Ondřejov Southern Sky Photometry Survey Dynamic Light curves

Jiří Nádvorník

Astronomical Institute
Academy of Sciences of the Czech Republic

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Czech Virtual Observatory

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Data

- 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

Standard approach

Overlap images (standard)

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

Process individually (ours)

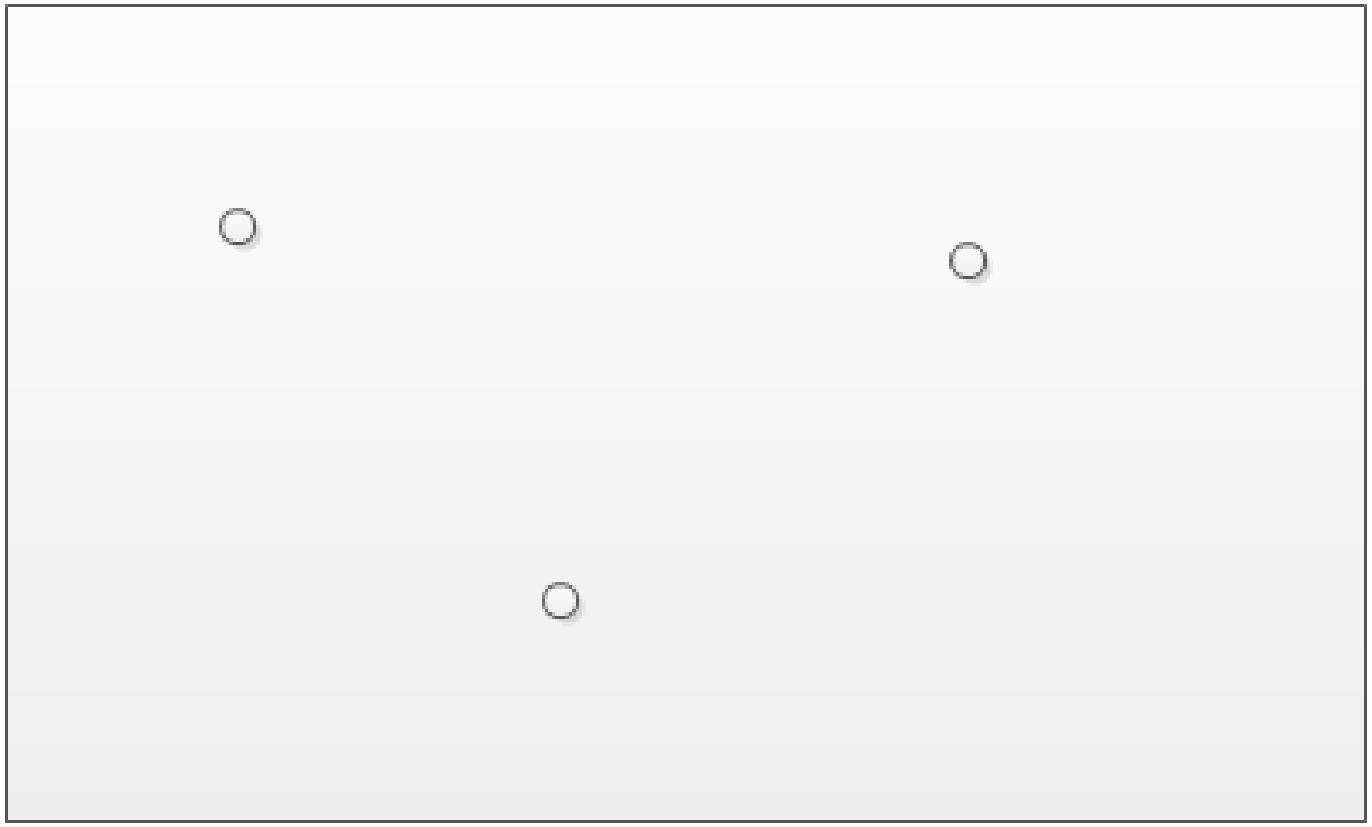
- Needs only identifiers
- Images can shift
- Working with actual data on the images
- Aperture photometry, astrometry (individual for each frame)
- Reusable for any image ever taken

Pipeline

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

Problem

- Identified objects on one image (Munipack result)



Problem

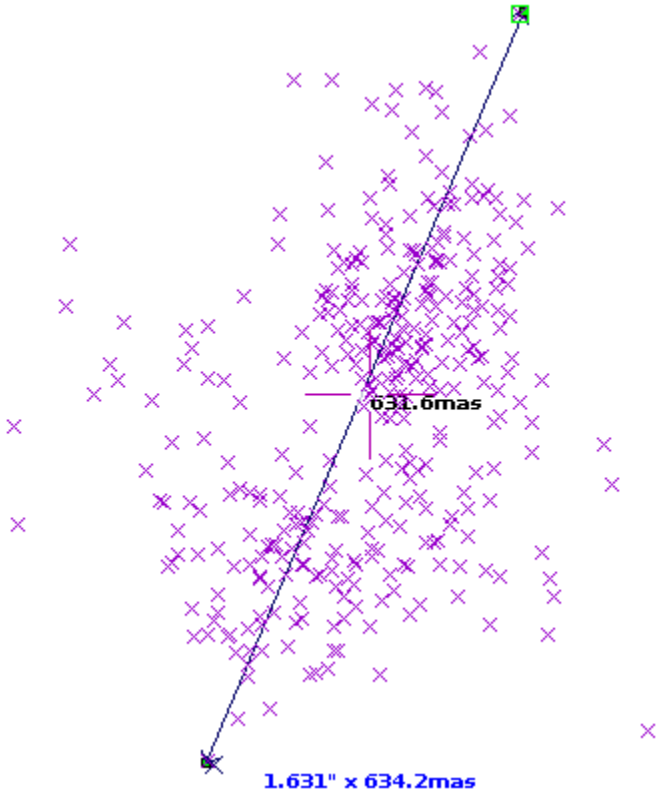
- Identified objects overlapped (error in astrometry)

Problem

- Identifying clusters of positions of light curves

Example

- Identifying cluster



Continuous identification

- 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?

Identificators generation

- 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 optimalization)
    - Lightweight iterative (95 % accuracy) ~ linear complexity
    - Self-join all (>99,9 % accuracy?) ~ quadratic complexity
    - Need combination

Lightcurve publication

- SSAP service
  - Slightly different from specral 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=666718357462397747OR
  - Result: Cutouted light curve in SDM

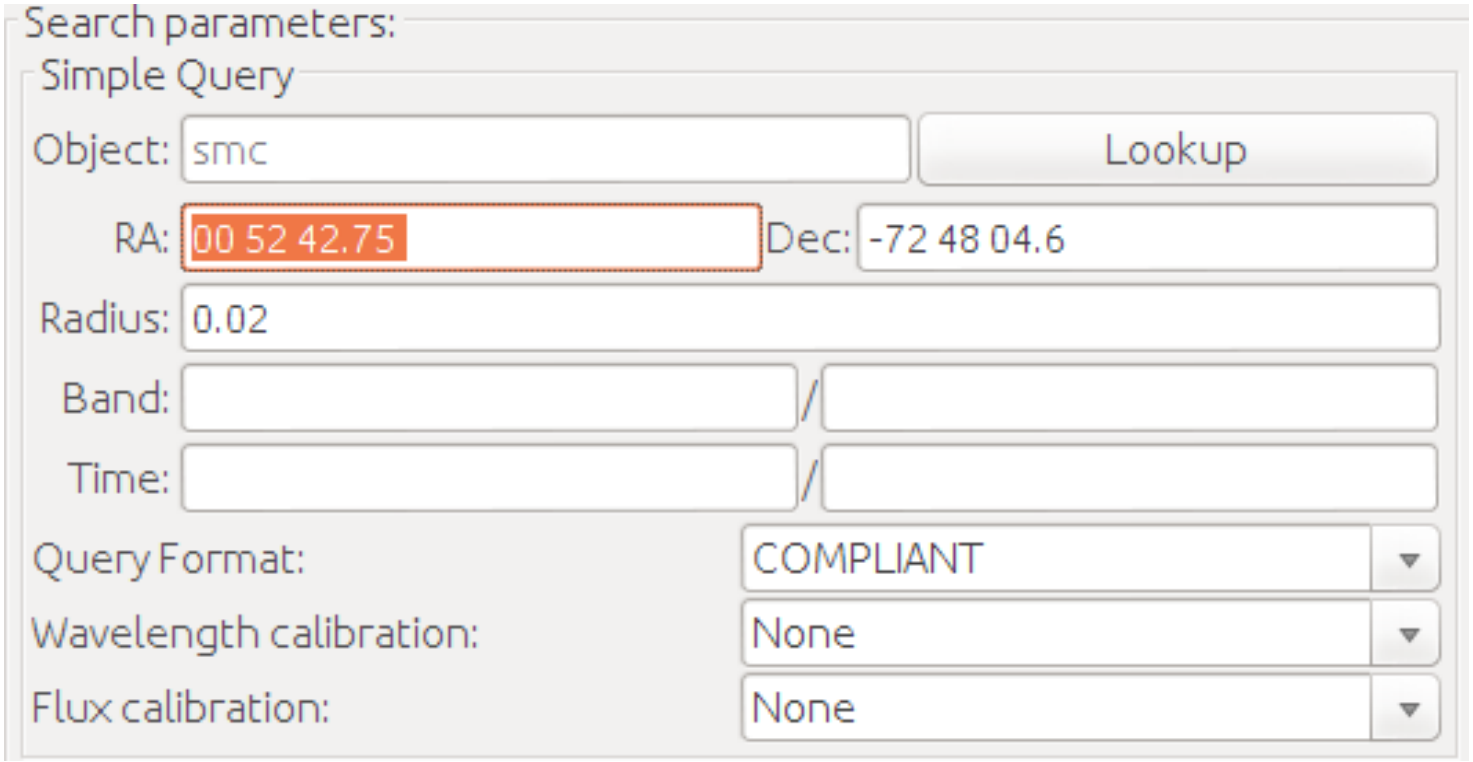
Light curve construction

- Absolutely dynamical (SQL + Python)

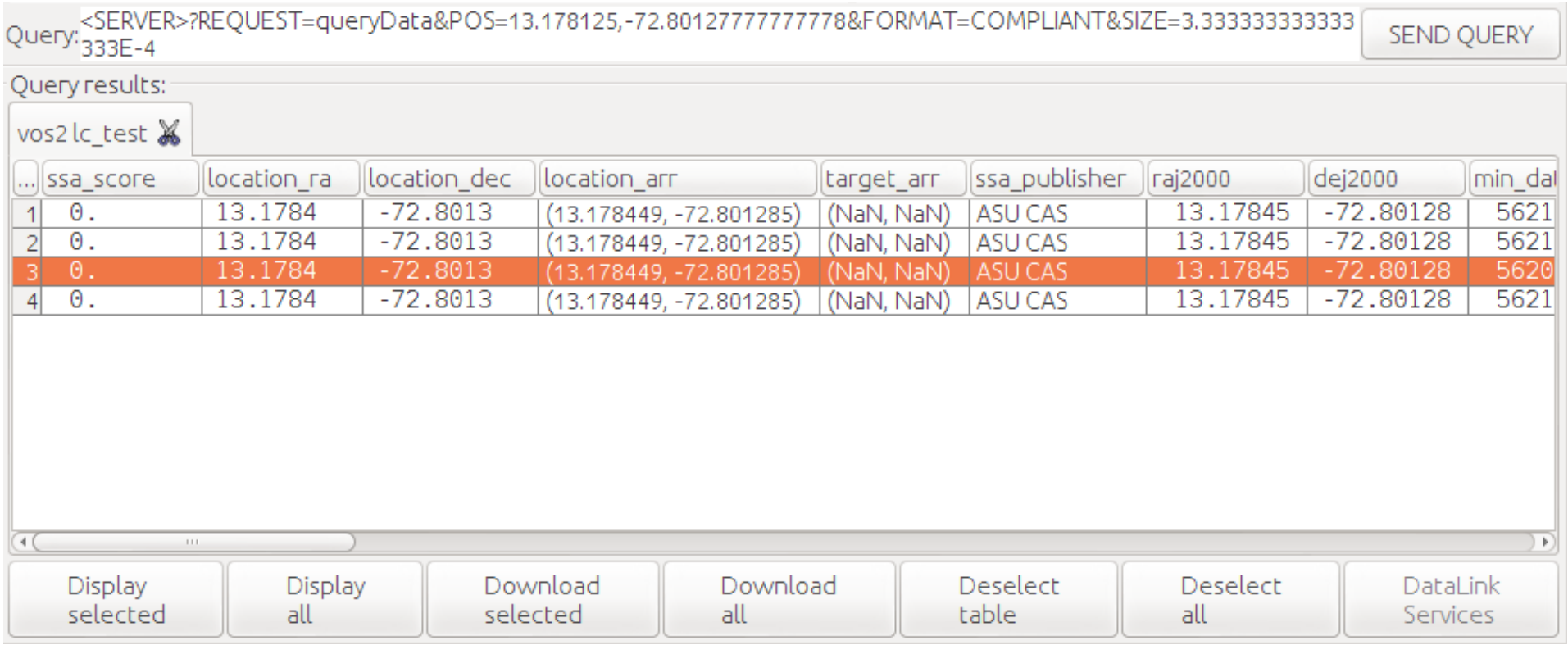
```
SELECT
        hjd, mag
FROM
        \schema.objobs_complete
WHERE
        ipix=…
AND
        band=…
ORDER BY
        hjd
```

Practical

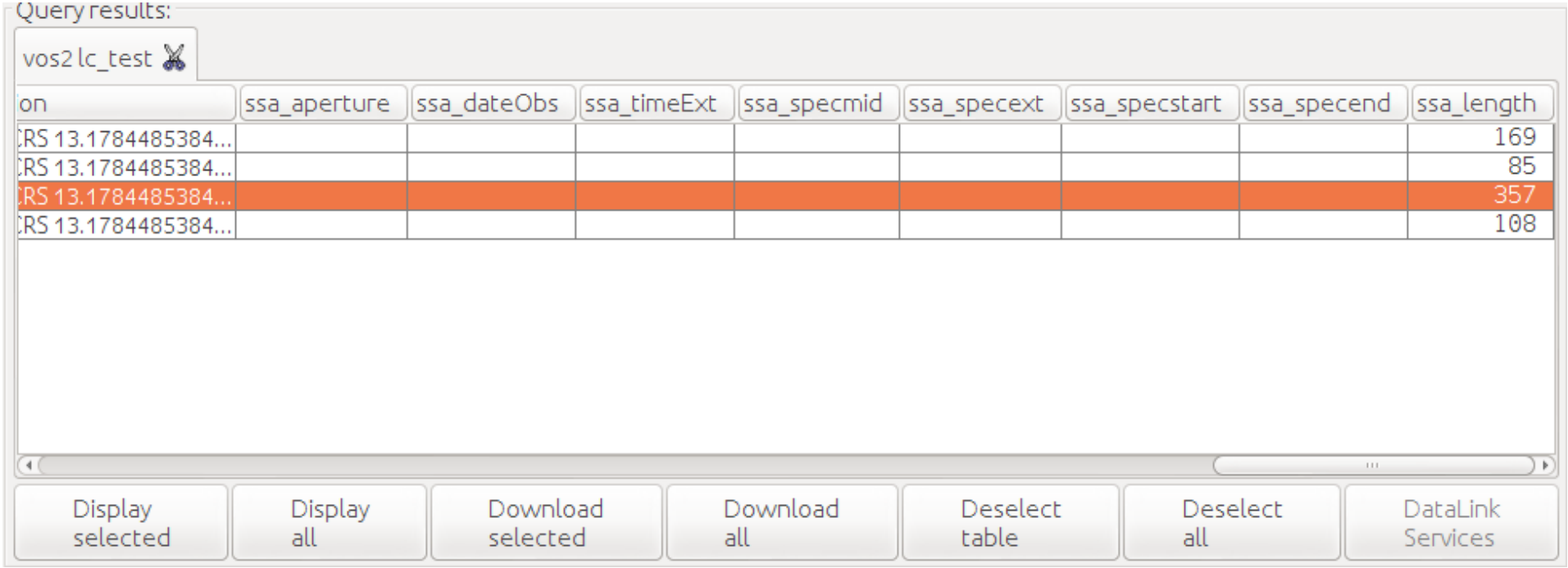
- SPLAT SSAP 00 52 42.75 -72 48 04.6



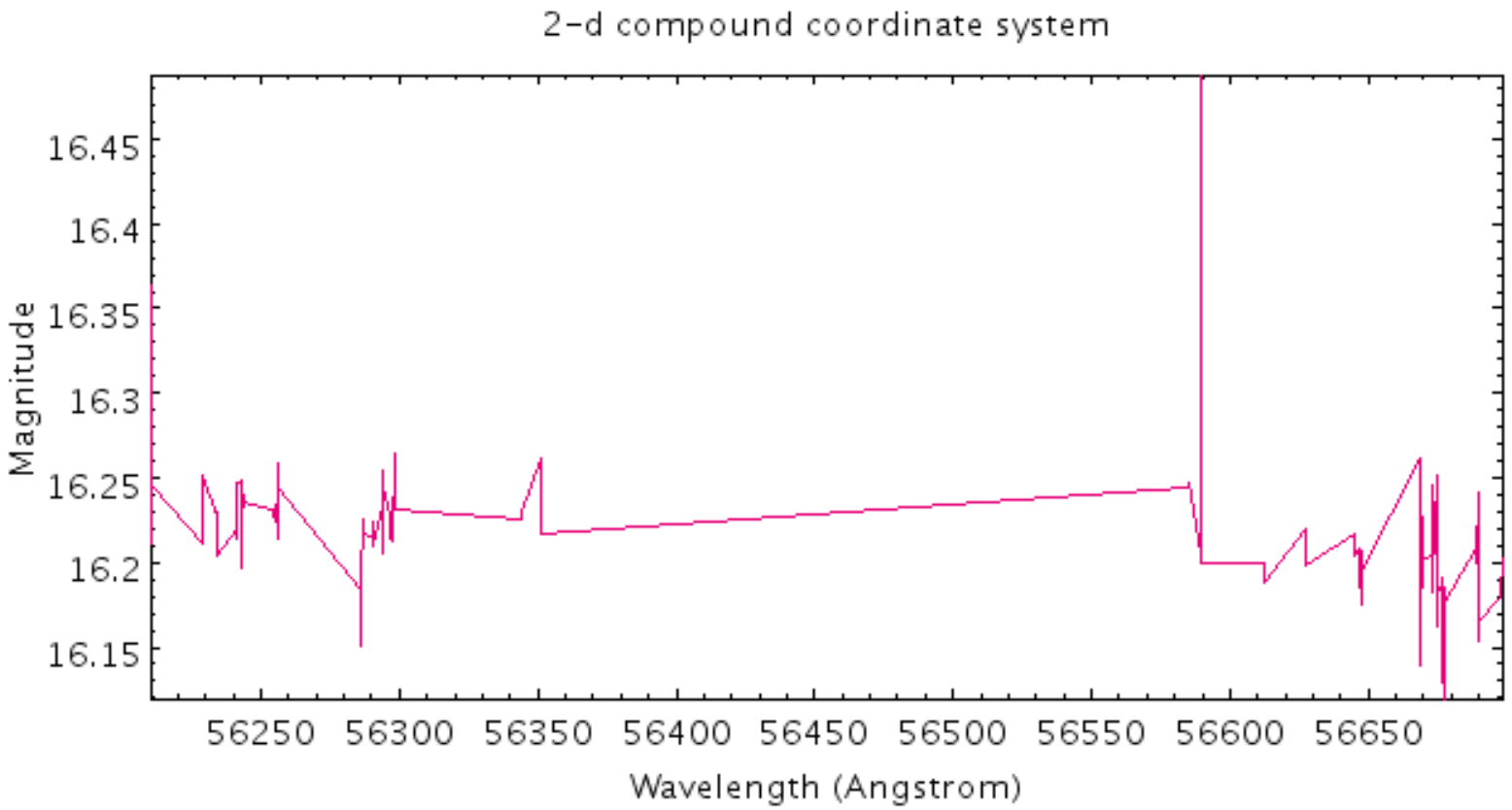
- SPLAT SSAP result



- SPLAT SSAP length

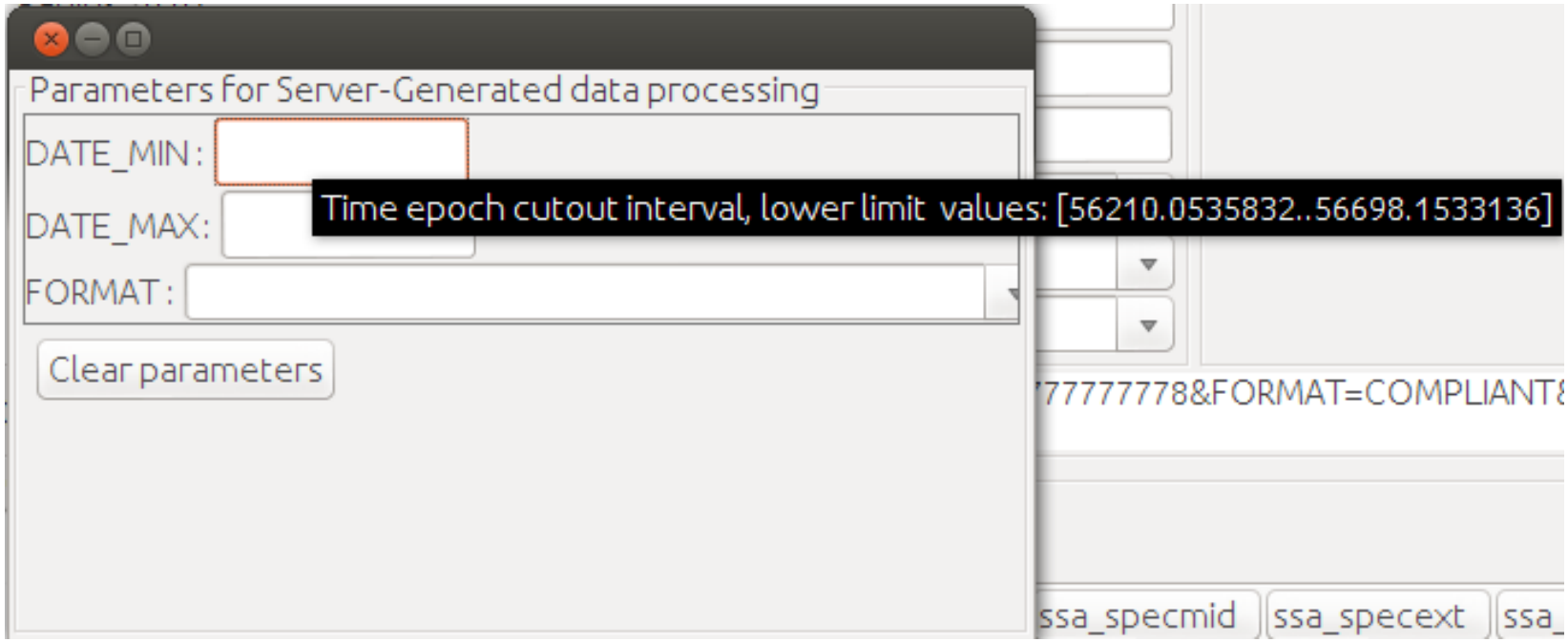


- Whole light curve

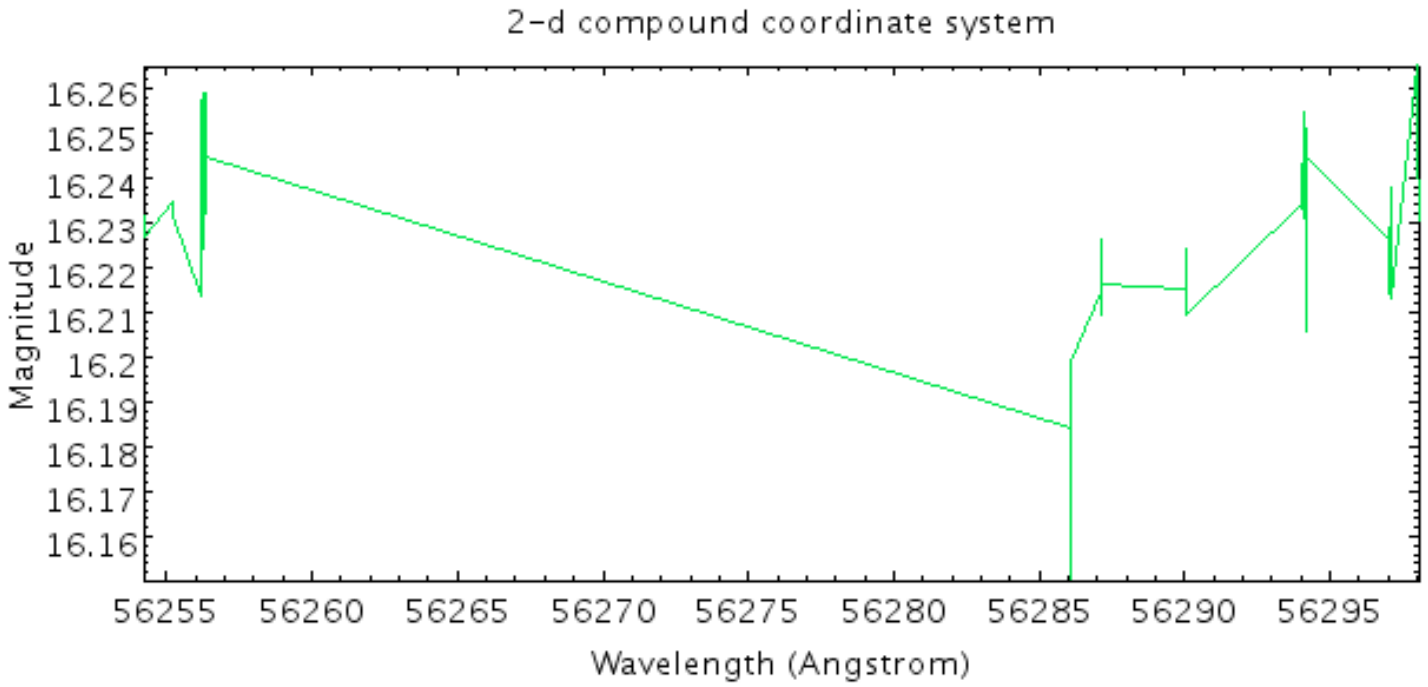


Practical

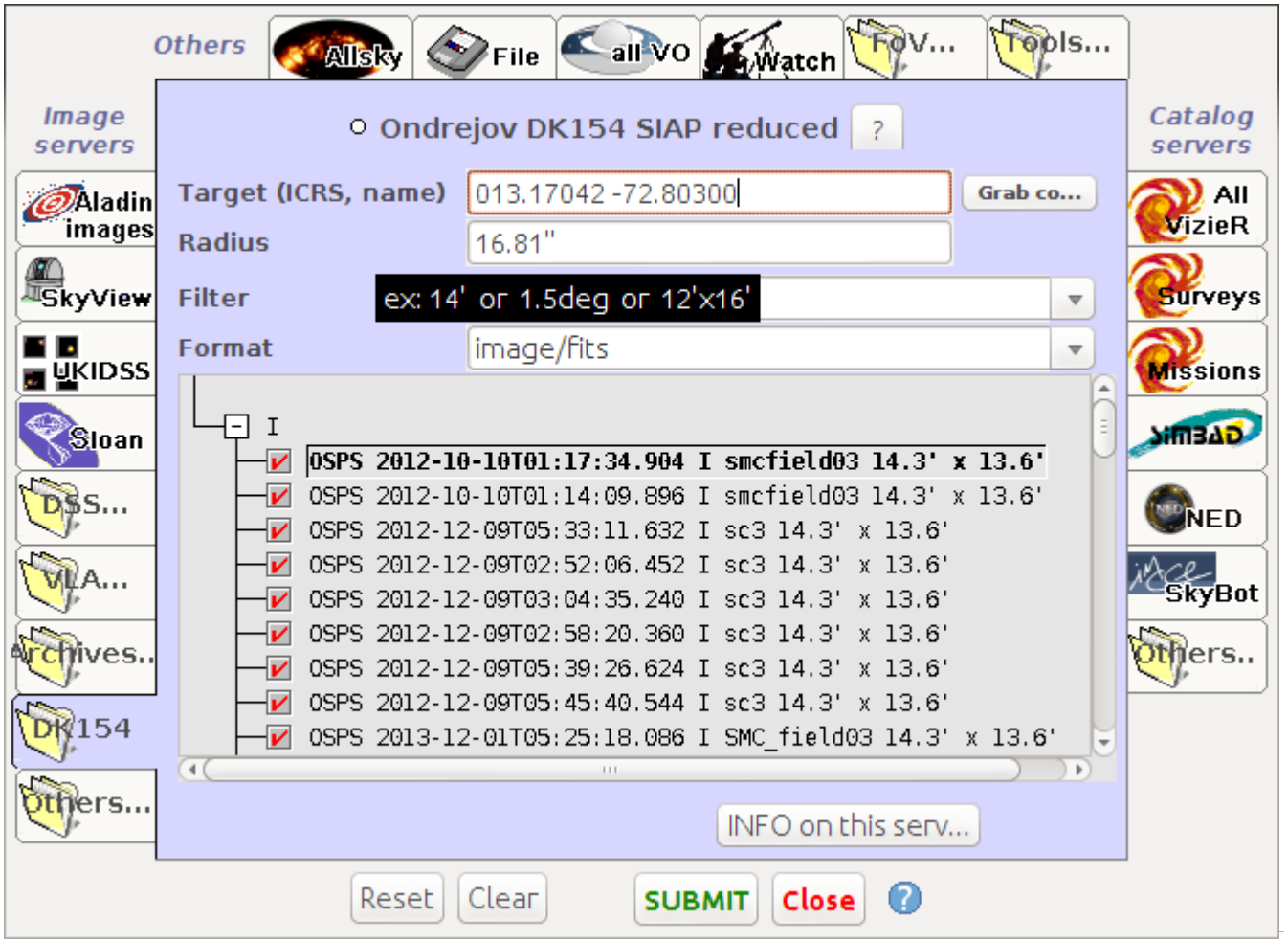
- SPLAT datalink



- Light curve cutout



- Aladin SIAP


Others
Allsky
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all VO
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FoV...
Tools...
Image servers
Catalog servers
Ondrejov DK154 SIAP reduced
?
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SkyView
UKIDSS
Sloan
DSS...
VLA...
Archives..
DK154
Others...
All VizieR
Surveys
Missions
SIMBAD
NED
SkyBot
Others..
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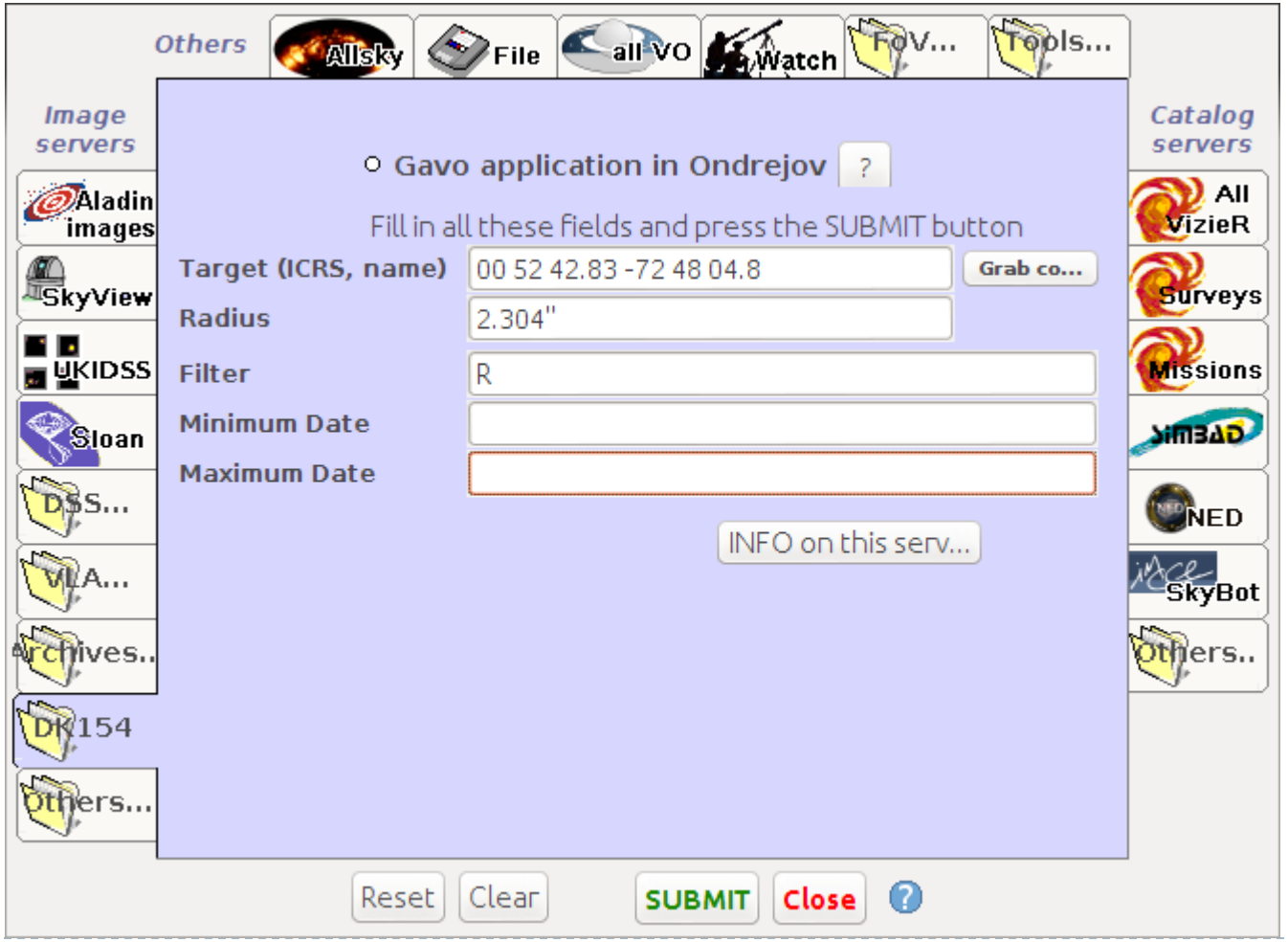
OSPS 2012-10-10T01:17:34.904 I smcfield03 14.3' x 13.6'
OSPS 2012-10-10T01:14:09.896 I smcfield03 14.3' x 13.6'
OSPS 2012-12-09T05:33:11.632 I sc3 14.3' x 13.6'
OSPS 2012-12-09T02:52:06.452 I sc3 14.3' x 13.6'
OSPS 2012-12-09T03:04:35.240 I sc3 14.3' x 13.6'
OSPS 2012-12-09T02:58:20.360 I sc3 14.3' x 13.6'
OSPS 2012-12-09T05:39:26.624 I sc3 14.3' x 13.6'
OSPS 2012-12-09T05:45:40.544 I sc3 14.3' x 13.6'
OSPS 2013-12-01T05:25:18.086 I SMC_field03 14.3' x 13.6'
INFO on this serv...
Reset
Clear
SUBMIT
Close

- Aladin SCS


Others
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File
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Image servers
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SkyView
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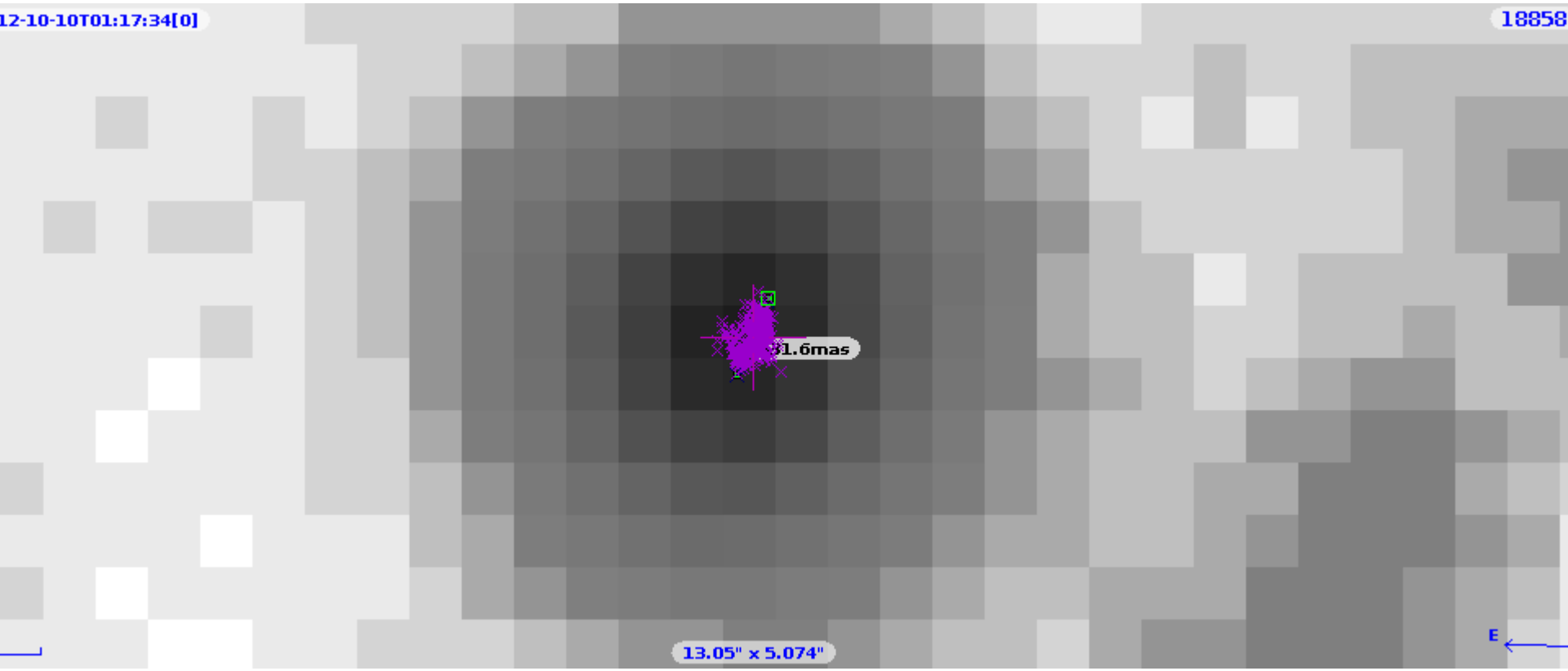
Surveys
Missions
SIMBAD
NED
SkyBot
Others..
Reset
Clear
SUBMIT
Close

Pracical

- Aladin cluster



Summary

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

Acknowledgement

- Special thanks to Markus

Technology

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

Questions

- Room for discussion