Centre de Calcul
de l'Institut National de Physique Nucléaire
et de Physique des Particules

La plateforme informatique pour l'Observatoire Vera C. Rubin

14e Journées Informatiques l'IN2P3/IRFU

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16 Novembre 2022

Plan

1. L’Observatoire Vera C. Rubin
2. Le role de l’IN2P3 et du CC-IN2P3
3. La plateforme informatique
4. Conclusions

L’Observatoire Vera C. Rubin

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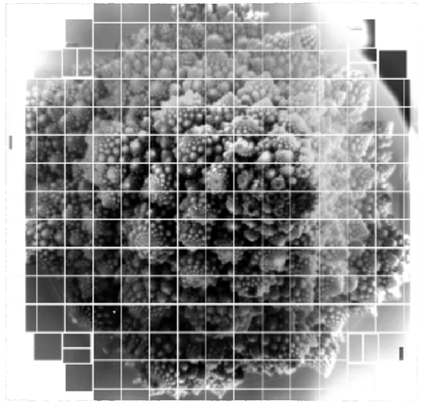
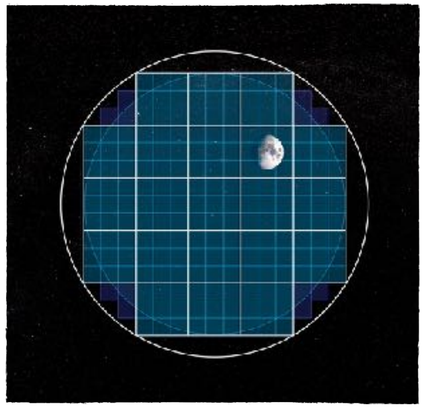
L’Observatoire Rubin

- Cerro Pachón en Chili (2647m slm)
- Miroir primaire de **8.4m**
- Camera de **3.2 Gpixel**
- FoW de 9.6 deg^2





Source: Rubin Observatory

L'Observatoire Rubin

- Etude de l'énergie sombre et de la matière noire
- Faire un inventaire du système solaire
- Observer les objets variables et transitoires
- Cartographier la Voie Lactée

- 20 To/nuit, 300 nuits par an, 10 ans
- 6 millions d'orbites des objets du Système Solaire
- 10 millions d'alertes par nuit
- 37 milliards d'objets cartographiés (galaxies et étoiles)

Raw Data: 20TB/night

Sequential 30s images covering the entire visible sky every few days

Prompt Data Products

Alerts: up to 10 million per night

60s via nightly alert streams

Raw & Processed Visit Images, Difference Images, Templates

Transient and variable sources from Difference Image Analysis

Solar System Objects: ~ 6 million

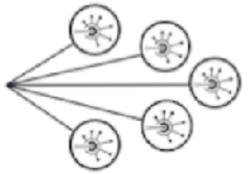
24h via Prompt Products DB

Data Release Data Products

Final 10yr Data Release:

- Images: 5.5 million x 3.2 Gpixels
- Catalog: 15PB, 37 billion objects

via Data Releases



Community Brokers

Rubin Data Access Centres (DACs)

USA (USDF)
Chile (CLDF)
France (FRDF)
United Kingdom (UKDF)

Independent Data Access Centers (IDACs)

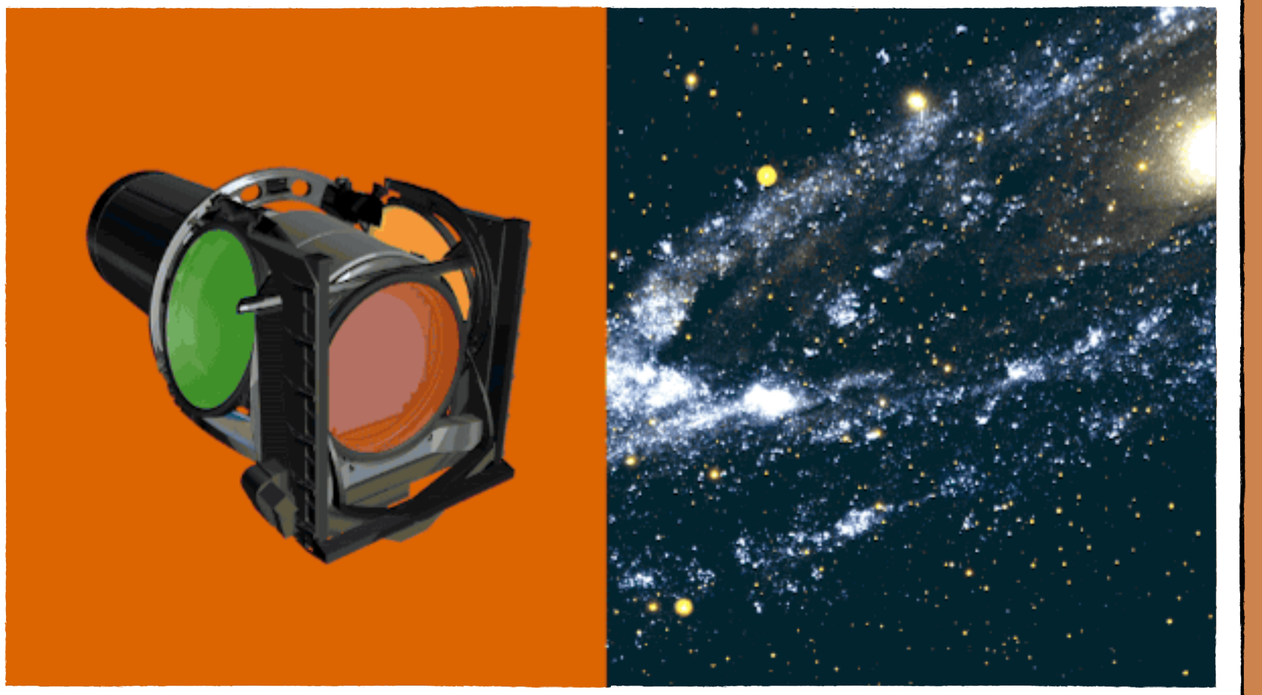
Source: Rubin Observatory

Le role de l’IN2P3 et du CC-IN2P3

2

Le role IN2P3

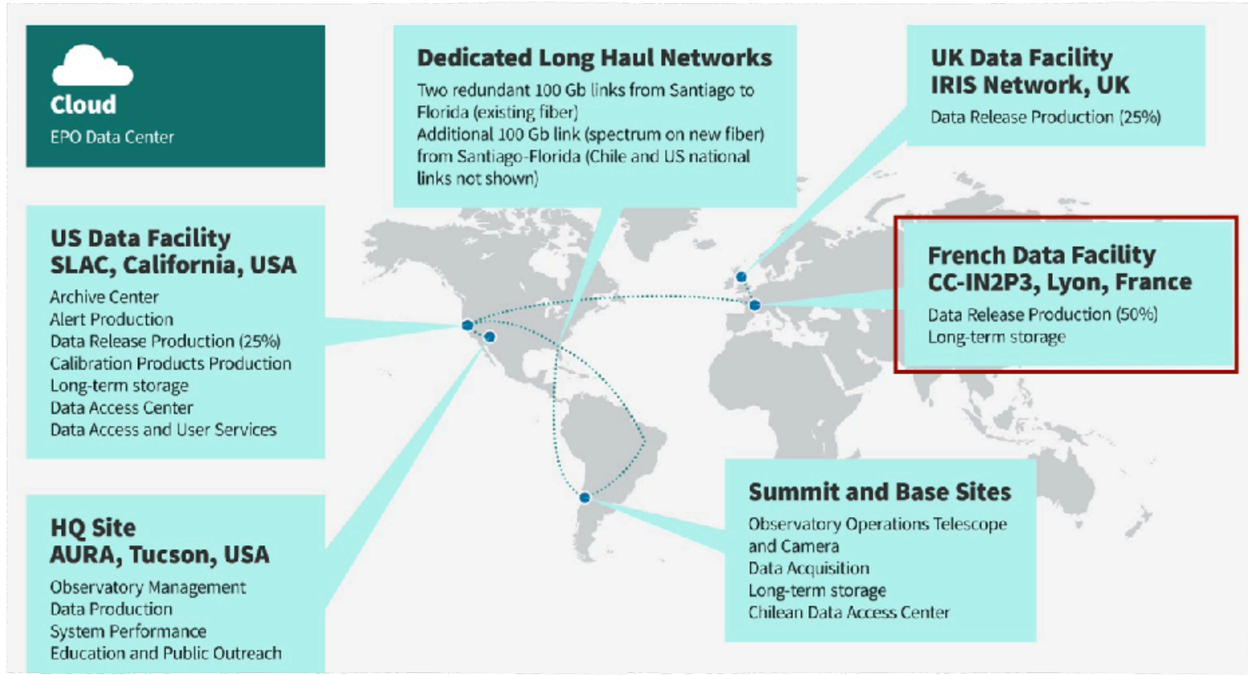
- 10 laboratoires impliqués:
  - APC, CC-IN2P3, CPPM, IJCLab, IP2I, LAPP, LPC, LPNHE, LPSC, LUPM
- Contribution significative à la collaboration DESC (Dark Energy Science Collaboration)
- Contribution à la construction de la camera, du plan focal et au changeur des filtres



Source: Rubin Observatory

Le role du CC-IN2P3

- Un des trois DataFacilities (**FrDF** avec USDF, UKDF)
- Traitement annuel de 50% des données cumulées
- Stockage d'une copie intégrale des produits publiés ("data release")
- 900 Po sur disque/bandes, 29 Po pour le catalog astronomique



Source: Rubin Observatory

- Mettre à disposition des chercheurs les ressources pour accéder et analyser facilement les données Rubin-LSST
  - Déployer l’infrastructure informatique
  - L’intégrer à l’environnement du CC-IN2P3 (authentification, accès aux $HOME, …)

La plateforme informatique

3

La plateforme informatique

- Deux composant majeures:
  - **Qserv**: la base des données du catalog astronomique
  - **Rubin Science Platform** (RSP): la plateforme pour l’analyse interactive

- **Kubernetes**, Helm , Argo Workflow/CD
- Développement open source : https://github.com/lsst-sqre
- Documentation détaillée : https://www.lsst.io/
- Gestion de projet/suivi de bug via Confluence et Jira

Le cluster dédié

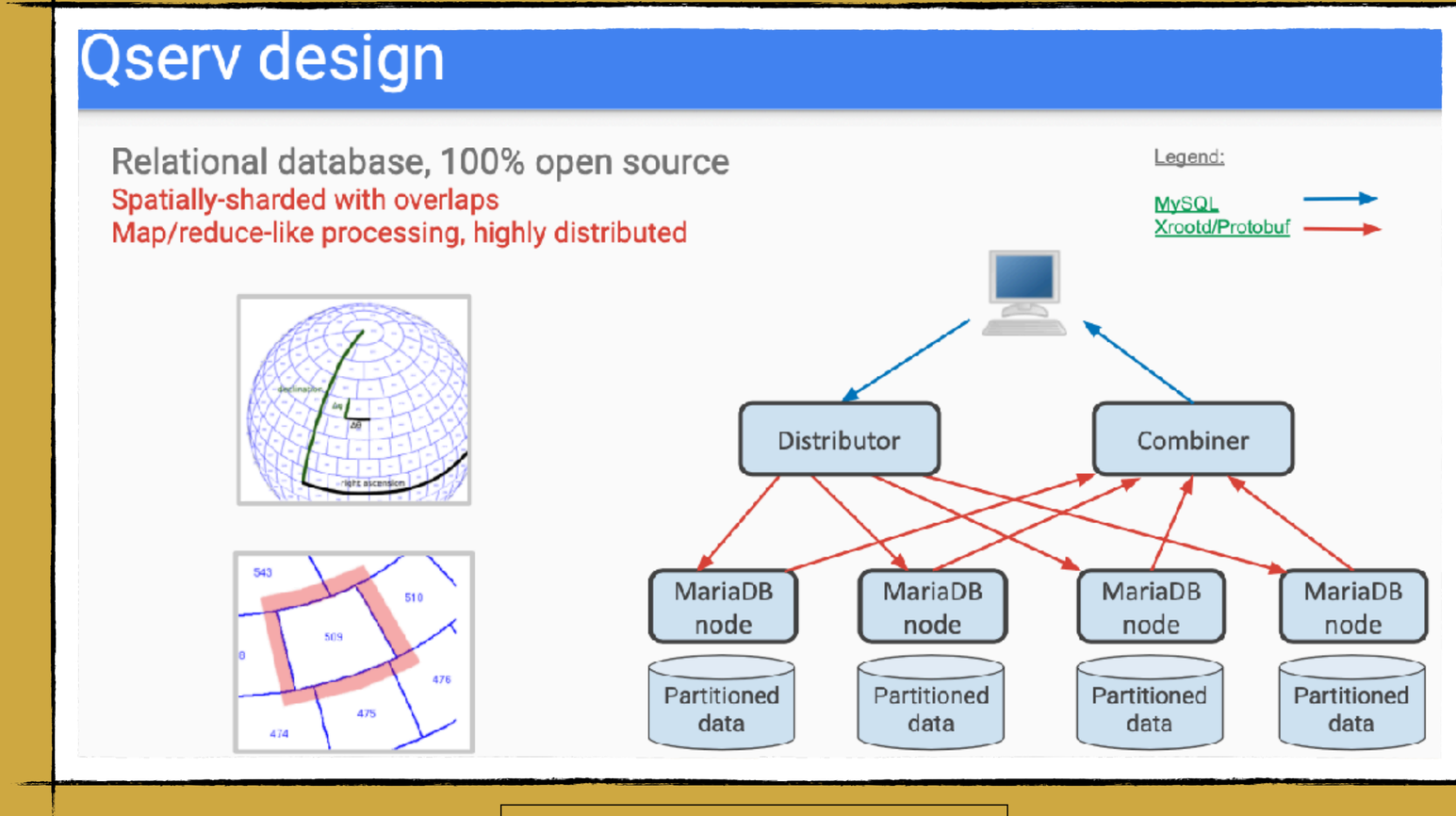
- K8S est déployé sur un cluster physique dédié, utilisé par Qserv et RSP :
  - 25 workernodes
  - 5 DELL PowerEdge R440, 20 DELL PowerEdge R540
  - 3 noeuds master K8S
  - 17 noeuds réservés à Qserv (via taint)
- RSP noeuds :
  - 5 server DELL PowerEdge R540, CPUs: 40 Intel Xeon Silver 4210 CPU @ 2.20GHz
  - RAM: 256 GB
  - Local storage: 50 TB
- Merci Christelle E. et Fabien W.

Qserv

3.1

Qserv

- Database Relational
- Contribution IN2P3
- MariaDB, XRootD
- Shared-nothing MPP
- Partitionnement sphérique avec overlap, sciSQL (UDF)
- Shared scans (concurrent query load)
- Replicated data (Résilience)
- 100 % Open Source
- Déployable sur le Cloud ou sur cluster physique



Source: F. Muller, Rubin Observatory

https://github.com/lsst/qserv-operator

Configuration et Déploiement

- Basé sur le framework operator-sdk
- 2 commandes pour le déployer
  - `k apply -f manifest/operator.yaml`
  - `k apply -k manifest/<instance>`

```
qserv-czar-0                                  2/2
qserv-ingest-db-0                             1/1
qserv-repl-ctl-0                              1/1
qserv-repl-db-0                               1/1
qserv-repl-registry-5bdf55c8ff-jvp9p          1/1
qserv-worker-0                                4/4
qserv-worker-1                                4/4
qserv-worker-2                                4/4
qserv-worker-3                                4/4
qserv-worker-4                                4/4
qserv-worker-5                                4/4
qserv-worker-6                                4/4
qserv-worker-7                                4/4
qserv-worker-8                                4/4
qserv-worker-9                                4/4
qserv-worker-10                               4/4
qserv-worker-11                               4/4
qserv-worker-12                               4/4
qserv-worker-13                               4/4
qserv-worker-14                               4/4
qserv-xrootd-redirector-0                     2/2
```

```yaml
apiVersion: qserv.lsst.org/v1beta1
kind: Qserv
metadata:
  name: qserv
spec:
  queryService:
    type: NodePort
    nodePort: 30040
  storageClassName: "qserv-local-storage"
  storage: "100Gi"
  worker:
    replicas: 15
    replicationResources:
      limits:
        cpu: 36
  tolerations:
  - key: "dedicated"
    operator: "Equal"
    value: "qserv"
    effect: "NoSchedule"
```

https://github.com/lsst/qserv-operator

https://qserv.lsst.io/

https://qserv-operator.lsst.io/

Qserv Ingest

- Utilisé pour charger les données
  - Dévéloppé par F. James (LPC - IN2P3)
  - Argo workflow
- Pre-réquis:
  - Données partitionnés (CSV)
  - Schema DB et partitionnement

```
ingest:
    input:
        # Servers which provides input data
        # TODO Add support for webdav protocol
        # Use file:// as first element in list when using local data
        servers:
            - https://ccnetlsst01.in2p3.fr:65101
            - https://ccnetlsst02.in2p3.fr:65101
            - https://ccnetlsst03.in2p3.fr:65101
            - https://ccnetlsst04.in2p3.fr:65101
        # Path on server where input data is available
        path: stable/idf-dp0.2-catalog-chunked/PREOPS-905
    qserv:
        # TODO add support for secondary index generation method
        # Override the default value stored in input metadata
        # 1: build secondary index after each transaction
        # 0: build secondary index after ingest
        auto_build_secondary_index: 0

        # URL of Qserv services
        # Proxy URL
        query_url: "mysql://qsmaster:@qserv-czar:4040"
        # Ingest database URL
        queue_url: "mysql://qsingest:@qserv-ingest-db-0.qserv-ingest-db/qservIngest"
        # Replication service URL
        replication_url: http://qserv-repl-ctl-0.qserv-repl-ctl:8080
```

https://github.com/lsst-dm/qserv-ingest

```
- name: main
  dag:
    tasks:
    - name: queue
      template: ingest-step
      arguments:
        parameters: [{name: script, value: load-queue.sh}]
    - name: register
      template: ingest-step
      arguments:
        parameters: [{name: script, value: register.sh}]
    - name: transactions
      template: transactions
      dependencies: [queue, register]
    - name: check-transactions
      template: ingest-step
      arguments:
        parameters: [{name: script, value: check-transactions.sh}]
      dependencies: [transactions]
    - name: publish
      template: ingest-step
      arguments:
        parameters: [{name: script, value: publish.sh}]
      dependencies: [check-transactions]
    - name: index-tables
      template: index-tables
      dependencies: [publish]
    - name: validate
      template: ingest-step
      arguments:
        parameters: [{name: script, value: validate.sh}]
      dependencies: [index-tables]
    - name: benchmark
      template: benchmark
      dependencies: [validate]
```

https://qserv-ingest.lsst.io/

Qserv Status Replication Ingest Tools Qserv Monitor

chunk Search

Catalogs | Replication Level | Workers | User Queries Monitor | Active Chunks Map | Query Inspector

Updated: Sun Nov 13 2022 11:22:54

Started	Progress	Sched	Elapsed	Left (est.)	Chunks	Ch/min	QID	Query

Search past queries

Submitted: MOST RECENTLY | Status: | Min.elapsed [sec]: 0 | Type: | Search pattern: | Search mode: NATURAL | Max.queries: 200 | interval: 10 sec | Reset

Submitted	Status	Elapsed	Type	Chunks	Ch/min	∑ Bytes	∑ Rows	Rows	QID	Query
2022-11-11 16:36:33	COMPLETED	00s	SYNC	0		0	0	0	31337	SELECT dp02_dc2_catalogs.Object.coord_dec,dp02_dc2_catalogs.Objec
2022-11-11 16:36:16	COMPLETED	00s	SYNC	0		0	0	0	31336	SELECT dp02_dc2_catalogs.Object.coord_dec,dp02_dc2_catalogs.Objec
2022-11-11 16:10:50	COMPLETED	02s	SYNC	1	30	6398	44	44	31335	SELECT t.expMidptMJD,s.objectId,s.band,s.psfFlux,s.psfFluxErr,s.p
2022-11-11 16:06:10	COMPLETED	02s	SYNC	1	30	703960	3746	3746	31334	SELECT objectId,coord_ra,coord_dec,detect_isPrimary,scisql_nanoja
2022-11-10 16:10:14	COMPLETED	01m 00s	SYNC	1477	1477	12927449	21400	9999	31333	SELECT dp02_dc2_catalogs.DiaSource.apFlux,dp02_dc2_catalogs.DiaSo
2022-11-10 15:24:41	COMPLETED	00s	SYNC	1		485	11	11	31332	SELECT coord_ra,coord_dec FROM dp01_dc2_catalogs.position WHERE s
2022-11-10 15:24:41	COMPLETED	00s	SYNC	1		484	11	11	31331	SELECT coord_ra,coord_dec FROM dp01_dc2_catalogs.position WHERE s
2022-11-10 15:17:33	COMPLETED	04s	SYNC	1	15	160087	416	416	31330	SELECT t.expMidptMJD,s.band,s.ccdVisitId,s.coord_dec,s.coord_ra,s
2022-11-10 15:16:33	COMPLETED	03s	SYNC	1	20	5327	37	37	31329	SELECT t.expMidptMJD,s.objectId,s.band,s.psfFlux,s.psfFluxErr,s.p

Qserv Status Replication Ingest Tools Qserv Monitor

chunk Search

Catalogs | Replication Level | Workers | User Queries Monitor | Active Chunks Map | Query Inspector

Databases

Updated: Sun Nov 13

			Data [GB]																	
			in unique chunks										in all replicas							
	#chunks		chunks			overlaps			regular				chunks			overlaps			regular	
Database	unique	replicas	data	index	Σ	data	index	Σ	data	index	Σ	Σ	data	index	Σ	data	index	Σ	data	index
cosmoDC2_v1_1_4_image	1730	1744	3569.4	69.4	3638.7	41.9	<0.1	41.9	0.0	0.0	0.0	3680.7	3569.4	69.4	3638.7	41.9	<0.1	41.9	0.0	0.0
dp01_dc2_catalogs	1398	1412	915.3	58.9	974.2	114.3	<0.1	114.3	0.0	0.0	0.0	1088.5	915.3	58.9	974.2	114.3	<0.1	114.3	0.0	0.0
dp02_dc2_catalogs	1478	1492	31746.3	2737.4	34483.7	2138.3	<0.1	2138.3	0.0	0.0	0.0	36622.0	31746.3	2737.4	34483.7	2138.3	<0.1	2138.3	0.0	0.0
skysim5000_v1_1_1_parquet	18738	18752	13171.2	261.5	13432.7	157.9	<0.1	158.0	0.0	0.0	0.0	13590.7	13171.2	261.5	13432.7	157.9	<0.1	158.0	0.0	0.0
Total [TB for data]	**23344**	**23400**	**49.4**	**3.1**	**52.5**	**2.5**	**<0.1**	**2.5**	**0.0**	**0.0**	**0.0**	**55.0**	**49.4**	**3.1**	**52.5**	**2.5**	**<0.1**	**2.5**	**0.0**	**0.0**

Partitioned tables

					Data [GB]										
					in unique chunks							in all replicas			
		#rows in			chunks			overlaps				chunks			o
Database	Table	chunks	overlaps	Σ	data	index	Σ	data	index	Σ	Σ	data	index	Σ	d

Qserv Status Replication Ingest Tools Qserv Monitor

chunk Search

Catalogs | Replication Level | Workers | User Queries Monitor | Active Chunks Map | Query Inspector

This dynamically updated table shows the status of **Worker** services in each category. A **Qserv** worker is supposed to be **OFF-LINE** if no response is received from the worker during the most recent **Health Monitoring probe**. In that case a non-zero value (the number of seconds) would be show in column **Last Response**. The state of the **Replication System**s workers is a bit more complex. Workers in this category can be in one of the following states: **ENABLED**, **READ-ONLY**, or **DISABLED**. Note that the **Last Response** tracking for this type of workers is done in the first two categories only. Regardless of a status (or a response delay) of a worker, a number shown in the **#replicas** column will indicate either the actual number of replicas on the corresponding node, or the latest recorded number obtained from the last recorded scan of the worker node made by the **Replication System** before the worker service became non-responsive.

Updated: Sun Nov 13 2022 11:23:03

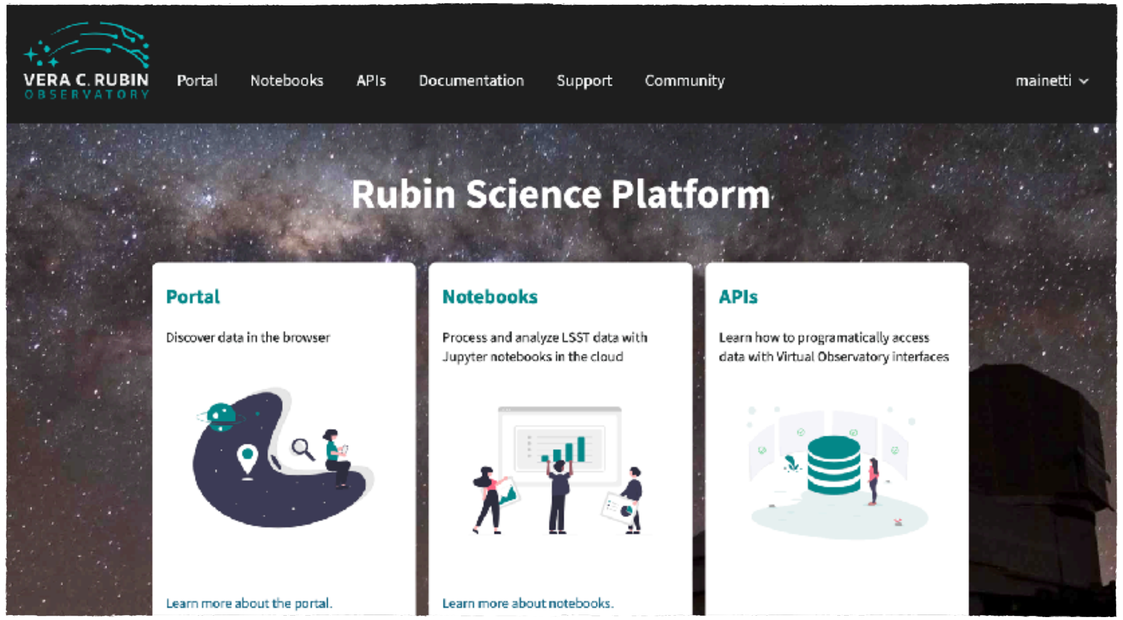
Worker	#replicas	Qserv		Replication Sys.	
		Status	Last Response [s]	Status	Last Response [s]
qserv-worker-0	1558	ON-LINE	0	ENABLED	0
qserv-worker-1	1577	ON-LINE	0	ENABLED	0
qserv-worker-10	1522	ON-LINE	0	ENABLED	0
qserv-worker-11	1524	ON-LINE	0	ENABLED	0
qserv-worker-12	1636	ON-LINE	0	ENABLED	0
qserv-worker-13	1506	ON-LINE	0	ENABLED	0
qserv-worker-14	1561	ON-LINE	0	ENABLED	0
qserv-worker-2	1568	ON-LINE	0	ENABLED	0
qserv-worker-3	1572	ON-LINE	0	ENABLED	0
qserv-worker-4	1623	ON-LINE	0	ENABLED	0
qserv-worker-5	1525	ON-LINE	0	ENABLED	0
qserv-worker-6	1551	ON-LINE	0	ENABLED	0
qserv-worker-7	1557	ON-LINE	0	ENABLED	0
qserv-worker-8	1534	ON-LINE	0	ENABLED	0

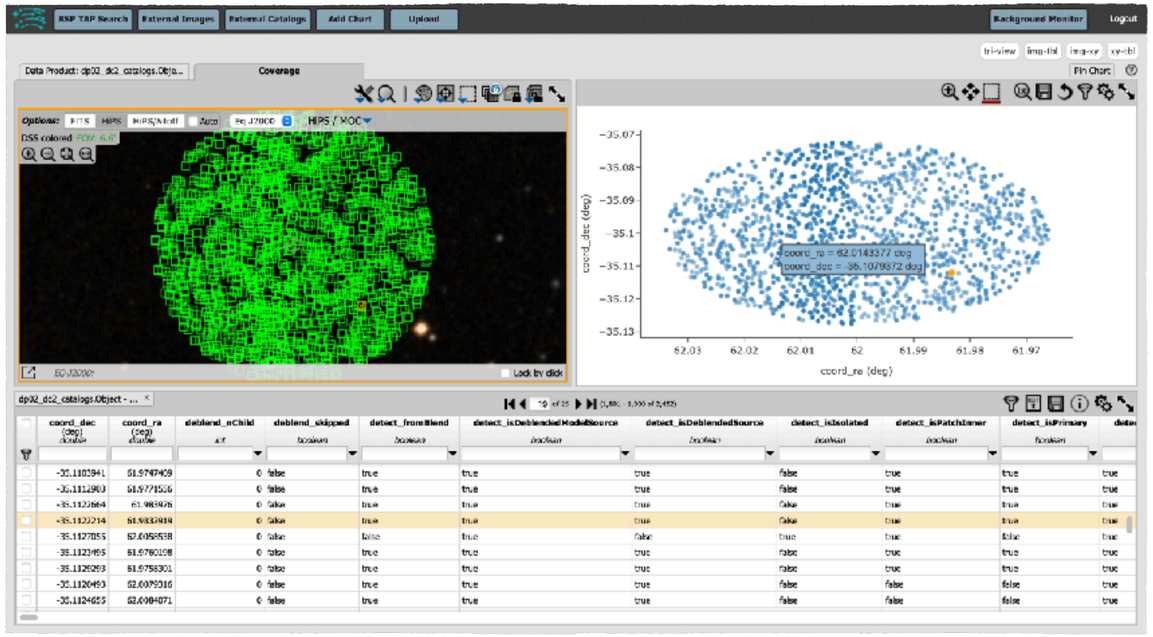
Rubin Science Platform

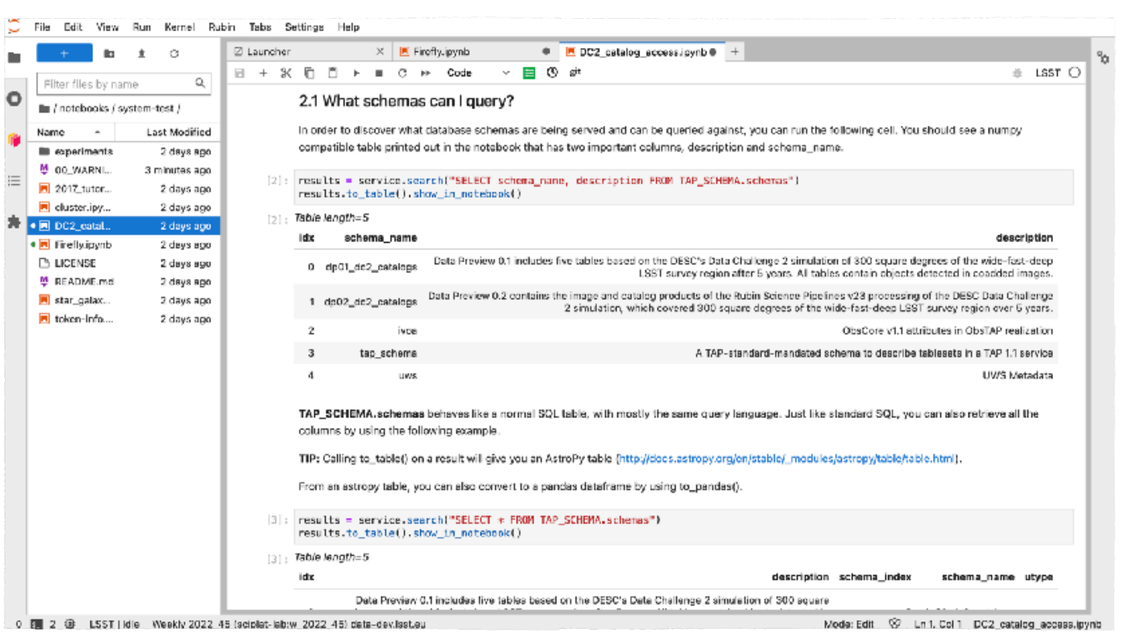
3.2

RSP

- Environnement web pour l’exploitation interactive des données
- Access aux données Qserv via UI ou via script
- Visualisation des images, creation des graphiques, exploitation des tables
- Execution des notebooks (API Python)
- Porte d’entrée à Qserv pour les outils “VO”







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Configuration et Déploiement

- Configuration via Helm chart
- Une config pour chaque environnement et pour chaque application

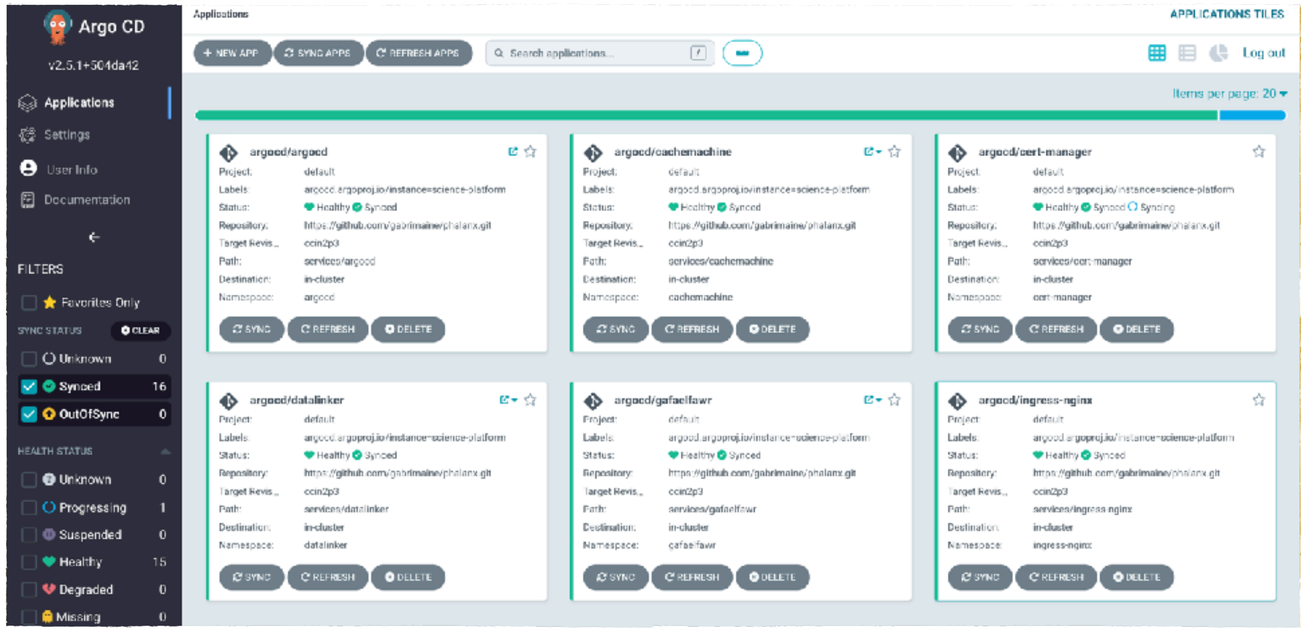
```yaml
config:
  gcsBucket: "async-results.lsst.codes"
  gcsBucketUrl: "https://cccephs3.in2p3.fr:8080"
  gcsBucketType: "S3"
  jvmMaxHeapSize: "31G"

qserv:
  host: "ccqserv201.in2p3.fr:30040"
  mock:
    enabled: false
```

- Déploiement via ArgoCD
- Secrets gérer via Vault (HashiCorp)

https://github.com/lsst-sqre/phalanx

https://phalanx.lsst.io/

templates	Clean up the sqlproxy service
Chart.yaml	Fix typo in science-platform Chart.yaml
README.md	Updated missed values to reflect new naming
values-base.yaml	Delete obstap service
values-ccin2p3.yaml	activate datalinker
values-idfdev.yaml	adjusted naming to be more generic
values-idfint.yaml	Update values-idfint.yaml
values-idfprod.yaml	Delete obstap service



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VERA C. RUBIN OBSERVATORY

Portal Notebooks APIs Documentation Support Community

mainetti

Rubin Science Platform

Portal

Discover data in the browser

Learn more about the portal.

Notebooks

Process and analyze LSST data with Jupyter notebooks in the cloud

Learn more about notebooks.

APIs

Learn how to programatically access data with Virtual Observatory interfaces

RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view img-tbl img-xy xy-tbl

TAP Searches

1. Select TAP Service Using LSST RSP https://data-dev.lsst.eu/api/tap - Replace...

2. Select Query Type ○ Single Table (UI assisted) ● Edit ADQL (advanced) ○ Image Search (ObsTAP)

3. Advanced ADQL ADQL edits below will not be reflected in **Single Table** view

Schema Browser

Schema -> Table -> Column

- dp02_dc2_catalogs
- ivoa
- dp01_dc2_catalogs
- tap_schema
- uws

ADQL Query: Reset Clear

```
SELECT objectId, coord_ra, coord_dec, detect_isPrimary,
scisql_nanojanskyToAbMag(g_cModelFlux) as gmag, scisql_nanojanskyToAbMag(i_cModelFlux) as imag,
scisql_nanojanskyToAbMag(r_cModelFlux) as rmag,
scisql_nanojanskyToAbMagSigma(g_cModelFlux, g_cModelFluxErr) as gmag_err,
scisql_nanojanskyToAbMagSigma(i_cModelFlux, i_cModelFluxErr) as imag_err,
scisql_nanojanskyToAbMagSigma(r_cModelFlux, r_cModelFluxErr) as rmag_err
FROM dp02_dc2_catalogs.Object
WHERE CONTAINS (POINT('ICRS', coord_ra, coord_dec), CIRCLE('ICRS', 62.0, -37.0, 0.05)) = 1
AND detect_isPrimary = 1
```

ADQL to submit to the selected TAP service

Type ADQL text; you can use the Schema Browser on the left to insert table and column names.

☑ Insert fully-qualified column names (recommended for table joins)

Popular Functions

```
TOP n  -- Limit the results to n number of records
ORDER BY [ASC/DESC] -- Used for sorting
POINT('<coordinate system>', RIGHT_ASCENSION, DECLINATION)
CIRCLE('<coordinate system>', RIGHT_ASCENSION_CENTER, DECLINATION_CENTER, RADIUS)
BOX('<coordinate system>', RIGHT_ASCENSION_CENTER, DECLINATION_CENTER, WIDTH, HEIGHT)
POLYGON('<coordinate system>', POINT1, POINT2, POINT3...)
DISTANCE(POINT1, POINT2)
CONTAINS(REGION1, REGION2)
INTERSECTS(REGION1, REGION2)
```

Sample Queries

Query the object table to get positions and composite model magnitudes and their errors in three filters using a CONE search to define a region on the sky. Filter on deblended sources with i-band magnitudes brighter than 25 mag.

```
SELECT objectId, coord_ra, coord_dec, detect_isPrimary,
scisql_nanojanskyToAbMag(g_cModelFlux) as gmag, scisql_nanojanskyToAbMag(i_cModelFlux) as imag,
scisql_nanojanskyToAbMag(r_cModelFlux) as rmag,
scisql_nanojanskyToAbMagSigma(g_cModelFlux, g_cModelFluxErr) as gmag_err,
scisql_nanojanskyToAbMagSigma(i_cModelFlux, i_cModelFluxErr) as imag_err,
scisql_nanojanskyToAbMagSigma(r_cModelFlux, r_cModelFluxErr) as rmag_err
```

RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view | img-tbl | img-xy | xy-tbl

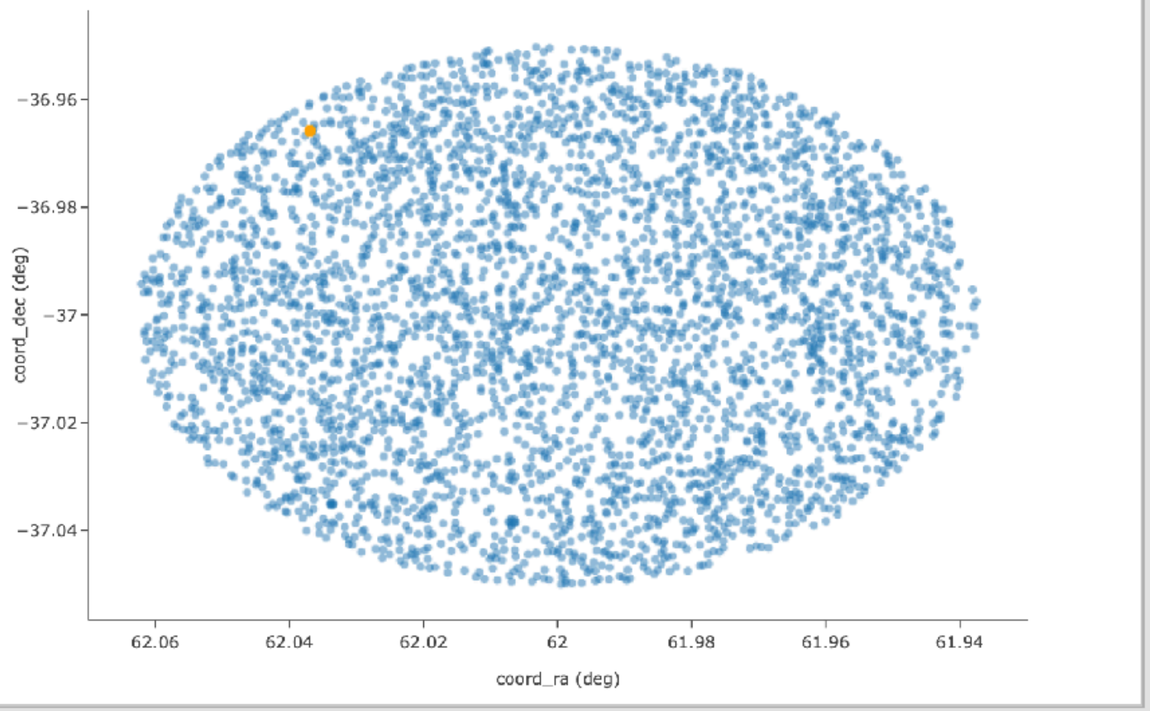
Pin Chart

Data Product: dp02_dc2_catalogs.... | Coverage

Show: Retrieve ForcedSource time series

table: dp02_dc2_catalogs.Forcec
id_column: objectId
join_time_column: dp02_dc2_catalogs.CcdVis
band: all
detail: full

Submit



dp02_dc2_catalogs.Object - ...

1 of 38 (1 - 100 of 3,746)

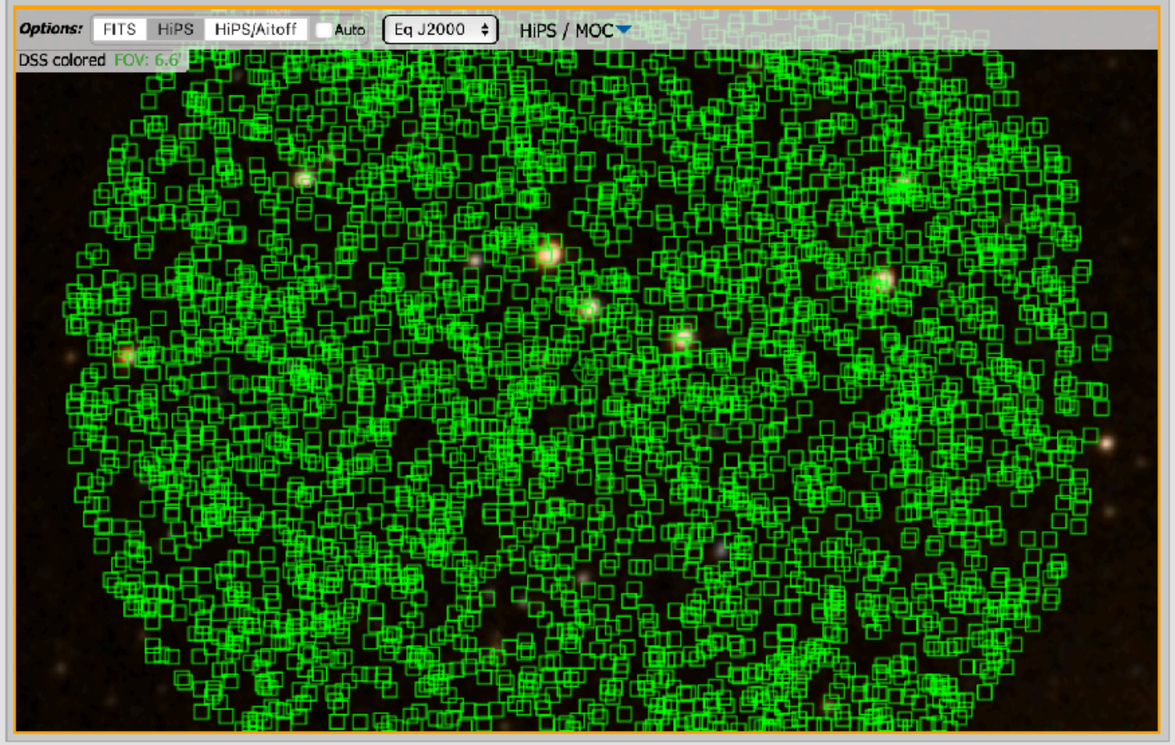
objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1651281746966117378	62.0369809	-36.9656694	true	26.67173660478293	27.024703363026102	26.883359372072213	0.15826734373514037	0.4471855727116457	0.22074339335837545
1651281746966117379	62.036374	-36.965212	true	26.998386344940823	27.448800101174587	26.979927998579818	0.21372588476671137	0.6606754023710516	0.24195122241984937
1651281746966117377	62.0365534	-36.9657835	true	26.66316023476891	25.862104570781455	26.288498255832227	0.15736180196107669	0.15346720978074532	0.12959933941892998
1651281746966117372	62.0042675	-36.9658675	true	24.839462682886705	25.05803370135762	24.994058043731094	0.04449195847840843	0.11461361221211118	0.059446549453685944

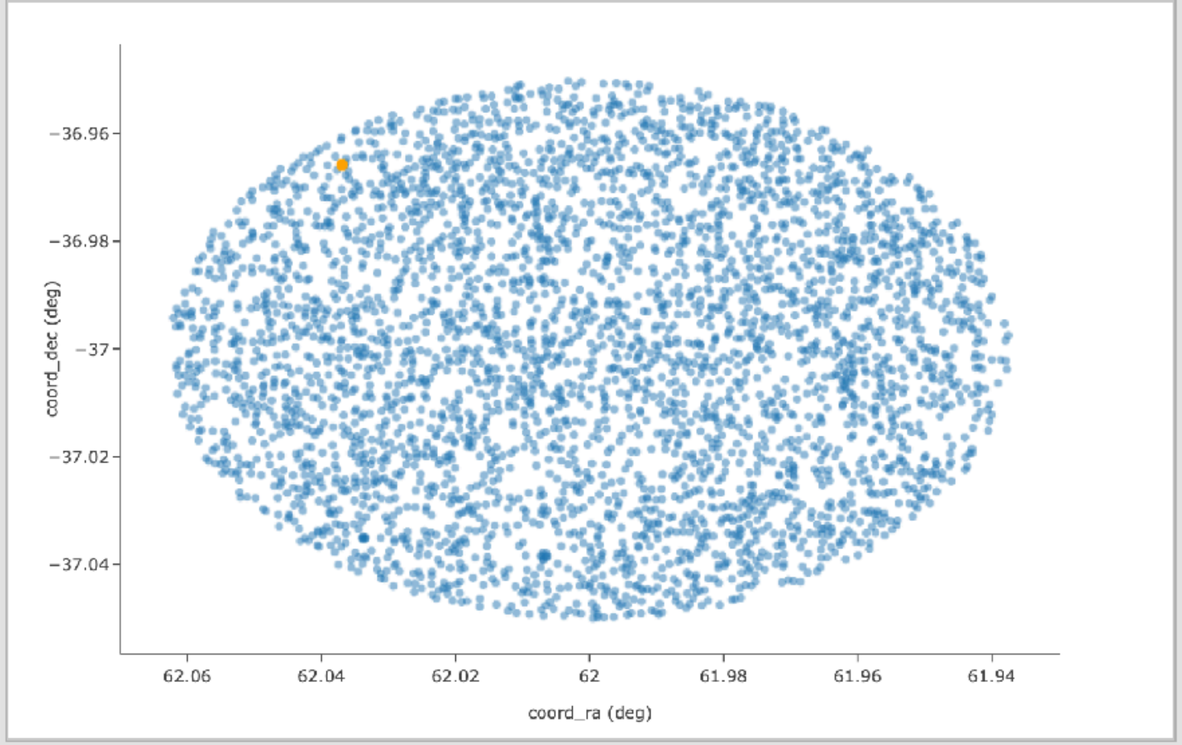
RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view | img-tbl | img-xy | xy-tbl

Pin Chart

Data Product: dp02_dc2_catalogs.Object... | Coverage

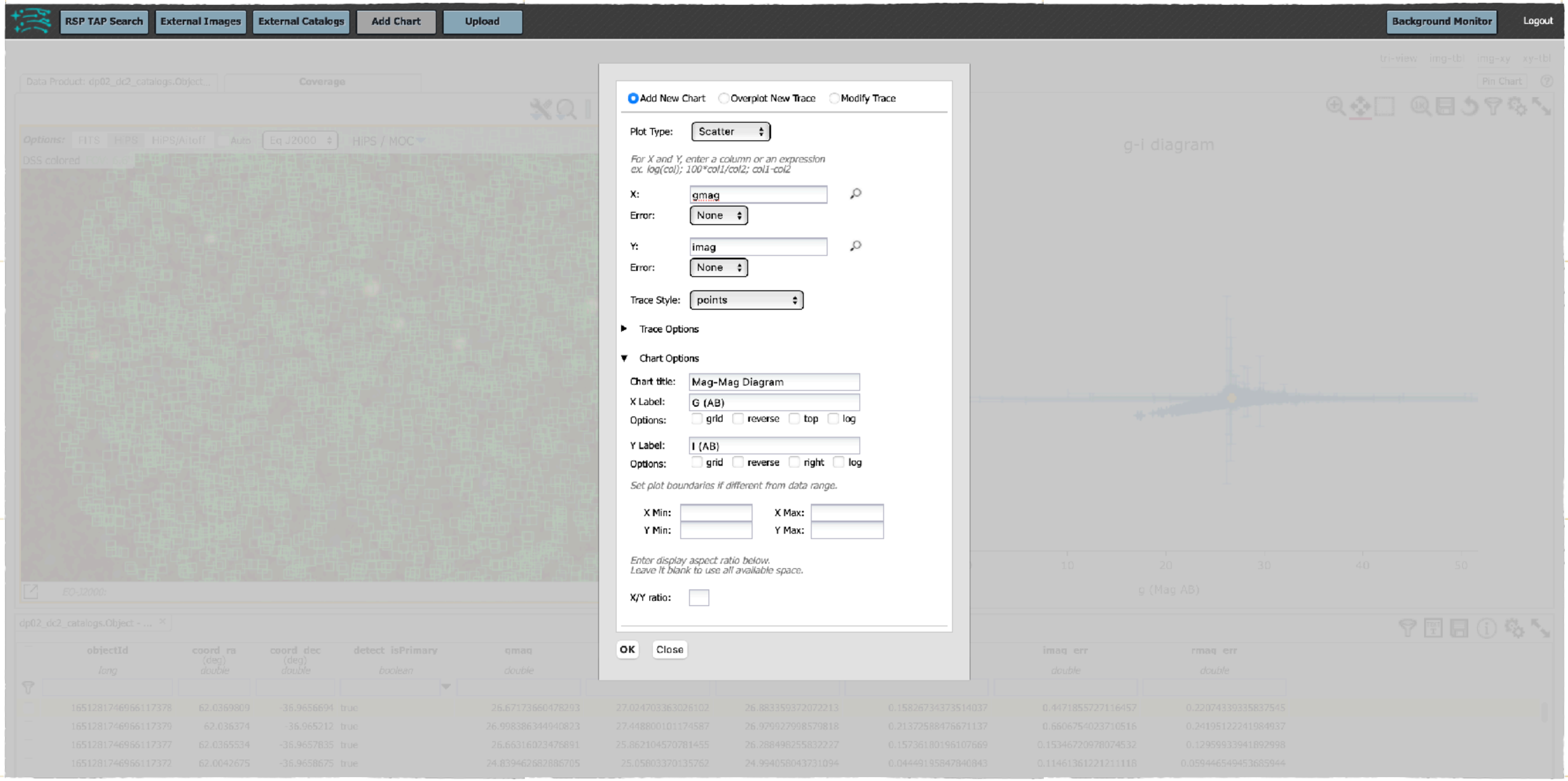




dp02_dc2_catalogs.Object - ...

1 of 38 (1 - 100 of 3,746)

objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1651281746966117378	62.0369809	-36.9656694	true	26.67173660478293	27.024703363026102	26.883359372072213	0.15826734373514037	0.4471855727116457	0.22074339335837545
1651281746966117379	62.036374	-36.965212	true	26.998386344940823	27.448800101174587	26.979927998579818	0.21372588476671137	0.6606754023710516	0.24195122241984937
1651281746966117377	62.0365534	-36.9657835	true	26.66316023476891	25.862104570781455	26.288498255832227	0.15736180196107669	0.15346720978074532	0.12959933941892998
1651281746966117372	62.0042675	-36.9658675	true	24.839462682886705	25.05803370135762	24.994058043731094	0.04449195847840843	0.11461361221211118	0.059446549453685944


RSP TAP Search
External Images
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Upload
Background Monitor
Logout
Add New Chart
Overplot New Trace
Modify Trace
Plot Type:
Scatter
For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2
X:
gmag
Error:
None
Y:
imag
Error:
None
Trace Style:
points
Trace Options
Chart Options
Chart title:
Mag-Mag Diagram
X Label:
G (AB)
Options:
grid
reverse
top
log
Y Label:
I (AB)
Options:
grid
reverse
right
log
Set plot boundaries if different from data range.
X Min:
X Max:
Y Min:
Y Max:
Enter display aspect ratio below.
Leave it blank to use all available space.
X/Y ratio:
OK
Close
g-i diagram
g (Mag AB)

RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view | img-tbl | img-xy | xy-tbl

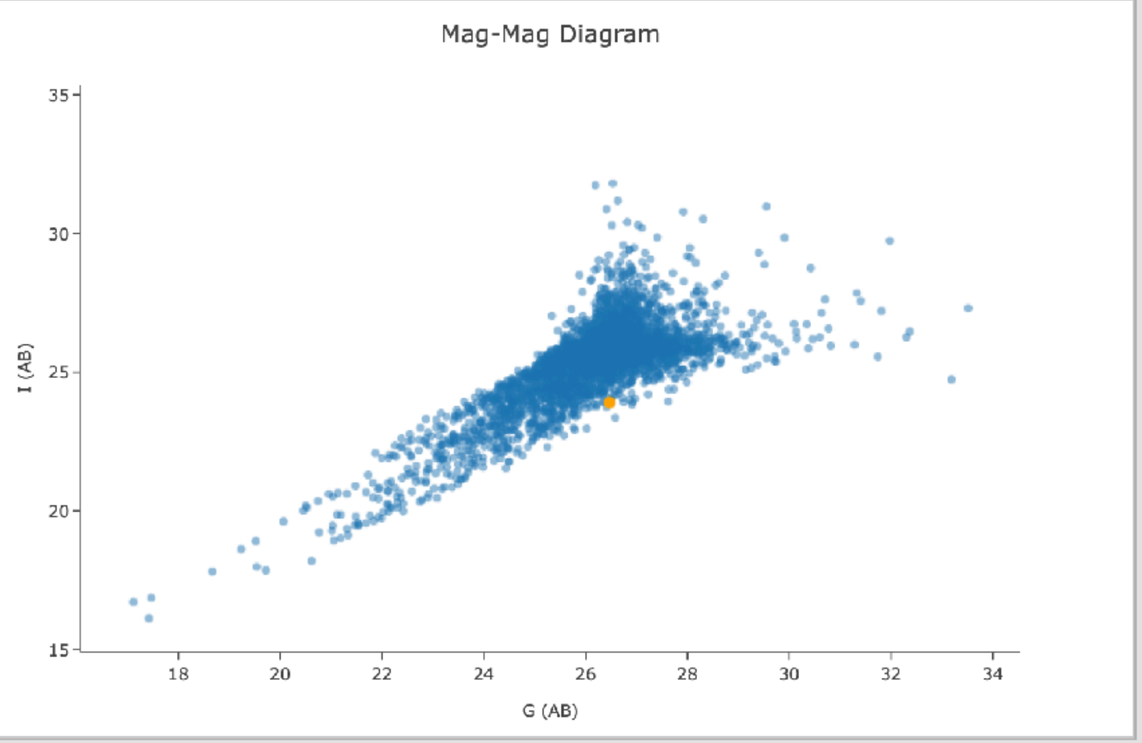
Pin Chart

Data Product: dp02_dc2_catalogs.Object... | Coverage

Options: FITS | HiPS | HiPS/Aitoff | Auto | Eq J2000 | HiPS / MOC

DSS colored FOV: 6.6'

EQ-J2000: | Lock by click



dp02_dc2_catalogs.Object - ...

9 of 38 (801 - 900 of 3,746)

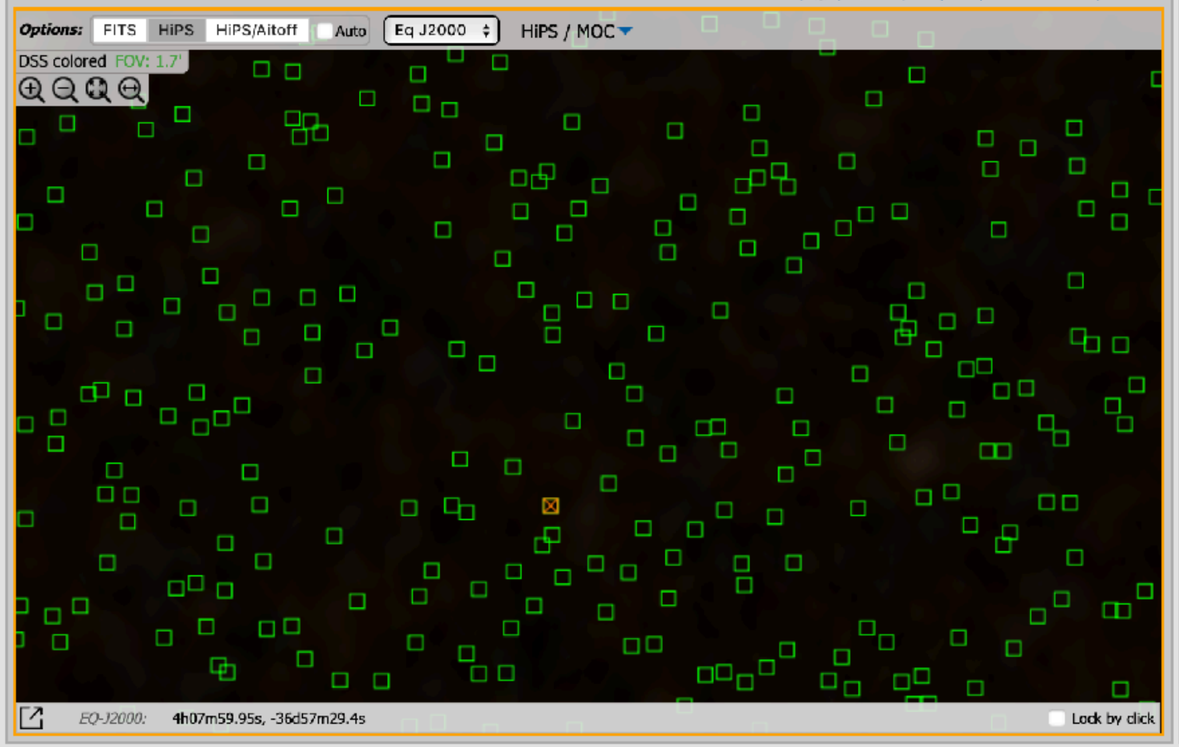
objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1651220174314939438	62.0477095	-37.02137	true	26.46708692509574	23.93286712399394	24.99726417767179	0.16342354172154275	0.03667950163682804	0.050073943468245666
1651220174314939549	61.9973158	-37.0190025	true	26.377803011165245	25.342046490525007	25.882091304165 98	0.18983233964346904	0.146246421769033	0.14154401359595323
1651220174314939543	62.0398852	-37.0191499	true	27.301899543915688	25.05501999091421	25.726887237284735	0.40379792007339904	0.10851332491675626	0.116631364761643
1651220174314939569	62.0023118	-37.0183855	true	25.86960238415471	24.011177921002854	24.694505440529674	0.08561891774139752	0.030305322322981738	0.03371049191696895

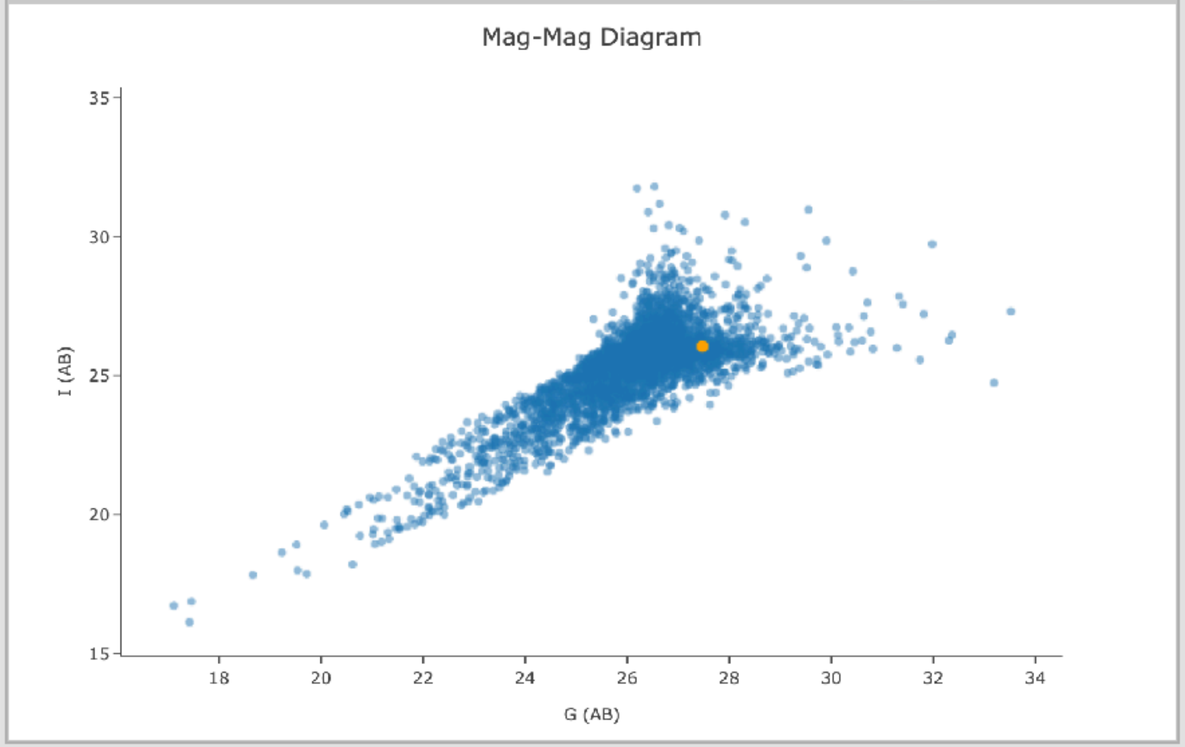
RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view | img-tbl | img-xy | xy-tbl

Pin Chart

Data Product: dp02_dc2_catalogs.Object... | Coverage





dp02_dc2_catalogs.Object - ...

25 of 38 (2,401 - 2,500 of 3,746)

objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1652781746966087705	62.0239613	-36.962663	true	26.77826348408676	26.03696725889422	27.163206811405317	0.18103605645640558	0.18956432341186105	0.30749724133841166
1652781746966087701	62.0030148	-36.9627734	true	27.468637261048556	26.07788276388544	30.170661138789	0.3292788432861664	0.19912888144650845	4.7931374658853985
1652781746966087717	62.0218731	-36.9623218	true	27.360912167765214	25.7443705334684	26.978874953964443	0.32706165729965675	0.1504777130060255	0.2719207258329404
1652781746966087724	62.0042035	-36.9617955	true	23.756298525445622	22.071307371240295	22.75364389403064	0.014699070521214117	0.006529785044726593	0.0068692182141422

RSP TAP Search | External Images | External Catalogs | Add Chart | Upload | Background Monitor | Logout

tri-view | img-tbl | img-xy | xy-tbl

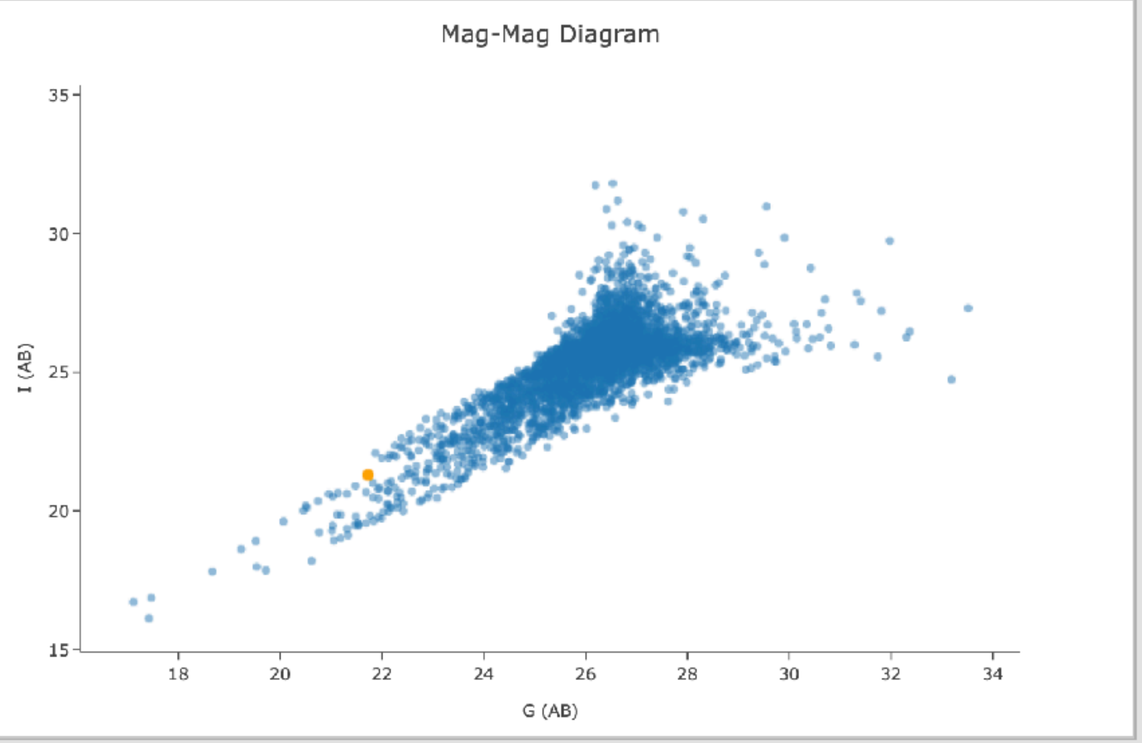
Pin Chart

Data Product: dp02_dc2_catalogs.Object... | Coverage

Options: FITS | HiPS | HiPS/Aitoff | Auto | Eq J2000 | HiPS / MOC

DSS colored FOV: 1.7'

EQ-J2000: Lock by click



dp02_dc2_catalogs.Object - ...

14 of 38 (1,301 - 1,400 of 3,746)

objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1651228970408001325	61.9503052	-37.0228453	true	27.701019882959585	26.923336550786132	26.894762951453703	0.40864063676662665	0.41385379130923644	0.23483291092935576
1651228970408001324	61.9500144	-37.0228788	true	28.645342245858785	26.67841465210148	26.843320414401912	0.9779167667109859	0.3300277332805228	0.2213069976133416
1651228970408001323	61.9507092	-37.0242883	true	26.14133118689364	25.91375602083081	26.09702826887721	0.13889187862505958	0.23620523812785651	0.16059972965697075
1651228970408001322	61.950694	-37.0220721	true	24.154833550220946	23.800474507489017	24.032386149726157	0.021923494730634024	0.033184909682772594	0.023405482406159674

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Data Product: dp02_dc2_catalogs.... | Coverage

Pin Chart

More | Pin Table | Redo Search | Table | Chart

VOTable (10 cols x 44 rows) 1 of 1 (1 - 44 of 44)

expMidptMJD (d) double	objectId long	band char	psfFlux (nJy) double	psfFluxErr (nJy) double	psfDiffFlux (nJy) double	psfDiffFluxErr (nJy) double	ccdVisitId long
60560.2808142	1651228970408001321	g	7191.1850357	134.4170507	-132.6894418	136.1094143	662522100
60588.1935492	1651228970408001321	g	7249.6683149	105.0856791	76.6323078	100.7886535	680232047
60560.2662942	1651228970408001321	g	7251.7707816	139.3366866	-30.371742	140.6404261	662491114
60559.3347232	1651228970408001321	g	7295.9704115	106.4014165	80.4963812	104.4641556	661721058
60560.2708912	1651228970408001321	g	7199.2881708	134.966232	-89.4533972	137.1228943	662501027
60610.1674572	1651228970408001321	g	7303.244878	98.8968643	176.302723	94.9712474	697938134
60734.0757792	1651228970408001321	g	7320.3106572	134.5322685	26.9173889	136.1459829	784702061
59791.3664842	1651228970408001321	g	7370.2667256	145.8302836	47.4518085	146.7106955	159507147
60145.4234672	1651228970408001321	g	7138.6023162	109.909999	-49.8419876	108.1141896	400460180
59791.3725022	1651228970408001321	g	7144.7021511	136.4682259	-146.2927364	137.3435013	159520095
60934.2793832	1651228970408001321	g	7386.9130726	102.8225214	192.9716011	99.0248849	921353104
60530.3764142	1651228970408001321	g	7265.6162921	114.6463228	-0.9019478	116.7512251	637920027
60934.2566012	1651228970408001321	g	7222.8455469	105.52396	86.8756032	102.8215625	921307111
61109.0477132	1651228970408001321	g	7228.5905962	146.5486665	-107.4964553	147.7820059	1039959180
59841.2961872	1651228970408001321	g	7253.278194	154.0412036	-118.6549826	155.4539625	194860097
61084.0886352	1651228970408001321	g	7248.988087	108.9147274	63.7929628	105.6490539	1019931124
61084.0890902	1651228970408001321	g	7197.2618983	110.4972083	25.9592663	112.1190117	1019932157
60559.3197612	1651228970408001321	g	7115.167331	107.0626558	-150.6754311	108.9075394	661689101
61084.1099662	1651228970408001321	g	7119.2947366	113.2677166	-108.833929	115.0498032	1019973160
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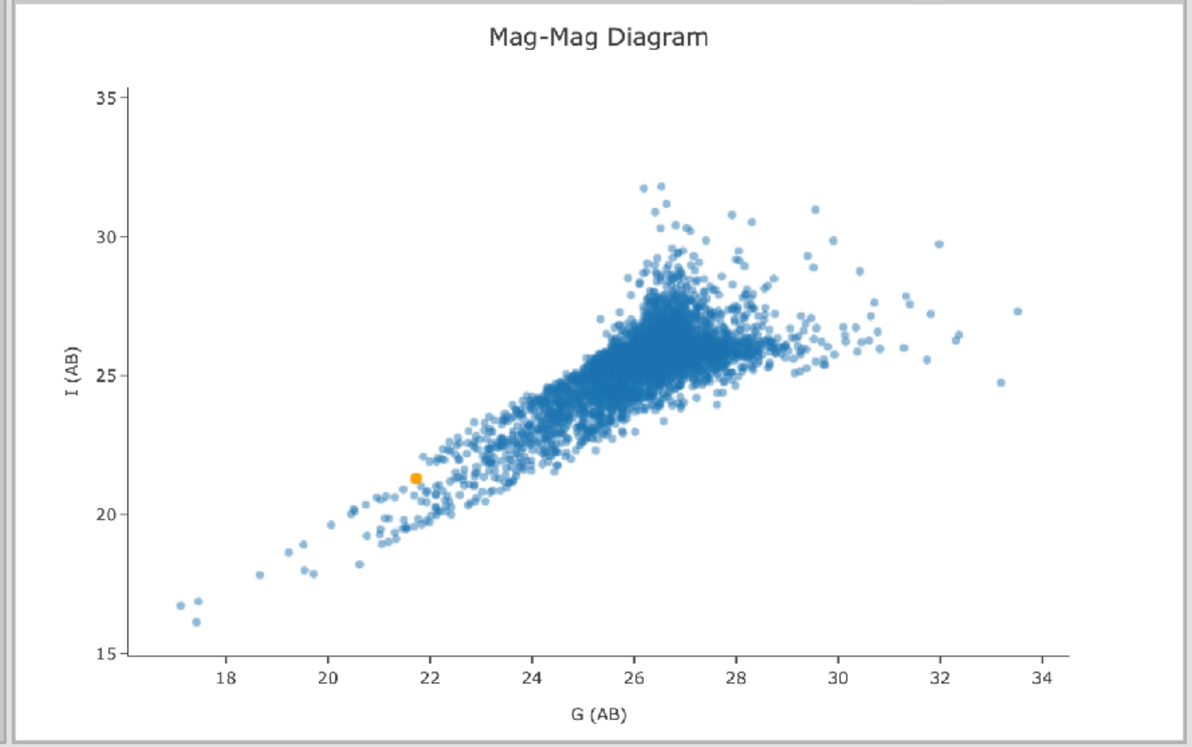

dp02_dc2_catalogs.Object - ... 14 of 38 (1,301 - 1,400 of 3,746)

objectId long	coord_ra (deg) double	coord_dec (deg) double	detect_isPrimary boolean	gmag double	imag double	rmag double	gmag_err double	imag_err double	rmag_err double
1651228970408001325	61.9503052	-37.0228453	true	27.701019882959585	26.923336550786132	26.894762951453703	0.40864063676662665	0.41385379130923644	0.23483291092935576
1651228970408001324	61.9500144	-37.0228788	true	28.645342245858785	26.67841465210148	26.843320414401912	0.9779167667109859	0.3300277332805228	0.2213069976133416
1651228970408001323	61.9507092	-37.0242883	true	26.14133118689364	25.91375602083081	26.09702826887721	0.13889187862505958	0.23620523812785651	0.16059972965697075
1651228970408001322	61.950694	-37.0220721	true	24.154833550220946	23.800474507489017	24.032386149726157	0.021923494730634024	0.033184909682772594	0.023405482406159674

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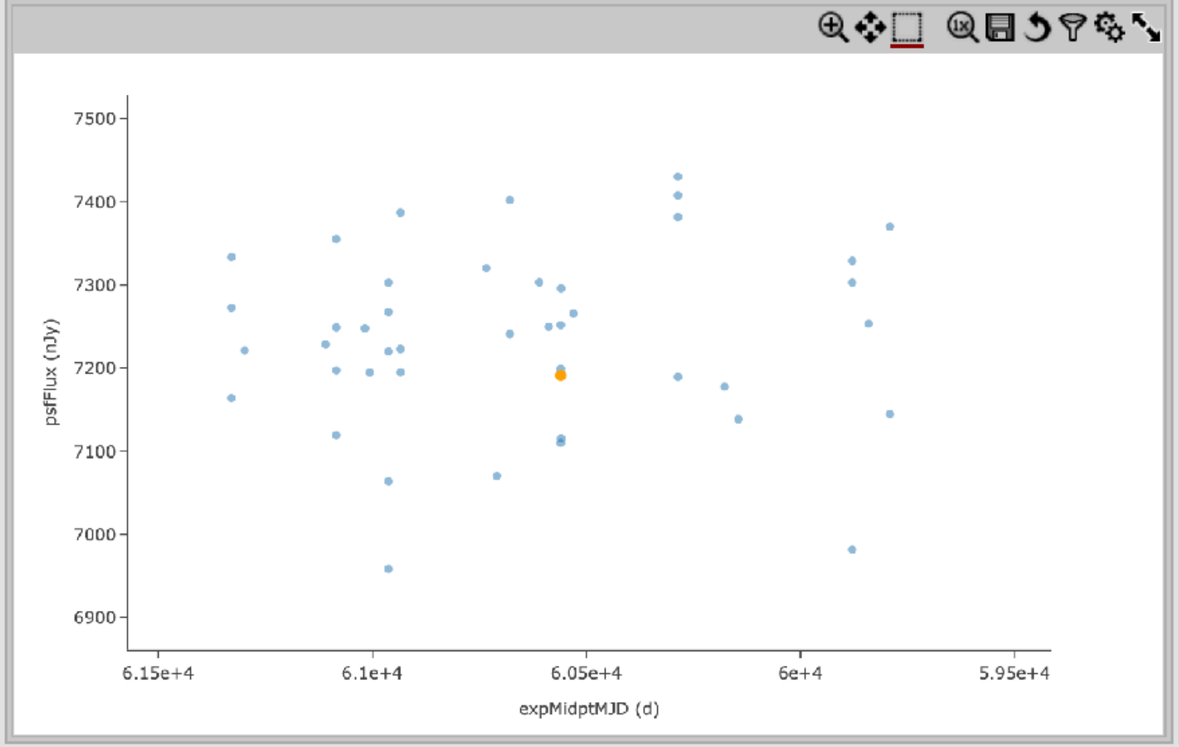
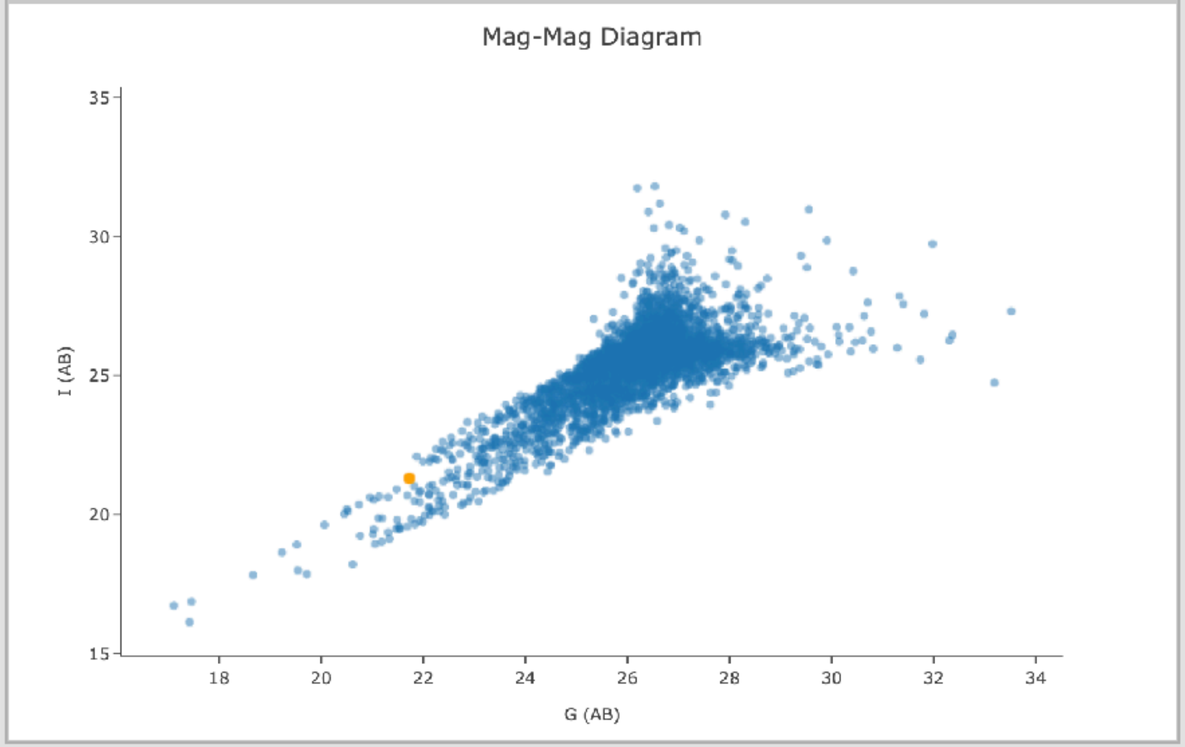
tri-view | img-tbl | img-xy | xy-tbl

Data Product: dp02_dc2_catalogs.... | Coverage

Pin Chart

More | Pin Table | Redo Search | Table | Chart

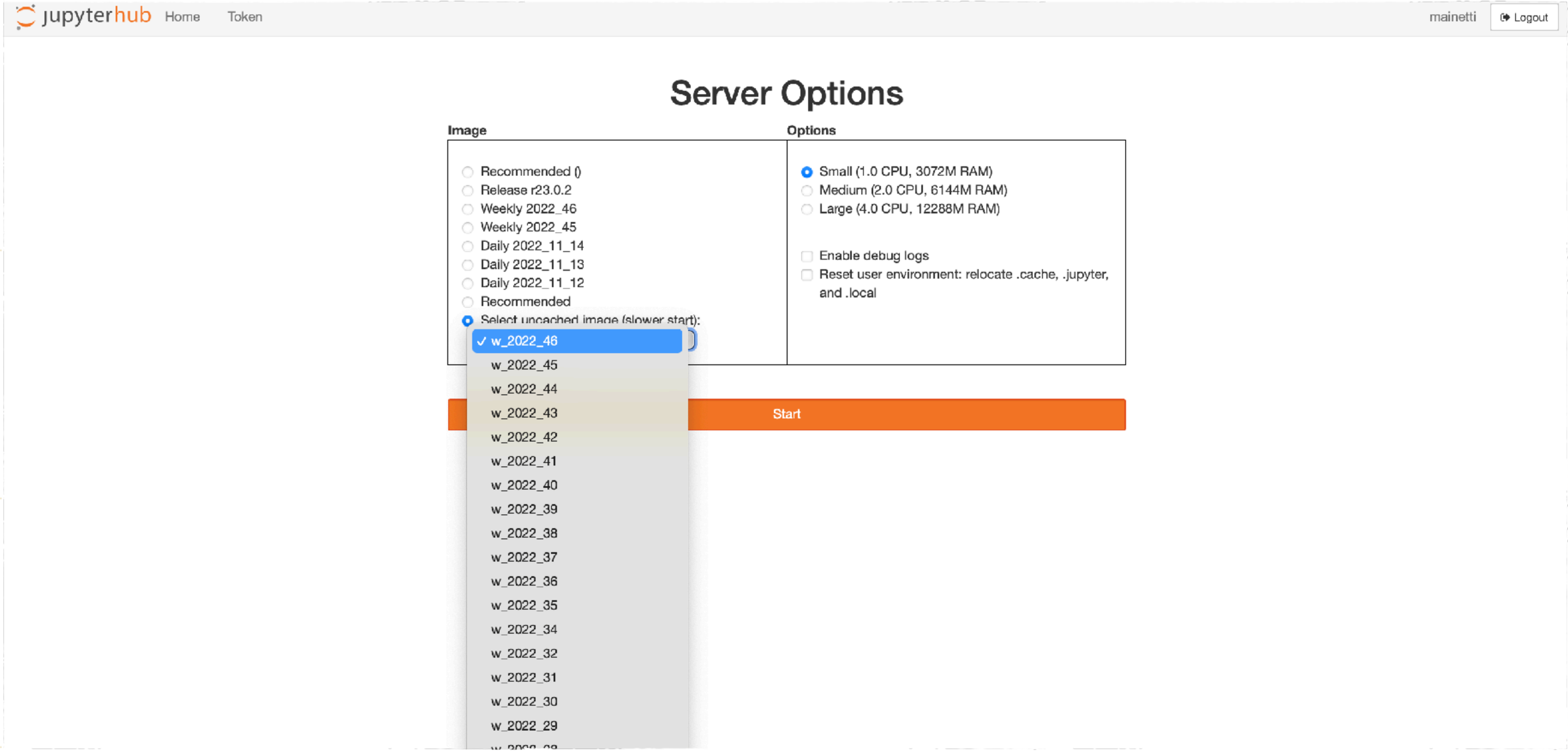


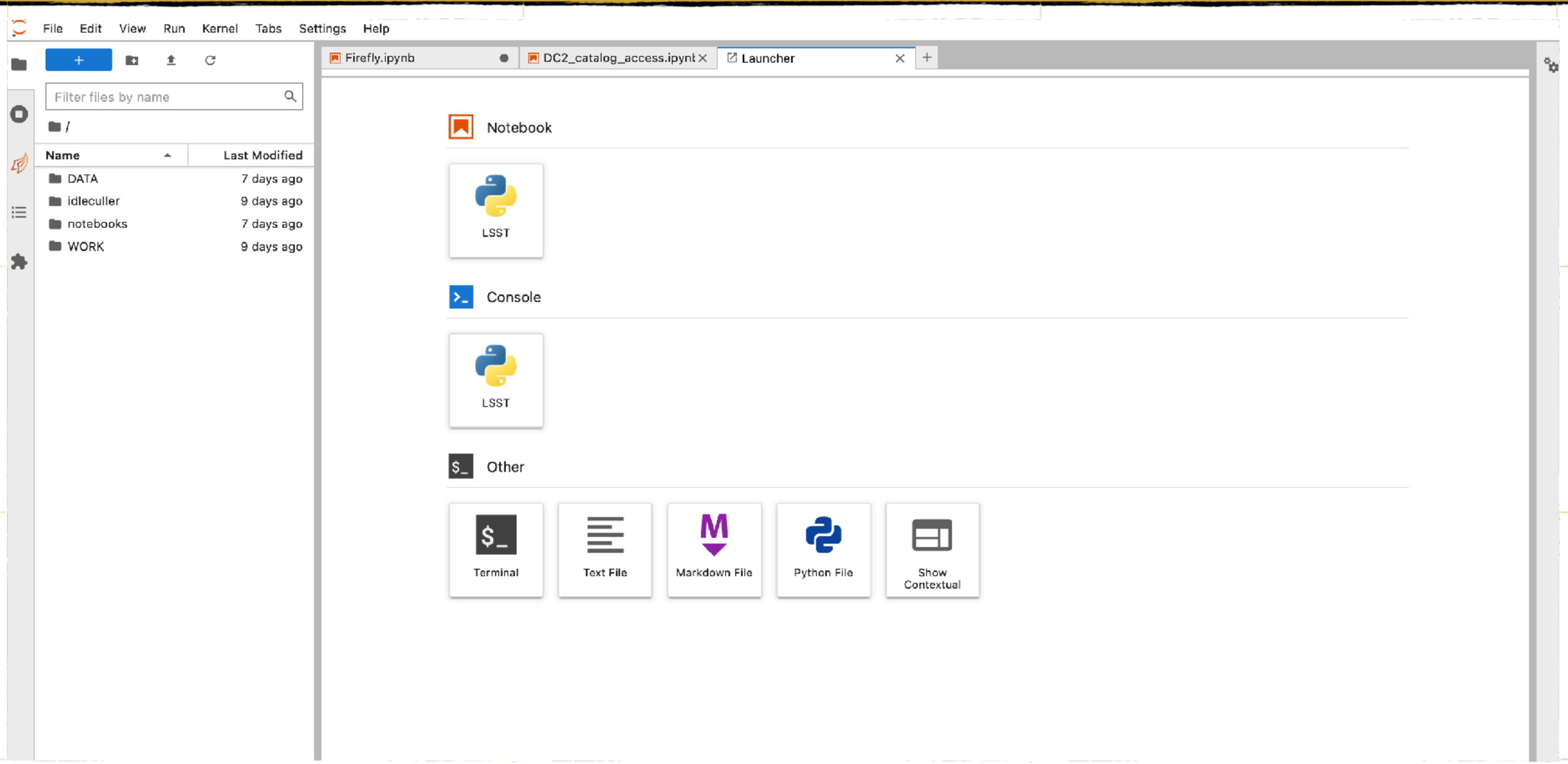


dp02_dc2_catalogs.Object - ...

14 of 38 (1,301 - 1,400 of 3,746)

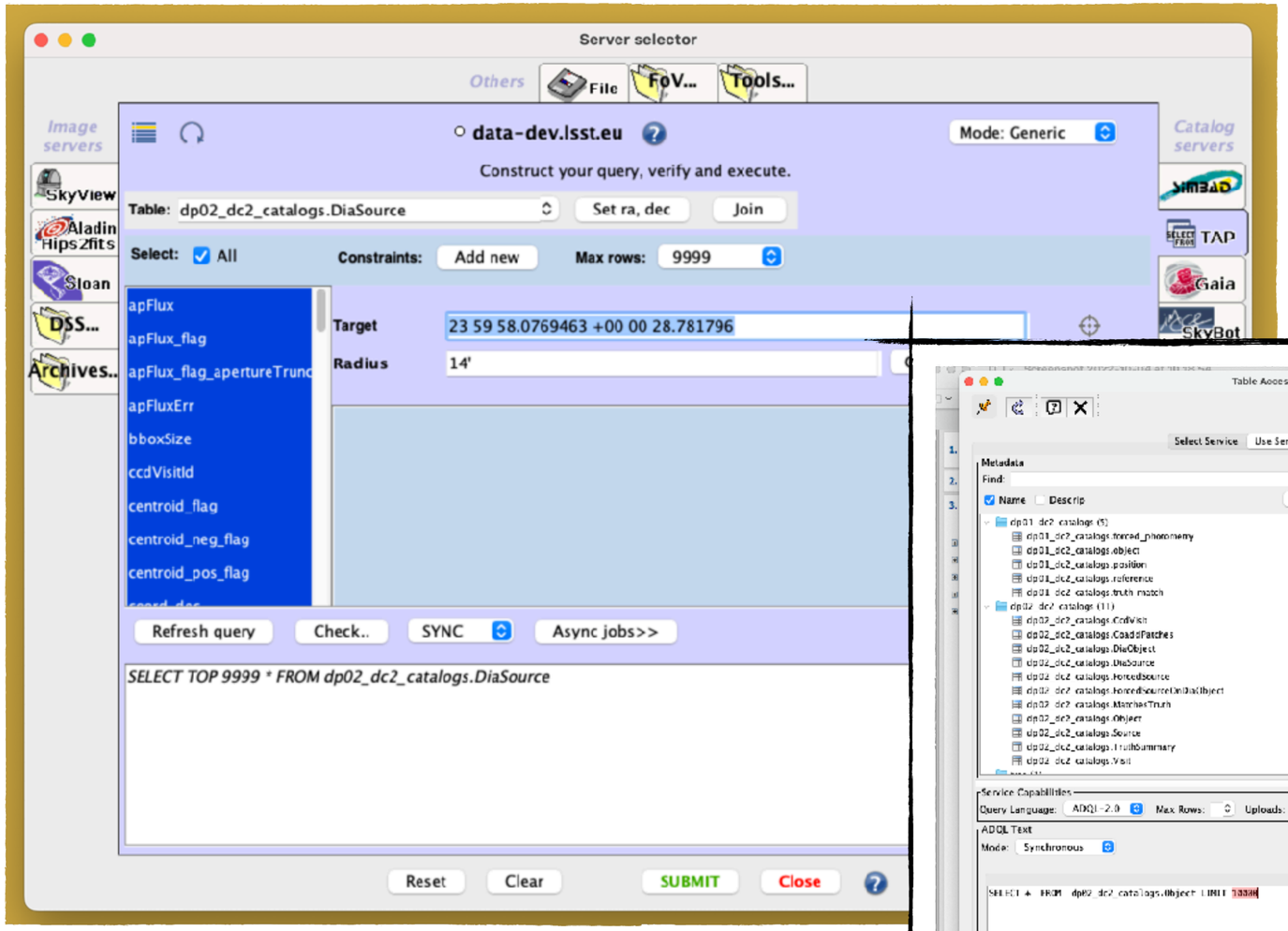
objectId *long*	coord_ra (deg) *double*	coord_dec (deg) *double*	detect_isPrimary *boolean*	gmag *double*	imag *double*	rmag *double*	gmag_err *double*	imag_err *double*	rmag_err *double*
1651228970408001325	61.9503052	-37.0228453	true	27.701019882959585	26.923336550786132	26.894762951453703	0.40864063676662665	0.41385379130923644	0.23483291092935576
1651228970408001324	61.9500144	-37.0228788	true	28.645342245858785	26.67841465210148	26.843320414401912	0.9779167667109859	0.3300277332805228	0.2213069976133416
1651228970408001323	61.9507092	-37.0242883	true	26.14133118689364	25.91375602083081	26.09702826887721	0.13889187862505958	0.23620523812785651	0.16059972965697075
1651228970408001322	61.950694	-37.0220721	true	24.154833550220946	23.800474507489017	24.032386149726157	0.021923494730634024	0.033184909682772594	0.023405482406159674


jupyterhub
Home
Token
mainetti
Logout
Server Options
Image
Options
Recommended ()
Release r23.0.2
Weekly 2022_46
Weekly 2022_45
Daily 2022_11_14
Daily 2022_11_13
Daily 2022_11_12
Recommended
Select uncached image (slower start):
w_2022_46
w_2022_45
w_2022_44
w_2022_43
w_2022_42
w_2022_41
w_2022_40
w_2022_39
w_2022_38
w_2022_37
w_2022_36
w_2022_35
w_2022_34
w_2022_32
w_2022_31
w_2022_30
w_2022_29
Small (1.0 CPU, 3072M RAM)
Medium (2.0 CPU, 6144M RAM)
Large (4.0 CPU, 12288M RAM)
Enable debug logs
Reset user environment: relocate .cache, .jupyter, and .local
Start

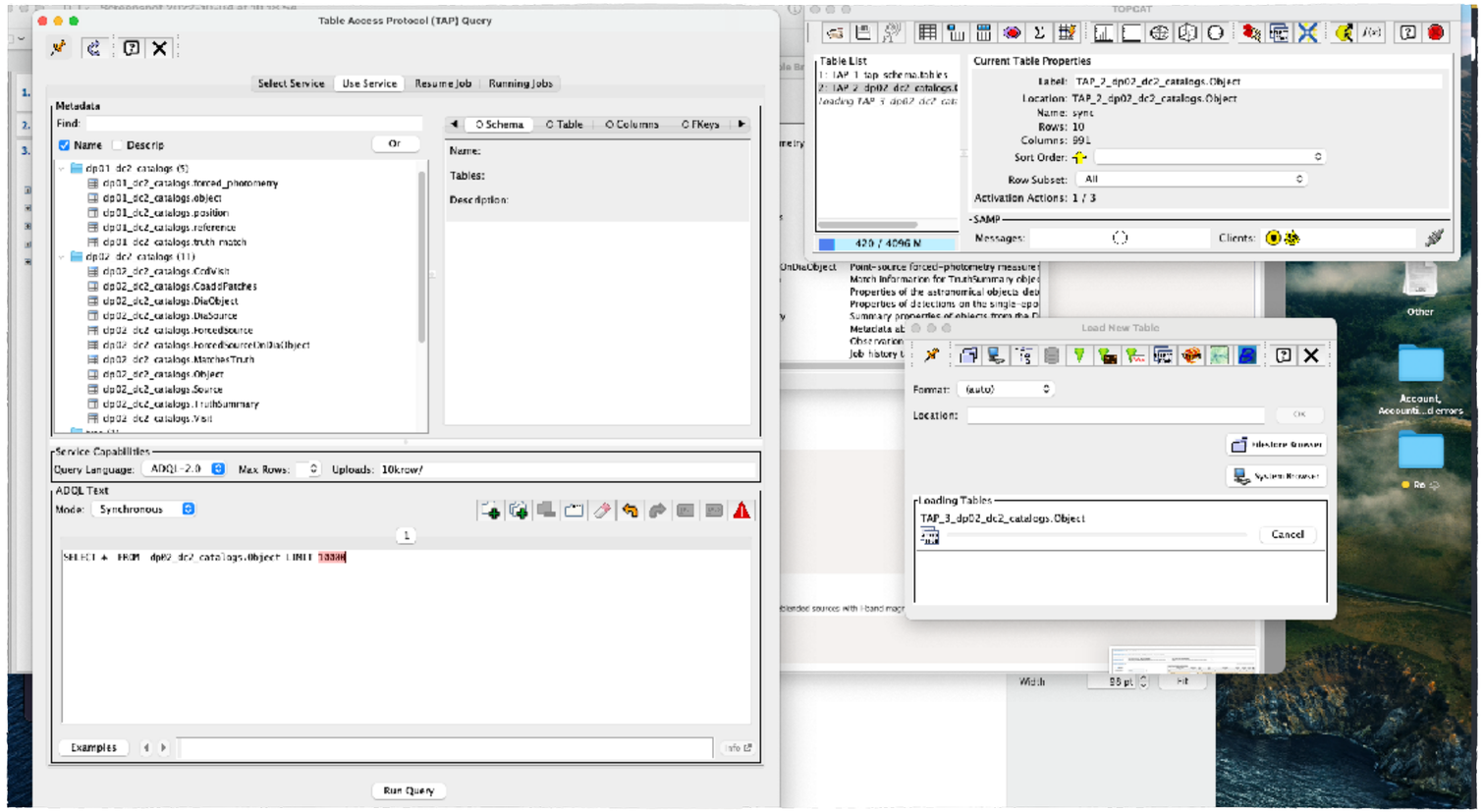

File
Edit
View
Run
Kernel
Tabs
Settings
Help
Firefly.ipynb
DC2_catalog_access.ipynb
Launcher
Filter files by name
/
Name
Last Modified
DATA
7 days ago
idleculler
9 days ago
notebooks
7 days ago
WORK
9 days ago
Notebook
LSST
Console
LSST
Other
Terminal
Text File
Markdown File
Python File
Show Contextual

Inter-opérabilité

- Ouverture au services Virtual Observatory
- Token fournis pas la RSP



ALADIN



TOPCAT

Conclusions

4

Conclusions

- Le défi de Rubin : la quantité des données et les ressources de calcul nécessaires pour les traiter

- Notre objectif :
  - Mettre à disposition des chercheurs une plateforme pour accéder/analyser facilement les données (images et catalogs)
  - Intégrer la plateforme à l'environnement du CC-IN2P3

- La plateforme :
  - La base de données du catalog Astronomique : Qserv
  - La plateforme pour l'analyse interactive : RSP
  - Kubernetes, Helm, Argo Workflow/CD