

European ARC Network



Supporting your
science:
How the ALMA
network “works”

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Allegro ARC Node (Leiden Observatory)

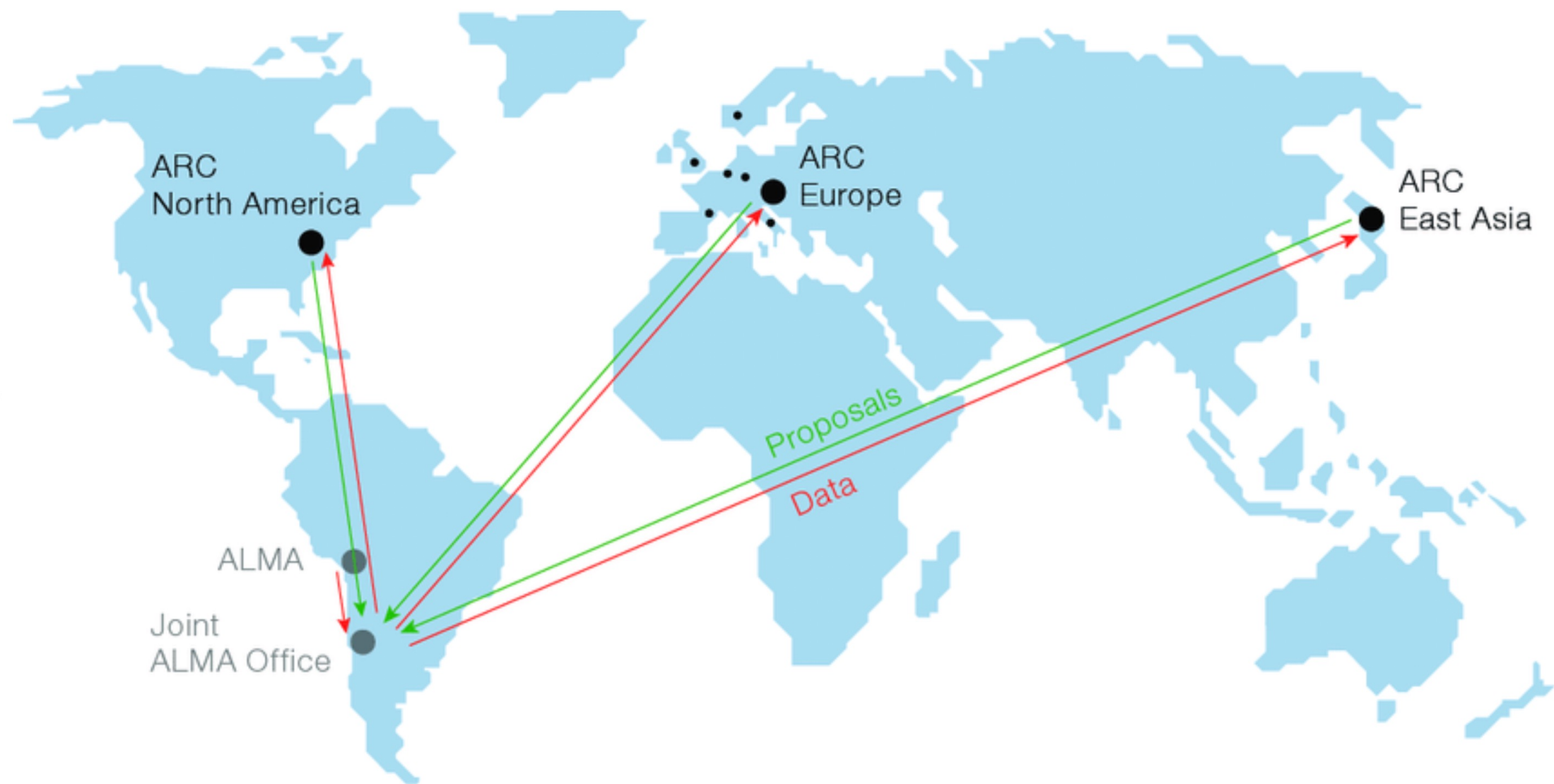
The ALMA Regional Centres (ARCs)

The ALMA Regional Centres (ARCs) are the interface between the user communities and the observatory

There is one ARC for each “executive”:
Europe, North America, East Asia

The ARCs provide services to ALMA Operations in Chile and their regional user communities

Close links with the Department of Science Operations (DSO) in Chile



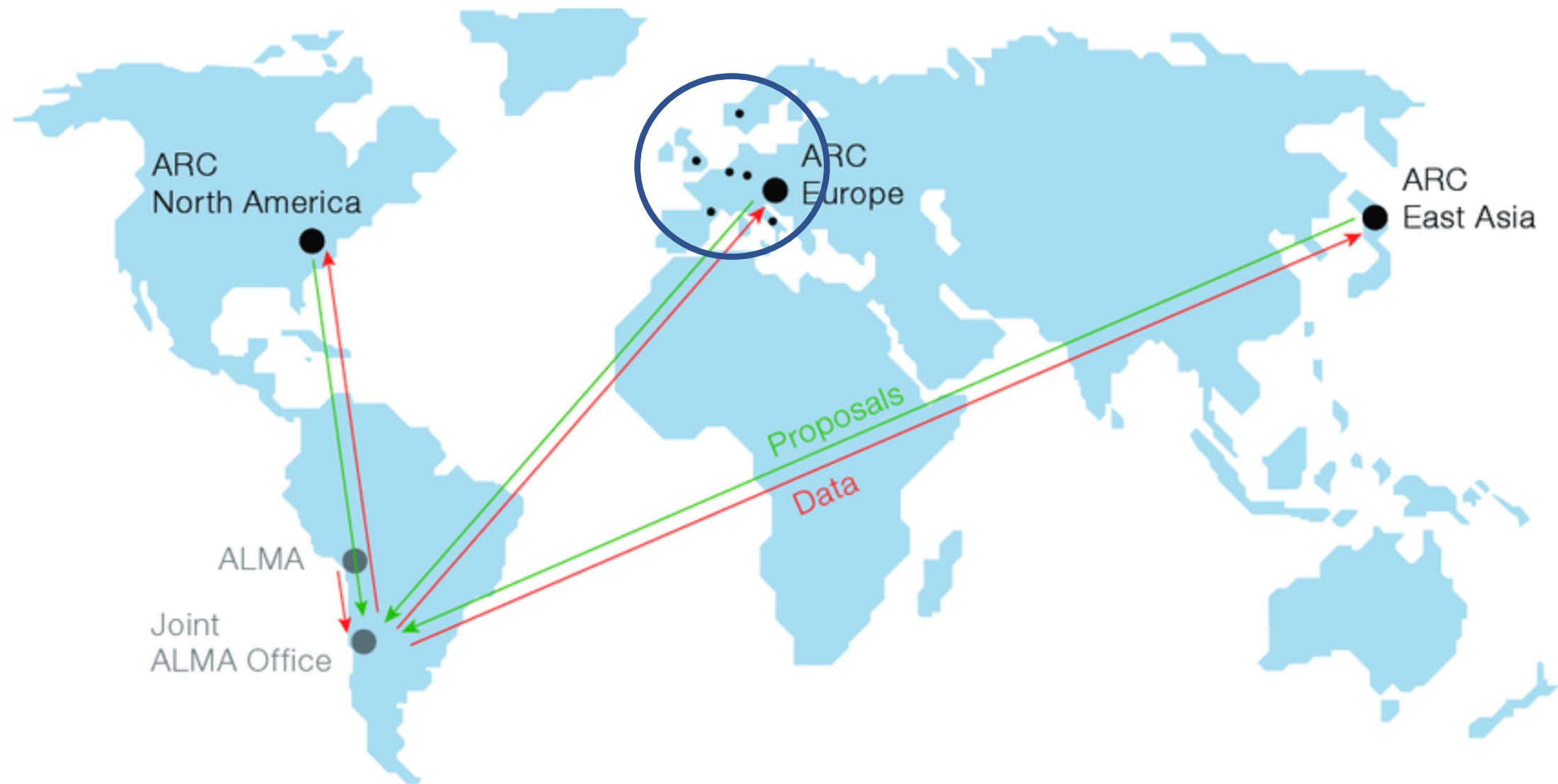
Introducing: The European ARC Nodes

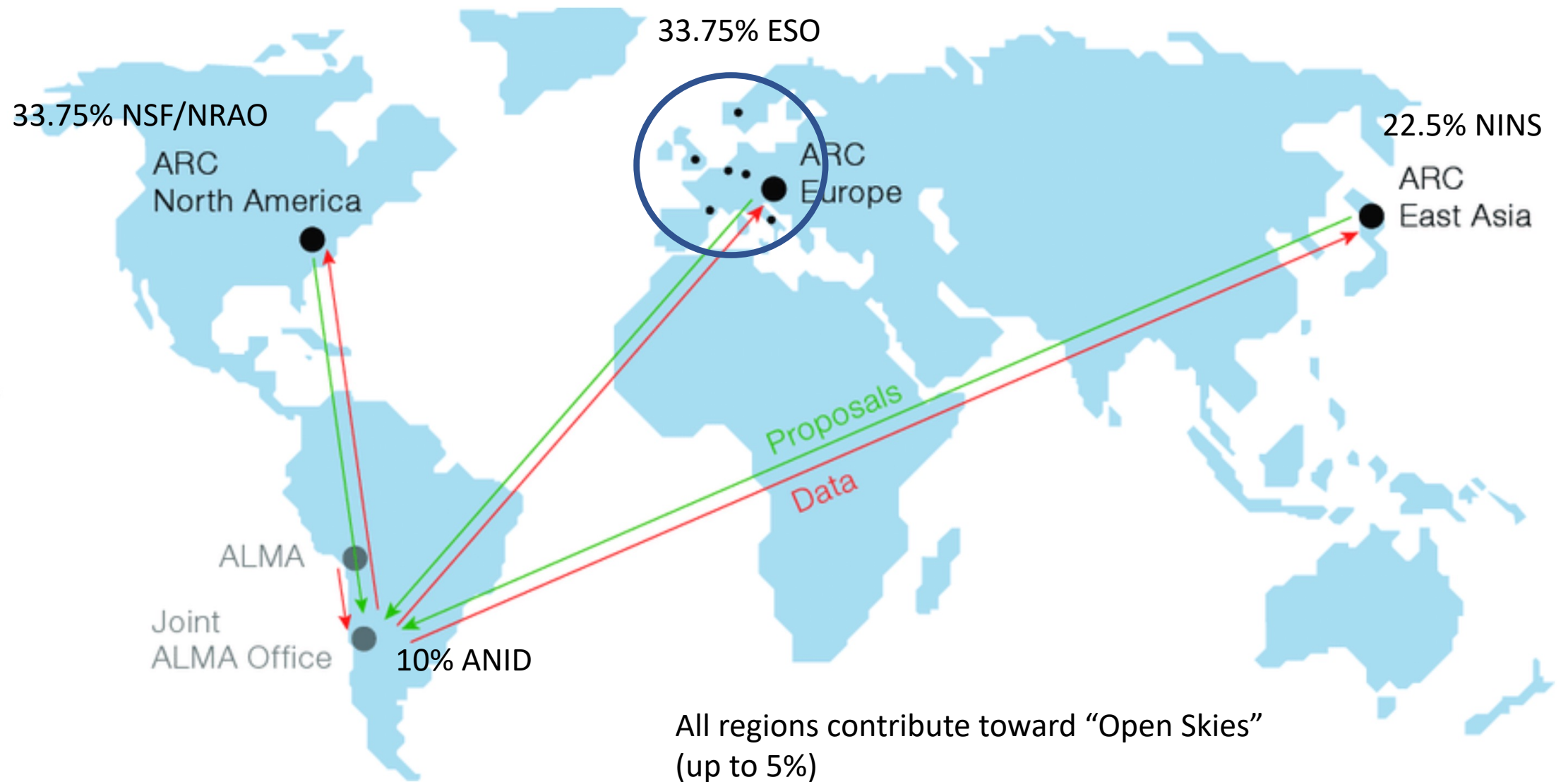
The European ARC is the point of contact for European ALMA users from proposal submission to the distribution of calibrated data and analysis.

The European ARC is organized as a network of scientific support nodes distributed across Europe.

The central node is at ESO Headquarters and carries out the core ARC activities & the coordination of the regional nodes.

The ARC Nodes have independent funding and operate in collaboration with the EU ARC.





Enhanced User Services

**EU ARC
nodes**

EU ARC



NA ARC



EA ARC



Joint ALMA Observatory

JAO provides:

- Array operations
- Scheduling of projects
- Execution of observations
- Data quality assurance and trend analysis
- Calibration plan maintenance
- Delivery of data to the archives
- Archive operations
- Pipeline operations
- Software subsystem scientists

The ARCs are the interfaces to the user community.
The ARCs provide (core tasks):

- user support (via helpdesk and f2f)
- delivery of data to the PIs
- Mirror archive operations
- AoDs and Subsystem scientists.
- Data quality assurance

The history of the EU ARC network

Conceived as an experiment

Distributed user support favoured by community in 2002 ALMA community day

STC and Council approved Call for Statements of Interest, issued in 2004

Six institutes replied with national funding agencies support

Memorandum of Understanding (MoU) was signed in 2008

Czech node joined in 2009

External review in 2015

New MoU signed in December 2017

Strategic plan (2019 - 2025) consolidated in 2019

Mission of the EU ARC nodes

“Personalised face-to-face support is the biggest success of the European ARC network and the *raison d'être* of the ARC nodes.”

E. Hatziminaoglou, The ESO messenger 162

Mission of the EU ARC nodes

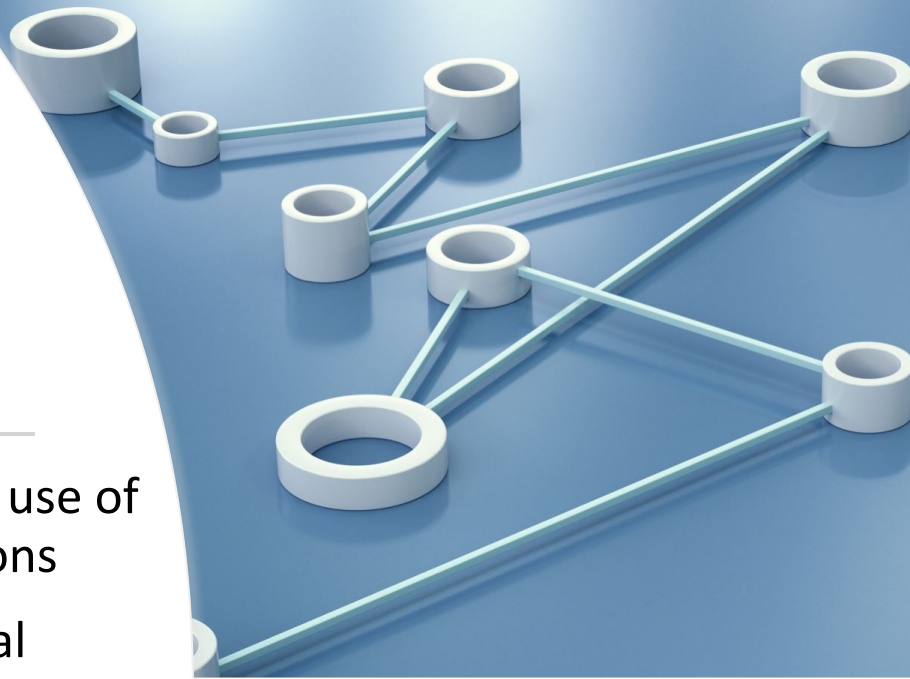
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- Face-to-face user support
- Unique scientific or technical expertise (e.g. Solar observation, polarimetry, high frequency and long-baseline phase corrections and array combination)
- Personalized services
- General ALMA development

Strengths (and challenges) of the node system

- **Geographic distribution** of nodes: requires the use of technology to support work and communications
- Understanding of the **cultural** and interpersonal differences --> relies on smooth communication, a common aim and a shared sense of responsibility, respecting the uniqueness in individual organisations
- **Heterogeneous** structure: nodes have different organisations, funding schemes, community size and expertise



EU ARC network concepts

- Contracts:
 - There are no contractual obligations between ESO or ALMA and the ARC nodes
 - Collaboration is based on trust and Memorandum of Understanding
- Finance:
 - ESO does not provide financial support for the ARC nodes
 - ARC nodes seek their own funding
- Mandates:
 - 'ranging from ARC nodes can only do user support' to 'ARC nodes should support ALMA'
 - ranging from just support ALMA users' to 'be part of general support body (LOFAR, NOEMA, SKA, ...)

High level perspective for the ARC network

Support

Provide optimal and uniform user support to the European community

Community

Strengthen European ALMA community

Accessibility

Broaden access to ALMA science

- Make ALMA accessible to all European astronomers and optimise scientific return

Participate

Provide expert assistance towards ALMA commissioning and optimisation

Tools

Provide tools to users and observatory

- Contribute to 'making ALMA work'

Objectives

Unique services and expertise

- Provide face-to-face user support
- Act as Contact Scientists for approved ALMA projects
- Contribute to helpdesk
- Maintain and develop unique scientific or technical expertise
- Provide enhanced services
- Continue contribution to ALMA development programme
- Invest into local community development
- Continue building the user base
- Contribute to Quality Assurance

Objectives

Development of new support procedures

- Archival research support (archive school)
- Advanced data reduction (e.g., polarization training)
- Advanced software development (e.g., ALMINER, CS tracker)
- Participation in Observatory tasks (e.g., AOD shifts, participating in obsmode review)
- Remote user support (Implemented during COVID times)
- Remote user participation to training events (e.g., online proposal preparation, I-TRAIN)

•Towards science-oriented support

•Towards general support centres

•ALMA archive: towards an “enhanced” user experience

Network: support in practice

- After the successful execution and data delivery of your project, PIs can ask for face-to-face support for regular or advanced data reduction.
- Face-to-face support can also be requested for the purposes of **proposal preparation** or **archival research**.
- **Support:** High-computing resources; remote and on-site user support
- **Helpdesk tickets** submitted via the Science portal are passed to the relevant node.
- PIs may also contact the nodes directly.

European ARC Network

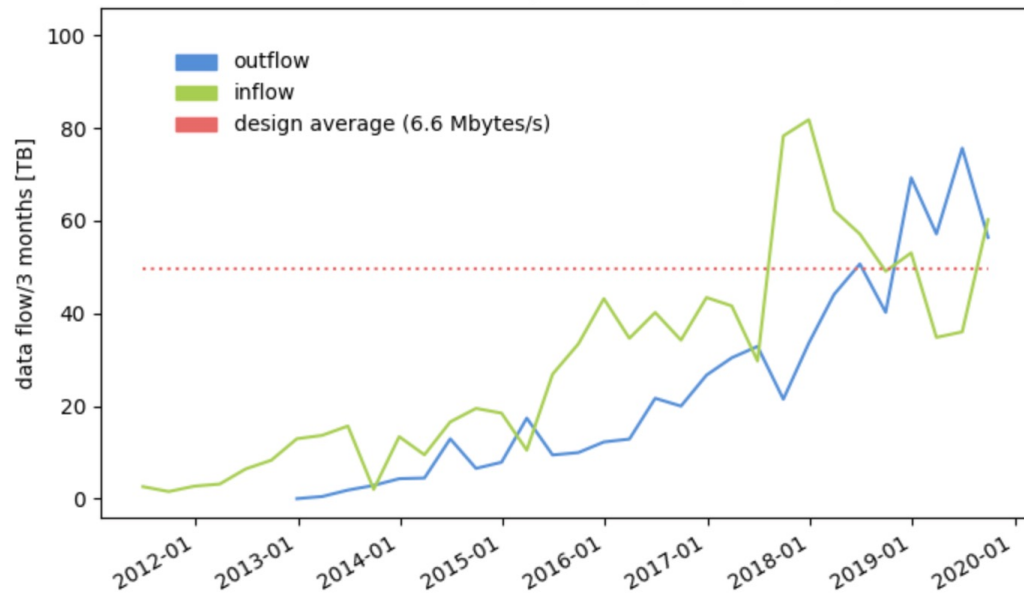


News and Announcements

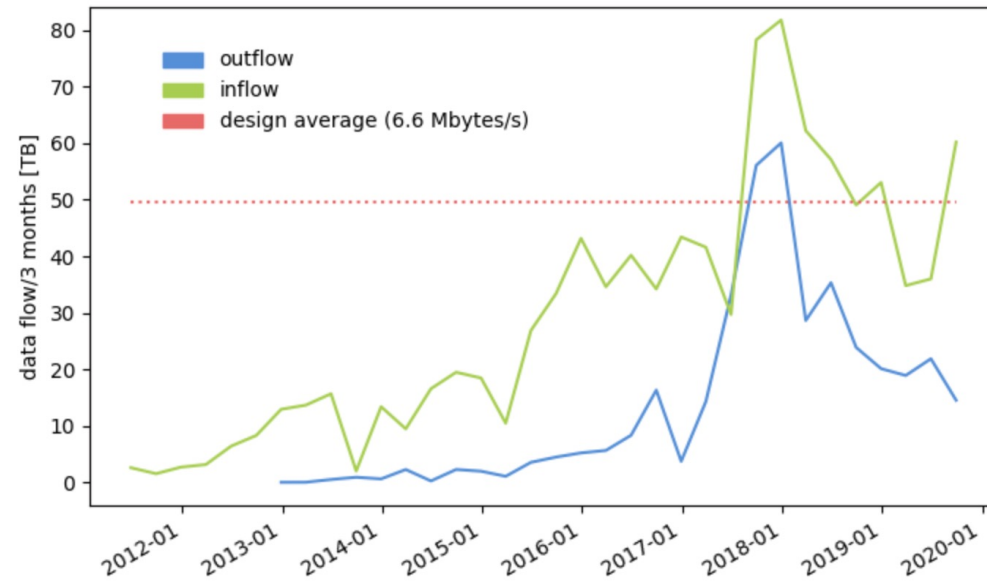
ALMA Helpdesk for direct support

ALMA Science Portal

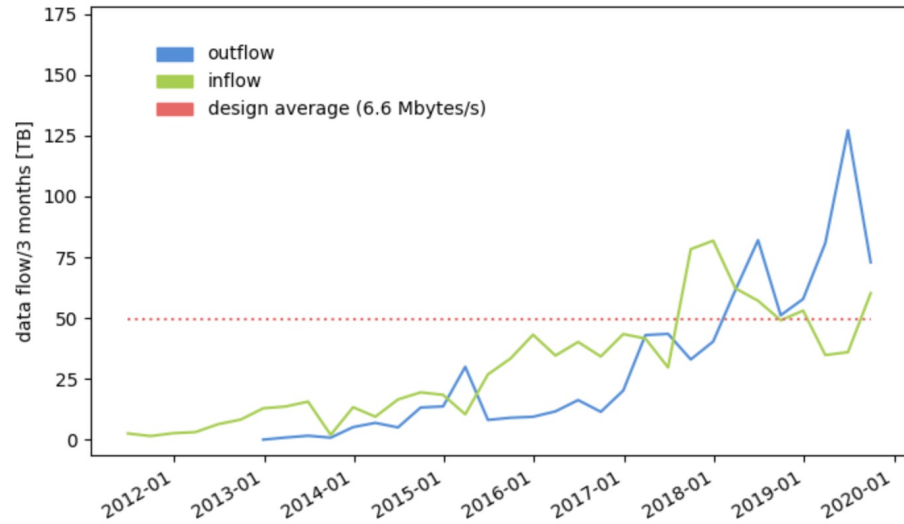
na ALMA data flow (total out/in: 683/996 TB)



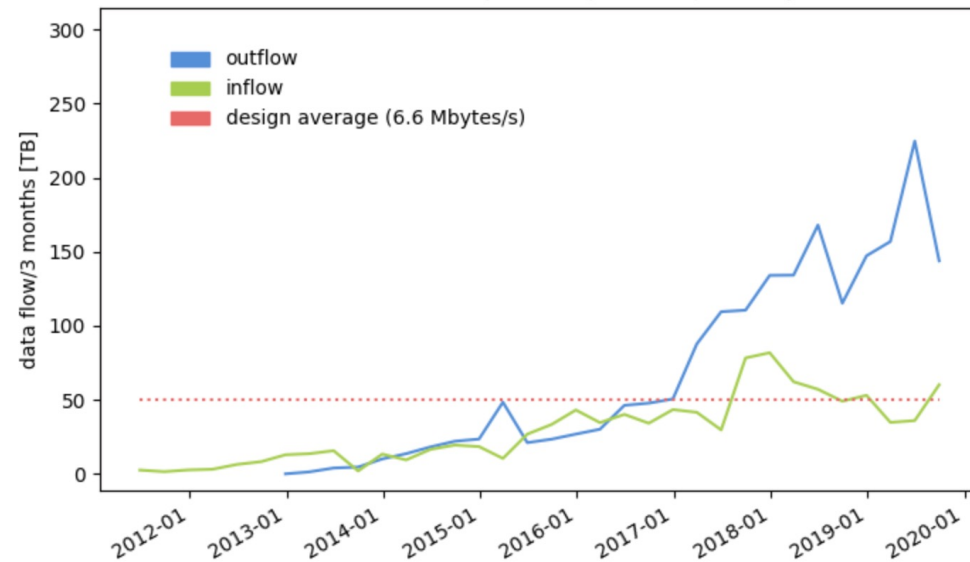
ea ALMA data flow (total out/in: 383/996 TB)



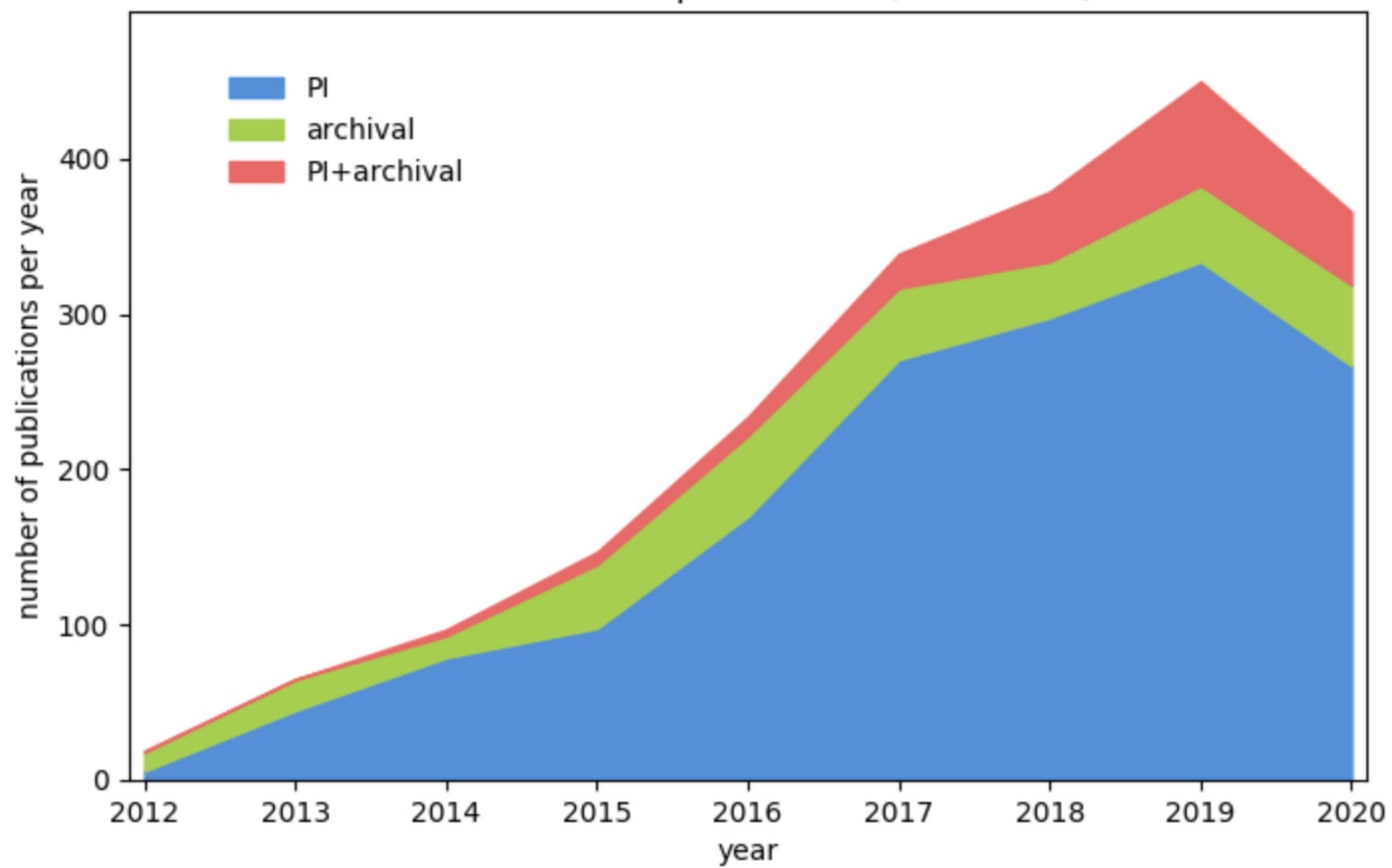
eu ALMA data flow (total out/in: 857/996 TB)



ALMA data flow (total out/in: 1924/996 TB)



Refereed ALMA publications (total: 2096)



The EU ARC network

- The ARCs are the interface between the user communities and the observatory
- These ARC nodes
 - have close ties with the community (active research environments)
 - host many of the mm/sub-mm experts in Europe
 - are actively involved in ALMA commissioning and optimisation

European ARC Network



EUROPEAN ARC
ALMA Regional Centre

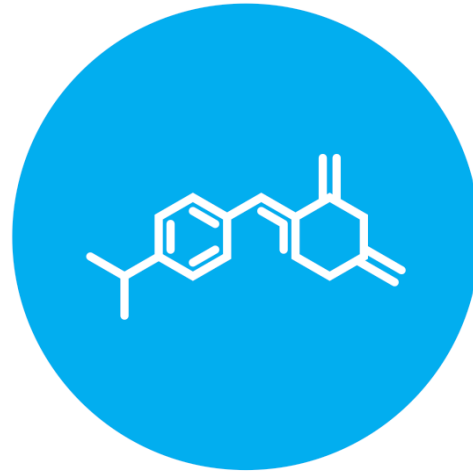
What about ALMA science?

In Search of our Cosmic Origins



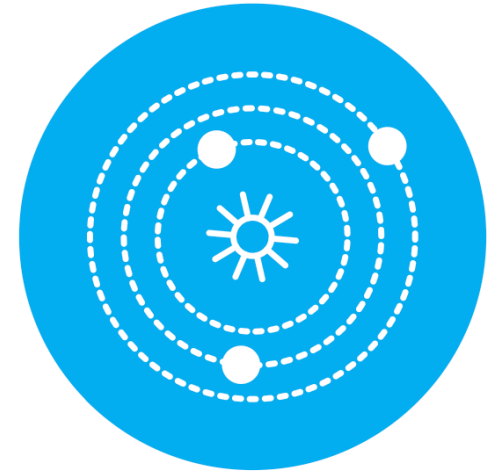
ORIGINS OF GALAXIES

Trace the cosmic evolution of key elements from the first galaxies ($z > 10$) through the peak of star formation ($z = 2-4$) by detecting their cooling lines, both atomic ([CII], [OIII]) and molecular (CO), and dust continuum, at a rate of 1-2 galaxies per hour.



ORIGINS OF CHEMICAL COMPLEXITY

Trace the evolution from simple to complex organic molecules through the process of star and planet formation down to solar system scales ($\sim 10-100$ au) by performing full-band frequency scans at a rate of 2-4 protostars per day.



ORIGINS OF PLANETS

Image protoplanetary disks in nearby (150 pc) star formation regions to resolve the Earth forming zone (~ 1 au) in the dust continuum at wavelengths shorter than 1mm, enabling detection of the tidal gaps and inner holes created by planets undergoing formation.



Thank you for you attention!!!

