



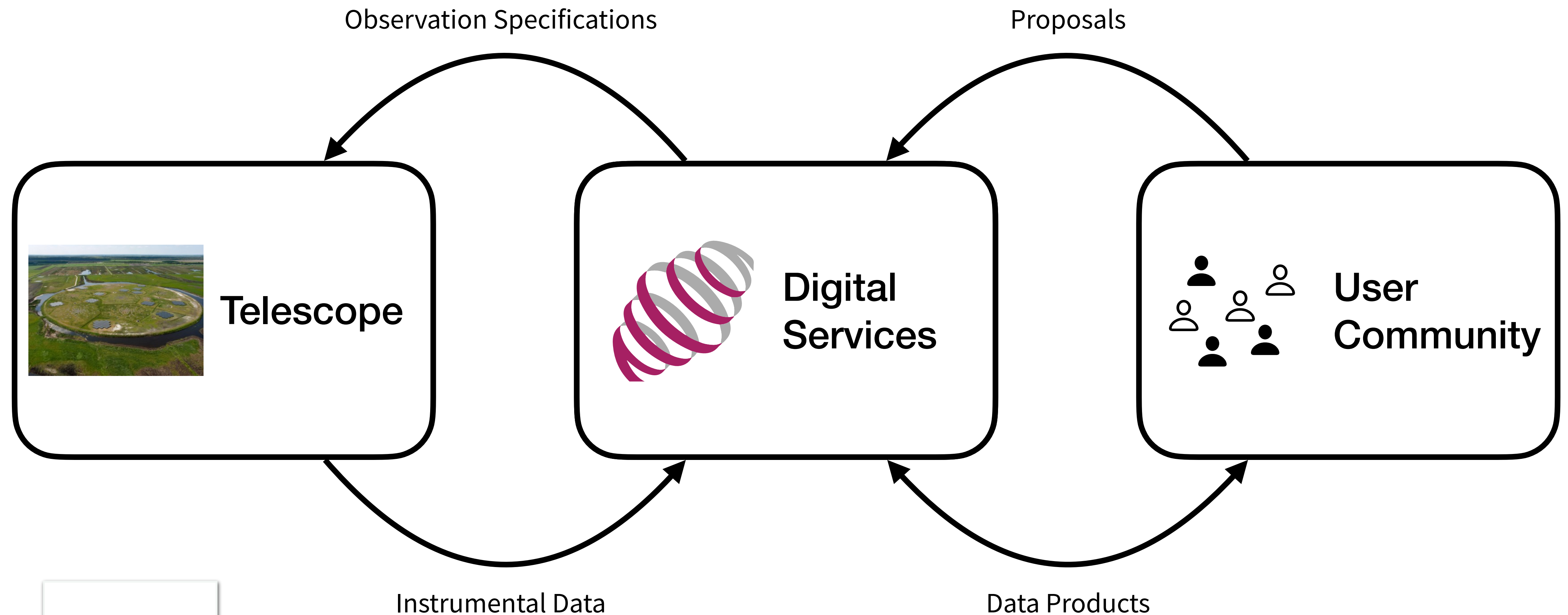
AST(RO)N

Netherlands Institute for Radio Astronomy

LOFAR2.0 Digital Services

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SDC Programme Manager, ASTRON





LOFAR2.0 Large Programme Proposals
Data Management
Capabilities

Activity / Authority	Organisation / Organisation	Deliverable / Deliverable
Submission / Submission	ASTRON ASTRON ASTRON	2015-01-01
Coordination / Coordination	---	---
Coordination / Approval	---	---
Administration / Administration	---	---
Handbook / Handbook	---	---

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SDC Doc. No.: DDC-011
Rev.: 1.0
Date: 2015-06-07
Doc. Type: Note

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“Services to process, archive, and distribute LOFAR2.0 Data Products. These services, deriving from development effort, operational activities, and infrastructure capacity contributed by various partners, will be provided to end users under the management of the ASTRON Science Data Centre.”

LOFAR2.0 Data Management Capabilities; <https://www.lofar.eu/lofar2-0-documentation/>



**Digital
Services**



Proposal
Management



Digital
Services



Proposal
Management



Archiving
& Curation



Digital
Services



Proposal
Management



Archiving
& Curation



Scientific
Pipelines



Digital
Services



Proposal
Management



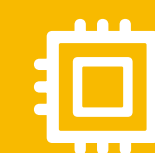
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Proposal
Management



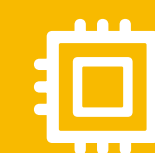
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Proposal
Management



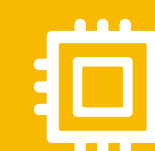
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Interactive
Data Analysis



Proposal
Management



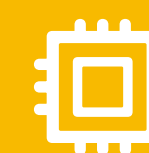
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Interactive
Data Analysis

COMING LATER



Proposal
Management



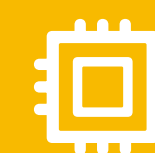
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Interactive
Data Analysis

COMING LATER



User Pipeline
Execution



Proposal
Management



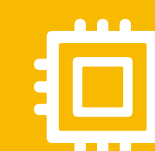
Archiving
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Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Interactive
Data Analysis



User Pipeline
Execution

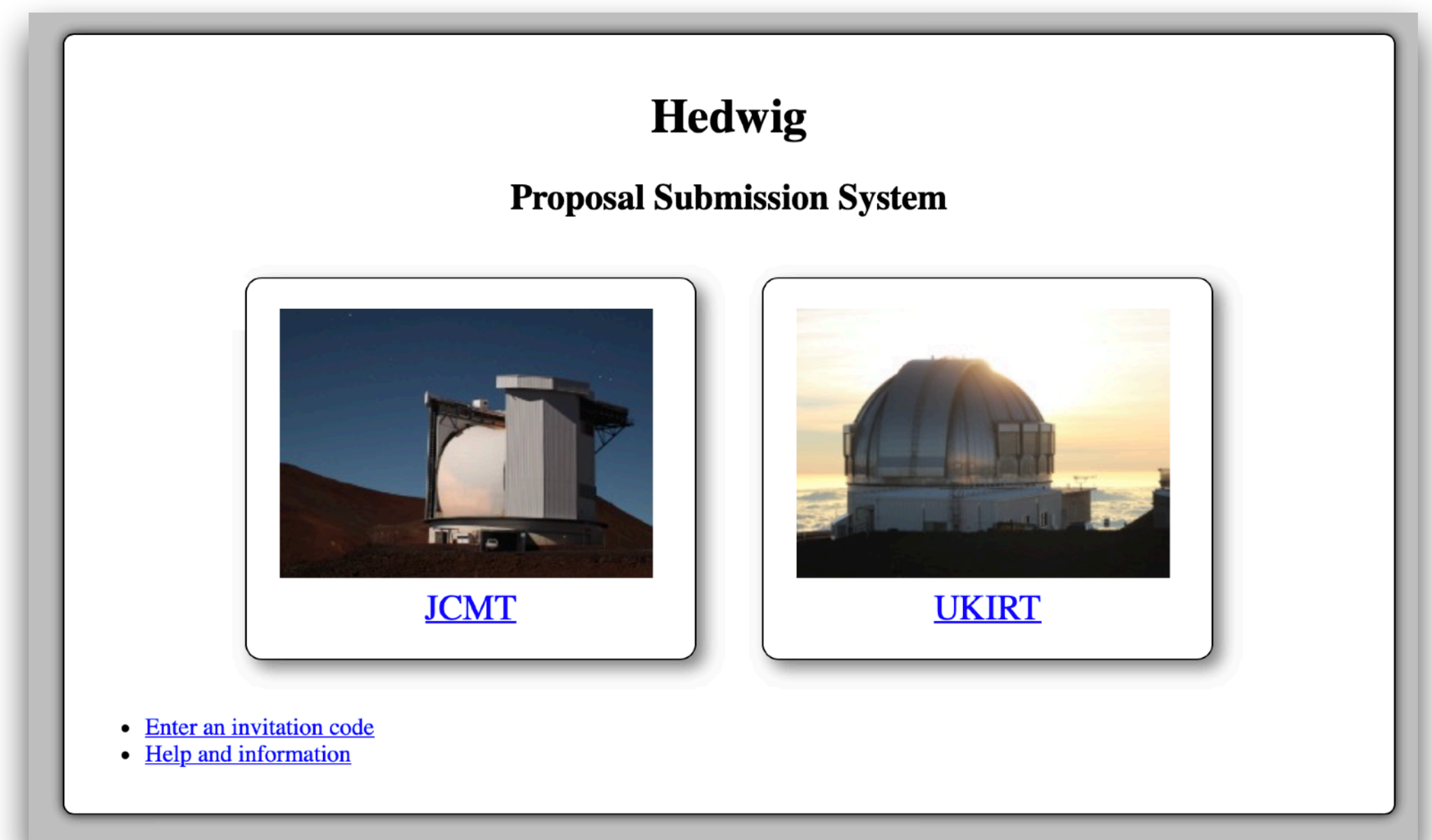
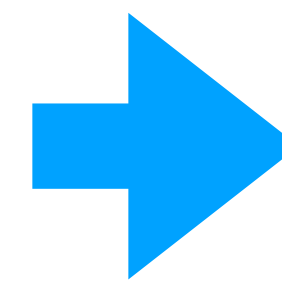
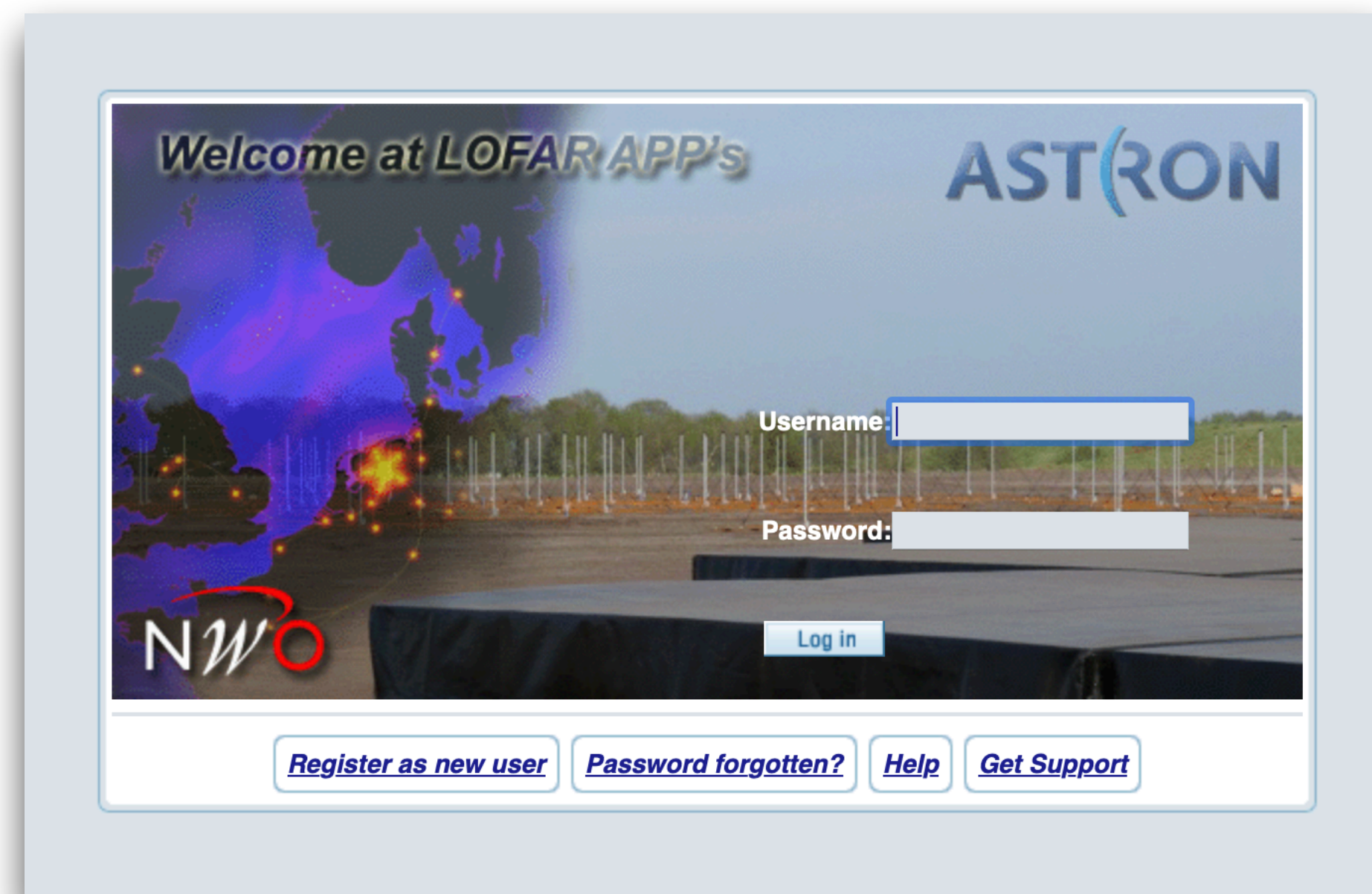
COMING LATER

COMING LATER



Proposal Management

- Proposal creation & experiment specification.
 - Proposal review.
 - Transfer specifications to facility (LOFAR, data services) management systems
- Northstar will be replaced with a new tool that improves maintainability, flexibility, and accessibility.
 - Expect this to be derived from Hedwig, developed/used at the East Asian Observatory.
 - <https://proposals.eaobservatory.org>
 - <https://github.com/eaobservatory/hedwig>





Archiving & Curation

Product Type	Example	Retention Period
Raw	Unprocessed visibilities	Not retained
Instrumental	Flagged & compressed visibilities	O(18 months)
Intermediate	Direction-independent calibrated visibilities	O(18 months)
Advanced	Image cubes	Indefinite
Special Cases	Unique observations that cannot be repeated	For discussion

- LTA retains only instrumental data products with high legacy value indefinitely; others expired after TBD period based on available infrastructure.
- LTA support for advanced data products, which are retained indefinitely.
- The ability to ingest advanced products generated by the wider community.
 - Including management of data rights.
 - The ambition to become a “hub” for access to advanced LOFAR products, wherever they are generated.



- Key pipeline components — DP3, WSClean, etc — provided and supported.
- Pipelines for preprocessing, direction-independent (LINC), and direction-dependent (Rapthor) calibration and imaging provided, building on those components.
- These pipelines provide a default “science grade” imaging capability, with the expectation that some teams/programmes will need to provide their own additional effort to meet their science goals.
- PULP and other pipelines remain community-developed & supported at a “best efforts” level.



RAPTHOR



**Release
1.0**

- Hot off the press; *released last week*.
- Observatory supported pipeline to produce LOFAR images based on direction-dependent calibration...
- ...and a testbed for HPC research and new algorithm development.
- Built on existing pipeline components (DP3, WSClean, PyBDSF, etc) and with a focus on rigorous software engineering.
- Current release focuses on HBA-NL processing, but long baseline & LBA support is planned.

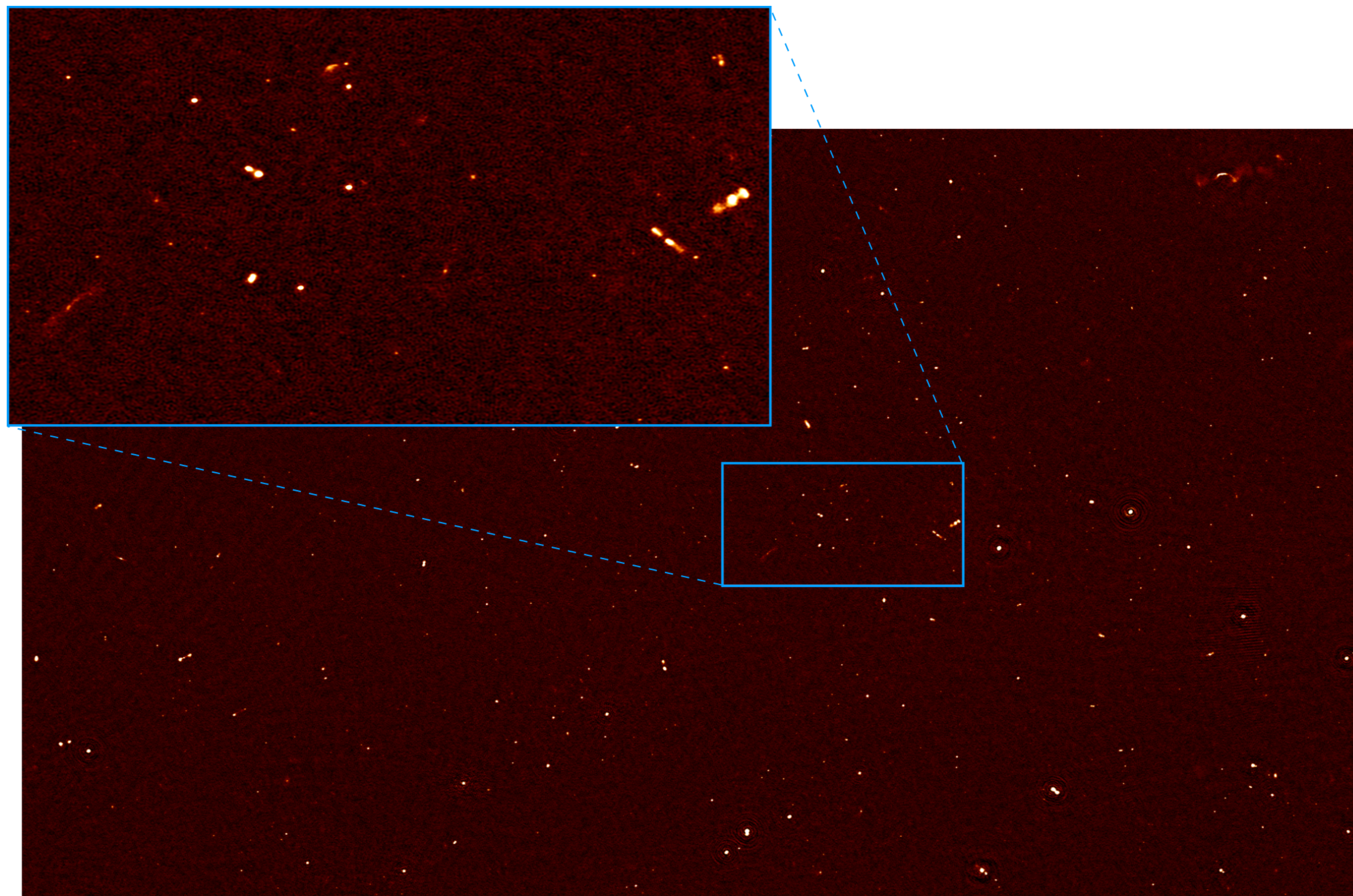


Scientific
Pipelines

RAPTHOR



Release
1.0



- HBA data
- 12 MHz bandwidth
- 3 mJy/beam maximum colour scale
- Many sub-mJy sources visible
- 150 μ Jy noise

Image: André Offringa

RAPTHOR



Release 1.0

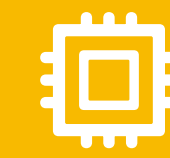
- We aim to make Rapthor a compelling product not just because it makes good images but because we provide:
 - Good documentation: <https://rapthor.readthedocs.io/>
 - Easy installation: <https://git.astron.nl/RD/rapthor/-/blob/master/README.md>
 - Professional support: <https://support.astron.nl/jira/servicedesk/customer/portal/7>
- Please tell us how we are doing!

RAPTHOR



Release 1.0

- Huge credit & thanks to Team Rapthor for *lots* of hard work making this happen:
 - Tammo Jan Dijkema (ASTRON)
 - Alexander Drabent (Tautenberg)
 - Marcel Loose (ASTRON)
 - Maikel Lukkezen (CGI)
 - André Offringa (ASTRON)
 - David Rafferty (Hamburg)
 - Frits Sweijen (Leiden / ASTRON)
 - Mark de Wever (S&T)
 - Matthijs van der Wild (Durham)
 - Sarod Yatawatta (ASTRON)
- And to *everybody* who has helped develop, test, or commission Rapthor or its components over many years.



Managed Processing

- Preprocessing or PULP executed for all applicable data on CEP.
- Capability to execute LINC & Rapthor at scale within the LTA.
- Total data processing capacity depends the available infrastructure; the ILT has indicated it will “use various resources and budget acquisition opportunities ... to obtain structural processing allocations at LTA sites and other sites”.
- Pulsar survey processing on separate systems, not under SDC management (e.g. DRAGNET).

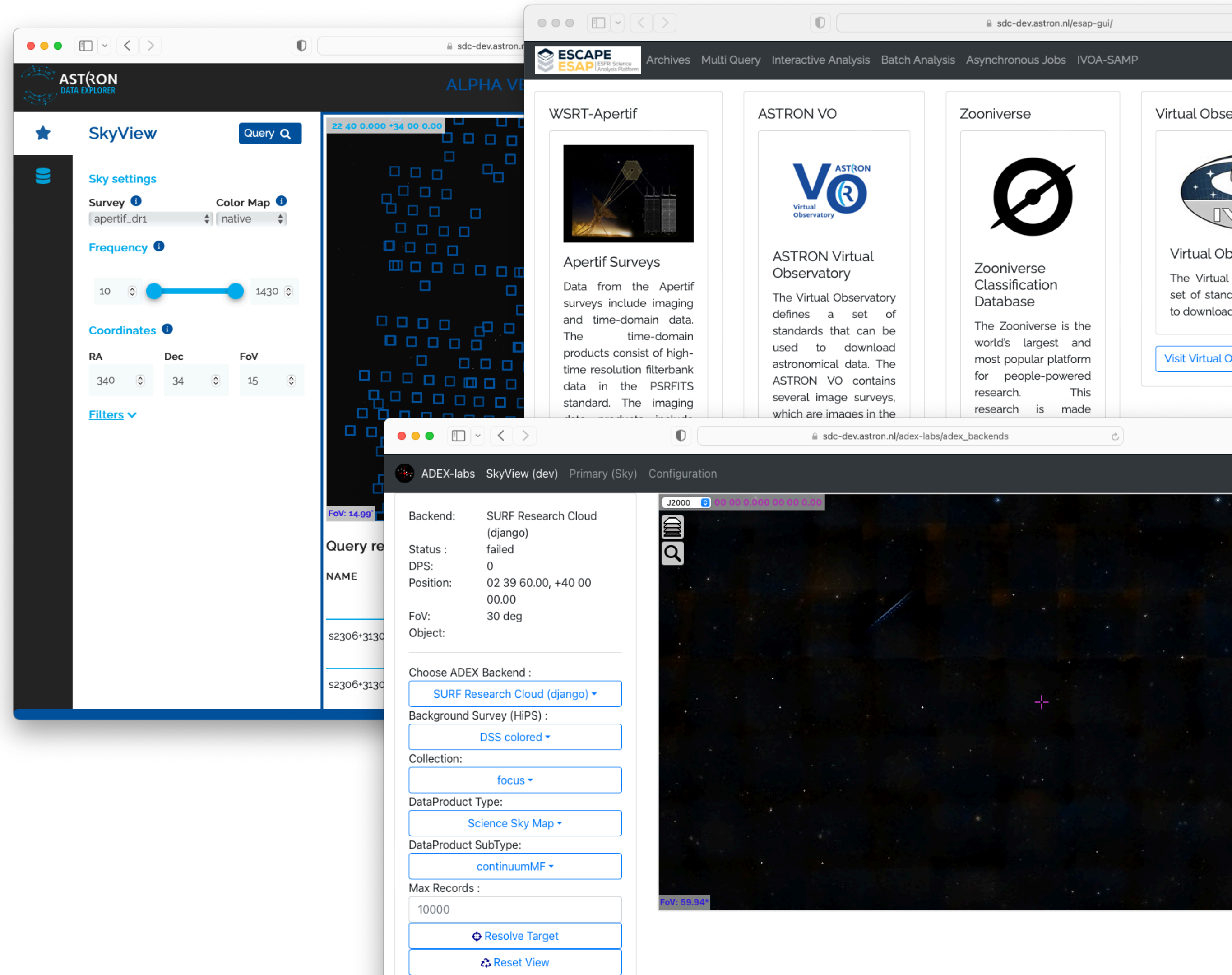
The screenshot shows the LDV ATDB web interface. The top navigation bar includes links for Tasks, Dashboard, Filter, Quality, Validation, Failures, Archived, Monitoring, and Diagram. A search bar is located on the right. Below the navigation bar, there is a section for filtering tasks, with a 'Click to Filter 0' button and a list of status filters: Clear Filter, Active, Failed, On Hold, defined, staging, staged, fetching, fetched, processing, processed, storing, stored, validated, scrubbing, scrubbed, archiving, archived, and finished. A table of tasks is displayed below the filters, with columns for ID, Details, Workflow, Priority, Status, Project, SAS_ID, Filter, CreationTime, Size, and Actions. The table contains 20 rows of data, with some rows highlighted in yellow. The bottom of the interface shows a version number: Version 13 Januari 2022 - 11:00.

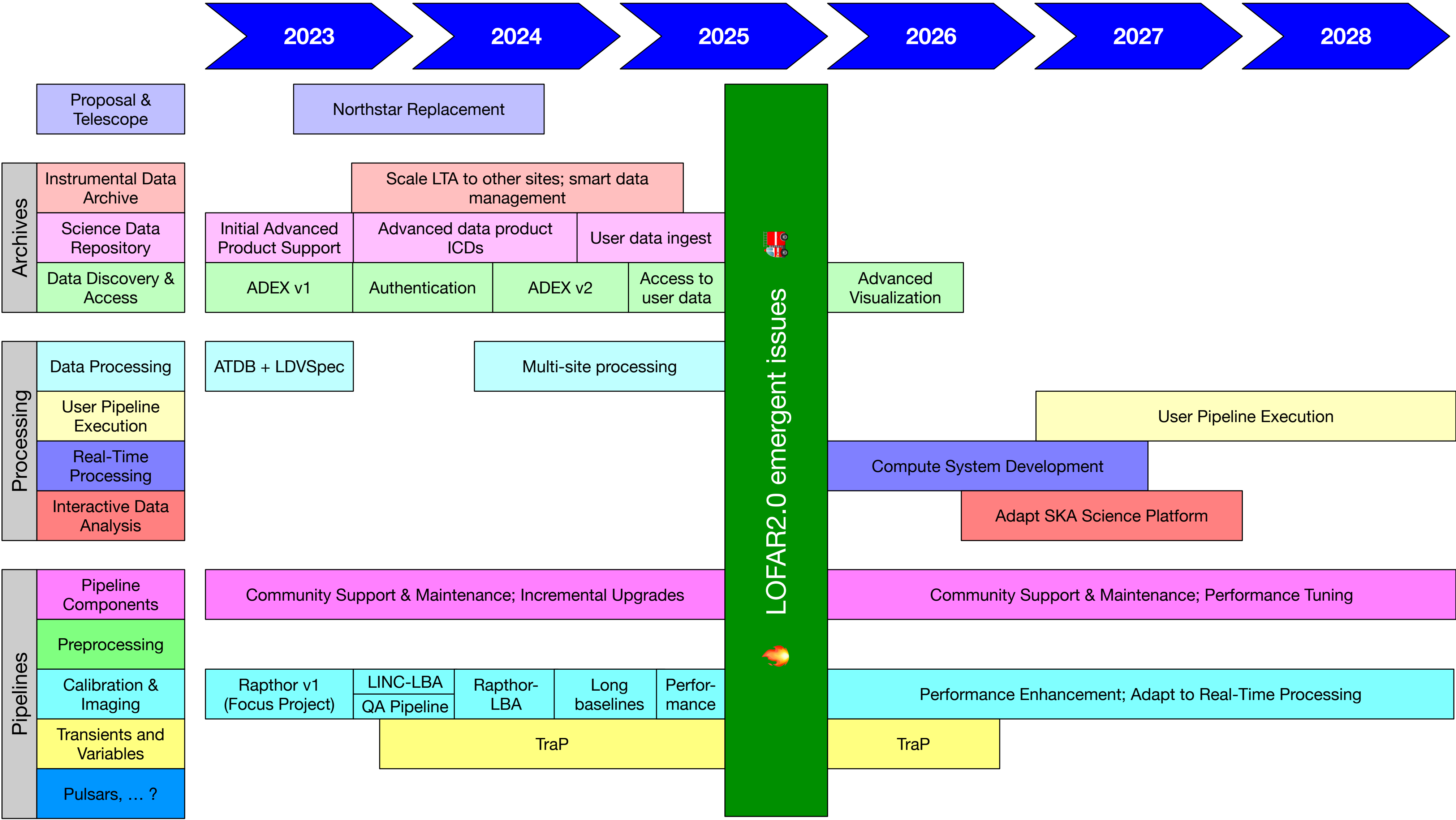
ID	Details	Workflow	Priority	Status	Project	SAS_ID	Filter	CreationTime	Size	Actions
23990		16	100	defining	lt5_004	447296	ldv-spec:61	2023-01-11 09:07:34	30.2 GB	
23989		16	100	defining	lco_012	86577	ldv-spec:10	2022-12-19 10:22:22	3.8 GB	
23988		16	100	defining	lco_012	86577	ldv-spec:3	2022-12-19 10:20:01	1.3 GB	
23987		16	100	defining	lco_012	86577	ldv-spec:3	2022-12-19 10:20:01	1.3 GB	
23986		16	100	defining	lco_012	86577	ldv-spec:3	2022-12-19 10:19:52	1.3 GB	
23985		16	100	staged_failed	pulsars2	36848	pulsars2_vk_bftgz_master	2022-12-12 21:33:06	51.8 GB	Retry
23983		16	100	stored	lco_008	102168	lco_008_mi_bftgz	2022-12-09 10:05:42	88.9 GB	
23982		16	100	stored	lco_008	102168	lco_008_mi_bftgz	2022-12-09 10:05:42	113.8 MB	
23960		16	100	stored	lc1_027	192567	lc1_027_vk_bftgz	2022-12-07 12:30:09	735.4 MB	
23193		16	100	archived_failed	lc1_027	227292	lc1_027_mi_bftgz	2022-10-12 15:30:06	71.1 GB	Retry
22516		8	100	archived	lc12_012	727738	lc12_012_mi_prefactor	2022-05-25 09:27:56	2.1 TB	
22515		6	100	archived	lc12_012	727742	lc12_012_mi_prefactor	2022-05-23 07:36:02	90.9 GB	
22514		6	100	archived	lc12_012	727732	lc12_012_mi_prefactor	2022-05-23 07:35:58	90.9 GB	
22500		14	100	archived	lco_024	119612	lco_024_mi_comp	2022-04-06 07:21:49	80.9 GB	
22497		14	100	archived	lco_003	151714	lco_003_mi_comp	2022-04-04 10:37:37	2.4 GB	
22492		8	100	defined (holding)	lc1_002	189229	demo_prefactor	2022-03-08 14:23:57	984.9 GB	
22491		6	100	processed_failed	lc1_002	189230	demo_prefactor	2022-03-08 14:23:47	11.3 GB	Retry
22483		8	100	stored	lc10_010	667526	prefactor_target_test	2022-01-10 15:31:32	3.9 TB	
16663		6	100	stored	lc10_010	667520	prefactor_calibrator_test	2021-12-09 12:07:10	83.9 GB	



Discovery
& Access

- All LTA products available through VO interfaces.
- New, friendly, *accessible*, modernized, data discovery portal (ADEX; early concepts at right).
- Our ambition is for the archive to be fully FAIR-compliant.
 - Findable, Accessible, Interoperable, Reusable
 - <https://force11.org/info/the-fair-data-principles/>





An ambition, not a commitment...!

Conclusions

- The *LOFAR2.0 Digital Services* will provide a suite of new services and enhanced capabilities for working with LOFAR data.
 - Proposal Management
 - Archiving & Curation
 - Scientific Pipelines
 - Managed Processing
 - Data Discovery & Access
- While ASTRON is managing development and operation of these services, they will only be successful if the whole community works together to build them.
- The Raptor pipeline is available now, and we'd love your feedback! 🦖