

Les données Radio (et millimétriques) dans l'Observatoire Virtuel : état de l'art et questions ouvertes



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remerciements à l'IVOA DAL WG, DM WG, TDIG, aux collaborations
ASTERICS DADI, aux équipes XMM/SVOM et CDS de Strasbourg



Résumé

- 0) Contexte politique de cette revue
- I) rappel de ce qui fonctionne
 - Exemples de projets
 - Problèmes pour l'interopérabilité
 - Rappels des modèles de données utiles
 - Solutions pour la découverte: ObsCore, SIAV2
 - Solutions pour l'accès : DataLink et SODA
 - Discovery + Access + View : MOC et HiPS
 - Interfaces : Aladin, TOPCAT
- II) implémentation dans l'archive scientifique ALMA
 - Données disponibles dans l'archive
 - Interface ObsTAP
- III) données ASKAP : implémentation CASDA
- IV) Questions ouvertes et plus complexes
 - Caractérisation fine
 - Accès / traitement des données de type



Cubes radio dans le VO contexte « politique »

- Aiguillon de Priorité IVOA « Multi-D »
- Précurseurs de SKA dans ASTERICS :
ALMA, LOFAR, ASKAP. Résultats limités
- Participation de SKA dans le projet ESCAPE =
changement d'échelle.
- Réunion du 28 février pendant le dernier Tech
Forum ASTERICS/ DADI → lancement ESCAPE



Radio data Cubes

- ALMA, CADC
 - LOFAR, ASKAP, JIVE
 - Vers SKA
- découverte des données par sélection de critères portant sur les attributs de description ou métadonnées
- Accès aux données : extraction de données utiles dans les « datasets » découverts



Accès aux données

Les Cubes radio sont « énormes »

Le chargement du cube complet est trop long

→ Nécessité des cutouts ?

→ Finalement veut-on du traitement à la volée (données virtuelles, rééchantillonnage)?

→ nécessité de métadonnées détaillées au-delà d'ObsCore (Modèle de données Cube , qui peut venir plus tard)....



Modélisation OV

1) Obscore : métadonnées pour la découverte

obs_collection	unitless	String	Name of the data collection
obs_id	unitless	String	Observation ID
obs_publisher_did	unitless	String	Dataset identifier given by the publisher
access_url	unitless	String	URL used to access (download) dataset
access_format	unitless	String	File content format (see in App. BB.5.2)
access_estsize	kbyte	integer	Estimated size of dataset in kilo bytes
target_name	unitless	String	Astronomical object observed, if any
s_ra	deg	double	Central right ascension, ICRS
s_dec	deg	double	Central declination, ICRS
s_fov	deg	double	Diameter (bounds) of the covered region
s_region	unitless	String	Sky region covered by the data product (expressed in ICRS frame)
s_xel1	unitless	integer	Number of elements along the first spatial axis
s_xel2	unitless	integer	Number of elements along the second spatial axis
s_resolution	arcsec	double	Spatial resolution of data as FWHM
t_min	d	double	Start time in MJD
t_max	d	double	Stop time in MJD
t_exptime	s	double	Total exposure time
t_resolution	s	double	Temporal resolution FWHM
t_xel	unitless	integer	Number of elements along the time axis
em_min	m	double	Start in spectral coordinates
em_max	m	double	Stop in spectral coordinates
em_res_power	unitless	double	Spectral resolving power
em_xel	unitless	integer	Number of elements along the spectral axis

Modélisation OV

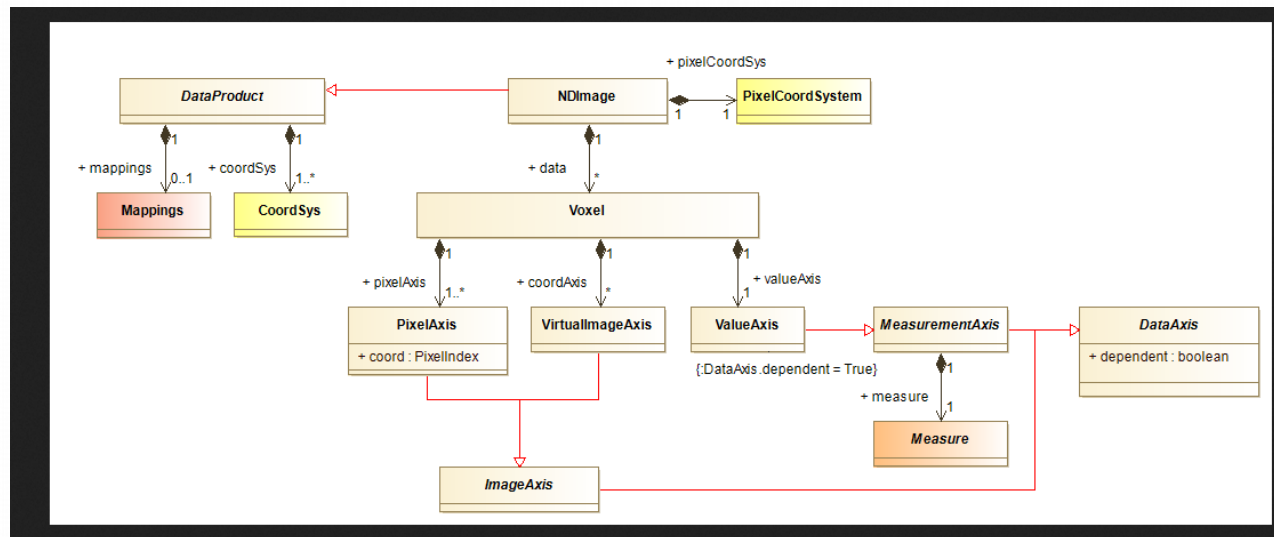
2) Autres modèles utiles existants

- STC 1.0 : concepts utiles, actuellement en révision majeure (Coords, Measurements et Transformations)
- PhotDM : principalement pour l'astronomie optique
- Characterisation 1.0 : réutilisé par d'autres modèles de données (comme ObsCore, Cube) en révision
- Spectral Line Data Model : Des observations à la Physique
- Modèle de données Simulation et protocole DAL.
Comparaison avec les Simulations



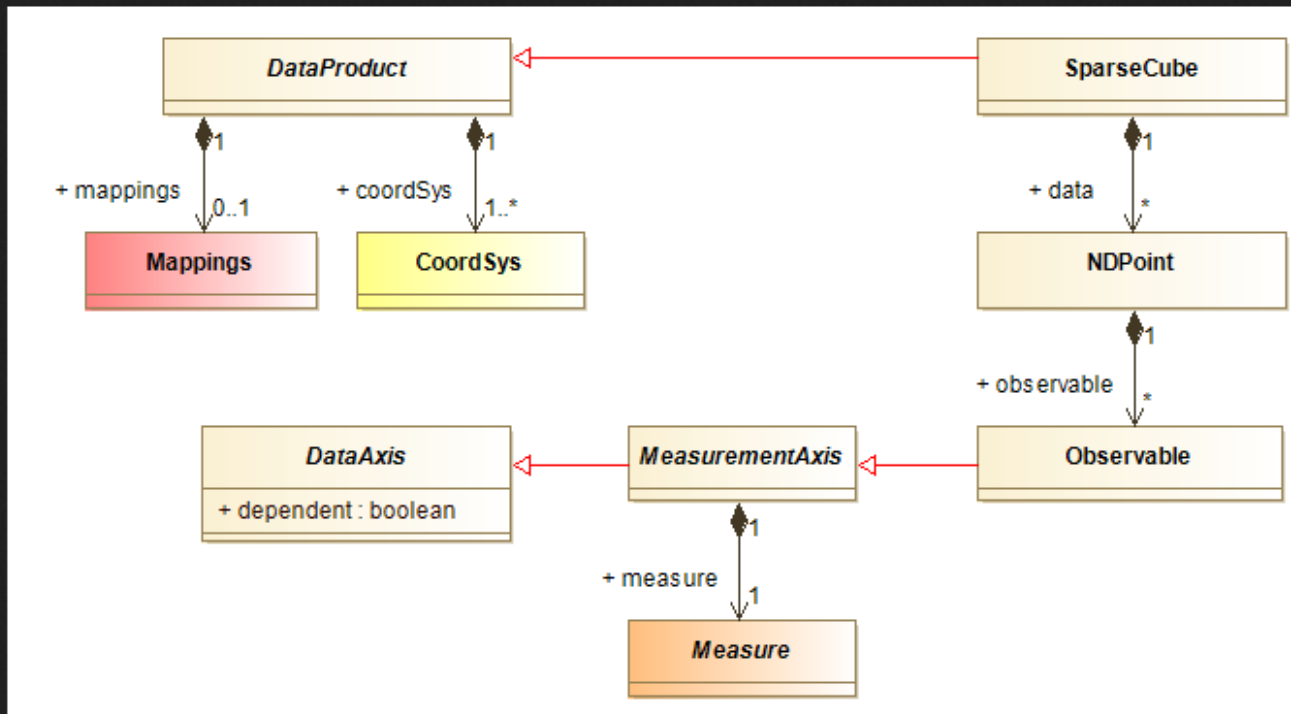
Modélisation OV

3) Cube datamodel (travail en cours) : Image ND



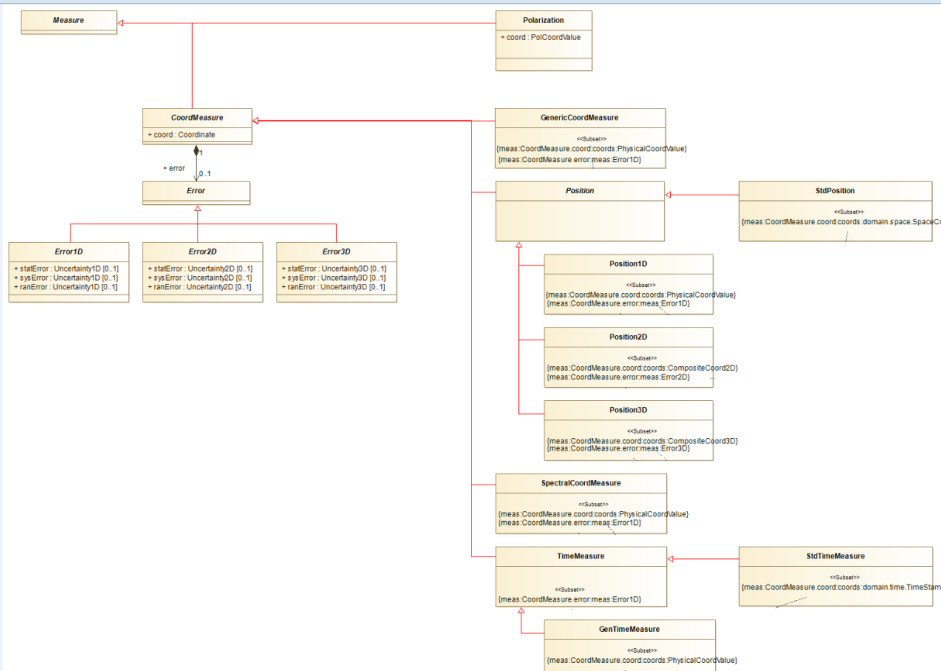
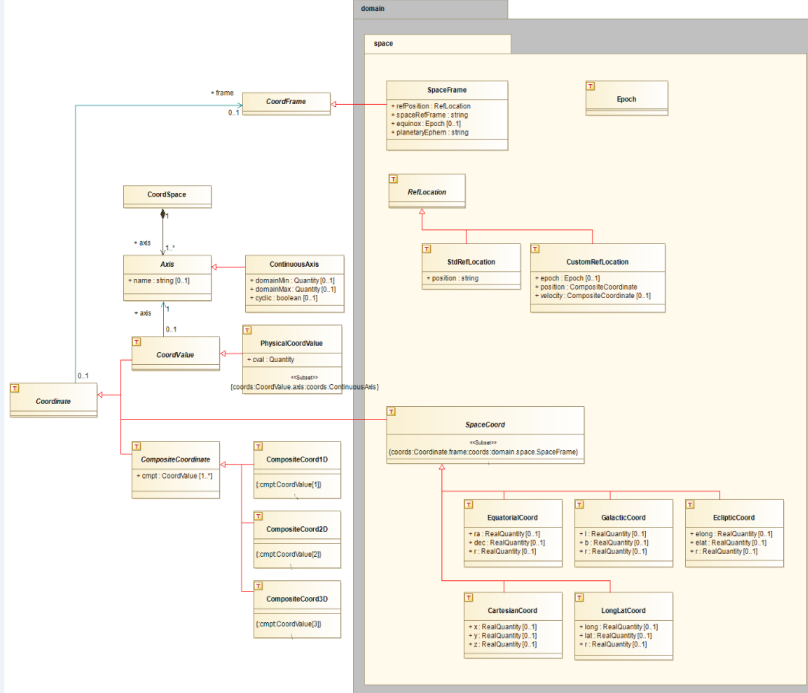
Modélisation OV

3) Cube datamodel (travail en cours) : sparse cube



Modélisation OV

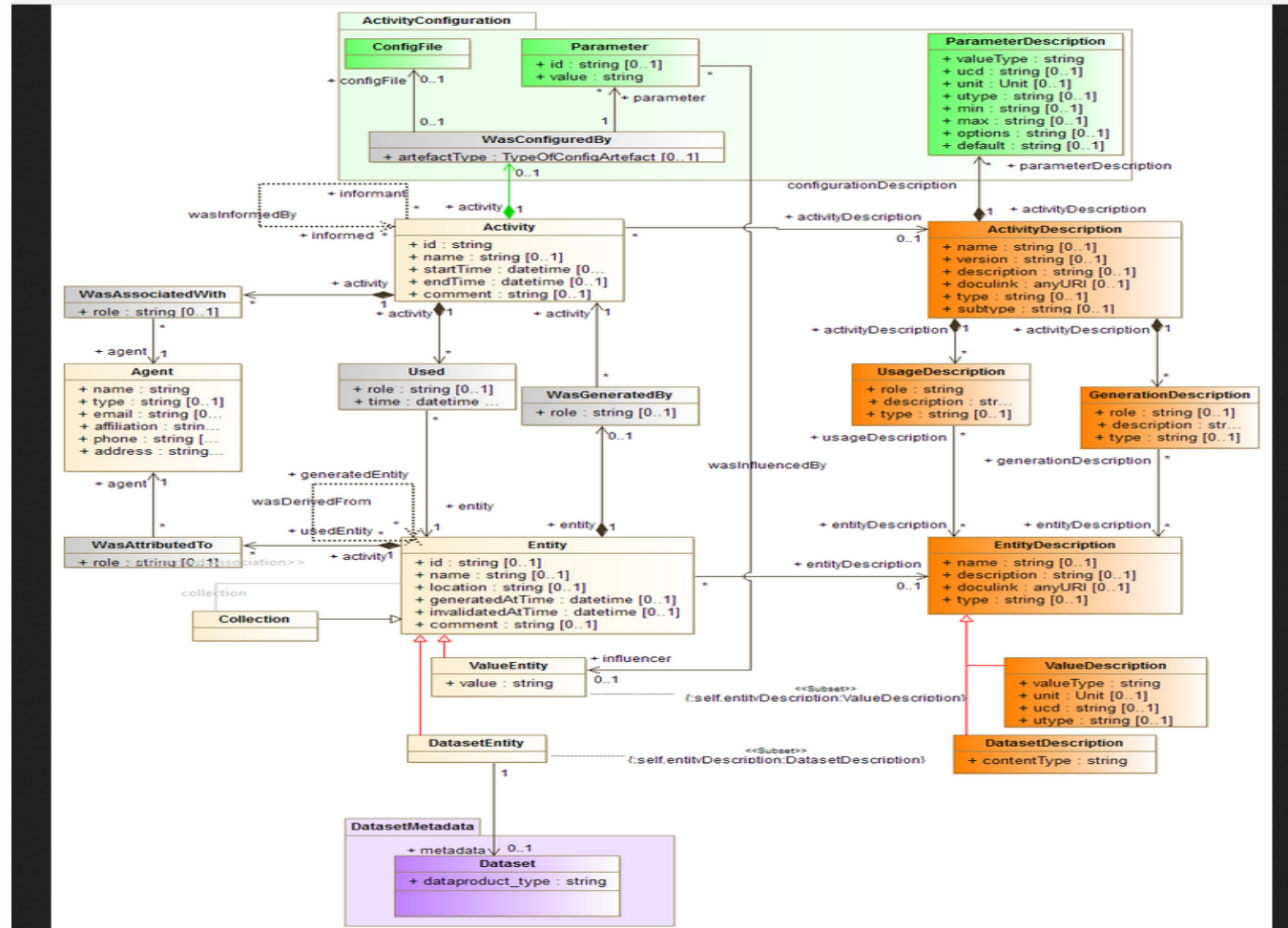
4)STC coords et measurements (travail en cours)



Modélisation OV

5) Provenance (travail en cours)

ActivityAndConfigurationDescriptionForPR2_1502.png



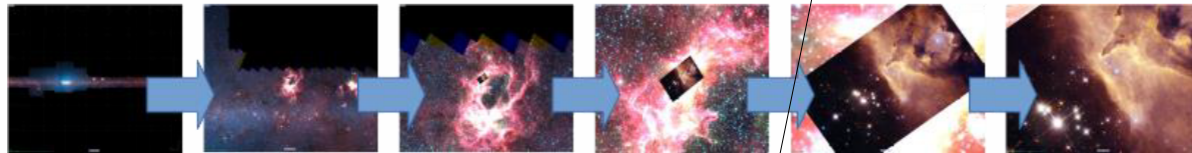
Couche d'accès aux données OV Solutions

- ObsTAP
- SIAV2
- Chargement du dataset complet ou
 - DataLink et SODA
- Alternative : Découverte , Représentation et Visualisation de cubes en HiPS



□ HiPS ? What is it ?

- **H**ierarchical **P**rogressive **S**urvey
"The more you zoom in on a particular area, the more details show up"
- Multi-resolution **HEALPix** data structure
- for **I**mages, **C**atalogues, 3-dimensional data **c**ubes, ...
- **C**onserves **s**cientific data properties alongside visualisation considerations
- No databases or dedicated servers are required, just http



3

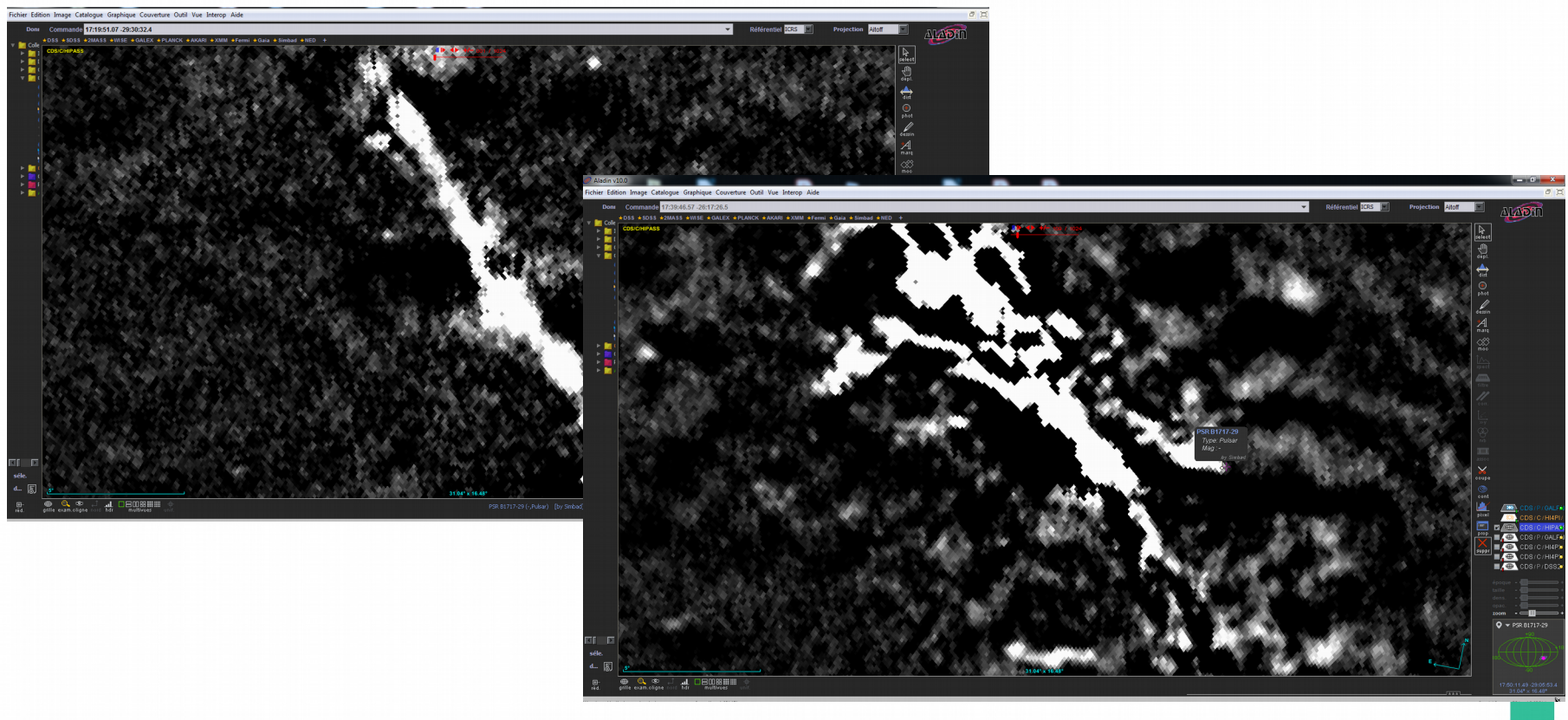
Et MOC pour
découverte : indexation
Par cellule HEALPIX

View, Access, Discovery of DataCube



Cube HiPS

- HI4PI (Effelsberg), GALFAHI (Arecibo), et HIPASS (Australie)



Archive scientifique ALMA

- ALMA fournit des données interférométriques dans le domaine millimétrique
- L'archive a un interface natif
- Cubes en imagerie pas disponibles partout
- L'archive ALMA délivre lentement des blocs d'interfaces OV :
 - Un service ObsTAP est dispo (voir diapos suivantes)
 - MOC est disponible
 - Intégré dans ESA Sky (avec AladinLite)
 - Projets d'intégration : DataLink, SIAV2, SAMP dans l'interface
 - Un projet de Service de retraitement installé en UWS



Archive scientifique ALMA service (obs)TAP dans Aladin

10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 21973 / 219
In view Out view

Command: 06:05:41.72100 -86:37:55.0200

Frame: ICRS Projection: Aitoff

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

DSS2 color

Server selector

Others File FoV... Tools...

Image servers: Aladin images, SkyView, Sloan, DSS..., W.A., Archives..., Others...

Catalog servers: All, Vizier, SIMBAD, SELECT, TAP, Gaia, SkyBot, NED, VO, Others...

Construct your query, verify and execute.

Table: alma.obscore Set ra, dec

Select: ☒ All

Constraints: Add new Max rows:

Target: 06 05 41.72100 -86 37 55.0200

Radius: 128.7° CIRCLE Add

access_format, calib_level, s_ra, s_dec, s_fov

Refresh query Check.. SYNC Async jobs>>

SELECT TOP 100 * FROM alma.obscore

Reset Clear SUBMIT Close ?

15° 112.9° × 61.7°

Search

	calib_level	s_ra	s_dec	s_fov	s_region	t_min	t_max	Observation En...	t_exptime	t_ra
text/html	2	91.423837500...	-86.63195	26.564235597...	FoV	2.2102533595...	57145.964021	2015-05-03T23...	1300.32	
text/html	2	91.423837500...	-86.63195	26.564235597...	FoV	2.2102533595...	57145.964021	2015-05-03T23...	1300.32	
text/html	2	91.423837500...	-86.63195	26.564235597...	FoV	2.2102533595...	57145.964021	2015-05-03T23...	1300.32	
text/html	2	91.423837500...	-86.63195	26.564235597...	FoV	2.2102533595...	57145.964021	2015-05-03T23...	1300.32	
text/html	2	73.14289725	-85.588400972...	26.564235597...	FoV	2.2840199243...	57145.964021	2015-05-03T23...	151.2	
text/html	2	73.14289725	-85.588400972...	26.564235597...	FoV	2.2840199243...	57145.964021	2015-05-03T23...	151.2	
text/html	2	73.14289725	-85.588400972...	26.564235597...	FoV	2.2840199243...	57145.964021	2015-05-03T23...	151.2	
text/html	2	73.14289725	-85.588400972...	26.564235597...	FoV	2.2840199243...	57145.964021	2015-05-03T23...	151.2	
text/html	2	73.14289725	-85.588400972...	26.564235597...	FoV	2.2840199243...	57145.964021	2015-05-03T23...	151.2	

Click on it to show/hide the associated footprint

select from all collections

exp. sort view scan filter

epoch size dens. opac. zoom

cross filter

epoch size dens. opac. zoom

crop cont pixel prop del

Field: s_region
Value: Polygon ICRS
91.486637 -86.631948
91.482204 -86...
Unit: deg
UCD:
Utype:
region bounded by observation

http://cds.fr/DSS2/

epoch size dens. opac. zoom

crop cont pixel prop del

Archive scientifique ALMA

l'url dans la réponse ObsCore mène à une page affichée dans le navigateur
(pas encore de transfert direct de données)

Available data → 21973 / 219
in view outview

Collections → 21973
Image → 375
Data base → 5
Catalog → 20206
Cube → 10
Solar system → 47
Ancillary → 65
Outreach → 44
Others → 1218
Problematic → 3

Command
DSS color

ALMA Science Archive - Mozilla Firefox
almascience.eso.org/aq/member_ous_id=uid://A001/X145/X199

ALMA Science Archive
Query Form Results Table
Submit download request
Close Viewer Results Bookmark Export Table Results Help

J2000 06 05 41.721 -86 37 55.02
FeV: 2.22'

More columns Showing 1 of 1 rows.

	Project code	Source name	RA	Dec	Band	Integration	Release date	Velocity resolution	Frequency support
Filter:									
☐	2013.1.00623.S	ESO005-G004	06:05:41.72	-86:37:55.0	6	1300.320	2016-12-12	38006.03	227.81_246.51GHz

select
from --all collections--

ord	em	res	power	access	url	access	estsize	obs	publisher	obs	collectio
H2	7353.7783250			http://almascience		ADSIJAO	ALMA#3	ALMA			
H2	7888.0240400			http://almascience		ADSIJAO	ALMA#2	ALMA			
H2	7820.3918826			http://almascience		ADSIJAO	ALMA#3	ALMA			
H2	7423.7358826			http://almascience		ADSIJAO	ALMA#2	ALMA			
H2	7353.7783250			http://almascience		ADSIJAO	ALMA#3	ALMA			
H2	7423.7358826			http://almascience		ADSIJAO	ALMA#3	ALMA			
H2	7820.3918826			http://almascience		ADSIJAO	ALMA#3	ALMA			
H2	7888.0240400			http://almascience		ADSIJAO	ALMA#3	ALMA			

uid	ALMA	ALMA	uid://A001/X145	image	J0452-8535	XX.YY	phot flux density
uid://A001/X145 <td>ALMA<td>ALMA<td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td></td></td>	ALMA <td>ALMA<td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td></td>	ALMA <td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td>	uid://A001/X145 <td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td>	image <td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td>	J0452-8535 <td>XX.YY<td>phot flux density</td></td>	XX.YY <td>phot flux density</td>	phot flux density
uid://A001/X145 <td>ALMA<td>ALMA<td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td></td></td>	ALMA <td>ALMA<td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td></td>	ALMA <td>uid://A001/X145<td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td></td>	uid://A001/X145 <td>image<td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td></td>	image <td>J0452-8535<td>XX.YY<td>phot flux density</td></td></td>	J0452-8535 <td>XX.YY<td>phot flux density</td></td>	XX.YY <td>phot flux density</td>	phot flux density

12:02:55820 -86:36:44.43
112.9° x 61.7°

Données ASKAP : services CASDA

- CASDA a implémenté
 - MOC
 - ObsTAP, et services SIA disponibles
 - DataLink avec Cutouts
 - Interface SODA
 - Scripts



CASDA (= données ASKAP)

(distribution des cubes de données sur tout le ciel)

10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 / 21976

Command

Frame ICRS Projection Aitoff

DSS2 color

CSIRO ASKAP Science Data Archive Image Access Service ...

Coverage: 433.2°

Access mode & derived prod. ☐ in view ☐ custom ☒ space cov.

Load

no preview

Image

au.csiro/casda/sia2

select

from all collections

coll sort view scan filter

360° x 180°

360° x 180°

55:57.72658 -60:28:06.65

360° x 180°

Welcome to Aladin,
your professional sky
atlas.

- Discover all astronomical data available over the net!
- Compare them with your own data.
- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

select
pan
dist
phot
draw
tag
moc
spect
filter
cross
x-y
rgb
assoc
crop
cont
epoch
size
dens.
opac.
zoom
del

Données ASKAP : services CASDA

SIAP 2.0

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Command: 16:29:08.41 -18:02:00.0

Frame: ICRS Projection: Aitoff

Available data → 4
in view out view

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

DSS2 color

Available data → 4
in view out view

ctions → 4 / 22454
ers → 4 / 1248
IA2 (imagecube) → 1 / 6
au.csiro → 1
CSIRO ASKAP Science I
SA (spectrum) → 1 / 115
au.csiro → 1
CSIRO ASKAP Science I
S (table) → 1 / 565
au.csiro → 1 / 2
CSIRO ASKAP Science I
AP (table) → 1 / 224
au.csiro → 1 / 3
CSIRO ASKAP Science I

Server selector

Others File FoV... Tools...

Image servers

Aladin images
SkyView
Sloan
DSS...
VLA...
Archives...
Others...

Catalog servers

All
VizieR
Simbad
TAP
Gaia
SkyBot
NED
VO
Others..

Generic SIAP2 query ?

Target (ICRS, name) rho oph

Radius 14'

Server IVOID or ba... au.csiro/casda/sia2

Data set identifier

Collection name

Telescope name

Instrument name

Target

Calibration level (0..

Maximum number ... 99999

Reset Clear SUBMIT Close ?

15°

1.491° x 46.2°

grid study wink north hdr multiview match

access url	dataprodu	calib level	obs collection	obs id	obs publisher	access format	access estsize	target name	s ra
https://data.csiro.au/casda_vo/proxvo/datalink/links?ID=cube-729	cube	3	P248	P248	cube-729	application/x-vot	54467	246.2870972	
https://data.csiro.au/casda_vo/proxvo/datalink/links?ID=cube-778	cube	3	P248	P248	cube-778	application/x-vot	54456	247.2850553	

select casda

from -- all co...

coll sort view scan

Search

epoch - +
size - +
dens. - +
opac. - +
zoom - +

Rho Oph

16:25:35.12 -23:26:49.8
1.491° x 46.2°

2 sel / 2 src 375Mb

Données ASKAP : services CASDA

Champ de vue du dataset

Aladin v10.0

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command: 16:25:08.90 -26:02:00.0 Frame: ICRS Projection: Aitoff

in view out view

CSIRO ASKAP Science I

SA (spectrum) → 1 / 115

CSIRO ASKAP Science I

S (table) → 1 / 565

CSIRO ASKAP Science I

AP (table) → 1 / 224

CSIRO ASKAP Science I

DSS2 color

15° 83.29° x 47.17°

results

access url	calib level	obs id	cube-729	cube-778	target name	s_ra	s_dec
https://data.csiro.au/casda/vo/proxy/0/datalink/1/cube	3	P248	54467	54436		246.28709726...	-26.03332860...
	3	P248			application/x-vot	247.28505537...	-18.03333018...

Click on it to load the corresponding archive data in the stack

select casda from all co...

coll sort view scan

epoch - size - dens. - opac. - zoom -

Rho Oph

15:41:00.69 -25:47:21.1 83.29° x 47.17°

Données ASKAP : services CASDA DataLink

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

Aladin v10.0 *** PROTOTYPE VERSION (based on v10.098) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command 18:19:23.82 -29:05:24.8

in view out view

Collections → 4 / 22

- Others → 4 / 1258
- SIA2 (image) cut
- au.csiro → 1
- CSIRO ASKAI
- SSA (spectrum)
- au.csiro → 1
- CSIRO ASKAI
- CS (table) → 1 /
- au.csiro → 1 /
- CSIRO ASKAI
- TAP (table) → 1
- au.csiro → 1 /
- CSIRO ASKAI

639675.618

15° 94.06° x 50.27°

Search

epoch - size - dens. - opac. - zoom -

Download data product via web (size 55774208 byte)

Download data at Pawsey Centre. Note: Only users from within PSC network can access the data through this link. Only use if you currently have access to Pawsey facilities. (size 55774208 byte)

Scripted file access via Web (size 55774208 byte)

Scripted file access via Pawsey Centre. Note: Only users from within PSC network can access the data through this link. Only use if you currently have access to Pawsey facilities. (size 55774208 byte)

Scripted cut-out service

Scripted spectrum generation service

2 sel / 2 src 527Mb

Données ASKAP : services CASDA interface SODA

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command 16:25:08.90334 -26:01:59.9830

in view out view DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

DSS2 color

Service casda.csiro.au

○ Cutout prototype for SODA server ?

Fill in all these fields and press the SUBMIT button

Target (ICRS, name)

Radius

Time

Band 0.21015484916529545 0.220026116655881

Pol

ID |AwjdlcT1HIEq7251deoebNLMEEsqZ3bmz

ASUNC

Reset Clear Submit Close

23.42° x 13.87°

Search

Download data product via web (size 55774208 byte)

Download data at Pawsey Centre. Note: Only users from within PSC network can access the data through this link. Only use if you currently have access to Pawsey facilities. (size 55774208 byte)

Scripted file access via Web (size 55774208 byte)

Scripted file access via Pawsey Centre. Note: Only users from within PSC network can access the data through this link. Only use if you currently have access to Pawsey facilities. (size 55774208 byte)

Scripted cut-out service

Scripted spectrum generation service

2 sel / 3 arc 449Mb

Données ASKAP : services CASDA

SODA : Prêt à lancer la requête

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4
in view out view

Command 13:58:08.23 -60:42:26.6

Frame ICRS Projection Aitoff

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

DSS2 color

Service casda.csiro.au

● Cutout prototype for SODA server ?

Fill in all these fields and press the SUBMIT button

Target (ICRS, name) 16 34 13.5 -25 43 46.0

Radius 0.73°

Time

Band 0.21015484917063945 0.2200261166617463

Pol

ID T21AwjdlcT1HIEpZLk-AQYke0t5LMtVlqiUX

ASync

Reset Clear Submit Close

15°

122.2° x 69.91°

Search

access url	data product	calib level	obs collection	obs id	obs publisher	access format	access estsize	target name	s.ra	s.dec
https://data.csiro.au	cube	3	P248	P248	cube-729	application/x-vot	54467		246.28709726...	-26.03332860...
https://data.csiro.au	cube	3	P248	P248	cube-778	application/x-vot	54456		247.28505537...	-18.03333018...

select casda

from all co...

coll sort view scan

Job controller

epoch size dens. opac. zoom

17:01:25.83163 -35:56:35.1887

122.2° x 69.91°

Données ASKAP : services CASDA

La tâche SODA asynchrone terminée

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

Aladin v10.0 *** PROTOTYPE VERSION (based on v10.098) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command 16:29:08.41329 -18:01:59.9887

in View out View DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

Service casda.csiro.au

● Cutout prototype for SODA server ?

Fill in all these fields and press the SUBMIT button

Target (ICRS, name) 16 34 13.5 -25 43 46.0

Radius 0.73°

Time

Band 0.21015484917063945 0.2200261166617463

Pol

ID T21AwjdlcT1HIEpZLk-AQYke0t5LMtVlqiUX

Job controller

Asynchronous jobs of current session:

COMPLETED, Start time: 2019-01-10T02:00:39.680+0800 (server: [SODA]casda.csiro.au)

Or choose an already submitted job:

Job URL

GO

Load from /results/result ABORT DELETE Delete on closing Aladin

Job details:

Load on Aladin: <http%3A%2F%2Fcasda.csiro.au%2Fdownload%2Fweb%2F2a0b425e-9fc8-43fb-b58e-e0474563cb0b%2Fcutout-12881-imagecube-729.fits> LOAD

Job ID: 2a0b425e-9fc8-43fb-b58e-e0474563cb0b

Run ID: null

URL: https://casda.csiro.au/casda_data_access/data/async/2a0b425e-9fc8-43fb-b58e-e0474563cb0b

name	cube	3	P248	P248	cube-729	application/x-vot	54467	246.28709726...	-26.03332880...	120
https://casda.csiro.au/casda_data_access/data/async/2a0b425e-9fc8-43fb-b58e-e0474563cb0b	cube	3	P248	P248	cube-778	application/x-vot	54456	247.28505537...	-18.03333018...	120

select casda

from -- all co...

coll sort view scan

17:01:25.83163 -35:56:35.1887
122.2° x 69.91°

2 sel / 3 src 676Mb

Données ASKAP : services CASDA

sous - cube extrait et chargé

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

Aladin v10.0 *** PROTOTYPE VERSION (based on v10.098) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4
in view out view

Command: Frame: CRS Projection: Aitoff

ctions → 4 / 22641
ers → 4 / 1258
IA2 (image|cube) → 1 / 8
au.csiro → 1
CSIRO ASKAP Science I
SA (spectrum) → 1 / 114
au.csiro → 1
CSIRO ASKAP Science I
S (table) → 1 / 566
au.csiro → 1 / 2
CSIRO ASKAP Science I
AP (table) → 1 / 219
au.csiro → 1 / 3
CSIRO ASKAP Science I

-534351.977

058 / 1024

2.622° x 0.494°

30°

Search

access url	datapoint t...	calib level	obs collection	obs id	obs publisher	access format	access estsize	target name	s.ra	s.dec
https://data.c...	cube	3	P248	P248	cube-729	application/x-vot...	54467		246.28709726...	-26.03332860...
https://data.c...	cube	3	P248	P248	cube-778	application/x-vot...	54456		247.28505537...	-18.03333018...

select casda
from all co...

coll sort view scan

epoch -
size -
dens. -
opac. -
zoom -

au.csiro/casda/sia2-1
CDS/P/DSS2/color

1.538° x 1.538°

2 sel / 3 src 620Mb

Données ASKAP : services CASDA spectre extrait

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command 16:28:09.05 -25:58:01.6

in view out view DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

ctions → 4 / 22641
iers → 4 / 1258
IA2 (image/cube) → 1 / 8
au.csiro → 1
CSIRO ASKAP Science I
SA (spectrum) → 1 / 114
au.csiro → 1
CSIRO ASKAP Science I
S (table) → 1 / 566
au.csiro → 1 / 2
CSIRO ASKAP Science I
AP (table) → 1 / 219
au.csiro → 1 / 3
CSIRO ASKAP Science I

Service casda.csiro.au

○ Cutout prototype for SODA server ?
Fill in all these fields and press the SUBMIT button

Target (ICRS, name) 16 27 46.15903 -25 44 54.2702

Radius 25.26'

Time

Band 0.21015484916529545 0.220026116655881

Pol

ID |AwjdlcT1HIEq7251deoebNLMEEsqZ3bmz

ASYNCR

Reset Clear Submit Close

23.42° x 13.87°

Search

select casda
from all co...

coll sort view scan

eu.csiro/casda/sia2-1
CDS/P/DSS2/color

epoch +
size +
dens. +
opac. +
zoom -

16:25:35.11766 -23:26:49.9150
23.42° x 13.87°

0 sel / 9 src 345Mb

Données ASKAP : services CASDA spectre extrait

Aladin v10.0 *** BETA VERSION (based on v10.073) ***

Aladin v10.0 *** PROTOTYPE VERSION (based on v10.098) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Available data → 4 Command: 16:25:08.90334 -26:01:59.9830

Service casda.csiro.au

bad NED +

Cutout prototype for SODA server ?

Fill in all these fields and press the SUBMIT button

Target (ICRS, name) 16 25 18.95162 -26 02 18.7137

Radius 2.704'

Time

Band 0.21015484917063945 0.2200261166617463

Pol

ID ERxaCEZ6CFBcQEBVu8wpW4ALYUIAttPIA

ASYNC

Reset Clear Submit Close

FITS header

```
SIMPLE = T / conforms to FITS standard
BITPIX = -64 / array data type
NAXIS = 3 / number of array dimensions
NAXIS1 = 1
NAXIS2 = 1
NAXIS3 = 1024
DATAMIN = -8.0000000E+00
DATAMAX = 3.2000000E+01
BMAJ = 2.583334E-01
BMIN = 2.583334E-01
BPA = 0.0000000E+00
BUNIT = 'Jy' / Brightness (pixel) unit
EPOCH = 2.000000000000E+03
LONPOLE = 1.800000000000E+02
CTYPE1 = 'RA--SIN'
CRVAL1 = 2.462500000000E+02
CDELT1 = -6.666667014360E-02
CROT1 = 0.000000000000E+00
CRPIX1 = 3.
CUNIT1 = 'deg'
CTYPE2 = 'DEC--SIN'
CRVAL2 = -2.600000000000E+01
CDELT2 = 6.666667014360E-02
CROT2 = 0.000000000000E+00
CRPIX2 = 3.
CUNIT2 = 'deg'
CTYPE3 = 'VELO-HEL'
CRVAL3 = -4.024387640672E+05
CDELT3 = 1.319132129105E+04
CROT3 = 0.000000000000E+00
CRPIX3 = 68.
CUNIT3 = 'km/s'
```

Job controller

Asynchronous jobs of current session:

COMPLETED, Start time: 2019-01-10T02:00:39.680+0800 (server: [SODA]casda.csiro.au)

COMPLETED, Start time: 2019-01-10T02:07:04.558+0800 (server: [SODA]casda.csiro.au)

Use an already submitted job:

URL

GO

Load from /results/result ABORT DELETE Delete on closing Aladin

Aladin: http%3A%2F%2Fcasda.csiro.au%2Fdownload%2Fweb%2F880a27f9-8ba9-4dc0-8046-7a3a66d58f1c%2Fspectrum-12883-imagecube-729.fits LOAD

880a27f9-8ba9-4dc0-8046-7a3a66d58f1c

casda.csiro.au/casda_data_access/data/async/880a27f9-8ba9-4dc0-8046-7a3a66d58f1c

1 sel / 8 src 608Mb

Limitations

- Données complexes (plusieurs sous-parties) et volumineuses
- Caractérisation ObsCore insuffisante en terme de sensibilité, de couverture du plan UV, etc...
- Beaucoup de données non réduites dans les archives (« visibility » data).
- Réductions possibles non uniques



Limitations. Comment les lever ?

- Données complexes (plusieurs sous-parties) et volumineuses
- Compléter Obscore avec une stratégie à la CAOM (parties et wcs accessibles)?
- Proposition de faire des HiPS des cartes continuum ou de cartes de moment, et d'accéder aux vraies données via l'interface « original data ».



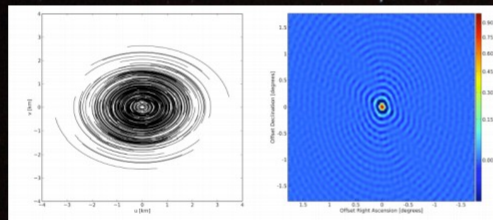
Données Visibility ?

(découverte directe ou via provenance)

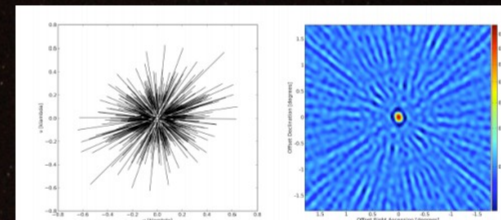
Data Types: Visibilities

ASTRON

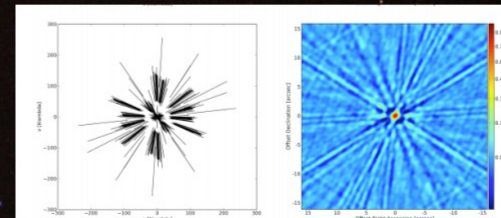
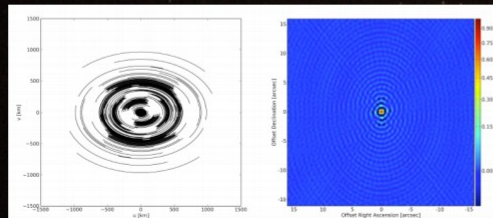
- Interferometer: Creating virtual aperture up to $\sim 2000\text{km}$ (λ/D)
- Incomplete coverage
- Typical use of Radio Telescopes: imaging depending on science
- LOFAR: Projection effects (No moving dish/mirror)



6 hours



1 second

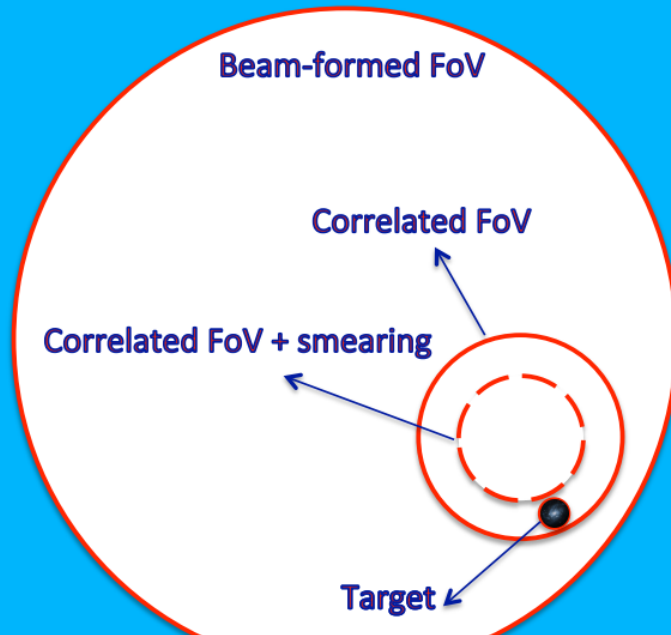


Portail de données ASTRON

The ADP & new tooling



Characterization tools needed when dealing with level 0/1 data products from wide-field interferometers → accounting for beam-shapes of different modes for searches and selection but also for processing / analysis



Observed / processed data characterization in terms of:

- uv-coverage
- beam pattern (FoV & sensitivity)

Accurate reconstruction:

- computationally expensive, need data
→ not practical

Approximated reconstruction:

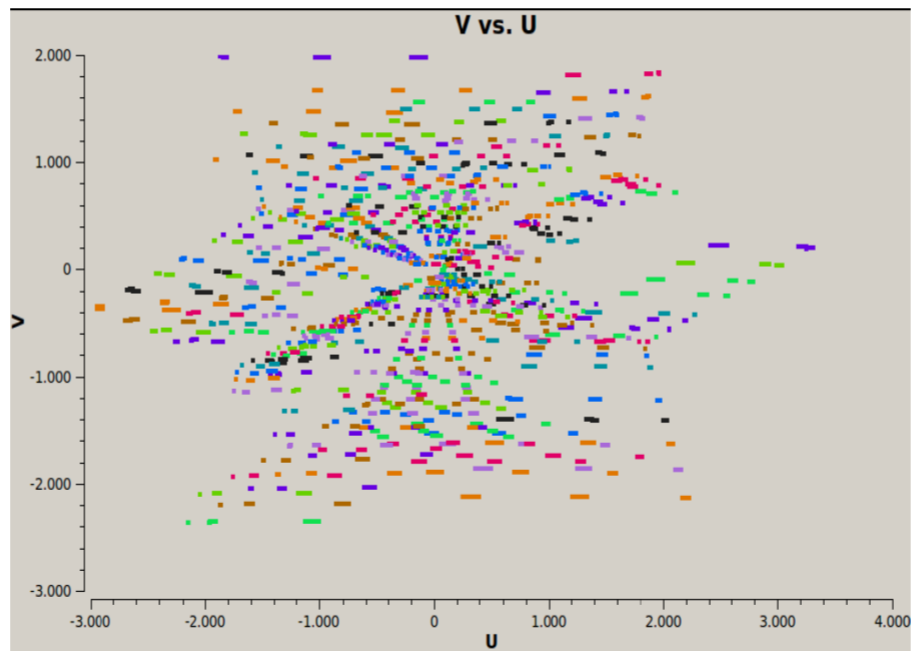
- only metadata needed → enough for data selection

Limitations : comment les lever ?

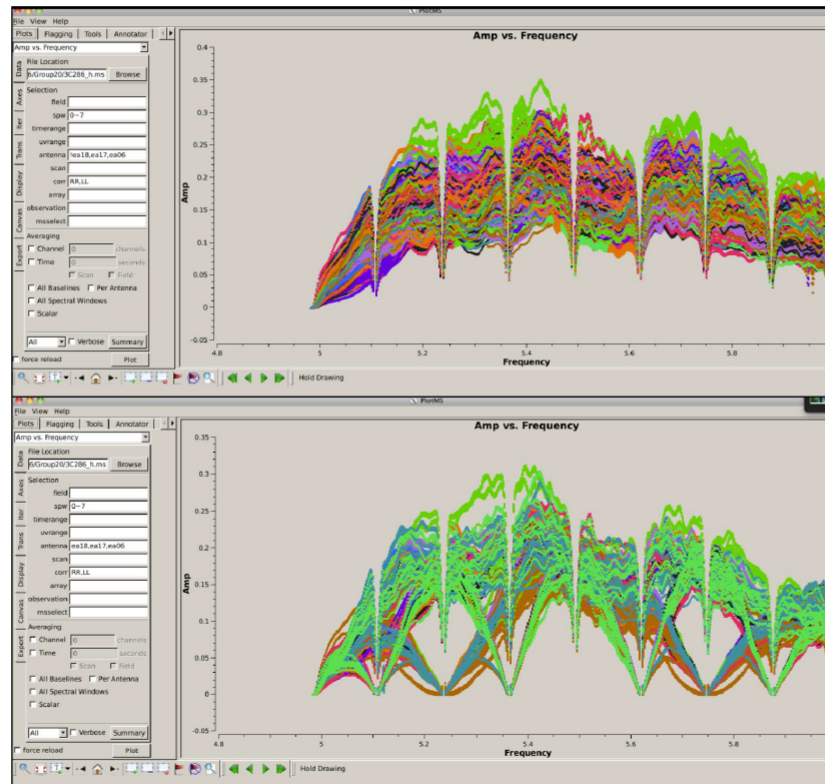
- Découverte « gros grain » via ObsCore + métadonnées additionnelles (caractérisation fine) via DataLink
 - Plot UV (radialement, ou dans plan uv)
 - Courbes fréquence / amplitude, ou phase / amplitude
 - Forme et taille du « beam »
 - Nombres d'antennes, détails instrumentaux
- Caractérisation dynamique (quelles données brutes assembler pour un but recherché) --→ Web service ou Application dédiée



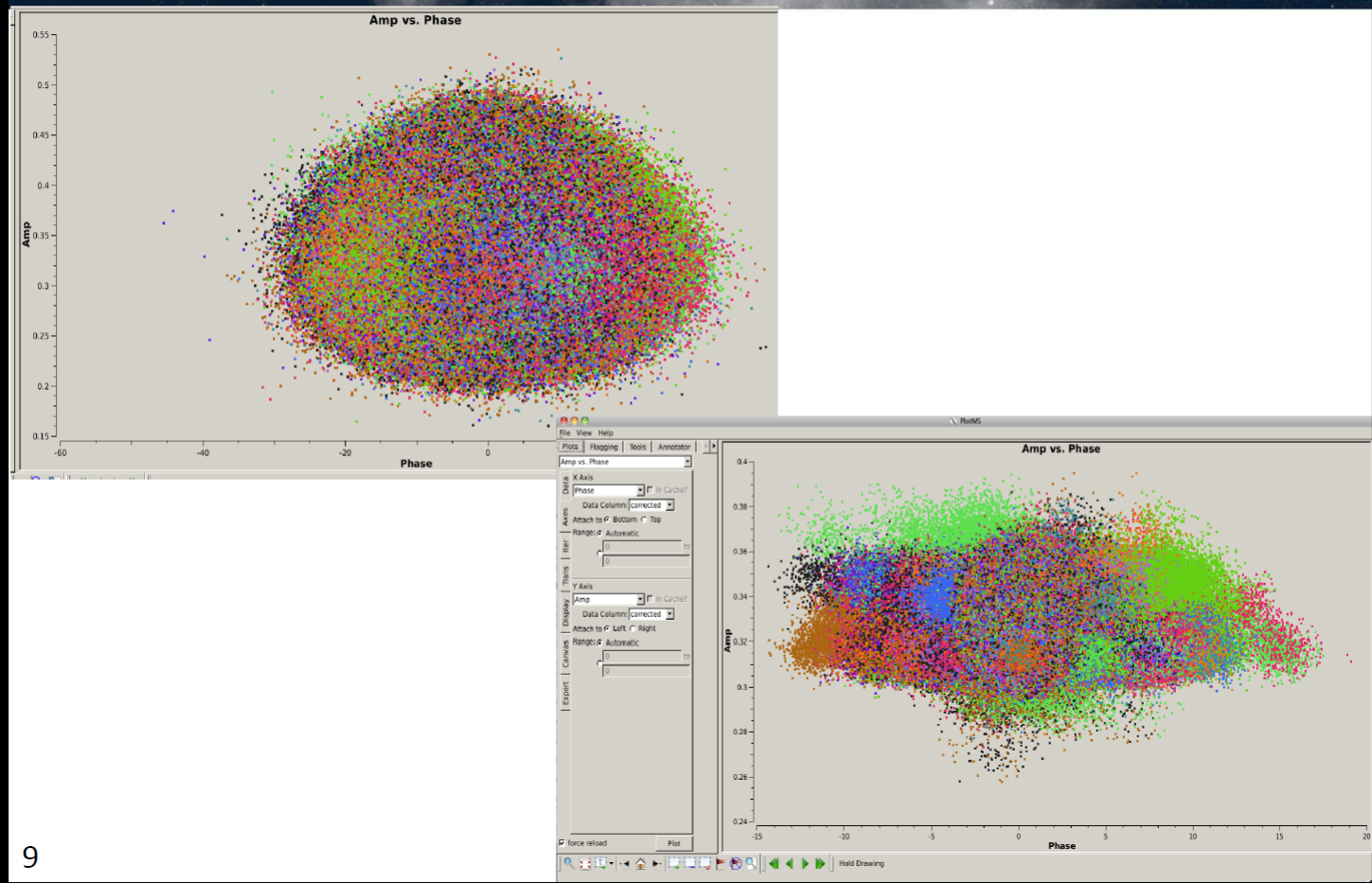
□ Uv coverage



□ Amp vs. Freq



□ Amp vs. phase



Limitations

- Beaucoup de données non réduites dans les archives (« visibility » data).
- Réductions possibles non uniques



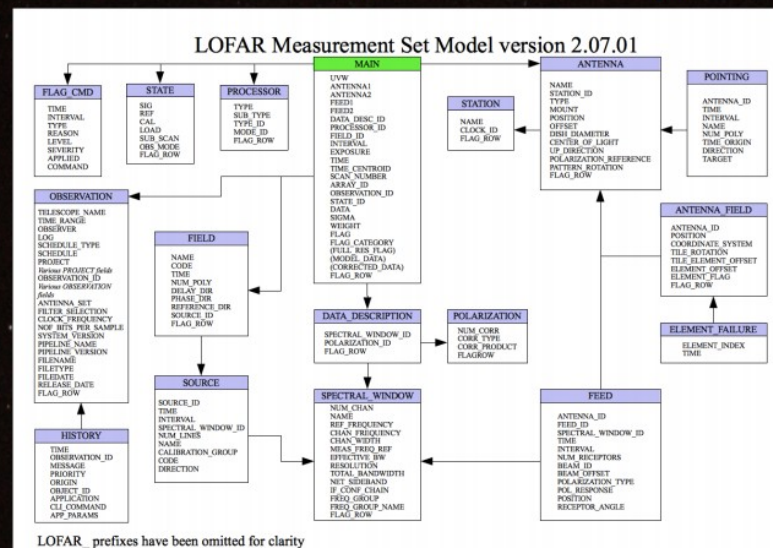
données Visibility?

(modèle des « measurement sets »
cas LOFAR)

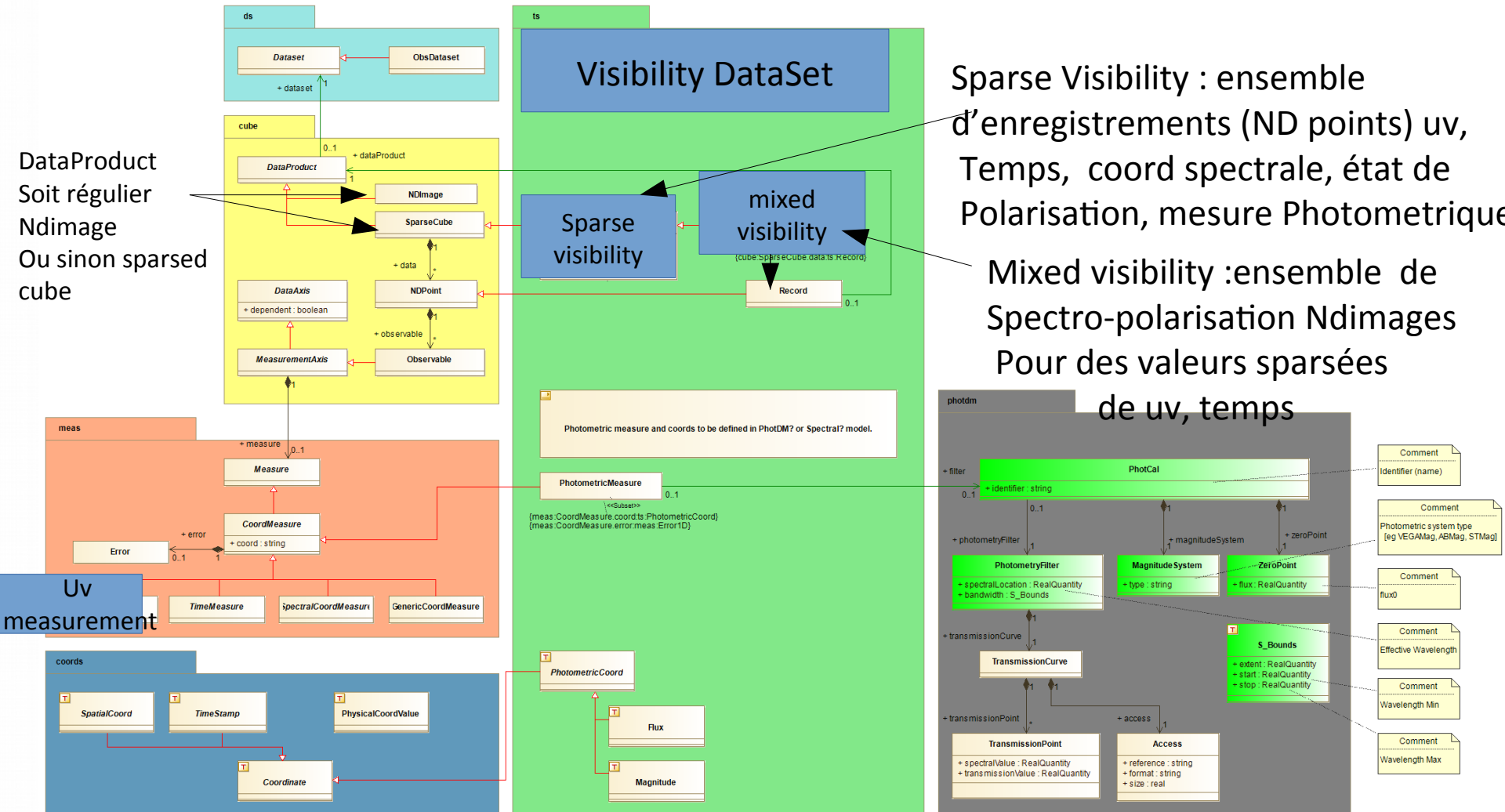
Data Types: Visibilities

ASTRON

- Stored as CASA Measurement Sets
 - 10 MB - 100 GB in size, per 192 kHz frequency band
 - Usually 400-488 per observation
 - Relational structure
 - Each cell can have multiple dimensions (pol x freq)



Visibility : derivé du modèle cube.datamodel



Limitations. Comment les lever ? construire des données « scientifiques »

- Retourner aux données d'origine via les métadonnées provenance
- Stocker et rendre accessibles les cubes réduits par les scientifiques utilisateurs des archives
- Proposer un service qui calcule lui même un cube en fonction des caractérisations souhaitées (ALMA).
- Une fois données découvertes, lancer les codes (CASA par exemple) à distance
- Amener le code vers les données (Jupiter Note book)



Dans ESCAPE : comment commencer

- Faire connaître l'existant
- Collecter et décrire de façon détaillée les cas d'utilisation scientifique
- Expérimenter et prototyper de nouvelles standardisations et nouveaux services
- Retour d'expérience.

