

# Implementing a VO archive for datacubes of galaxies

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# Discovering Cubes

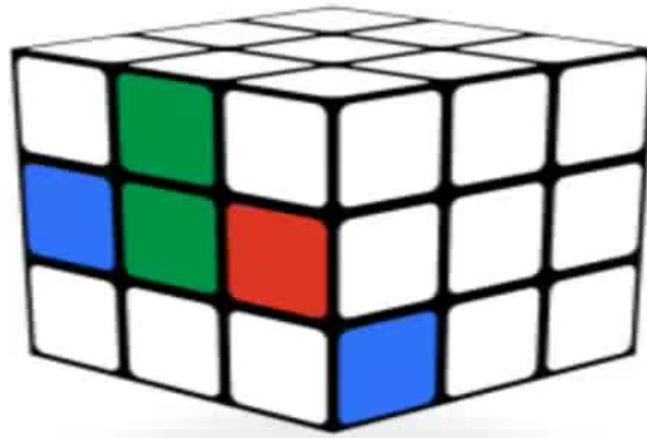


Buscar con Google

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# And doing something...



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Buscar con Google

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# Collections

## SMA B0DEGA

### Below 0 Degrees Galaxies

- 30 FITS Files
- Single Object / Single Line Emission
- 2D Spatial + 1D **Velocity** + 1D Polarization
- 12 CO 21 Molecular Transition

## WSRT WHISP

### Westerbork observations of neutral Hydrogen in Irregular and SPiral galaxies

- 33 FITS Files
- Single Object / Single Line Emission
- 2D Spatial + 1D **Frequency** + 1D Polarization
- HI 21cm Transition





# Collections

## SMA B0DEGA

### Below 0 Degrees Galaxies

- 30 FITS Files
- Single Object / Single Line Emission
- 2D Spatial + 1D **Velocity** + 1D Polarization
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## WSRT WHISP

### Westerbork observations of neutral Hydrogen

- 33 FITS Files
- Single Object / Single Line Emission
- 2D Spatial + 1D **Frequency** + 1D Polarization
- HI 21cm Transition

```
WHISP.txt
IMPLE = T / SIMPLE FITS FORMAT
BITPIX = 16 / NUMBER OF BITS PER PIXEL
NAXIS = 3 / NUMBER OF AXES
NAXIS1 = 512 / LENGTH OF AXIS
NAXIS2 = 512 / LENGTH OF AXIS
NAXIS3 =
BLOCKED =
CDEL1 = -2.
CRPIX1 = 2.
CRVAL1 = 3.
CTYPE1 = 'RA'
CUNIT1 = 'DEG'
CDEL2 = 2.
CRPIX2 = 2.
CRVAL2 = 3.
CTYPE2 = 'DEC'
CUNIT2 = 'DEG'
CDEL3 = -7.
CRPIX3 = 3.
CRVAL3 = 1.
CTYPE3 = 'FREQ'
CUNIT3 = 'Hz'
DRVAL3 = 4.
DTYPE3 = 'VEL'
DUNIT3 = 'km/s'
EPOCH = 1.
INSTRUME='WSR'
BLANK =
BSCALE =
BZERO =
OBJECT = 'U18'
DATE = '25/'
DATE-OBS=
DATAMAX =
DATAMIN =
NOISE = 0.36
ORIGIN = 'WFI'
BMAJ = 0.29
BMIN = 0.24
BMPA = 0.00
FFTRA =
BLGRAD = 'NAT'
BUNIT = 'W.U'
FIRSTLCH=
LASTLCH=
CHANSTA =
CHANEND =
FREQ =
BANDW =
CRESL3 =
DATYYP = 'NOR'
UVGRID = 'EXP'
FFTDEC =
PGCNR =
NFREQ =
INPTS =
NINTF =
SETNR =

B0DEGA.txt
SIMPLE = T / SIMPLE FITS FORMAT
BITPIX = -32 / NUMBER OF BITS PER PIXEL
NAXIS = 3 / NUMBER OF AXES
NAXIS1 = 300 / LENGTH OF AXIS
NAXIS2 = 300 / LENGTH OF AXIS
NAXIS3 = 25 / LENGTH OF AXIS
BLOCKED = T / TAPE MAY BE BLOCKED
CDEL1 = -8.333333940130E-05 / PRIMARY PIXEL SEPARATION
CRPIX1 = 1.510000000000E+02 / PRIMARY REFERENCE PIXEL
CRVAL1 = 2.326920826060E+02 / PRIMARY REFERENCE VALUE
CTYPE1 = 'RA---SIN' / PRIMARY AXIS NAME
CUNIT1 = 'DEGREE' / PRIMARY AXIS UNITS
CDEL2 = 8.333333940130E-05 / PRIMARY PIXEL SEPARATION
CRPIX2 = 1.510000000000E+02 / PRIMARY REFERENCE PIXEL
CRVAL2 = -2.829444329680E+00 / PRIMARY REFERENCE VALUE
CTYPE2 = 'DEC--SIN' / PRIMARY AXIS NAME
CUNIT2 = 'DEGREE' / PRIMARY AXIS UNITS
CDEL3 = 1.999874428240E+04 / PRIMARY PIXEL SEPARATION
CRPIX3 = -3.600000000000E+01 / PRIMARY REFERENCE PIXEL
CRVAL3 = 1.799888158970E+06 / PRIMARY REFERENCE VALUE
CTYPE3 = 'VELO-LSR' / PRIMARY AXIS NAME
CUNIT3 = 'm/s' / PRIMARY AXIS UNITS
EPOCH = 2.000000000000E+03 / EPOCH
FREQ = 2.305379700000E+11 / REST FREQUENCY
INSTRUME='SMA' / INSTRUMENT
DATAMAX = 4.180090E-01 / MAXIMUM DATA VALUE
DATAMIN = -1.844170E-01 / MINIMUM DATA VALUE
ORIGIN = 'WFITS VERSION 1.3' / VERSION OF THE GIPSY PROGRAM
OBJECT = 'NGC5937' /
OBSERVER='smartin' /
CELLSCAL='1/F' /
BUNIT = 'JY/BEAM' /
BMAJ = 9.20977094211E-04 /
BMIN = 5.18696615472E-04 /
DATE-OBS= '2009-04-07T09:36:08.8' /
BTYPE = 'intensity' /
BPA = 8.37292938232E+01 /
NITERS = 37061 /
PBTYPE = 'GAUS(5.132E+01)' /
RMS = 2.69746705890E-02 /
LWIDTH = 1.00000000000E+00 /
LSTEP = 1.00000000000E+00 /
LSTART = 1.00000000000E+00 /
VOBS = -2.95935363770E+01 /
LTYPE = 'channel' /
1024 /FFT SIZE IN DEC.
9247
63 /TOTAL # OF FREQUENCY POINTS
13566 /INPUT POINTS.
40 /TOTAL INTERFEROMETERS
1 /# OF SET.
```



# Technologies

- Linux Ubuntu 12.04 LTS Server
- MySQL Community Server
- Apache HTTP Server
- Django Web Framework 1.6
  
- MySQL Workbench
- **IPython Notebooks Framework**
- Python Libraries and Software
  - Kapteyn Package
  - AstroPy
  - APLPy
  - PVExtractor
  - PySpeckit
  - yt project
- GIPSY

Access Data

**Functions**  
The following functions generate SQL statements with values extracted from FITS file headers.

**ProcessCoordinates**

```
In [43]: def ProcessCoordinates(ra, dec, epoch):
         galaxy = FKSCoordinates(ra, dec, unit=(u.degree, u.degree), equinox=astrotim(epoch, forma
         t='jyear', scale='utc'))
         galaxy.process_to_astrotim(2000, format='jyear', scale='utc')
         return galaxy.ra.deg, galaxy.dec.deg
```

**TableFieldUpdateValue**

```
In [43]: # update table/field with last inserted autoincremental identifier
```

In [11]: # Position-velocity plot at RA=16pLx

```
fig = plt.figure()
F2 = aply.FITSfigure(filecube, figure=fig, dimensions=[1,2], slices=[150])
F2.show_colorscale(vmin=0, aspect=4)
```

INFO:astropy:Auto-setting vmax to 8.070e-01  
INFO: Auto-setting vmax to 8.070e-01 [aplypy.aplypy]

**Functions**  
The following functions generate SQL statements with values extracted from FITS file headers.

**ProcessCoordinates**

```
In [42]: def ProcessCoordinates(ra, dec, epoch):
         galaxy = FKSCoordinates(ra, dec, unit=(u.degree, u.degree), equinox=astrotim(epoch, forma
         t='jyear', scale='utc'))
         galaxy.process_to_astrotim(2000, format='jyear', scale='utc')
         return galaxy.ra.deg, galaxy.dec.deg
```

**TableFieldUpdateValue**

```
identifier
```

```
value+'' ORDER BY 'ID' DESC LIMIT 1;
```

**TableFieldUpdateValue**

```
+ hdr[hdr['WAVEID'] ]
```

In [6]: # Channel 12

```
fig = plt.figure()
F2 = aply.FITSfigure(filecube, figure=fig, dimensions=(0,1), slices=[11])
F2.tick_labels.set_xformat('hh:mm:ss')
F2.show_colorscale(vmin=0)
F2.add_colorbar()
F2.colorbar.set_axis_label_text(r'$\lambda$/beam$')
F2.colorbar.set_axis_label_fontsize(15)
```

INFO:astropy:Auto-setting vmax to 4.638e-01  
INFO: Auto-setting vmax to 4.638e-01 [aplypy.aplypy]



# Image DM, ObsCore, Spectral DM

# Data Model

FieldID – Type – UType – UCD – Description – FITS  
Group Name

Field ID	Type	UType	UCD	Description
<b>@@ACCESS Model</b>				
<b>Query Metadata</b>				
query_score	Query	Query Score	Query	Degree of match to query parameters
query_token	String	Query Token	Association	Continuation token for large queries
<b>Association Metadata</b>				
assoc_type	Association	Association Type	Association	Type of association
assoc_id	String	Association ID	meta.id	Association identifier
assoc_key	String	Association Key	meta.id	Key used to distinguish association statements
<b>Access Metadata</b>				
access_url	URL	Access Reference	meta.url	URL used to access dataset
access_format	String	Access Format	meta.number	Content or MIME type of dataset
access_size	String	Access Size	meta.number	Estimated dataset size
<b>Dataset Metadata</b>				
<b>General Dataset Metadata</b>				
datamodel_name	String	Dataset DataModel Name	meta.id	Data model name and version
datamodel_prefix	String	Dataset DataModel Prefix	meta.id	Data model prefix
datamodel_url	String	Dataset DataModel URL	meta.url	Reference URL for data model
datamodel_type	String	Dataset Type	meta.id	Dataset type (data type)
datamodel_subtype	String	Dataset Subtype	meta.id	Dataset subtype (secondary type)
datamodel_level	String	Dataset Level	meta.number	Collection level
datamodel_length	String	Dataset Length	meta.number	Number of pixels
datamodel_deleted	String	Dataset Deleted	meta.id	Set if dataset is deleted
<b>Image Metadata</b>				
img_subarray	Image	Image Subarray	meta.number	Image-specific Dataset metadata
img_name	String	Image Name	meta.number	Number of image axes
img_headers	String	Image Headers	meta.number	Length of each axis of each subarray
img_pixtype	String	Image Pixtype	meta.number	Image pixel type
img_wcsaxes	String	Image WCS Axes	meta.url	WCS axis coordinate type
img_dataset	String	Image Dataset	meta.url	Access reference URL for Data element metadata
<b>Dataset Identification Metadata</b>				
obs_title	String	Dataset Title	meta.id	Dataset title
obs_creator_name	String	Dataset Creator	meta.id	Dataset creator
obs_collection	String	Dataset Collection	meta.id	Data collection to which dataset belongs
obs_id	String	Dataset ID	meta.id	Unique observation ID shared by all obs datasets
obs_creator_id	String	Dataset Creator ID	meta.id	UCM Dataset ID
obs_creator_sid	String	Dataset Creator SID	meta.id	Creator's ID for the dataset
obs_epoch	String	Dataset Epoch	meta.id	Data processing/observation date
obs_version	String	Dataset Version	meta.id	Version of dataset
obs_creation_type	String	Dataset Creation Type	meta.id	Dataset creation type
obs_logo	String	Dataset Logo	meta.url	URL for creator logo
obs_contributor	String	Dataset Contributor	meta.id	Contributor
<b>Provenance Metadata</b>				
facility_name	String	Provenance ObsConfig Facility Name	meta.id	Instrument name
instrument_name	String	Provenance ObsConfig Instrument Name	meta.id	Specialized name or names
obs_destination	String	Provenance ObsConfig Destination	meta.id	Original source of the data
obs_data_source	String	Provenance ObsConfig Data Source	meta.id	Proposed if any dataset is associated with
proposal_id	String	Provenance Proposal Identifier	meta.id	Proposed if any dataset is associated with
<b>Curator Metadata</b>				
publisher	String	Curator Publisher	meta.id	Dataset publisher
publisher_id	String	Curator Publisher ID	meta.id	URL for VDO Publisher
obs_publisher_sid	String	Curator Publisher SID	meta.id	Publisher's ID for the dataset ID
obs_release_date	String	Curator Release Date	meta.id	Dataset release date
version	String	Curator Version	meta.id	URL of preview graphic for dataset
data_rights	String	Curator Rights	meta.id	Publisher's version of the dataset
obs_reference	String	Curator Reference	meta.id	Restrictions on data access
contact_name	String	Curator Contact Name	meta.id	URL or Bibcode for documentation
contact_email	String	Curator Contact Email	meta.id	Contact name
<b>Target Metadata</b>				
target_name	String	Target Name	meta.id	Target name
target_class	String	Target Class	meta.id	Target description
target_specclass	String	Target Spectral Class	meta.id	Object class of observed target
target_pos	String	Target Pos	meta.id	Object spectral class
target_ra	String	Target RA	meta.id	Target RA and Dec
target_dec	String	Target Dec	meta.id	Target RA and Dec
target_varamp	String	Target VarAmp	meta.id	Target variability amplitude (typical)
<b>Derived Metadata</b>				
derived_snr	String	Derived SNR	meta.id	Signal-to-noise for observed target
derived_redshift	String	Derived Redshift Value	meta.id	Measured redshift for target
derived_status	String	Derived Redshift Status	meta.id	Error on measured redshift
derived_redshift_conf	String	Derived Redshift Confidence	meta.id	Confidence value on redshift
derived_varamp	String	Derived VarAmp	meta.id	Variability amplitude as fraction of mean
<b>Coordinate System Metadata</b>				
<b>CoordSys</b>				
coordsys_id	String	CoordSys ID	meta.id	ID string for coordinate system
<b>SpaceFrame</b>				
sf_id	String	CoordSys SpaceFrame ID	meta.id	ID string for spatial frame
sf_name	String	CoordSys SpaceFrame Name	meta.id	Spatial coordinate frame name
sf_ucd	String	CoordSys SpaceFrame UCD	meta.id	Space frame UCD
sf_pos	String	CoordSys SpaceFrame Pos	meta.id	Origin of SpaceFrame
sf_equinox	String	CoordSys SpaceFrame Equinox	meta.id	Equinox
<b>TimeFrame</b>				
tf_id	String	CoordSys TimeFrame ID	meta.id	ID string for time frame
tf_name	String	CoordSys TimeFrame Name	meta.id	Timeframe name
tf_ucd	String	CoordSys TimeFrame UCD	meta.id	Timeframe UCD
tf_pos	String	CoordSys TimeFrame Pos	meta.id	Location for times of photon arrival
tf_zero	String	CoordSys TimeFrame Zero	meta.id	Zero point of timescale in MJD
<b>SpectralFrame</b>				
sf_id	String	CoordSys SpectralFrame ID	meta.id	ID string for spectral frame
sf_name	String	CoordSys SpectralFrame Name	meta.id	Spectral frame name
sf_ucd	String	CoordSys SpectralFrame UCD	meta.id	Spectral frame UCD
sf_pos	String	CoordSys SpectralFrame Pos	meta.id	Spectral frame origin
sf_redshift	String	CoordSys SpectralFrame Redshift	meta.id	Redshift value used if redshift is corrected
<b>RedshiftFrame</b>				
rf_id	String	CoordSys RedshiftFrame ID	meta.id	ID string for redshift frame
rf_name	String	CoordSys RedshiftFrame Name	meta.id	Redshift frame name

Field ID	Type	UType	UCD	Description
<b>@@ACCESS Model</b>				
<b>Query Metadata</b>				
query_score	Query	Query Score	Query	Degree of match to query parameters
query_token	String	Query Token	Association	Continuation token for large queries
<b>Association Metadata</b>				
assoc_type	Association	Association Type	Association	Type of association
assoc_id	String	Association ID	meta.id	Association identifier
assoc_key	String	Association Key	meta.id	Key used to distinguish association statements
<b>Access Metadata</b>				
access_url	URL	Access Reference	meta.url	URL used to access dataset
access_format	String	Access Format	meta.number	Content or MIME type of dataset
access_size	String	Access Size	meta.number	Estimated dataset size
<b>Dataset Metadata</b>				
<b>General Dataset Metadata</b>				
datamodel_name	String	Dataset DataModel Name	meta.id	Data model name and version
datamodel_prefix	String	Dataset DataModel Prefix	meta.id	Data model prefix
datamodel_url	String	Dataset DataModel URL	meta.url	Reference URL for data model
datamodel_type	String	Dataset Type	meta.id	Dataset type (data type)
datamodel_subtype	String	Dataset Subtype	meta.id	Dataset subtype (secondary type)
datamodel_level	String	Dataset Level	meta.number	Collection level
datamodel_length	String	Dataset Length	meta.number	Number of pixels
datamodel_deleted	String	Dataset Deleted	meta.id	Set if dataset is deleted
<b>Image Metadata</b>				
img_subarray	Image	Image Subarray	meta.number	Image-specific Dataset metadata
img_name	String	Image Name	meta.number	Number of image axes
img_headers	String	Image Headers	meta.number	Length of each axis of each subarray
img_pixtype	String	Image Pixtype	meta.number	Image pixel type
img_wcsaxes	String	Image WCS Axes	meta.url	WCS axis coordinate type
img_dataset	String	Image Dataset	meta.url	Access reference URL for Data element metadata
<b>Dataset Identification Metadata</b>				
obs_title	String	Dataset Title	meta.id	Dataset title
obs_creator_name	String	Dataset Creator	meta.id	Dataset creator
obs_collection	String	Dataset Collection	meta.id	Data collection to which dataset belongs
obs_id	String	Dataset ID	meta.id	Unique observation ID shared by all obs datasets
obs_creator_id	String	Dataset Creator ID	meta.id	UCM Dataset ID
obs_creator_sid	String	Dataset Creator SID	meta.id	Creator's ID for the dataset
obs_epoch	String	Dataset Epoch	meta.id	Data processing/observation date
obs_version	String	Dataset Version	meta.id	Version of dataset
obs_creation_type	String	Dataset Creation Type	meta.id	Dataset creation type
obs_logo	String	Dataset Logo	meta.url	URL for creator logo
obs_contributor	String	Dataset Contributor	meta.id	Contributor
<b>Provenance Metadata</b>				
facility_name	String	Provenance ObsConfig Facility Name	meta.id	Instrument name
instrument_name	String	Provenance ObsConfig Instrument Name	meta.id	Specialized name or names
obs_destination	String	Provenance ObsConfig Destination	meta.id	Original source of the data
obs_data_source	String	Provenance ObsConfig Data Source	meta.id	Proposed if any dataset is associated with
proposal_id	String	Provenance Proposal Identifier	meta.id	Proposed if any dataset is associated with
<b>Curator Metadata</b>				
publisher	String	Curator Publisher	meta.id	Dataset publisher
publisher_id	String	Curator Publisher ID	meta.id	URL for VDO Publisher
obs_publisher_sid	String	Curator Publisher SID	meta.id	Publisher's ID for the dataset ID
obs_release_date	String	Curator Release Date	meta.id	Dataset release date
version	String	Curator Version	meta.id	URL of preview graphic for dataset
data_rights	String	Curator Rights	meta.id	Publisher's version of the dataset
obs_reference	String	Curator Reference	meta.id	Restrictions on data access
contact_name	String	Curator Contact Name	meta.id	URL or Bibcode for documentation
contact_email	String	Curator Contact Email	meta.id	Contact name
<b>Target Metadata</b>				
target_name	String	Target Name	meta.id	Target name
target_class	String	Target Class	meta.id	Target description
target_specclass	String	Target Spectral Class	meta.id	Object class of observed target
target_pos	String	Target Pos	meta.id	Object spectral class
target_ra	String	Target RA	meta.id	Target RA and Dec
target_dec	String	Target Dec	meta.id	Target RA and Dec
target_varamp	String	Target VarAmp	meta.id	Target variability amplitude (typical)
<b>Derived Metadata</b>				
derived_snr	String	Derived SNR	meta.id	Signal-to-noise for observed target
derived_redshift	String	Derived Redshift Value	meta.id	Measured redshift for target
derived_status	String	Derived Redshift Status	meta.id	Error on measured redshift
derived_redshift_conf	String	Derived Redshift Confidence	meta.id	Confidence value on redshift
derived_varamp	String	Derived VarAmp	meta.id	Variability amplitude as fraction of mean
<b>Coordinate System Metadata</b>				
<b>CoordSys</b>				
coordsys_id	String	CoordSys ID	meta.id	ID string for coordinate system
<b>SpaceFrame</b>				
sf_id	String	CoordSys SpaceFrame ID	meta.id	ID string for spatial frame
sf_name	String	CoordSys SpaceFrame Name	meta.id	Spatial coordinate frame name
sf_ucd	String	CoordSys SpaceFrame UCD	meta.id	Space frame UCD
sf_pos	String	CoordSys SpaceFrame Pos	meta.id	Origin of SpaceFrame
sf_equinox	String	CoordSys SpaceFrame Equinox	meta.id	Equinox
<b>TimeFrame</b>				
tf_id	String	CoordSys TimeFrame ID	meta.id	ID string for time frame
tf_name	String	CoordSys TimeFrame Name	meta.id	Timeframe name
tf_ucd	String	CoordSys TimeFrame UCD	meta.id	Timeframe UCD
tf_pos	String	CoordSys TimeFrame Pos	meta.id	Location for times of photon arrival
tf_zero	String	CoordSys TimeFrame Zero	meta.id	Zero point of timescale in MJD
<b>SpectralFrame</b>				
sf_id	String	CoordSys SpectralFrame ID	meta.id	ID string for spectral frame
sf_name	String	CoordSys SpectralFrame Name	meta.id	Spectral frame name
sf_ucd	String	CoordSys SpectralFrame UCD	meta.id	Spectral frame UCD
sf_pos	String	CoordSys SpectralFrame Pos	meta.id	Spectral frame origin
sf_redshift	String	CoordSys SpectralFrame Redshift	meta.id	Redshift value used if redshift is corrected
<b>RedshiftFrame</b>				
rf_id	String	CoordSys RedshiftFrame ID	meta.id	ID string for redshift frame
rf_name	String	CoordSys RedshiftFrame Name	meta.id	Redshift frame name



# Data Model

Single-line / Single-object velocity data cubes  
Velocity associated to emission line

<b>VelocityAxisName</b>	<b>Name for velocity axis</b>
<b>VelocityAxisUCD</b>	<b>UCD for velocity</b>
<b>VelocityAxisUnit</b>	<b>Unit for velocity</b>
<b>LineName</b>	<b>Name of spectral line</b>
<b>LineRestFrequency</b>	<b>Line rest frequency</b>
<b>VelocityAxisLocation</b>	<b>Central velocity in datacube</b>
<b>VelocityAxisExtent</b>	<b>Velocity axis length</b>
<b>VelocityAxisSupportExtent</b>	<b>Velocity line length</b>
<b>VelocityStart</b>	<b>Start value for measured velocity in line</b>
<b>VelocityStop</b>	<b>Last value for measured velocity in line</b>
<b>VelocityBinSize</b>	<b>Velocity bin size</b>

## Better Flux Characterization

FluxAxisName	<b>FluxMin</b>	<b>Flux min value</b>	char	*
FluxAxisUCD	<b>FluxMax</b>	<b>Flux max value</b>	char	*
FluxAxisUnit	<b>FluxSupportExtent</b>	<b>Flux dynamic range</b>	char	*
FluxMin	<b>FluxLineAxisMax</b>	<b>Max value for flux measured for the line</b>	double	
FluxMax			double	
FluxSupportExtent			double	
FluxLineAxisMax			double	
FluxStatError			double	
FluxSysError			double	
FluxCalibration			char	*



# Data Model

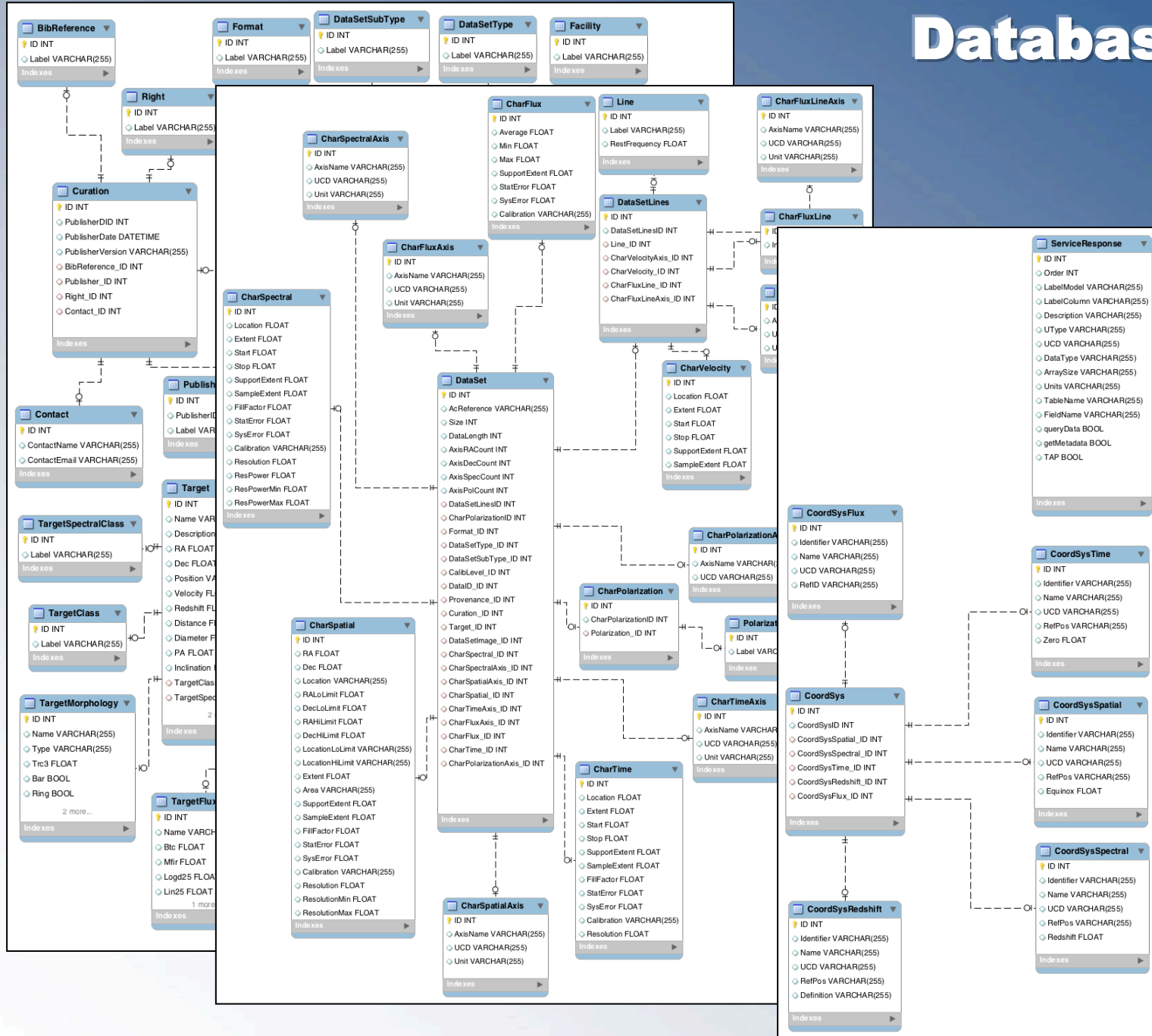
## Instrumental and Post processing Provenance

<b>BeamMajorAxis</b>	Major axis (FWHM) of beam (arcsec)		
<b>BeamMinorAxis</b>	Minor axis (FWHM) of beam (arcsec)		
<b>BeamPositionAngle</b>	Position angle of major axis of beam (N->E)		
<b>Tapering</b>	Taper type in cleaning process		
<b>OverSampling</b>	Number of pixels considered as spatial resolution for CLEAN		
<b>MaximumAngularScale</b>	Maximum angular scale for radiointerferometric observations		

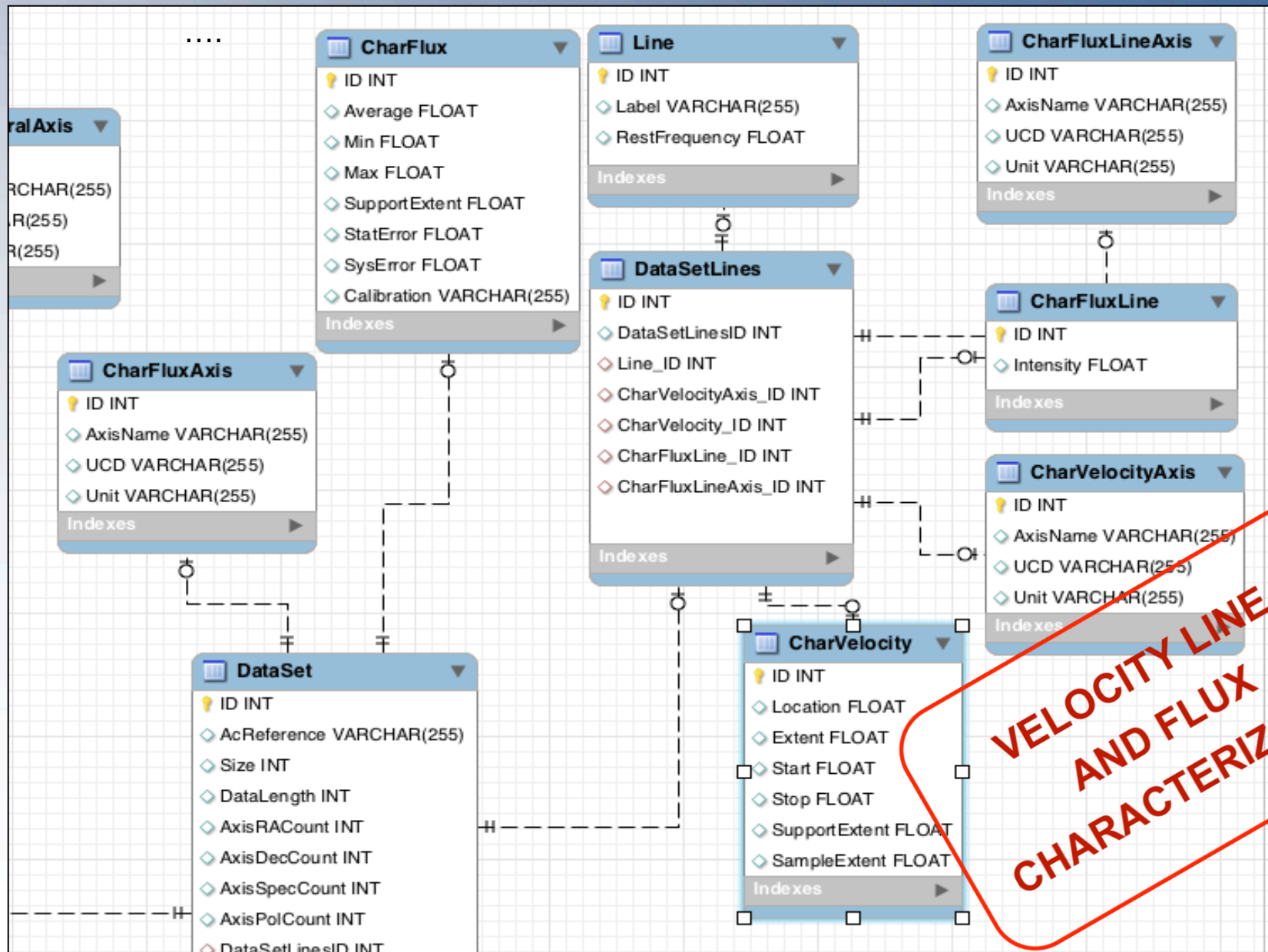
## Derived properties associated to the Target

<b>DerivedVelocity</b>	Measured velocity for target		
<b>DerivedDistance</b>	Derived distance for target		
<b>DerivedInclination</b>	Derived inclination for target		
<b>TargetPositionAngle</b>	Measured position angle for target		
<b>DerivedMorphologyType</b>	Morphology Hubble classification code		
<b>DerivedBar</b>	Presence of ring		
<b>DerivedRing</b>	Presence of bar		
<b>DerivedBTc</b>	Derived corrected bolometric absolute magnitude in B band		
<b>DerivedMFIR</b>	Derived absolute magnitude in far infrared		
<b>DerivedLogLB</b>	Log of derived total luminosity in solar units for B band		

# Database



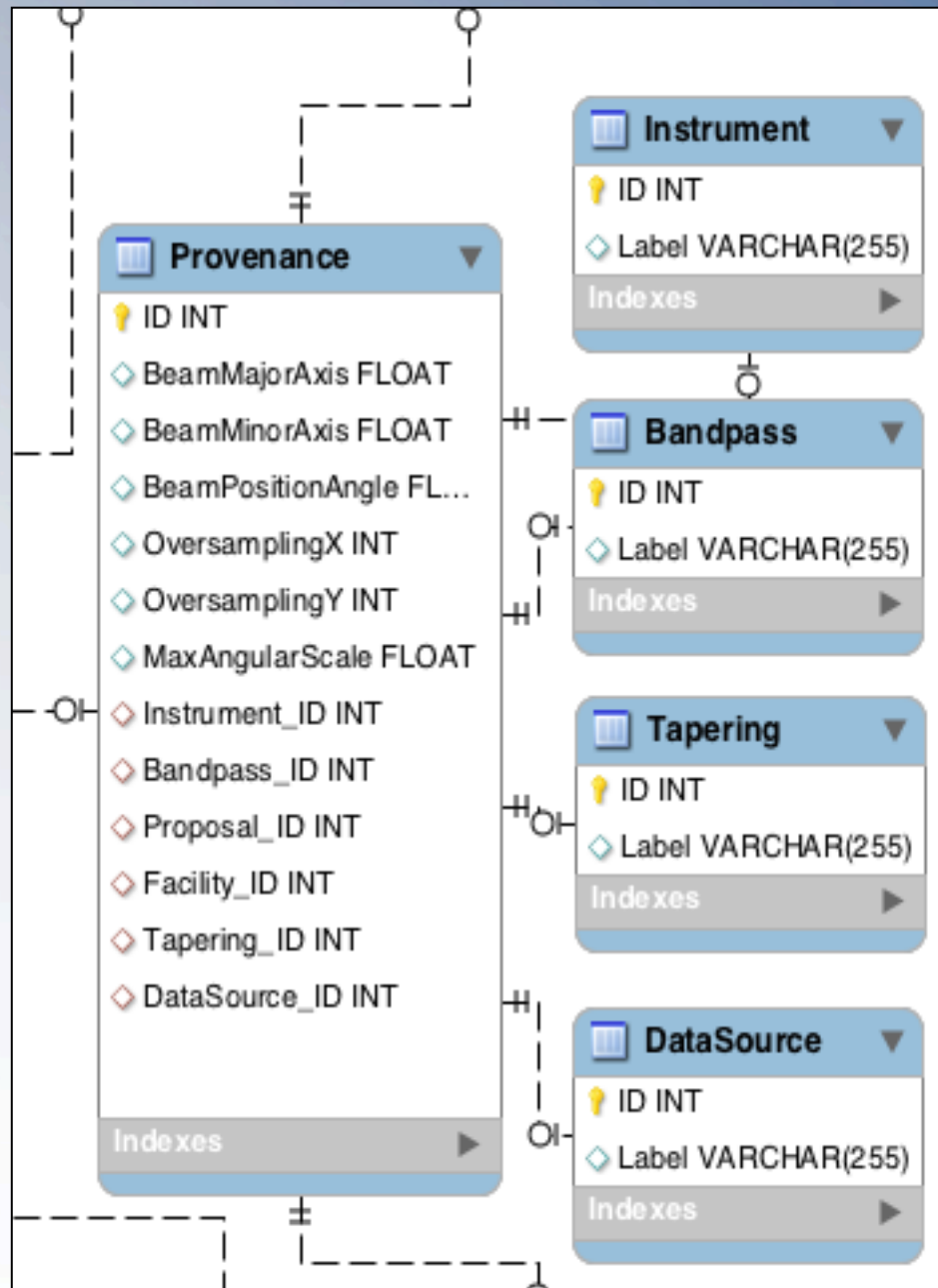
# Database



VELOCITY LINE  
AND FLUX  
CHARACTERIZATION



# Database

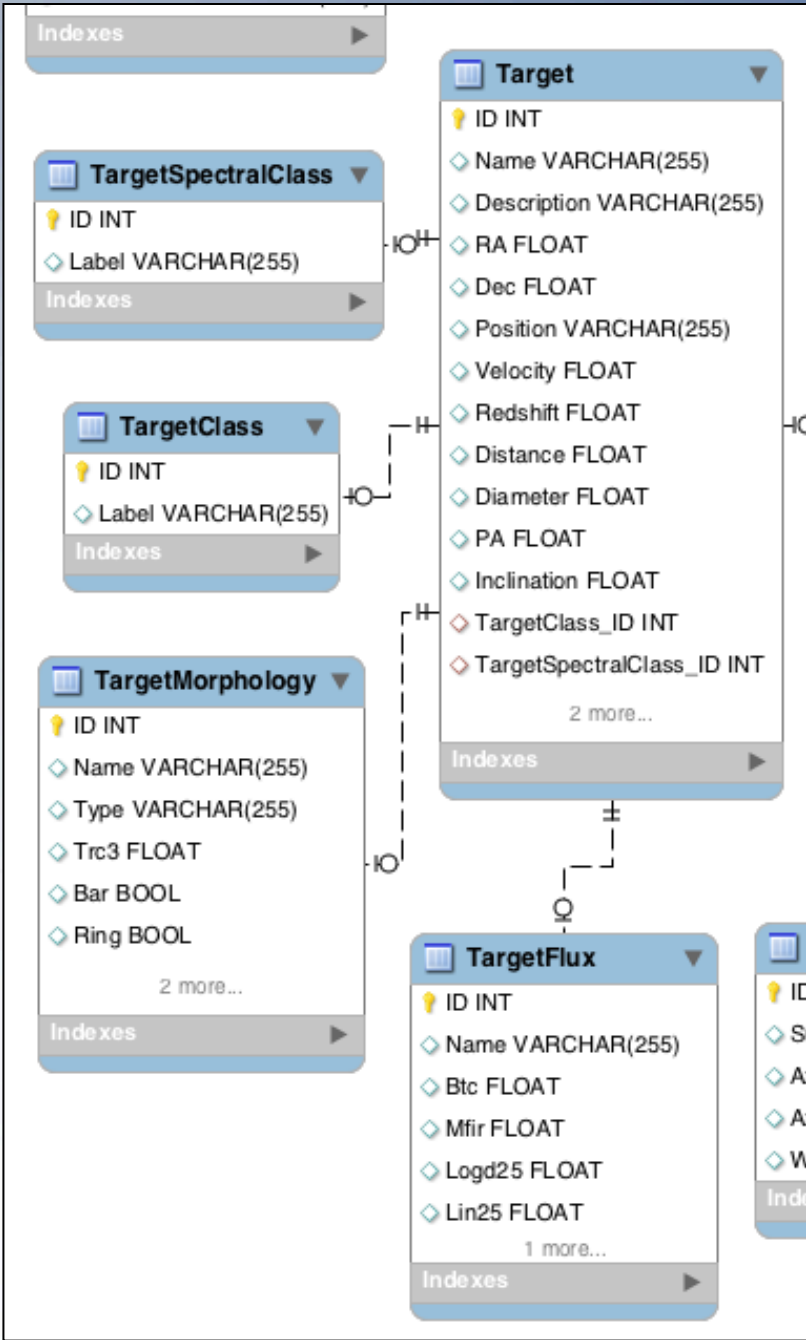


**INSTRUMENTAL AND  
POST PROCESSING  
PROVENANCE**





# Database



**DERIVED  
TARGET PROPERTIES**



# Database Filling

## IPython Notebook Executable Recipe

- Web tool **executable in the browser**
- Imports a **single Collection** each time
- **Single-target single-line** velocity data cubes of galaxies
- **Configuration of parameters** for each Collection
  - Type, SubType, File Format, Calibration Level
  - Collection, Access Rights, Publisher, Contact, Creator, CreationType
  - Facility, Instrument, Bandpass, DataSource, Proposal
  - UCD/Unit Axis Characterization, Line Characterization
- Fills a **specific MySQL BDD structure**
- DataSets are **FITS files** placed in a specified folder
- Configurable **FITS headers mapping**
- Produces a **SQL Script**
- Addition of **Derived Metadata for Targets** in a second step

```
Functions
The following functions generate SQL statements with values extracted from FITS files headers.

PrecessCoordinates
In [42]: def PrecessCoordinates(ra, dec, epoch):
        galaxy = FESCoordinates(ra, dec, unit=(u.degree, u.degree), equinox=astro7line(epoch, format='year', scale='utc'))
        galaxy.precess_to(astroTime(2000, format='year', scale='utc'))
        return galaxy.ra.deg, galaxy.dec.deg

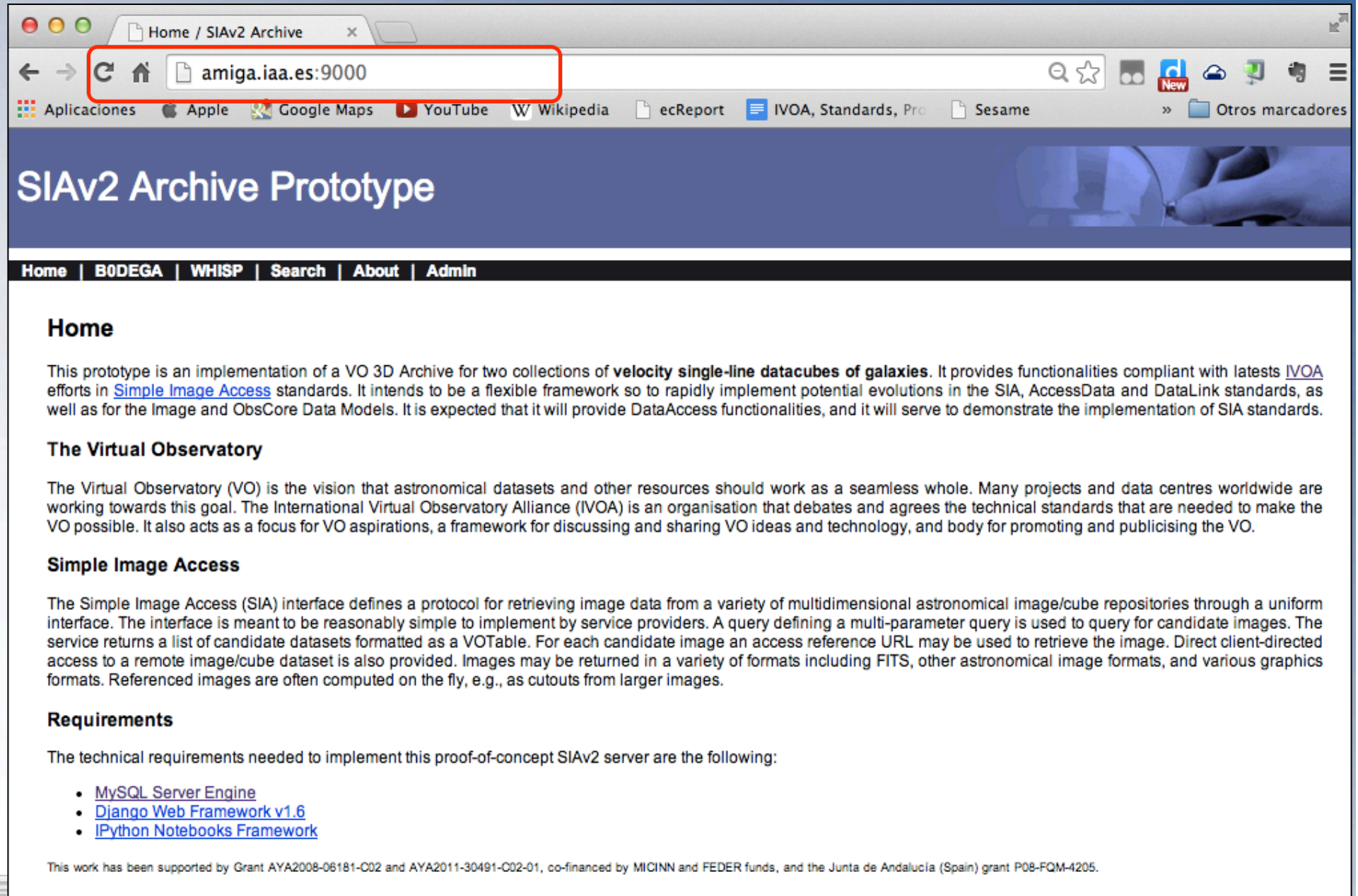
TableFieldUpdateValue
In [43]: # update table/field with last inserted autoincremental identifier
        def TableFieldUpdateValue(table, field, value):
            sqlupdate = ""
            UPDATE ""table"" SET ""field""=""str(value)"" ORDER BY 'ID' DESC LIMIT 1;
            ""
            return sqlupdate

Data Product
In [44]: def DataProduct(hdr, filename):
        statinfo = os.stat(filename)
        size = statinfo.st_size
        length = hdr[head['NAXIS1']] * hdr[head['NAXIS2']] * hdr[head['NAXIS3']]
        #removepath, tail = os.path.split(filename)

        DataSetSQL = ""
        INSERT INTO 'DataSet' (
            'Reference', 'Size', 'DataLength',
            'Axis3Count', 'Axis2Count', 'Axis1Count'
```



# Web Interface



Home / SIAv2 Archive

amiga.iaa.es:9000

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## SIAv2 Archive Prototype

Home | B0DEGA | WHISP | Search | About | Admin

### Home

This prototype is an implementation of a VO 3D Archive for two collections of **velocity single-line datacubes of galaxies**. It provides functionalities compliant with latests [IVOA](#) efforts in [Simple Image Access](#) standards. It intends to be a flexible framework so to rapidly implement potential evolutions in the SIA, AccessData and DataLink standards, as well as for the Image and ObsCore Data Models. It is expected that it will provide DataAccess functionalities, and it will serve to demonstrate the implementation of SIA standards.

### The Virtual Observatory

The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole. Many projects and data centres worldwide are working towards this goal. The International Virtual Observatory Alliance (IVOA) is an organisation that debates and agrees the technical standards that are needed to make the VO possible. It also acts as a focus for VO aspirations, a framework for discussing and sharing VO ideas and technology, and body for promoting and publicising the VO.

### Simple Image Access

The Simple Image Access (SIA) interface defines a protocol for retrieving image data from a variety of multidimensional astronomical image/cube repositories through a uniform interface. The interface is meant to be reasonably simple to implement by service providers. A query defining a multi-parameter query is used to query for candidate images. The service returns a list of candidate datasets formatted as a VOTable. For each candidate image an access reference URL may be used to retrieve the image. Direct client-directed access to a remote image/cube dataset is also provided. Images may be returned in a variety of formats including FITS, other astronomical image formats, and various graphics formats. Referenced images are often computed on the fly, e.g., as cutouts from larger images.

### Requirements

The technical requirements needed to implement this proof-of-concept SIAv2 server are the following:

- [MySQL Server Engine](#)
- [Django Web Framework v1.6](#)
- [IPython Notebooks Framework](#)

This work has been supported by Grant AYA2008-06181-C02 and AYA2011-30491-C02-01, co-financed by MICINN and FEDER funds, and the Junta de Andalucía (Spain) grant P08-FQM-4205.



Browser window: / SIAv2 Archive x  
amiga.iaa.es:9000/search/

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## SIAv2 Archive Prototype

Home | BODEGA | WHISP | Search | About | Admin

### Search criteria

**Spatial Axis**  
Coordinates ("ra,dec" in degrees):  Width (deg):

**Energy Axis**

**Frequency**  
Central value (Hz):  Width (Hz):

**Velocity**  
Line:  Central value (km/s):  Width (km/s):

Frequency inputs prevail over velocities.

**Collection**  
Data collection:

**Output Options**  
Format Response:

Spatial  
Frequency  
Line Velocity  
Collection



# Response List

Browser: / SIAv2 Archive | amiga.iaa.es:9000/search/ | Aplicaciones | Apple | Google Maps | YouTube | Wikipedia | ecReport | IVOA, Standards, Pro | Sesame | Interferometry | Otros marcadores

**SIAv2 Archive Prototype**

Home | B0DEGA | WHISP | Search | About | Admin

Name	RA (")	Dec (")	Type	Target			PA (")	Incl (")	LogLB	Line	Velocity		Spectral		Collection
				Bar	Ring	Diam (")					Central Value (km/s)	Bin (km/s)	Central Value (Hz)	Bin (Hz)	
<a href="#">NGC613</a>	23.5758	-29.4183	Sbc	1		17.5	118.6	46.9	10.4	12 CO 21	1490.08	20.0011			B0DEGA
<a href="#">NGC3110</a>	151.009	-6.47528	SBb	1		69.0	176.0	64.89		12 CO 21	4989.95	19.9998			B0DEGA
<a href="#">NGC2559</a>	124.275	-27.4558	SBbc	1		20.0	3.68	64.2		12 CO 21	1540.04	20.0005			B0DEGA
<a href="#">NGC3175</a>	153.676	-28.8717	Sab	1		14.9	55.5	76.2	10.1	12 CO 21	1040.03	20.0005			B0DEGA
<a href="#">NGC5247</a>	204.512	-17.8842	SABb	1		22.2	170.17	38.1	10.57	12 CO 21	1339.98	19.9997			B0DEGA
<a href="#">NGC1022</a>	39.6362	-6.6775	SBA	1		18.5	67.63	59.87	9.87	12 CO 21	1430.07	20.001			B0DEGA
<a href="#">NGC5792</a>	224.595	-1.09111	Sb	1		30.6	88.48	72.37	10.52	12 CO 21	1899.88	19.9987			B0DEGA
<a href="#">NGC4691</a>	192.057	-3.33278	SO-a	1		22.5	15.28	38.67	10.24	12 CO 21	1090.02	20.0004			B0DEGA
<a href="#">NGC3672</a>	171.26	-9.79528	Sc			28.4	6.5	56.16	10.66	12 CO 21	1840.12	20.0013			B0DEGA
<a href="#">NGC4030</a>	180.098	-1.1	Sbc			25.9	8.59	40.0	10.3	12 CO 21	1440.04	20.0005			B0DEGA
<a href="#">NGC4984</a>	197.239	-15.5164	SO-a	1		21.3	45.0	47.1	10.21	12 CO 21	1239.87	19.9979			B0DEGA
<a href="#">NGC5054</a>	199.244	-16.6347	Sbc			27.3	171.11	57.05	10.66	12 CO 21	1680.0	20.0			B0DEGA
<a href="#">NGC232</a>	10.6908	-23.5617	SBA	1	1	89.0	17.18	47.36		12 CO 21	6649.71	24.9989			B0DEGA
<a href="#">NGC134</a>	7.59083	-33.2442	SABb	1		19.0	49.88	77.3	10.63	12 CO 21	1540.08	20.0011			B0DEGA
<a href="#">NGC4433</a>	186.911	-8.27833	SABa	1		41.8	3.27	79.41	10.52	12 CO 21	2940.14	20.001			B0DEGA
<a href="#">NGC4666</a>	191.286	-0.461944	SABc	1		14.1	39.73	69.67	10.1	12 CO 21	1540.03	20.0004			B0DEGA
<a href="#">NGC1808</a>	76.9262	-37.5131	Sa	1	1	10.8	136.01	83.87	10.0	12 CO 21	1020.03	20.0005			B0DEGA
<a href="#">NGC5937</a>	232.692	-2.82944	SABb	1		41.0	175.27	57.97		12 CO 21	2779.83	19.9987			B0DEGA
<a href="#">NGC5713</a>	220.048	-0.29	SABb	1		30.4	11.0	48.18	10.43	12 CO 21	1839.86	19.9985			B0DEGA
<a href="#">NGC1087</a>	41.605	-0.498611	SABc	1	1	19.0	12.03	33.2	10.28	12 CO 21	1530.09	20.0011			B0DEGA
<a href="#">NGC4418</a>	186.727	-0.8775	SABa	1		33.0	65.36	68.19		12 CO 21	2090.1	20.001			B0DEGA
<a href="#">NGC908</a>	35.7692	-21.2339	SABc	1		17.8	76.83	57.8	10.51	12 CO 21	1480.0	20.0015			B0DEGA
<a href="#">NGC1084</a>	41.4996	-7.57861	Sc			17.1	35.5	46.0	10.3	12 CO 21	1390.07	20.001			B0DEGA
<a href="#">NGC5861</a>	227.317	-11.3217	SABc	1	1	28.9	149.2	69.47	10.51	12 CO 21	1839.84	19.9982			B0DEGA
<a href="#">NGC1385</a>	54.3679	-24.5014	SBc	1		17.5	3.5	53.0	10.1	12 CO 21	1480.1	20.001			B0DEGA
<a href="#">E493G16</a>	117.183	-26.2464	Sbc			34.0	149.32	82.67		12 CO 21	2630.14	20.0011			B0DEGA
<a href="#">NGC986</a>	38.3929	-39.045	Sab	1	1	23.2	28.06	38.06	10.26	12 CO 21	1940.06	20.0006			B0DEGA
<a href="#">NGC1667</a>	72.1542	-6.32	SABc	1	1	61.0	20.0	39.99		12 CO 21	4479.96	19.9998			B0DEGA
<a href="#">NGC157</a>	8.69417	-8.39639	SABb	1		20.9	28.1	61.74	10.53	12 CO 21	1640.09	20.0011			B0DEGA
<a href="#">NGC1482</a>	58.6621	-20.5025	SO-a			19.6	107.29	63.58		12 CO 21	1840.05	20.0005			B0DEGA
<a href="#">CIG0232</a>	121.75	34.1								HI 21cm	5290.0		1395620000.0	19531.2	WHISP
<a href="#">CIG0105</a>	36.0704	33.3542								HI 21cm	553.0		1417720000.0	19531.2	WHISP
<a href="#">CIG0449</a>	162.56	73.955								HI 21cm	1262.0		1414380000.0	19531.2	WHISP
<a href="#">CIG0186</a>	109.975	61.7833								HI 21cm	1733.0		1412300000.0	9765.62	WHISP
<a href="#">CIG0235</a>	122.615	45.8972								HI 21cm	581.0		1417680000.0	19531.2	WHISP
<a href="#">CIG0724</a>	241.8	36.75								HI 21cm	9080.0		1378570000.0	78125.0	WHISP
<a href="#">CIG0434</a>	159.98	34.7203								HI 21cm	639.0		1417360000.0	9765.62	WHISP
<a href="#">CIG0347</a>	142.333	21.7219								HI 21cm	574.0		1417780000.0	19531.2	WHISP
<a href="#">CIG0699</a>	235.333	67.4082								HI 21cm	427.0		1418370000.0	9765.62	WHISP

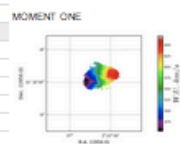
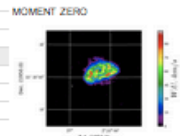
Target  
Line Velocity  
Wavelength  
Collection

# Record

[Home](#) | [BIDEGA](#) | [WHSP](#) | [Search](#) | [About](#) | [Admin](#)

## SIAv2 Archive Prototype

Characterization: NGC385					
Target					
Target Name	G0105	meta.id.src		Duration	
Target Description		meta.note.src		Duration Publisher	The AMIGA Group
Target Class	G	src.class		Duration PublisherID	ivo://ivo.iaa.es
Target Pos	(36.07, 33.35)	pos.eq.src		Duration PublisherOID	ivo://ivo.iaa.es/Reiv2-32
Target OpticalAngDiameter		phys.diameter;phys.angSize		Dataset	
Target Derived Properties				Dataset Title	G0105
Derived Velocity		km/s	phys.veloc	Dataset Collection	WHSP
Derived Redshift			src.redshift	Dataset Type	cube
Derived Distance		Mpc	pos.distance	Dataset Subtype	whsp.cube.refcube
Derived PA		deg	pos.posAng	Dataset CellSize	Level 2
Derived Inclination		deg	src.orbital.inclination	Dataset Length	3252288
Derived Morphology Type			src.morph;src.morph.type	Dataset Image	
Derived Bar			src.morph.panam	Image Nexes	3
Derived Ring			src.morph.panam	Image Nexes	512 512 127
Derived BTc			phys.magAbs bol	Image WCSAxes	RA—NOP DEC—NOP FREQ—OHEL
Derived MFIR			[?]	Image ImageScale	0.0227734
Derived LogLS			[?]	Access	
Char: SpatialAxis				Access Reference	<a href="#">FITS File</a>
Char: SpatialAxis Coverage Location Coord Position2D Value2 C1	36.07	deg	pos.eq.ra;meta.main	Access Format	application/fits
Char: SpatialAxis Coverage Location Coord Position2D Value2 C2	33.35	deg	pos.eq.dec;meta.main	Access Size	65033
Char: SpatialAxis Coverage Bounds Extent Diameter	0.710999	deg	pos.angSize;instr.fov	Access	kibytes
Char: SpatialAxis Coverage Bounds Limits LoLimit2Vec C1	35.96	deg	pos.eq.ra;stat.min	Access	
Char: SpatialAxis Coverage Bounds Limits LoLimit2Vec C2	32.64	deg	pos.eq.dec;stat.min	Access	<a href="#">Link</a>
Char: SpatialAxis Coverage Bounds Limits HLimit2Vec C1	36.78	deg	pos.eq.ra;stat.max	Derived Images	
Char: SpatialAxis Coverage Bounds Limits HLimit2Vec C2	34.07	deg	pos.eq.dec;stat.max		
OChar: SpatialAxis Resolution RefVal Value	0.0227734	deg	pos.angResolution		
Char: SpectralAxis					
Char: SpectralAxis Coverage Location Coord Spectral Value	141720000.0	Hz	em.wl;instr.bandpass		
Char: SpectralAxis Coverage Bounds Extent	2480470.0	Hz	em.wl;instr.bandwidth		
Char: SpectralAxis Coverage Bounds Limits LoLimit	141885000.0	Hz	em.wl;stat.min		
Char: SpectralAxis Coverage Bounds Limits HLimit	141972000.0	Hz	em.wl;stat.max		
Char: SpectralAxis Coverage Support Extent	1289090.0	Hz	em.wl;instr.bandwidth		
Char: SpectralAxis Sampling SampleExtent	19531.2	Hz	em.wl;spect.binSize		
Char: VelocityAxis					
Char: VelocityAxis LineName	H $\epsilon$ 21cm		meta.id.spect.line		
Char: VelocityAxis LineRestFrequency	1420410000.0	Hz	em.freq.spect.line		
Char: VelocityAxis Location	553000.0	m/s	phys.veloc;stat		
Char: VelocityAxis Coverage Extent		m/s	phys.veloc		
Char: VelocityAxis Coverage Support Extent Limits LoLimit		m/s	phys.veloc;stat		
Char: VelocityAxis Coverage Support Extent Limits HLimit		m/s	phys.veloc;stat		
Char: VelocityAxis Coverage Support Extent		m/s	phys.veloc		
Char: VelocityAxis Sampling Sample Extent		m/s	phys.veloc		
Char: ObservableAxis					
Char: ObservableAxis Support Extent		W.U.	phot.flux		
Char: ObservableAxis Min	-45.8398	W.U.	phot.flux;stat.min		
Char: ObservableAxis Max	40.8942	W.U.	phot.flux;stat.max		
Char: ObservableAxis Accuracy StatError RefVal value	0.404524	W.U.	stat.error;phot.flux.density;em		
Char: PolAxis					
Char: PolAxis StateList	L		meta.code;phys.polarization		
Char: TimeAxis					
Char: TimeAxis Coverage Location Coord Time TimeInstant		d	time.epoch;obs		
Instrumental Provenance					
Provenance ObsConfig Facility Name	ASTRON WSRT		meta.id.instr.tel		
Provenance ObsConfig Instrument Name	WSRT		meta.id.instr		
Provenance ObsConfig MaxAngScale		deg	instr.panam		



# Target and Derived Properties

Target			
Target.Name	NGC4666		meta.id;src
Target.Description			meta.note;src
Target.Class	G		src.class
Target.Pos	(191.29, -0.46)	deg	pos.eq;src
Target.OpticalAngDiameter	14.1	arcsec	phys.diameter;phys.angSize
Target Derived Properties			
Derived.Velocity	1518.3	km/s	phys.veloc
Derived.Redshift			src.redshift
Derived.Distance		Mpc	pos.distance
Derived.PA	39.73	deg	pos.posAng
Derived.Inclination	69.67	deg	src.orbital.inclination
Derived.MorphologyType	4.9		src.morph;src.morph.type
Derived.Bar	1		src.morph.param
Derived.Ring			src.morph.param
Derived.BTc	10.666		phys.magAbs bol
Derived.MFIR			[?]
Derived.LogLB	10.1		[?]

Provenance_ObsConfig.Facility.Name	ASTRON WSRT	meta.id;instr.id
Provenance_ObsConfig.Instrument.Name	WSRT	meta.id;instr
Provenance_ObsConfig.MaxAngScale	deg	instr.param



# Spatial and Spectral Characterization

Char.SpatialAxis			
Char.SpatialAxis.Coverage.Location.Coord.Position2D.Value2.C1	36.07	deg	pos.eq.ra;meta.main
Char.SpatialAxis.Coverage.Location.Coord.Position2D.Value2.C2	33.35	deg	pos.eq.dec;meta.main
Char.SpatialAxis.Coverage.Bounds.Extent.Diameter	0.710999	deg	pos.AngSize;instr.fov
Char.SpatialAxis.Coverage.Bounds.Limits.LoLimit2Vec.C1	35.36	deg	pos.eq.ra;stat.min
Char.SpatialAxis.Coverage.Bounds.Limits.LoLimit2Vec.C2	32.64	deg	pos.eq.dec;stat.min
Char.SpatialAxis.Coverage.Bounds.Limits.HiLimit2Vec.C1	36.78	deg	pos.eq.ra;stat.max
Char.SpatialAxis.Coverage.Bounds.Limits.HiLimit2Vec.C1	34.07	deg	pos.eq.dec;stat.max
CChar.SpatialAxis.Resolution.Refval.Value	0.00277734	deg	pos.angResolution
Char.SpectralAxis			
Char.SpectralAxis.Coverage.Location.Coord.Spectral.Value	1417720000.0	Hz	em.wl;instr.bandpass
Char.SpectralAxis.Coverage.Bounds.Extent	2480470.0	Hz	em.wl;instr.bandwidth
Char.SpectralAxis.Coverage.Bounds.Limits.LoLimit	1418850000.0	Hz	em.wl;stat.min
Char.SpectralAxis.Coverage.Bounds.Limits.HiLimit	1416720000.0	Hz	em.wl;stat.max
Char.SpectralAxis.Coverage.Support.Extent	1289060.0	Hz	em.wl;instr.bandwidth
Char.SpectralAxis.Sampling.SampleExtent	19531.2	Hz	em.wl;spect.binSize

# Line Velocity Characterization

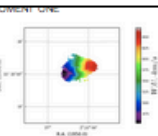
Char.VelocityAxis			
Char.VelocityAxis.LineName	12 CO 21		meta.id;spect.line
Char.VelocityAxis.LineRestfrequency	2.30538e+11	Hz	em.freq;spect.line
Char.VelocityAxis.Location	1540030.0	m/s	phys.veloc.rotat
Char.VelocityAxis.Coverage.Extent	500010.0	m/s	phys.veloc
Char.VelocityAxis.Coverage.Support.Extent.Limits.LoLimit	1280030.0	m/s	phys.veloc.rotat
Char.VelocityAxis.Coverage.Support.Extent.Limits.HiLimit	1780040.0	m/s	phys.veloc.rotat
Char.VelocityAxis.Coverage.Support.Extent		m/s	phys.veloc
Char.VelocityAxis.Sampling.Sample.Extent	20000.4	m/s	phys.veloc
Char.ObservableAxis			
Char.ObservableAxis.SupportExtent		Jy/Beam	phot.flux
Char.ObservableAxis.Min	-0.34842	Jy/Beam	phot.flux;stat.min
Char.ObservableAxis.Max	1.06195	Jy/Beam	phot.flux;stat.max
Char.ObservableAxis.Accuracy.StatError.Refval.value	0.0160589	Jy/Beam	stat.error;phot.flux.density;em

# Polarization and Time

Browser window: / SIAv2 Archive x  
 amiga.iaa.es:9000/record/32/  
 Aplicaciones Apple Google Maps YouTube Wikipedia ecReport IVOA, Standards, Pro Sesame Interferometry Otros marcadores

SIAv2 Archive Prototype

Characterization: NGC385					
Target					
Target Name	CG0105	meta.id.src	Curation	The AMIGA Group	meta.curation
Target Description		meta.note.src	Curation PublisherID	ivo://ivo.amiga.iaa.es	meta.ref.uri;meta.curation
Target Class	G	src.class	Curation PublisherOID	ivo://ivo.amiga.iaa.es/Relav2-32	meta.ref.uri;meta.curation
Target Pos	(36.07, 33.35)	deg pos.eq.src	DataID		
Target OpticalAngDiameter		arcsec phys.diameter;phys.angSize	DataID Title	CG0105	meta.title;meta.dataset
Target Derived Properties			DataID Collection	WHSP	meta.title;meta.dataset
Derived Velocity		km/s phys.veloc	Dataset		
Derived Redshift		src.redshift	Dataset Type	cube	
Derived Distance		Mpc pos.distance	Dataset Subtype	whsp.cube.refcube	
Derived PA		deg pos.pasAng	Dataset CellLevel	Level 2	
Derived Inclination		deg src.orbital.inclination	Dataset Length	3325288	meta.number
Derived Morphology Type		src.morph;src.morph.type	Dataset Image		
Derived Bar		src.morph.param	Image Nexes	3	meta.number
Derived Ring		src.morph.param	Image Nexes	512 512 127	meta.number
Derived STc		phys.magAxis.tbl	Image WCSAxes	RA—NCP DEC—NCP FREQ—OHEL	meta.number
Derived					
Derived					
Char.S	Char.PolAxis				
Char.S	Char.PolAxis.StateList	L		meta.code;phys.polarization	
Char.S	Char.TimeAxis				
Char.S	Char.TimeAxis.Coverage.Location.Coord.Time.TimeInstant	d		time.epoch;obs	
Char.VelocityAxis					
Char.VelocityAxis.LineName	H $\epsilon$ 21cm	meta.id.spect.line			
Char.VelocityAxis.LineRestFrequency	1420410000.0	Hz em.freq.spect.line			
Char.VelocityAxis.Location	553000.0	m/s phys.veloc.rotat			
Char.VelocityAxis.Coverage.Extent		m/s phys.veloc			
Char.VelocityAxis.Coverage.Support.Extent.Limits.Limit		m/s phys.veloc.rotat			
Char.VelocityAxis.Coverage.Support.Extent.Limits.HLimit		m/s phys.veloc.rotat			
Char.VelocityAxis.Coverage.Support.Extent		m/s phys.veloc			
Char.ObservableAxis					
Char.ObservableAxis.SupportExtent		W.U.	phot.flux		
Char.ObservableAxis.Min	-8.8398	W.U.	phot.flux.stat.min		
Char.ObservableAxis.Max	80.8042	W.U.	phot.flux.stat.max		
Char.ObservableAxis.Accuracy.StateError.RefVal.value	0.404524	W.U.	stat.error;phot.flux.density.em		
Char.PolAxis					
Char.PolAxis.StateList	L		meta.code;phys.polarization		
Char.TimeAxis					
Char.TimeAxis.Coverage.Location.Coord.Time.TimeInstant		d	time.epoch;obs		
Instrumental Provenance					
Provenance.ObsConfig.Facility.Name	ASTRON WSRT		meta.id.instr.tbl		
Provenance.ObsConfig.Instrument.Name	WSRT		meta.id.instr		
Provenance.ObsConfig.MaxAngScale		deg	instr.param		



# Instrumental and Post Processing Provenance

Browser window showing the URL `amiga.iaa.es:9000/record/32/`. The browser's address bar and toolbar are visible, along with various application icons like Google Maps, YouTube, and Wikipedia.

SIAv2 Archive Prototype navigation bar with links for Home, BICEGA, WHISP, Search, About, and Admin.

Characterization: NGC985

Instrumental Provenance			
Provenance.ObsConfig.Facility.Name	ASTRON.WSRT		meta.id:instr.tel
Provenance.ObsConfig.Instrument.Name	WSRT		meta.id;instr
Provenance.ObsConfig.MaxAngScale		deg	instr.param
Provenance.Postprocessing.Bmaj	31.7461	arcsec	instr.beam
Provenance.Postprocessing.Bmin	26.8155	arcsec	instr.beam
Provenance.Postprocessing.Bpa		arcsec	instr.beam;instr.param
Provenance.Postprocessing.Tapering	NATURAL		instr.param
Provenance.Postprocessing.Oversampling			instr.param

Char: Observable			
Char: ObservableAxis.SupportExtent		W.U.	phot.flux
Char: ObservableAxis.Min	-8.8398	W.U.	phot.flux.stat.min
Char: ObservableAxis.Max	80.8042	W.U.	phot.flux.stat.max
Char: ObservableAxis.Accuracy.StatError.RefVal	0.404204	W.U.	stat.error.phot.flux.density.err
Char: PolAxis			
Char: PolAxis.StateList	L		meta.code.phys.polarization
Char: TimeAxis			
Char: TimeAxis.Coverage.Location.Coord.Time.TimeInStart		d	time.epoch.obs
Instrumental Provenance			
Provenance.ObsConfig.Facility.Name	ASTRON.WSRT		meta.id:instr.tel
Provenance.ObsConfig.Instrument.Name	WSRT		meta.id:instr
Provenance.ObsConfig.MaxAngScale		deg	instr.param

# Dataset Curation and Characterization

[Home](#)
[B0DEGA](#)
[WHSP](#)
[Search](#)
[About](#)
[Admin](#)

Characterization: NGC385

- Target
- Target Name
- Target Description
- Target Class
- Target Pos
- Target OpticalAngularDiameter
- Target Derived Properties
- Derived Velocity
- Derived Redshift
- Derived Distance
- Derived PA
- Derived Inclination
- Derived Morphology Type
- Derived Bar
- Derived Ring
- Derived BTc
- Derived MFIR
- Derived LogS
- Char: SpatialAxis
- Char: SpatialAxis Coverage Location Coord Position2D Value2 C1
- Char: SpatialAxis Coverage Location Coord Position2D Value2 C2
- Char: SpatialAxis Coverage Bounds Extent Diameter
- Char: SpatialAxis Coverage Bounds Limits LoLimit2Vec C1
- Char: SpatialAxis Coverage Bounds Limits LoLimit2Vec C2
- Char: SpatialAxis Coverage Bounds Limits HLimit2Vec C1
- Char: SpatialAxis Coverage Bounds Limits HLimit2Vec C2
- Char: SpatialAxis Resolution RefVal Value
- Char: SpectralAxis
- Char: SpectralAxis Coverage Location Coord Spectral Value
- Char: SpectralAxis Coverage Bounds Extent
- Char: SpectralAxis Coverage Bounds Limits LoLimit
- Char: SpectralAxis Coverage Bounds Limits HLimit
- Char: SpectralAxis Coverage Support Extent
- Char: SpectralAxis Sampling SampleExtent
- Char: VelocityAxis
- Char: VelocityAxis LineName
- Char: VelocityAxis LineRestFrequency
- Char: VelocityAxis Location
- Char: VelocityAxis Coverage Extent
- Char: VelocityAxis Coverage Support Extent Limits LoLimit
- Char: VelocityAxis Coverage Support Extent Limits HLimit
- Char: VelocityAxis Coverage Support Extent
- Char: VelocityAxis Sampling Sample Extent
- Char: ObservableAxis
- Char: ObservableAxis SupportExtent
- Char: ObservableAxis Min
- Char: ObservableAxis Max
- Char: ObservableAxis Accuracy StateError RefVal value
- Char: PosAxis
- Char: PosAxis StateList
- Char: TimeAxis
- Char: TimeAxis Coverage Location Coord Time TimeInstant
- Instrumental Provenance
- Provenance ObsConfig Facility Name
- Provenance ObsConfig Instrument Name
- Provenance ObsConfig MaxAngScale

Curation		
Curation.Publisher	The AMIGA Group	meta.curation
Curation.PublisherID	ivo://svo.amiga.iaa.es	meta.ref.url;meta.curation
Curation.PublisherDID	ivo://svo.amiga.iaa.es/#siav2:16	meta.ref.url;meta.curation
DataID		
DataID.Title	NGC4666	meta.title;meta.dataset
DataID.Collection	B0DEGA	meta.title;meta.dataset
Dataset		
Dataset.Type	cube	
Dataset.Subtype	bodega.cube.refcube	
Dataset.CalibLevel	Level 2	
Dataset.Length	2250000	meta.number
Dataset.Image		
Image.Naxes	3	meta.number
Image.Naxis	300 300 25	meta.number
Image.WCSAxes	RA--SIN DEC--SIN VELO-LSR	meta.number
Image.ImageScale	8.33333e-05	deg/pix meta.number

[New](#)
[Otros marcadores](#)

- meta.curation
- meta.ref.url;meta.curation
- meta.ref.url;meta.curation
- meta.title;meta.dataset
- meta.title;meta.dataset
- meta.number
- meta.number
- meta.number
- meta.number
- meta.number
- meta.ref.url
- meta.number

deg/pix instr\_param



# Access and Thumbnails

Browser window: / SIAv2 Archive | amiga.iaa.es:9000/record/32/ | Aplicaciones | Apple | Google Maps | YouTube | Wikipedia | ecReport | IVOA, Standards, Pro | Sesame | Interferometry | Otros marcadores

Characterization: NGC385					
Target					
Target Name	OQ0105	meta.id.src		Curation	
Target Description		meta.name.src		Curation Publisher	The AMIGA Group
Target Class	G	src.class		Curation PublisherID	ivo://ivo.amiga.iaa.es
Target Pos	(36.07, 33.35)	pos.eq.src		Curation PublisherCID	ivo://ivo.amiga.iaa.es/Resv2-32
Target OpticalAngDiameter		arcsec	phys.diameter,phys.angSize	DataID	
Target Derived Properties				DataID Title	OQ0105
Derived Velocity		km/s	phys.veloc	DataID Collection	WHSP
Derived Redshift			src.redshift	Dataset	
Derived Distance		Mpc	pos.distance	Dataset Type	cube
Derived PA		deg	pos.pasAng	Dataset Subtype	whsp.cube.refcube
Derived Inclination		deg	src.orbital.inclination	Dataset CellLevel	Level 2
Derived Morphology Type			src.morph,src.morph.type	Dataset Length	3329288
Derived Bar			src.morph.panam	Dataset Image	
Derived Ring			src.morph.panam	Image Nexus	3
Derived BTc			phys.magAbs.bt	Image Nexus	512 512 127
Derived MFIR		[?]	[?]	Image WCSAxes	RA—NOP DEC—NOP FREQ—OHEL
Derived LogLS		[?]	[?]	Image ImageScale	0.0277734
Char: SpatialAxis				Access	
Char: SpatialAxis Coverage Location Coord PositionID Value2 C1	36.07	deg	pos.eq.ra.meta.main	Access Reference	<a href="#">FITS File</a>
Char: SpatialAxis Coverage Location Coord PositionID Value2 C2	33.35	deg	pos.eq.dec.meta.main	Access Format	application/fits
Char: SpatialAxis Coverage Bounds Extent Diameter	0.710999	deg	pos.angSize.instr.fov	Access Size	8503
Char: SpatialAxis Coverage Bounds Limits LoLimit2Vec C1	35.36	deg	pos.eq.ra.stat.min	Aladin	
				Aladin Applet	<a href="#">[ Link ]</a>

Access			
Access.Reference	<a href="#">FITS File</a>		meta.ref.url
Access.Format	application/fits		
Access.Size	8800	kilobytes	meta.number
Aladin			
Aladin Applet	<a href="#">[ Link ]</a>		

Provenance ObsConfig Instrument Name	WSRT		meta.id.instr
Provenance ObsConfig MaxAngScale		deg	instr.panam

# Access and Thumbnails

MOMENT ZERO

Dec. (2000.0)

R.A. (2000.0)

$Jy/beam \cdot km/s$

Aladin Applet [\[Link\]](#)

meta.creation
meta.ref.uri;meta.creation
meta.ref.uri;meta.creation
meta.title;meta.dataset
meta.title;meta.dataset
meta.number
meta.number
meta.number
meta.number
meta.number
meta.ref.uri
meta.number

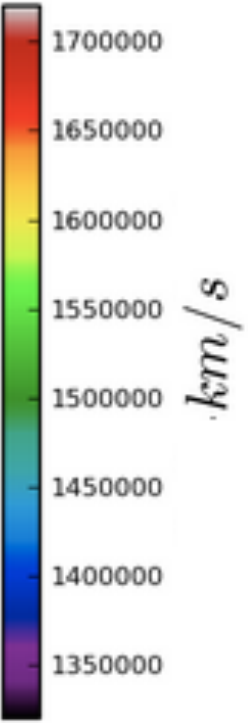
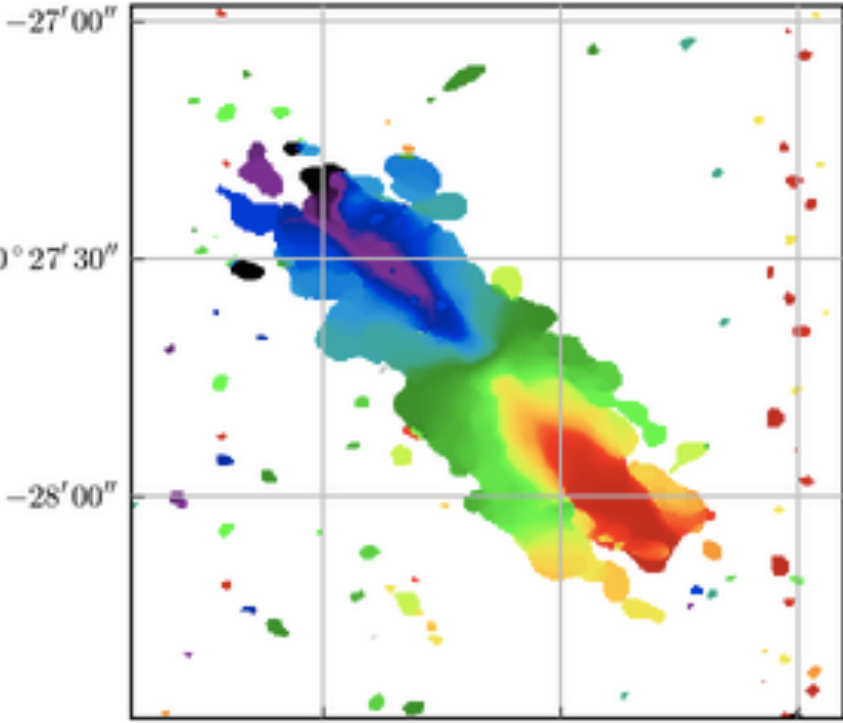
# Access and Thumbnails

MOMENT ZERO

MOMENT ONE

Dec. (2000.0)

Dec. (2000.0)



km/s

Aladin A



# VOTables

Table Columns for 4: SIAv2VOTable.vot

	SID	Class	Shape	Units	Description	UCD	Utype
24	\$24	Double			Derived corrected bolometric absolute magnitude in B band	phys.magAbs.bol	im:Derived.BTC
25	\$25	Double			Derived absolute magnitude in far infrared		im:Derived.MFIR
26	\$26	Double			Log of derived total luminosity in solar units for B band		im:Derived.LogLB
27	\$27	Double		deg	Spatial position first coordinate	pos.eq.ra;meta.main	im:Char.SpatialAxis.Coverage.Loca
28	\$28	Double		deg	Spatial position second coordinate	pos.eq.dec;meta.main	im:Char.SpatialAxis.Coverage.Loca
29	\$29	Double		deg	Diameter of field of view	pos.AngSize;instr.fov	im:Char.SpatialAxis.Coverage.Boun
30	\$30	Double		deg	Lower bounds of image spatial coordinates	pos.eq.ra;stat.min	im:Char.SpatialAxis.Coverage.Boun
31	\$31	Double		deg	Lower bounds of image spatial coordinates	pos.eq.dec;stat.min	im:Char.SpatialAxis.Coverage.Boun
32	\$32	Double		deg	Higher bounds of image spatial coordinates	pos.eq.ra;stat.max	im:Char.SpatialAxis.Coverage.Boun
33	\$33	Double		deg	Higher bounds of image spatial coordinates	pos.eq.dec;stat.max	im:Char.SpatialAxis.Coverage.Boun
34	\$34	Double		arcsec	Spatial resolution of data	pos.angResolution	im:Char.SpatialAxis.Resolution.Ref
35	\$35	Double		Hz	Spectral coord value	em.wl;instr.bandpass	im:Char.SpectralAxis.Coverage.Loc
36	\$36	Double		Hz	Width of spectrum	em.wl;instr.bandwidth	im:Char.SpectralAxis.Coverage.Bou
37	\$37	Double		Hz	Start in spectral coordinate	em.wl;stat.min	im:Char.SpectralAxis.Coverage.Bou
38	\$38	Double		Hz	Stop in spectral coordinate	em.wl;stat.max	im:Char.SpectralAxis.Coverage.Bou
39	\$39	Double		Hz	Effective width of spectrum	em.wl;instr.bandwidth	im:Char.SpectralAxis.Coverage.Sup
40	\$40	Double		Hz	Wavelength bin size	em.wl;spect.binSize	im:Char.SpectralAxis.SamplingPrec
41	\$41	String			Name of spectral line	meta.id;spect.line	im:Char.VelocityAxis.Name
42	\$42	Double		Hz	Line rest frequency	em.freq;spect.line	im:Char.VelocityAxis.RestFreque
43	\$43	Double		m/s	Central velocity in datacube	phys.veloc.rotat	im:Char.VelocityAxis.Location.Coor
44	\$44	Double		m/s	Velocity axis length	phys.veloc	im:Char.VelocityAxis.Coverage.Ext
45	\$45	Double		m/s	Start value for measured velocity in line	phys.veloc	im:Char.VelocityAxis.Coverage.Sup
46	\$46	Double		m/s	Last value for measured velocity in line	phys.veloc	im:Char.VelocityAxis.Coverage.Sup
47	\$47	Double		m/s	Velocity line length	phys.veloc	im:Char.VelocityAxis.Coverage.Sup
48	\$48	Double		m/s	Velocity bin size	phys.veloc	im:Char.VelocityAxis.Sampling.Sam
49	\$49	Double			Flux dynamic range	phot.flux	im:Char.ObservableAxis.Coverage.
50	\$50	Double			Flux min value	phot.flux	im:Char.ObservableAxis.Coverage.
51	\$51	Double			Flux max value	phot.flux	im:Char.ObservableAxis.Coverage.
52	\$52	Double			Flux statistical error	stat.error;phot.flux.density;em	im:Char.ObservableAxis.Accuracy.I
53	\$53	String			Unit for observable	meta.unit	im:Char.ObservableAxis.Unit
54	\$54	String			List of polarization states present	meta.code;phys.polarization;meta.fits	im:Char.PolAxis.StateList
55	\$55	Double		d	Midpoint of exposure on MJD scale	time.epoch;obs	im:Char.TimeAxis.Coverage.Locati
56	\$56	String			Facility name	meta.id:instr.tel	im:Provenance.ObsConfig.Facility.N
57	\$57	String			Instrument name	meta.id:instr	im:Provenance.ObsConfig.Instrume
58	\$58	Double		deg	Maximum angular scale for radiointerferometric observations	pos.AngDistance;instr.fov	im:Provenance.ObsConfig.MaxAngl
59	\$59	Double		arcsec	Major axis (FWHM) of beam	instr.beam	im:Provenance.Postprocessing.Bm
60	\$60	Double		arcsec	Minor axis (FWHM) of beam	instr.beam	im:Provenance.Postprocessing.Bm
61	\$61	Double		deg	Position angle of major axis of beam (N->E)	instr.beam;instr.param	im:Provenance.Postprocessing.Bpa
62	\$62	String			Taper type in cleaning process	instr.param	im:Provenance.Postprocessing.Tap
63	\$63	double[]	?		Number of pixels considered as spatial resolution for CLEAN	instr.nbeam	im:Provenance.Postprocessing.Bna



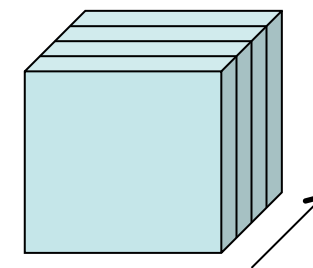
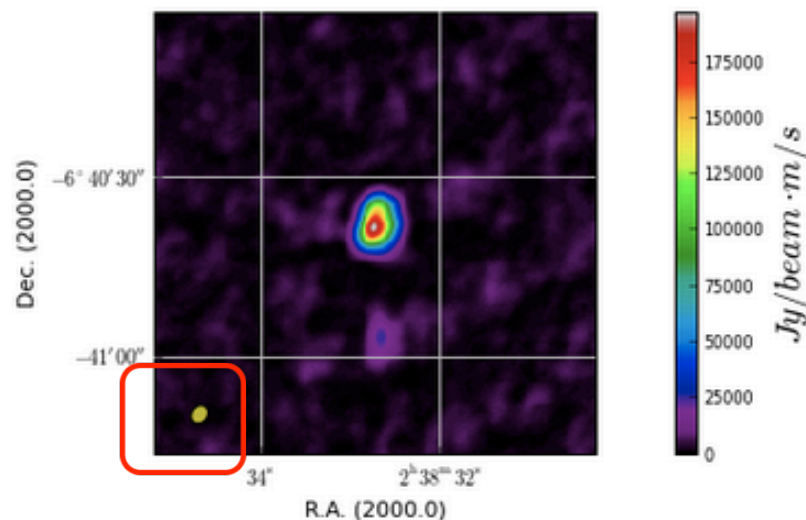
# 3D Exploration /Access Data Use Cases

## Collapsing the cube: Moment Zero

```
In [1]: from kapteyn import maputils  
        disable_notebook()
```

```
In [2]: fitsfile = "/var/opt/VO3DArchive/VO3DArchive/media/data/B0DEGA/FITS/ngc1022_MOM0.fits"  
        pngfile = "ngc1022_MOM0.png"  
        fitsobj = maputils.FITSimage(fitsfile)  
  
        mplim = fitsobj.Annotatedimage(cmap="spectral")  
        mplim.Image()  
        pos = '39.6445 deg, -6.686 deg'  
        mplim.Beam(3.23253, 2.64966, units='arcsec', pa=-36.731)  
        mplim.Graticule()  
        units = r'$Jy/beam\cdot m/s$'  
        colbar = mplim.Colorbar(fontsize=8)  
        colbar.set_label(label=units, fontsize=18)  
        mplim.plot()  
        savefig(pngfile, dpi=150)
```

Range in velocity  
Range in flux  
Beam



Integrated Emission

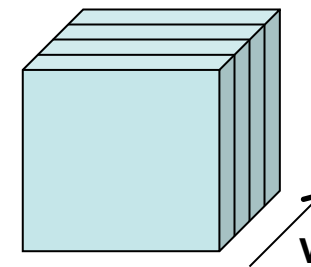
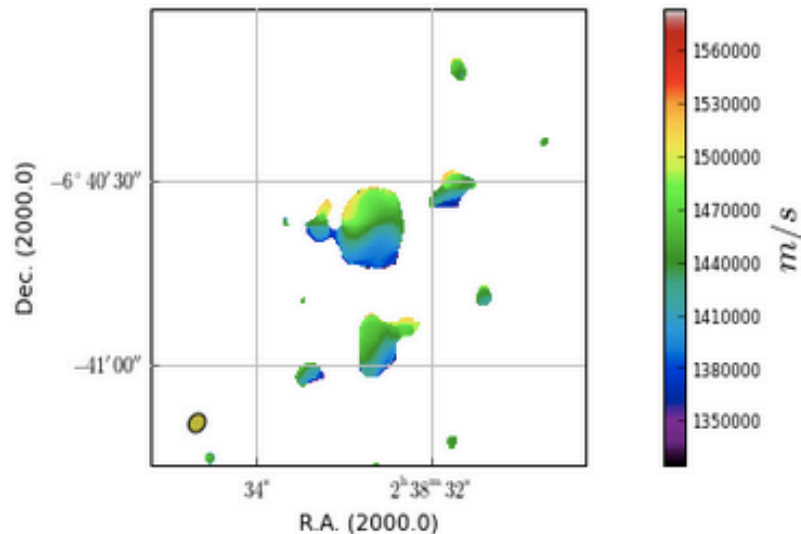
# 3D Exploration /Access Data Use Cases

## Collapsing the cube: Moment One

```
In [4]: fitsfile = "/var/opt/VO3DArchive/VO3DArchive/media/data/B0DEGA/FITS/ngc1022_MOM1.fits"
pngfile = "ngc1022_MOM1.png"
fitsobj = maputils.FITSimage(fitsfile)

mplim = fitsobj.Annotatedimage(cmap="spectral")
mplim.Image()
pos = '39.6445 deg, -6.686 deg'
mplim.Beam(3.23253, 2.64966, units='arcsec', pa=-36.731)
mplim.Graticule()
units = r'$m/s$'
colbar = mplim.Colorbar(fontsize=8)
colbar.set_label(label=units, fontsize=18)
mplim.plot()
savefig(pngfile, dpi=150)
```

Range in velocity  
Range in flux  
Beam

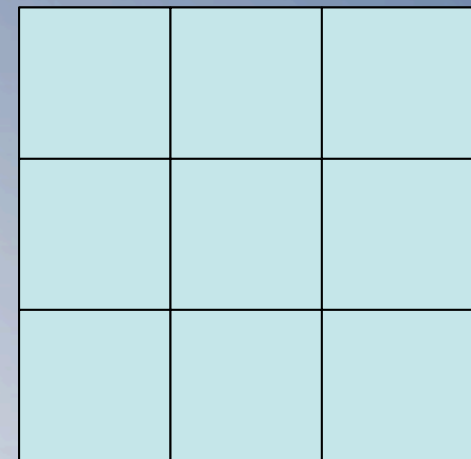
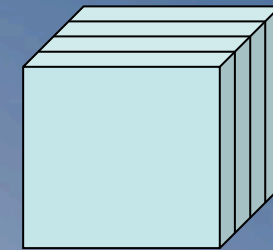
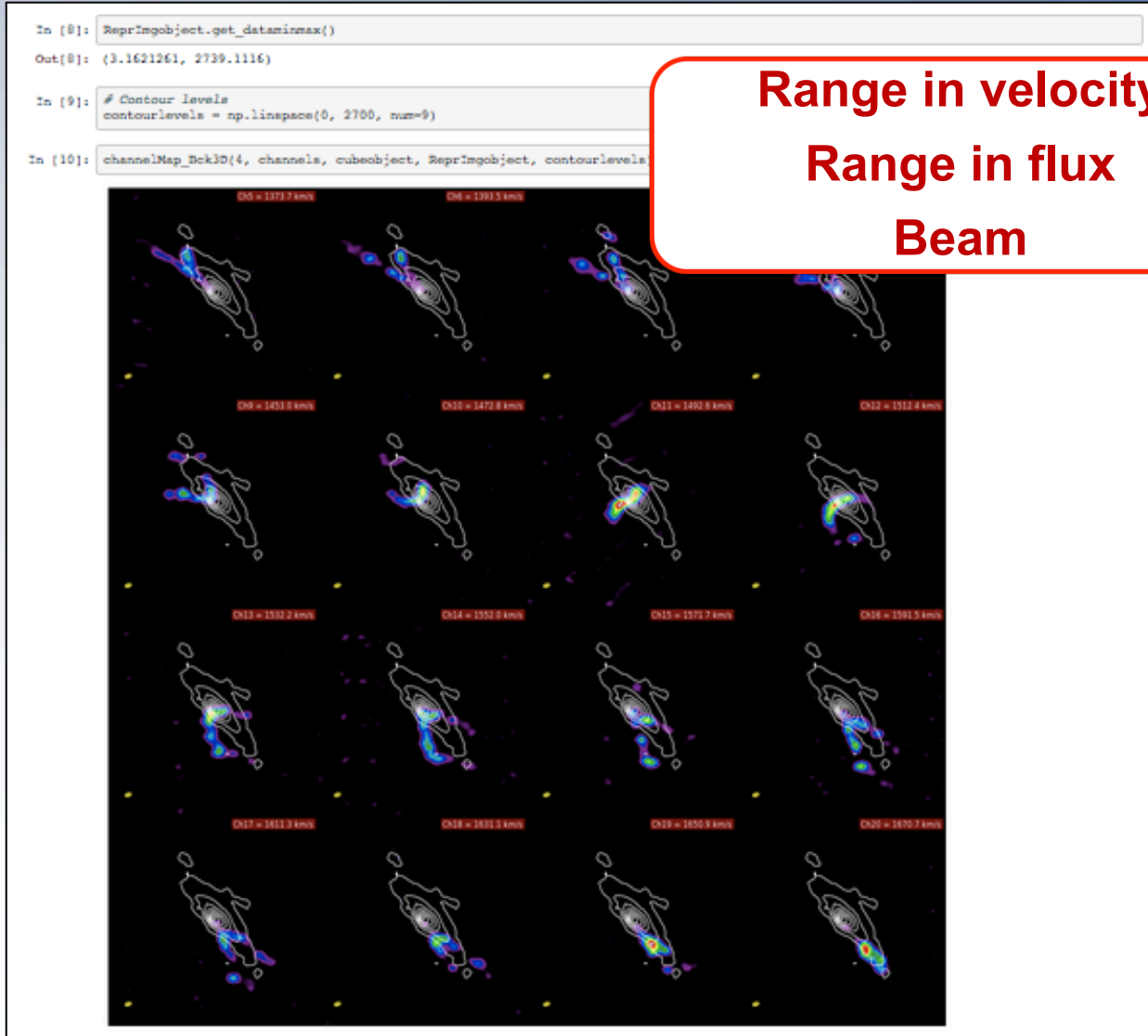


Velocity Weighted Integrated Emission



# 3D Exploration /Access Data Use Cases

## Channel Maps and Contour Overlay



Channel Slicing

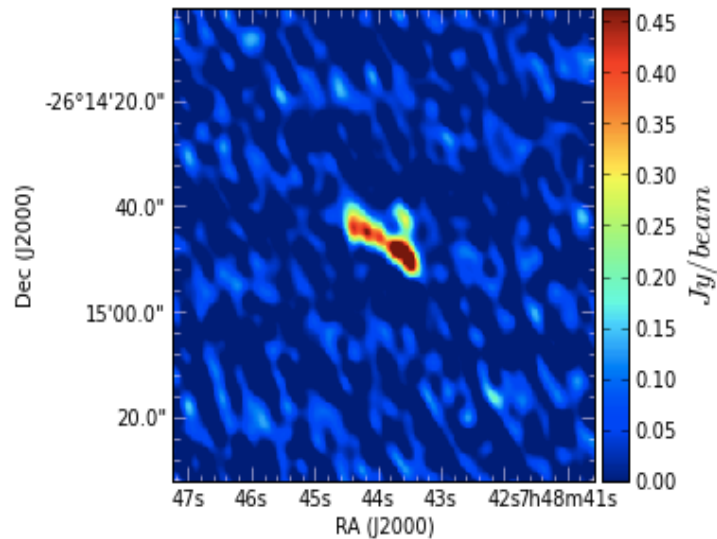
# 3D Exploration /Access Data Use Cases

## Channel Slicing

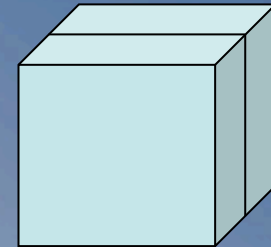
```
In [6]: # Channel 12
fig = plt.figure()
F2 = aplpy.FITSFigure(filecube, figure=fig, dimensions=[0,1], slices=[11])
F2.tick_labels.set_xformat('hh:mm:ss')
F2.show_colorscale(vmin=0)
F2.add_colorbar()
F2.colorbar.set_axis_label_text(r'$Jy/beam$')
F2.colorbar.set_axis_label_font(size=15)
```

INFO:astropy:Auto-setting vmax to 4.638e-01

INFO: Auto-setting vmax to 4.638e-01 [aplpy.aplpy]



Range in flux





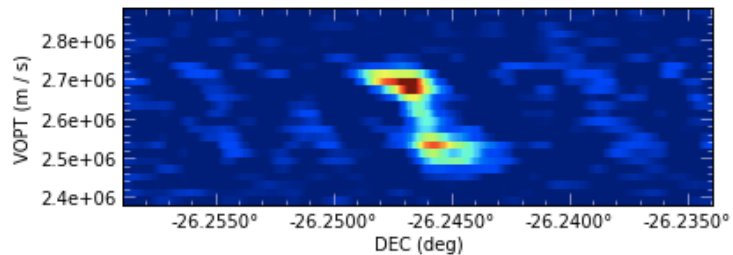
# 3D Exploration /Access Data Use Cases

## Position Velocity at Fixed RA

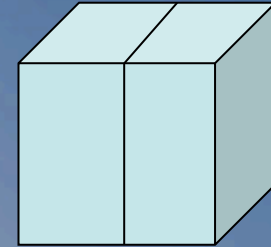
```
In [11]: # Position-velocity plot at RA=160pix
fig = plt.figure()
F2 = aplpy.FITSFigure(filecube, figure=fig, dimensions=[1,2], slices=[150])
F2.show_colorscale(vmin=0, aspect=4)
```

INFO:astropy:Auto-setting vmax to 8.070e-01

INFO: Auto-setting vmax to 8.070e-01 [aplpy.aplpy]



**Range in velocities**  
**Range in flux**

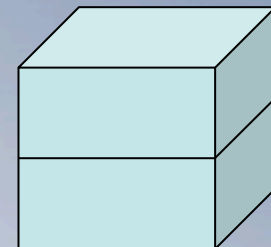
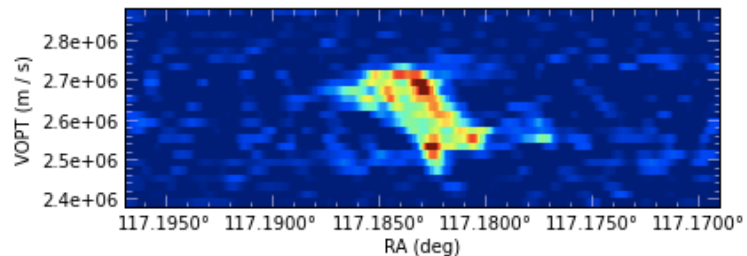


## Position Velocity at Fixed Dec

```
In [12]: # Position-velocity plot at DEC=160pix
fig = plt.figure()
F2 = aplpy.FITSFigure(filecube, figure=fig, dimensions=[0,2], slices=[150])
F2.show_colorscale(vmin=0, aspect=4)
```

INFO:astropy:Auto-setting vmax to 6.292e-01

INFO: Auto-setting vmax to 6.292e-01 [aplpy.aplpy]



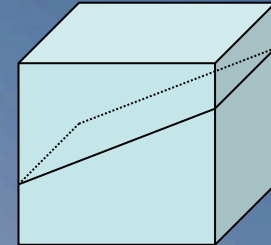
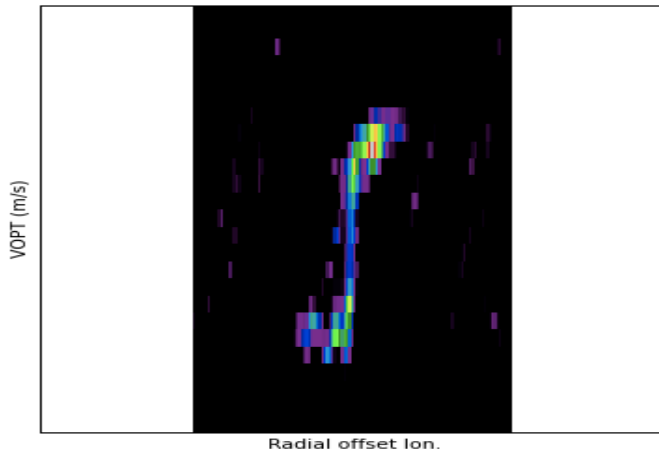
# 3D Exploration /Access Data Use Cases

## Position Velocity at Defined Position Angle

```
In [22]: # Use Gipsy
# SLICE
#
task = ""
SLICE
INSET="" + gipsySet + "" VELO
POSITION=0,0
ANGLE=135
GRIDOUT=1
POINTS=250
SLICES=2,2
SPACE=2
OUTSET=SlicedCubeVelo
""
print(Gipsy(task))
```

```
In [25]: # Create canvas
fig = plt.figure(figsize=(6,6))
frame = fig.add_subplot(1,1,1)

# Central Plane
fitsobject.set_imageaxes(1,3,slicepos=3)
mplim = fitsobject.Annotatedimage(frame=frame, cmap="spectral", clipmin=0.08)
mplim.Graticule(visible=False, skipx=True, skipy=True)
mplim.Image()
mplim.plot()
```



**Range in velocities**  
**Range in flux**  
**Position angle**

# 3D Exploration /Access Data Use Cases

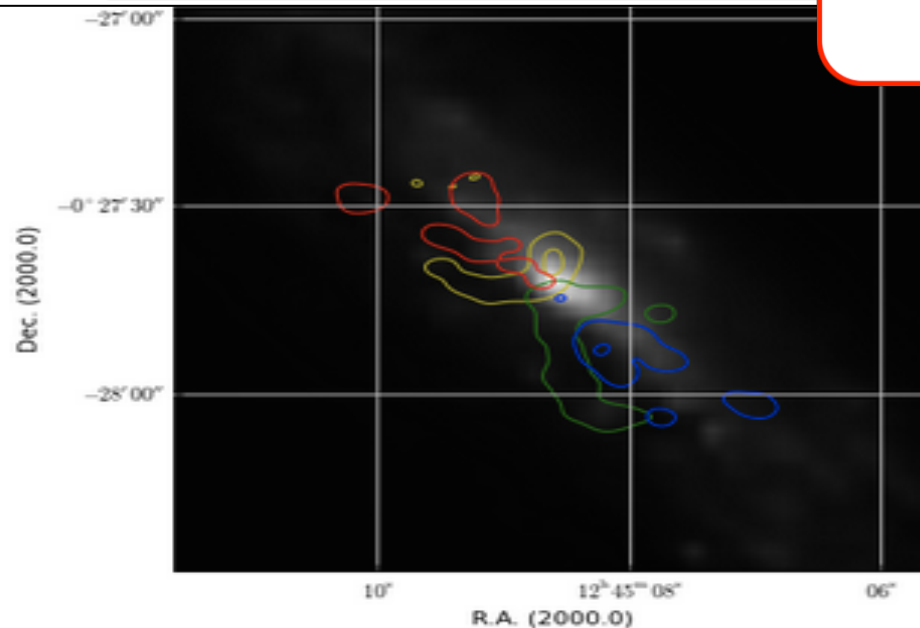
Renzogram: 2D overlay of contour channels with different colors

```
In [12]: # Create canvas
fig = plt.figure(figsize=(6,6))
frame = fig.add_subplot(1,1,1)

# Display Optical Image
baseim = Reprofits.Annotatedimage(frame, cmap="gist_gray")
baseim.Image()
baseim.Graticule()
baseim.plot()

# Renzogram
# Slicing the cube
slices = {'6':'r','10':'y','14':'g','18':'b'}
for slicepos, color in slices.iteritems():
    planeindex = int(slicepos)
    cubeobject.set_imageaxes(1,2,slicepos=planeindex)

# Contour levels overlay
overlay = cubeobject.Annotatedimage(frame, clipmin=
minval, maxval = cubeobject.get_dataminmax())
contourlevels = np.linspace(minval, maxval,4)
overlay.Contours(levels=contourlevels, colors=color)
overlay.plot()
```



Range in velocities

Range in flux

Position angle



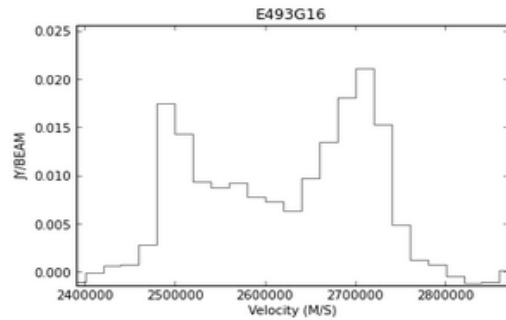


# 3D Exploration /Access Data Use Cases

## Aperture Velocity Profile

```
In [32]: # circular aperture (xcen,ycen,radius)
# elliptical aperture (xcen,ycen,height,width,PA)
# method mean or sum

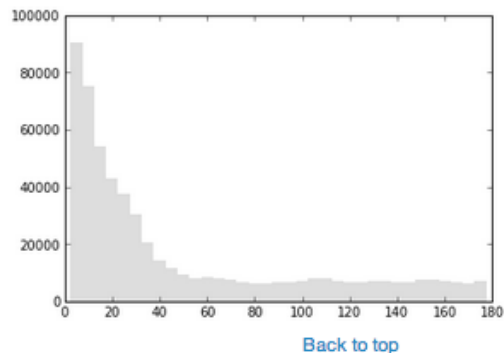
spcube = pyspeckit.SpectralCube.Cube(filecube)
spcube.plot_apspec(aperture=(150,150,80,180,135), method='mean')
```



**Spatial aperture**  
**Range in velocities**  
**Range in flux**

## Integrated Emission Radial Profile

```
In [36]: binsize=5
radii, vals = agpy.azimuthalAverage(scidata, binsize=binsize, retu
rnradii=True)
plt.bar(radii, vals, width=binsize, align='edge', linewidth=0, fil
l=True, color='#dddddd')
plt.show()
```



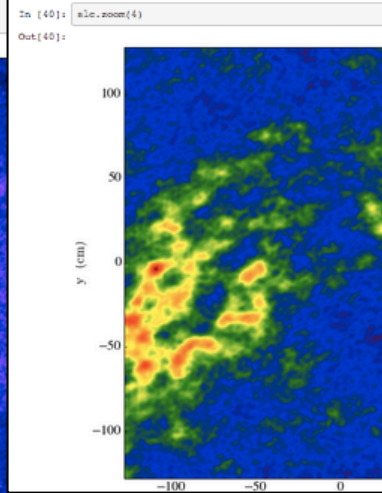
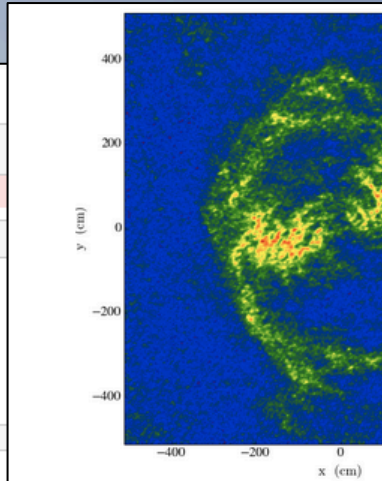
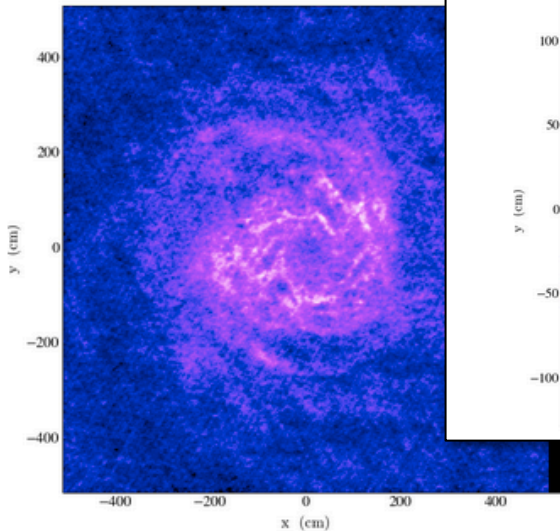
**Range in velocities**  
**Range in flux**  
**Position angle**  
**Elliptical rings**



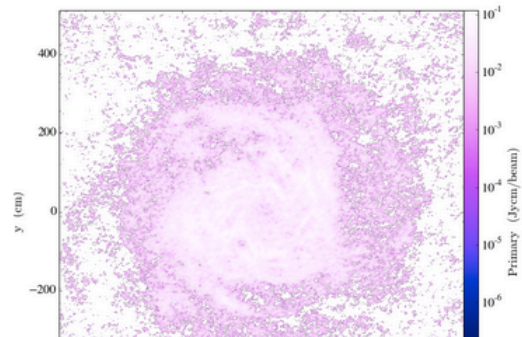
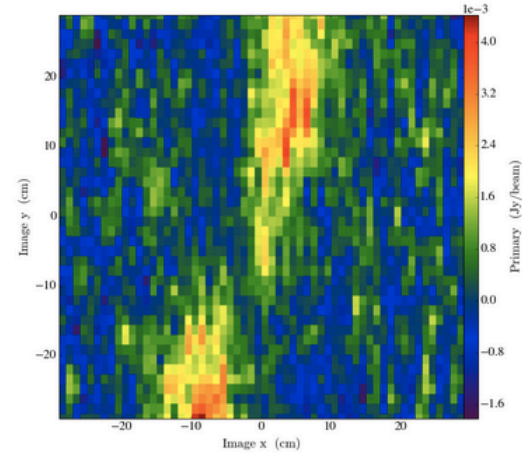
# 3D Exploration /Access Data Use Cases

Visualization as a service  
IPython implementation of yt-project software

```
Use of Yt Python Library for RadioInterferometric DataCubes  
http://yt-project.org/  
  
In [1]: import yt  
        from yt.frontends.fits.misc import *  
        ds = yt.load("MOC_628_SA_CUBM_THINGS1.FITS", mask_nans=True)  
        WARNING:yt:Cannot find time  
        WARNING:yt:No length conversion provided. Assuming l = 1 cm.  
  
In [4]: dd = ds.all_data()  
        dd.quantities.keys()  
  
Out[4]: ['SpinParameter',  
         'MinLocation',  
         'WeightedVariance',  
         'TotalMass',  
         'AngularMomentumVector',  
         'WeightedAverageQuantity',  
         'TotalQuantity',  
         'CenterOfMass',  
         'BulkVelocity',  
         'Extrema',  
         'MaxLocation']  
  
In [34]: dd.quantities["Extrema"]("primary")  
  
Out[34]: (-0.00315919821151 Jy/beam, 0.00388725404628 Jy/beam)  
  
In [35]: prj = yt.ProjectionPlot(ds, "z", ["primary"])  
        prj.set_cmap("primary", "purple_cm")  
        prj.show()
```



```
In [41]: slc = yt.OffAxisSlicePlot(ds, [1.0, 1.0, 0.0], ("primary"))  
        slc.show()  
  
In [38]: prj.set_log("primary", True)  
        prj.show()
```



# Conclusions

- SIAv2 prototype/testbed **evolving with in progress standards**
- Two different collections of **single target /single line-emission** velocity cubes of galaxies
- Import from FITS into MySQL database with IPython executable notebook /tool
- Web Interface for discovery and display of **SIAv2/ImageDM UCDs and Utypes**
- accesData UseCases implemented as **programmatic access services**
- **Additions performed into DM** to provide better knowledge of the dataSet:
  - Emission-line characterization (**velocity and flux**)
  - **Post-processing provenance** in radio interferometric cleaned datacubes
  - Archive-specific physical properties of Targets



# Links

## SIAv2 Prototype

<http://amiga.iaa.es:9000>

## IPython Notebooks Recipes

### Datafiller

<http://nbviewer.ipython.org/gist/Bultako/690e88d3548745ca194e>

### Moments

<http://nbviewer.ipython.org/gist/Bultako/6522a416d749701d1310>

### Slicing Datacubes

<http://nbviewer.ipython.org/gist/Bultako/badb836e659599b104db>

### Contour Overlays on Channel Maps

<http://nbviewer.ipython.org/gist/Bultako/73f82690e90e2dbb3d76>


### Renzograms /Contour Overlays on 2DImage

<http://nbviewer.ipython.org/gist/Bultako/11427424>

### Visualization with yt-project software package

<http://nbviewer.ipython.org/gist/bultako/11137094>

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