



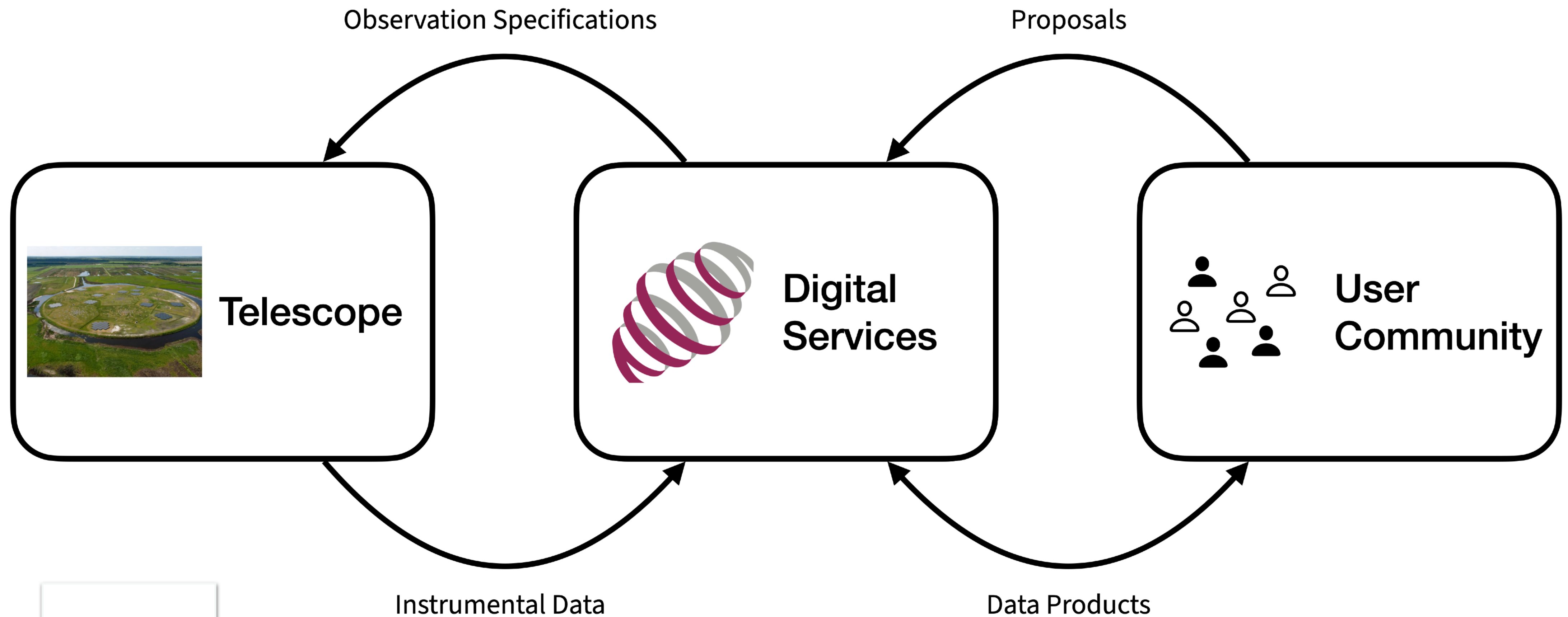
ASTRON

Netherlands Institute for Radio Astronomy

SDC Developments Towards LOFAR2.0

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LOFAR2.0 Large Programme Proposals
Data Management
Capabilities

Activity / Deliverable	Responsible / Organisation	Status / Date
Business Plan	ASTRON	2023-06-07
Data ID / Naming	ASTRON	
System Requirements	ASTRON	
Compliance / Checklist		
...
Collaboration / Approval		
...
Architecture / Interactions		
...
Handover / Migration		

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Rev: 1.4
Date: 2023-06-07
Doc. Type: Note

1 / 3 SDC

“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.”

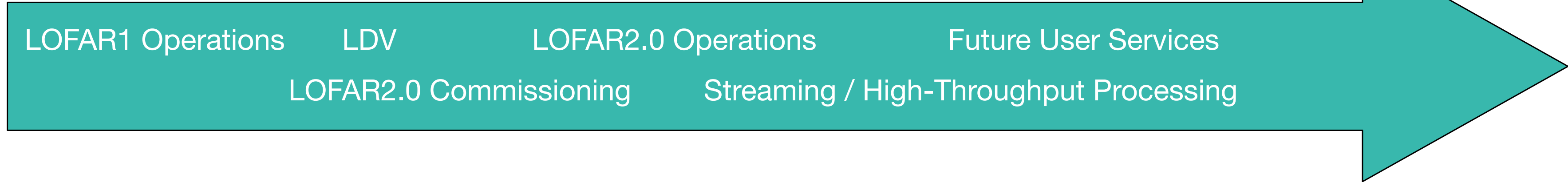
LOFAR2.0 Data Management Capabilities; <https://www.lofar.eu/lofar2-0-documentation/>

2022 2023 2024 2025 2026 2027 2028 2029 2030

LOFAR Digital Services

ASTRON SDC

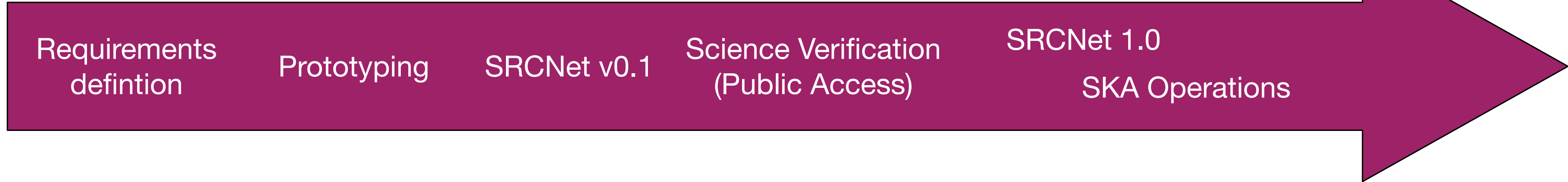
LOFAR ERIC
Partners &
Community



SKA Regional Centre Network

ASTRON SDC

SRCNet
Release
Train



Apertif Long Term Archive

ASTRON SDC

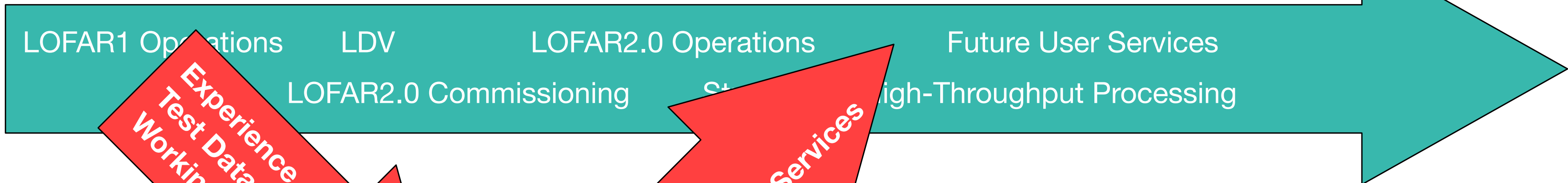


2022 2023 2024 2025 2026 2027 2028 2029 2030

LOFAR Digital Services

ASTRON SDC

LOFAR ERIC
Partners &
Community



Experience,
Test Data,
Working Services

Technology,
Next Generation Services

SKA Regional Cent

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Apertif Long Term Archive

ASTRON SDC





Proposal
Management



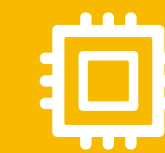
Archiving
& Curation



Scientific
Pipelines



Digital
Services



Managed
Processing



Discovery
& Access



Interactive
Data Analysis



User Pipeline
Execution



Proposal
Management



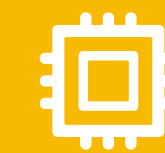
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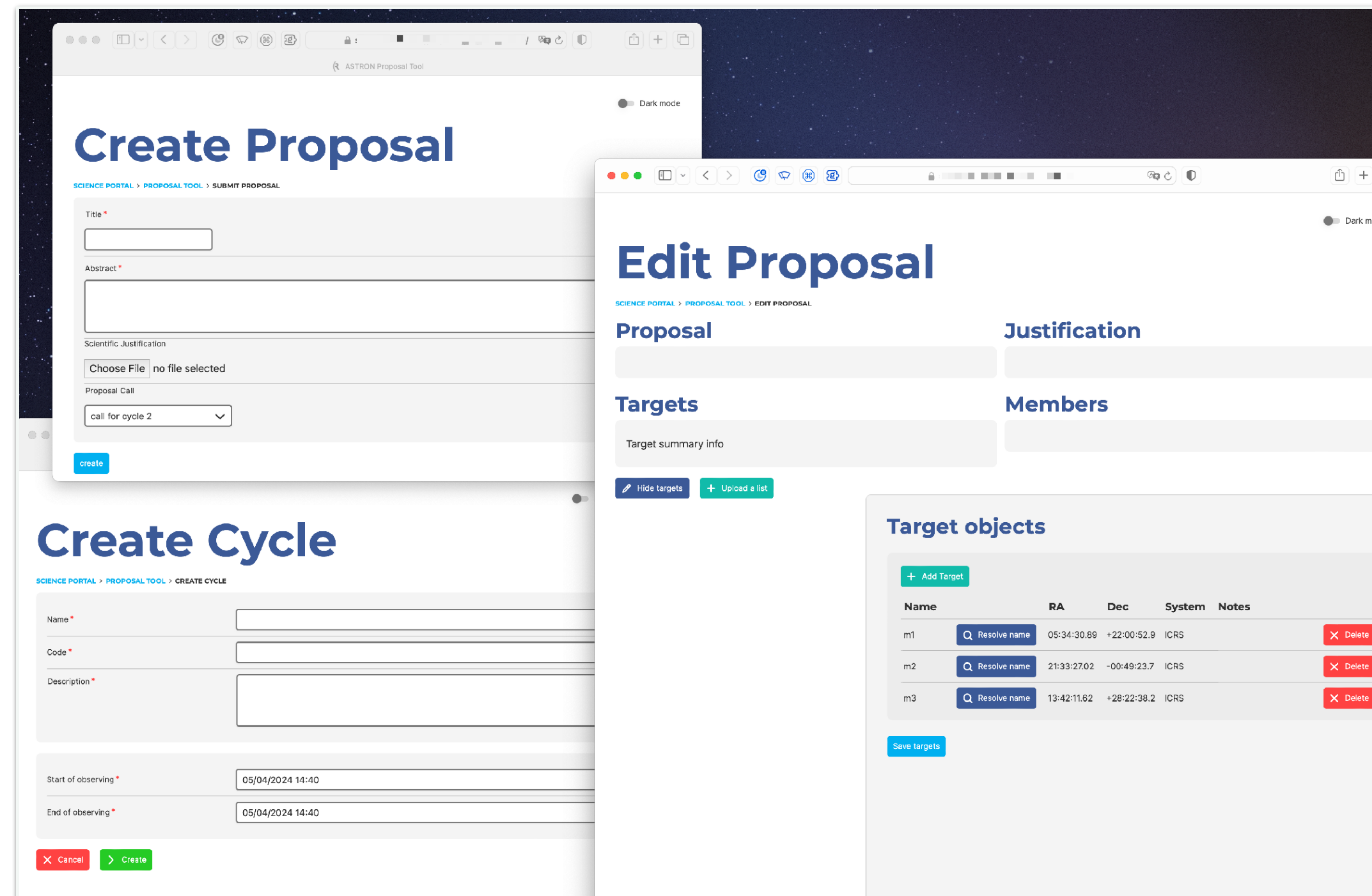
User Pipeline
Execution

COMING LATER

COMING LATER

Proposal Management

- Replacement for the Northstar tool used in LOFAR1, which is obsolete & unmaintainable.
- This also includes new user/group management systems: “federated authentication & authorization”.
- Usable / testable / commissionable version ~this summer.



Federated AAI: SURF SRAM

Logging in with your own institutional account

The image shows a sequence of screenshots from the SURF SRAM interface. On the left, a 'Sign in to your account' form is visible with fields for Username and Password, and a 'Sign In' button. Below it, there are options for 'SRAM acceptance environment' and 'SRAM prod'. In the center, a 'SURF' logo is shown with a 'Login with' dropdown menu. On the right, a 'Proposal Overview' page is displayed, showing a table of collaborative organizations with columns for Title, Collaborative Organization (with ID), and Actions (Edit, View, Write). The user is logged in as 'hotties.astron@gmail.com'.

Collaboration (project team) management

This block contains several screenshots of the SURF SRAM collaboration management interface.

1. 'Create new collaboration' dialog: A form with fields for Name, Short name, Description, and Invitees (comma separated). The 'Submit' button is highlighted in pink.

2. 'Welcome to My gr8 collaboration' dialog: A modal window showing an invitation to join a collaboration. It includes a warning about data sharing, the purpose of the collaboration, and a list of services (Astron Proposal Service). A 'Proceed to My gr8 collaboration' button is at the bottom.

3. 'My gr8 collaboration' overview: A main page for the 'gr8' collaboration, showing it has 1 member and no groups. It lists services and provides links for membership requests and administrator contact.

4. 'Members (2)' table: A table listing the members of the collaboration.

Name / email	Institution	Role	Membership
hotties.astron@gmail.com		Admin	Invited on Mar 13
e.g. Tim Hotties hotties.astron@gmail.com	eduid.nl	Member	Expires in 1 year

Consent for GDPR & Acceptable use

This block shows two related screens.

1. 'Review your information that will be shared. eduTEAMS Service will receive': A form displaying user details: Display Name (Hanno Hotties), Full Name (hotties), First name (Hanno), Surname (Hotties), and Email address (hotties@astron.nl). It also shows an identifier and logos for 'provided by SURFconect'.

2. 'Welcome to My gr8 collaboration' consent screen: A modal window with a warning about data sharing, the purpose of the collaboration, and a list of services. A checkbox 'I agree to the service's acceptable use policy' is checked, and a 'Proceed to My gr8 collaboration' button is at the bottom.

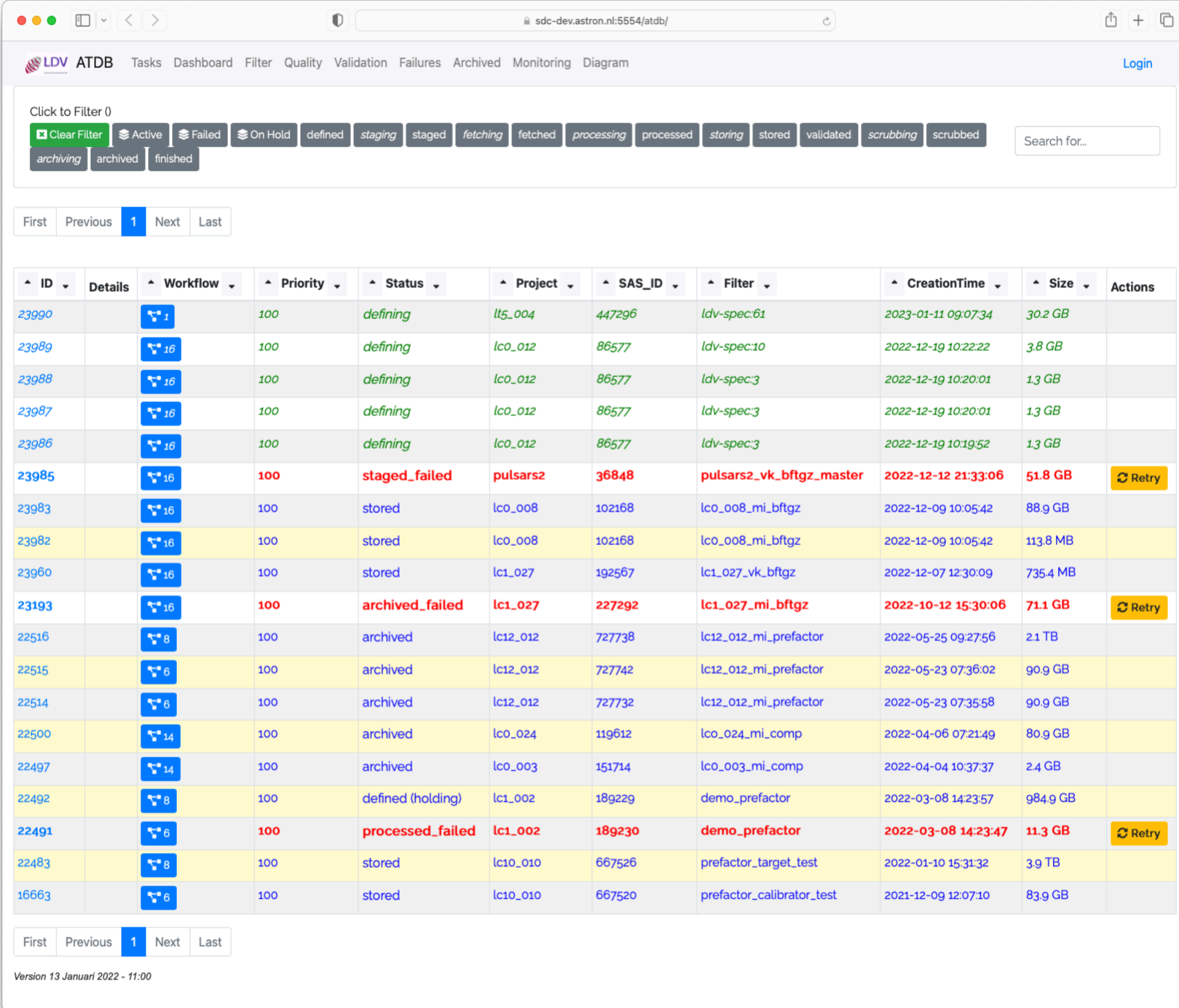
Archiving & Curation

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 Support for LOFAR ERIC agreed data policy.
- LTA support for “advanced” data products (e.g. images).
- Goal: the ability to ingest advanced / science-ready data products generated by the wider community.
 - Including management of data rights.
 - Become a “hub” for access to LOFAR data, wherever it is generated.

Managed Processing

- Execute predefined pipelines “at scale” against data in the LTA.
- Capability developed in the context of the LOFAR Data Valorization effort, currently running at SURF.
- Future work:
 - Scale to other LTA sites (Jülich, Poznań, maybe more).
 - Increased automation.
 - Incorporate more pipelines.
 - Polish & user enhancements.

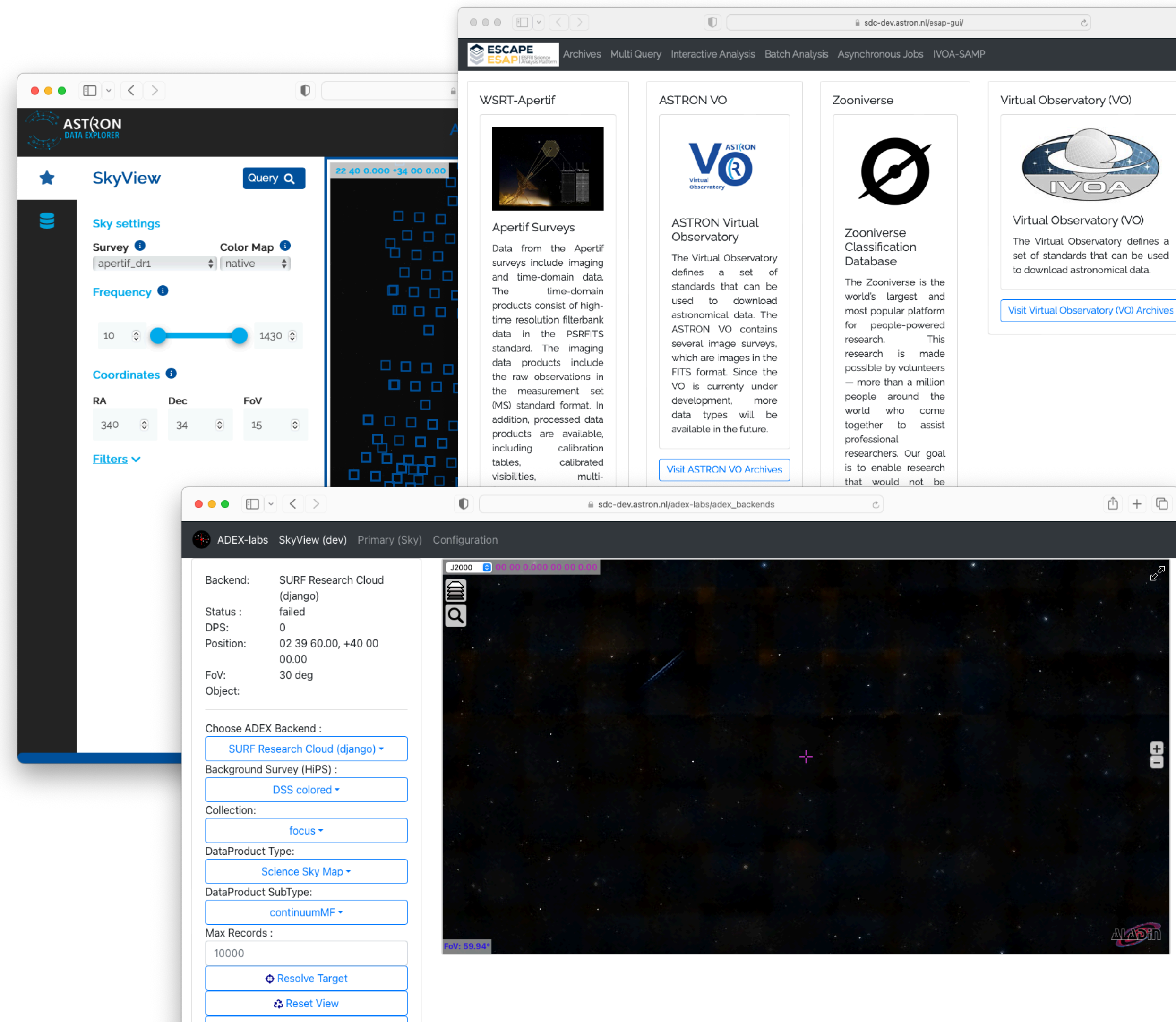


The screenshot shows the LDV ATDB web interface. The top navigation bar includes 'LDV ATDB', 'Tasks', 'Dashboard', 'Filter', 'Quality', 'Validation', 'Failures', 'Archived', 'Monitoring', and 'Diagram'. A search bar is on the right. Below the navigation, there are filter buttons for 'archiving', 'archived', and 'finished'. A table of tasks is displayed with columns for ID, Details, Workflow, Priority, Status, Project, SAS_ID, Filter, CreationTime, Size, and Actions. The table contains 20 rows of task data.

ID	Details	Workflow	Priority	Status	Project	SAS_ID	Filter	CreationTime	Size	Actions
23990			100	defining	lt5_004	447296	ldv-spec:61	2023-01-11 09:07:34	30.2 GB	
23989			100	defining	lc0_012	86577	ldv-spec:10	2022-12-19 10:22:22	3.8 GB	
23988			100	defining	lc0_012	86577	ldv-spec:3	2022-12-19 10:20:01	1.3 GB	
23987			100	defining	lc0_012	86577	ldv-spec:3	2022-12-19 10:20:01	1.3 GB	
23986			100	defining	lc0_012	86577	ldv-spec:3	2022-12-19 10:19:52	1.3 GB	
23985			100	staged_failed	pulsars2	36848	pulsars2_vk_bftgz_master	2022-12-12 21:33:06	51.8 GB	Retry
23983			100	stored	lc0_008	102168	lc0_008_mi_bftgz	2022-12-09 10:05:42	88.9 GB	
23982			100	stored	lc0_008	102168	lc0_008_mi_bftgz	2022-12-09 10:05:42	113.8 MB	
23960			100	stored	lc1_027	192567	lc1_027_vk_bftgz	2022-12-07 12:30:09	735.4 MB	
23193			100	archived_failed	lc1_027	227292	lc1_027_mi_bftgz	2022-10-12 15:30:06	71.1 GB	Retry
22516			100	archived	lc12_012	727738	lc12_012_mi_prefactor	2022-05-25 09:27:56	2.1 TB	
22515			100	archived	lc12_012	727742	lc12_012_mi_prefactor	2022-05-23 07:36:02	90.9 GB	
22514			100	archived	lc12_012	727732	lc12_012_mi_prefactor	2022-05-23 07:35:58	90.9 GB	
22500			100	archived	lc0_024	119612	lc0_024_mi_comp	2022-04-06 07:21:49	80.9 GB	
22497			100	archived	lc0_003	151714	lc0_003_mi_comp	2022-04-04 10:37:37	2.4 GB	
22492			100	defined (holding)	lc1_002	189229	demo_prefactor	2022-03-08 14:23:57	984.9 GB	
22491			100	processed_failed	lc1_002	189230	demo_prefactor	2022-03-08 14:23:47	11.3 GB	Retry
22483			100	stored	lc10_010	667526	prefactor_target_test	2022-01-10 15:31:32	3.9 TB	
16663			100	stored	lc10_010	667520	prefactor_calibrator_test	2021-12-09 12:07:10	83.9 GB	

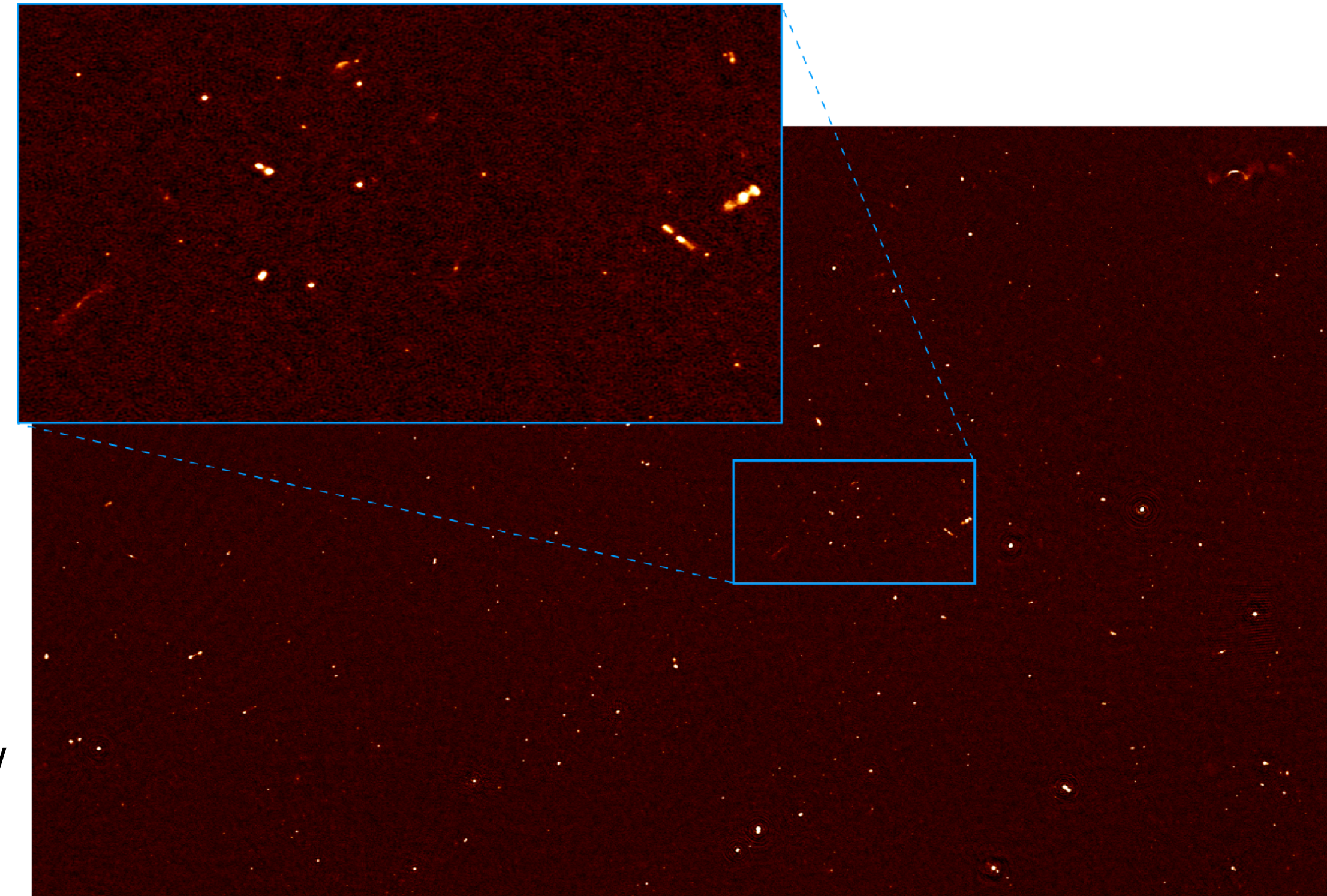
Discovery & Access

- Software solutions to make archive access as robust & reliable as possible...
- ...in tandem with LOFAR ERIC service level agreements with data centres.
- Upgraded archive interface: “ADEX”.
- Pervasive use of Virtual Observatory interfaces for publishing data.
- Aiming for a fully “FAIR” compliant archive:
 - Findable, Accessible, Interoperable, Reusable
 - <https://force11.org/info/the-fair-data-principles/>



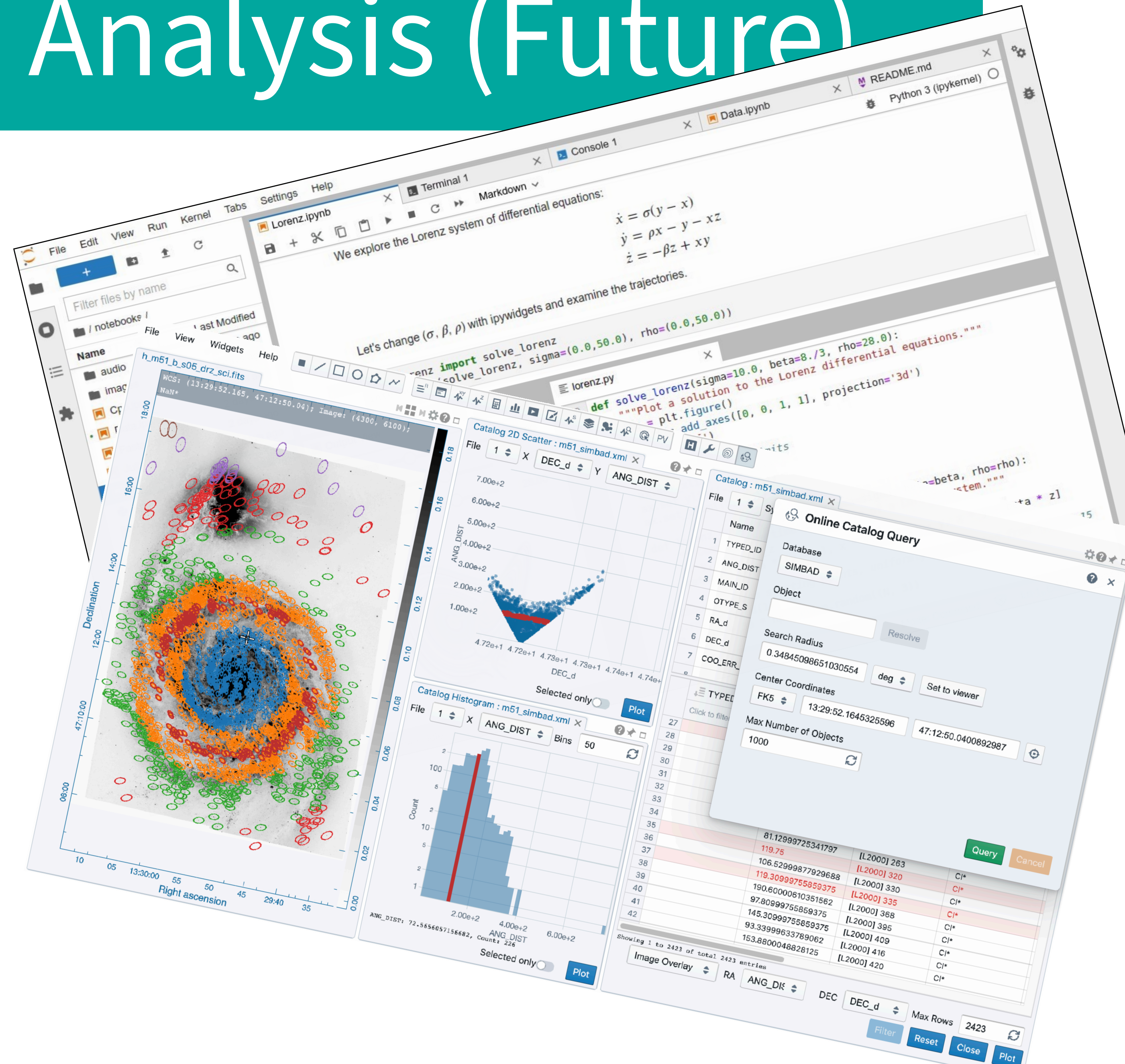
Scientific Pipelines

- The Observatory-supported portfolio for LOFAR2.0:
 - Pre-Processing
 - LINC (direction-independent calibration)
 - Raptor (direction-dependent calibration)
 - VLBI (postage stamps & wide field)
 - PULP (known pulsars)
 - TraP (image plane transients; *stretch goal*)
- For cost & science productivity reasons, processing plans/pipelines must be in place before observations start.
- Not “ASTRON's pipelines”, but *our* pipelines; we work together to make them effective.
 - Best way to start: commissioning. See the pipelines session later today.



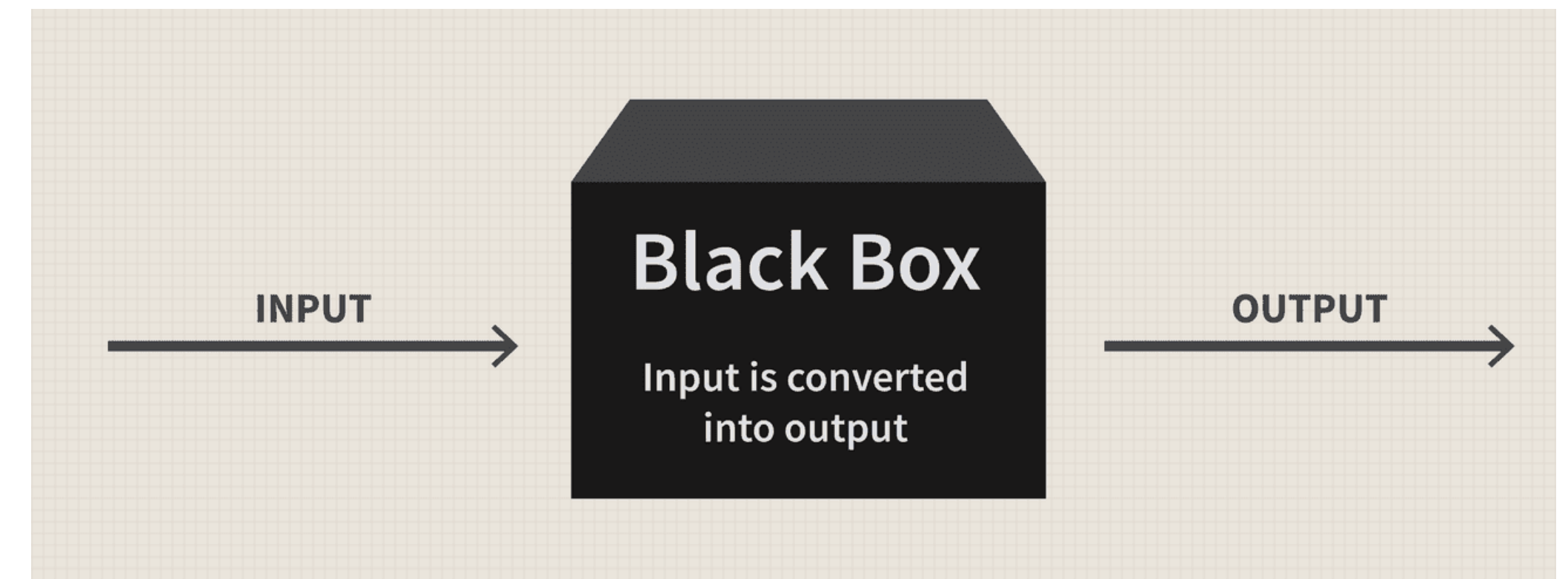
Interactive Data Analysis (Future)

- Common expectation: Jupyter notebooks running next to the data.
 - Jupyter notebook: interactive browser-based environment including live code, text, figures, etc.
- Also: “legacy” graphical applications (CASA, TOPCAT, ...), though e.g. VNC/remote desktop connections.
- Also also: command line applications, through e.g. SSH.
- Implies the existence of shared, persistent storage for work in progress, output products, etc.

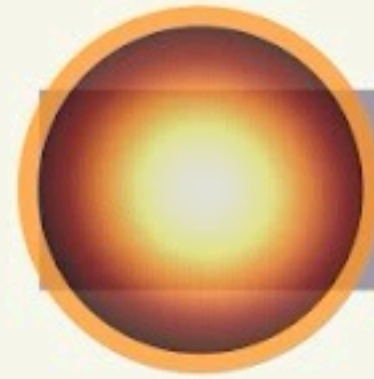


User Pipeline Execution (Future)

- Whatever observatory-supported pipelines are available, there will always be new science cases that aren't supported.
- Enable them, while minimizing risk to our operational system.
- Provide an API against which pipelines can be developed.
- Provide a “black box” system with appropriate quotas etc for executing untrusted payloads.



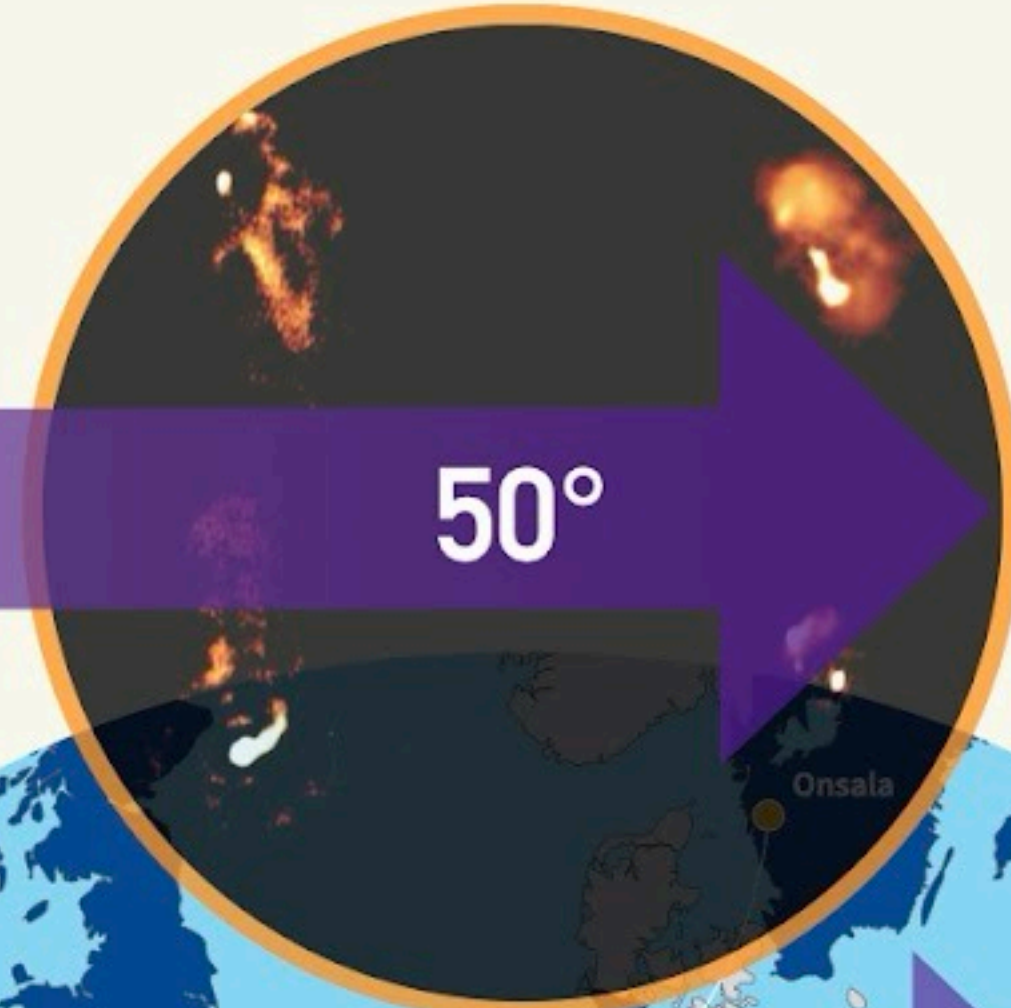
Carbon neutral Science



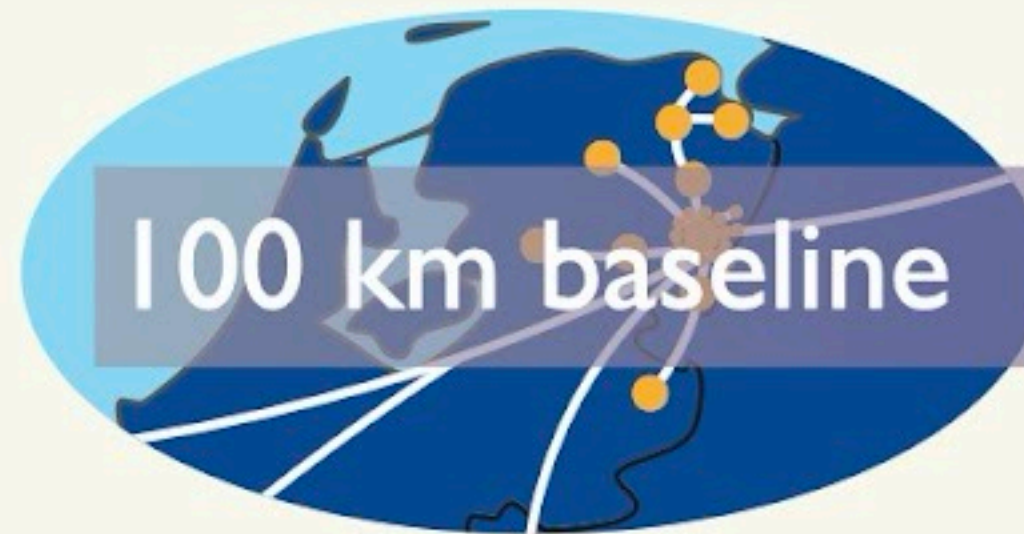
12°

field-of-view

x4



50°



100 km baseline

Resolution

x20



2000 km baseline



20 days

Speed to science

x40

12 hours



LOFAR2.0

LOFAR2.0+LENS

Conclusions

- The ASTRON SDC is coordinating development of digital services across LOFAR, SRCNet, and Apertif/ALTA...
 - ...but fully dependent on working with partners.
- Development of a set of digital services to make you scientifically productive in the LOFAR2.0 era is well underway...
 - ...but we need your help, especially in commissioning.
- Looking towards the future, we have exciting plans for what comes after the core LOFAR2.0 services and how we can benefit from the huge development effort currently underway for SKA.