



Report from the event supported by RadioNet

TITLE *EUROPEAN RADIO INTERFEROMETRY SCHOOL*

DATE: *2017 OCTOBER 16—20*

LOCATION: *DWINGELOO, THE NETHERLANDS*

MEETING WEBPAGE: www.astron.nl/eris2017/

HOST INSTITUTE: *NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY (ASTRON)*

**RADIONET
BENEFICIARY / NO:** *ASTRON/2*

Report:

1. SCIENTIFIC SUMMARY

The European Radio Interferometry School (ERIS) is a bi-annual graduate level school that forms a fundamental part of the training and development of young radio astronomers primarily from Europe, but also from RadioNet partner countries throughout the world. The school has both lectures and 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). The previous schools have been extremely successful in delivering the training needed to prepare radio astronomy students to write their own proposals, reduce interferometry data and interpret their results. The ERIS school is a RadioNet training events deliverable.

This year, the seventh ERIS was organised jointly between the Netherlands Institute for Radio Astronomy (ASTRON) and the Joint Institute for VLBI ERIC (JIVE) at ASTRON headquarters in Dwingeloo from 2017 October 16–20.

The Scientific Organising Committee was J. P. McKean (Co-Chair; ASTRON/RuG), H. J. van Langevelde (Co-Chair; JIVE), A. D. Biggs (ESO), R. Campbell (JIVE), M. Giroletti (IRA-INAF), M. Iacobelli (ASTRON), K. Johnston (Leed U.), R. Laing (ESO), Z. Paragi (JIVE), V. Piétu (IRAM), A. Richards (Manchester U.) and W. Vlemmings (Chalmers U.).

The topics covered by the lectures/tutorials included,

1. calibration and imaging of continuum, spectral line, and polarization data;
2. low frequency (LOFAR domain), cm-wave (e-MERLIN domain), high frequency (ALMA/NOEMA domain), and VLBI interferometry;
3. extracting the information from astronomical data and interpreting the results; and
4. choosing the most suitable array and observing plan for your project.

ERIS is a fundamental part of the training of radio astronomers in Europe since over a period of a week it provides the participants with the theoretical understanding of the complex concepts of interferometry, gives hands-on experience of using standard analysis software (CASA, AIPS), develops critical thinking in the preparation and execution of interferometry observations, and facilitates the networking of early stage researchers. In addition, 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 significant.

As part of the review of the school, the students completed a short questionnaire (~30% response), in which 100% of the respondents considered the school to be “useful”. Additional comments and suggestions (mainly about the limited time allotted for tutorials) from the participants will be incorporated into future ERIS.

The teaching materials, including the lecture notes, tutorial guides and datasets used for the school are archived on the school website,

www.astron.nl/eris2017/

which 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.

2. AGENDA OF THE EVENT

ERIS is carried out over a week, and contains a science programme of 45 minute lectures (including 5 mins for questions), and 1 to 2.5 hour plenary tutorials and a day of in depth tutorials on ALMA, LOFAR and VLBI.

There were 16 lecturers / tutorial leads, of which 5 were female.

The science programme was:

Monday, 16 October 2017

08:30	Registration	
08:50	Opening/Welcome	John McKean (SOC/LOC), Directors
09:00	L1: Introduction to Radio Astronomy	John McKean (ASTRON, Netherlands)
09:45	L2: Introduction to Interferometry	Anna Scaife (JBCA, UK)
10:30	Tea/coffee	
11:00	L3: Fundamentals of Interferometry	Robert Laing (SKA, UK)
11:45	T1: Fun with Interferometers (S)	Robert Laing (SKA, UK)
12:30	Lunch	
13:30	L4: Modern Interferometers	Joe Callingham (ASTRON, Netherlands)
14:15	L5: Data formats and editing	Andre Offringa (ASTRON, the Netherlands)
15:00	T2: Data loading, inspection and flagging	Andy Biggs (ESO, Germany)
16:45	T3: Introduction to Writing a proposal	Robert Laing (SKA, UK)
17:00	Leave for tour of WSRT	
18:30	BBQ@WSRT	
22:00	Arrival to Hotel	

Tuesday, 17 October 2017

08:50	LOC announcements	
09:00	L6: Introduction to Millimetre Interferometry	Vincent Pietu (IRAM, France)
09:45	L7: Introduction to Calibration	John McKean (ASTRON, Netherlands)
10:30	Tea/coffee	
11:00	T4: Calibration (Part 1)	Anita Richards (JBCA, UK)
12:30	Lunch	
13:30	T4: Calibration (Part 2)	Anita Richards (JBCA, UK)
14:30	L8: Introduction to Imaging	Anna Scaife (JBCA, UK)
15:15	Tea/coffee	
15:45	T5: Imaging	Joe Callingham (ASTRON, Netherlands)
17:15	L9: Introduction to Low Frequency Interferometry	Vanessa Moss (ASTRON, Netherlands)
18:00	Close	
21:00	Evening lecture	Heino Falcke (RU, Netherlands)
22:00	End of Day	

Wednesday, 18 October 2017

08:50	LOC announcements	
09:00	L10: Advanced Imaging	Andre Offringa (ASTRON, Netherlands)
09:45	L11: Spectral Line Interferometry	Katharine Johnston (Leeds U., UK)
10:30	Tea/Coffee	
11:00	T6: Error recognition and Image Analysis	Anita Richards (JBCA, UK)
12:30	Lunch	
13:30	T7: Self-calibration	John McKean (ASTRON, Netherlands)
15:30	Tea/coffee	
16:00	L12: Very Long Baseline Interferometry	Bob Campbell (JIVE, Netherlands)
16:45	T8: Very Long Baseline Interferometry	Minnie Mao (JBCA, UK)
18:15	Close	

Thursday, 19 October 2017

08:50	LOC announcements	
09:00	L13: Polarisation	Ivan Marti-Vidal (Onsala, Sweden)
09:45	L14: Pipelines	Benito Marcote/Andy Biggs (JIVE, ESO)
10:30	Tea/Coffee	
11:00	Advanced Tutorials	

T9A	Metre/Wide-field (LOFAR)	Marco Iacobelli (ASTRON, Netherlands)
T9B	Centimetre/Polarisation	Ivan Marti-Vidal (Onsala, Sweden)
T9C	Centimetre/e-VLBI	Minnie Mao (JBCA, UK)
T9D	Millimetre/Spectral line (ALMA/NOEMA)	Katharine Johnstone (Leeds U., UK)
12:30	Lunch	
13:30	Advanced Tutorials (Cont.)	
15:30	Tea/Coffee	
16:00	Advanced Tutorials (Cont.)	
17:00	L15: Proposals and scheduling	Marcello Giroletti (INAF, Italy)
17:45	T10: Writing a proposal	
18:30	Close	
19:30	Conference Dinner	
21:00	(Interferometry) Pub Quiz	
Friday, 20 October 2017		
08:50	LOC announcements	
09:00	L16: Archives and legacy data	Marcello Giroletti (INAF, Italy)
09:45	T10: Writing a proposal	
10:30	Tea/Coffee	
11:00	T10: Proposal presentations	
12:30	Lunch	
13:30	T10: Proposal presentations	
15:00	Concluding remarks / Feedback	John McKean (SOC/LOC), Directors
15:30	End of School	

3. PARTICIPANTS

ERIS was open to all regardless of their ethnicity, gender and academic position. However, there was an effort to actively encourage the attendance of those students from developing countries, by advertising the school as widely as possible. Also, all attendees had to agree to the Dwingeloo 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 the size of the venue, we restricted the attendance to approximately 80 students, with a “first come, first served” registration policy. In total, 73 participants attended the school from 21 countries (see Figure 1). The vast majority of the participants were at graduate level (Masters/PhD) with a few staff members and a few at bachelor level. The number that was female was 35, giving a gender ratio between male and female of 1:0.92, which was excellent. It is hoped that future ERIS will maintain this gender parity, and that a similar balance can be achieved at the lecturer / tutorial lead level (1:0.45).

In addition to the participants, there were 16 invited lecturers / tutorial leads and 4 LOC members dealing with the daily organisation of the meeting.



Figure 1 - Map of the world showing the locations of the participants of ERIS 2017.

4. RADIONET FINANCIAL CONTRIBUTION

The RadioNet contribution was used to cover the costs associated with the logistics and running of the school (15k Euros), with up to an additional (5k Euros) used to cover the costs of the invited lecturers and tutors.

5. PUBLICATIONS

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