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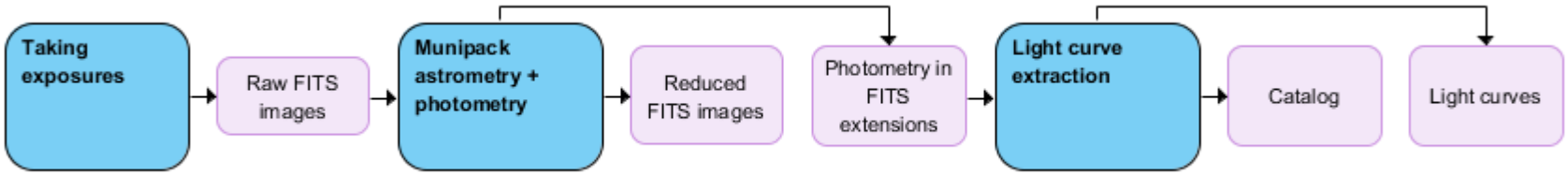
Managing data products of your pipeline

1. Data ingestion (FITS format - Level 0, 1)
2. Light curve extraction (Proprietary format - Level 2)
3. Interoperable publication (Images, photometry, light curves)



Pipeline producing data

Data ingestion (DaCHS)

- XML driven tables, mappings
- Extract – reading FITS
- Transform – correcting dates, cleaning data
- Load – exposure table definition, FITS field mappings

```
<!-- table holding informations about the image, e.g. observation date, band, meteorological information,
... -->
<table id="exposure" onDisk="True" primary="obsname_id" adql="true">

    <meta name="description">Common information (band, dateObs,...) on observations. 1 row per file</meta>

    <column name="accref" type="text"
        description="internal file reference" ucd="meta.ref.url;datalink.preview"/>
    <column name="dateObs"
        type="timestamp" unit="d" tablehead="Obs. date"
        verbLevel="0" description="Epoch at midpoint of observation"
        displayHint="type=humanDate"/>
    <column name="HJD"
        type="double precision" unit="d" tablehead="HJD" ucd="VOX:Image_MJDateObs"
        verbLevel="0" description="Epoch at midpoint of observation in Heliocentric Modified Julian Date"
        utype="spec:Spectrum.Data.SpectralAxis.Value"/>
    <column name="band" ucd="VOX:BandPass_ID"
        tablehead="Bandpass" description="Freeform name of the bandpass used"
         type="text" verbLevel="10"/>
```

DaCHS configuration file example

FITS publication (DaCHS)

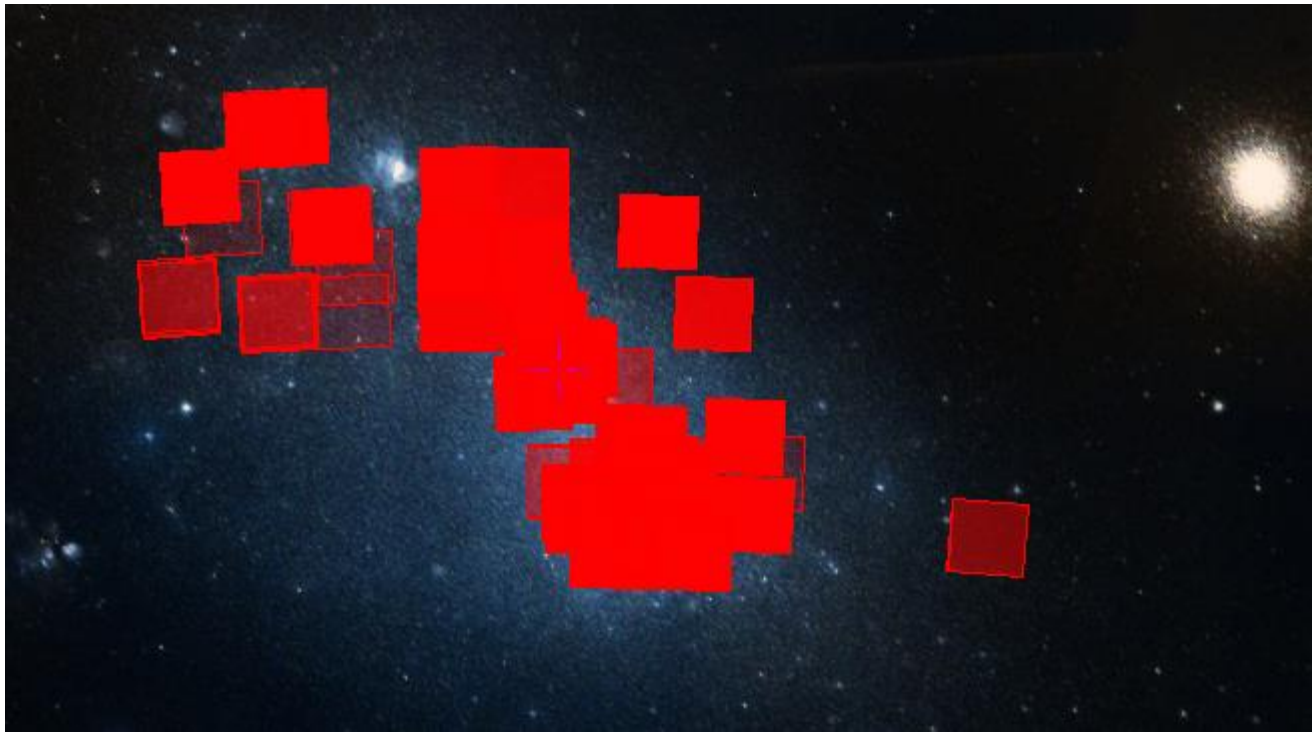
- XML driven services
- SIAP – raw, reduced images (Level 0, 1)
- SCS – sources on images (Level 1)

```
<service id="web" defaultRenderer="form">
    <meta name="shortName">Ondrejov Lightcurves Web</meta>
    <meta name="title">DK154 Lightcurves Web Interface</meta>
    <meta name="description">DK154 Lightcurves public web interface.</meta>
    <meta name="subject">DK154</meta>
    <!--<publish render="form" sets="local"/>-->

    <dbCore queriedTable="objobs_lightcurves">
        <condDesc original="//scs#humanInput"/>
        <condDesc buildFrom="dateObs"/>
        <condDesc id="bandCond">
            <inputKey name="BAND" type="text" description="Wavelength (range)
                of interest (or symbolic bandpass names)" unit="m" multiplicity="single"
                  std="True" utype="DataId.Bandpass">
```

DaCHS configuration example

Aladin – SIAP coverage

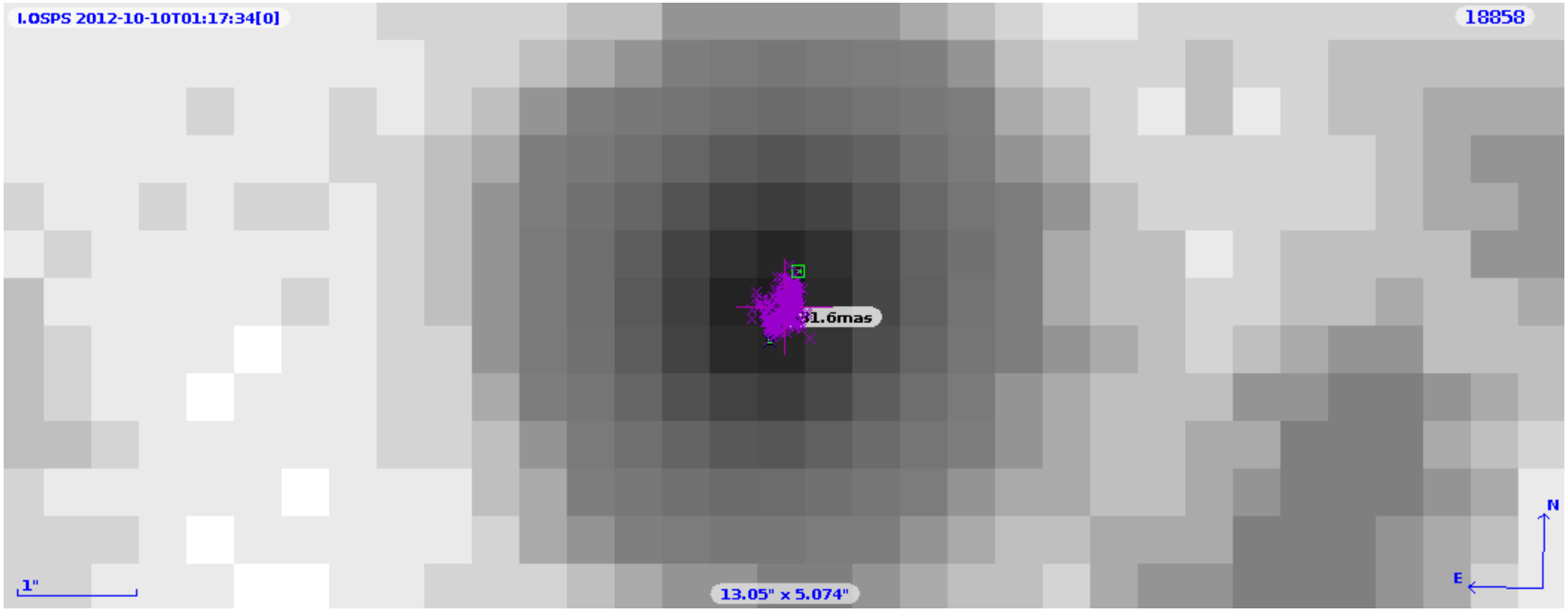


Survey coverage over SMC

Aladin – SIAP image

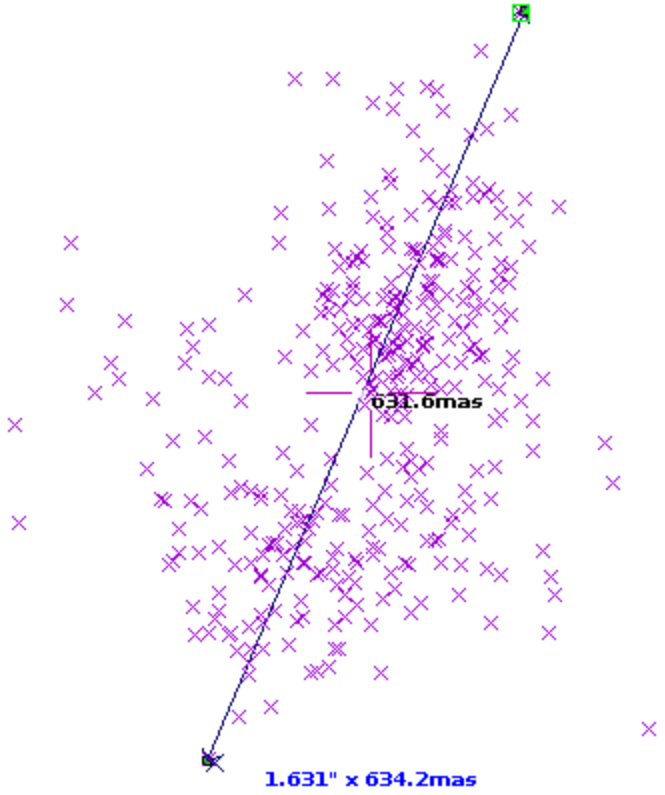
NGC 330 image

Aladin – SCS photometry



Cluster of sources for one star

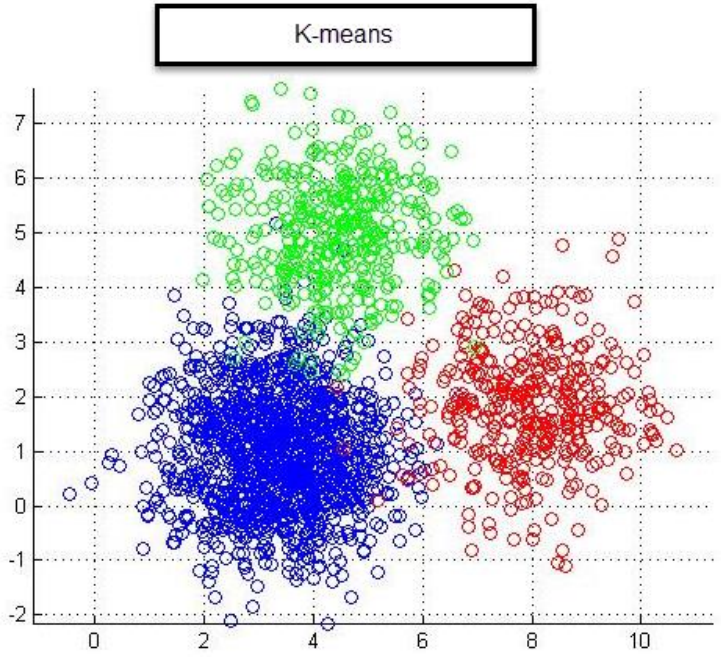
Aladin – SCS photometry

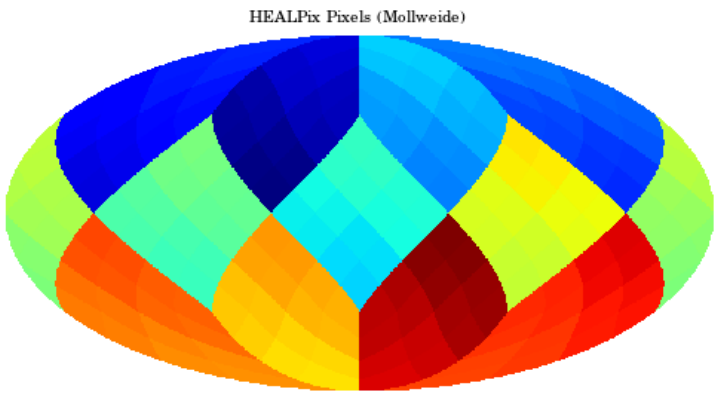


Sources of one object

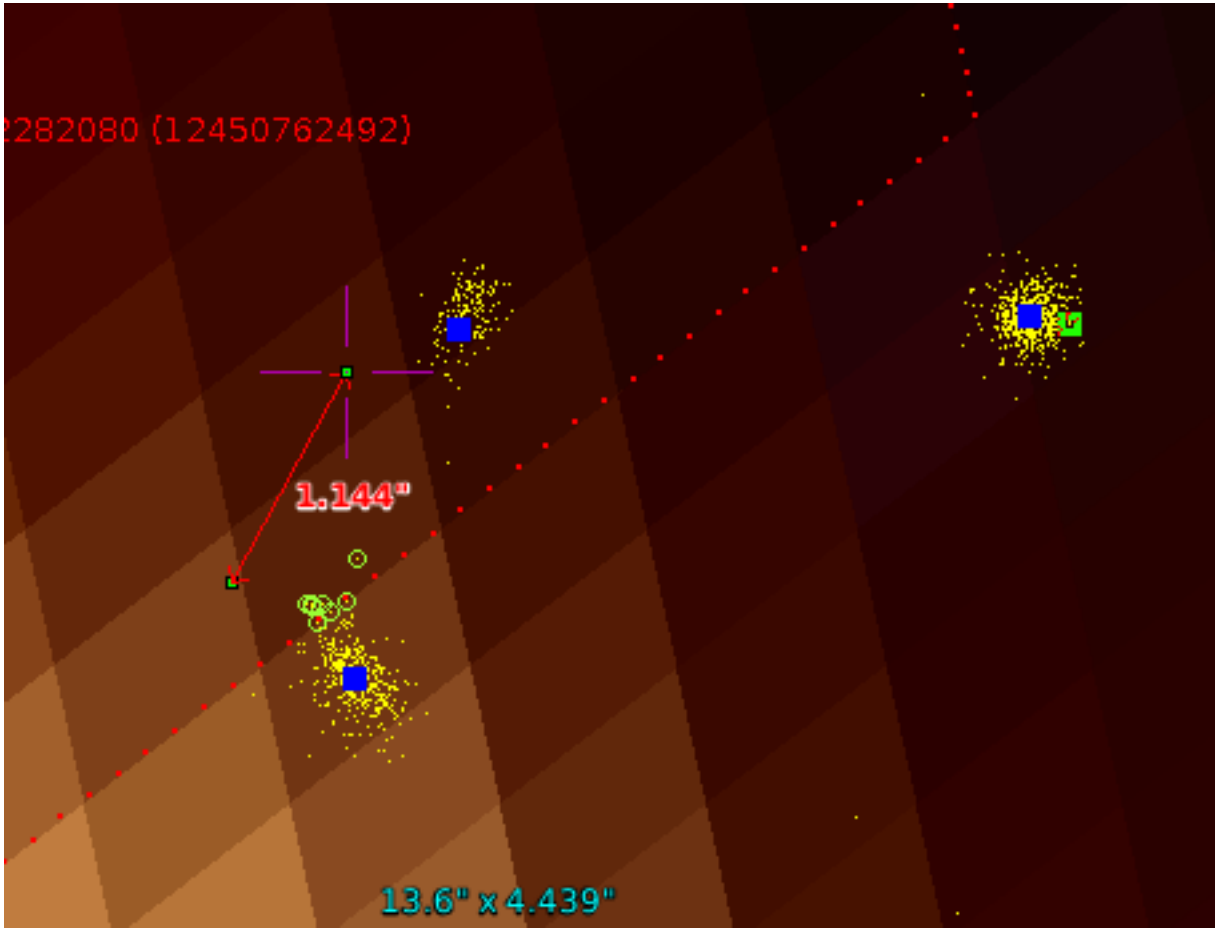
Light curve generation (C++ app)

1. Extract from DaCHS DB (already clean data)
2. Get identifiers in external C++ App
3. Import catalog into DB
4. Import relations into DB



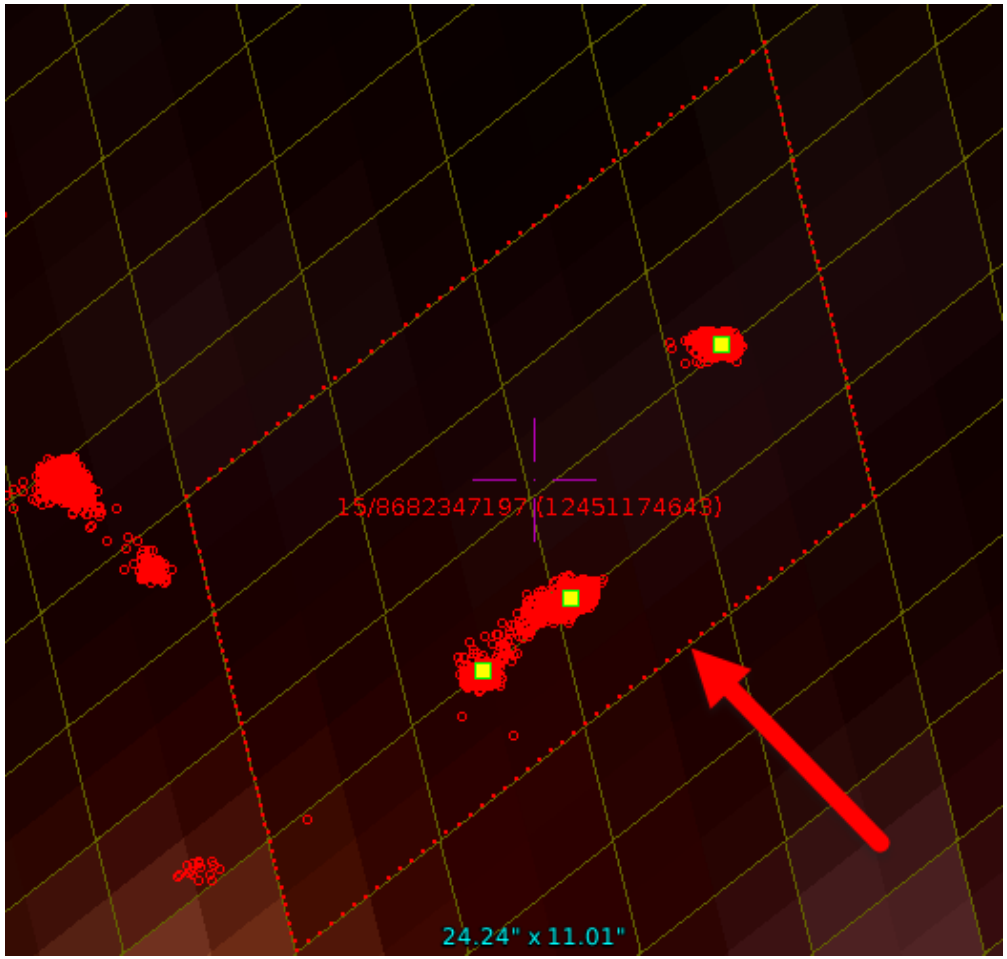


Check the results!



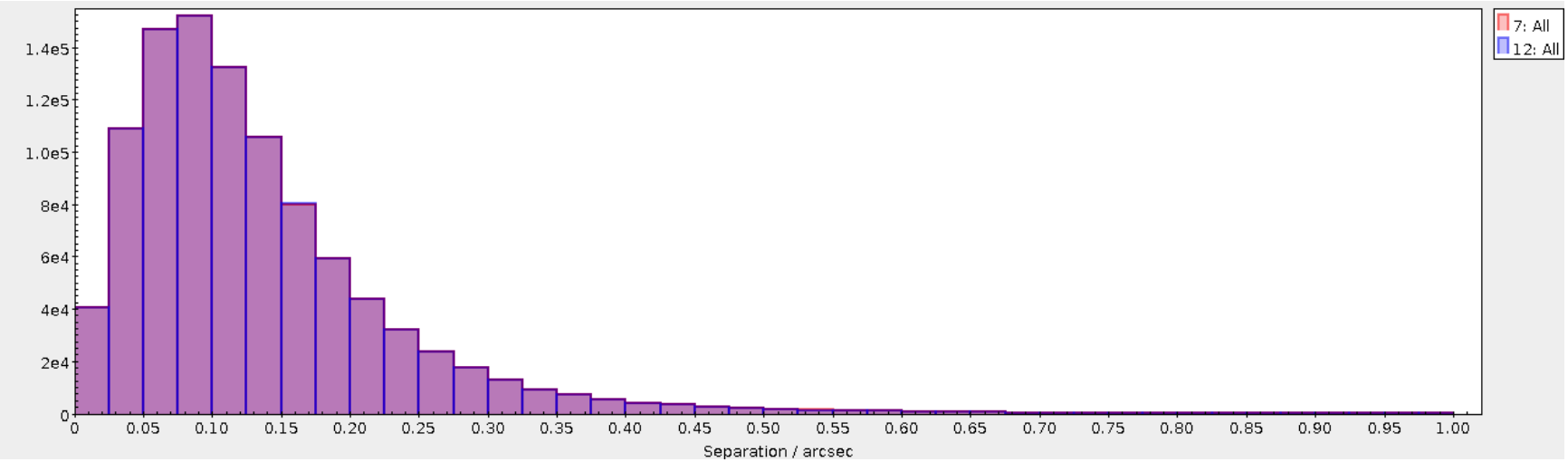
Clusters of sources with catalog IDs

Check the results!



Catalog IDs for overlapping sources

Check the results!



Crossmatch your catalog with others
(UCAC4, 2MASS, etc.)

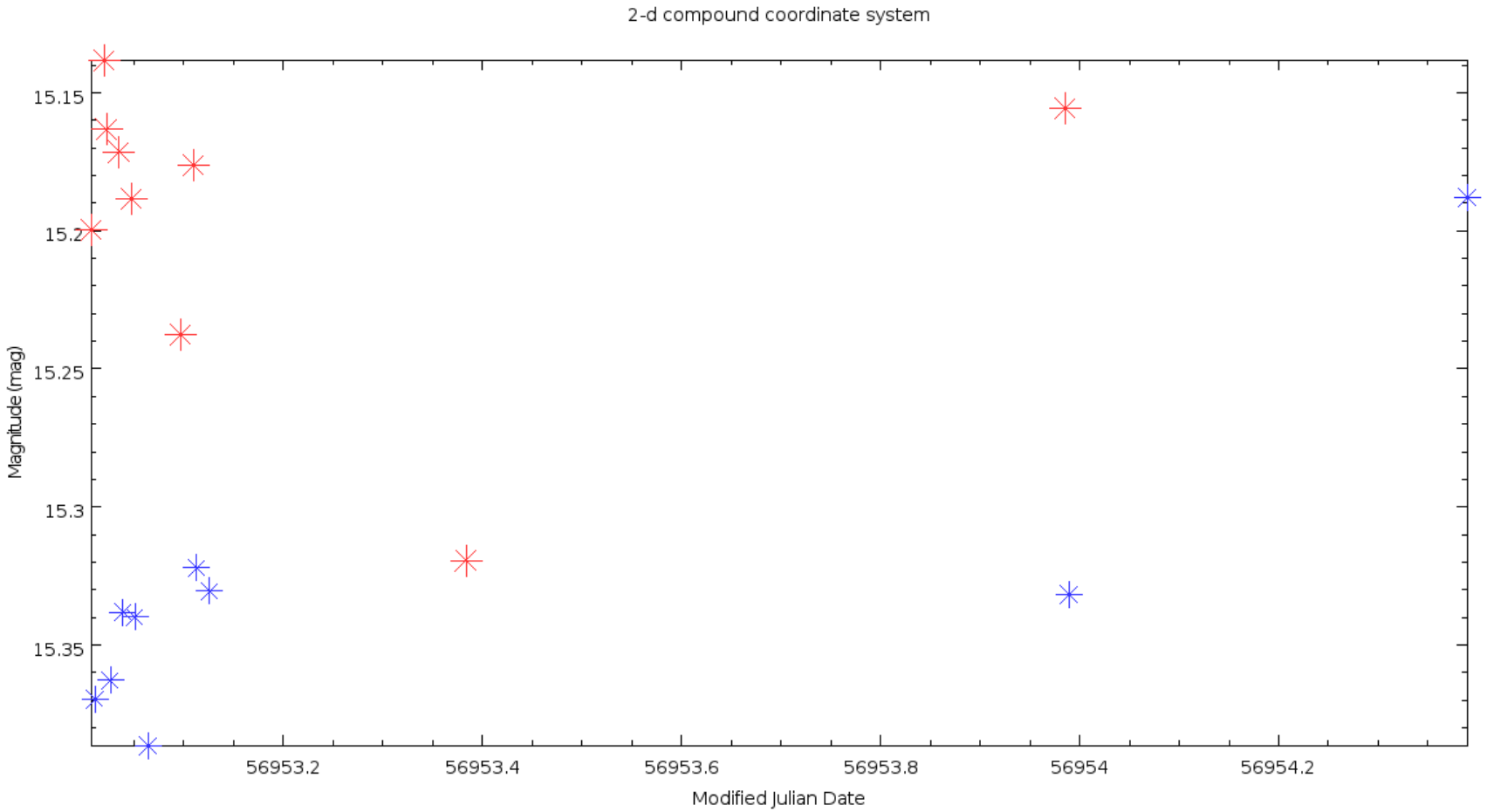
Light curve publication (DaCHS)

- XML Driven
- CubeDM

```
<table id="tsinstance" onDisk="False">
    <group utype="Cube">
        <group utype="Dataset">
                <paramRef key="dataset_type" utype="Type"/> <!-- this will be cube -->
                <paramRef key="dataset_subtype" utype="Subtype"/> <!-- format - sparsecube, imagecube-->
                <paramRef key="data_product_type" utype="dataProductType"/> <!-- logical type - timeseries, image, ..-->
        </group>

        <group utype="Cube.Char">
            <group utype="NDPoint">
                <group id="spatial_axis_points" utype="SpatialAxis" ucd="pos.eq.ra">
                    <columnRef key="raj2000" utype="Coverage.Location.Coord.Position2D.Value2.C1"/>
                    <columnRef key="dej2000" utype="Coverage.Location.Coord.Position2D.Value2.C2"/>
                </group>
                <group id="spatial_axis_image" utype="SpatialAxis" ucd="pos.eq.ra">
                    <columnRef key="ORIRA" utype="Coverage.Location.Coord.Position2D.Value2.C1"/>
                    <columnRef key="ORIDEC" utype="Coverage.Location.Coord.Position2D.Value2.C2"/>
                </group>
                <group id="time_axis_hjd" utype="TimeAxis" ucd="meta.main;time.epoch;pos.heliocentric">
                    <paramRef key="min_hjd" utype="Bounds.Limits.StartTime"/>
                    <paramRef key="max_hjd" utype="Bounds.Limits.StopTime"/>
                    <columnRef key="HJD" utype="Coverage.Location.Coord"/>
                </group>
```

SPLAT-VO light curves



What can I use?

- Reuse Level 0, 1 data publication (images, sources + photometry)
- Reuse Light curve generation (https://gitlab.com/nadvornik-ji/AstroClustering)
- Reuse high level data product publication (CubeDM)

Cube DM

- Publish any time series data
- Implementation and specification progress
- Gathering use cases – please supply yours
  - for inspiration see Enrique Solano's use cases http://wiki.ivoa.net/twiki/bin/view/IVOA/CSPTimeSeries
  - Contact us on voevent@ivoa.net

Questions