EPSC Abstracts
Vol. 13, EPSC-DPS2019-1602-1, 2019
EPSC-DPS Joint Meeting 2019

EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

Asteroid Astrometry and Photometry Using the Gaia Reference Catalog

David Tholen
Institute for Astronomy, University of Hawaii, USA (tholen@ifa.hawaii.edu)

Abstract

Until the release of the Gaia astrometric reference catalog, astrometry of faint asteroids referenced to catalog positions of background stars suffered from both systematic and increased random error caused by the catalog. We will present multiple examples of how our use of the Gaia catalog has reduced systematic as well as random error. With over 4300 astrometric observations of near-Earth asteroids made with the University of Hawaii 2.24-m telescope having been measured against Gaia, the astrometric solution has contributed an average of 0.007 arcsec to the overall astrometric uncertainty, most of which is due to limits on our ability to measure the centroid of a star point source or trail from a telescope located near the bottom of the Earth's turbulent atmosphere. The limiting factor in the overall quality of the astrometry has been our centroiding on the target itself, which has averaged 0.058 arcsec. However, it should be noted that even perfect spatial astrometry can still show systematic error in an orbit solution if the time of the observation is incorrectly reported. Clock synchronization software that silently fails, or hardware that wasn't designed to handle the GPS week counter rollover issue, or simple delays in the motion of a mechanical shutter mechanism can all contribute to errors in the time of an observation. We will also demonstrate how the astrometric observation of GPS satellites can be used to not only monitor clock offsets, but also correct for errors in the coordinates of the telescope itself. We have also determined transformation equations to convert Gaia G band magnitudes to Johnson V. In cases where the color of the target asteroid is unknown, an assumed color slightly redder than the Sun is appropriate and results in a V-G value of about 0.3 mag. We have encountered a problem when computation of an exposure's photometric zero point involves non-stellar Gaia sources, because the results are quite dependent on the size of the synthetic aperture that has been chosen.