PDC2019
Washington, DC, USA

Please send your abstract to iaapdc (at) iaamail.org

You may visit www.pdc.iaaweb.org

(please choose one box to be checked)
(you may also add a general comment - see end of the page)

☐ **Key International and Political Developments**
☒ **Advancements and Progress in NEO Discovery**
☐ **NEO Characterization Results**
☐ **Deflection and Disruption Models & Testing**
☐ **Mission & Campaign Designs**
☐ **Impact Consequences**
☐ **Disaster Response**
☐ **Decision to Act**
☐ **Public Education & Communication**

Impact Probability Evolution of Virtual Impacting Asteroids Observed by the Large Synoptic Survey Telescope

Bryce T. Bolin[(1)], Edward Lu[(2)], Mike Loucks[(3)], John Carrico[(4)], Clark Chapman[(5)]
[(1)(2)(3)(4)(5)]*B612 Asteroid institute, Mill Valley, CA, United States*

Keywords: *NEO discovery, observational surveys, impact monitoring*

ABSTRACT

The Large Synoptic Survey Telescope (LSST) will discover more than 10 times as many Near Earth Asteroids (NEAs) as all other telescopes combined (Ivezić et al., 2008, Jones et al., 2018). Among the more than 100,000 expected newly discovered NEAs, will be hundreds of asteroids with a worrisome chance (more than 10^-4) of hitting Earth. The probability of impact of any given asteroid is a function of the uncertainty in the orbit determination, and evolves as the knowledge of the orbit of the asteroid is refined by repeated observations. Eventually, the probability drops low enough to know that a collision with Earth can be ruled out, or in rarer cases the probability rises large enough to consider the asteroid a serious threat.

The goal of our study is to understand how the impact probabilities evolve with time prior to potential impact. This is critical because the danger posed by an asteroid may not be fully apparent because the uncertainty in the knowledge of the orbit may be large enough that the estimated impact probability is still small. As a result, the warning time for a threatening asteroid may be too short for mitigation efforts which can take years to execute and plan.

To understand the warning times that are likely to result for impacting asteroids, we have simulated decades of operation of LSST in observing an ensemble of 100,000 asteroids which are chosen to be representative of Earth impacting asteroids. From these series of observations, we carry out the orbit determination process and examine the evolution of the estimated asteroid orbits and their uncertainties to understand the evolution of impact probability as a function of time before impact. The tools for studying asteroid observations, including the calculation of asteroid impact probabilities, developed as part of this study will eventually become part of the Asteroid Decision and Mapping project (a program of the Asteroid Institute). These tools are intended to be public and open-source for use by the scientific community for orbit determination of NEA discoveries by LSST and other observatories in the coming decade.