

Ondřejov Southern Sky Photometry Survey

Dynamic Light curves

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- ▶ **Introduction**
 - ▶ Data
 - ▶ Continuous identification
- ▶ **Identification**
 - ▶ Constructing identifiers
 - ▶ Crossmatching
- ▶ **Light curve publication**
 - ▶ SSAP + Datalink
- ▶ **Practical**



- ▶ Data from several working groups
 - ▶ e.g. small planet light curves
- ▶ 99 % of data is not used
- ▶ Image coverage
 - ▶ Project objectives can move
 - ▶ No fixed survey grid
 - ▶ Image coverage can shift randomly
- ▶ ~ 300 mil measurements (several bands)
- ▶ ~ 8 mil sources and growing



Overlap images (standard)

- ▶ Need previous images
- ▶ Exactly same regions
- ▶ Working with images, not objects
- ▶ Differential photometry, astrometry
- ▶ Specific for one survey

Process individually (ours)

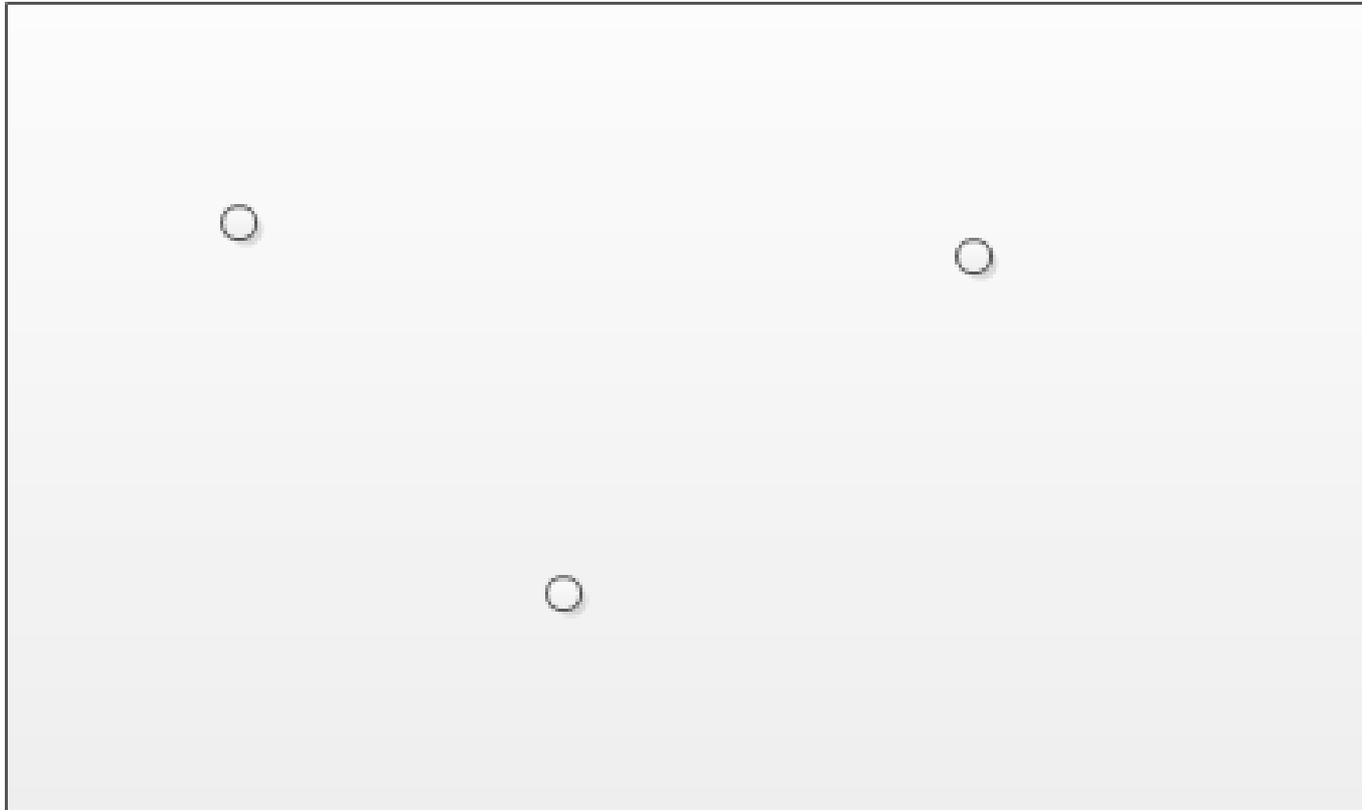
- ▶ Needs only identifiers
- ▶ Images can shift
- ▶ Working with actual data on the images
- ▶ Aperture photometry, astrometry (individual for each frame)
- ▶ Reusable for any image ever taken



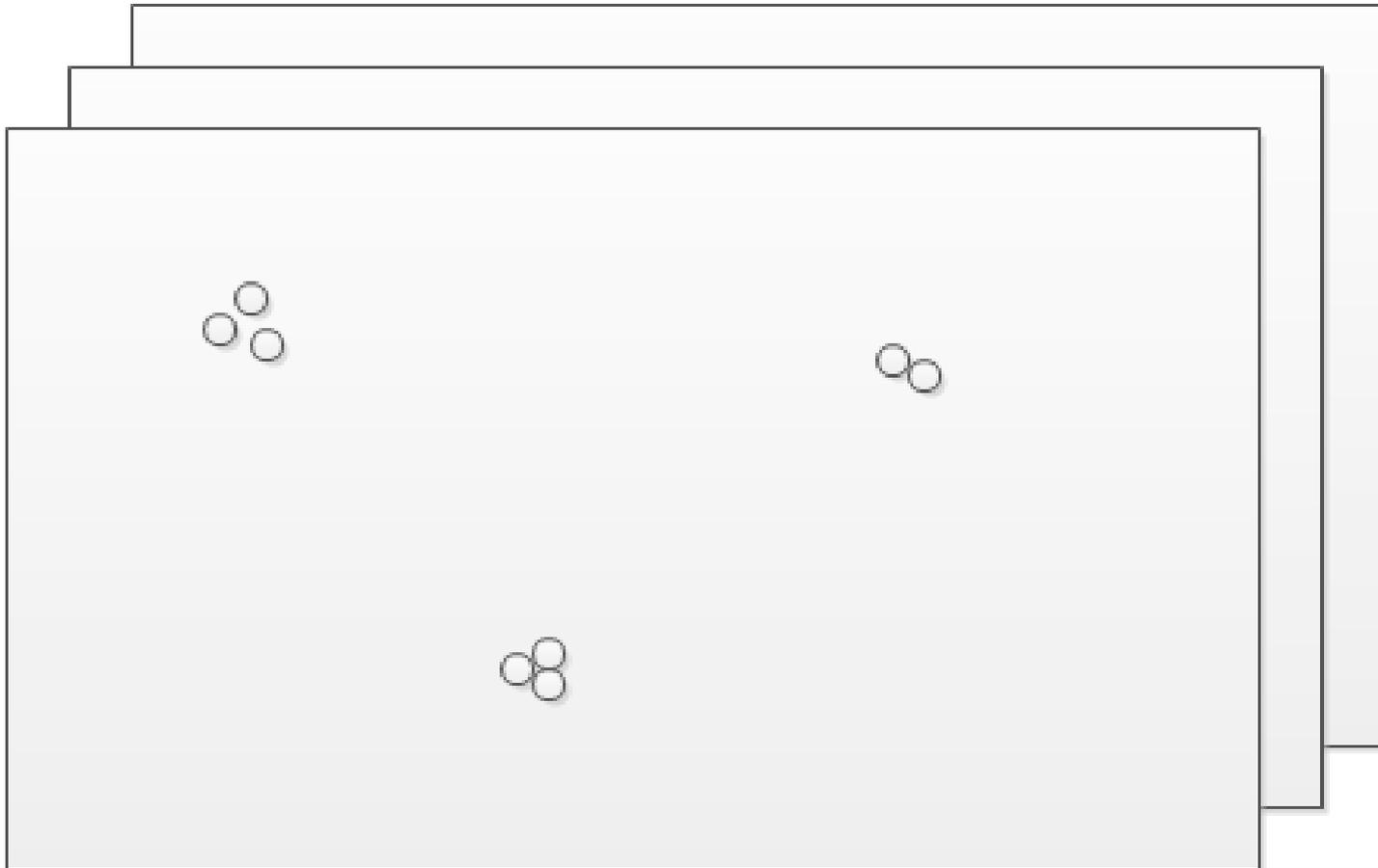
1. **Identify light dots on images with Munipack**
 - ▶ Astrometry + Photometry for individual images
2. **Generate common identifiers for actual objects**
 - ▶ Assigning the light dots to identifiers
3. **Dynamically construct light curve**
 - ▶ Possible cutout or any other post-processing



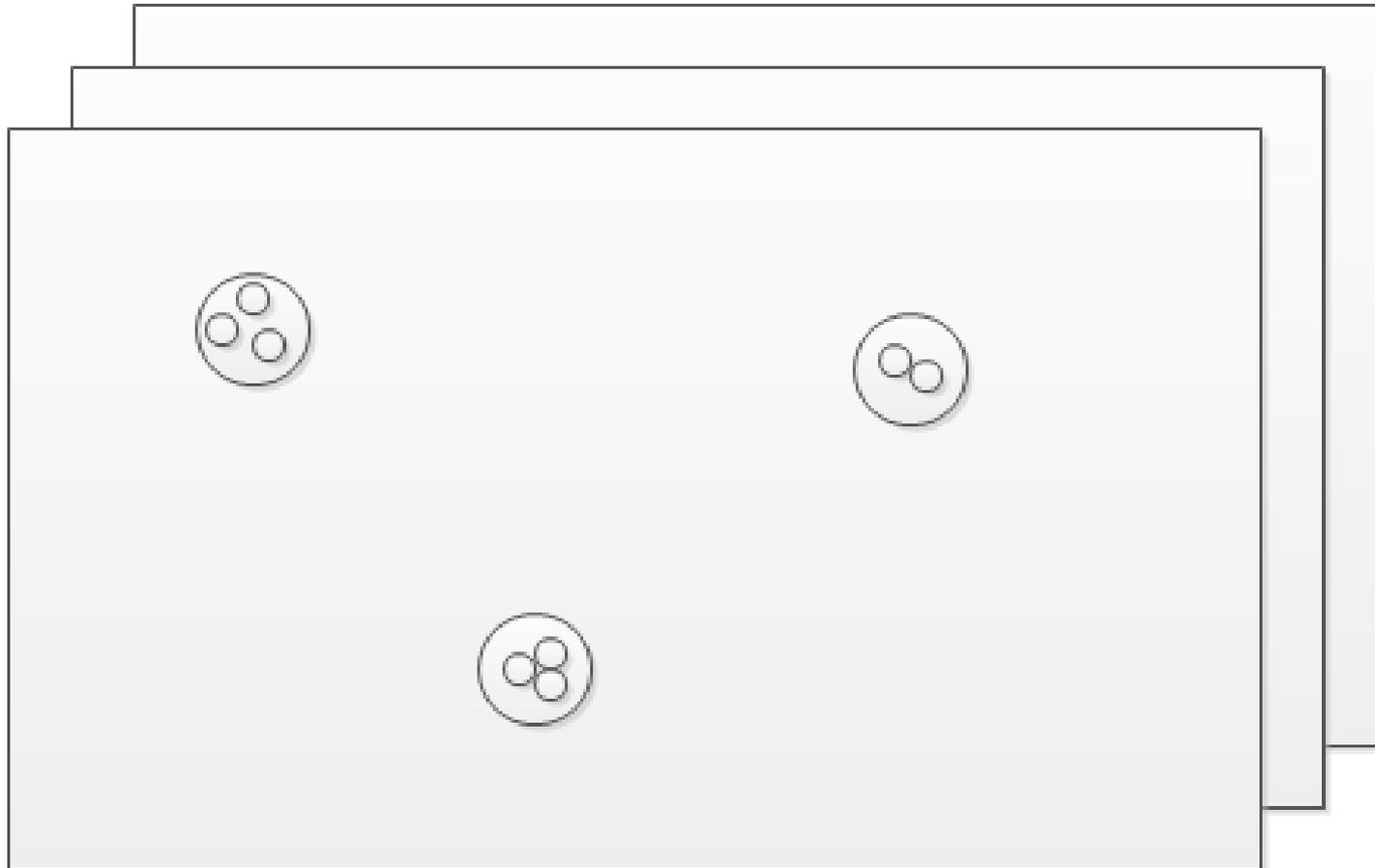
- ▶ Identified objects on one image (Munipack result)



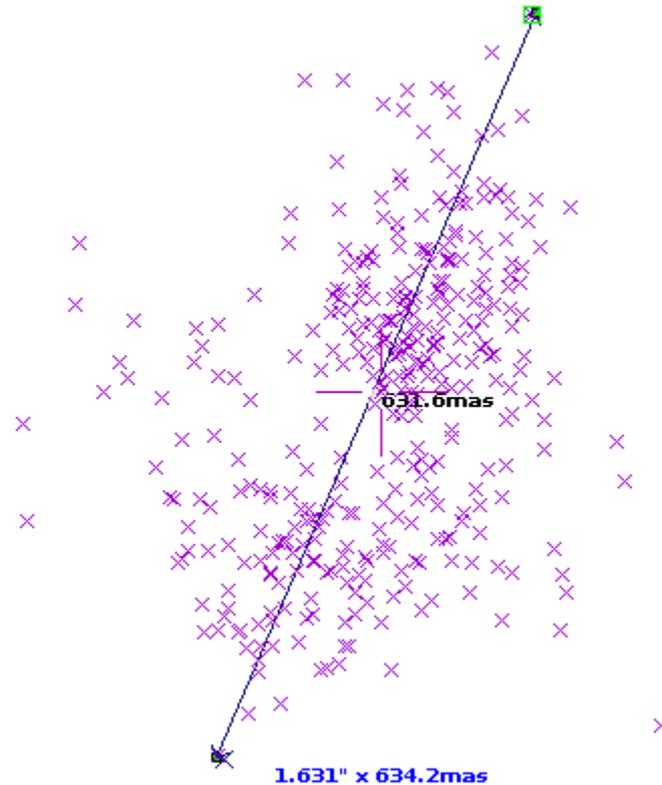
- ▶ Identified objects overlapped (error in astrometry)



- ▶ Identifying clusters of positions of light curves



► Identifying cluster



- ▶ **Strategy (version 2)**
 1. Generate catalog
 2. Cross-match observations
- ▶ **Continuous identification (updating catalog)**
 1. Is there catalog identifier?
 - ▶ No => Add identifier
 - ▶ Yes => Cross-match
 2. Possible Alerts
 - ▶ Mocks – is this object a nova?



- ▶ Technology for catalog generation
 - ▶ PostgreSQL with PgSphere + Q3C (indexing)
 - ▶ Python for parallelizing CPU-heavy parts
- ▶ Process
 1. Pick observation in center of the cluster
 2. Generate average coordinates from neighbors
- ▶ Sophistication question? (need optimization)
 - ▶ Lightweight iterative (95 % accuracy) ~ linear complexity
 - ▶ Self-join all (>99,9 % accuracy?) ~ quadratic complexity
 - ▶ Need combination



▶ SSAP service

- ▶ Slightly different from spectral data
- ▶ `ssap.xml?REQUEST=queryData&POS=13.15,-72.86&Band=I`
- ▶ Result: list of lightcurves

▶ Datalink post-processing

- ▶ Identified by catalog ID (ipix) + Bandpass (U,B,V,...)
- ▶ SDM model for light curve transfer
- ▶ Cutout on MJD
- ▶ `dlget?ID=6667183574623977470R`
- ▶ Result: Cutouted light curve in SDM



► **Absolutely dynamical (SQL + Python)**

```
SELECT
    hjd, mag
FROM
    \schema.objjobs_complete
WHERE
    ipix=...
AND
    band=...
ORDER BY
    hjd
```



► **SPLAT SSAP 00 52 42.75 -72 48 04.6**

Search parameters:

Simple Query

Object:

RA: Dec:

Radius:

Band: /

Time: /

Query Format: ▼

Wavelength calibration: ▼

Flux calibration: ▼



▶ SPLAT SSAP result

Query: <SERVER>?REQUEST=queryData&POS=13.178125,-72.80127777777778&FORMAT=COMPLIANT&SIZE=3.333333333333333E-4 SEND QUERY

Query results:

vos2 lc_test ✂

...	ssa_score	location_ra	location_dec	location_arr	target_arr	ssa_publisher	raj2000	dej2000	min_da
1	0.	13.1784	-72.8013	(13.178449, -72.801285)	(NaN, NaN)	ASU CAS	13.17845	-72.80128	5621
2	0.	13.1784	-72.8013	(13.178449, -72.801285)	(NaN, NaN)	ASU CAS	13.17845	-72.80128	5621
3	0.	13.1784	-72.8013	(13.178449, -72.801285)	(NaN, NaN)	ASU CAS	13.17845	-72.80128	5620
4	0.	13.1784	-72.8013	(13.178449, -72.801285)	(NaN, NaN)	ASU CAS	13.17845	-72.80128	5621

Display selected
Display all
Download selected
Download all
Deselect table
Deselect all
DataLink Services



▶ SPLAT SSAP length

Query results:

vos2lc_test ✂

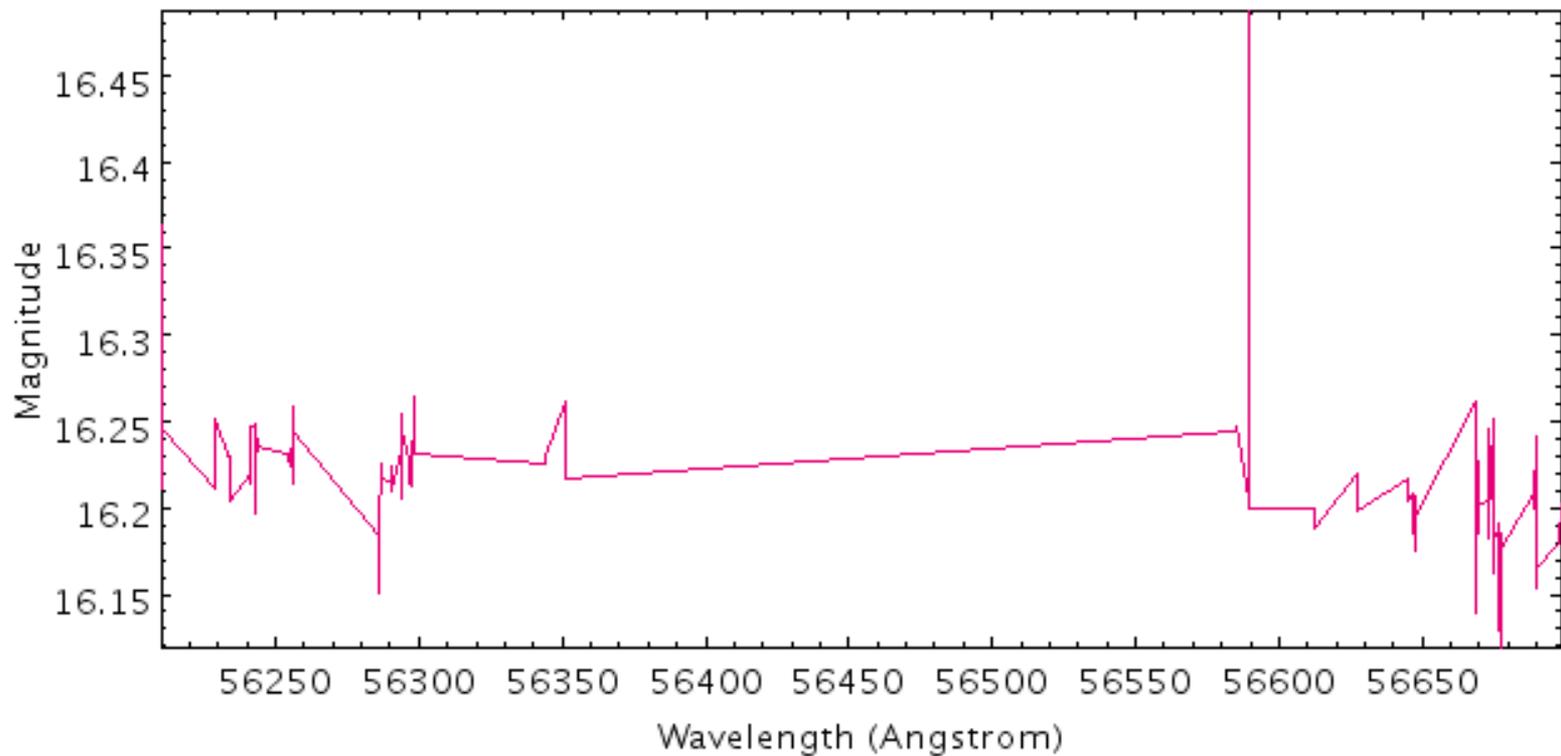
on	ssa_aperture	ssa_dateObs	ssa_timeExt	ssa_specmid	ssa_specext	ssa_specstart	ssa_specend	ssa_length
RS 13.1784485384...								169
RS 13.1784485384...								85
RS 13.1784485384...								357
RS 13.1784485384...								108

Display selected Display all Download selected Download all Deselect table Deselect all DataLink Services



▶ Whole light curve

2-d compound coordinate system

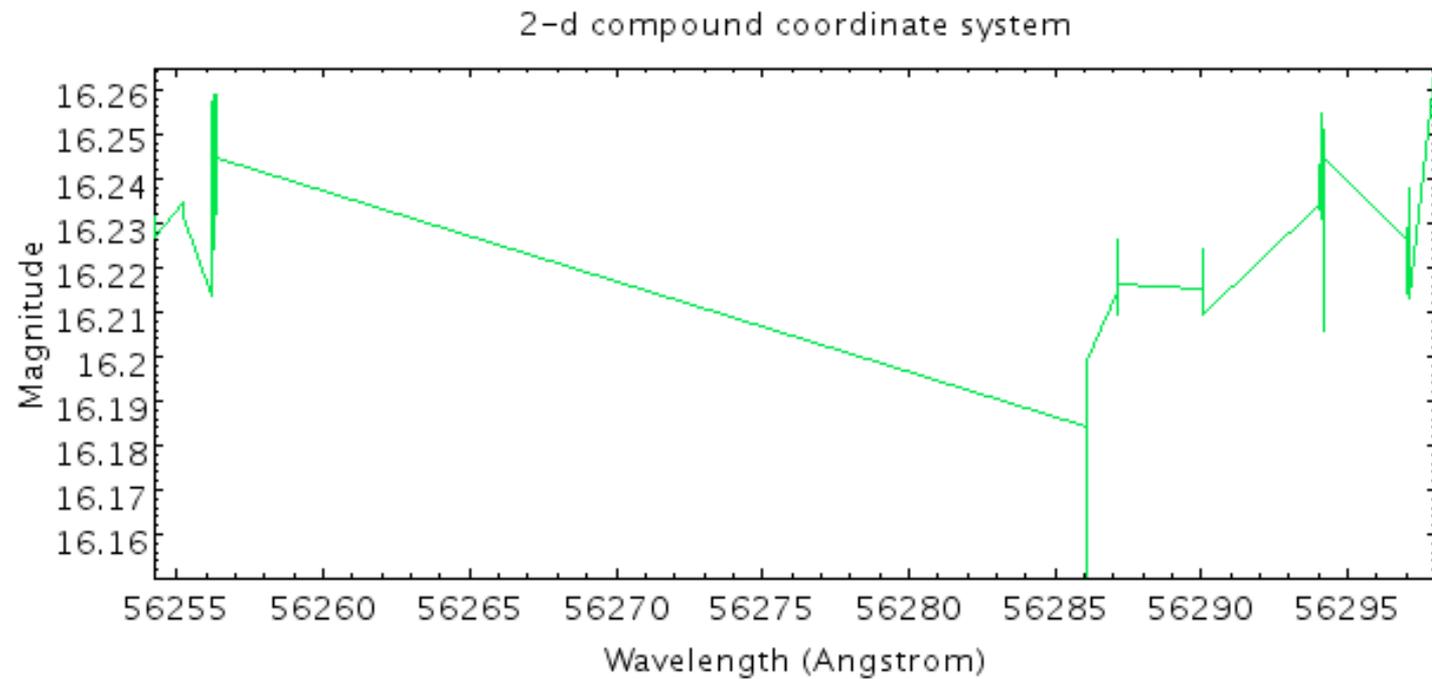


▶ SPLAT datalink

The screenshot shows a web browser window with a dialog box titled "Parameters for Server-Generated data processing". The dialog box contains three input fields: "DATE_MIN:", "DATE_MAX:", and "FORMAT:". A black tooltip box is overlaid on the "DATE_MAX:" field, containing the text "Time epoch cutout interval, lower limit values: [56210.0535832..56698.1533136]". Below the input fields is a button labeled "Clear parameters". In the background, a URL fragment is visible: "...77777778&FORMAT=COMPLIANT&". At the bottom of the page, there are input fields for "ssa_specmid", "ssa_specext", and "ssa_".



► Light curve cutout



▶ Aladin SIAP

The screenshot shows the Aladin SIAP web interface. At the top, there are navigation tabs: "Others", "Allsky", "File", "all VO", "Watch", "FoV...", and "Tools...". The main content area is titled "Ondrejov DK154 SIAP reduced" and contains the following search parameters:

- Target (ICRS, name): 013.17042 -72.80300
- Radius: 16.81"
- Filter: ex: 14' or 1.5deg or 12'x16'
- Format: image/fits

Below the search parameters is a list of image files, each with a checkbox and a file name:

File Name	Format	Dimensions
<input checked="" type="checkbox"/> 0SPS 2012-10-10T01:17:34.904 I smcfield03	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-10-10T01:14:09.896 I smcfield03	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T05:33:11.632 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T02:52:06.452 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T03:04:35.240 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T02:58:20.360 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T05:39:26.624 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2012-12-09T05:45:40.544 I sc3	I	14.3' x 13.6'
<input checked="" type="checkbox"/> 0SPS 2013-12-01T05:25:18.086 I SMC_field03	I	14.3' x 13.6'

At the bottom of the interface, there are buttons for "Reset", "Clear", "SUBMIT", "Close", and a help icon. A sidebar on the left lists "Image servers" (Aladin images, SkyView, UKIDSS, Sloan, DSS..., VLA..., Archives..., DK154, others...) and a sidebar on the right lists "Catalog servers" (All VizieR, Surveys, Missions, SIMBAD, NED, SkyBot, others...).

▶ Aladin SCS

Others      

Image servers

-  Aladin images
-  SkyView
-  UKIDSS
-  Sloan
-  DSS...
-  VLA...
-  Archives..
-  DK154
-  Others...

Catalog servers

-  All VizieR
-  Surveys
-  Missions
-  SIMBAD
-  NED
-  iSee SkyBot
-  Others..

○ Gavo application in Ondrejov ?

Fill in all these fields and press the SUBMIT button

Target (ICRS, name) [Grab co...](#)

Radius

Filter

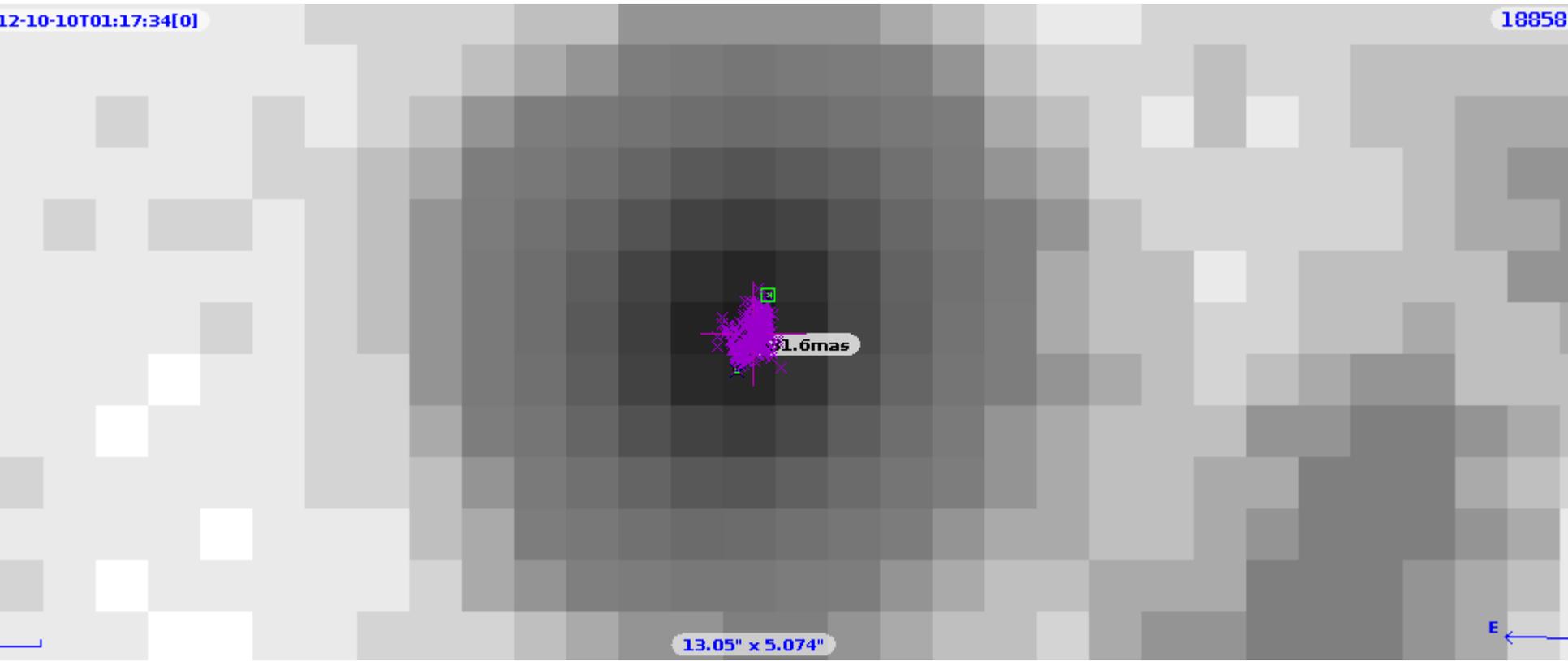
Minimum Date

Maximum Date

[INFO on this serv...](#)

[?](#)

▶ Aladin cluster



- ▶ Dynamic light curves
 - ▶ PostgreSQL access
- ▶ SSAP
- ▶ Datalink
- ▶ SIAP
- ▶ SCS



- ▶ Special thanks to Markus



- ▶ **Munipack, Filip Hroch**
 - ▶ <http://munipack.physics.muni.cz/>
- ▶ **Q3C paper, Sergey Kuposov**
 - ▶ <https://code.google.com/p/q3c/>
- ▶ **GAVO Dachs, Markus Demleitner**
 - ▶ <http://vo.ari.uni-heidelberg.de/soft/>



- ▶ Room for discussion

