Report from event supported by RadioNet

TITLE	EUROPEAN RADIO INTERFEROMETRY SCHOOL
DATE:	*2019 OCTOBER 7-11*
LOCATION:	*GOTHENBURG, SWEDEN*
MEETING WEBPAGE:	*https://www.chalmers.se/en/researchinfrastructure/oso/events/ERIS2019/Pages/default.aspx*
HOST INSTITUTE:	*CHALMERS*
RADIONET BENEFICIARY / NO:	*OSO/07*

RadioNet has received funding from the EU's Horizon 2020 research and innovation programme under the grant agreement No 730562

Report:

1 SCIENTIFIC SUMMARY

The European Radio Interferometry School (ERIS) is a bi-annual advanced school forming an important part of the training and development of young radio astronomers from Europe, but also from RadioNet partner countries throughout the world. The school has both lectures and in particular advanced practical tutorials that are given by invited specialists in interferometry who have the expertise and experience in using the main European radio astronomy facilities, which include the Atacama Large Millimetre/Sub-millimetre Array (ALMA), the e-Multi-Element Remotely Linked Interferometry Network (e-MERLIN), the European VLBI Network (EVN), the Low Frequency Array (LOFAR) and the Northern Extended Millimetre Array (NOEMA).

This year ERIS was hosted by Onsala Space Observatory at Chalmers University of Technology in Gothenburg October 7-11.

The Scientific Organising Committee consisted of Michael Lindqvist (Chalmers, Sweden; Chair), Arancha Castro-Carrizo (IRAM, NOEMA, France), Liz Humphreys (ESO, Garching, Germany), Katharine Johnston (University of Leeds, United Kingdom), Robert Laing (SKA, Jodrell Bank Observatory, United Kingdom), Matthias Maercker (Chalmers, Sweden), John McKean (ASTRON, The Netherlands), Monica Orienti (INAF, Italy), Anita Richards (JBCA, United Kingdom), Eduardo Ros (MPIfR, Bonn, Germany), Ilse van Bemmel (JIVE, The Nehterlands), Wouter Vlemmings (Chalmers, Sweden).

The Local Organising Committee consisted of Michael Lindqvist (Chalmers, Sweden; Chair), Stephen Bourke (Chalmers, Sweden), Matthias Maercker (Chalmers, Sweden), Magnus Thomasson (Chalmers, Sweden), Carmen Toribio (Chalmers, Sweden).

The topics covered by the lectures/tutorials included:

1. Calibration and imaging of continuum, spectral line, and polarization data;
2. observing techniques for low frequencies (e.g. LOFAR), intermediate frequencies (e.g. VLA and e-MERLIN), high frequencies (e.g. ALMA and NOEMA), and VLBI (e.g. EVN);
3. extracting the information from astronomical data and interpreting the results;
4. choosing the most suitable array and observing plan for your project.

The ERIS has become an important part in the training of young radio astronomers in Europe and beyond. It covers the theoretical concepts of interferometry, gives hands-on experience of using standard analysis software (CASA), develops critical thinking in the preparation and execution of interferometry observations, and facilitates the networking of early stage researchers. Furthermore, the school gives the opportunity for experienced researchers (postdocs) to develop their teaching skills through the delivery of lectures and tutorials. As it is the primary training event of RadioNet for basic interferometry techniques, its impact for the RadioNet community is highly significant.

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The ERIS 2019 presentations, including the lecture notes, tutorial guides and datasets used for the school are archived on the school website,

https://www.chalmers.se/en/researchinfrastructure/oso/events/ERIS2019/Pages/default.aspx

It provides an additional route for the transfer of knowledge to students that were unable to attend the school and will form the basis for the material used at future ERIS. It should be noted that the oversubscription was larger than 2, see section 3.

2 AGENDA OF THE EVENT

ERIS 2019 was carried out over a week containing both lectures and plenary tutorials was well as a day of in-depth advanced tutorials on ALMA, LOFAR and VLBI. There were 15 lecturers / tutorial leads, of which 7 were female. The science programme was the following:

Monday 7 October 2019

08:15		Registration	
08:40		Opening/Welcome	
09:00	L1	Introduction to interferometry, part 1	Marti-Vidal (M)
09:45	L2	Introduction to interferometry, part 2	Marti-Vidal (M)
10:30		Tea/Coffee	
11:00	T1	Fun with interferometers	Laing (M)
12:15	T2	Introduction to writing a proposal, short presentation	Laing (M)
12:30		Lunch	
13:30	L3+T3	Getting started with real data, interactive, part 1	Bourke (M), König (F)
14:15	L3+T3	Getting started with real data, interactive, part 2	Bourke (M), König (F)
15:15		Visit to Onsala Space Observatory Dinner	

Tuesday 8 October 2019

08:50		LOC announcements	
09:00	L4	Millimetre/low frequency interferometry: differences and similarities	Piétu (M), Williams (F)
09:45	L5+T4	Calibration, interactive, part 1	Richards (F), Muller (M), Laing (M)

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10:30		Tea/Coffee	
11:00	L5+T4	Calibration, interactive, part 2	Richards (F), Muller (M), Laing (M)
11:45	L5+T4	Calibration, interactive, part 3	Richards (F), Muller (M), Laing (M)
12:30		Lunch	
13:30	L6+T5	Introduction to imaging, interactive, part 1	Tafoya (M), Johnston (F), Spingola (F)
14:15	L6+T5	Introduction to imaging, interactive, part 2	Tafoya (M), Johnston (F), Spingola (F)
15:00		Tea/Coffee	
15:30	L6+T5	Introduction to imaging, interactive, part 3	Tafoya (M), Johnston (F), Spingola (F)
16:15	L6+T5	Introduction to imaging, interactive, part 4	Tafoya (M), Johnston (F), Spingola (F)
17:00		End	

Wednesday 9 October 2019

Note that presentations, datasets etc. can be found on this page.

08:50		LOC announcements	
09:00	L7+T6	Proposals and observing planning, interactive, part 1	Laing (M) + all
09:45	L7+T6	Proposals and observing planning, interactive, part 2	Laing (M) + all
10:30		Tea/Coffee	
11:00	T7	Self-calibration, part 1	Radcliffe (M), Richards (F)
11:45	T7	Self-calibration, part 2	Radcliffe (M), Richards (F)
12:30		Lunch	
13:30	L8	Polarisation	Marti-Vidal (M)
14:15	L9	Spectral line interferometry	Johnston (F)
15:00		Tea/Coffee	
15:30	L10+T8	Very long baseline interferometry, interactive, part 1	van Bemmel (F), Janssen (M), Marti-Vidal (M), Spingola (F)

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16:15	L10+T8	Very long baseline interferometry, interactive, part 2	van Bemmel (F), Janssen (M), Marti-Vidal (M), Spingola (F)
17:00	L10+T8	Very long baseline interferometry, interactive, part 3	van Bemmel (F), Janssen (M), Marti-Vidal (M), Spingola (F)
17:45		End	
18:30		Mingle with snacks	
19:00		Evening lecture by professor Jonathan Tan (M), Chalmers: Zooming-in on Massive Star Birth	

Thursday 10 October 2019

08:50		LOC announcements	
09:00	T9	Advanced tutorials	See below
09:45	T9	Advanced tutorials	See below
10:30		Tea/Coffee	
11:00	T9	Advanced tutorials	See below
11:45	T9	Advanced tutorials	See below
12:30		Lunch	
13:30	T9	Advanced tutorials	See below
14:15	T9	Advanced tutorials	See below
15:00		Tea/Coffee	
15:30	T9	Advanced tutorials	See below
16:15	T9	Advanced tutorials	See below
17:00		End	

Friday 11 October 2019

08:50		LOC announcements	
09:00	L11	Useful python tools	Bourke(M)
09:45	T10	Proposal presentations	Laing (M) + all
10:30		Tea/Coffee	
11:00	T10	Proposal presentations	Laing (M) + all
11:45	T10	Proposal presentations	Laing (M) + all

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12:30	Lunch
13:30	End of school
14:15	End

Advanced tutorials

Note that presentations, datasets etc. can be found on this page.

T9A	Metre/wide-field (LOFAR)	Williams (F), Toribio (F), Bourke (M)
T9B	Centimetre/polarisation	Richards (F), Johnston (F), Laing (M)
T9C	Centimetre/VLBI	van Bemmel (F), Radcliffe (M), Spingola (F)
T9D	Millimetre/spectral line (ALMA/NOEMA)	Johnston (F), König (F), Muller (M), Tafoya (M)
T9E	mm/VLBI	Janssen (M), Marti-Vidal (M)

3 PARTICIPANTS

The ERIS 2019 was open to all regardless of their ethnicity, gender and academic position. All attendees had to agree to a Code of Conduct during registration, which ensured a harassment-free school experience for everyone, regardless of gender, sexual orientation, disability, physical appearance, race, age, political opinion or religion.

Due to size of the venue we had to limit the number of students to 72. The number of applications received were more than 150. The following process was used to select students: Gender and country were weighted to achieve a balance. Career level was given the following weight after normalising: PhD student: 0.75, Postdoc or above: 0.15, Masters student: 0.08, Other: 0.02. An "Other information" field was provided on the application form. Some applicants wrote a motivation in there. This information was scored manually and included in the process. As this information was not requested it was given a small weight in the overall process. A random process was then used to rank the applicants using the above weightings.

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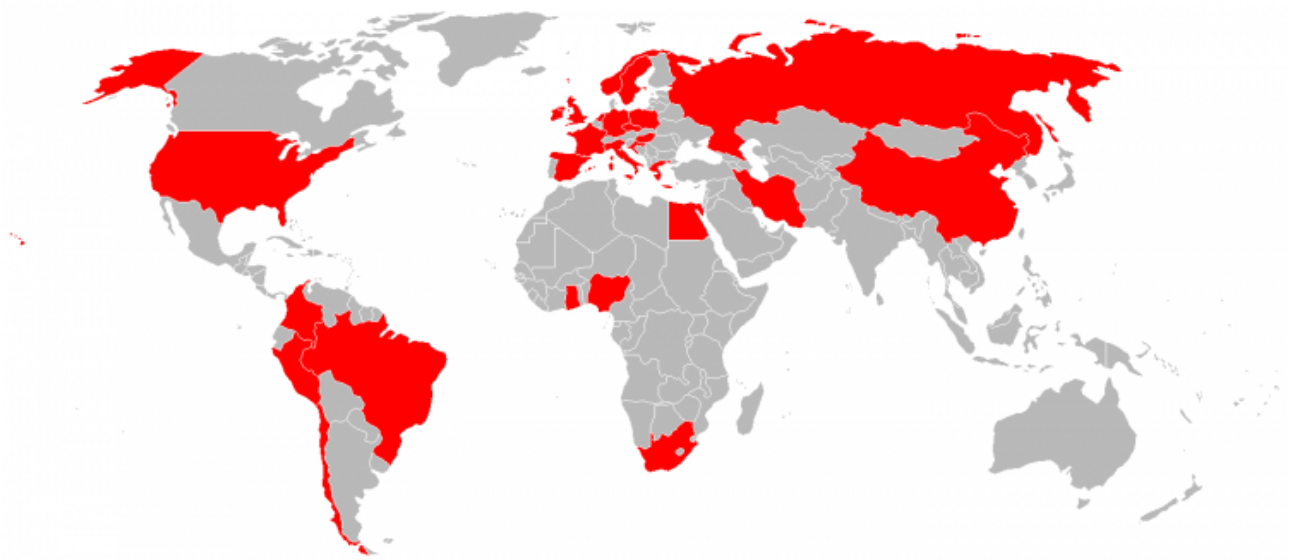

Figure 1. *Map of the world showing the distribution of the participants of ERIS 2019.*

The 72 students came from 26 countries, Fig. 1 and 2. The vast majority of the participants were at graduate level (Masters/PhD). The gender ratio (men vs women) for both students and lectures/ tutors were close to 50:50. In addition to the participants, there were 15 lecturers / tutorial leads (10 external, 5 internal from Chalmers).

Figure 2. *Participants in the ERIS 2019. Photo taken during a visit to Onsala Space Observatory. Credit: Magnus Thomasson, Chalmers.*

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4 RADIONET FINANCIAL CONTRIBUTION

The RadioNet contribution was used to cover the accommodation for the students (18 k€). The registration fee for each student was 1680 SEK (excluding VAT) which was used to cover the lunches. Onsala Space Observatory, Chalmers, covered the rest of cost for the school.

5 PUBLICATIONS

There are no publications from the school, but the lectures notes (slides), tutorial material and datasets are archived on the school website.

6 CONFIRMATION

I confirm that RadioNet is allowed to publish this report, incl. participants lists, statistic´s details, pictures, etc.

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