

High Contrast Data Center

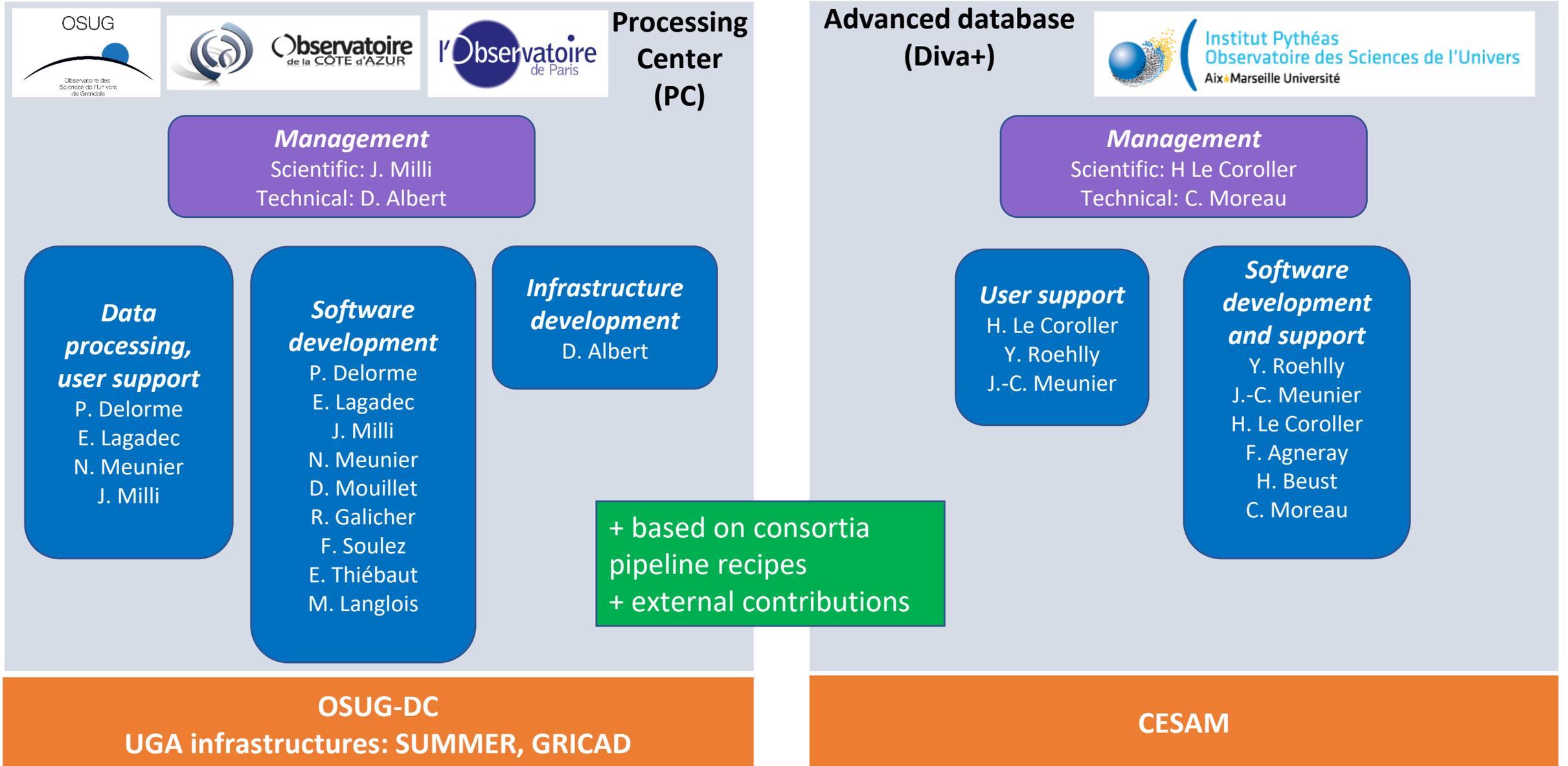
(ex SPHERE Data Center)

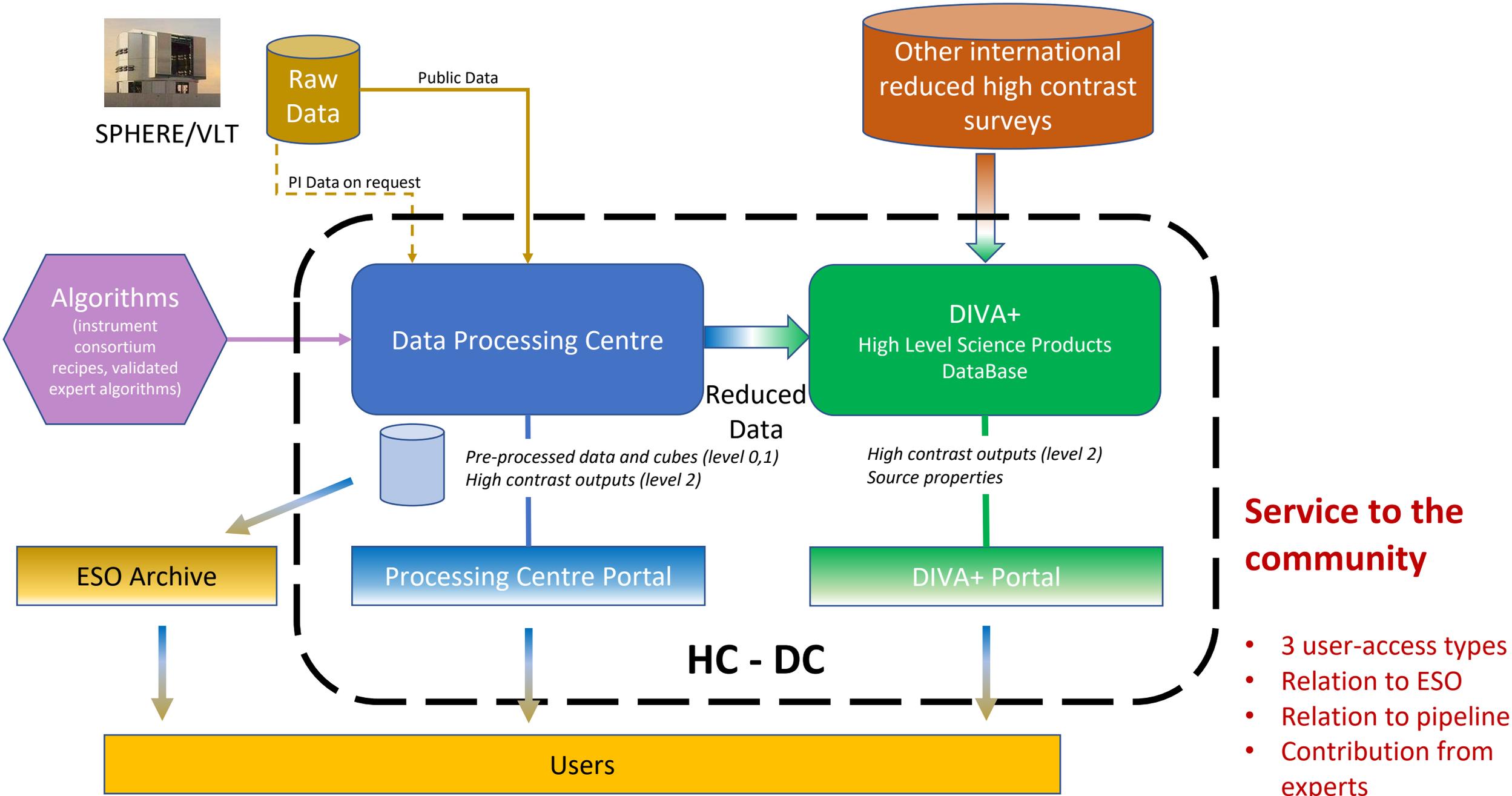
Damien Albert
on behalf of HC-DC team

<https://hc-dc.cnrs.fr/>

HC-DC Organization

PI: J. Milli

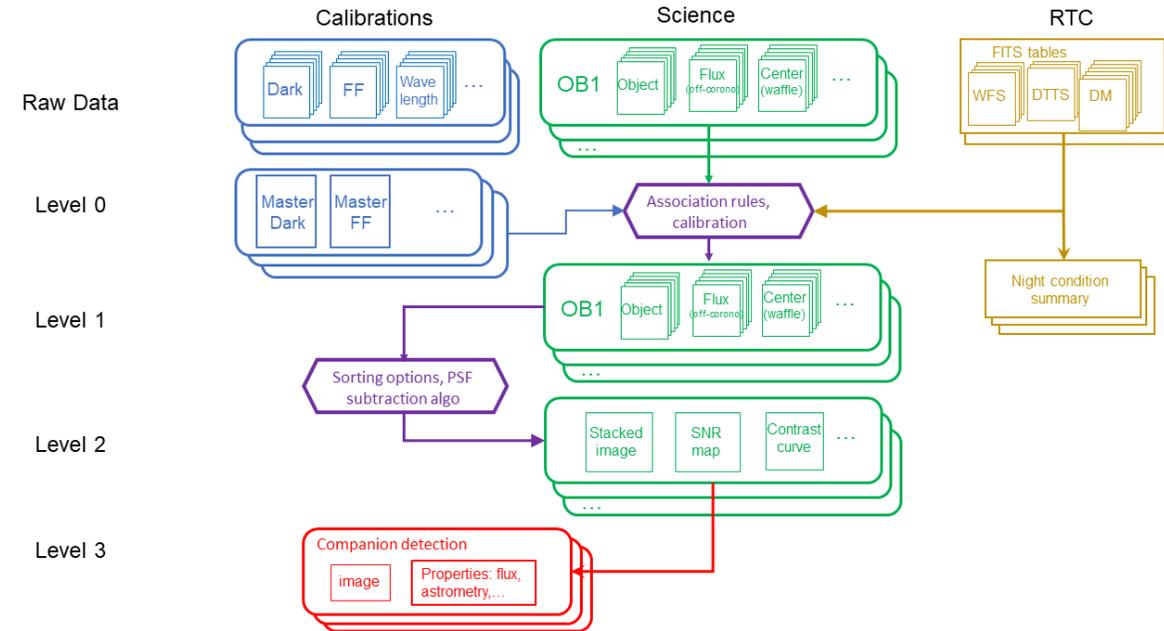




Data Processing Center: algorithms

Algorithms
(instrument consortium recipes, validated expert algorithms)

- **Based on ESO pipeline recipes**
- **Additional functionalities**
 - Automatic calibration treatment
 - Data association rules/optimization, frame selection
 - Links to adaptive optics telemetry data
 - Links to atmospheric parameters
 - Links to SIMBAD for target identification
- **Additional outputs dedicated to HC**
 - Level 2: S/N maps, contrast curves,...
 - Level 3: companion information
 - Possible dev/application of HC standard metrics
- **Possible additional algorithms from community**
(not necessarily available at the time of instrument delivery)
 - Polarimetry
 - PACO
 - RDI

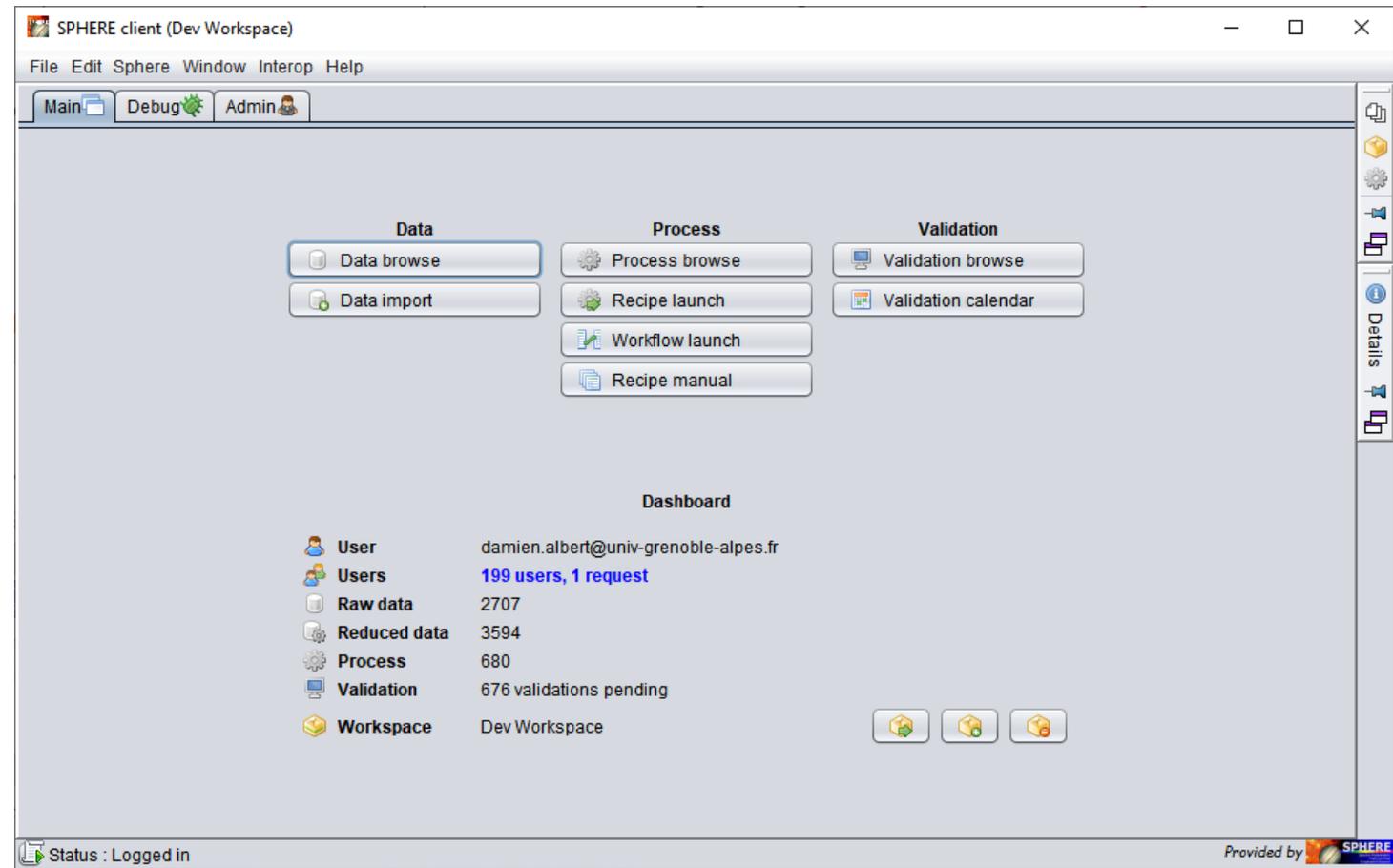


Data Processing Center: facility

- Based on Grenoble University meso-center
 - Storage (260To)
 - HPC Processing
- 10+ years development
 - Database structure for: data, executed processes, recipes
 - Data access management (*workspaces*)
 - Workflows, re-run capabilities, validation labels, data association rules

User Interface

- Data browse
- Data import
- Process browse
- Recipe launch
- Workflow launch
- Workspace management
- Recipe management
- Download scripts



SPHERE client (Dev Workspace)

File Edit Sphere Window Interop Help

Main Debug Admin Browse Process

Process Browse (1-1001 / 438503)

ID	Batch ID	Process date	Obs. night	Recipe	Version	User	Prog. ID	Reference	Prog...	Perf...	Status	Vali...
804081	193616	2026-02-20 09:22	2019-05-27	ird_make_es...	test	julien.milli@u...	103.200G.002	1999KW4 eso_phase3_P95.1.1-1				
804080	193609	2026-02-19 18:15	2019-05-27	ird_specal_dc	production	julien.milli@u...	103.200G.002	1999KW4 IRD_full_PUBLIC_P10...				
804079	193609	2026-02-19 18:14	2019-05-27	ird_sortframe...	production	julien.milli@u...	103.200G.002	1999KW4 IRD_full_PUBLIC_P10...				
804078	193609	2026-02-19 17:13	2019-05-27	ird_convert_r...	production	julien.milli@u...	103.200G.002	1999KW4 IRD_full_PUBLIC_P10...				
804077	2026-02-19 16:43	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 corrected no FT no...				
804076	2026-02-19 12:40	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 corrected no FT				
804075	2026-02-19 11:54	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	HD 109573 full_public faspol sat...				
804074	2026-02-19 11:49	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 batch3				
804073	2026-02-19 11:48	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 batch2				
804072	2026-02-19 11:48	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 batch1				
804071	193608	2026-02-19 11:44	2020-03-19	zpl_p1_make...	production	julien.milli@u...	0104.C-0436(A)	HD 109573 full_public_zpl_poL...				
804070	2026-02-19 11:08	2020-03-19	2020-03-19	zpl_science_...	production	julien.milli@u...	0104.C-0436(A)	fast pol ND1 corrected				

Info

Process ID: 804077
 Reference: fast pol ND1 corrected no FT no BS
 Status: ⚠️ Waiting validation
 Validation status: ⚠️ To validate
 Start: 2026-02-19 16:43:42.0
 End: 2026-02-19 16:47:55.0
 Duration: 4m13s
 Estimated duration: 19m02s (14m49s faster)
 Progress: 100%
 Server: sphere-dc (sphere-dc)

Observation night: 2020-03-19
 Observation date: 2020-03-20 04:14:09.0
 Observation ID: 2528154
 Program ID: 0104.C-0436(A)
 Recipe name: zpl_science_p1
 Pipeline version: production
 User: julien.milli@univ-grenoble-alpes.fr

Admin

Log

Raw Inputs

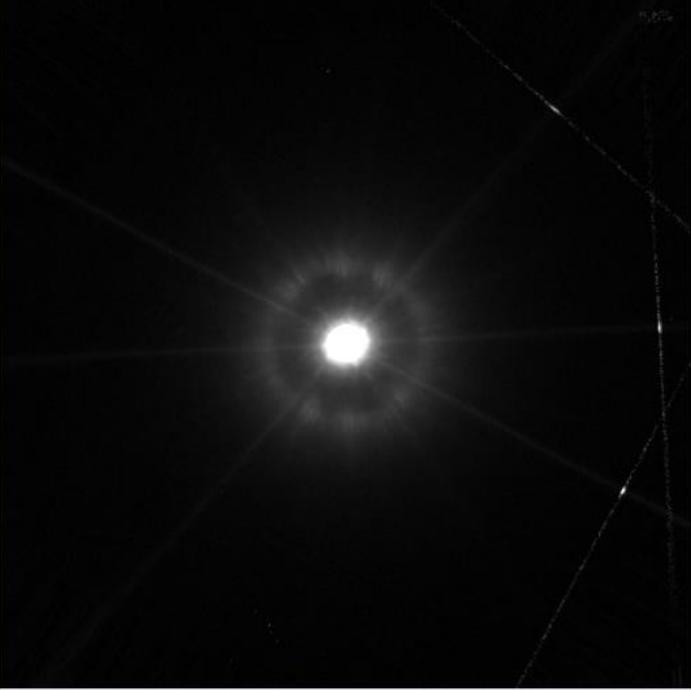
File ID	File name	Frame type	RA	DEC	File size	Obs. nig
2369125	SPHER.2020-03-20T05:10:16.838ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369132	SPHER.2020-03-20T05:10:49.839ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369142	SPHER.2020-03-20T06:03:55.986ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369152	SPHER.2020-03-20T06:09:59.836ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369158	SPHER.2020-03-20T06:03:21.837ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369178	SPHER.2020-03-20T04:14:43.826ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369195	SPHER.2020-03-20T04:15:48.850ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369244	SPHER.2020-03-20T05:10:32.023ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03
2369245	SPHER.2020-03-20T05:09:24.477ZPL_SCIENCE_P1_RAW.fits	ZPL_SCIENCE_P1_RAW	189.003299	-39.86891	18.1 MB	2020-03

Accept Reject To Reprocess Launch Download SOF

Status: Logged in

Data 9790358 detail

ID	File name	Size	Frame ...	Obs. date	RA	DEC	Filter	Exp. t...	Prog. ID	Ext. n°	Type	Raw...	Stan...	Status
9790358	zpl_science_...	16.1 ...	ZPL_S...	2020-03-...	189...	-39.8...	I_PR...	2.0	0104...	1				



View in JS9 FITS info FITS full info

Experimental API Access

- Reserved for advanced users for now
- Data browse
- Process browse
- JSON requests

SPHERE API doc / Process list

- The request must be sent as HTTP POST in Json format to: `http://sphere-dc.osug.fr:8080/sphere-server/webresources/api/process_list/`
- The authentication is done either:
 In the URL as `/process_list/<login>/<token>`.
 Or with the HTTP headers `X-Auth-Ident` and `X-Auth-Token`.
- If your user is restricted, you must set a `WORKSPACE` value in the `browse_filters`.
- *Performance warning:*
 The requests will be much faster as more filters are set. Do not hesitate to use `WORKSPACE`, date restrictions, and `limit`.
 Using `extract count()` method with `limit -1` is more powerful, but slower than using `count` main setting directly.

- Request settings, to set in the root node:

count (boolean, default: false)
Returns the process count after applying the filters, doesn't takes `limit` into consideration.

group (string, default: null)
Group the processes by this key.

limit (integer, default: 10)
Returns at most `limit` items per page. Set to `-1` to fetch all items at once.

extract (string|count(), default: null)
Extract only this key values as a list, use method `count(<key>)` to extract the number of values.
Can be used with or without `group`.
Be wary of `limit` and `sort` settings as those will be applied beforehand.

page (integer, default: 1)
Fetch the next `limit` items.

sort (string, default: id DESC)
Sort the result by a given key, syntax: `<key> ASC|DESC`.

- Available process filters, to set as key/value in `browse_filters`:

BATCH_ID
CURRENT_WORKSPACE
DATA_PIPELINE_VERSION
INSTRUMENT
MJD_OBS
OBSERVATION_DATE_MONTH
OBS_NIGHT_DATE
OBS_NIGHT_DATE_YEAR_MONTH
PROCESS_DATE_DAY
PROCESS_ID
PROCESS_VALIDATION_STATUS
RECIPE_PRESET
STAR_MAG_G
STAR_SIMPLIFIED_SPECTRAL_TYPE
USER
WORKFLOW_PRESET
WORKSPACE_GROUP

BATCH_NAME
DATA_FILE_ID
DEROTATOR_MODE
INSTRUMENT_FILTER
OBJECT
OBSERVATION_DATE_YEAR
OBS_NIGHT_DATE_DAY
PIPELINE_VERSION
PROCESS_DATE_MONTH
PROCESS_LIST
PROG_ID
RUN_SERVER
STAR_MAG_H
STAR_SPECTRAL_TYPE
USER_EMAIL
WORKFLOW_RECIPE

COORD_DEC
DATA_FRAME_TYPE
EXP_TIME
LAUNCHER
OBSERVATION_DATE
OBSERVATION_DATE_YEAR_MONTH
OBS_NIGHT_DATE_MONTH
PI_COI_NAME
PROCESS_DATE_YEAR
PROCESS_NUMBER
RECIPE
STANDARD
STAR_MAG_K
TARGET_IDENTIFIER
WORKFLOW
WORKFLOW_STEP

COORD_RA
DATA_IN_OUT
EXTENDED_ATTRIBUTE
LAUNCHER_TYPE
OBSERVATION_DATE_DAY
OBS_ID
OBS_NIGHT_DATE_YEAR
PROCESS_DATE
PROCESS_DATE_YEAR_MONTH
PROCESS_STATUS
RECIPE_NAME
STAR_LUMINOSITY
STAR_PARALLAX
TARGET_NAME
WORKFLOW_PIPELINE_VERSION
WORKSPACE

- Available switches, to list in filters:

FILTER_NO_HIDDEN_RECIPES
FILTER_PROCESS_EXCLUDE_REPROCESSED
SWITCH_PRODUCER_LIST

FILTER_NO_WORKSPACE
FILTER_PROCESS_NEED_VALIDATION

FILTER_PIPELINE_CURRENT_VERSION
FILTER_RESTRICT_USER

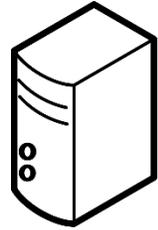
FILTER_PIPELINE_WORKFLOW_CURRENT_VERSION
SWITCH_CONSUMER_LIST

Servers Architecture



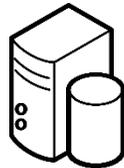
SPHERE Client

HC-DC



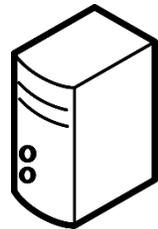
- SPHERE-DC server
- ESO Pipeline
- SPHERE Pipeline
- Local data cache
- Local workspace

sphere-dc
cobrex-dc



- Metadata DB

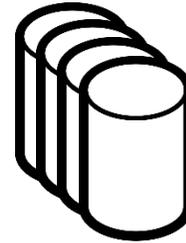
sphere-db



- SPHERE-DC server
- ESO Pipeline
- SPHERE Pipeline
- Local data cache
- Local workspace

sphere-dc-dev

SUMMER

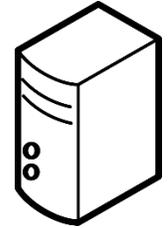


data_ext 1 - 6

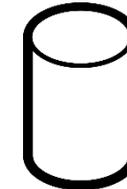
- Main data storage
- Remote workspace
- Shared files
- Performance graphs
- Thumbnails

CIMENT

- OAR API
- SPHERE-DC grid
- ESO Pipeline
- SPHERE Pipeline



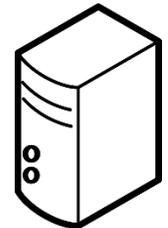
luke
dahu



- Best-Effort:
- NFS data cache
 - NFS workspace

bettik

- Local data cache
- Local workspace



luke54
luke63

Software

- Languages
 - Java (Client, server)
 - Python (grid wrapper)
 - SQL (metadata server)
 - Python, C++, IDL/GDL, MatLab (scientific codes)
- Tools
 - Tomcat (server)
 - Maven (deployment)
 - IntelliJ IDEA (development)
 - Docker / Apptainer (server tools, grid runtime)
 - Grafana (monitoring, reporting)
 - Ansible (server deployment and management)

Virtual Observatory : What / Where / How ?

Discussions in progress :

- Public data produced by an automatic workflow : RAW vs. Only reduced
- Based on HC-DC, or Diva+ subset
- Graphical data : Aladin Sky Atlas
- Direct FITS file access via TAP
- VESPA for the exoplanets

DOI Implementation : discussions ongoing