MOST - Moving Object Search Tool for NEOWISE and IRSA

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Introduction

Objectives

Top Level Design

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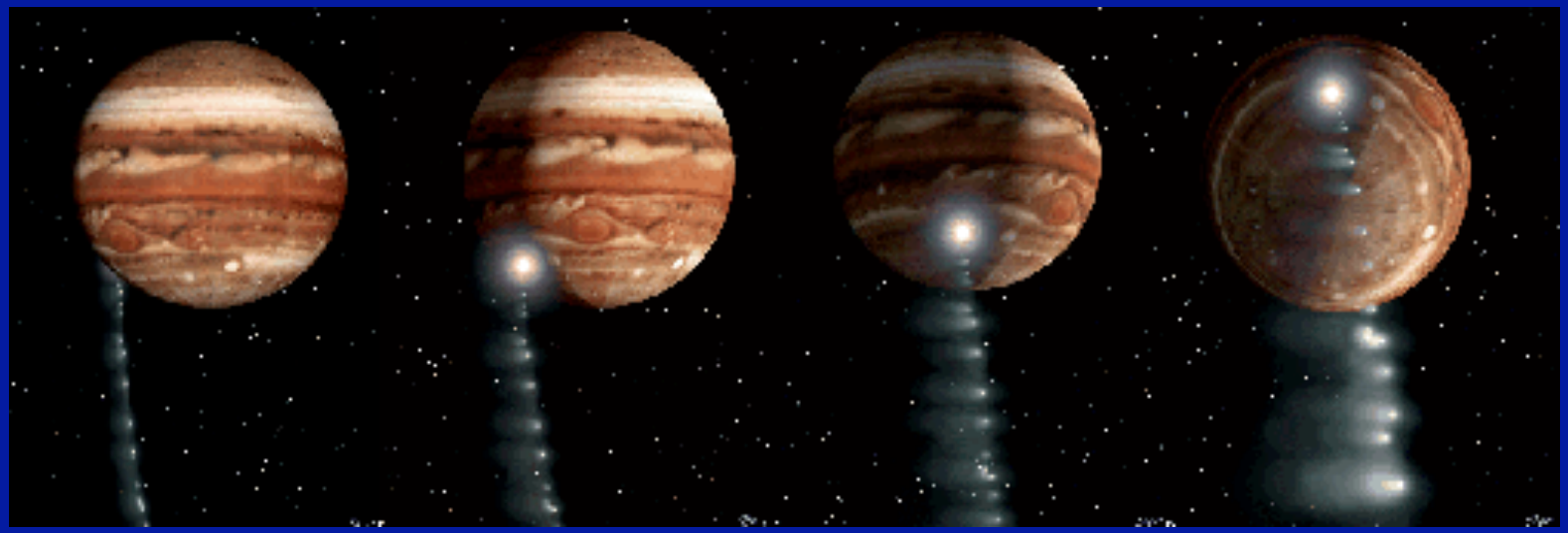
Introduction

Site of the 1908 Tunguska Event in Siberia, Russia.

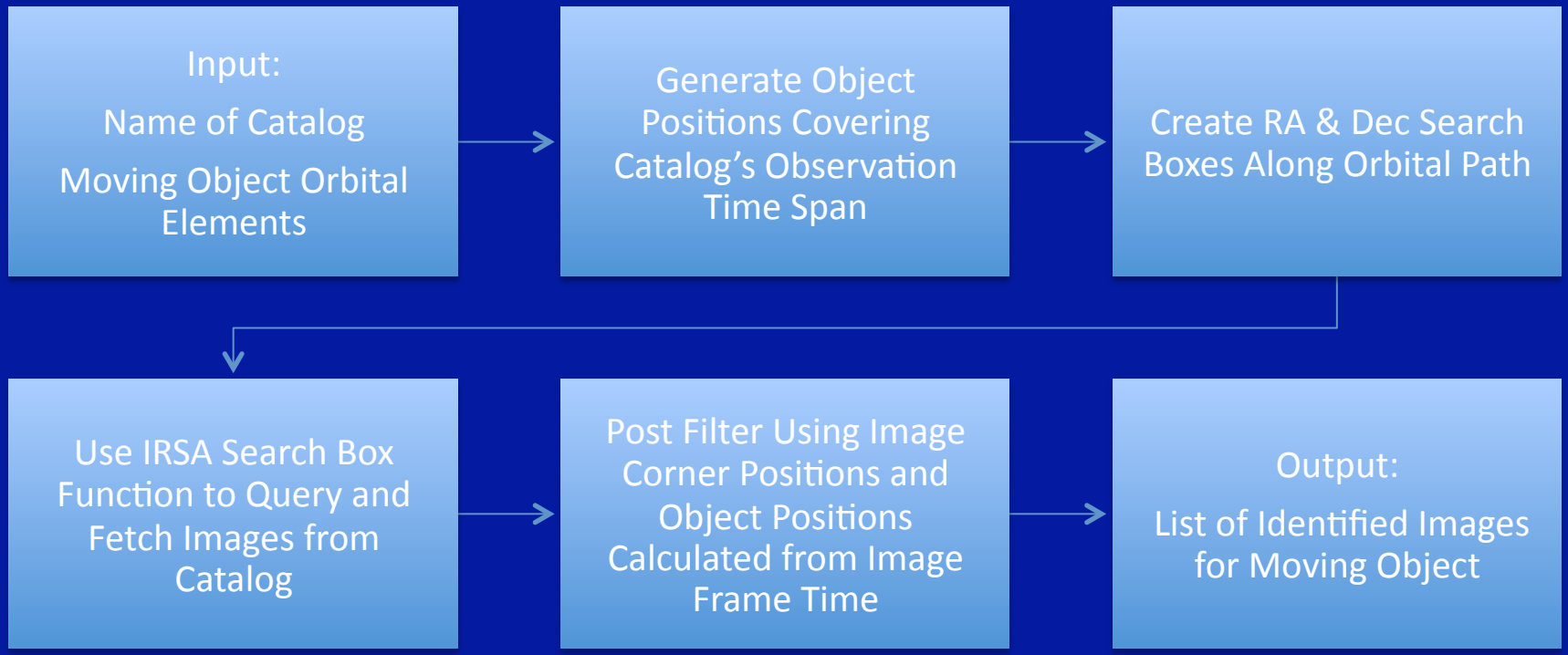


Comet Shoemaker-Levy 9 collision with Jupiter in July 1994.

Objectives

To enable researchers to search for asteroids, comets and any other serendipitous objects in the Solar System in the infrared astronomical catalogs of WISE and other IRSA archives such as Spitzer and PTF (Palomar Transient Factory).

Top Level Design



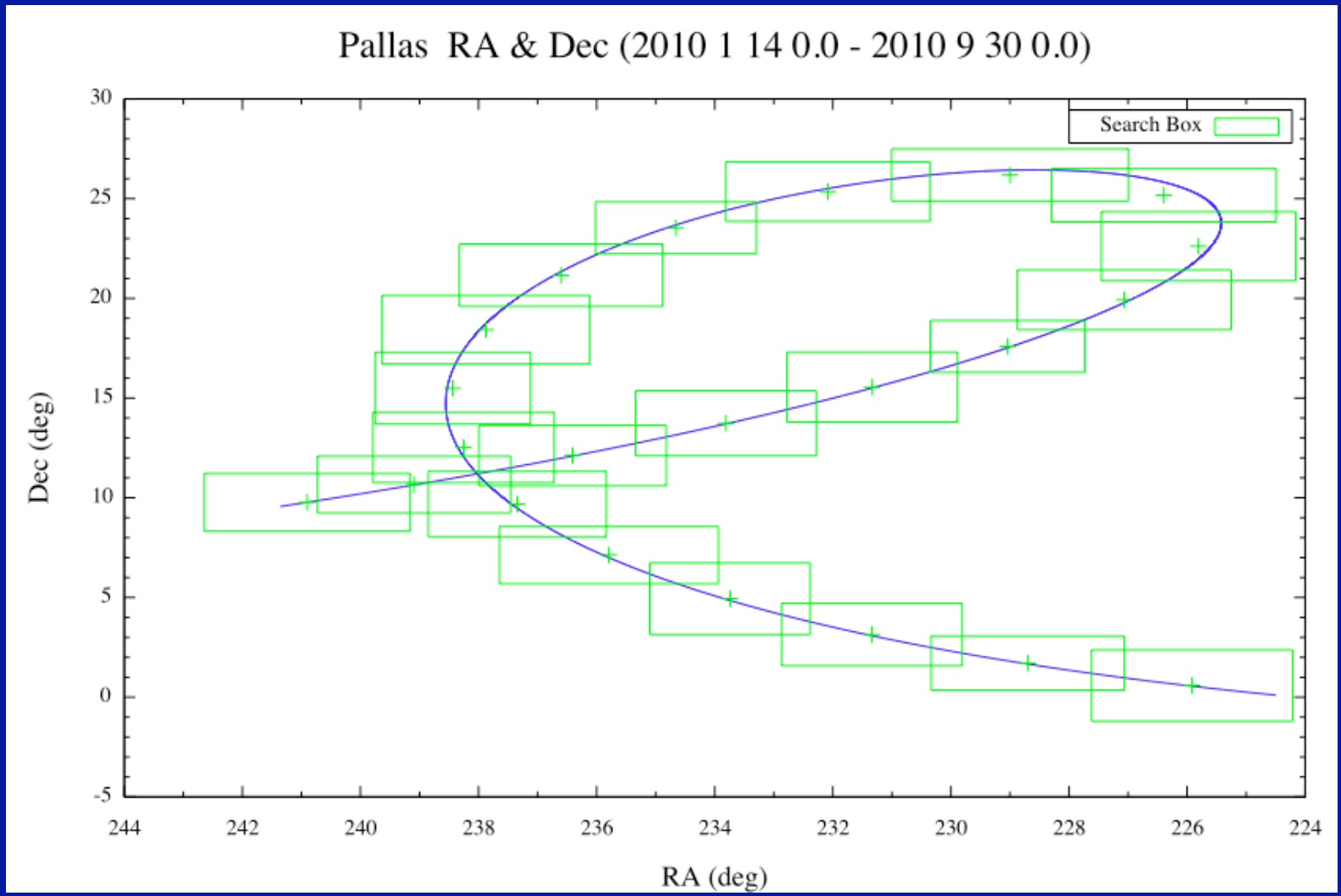
Special Features of Search Method

Narrow down the millions of images using a combined spatial and temporal search method.

1. Use search boxes to constraint search to certain regions of sky – by only selecting images along orbital track.
2. Use the image frame time tag to further refine the searches - by directly calculating the object position using frame time instead of a curve fit.

• Advantages over other algorithms: For example, SkyMorph used by NEAT searches every image frame.

Spatial Constraint Technique Using RA and Dec Search Boxes



Current Status and Results

MOST (Moving Object Search Tool)

Running Notes: Orbital parameters can be input by way of a known moving object name, an input file containing the orbital parameters or manually typing in each of the parameter values.

Search Criteria:

Catalog [wise_prov]

Observation Begin [2010 1 14 12:00:00.000]

Observation End [2010 9 30 12:00:00.000]

Ephemeris Step Size (day) [0.5]

Output Mode [Full]

Orbital Paramter Input:

(•) **(a) Name Input**

Object Name [Victoria]

( ) **(b) File Input:**

Orbital Parameter File [ ] [Browse...]

( ) **(c) Manual Input:**

Object Designation [ ]

Epoch (MJD) [ ]

Semi-major Axis (AU) [ ]

Eccentricity [ ]

Inclination (deg) [ ]

Argument of Perihelion (deg) [ ]

Ascending Node (deg) [ ]

Mean Anomaly (deg) [ ]

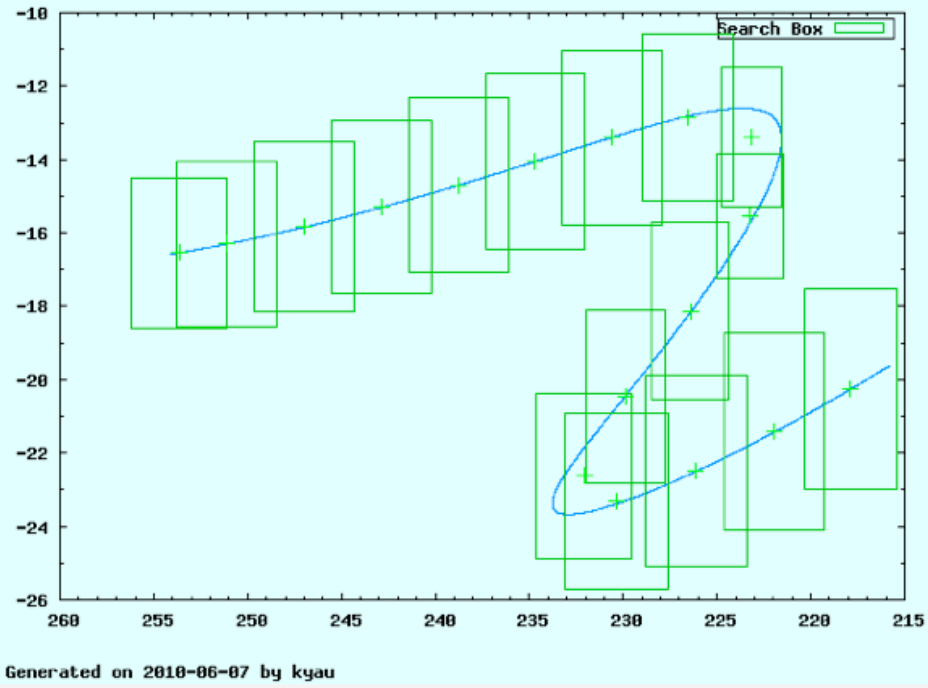
[Submit Query] [Reset]

MOST (Moving Object Search Tool) Output

MOST Input Directory: /irsa/cm/ws/kyau/irsa/web/cgi-bin/MOST/input
MOST Output Directory: /work/kyau_9160/TMP_xYcemh/MOST/pid25827
MOST Workspace URL: http://bacchus:9160/workspace/kyau_9160/TMP_xYcemh/MOST/pid25827

Orbital Path Plot for: Victoria

Observation Span: 2010 1 14 12:00:00.000 to 2010 9 30 12:00:00.000



Plotfile: http://bacchus:9160/workspace/kyau_9160/TMP_xYcemh/MOST/pid25827/orbitplot.png

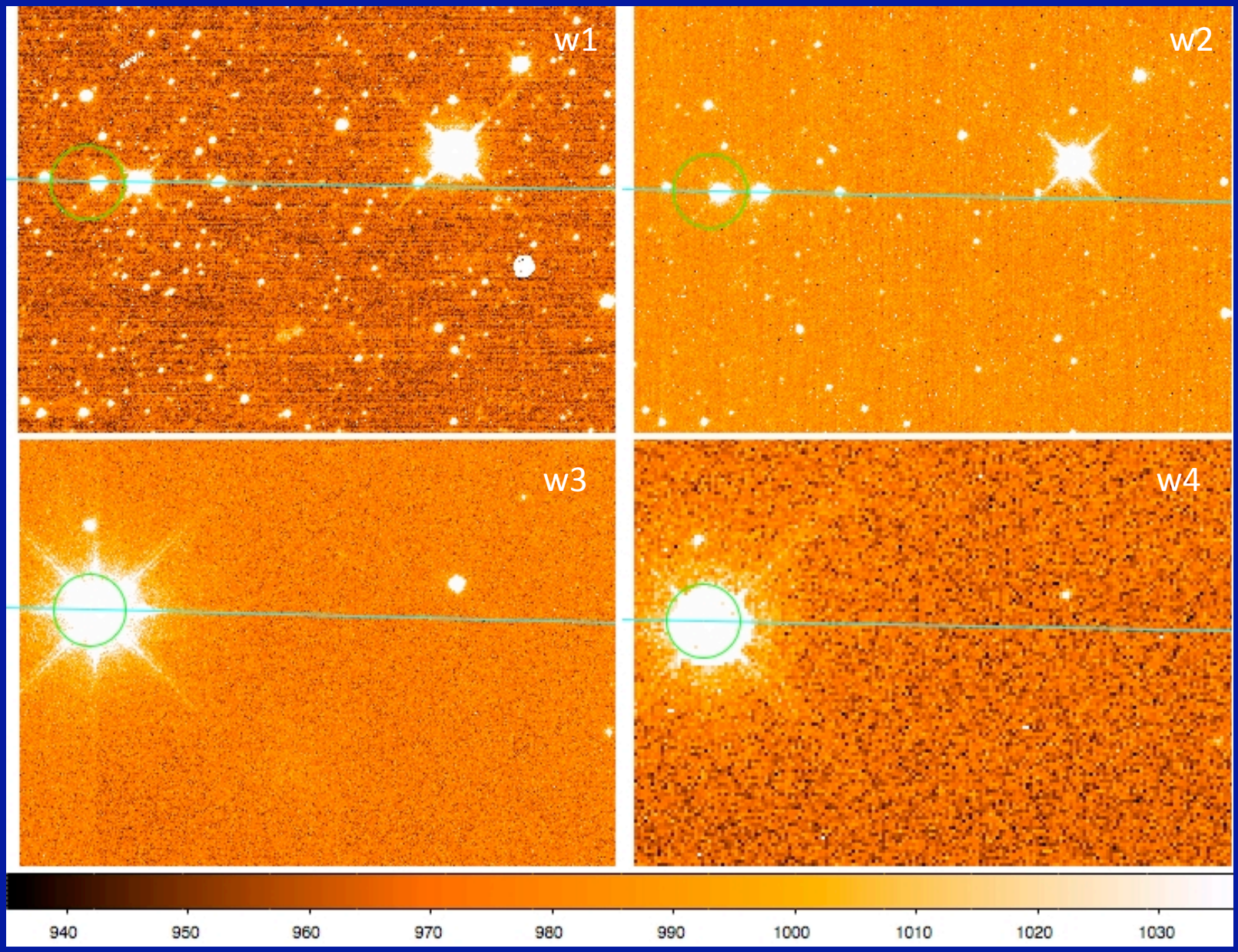
Search Results:

Summary of Object Orbital Parameters

bodyID : 12
name : Victoria
epochMJD : 55400.000000
epochOsc : 2455400.500000
semimajorAxis : 2.3339919
eccentricity : 0.22022357
inclination : 8.36352
argumentPerihelion : 69.80896
longitudeAscendNode : 235.50722
meanAnomaly : 328.5365330
magnitudeParamH : 7.24
magnitudeParamG : 0.22
ref : JPL 64

Image Frames with a Matched Object Position are given in the Table below.

scan ID	frame ID	band	date_obs	time_obs	mjd_obs	ra_obj	dec_obj	sun_dist	geo_dist	dist_ctr	click col	download
01602a	82	1	2010-02-05	12:48:59.460	55232.53402153	223.568006	-21.864435	2.33732	2.13775	0.33612	see image	region file
01602a	82	2	2010-02-05	12:48:59.460	55232.53402153	223.568006	-21.864435	2.33732	2.13775	0.33585	see image	region file
01602a	82	3	2010-02-05	12:48:59.460	55232.53402153	223.568006	-21.864435	2.33732	2.13775	0.33575	see image	region file
01602a	82	4	2010-02-05	12:48:59.460	55232.53402153	223.568006	-21.864435	2.33732	2.13775	0.33587	see image	region file
01604a	136	1	2010-02-05	14:24:09.496	55232.60010991	223.588866	-21.869880	2.33715	2.13675	0.32541	see image	region file
01604a	136	2	2010-02-05	14:24:09.496	55232.60010991	223.588866	-21.869880	2.33715	2.13675	0.32587	see image	region file
01604a	136	3	2010-02-05	14:24:09.496	55232.60010991	223.588866	-21.869880	2.33715	2.13675	0.32654	see image	region file
01604a	136	4	2010-02-05	14:24:09.496	55232.60010991	223.588866	-21.869880	2.33715	2.13675	0.32545	see image	region file
01604a	137	1	2010-02-05	14:24:20.500	55232.60023727	223.588907	-21.869890	2.33715	2.13675	0.38603	see image	region file
01604a	137	2	2010-02-05	14:24:20.500	55232.60023727	223.588907	-21.869890	2.33715	2.13675	0.38561	see image	region file
01604a	137	3	2010-02-05	14:24:20.500	55232.60023727	223.588907	-21.869890	2.33715	2.13675	0.38487	see image	region file
01604a	137	4	2010-02-05	14:24:20.500	55232.60023727	223.588907	-21.869890	2.33715	2.13675	0.38610	see image	region file
01669b	159	1	2010-02-07	18:48:31.837	55234.78370182	224.270653	-22.045764	2.33174	2.10391	0.37661	see image	region file
01669b	159	2	2010-02-07	18:48:31.837	55234.78370182	224.270653	-22.045764	2.33174	2.10391	0.37658	see image	region file
01669b	159	3	2010-02-07	18:48:31.837	55234.78370182	224.270653	-22.045764	2.33174	2.10391	0.37620	see image	region file
01669b	159	4	2010-02-07	18:48:31.837	55234.78370182	224.270653	-22.045764	2.33174	2.10391	0.37688	see image	region file
01673b	158	1	2010-02-07	21:59:02.921	55234.91600603	224.311486	-22.056170	2.33141	2.10192	0.25585	see image	region file
01673b	158	2	2010-02-07	21:59:02.921	55234.91600603	224.311486	-22.056170	2.33141	2.10192	0.25603	see image	region file
01673b	158	3	2010-02-07	21:59:02.921	55234.91600603	224.311486	-22.056170	2.33141	2.10192	0.25597	see image	region file
01673b	158	4	2010-02-07	21:59:02.921	55234.91600603	224.311486	-22.056170	2.33141	2.10192	0.25612	see image	region file
01677b	158	1	2010-02-08	01:09:34.004	55235.04831023	224.352263	-22.066547	2.33108	2.09993	0.27633	see image	region file
01677b	158	2	2010-02-08	01:09:34.004	55235.04831023	224.352263	-22.066547	2.33108	2.09993	0.27677	see image	region file
01677b	158	3	2010-02-08	01:09:34.004	55235.04831023	224.352263	-22.066547	2.33108	2.09993	0.27729	see image	region file
01677b	158	4	2010-02-08	01:09:34.004	55235.04831023	224.352263	-22.066547	2.33108	2.09993	0.27646	see image	region file
01681b	158	1	2010-02-08	04:20:05.083	55235.18061439	224.392984	-22.076895	2.33075	2.09794	0.39367	see image	region file
01681b	158	2	2010-02-08	04:20:05.083	55235.18061439	224.392984	-22.076895	2.33075	2.09794	0.39413	see image	region file
01681b	158	3	2010-02-08	04:20:05.083	55235.18061439	224.392984	-22.076895	2.33075	2.09794	0.39483	see image	region file
01681b	158	4	2010-02-08	04:20:05.083	55235.18061439	224.392984	-22.076895	2.33075	2.09794	0.39369	see image	region file
01681b	159	1	2010-02-08	04:20:16.088	55235.18074176	224.393023	-22.076905	2.33075	2.09794	0.30884	see image	region file
01681b	159	2	2010-02-08	04:20:16.088	55235.18074176	224.393023	-22.076905	2.33075	2.09794	0.30840	see image	region file
01681b	159	3	2010-02-08	04:20:16.088	55235.18074176	224.393023	-22.076905	2.33075	2.09794	0.30767	see image	region file
01681b	159	4	2010-02-08	04:20:16.088	55235.18074176	224.393023	-22.076905	2.33075	2.09794	0.30889	see image	region file
01685b	159	1	2010-02-08	07:30:47.167	55235.31304591	224.433689	-22.087223	2.33042	2.09595	0.15294	see image	region file
01685b	159	2	2010-02-08	07:30:47.167	55235.31304591	224.433689	-22.087223	2.33042	2.09595	0.15248	see image	region file
01685b	159	3	2010-02-08	07:30:47.167	55235.31304591	224.433689	-22.087223	2.33042	2.09595	0.15187	see image	region file
01685b	159	4	2010-02-08	07:30:47.167	55235.31304591	224.433689	-22.087223	2.33042	2.09595	0.15285	see image	region file



A Sample of Identified Image Frames containing Asteroid Victoria for the four WISE bands w1, w2, w3 and w4 respectively at 3.4, 4.6, 12 and 22 µm.

Next Steps

- Improve accuracy of results by revising the computation steps.
- Improve efficiency of search by automatically adjusting the size of search boxes based on the motion of the object.
- Integrate the standalone tool into the WISE image archive service.

Future Plans

- Extend the search tool to include multiple image sets from other IRSA archives.
- An observer module to handle different spacecraft parameters.
- Ability to find nearby images, useful in refining orbit.
- Draw vectors to indicate comet tail direction.

Conclusions

- Will provide a tool that will help researchers to locate image frames containing asteroids and comets in the WISE archive and also other IRSA catalogs.
- Which will help researchers study and understand their physical parameters and long-term orbital evolution especially those Near Earth Objects.
- Hopefully will prevent us from following the path of dinosaurs.

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HELP!