find moving objects in telescopic spacecraft data while measuring detection efficiency, which is key to constraining the existing population, both detected and undetected. Our search algorithm analyzes data taken within 24 hours and searches for linear motion. Candidate detections (including synthetic) are presented to an operator to flag spurious objects.

We present the results of the search of a subset of the archival data and the preliminary conclusions of this survey. We will be extending this method to the entire archive, which will place the strongest constraints on the IEO population.

References: [1] Fuentes, C. I. et al. (2010) *ApJ,* 722, 1290. [2] Bottke, W. F. et al. (2002) *Icarus, 156,* 399. [3] Harris, A. (2008) *Nature, 453,* 1178. [4] Zavodny, M. et al. (2008) *Icarus, 198,* 284. [5] Howard, R. A., et al. (2008) *Space Science Reviews, 136,* 67.