NEW WEB PORTAL FOR ASTORB, LOWELL OBSERVATORY'S PRIMARY ASTEROID DATABASE.

M. Bailen, N. Moskovitz, B. Burt, L. Wasserman, R. Schottland. U. S. Geological Survey, Astrogeology Science Center, 2255 N. Gemini Dr., Flagstaff, AZ, 86001 (mbailen@usgs.gov).

Summary: *astorb* [1] is a database of orbital elements for all known asteroids in the Solar System (780,489 objects as of 12 July 2018), has been hosted at Lowell Observatory for over 20 years, and is actively curated and automatically updated as new objects are discovered. Front-end access to the database and associated tools are available at asteroid.lowell.edu. Modernization and upgrades to the astorb system are ongoing with expected completion by mid-2019. Upgrades recently implemented include the addition of physical properties, such as albedo and rotation period, and redesigned observational planning tools, such as ephemeris and finder chart generators. Data on physical properties are pulled from multiple sources including NASA's Planetary Data System (PDS) [2], the asteroid Lightcurve Database (LCDB) [3], and a number of project-specific online compilations. Future upgrades will include additional physical properties, enhanced query capabilities, and a system for credentialed user input to the database as a way to facilitate rapid dissemination of observational results. User feedback on desired additional functionality is invited.

Overview of *astorb* Database: The *astorb* database has been maintained and developed at Lowell Observatory since the early 1990's. The database aims to be a public accessible, centralized, current and complete source for all asteroid data. On a monthly basis, MPC [4] observations are automatically downloaded and orbits are fit for new minor planets or existing minor planets with new observations. Orbit solutions are ingested directly into the SQL database, entries are created for new objects and new data on existing objects are updated appropriately. A background script monitors newly issued MPECs and immediately absorbs the orbital information into the database. In addition to orbital data, physical properties from public sources are incorporated into the holdings. The cadence of these inclusions depends on data release schedules and ranges from daily to one-time ingests. Actively maintained physical parameter databases are automatically monitored as new and updated data is ingested into *astorb*. Also occurring will be the ingestion of object-specific information submitted from vetted surveys and observers.
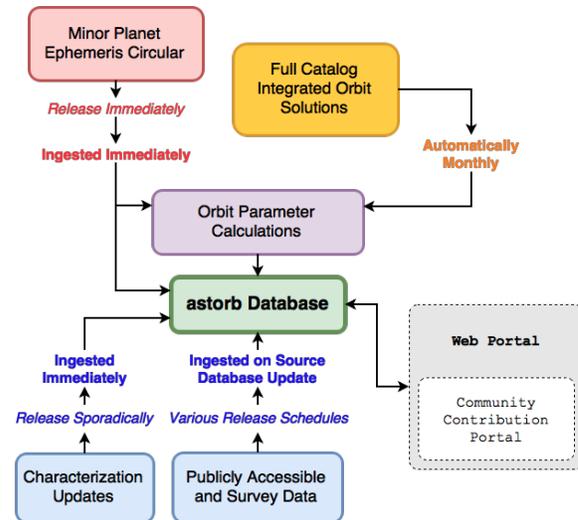

Figure 1. Workflow for the new *astorb* system.

Web Portal: In addition to numerous upgrades to the database and modernization of the tools used to access *astorb*, a new web portal (Figure 2) is being launched to simplify access to the data. The web portal will allow flexible search options based on dynamical types, semi-major axis, absolute magnitude, inclination, eccentricity and other fields. All searches will be plotted in real-time on a solar-system visualizer, allowing users to quickly appraise and cull their search results, thus narrowing down their area of interest. Options will be provided to download either plots of the data or CSV files listing asteroids and pertinent metadata. Once an asteroid is selected, its location will be plotted and a display panel with tabs will enable the user to access the orbital elements, lightcurve data, ephemeris data, characterization information, an orbital map and more.

References: [1] Moskovitz, N., et al., 2018, astorb at Lowell Observatory: A Comprehensive System to Enable Asteroid Science. American Astronomical Society, DPS meeting #50 id 408.08. [2] NASA PDS Small Bodies Node https://pds-smallbodies.astro.umd.edu/ [3] Warner, B., et al, 2009, The Asteroid Lightcurve Database, *Icarus*, Volume 202, Issue 1, p. 134-146. [4] IAU Minor Planet Center https://www.minorplanetcenter.net/iau/mpc.html
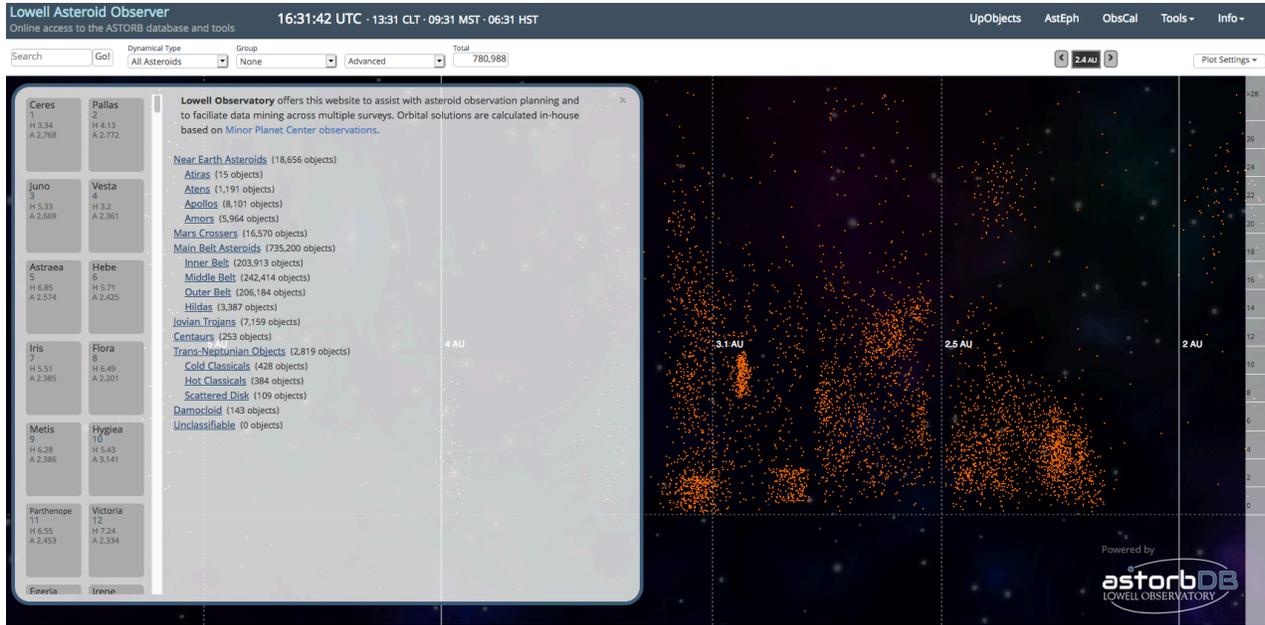
Figure 2: Screenshot of new web portal.