



Report from the event supported by RadioNet

TITLE *ADVANCED SOFTWARE TOOLS FOR INTERFEROMETRY*

DATE: *NOVEMBER 28-30, 2017*

LOCATION: *GOTHENBURG, SWEDEN*

MEETING WEBPAGE: <https://oso.nordic-alma.se/asti.php>

HOST INSTITUTE: *DEPARTMENT OF SPACE, EARTH AND ENVIRONMENT, ONSALA SPACE OBSERVATORY, CHALMERS UNIVERSITY OF TECHNOLOGY*

**RADIONET
BENEFICIARY / NO:** *OSO / 7*

Report:

1. SCIENTIFIC SUMMARY

ALMA is moving into full operation and is now continuously delivering high-quality science data to the community. The complexity of the data (i.e. interferometric visibilities, large spectral cubes) and the science analysis requires new software tools to be developed.

The aim of the event was to bring together the people working on software development at the European ALMA nodes to present existing tools and discuss the strategy and need for future software. Six key speakers were invited for their experience in software development within the European ARC node network. In addition, participants were allowed to submit contributed talks. The content of the workshop was shaped by the participants themselves, and talk subjects were chosen freely by all speakers. Additionally, no time constraints were given on presentations or the following discussion. As a result, the workshop achieved an informal atmosphere, where all presented software tools were discussed in detail by the entire group. The discussions focussed on the existing tools, coordinating future collaborations, and identifying the needs for future tools and/or specific implementations of existing tools. At all times, the scientific users of ALMA and maximising the data quality and scientific output from ALMA was central to the discussions. The free choice of topic ensured that the software needs for the entire European ALMA user community were addressed. This user community forms a large part of RadioNet's user base.

The workshop hosted a total of 26 participants, with representatives from all the nodes. A total of 18 presentations were given. The informal format of the workshop allowed for sufficient time for in-depth discussions on each topic.

The event covered the areas that European ALMA software developers are active in: (re-)calibration of data (e.g. array combination, spectral scans, self-calibration), data analysis (e.g. visibility or image fitting, source detection), archive mining, polarisation calibration, and solar observations. Direct input was given to individual tools, leading to plans for further development and collaborations.

The immediate goal of the meeting was to increase the knowledge and efficiency in software development between the ARC node members. In order to ensure that the results of the discussions will be carried on in the future, internal webpages will be established as a platform to present new tools and coordinate their further development between the nodes. Collaborations on specific projects were already initiated and will be organised by the individual project leaders. All participants expressed the wish to regularly repeat this workshop on a yearly basis, to increase efficiency in software development. Finally, to increase the support to the astronomical user community, a common open webpage will be created, presenting the software tools and providing support on their usage.

The software tools resulting from these collaborations and development will directly lead to improved data quality and significantly more advanced data analysis compared to what is possible today. The science produced with the tools discussed at this workshop will be more diverse, more efficient, and be based on higher quality data. It directly contributes to RadioNet's main goals in ensuring broad user access to ALMA and ALMA data, and providing a long-term development of tools required to maximise the scientific output from ALMA. The event webpage can be found at <https://oso.nordic-alma.se/asti.php>

2. AGENDA OF THE EVENT

Open discussion: During each presentation and at the end of each session

Tuesday, November 28, 9.00 – 17.30

9.00 – 12.00 Session 1: Data Calibration

- Advance Phase Calibration for ALMA (Luke Maud, Allegro, NL)
- Automating Self Calibration (Stephen Bourke, Nordic Node, SE)
- dreamBeam: a software tool for beam modelling of radio interferometers (Tobia Carozzi, Nordic Node, SE)

13.30 – 17.30 Session 2: Specific Tools

- Data simulation for ALMA: allowing a fair comparison to models (Eelco van Kampen, ESO, DE)
- Modelling of molecular clouds in CASA (Ian Stewart, Allegro, NL)
- ALMA and mmVLBI - two worlds apart? (Stefanie Mühle, German Node, DE)
- Building a toolkit for VLBI dataprocessing in CASA (Ilse van Bemmelen, JIVE, NL)

Wednesday, November 29, 9.00 – 17.30

9.00 – 12.00 Session 3: Data Analysis

- Modelling source structures in Fourier domain: UVMULTIFIT (Ivan Marti-Vidal, Nordic Node, SE)
- Spectral Scan data analysis (SpecScan) (Sebastien Muller & Ivan Marti-Vidal, Nordic Node, SE)
- STATCONT: A statistical continuum level determination method for line-rich source (Alvaro Sanchez-Monge, German Node, DE)

13.30 – 17.30 Session 3 continued

- Robust outlier detection with Bayesian Probability Theory (Fabrizia Guglielmetti, ESO, DE)
- Array combination studies for ALMA (Lydia Moser, German Node, DE)

Session 4: Archive and Data Mining

- ALMACAL: exploiting ALMA calibrator observations to carry out deep and wide (sub-)millimetre surveys (Martin Zwaan, ESO, DE)
- The ALMA Archive: Batch Processing and Data Mining (Elisabetta Liuzzo, Italian Node, IT)
- Simple Software Tools for Working with Complex Measurement Sets / The UK Continuum Finder (George Bendo, UK Node, UK)
- ARTEMIX - Alma RemoTE Mining eXperiment (Edwige Chapillon, IRAM Node, FR)

Thursday, November 30, 9.00 – 12.00

9.00 – 12.00 Session 5: Software Infrastructure

- Tools for ALMA observations of the Sun (Sven Wedemeyer – *moved from Session 2, Institute for Solar Physics, Oslo, NO*)
- Quo vadis CASA? - some remarks and ideas about the mid-term future of CASA (Dirk Petry, ESO, DE)
- ALMA data in GILDAS: some tools (Edwige Chapillon & Lopez Sepulcre, IRAM Node, FR)
- Final Wrap-up (All)

12.00

Meeting end

3. PARTICIPANTS

Participants at the workshop represented all of the European ALMA nodes, with exception of the Czech Node. This includes persons with home institutes in Italy, France, Germany, The Netherlands, The UK, Sweden, and Norway. The ratio between women/men was 15/9. The workshop had six invited speakers, of which two were women.

List of attendance, including respective ARC node and country:

Maercker, Matthias, Nordic Node, SE
Muller, Sebastien, Nordic Node, SE
Marti-Vidal, Ivan, Nordic Node, SE
Carozi, Tobia, Nordic Node, SE
König, Sabine, Nordic Node, SE
Bourke, Stephen, Nordic Node, SE
Zwaan, Martin, ESO, DE
Wedemeyer, Sven
Maud, Luke, Allegro, NL
van Bemmel, Ilse, JIVE, NL
Liuzzo, Elisabetta, Italian Node, IT
Petry, Dirk, ESO, DE
Humpreys, Liz, ESO, DE
Muehle, Stefanie, German Node, DE
Stewart, Ian, Allegro, NL
Lopez Sepulcre, Anna, French Node/IRAM, FR
Chapillon, Edwige, French Node/IRAM, FR
Harsono, Daniel, Allegro, NL
Bendo, George, UK Node, UK
Wong, Ka Tat, French Node/IRAM, FR
Guglielmetti, Fabrizia, ESO, DE
Moser, Lydia, German Node, DE
Sanchez-Monge, Alvaro, German Node, DE
Arumugam, Vinodiran, ESO, DE
van Kampen, Eelco, ESO, DE
Stanke, Thomas, ESO, DE



Matthias Maercker (for the organizers)



4. RADIONET FINANCIAL CONTRIBUTION

RadioNet financial support of 2700€ was used for reimbursement of travel and accommodation of the following invited speakers:

Martin Zwaan, NL
Sven Wedenmeyer, DE
Luke Maud, UK
Ilse van Bommel, NL
Elisabetta Liuzzo, IT
Dirk Petry, DE

5. PUBLICATIONS

No publications have originated from this meeting.