

Introduction to Catalogs_Plugin v1.00a

12 Nov 2021

This document is a short introduction to Catalogs_Plugin, a Java-based plugin for AstrolmageJ to query on-line photometry databases. The output is an AstrolmageJ-compatible radec file to overlay apertures on plate-solved images.

Update 12-Nov-2021:

Version 1.00a supports the VSP and APASS9 on-line catalogs as listed below

Version 1.00b: saves both selected and de-selected table records to radec file

Version 1.00c: adds option to download DSS fits file for current query parameters

Version 1.0d: plots target object altitude over 24 hr at geographic location specified in Coordinates Converter dialog. The object visibility plotter is based on the ING StarAlt program.

Note: screenshots may be from earlier versions.

Links:

AstrolmageJ:	https://www.astro.louisville.edu/software/astroimagej/
Variable Star Plotter:	https://app.aavso.org/vsp/
VizieR: (hosts APASS9 catalog)	http://cdsarc.u-strasbg.fr/doc/asu-summary.htx
Isaac Newton Group of Telescopes	http://catserver.ing.iac.es/staralt/index.php

Run plugin from AstrolmageJ toolbar

From the AstrolmageJ toolbar, select Plugins | Catalog Plugin to open the following form:

Simbad query successful for ObjectID: wasp 12

User interface after SIMBAD query on wasp 12

Note: the plugin runs as a modal dialog and must be closed to access other AIJ software.

SIMBAD Query – runs an object name-based query on Simbad on-line database. If a match is found, populates SIMBAD Data section as shown for WASP-12. In this example, no data was returned for R and I magnitude bands.

Save Query Data – saves current Catalog Query settings to disk; reloads saved data when plugin is closed and re-opened

Run Catalog Query – runs an on-line query on the selected catalog (APASS9) with user parameters specified in Catalog Query settings section. The results of a successful query are tabulated on the right of the form, shown in the next section.

Note: Current version (1.00a) limits total number download records to 1500.

Import RaDec File – reads and displays radec file data.

Close – closes plugin, any unsaved data will be lost.

Run an on-line catalog query:

The figure shows the interface after downloading data from the APASS9 catalog. All 70 records matching the specified query parameters are tabulated, sorted by increasing radial distance from the object star.

The screenshot displays the 'Catalogs Plugin ONEJAR-1.00a' window. On the left, there are buttons for 'SIMBAD Query', 'Save Query Data', 'Run Catalog Query', 'Import RaDec File', and 'Save RaDec File'. Below these are 'Update Table', 'Clear', and 'Close' buttons. The 'Catalog Query settings' section includes fields for 'ObjectID' (wasp 12), 'RA' (06:30:32.80), 'Dec' (+29:40:20.27), 'Fov' (10.0 arcmin), 'Limit' (15.0 mag), and 'Catalog' (APASS). The 'SIMBAD Data' section shows 'ObjectID: WASP-12', 'RA: 06:30:32.80', and 'DEC: +29:40:20.27'. The 'Filter Mag' section has 'MagB: 12.14', 'MagV: 11.57', and 'MagI: .'. The 'Set Mag Limits' section has 'Upper: 0', 'Nominal: 11.5', and 'Lower: 0'. The 'Ascending Sort' section has 'Distance' selected. The 'Nobs (APASS)' section has '1'. The 'Total records: 70' and 'Filtered records: 70' are displayed. The main table on the right lists 70 records with columns: Ap, ObjectID, Ra2000, Dec2000, Mag, Mag Err, Mag diff, Dist, Nobs, and USE. The records are sorted by increasing radial distance from the object star.

Ap	ObjectID	Ra2000	Dec2000	Mag	Mag Err	Mag diff	Dist	Nobs	USE
T01	wasp 12	06:30:32.80	+29:40:20.27	11.500	0.000	0.000	0.00	1	✓
C02	06303279+29402033	06:30:32.79	+29:40:20.33	11.415	0.070	-0.085	0.00	4	✓
C03	06303723+29400556	06:30:37.23	+29:40:05.56	15.175	0.083	3.675	0.99	4	✓
C04	06303103+29411843	06:30:31.03	+29:41:18.43	14.716	0.090	3.216	1.04	4	✓
C05	06302810+29400084	06:30:28.10	+29:40:00.84	15.839	0.122	4.339	1.07	3	✓
C06	06304003+29413214	06:30:40.03	+29:41:32.14	15.262	0.075	3.762	1.97	3	✓
C07	06303766+29420086	06:30:37.66	+29:42:00.86	15.711	0.000	4.211	1.98	2	✓
C08	06303481+29382199	06:30:34.81	+29:38:21.99	16.046	0.008	4.546	2.02	2	✓
C09	06303188+29422730	06:30:31.88	+29:42:27.30	11.983	0.081	0.483	2.13	4	✓
C10	06304243+29410531	06:30:42.43	+29:41:05.31	15.278	0.099	3.778	2.22	4	✓
C11	06302377+29391223	06:30:23.77	+29:39:12.23	13.973	0.064	2.473	2.27	4	✓
C12	06302522+29384115	06:30:25.22	+29:38:41.15	14.998	0.037	3.498	2.33	4	✓
C13	06303847+29422159	06:30:38.47	+29:42:21.59	15.978	0.071	4.478	2.37	2	✓
C14	06302618+29382110	06:30:26.18	+29:38:21.10	14.947	0.083	3.447	2.45	4	✓
C15	06303632+29375820	06:30:36.32	+29:37:58.20	12.963	0.074	1.463	2.49	4	✓
C16	06303223+29373473	06:30:32.23	+29:37:34.73	13.006	0.064	1.506	2.76	4	✓
C17	06302282+29383368	06:30:22.82	+29:38:33.68	14.619	0.092	3.119	2.80	4	✓
C18	06304613+29392873	06:30:46.13	+29:39:28.73	15.002	0.038	3.502	3.02	4	✓
C19	06303981+29374055	06:30:39.81	+29:37:40.55	10.203	0.076	-1.297	3.07	4	✓
C20	06304486+29383724	06:30:44.86	+29:38:37.24	15.386	0.113	3.886	3.13	2	✓
C21	06304305+29423509	06:30:43.05	+29:42:35.09	15.131	0.101	3.631	3.16	4	✓
C22	06304323+29375376	06:30:43.23	+29:37:53.76	13.641	0.071	2.141	3.33	4	✓
C23	06301809+29391979	06:30:18.09	+29:39:19.79	13.914	0.077	2.414	3.35	4	✓
C24	06302442+29372911	06:30:24.42	+29:37:29.11	13.335	0.076	1.835	3.38	4	✓
C25	06301861+29414715	06:30:18.61	+29:41:47.15	15.568	0.129	4.068	3.41	2	✓
C26	06304827+29393591	06:30:48.27	+29:39:35.91	11.381	0.058	-0.119	3.44	5	✓
C27	06304647+29383043	06:30:46.47	+29:38:30.43	14.135	0.058	2.635	3.49	5	✓
C28	06304824+29412601	06:30:48.24	+29:41:26.01	15.723	0.125	4.223	3.53	3	✓
C29	06302382+29431858	06:30:23.82	+29:43:18.58	15.767	0.120	4.267	3.55	2	✓
C30	06303980+29370443	06:30:39.80	+29:37:04.43	14.625	0.037	3.125	3.60	4	✓
C31	06302051+29424838	06:30:20.51	+29:42:48.38	15.906	0.000	4.406	3.63	2	✓
C32	06303876+29434608	06:30:38.76	+29:43:46.08	15.503	0.000	4.003	3.67	2	✓
C33	06302240+29371700	06:30:22.40	+29:37:17.00	15.473	0.069	3.973	3.80	4	✓
C34	06304828+29421207	06:30:48.28	+29:42:12.07	16.272	0.164	4.772	3.84	2	✓

User interface after Run Catalog Query

Ap – lists AstroImageJ aperture id

ObjectID – catalog object identifier.

Since records are not named in the APASS database, the plugin creates a unique identifier formatted HHMMSSSS±DDMMSSSS, as below for Ap C02

Ap	ObjectId	Ra2000	Dec2000
T01	wasp 12	06:30:32.80	+29:40:20.27
C02	06303279+29402033	06:30:32.79	+29:40:20.33

Ra200, Dec2000 – object coordinates

Mag, Mag Err – catalog magnitude values for selected filter band

Mag diff – difference between Catalog and Nominal magnitudes

Dist – radial distance (arcmin) to T01 object; by default, records are sorted by increasing radial distance.

Nobs – number of observations for each record (APASS)

USE – user selects or de-selects record to export to radec file.

Import RaDec File – over-writes current data with radec file data set.

Save RaDecFile – saves selected table data to AstrolmageJ-compatible file

<ObjectId>.<filter>.<fov>.radec.txt

Update Table – see below

Clear – clears table data

Apply user-selected filters and sort order:

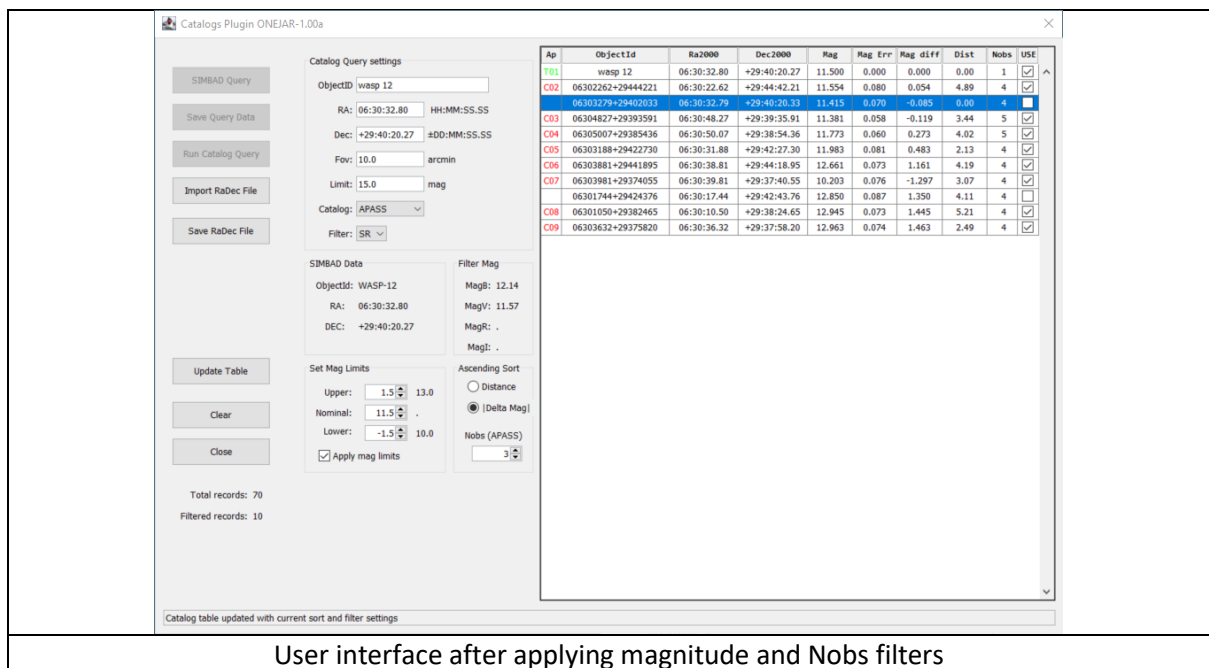
The tabulated record count is reduced to 10 records after applying the following filters:

Nominal (target) mag set to 11.5 mag

Mag range: 11.5 ± 1.5

Minimum number of observations: 3

Sort by: |Delta Mag|, i.e., by the absolute difference in comparison and nominal mag.

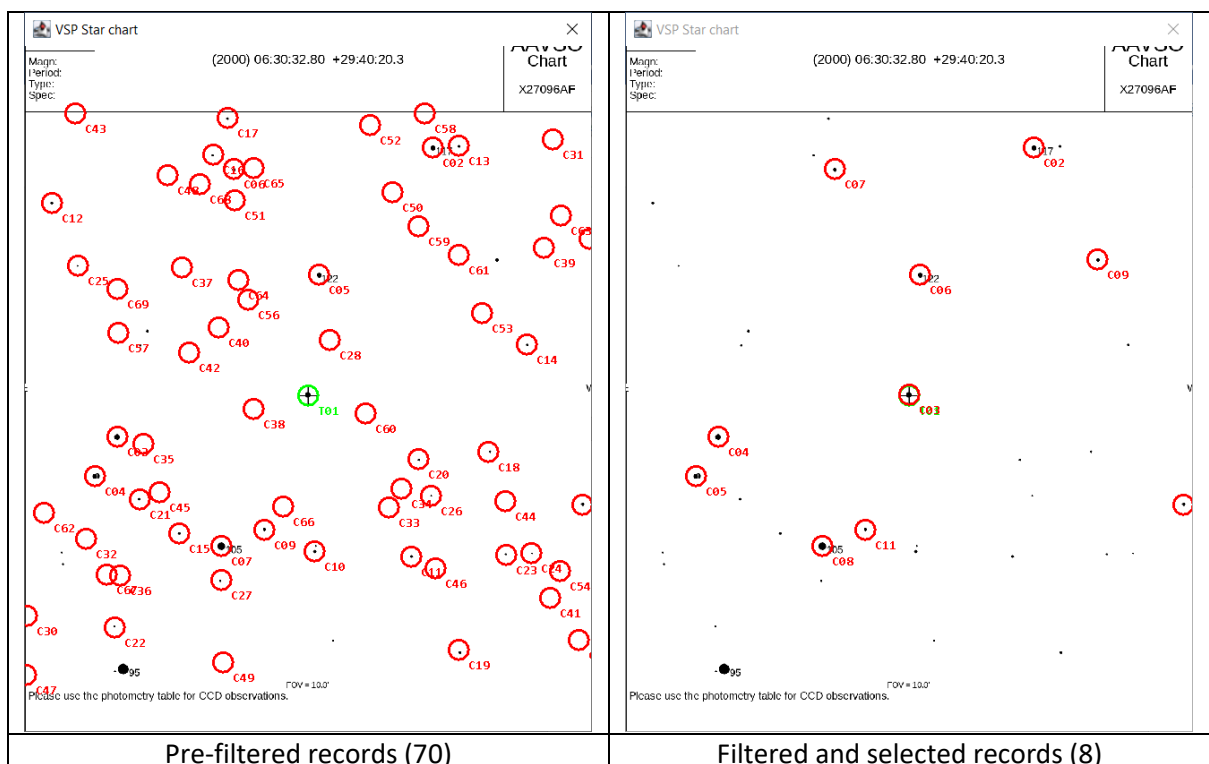


User interface after applying magnitude and Nobs filters

Update Table – applies selected sort order, magnitude and Nobs filter, selecting 10 of 70 records in this example.

USE – the figure shows two de-selected records with Ap column automatically entries updated accordingly.

VSP Chart



The left figure shows VSP chart opened after running a catalog query and the right figure after applying filter and user selections.

Save Radec File - saves the right-hand data set to a text file: wasp_12.SR.010.radec.txt

Example workflow

Open Catalogs_Plugin, enter ObjectID and run SIMBAD query to download coordinates and available magnitude data.

Input other Catalog Query settings and enter an estimate Nominal magnitude for this object, e.g., based on SIMBAD magnitude for that filter band.

Run Catalog Query to download all records matching query parameters. Set magnitude and Nobs (APASS catalog) filters and run Update as necessary until roughly 10 table records are displayed.

Review table and chart data to select or de-select table records. For example, in the filtered chart above, de-select C03 (overlaps target object) and (optionally) de-select the object at right edge of FOV.

Save chart data to radec file – the software automatically assigns filename with query-based format in radec subfolder.

Close Catalogs_Plugin, open a plate-solved image in AIJ image viewer, then import and over-lay apertures (File | Import Apertures from RA/DEC list ..., navigate to and select radec file).

Option: to change selected aperture, re-open Catalogs_Plugin, run Import Radec File and open saved radec file to import table records. De-select any unwanted apertures and save changes.

Note: Save RaDec File over-writes without warning any radec file for the same query settings.

Download Deep Sky Survey (DSS) Fits file option (v1.0c):

Run an on-line query or import radec file data as above to populate the catalog table.

Catalog Query settings

ObjectID:

RA: HH:MM:SS.SS

Dec: ±DD:MM:SS.SS

Fov: arcmin

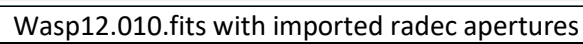
Limit: mag

Catalog:

Filter: ☒ Save DSS Fits File

Save DSS checkbox (v1.0c)

Close the Catalogs_Plugin, open wasp12.010.fits in AIJ and import radec apertures as below



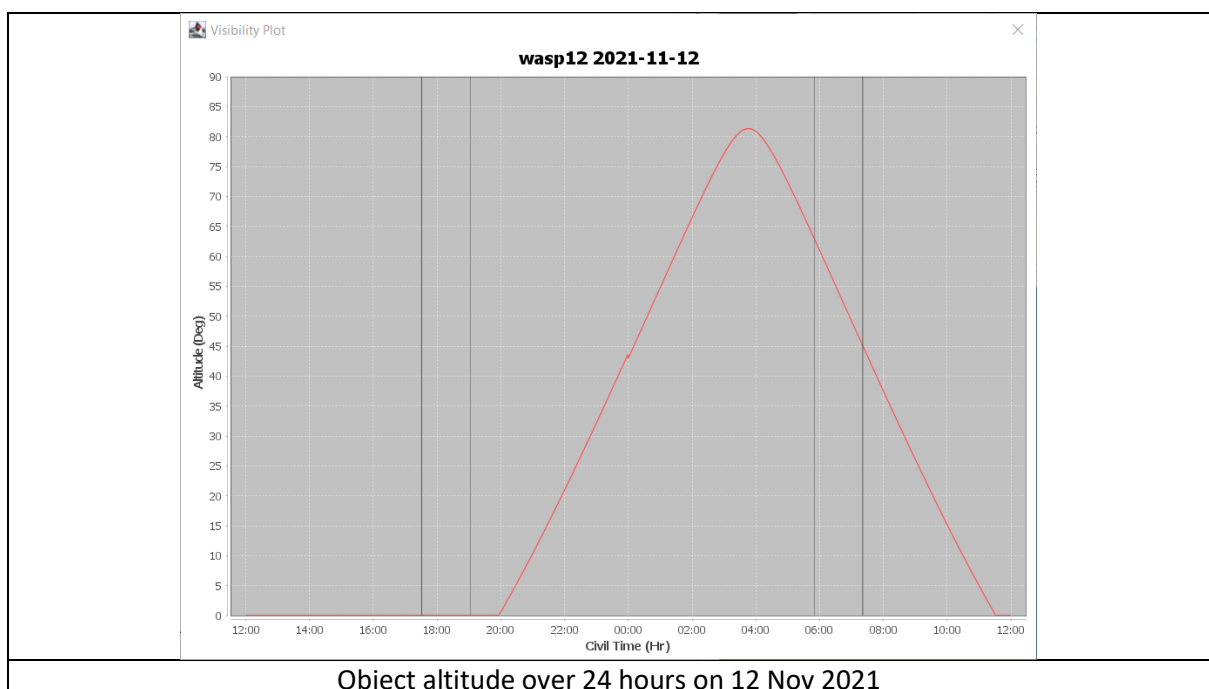
Plot target object altitude over 24-hour period

Version 1.0d with Plot Altitude control

The Geographic location and UTC offsets are imported from the Coordinates Converter dialog, saved in AIJ_Prefs.TXT file. In this case, the observing site is Moore Observatory and UTC offset is -5 hour (EST). The date picker automatically opens with today's date (November 12, 2021).

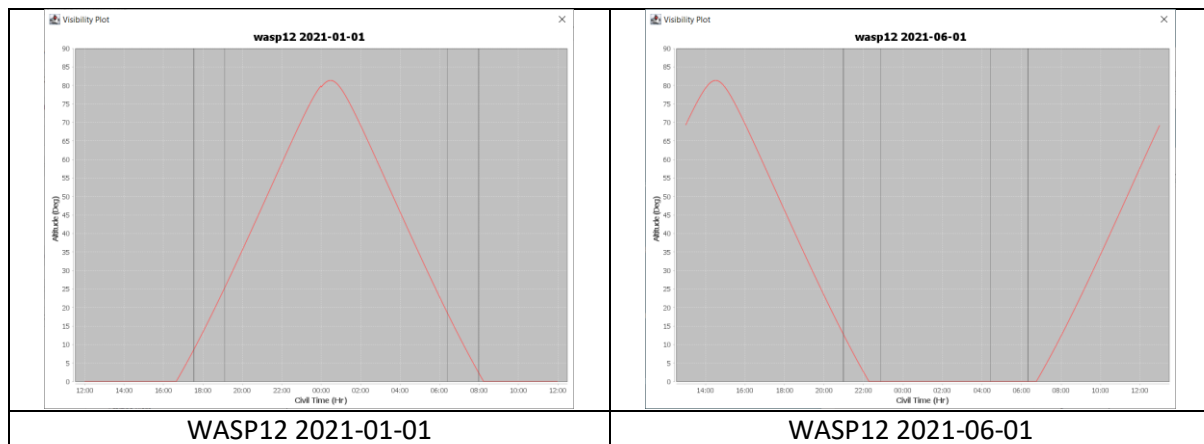
Civil Solar Times section shows Starting Night sunset and twilight end times, and twilight start and sunrise times for the next day (Nov 13). These times automatically update when the user selects another date.

Click [Plot Altitude] to open a new Visibility chart



The red line plots target object altitude against local time (EST), and clips to 1 when object goes below the horizon. The outer vertical lines mark sunset and sunrise, the inner lines mark twilight end and start times.

Example January and June plots for WASP12:



Notes

Main reference for astronomical calculations: *Practical Astronomy with your Calculator or Spreadsheet*, 4th ed. P. Duffett-Smith, J. Zwart.

JFreeChart graphing software: <https://www.jfree.org/jfreechart/> LGPL licence.

Date picker control: <https://github.com/LGoodDatePicker/LGoodDatePicker> MIT licence.

ING Object Visibility functions *not* implemented in v1.0d include plotting moon altitude and Startrack plotting object altitude-azimuth over the observing night.