

## Highlights of Spacewatch Observations in Calendar Year 2018:

Spacewatch focuses whenever possible on "Potentially Hazardous Asteroids" (PHAs as defined by the Minor Planet Center (MPC <<https://www.minorplanetcenter.net/iau/mpc.html> >) of the International Astronomical Union (IAU <[https://www.iau.org/science/scientific\\_bodies/commissions/X2/](https://www.iau.org/science/scientific_bodies/commissions/X2/) >)) as the objects of highest priority. NASA's Planetary Defense Coordination Office <<https://www.nasa.gov/planetarydefense/overview> >, which funds Spacewatch, quotes a directive by Congress "... to provide an analysis of alternatives to detect, track, catalogue, and characterize potentially hazardous near-Earth objects ... measuring at least 140 meters in diameter ...". That diameter of 140 meters also coincides with the definition of a PHA defined by the IAU. Such PHAs' orbital paths approach that of the Earth within 0.05 Astronomical Units (AUs), or about 1/20th of the distance between Earth and the sun.

Observations of the positions and motions of celestial objects are defined as "astrometry". In calendar year (CY) 2018, Spacewatch made astrometric observations of 1403 Near-Earth Asteroids (NEAs) and 248 PHAs. Those counts amounted to 35% and 42%, respectively, of the totals of such objects observed by everyone world-wide that year.

Astrometry of asteroids when they are *not* close to Earth help to improve knowledge of their orbits around the sun. Objects are fainter (dimmer in reflected sunlight) the farther they are from the sun and Earth. So in CY 2018, cognizant of that priority, ***Spacewatch made 77% of all the observations of PHAs world-wide that were fainter than V magnitude 22.5 at the time of observation.***

In addition to distance, the time at which astrometry is done also determines its value in orbit determination. Observations that extend the calendric span of all of the observations of an object allow more accurate knowledge of its orbit and improve the chances that it can be recovered during future apparitions. Referring again to PHAs observed in CY2018, Spacewatch's astrometry extended the calendric span of 248 PHAs an average of 6 months, corresponding to an average of a 50% increase in calendar span of the observations of those objects.