This research seeks to determine trends and orbital characteristics of comets discovered over recorded history; specifically “warning times” associated with comets that come within 1.3 astronomical unit (AU) of the Earth, also called Near-Earth Objects (NEOs), and Potentially Hazardous Objects (PHOs) which come within 0.05 AU of Earth’s Minimum Orbit Intersection Distance (MOID).

In this work, “warning time” means the time from discovery to perigee, including negative warning times when the comet is discovered after its perigee pass. This study proposes that warning times for comets approaching Earth should be increasing with increased telescope technology and an increased number of surveys focused on these objects in the past decades. Quantification occurs by investigating all known comets through recorded history, restricting this group to relevant Near-Earth Comets (NECs), and predicting appearance and warning times of future comets using the discovered trends.

Data for this study was obtained from the Jet Propulsion Laboratory’s (JPL) online HORIZONS system. The system has highly accurate ephemerides for asteroids and comets (612829 and 3,196 respectively on April 12, 2013) as well as other Solar System objects as well as orbital parameters and visualization tool for asteroids and comets. HORIZONS was used to build a database of all discovered comets up until February 8, 2013. The database includes the date discovered, date and distance of perigee, inclination, eccentricity, magnitude, and several other observations used in the orbital fit. The data was then analyzed for characteristics using both MATLAB and Excel for analysis and numerical computations.