Report from the event supported by RadioNet

TITLE	*HIGH RESOLUTION SURVEYING WITH INTERNATIONAL LOFAR*
DATE:	***19 – 23 MARCH 2018***
LOCATION:	*LEIDEN, THE NETHERLANDS*
MEETING WEBPAGE:	https://www.lorentzcenter.nl/lc/web/2018/983/info.php3?wsid=983&venue=Snellius
HOST INSTITUTE:	***UOXF***
RADIONET BENEFICIARY / NO:	UOXF / 11

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

Report:

1 SCIENTIFIC SUMMARY

Description and Aims
The aim of this workshop is to bring together expert and novice radio astronomers to (a) learn how to produce high resolution images with the Low Frequency Array (LOFAR, a RadioNet infrastructure) and (b) to discuss and finalize the details for implementing a specialised pipeline to do this on a large scale to post-process already existing observations from an all-sky survey. During this week we will provide tutorials for novices and conduct discussions with all interested parties on the large-scale processing of survey data. This entire workshop was focused on the RadioNet infrastructure of LOFAR, with the goal of improving and disseminating knowledge on how to use LOFAR for high resolution imaging.

Outcome
During the week, we had introductory talks on Monday, several smaller talks on related topics on Tuesday and Wednesday, and scheduled discussions on Thursday/Friday. The rest of the time the participants were divided into dedicated groups which worked on specific tasks. These tasks were:

- Testing the current version of the pipeline
- Addressing how to implement / check the flux density scale
- Subtraction of bright in-field calibrators
- Self-calibration and imaging
- Adapting a surveys quality control pipeline for the LB pipeline

Each day we had about 30 minutes of discussion where the smaller groups provided updates on their progress, to cross-fertilise ideas and collaboration between the groups. By the end of the week, we met these specific goals:

- Novice participants were able to test and run the long baseline pipeline, and provided feedback on the documentation detailing how to use the pipeline.
- A strategy was developed for implementing the steps necessary to provide the correct flux density scale.
- Subtracting bright sources has been successfully accomplished using two different methods.
- The self-calibration and imaging portion of the pipeline is now almost complete, and the only thing that remains is to incorporate the different parts and test.
- The quality control pipeline was successfully written.

The main outcome of the week is a concrete list detailing the issues that now must be addressed for the large-scale implementation of this pipeline for processing surveys data.

Highlights of the week
The highlight of the week was the discussion on Thursday afternoon, which resulted in a pathway forward for those who are working to finalise the pipeline. The participation in this discussion included not only experts but those new to the topic. Another notable moment was the testing of a new type of imaging software developed for the Event Horizon Telescope, but could have drastic and positive applications for critical points in the LOFAR pipeline.

Impact for the RadioNet Community
This event gathered high interest within the LOFAR infrastructure, as well as attention from many RadioNet participating institutions. There are two main impacts for the RadioNet community: 1) a large step forward in the development of high-resolution imaging strategies using LOFAR and 2)

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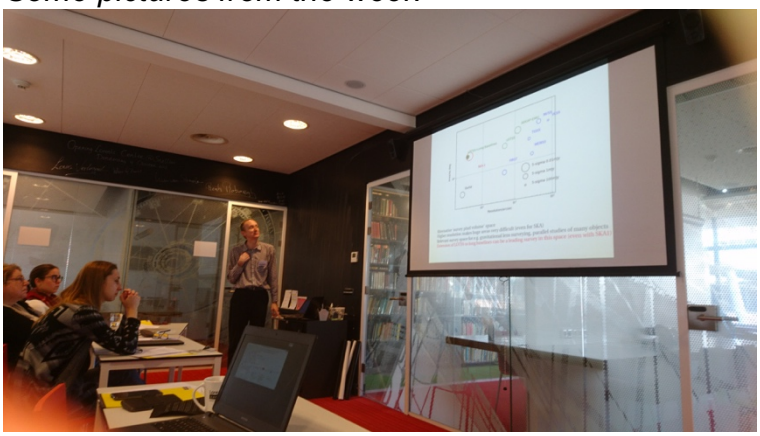
dissemination of this knowledge to new users both at RadioNet participating institutions as well as from RadioNet members to non-RadioNet members.

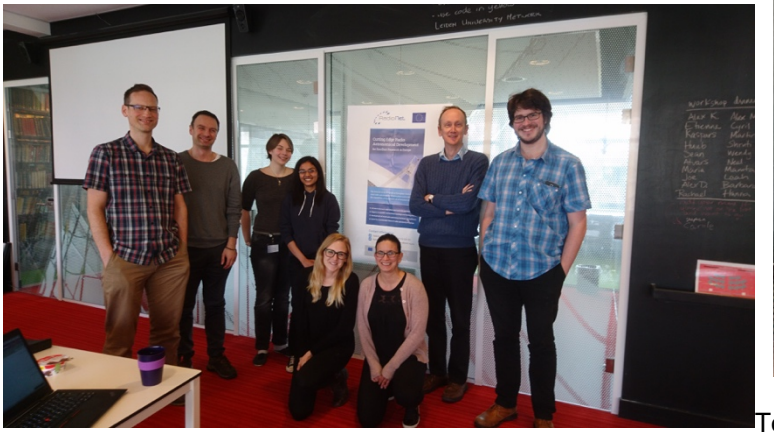
Workshop Format
Although we had a schedule for talks, even these included many discussions. The workshop space was ideal for our needs. It allowed the smaller groups to work without interfering with each other, but we were still able to gather as a large group at least once a day for larger discussions and/or talks.

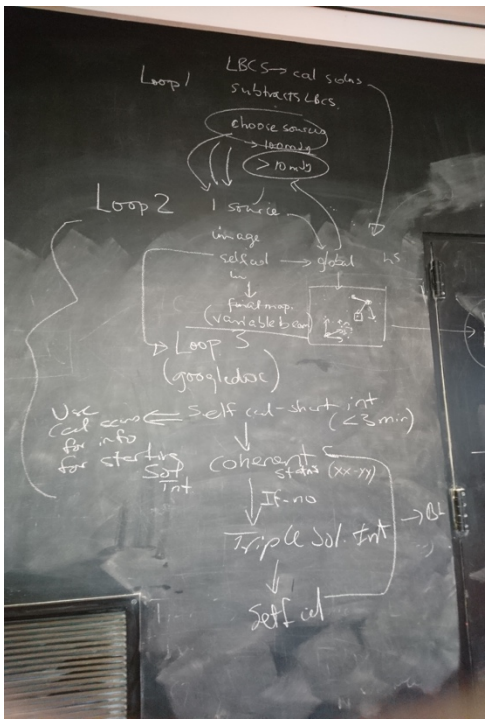
Event webpage
https://www.lorentzcenter.nl/lc/web/2018/983/info.php3?wsid=983

Talks are available at
https://zenodo.org/communities/highreslotss

Some pictures from the week







Top left: Neal Jackson comparing resolutions of radio surveys.
Bottom left: RadioNet funding recipients taking a break from a working session.
Right: A new self-calibration imaging strategy.

2 AGENDA OF THE EVENT

Tutors for the working time:

1. *Alexander Drabent, University of Tautenburg*

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2. *Carole Roskowinski, University of Torun*
3. *Sean Mooney, Trinity College Dublin*
4. *Alexander Kappes, University of Wurzburg*

19 May

	Title	Speaker	Institute
09:30 – 10:15	Arrival, registration	--	
10:15 – 10:30	Welcome by Lorentz Center	Lorentz Center	--
10:30 – 10:45	Opening by organizers: Welcome and explanation of goals	Leah Morabito	University of Oxford
10:45 – 11:15	Science with high-resolution surveys	Martin Hardcastle	University of Hertfordshire
11:15 – 11:50	High resolution imaging with LOFAR	Neal Jackson	University of Manchester
11:50 – 12:10	High resolution results: XMM-LSS	Leah Morabito	University of Oxford
12:10 – 12:30	High resolution results: Young Stellar Objects	Rachael Ainsworth	University of Manchester
12:30 – 14:00	Lunch @Snellius restaurant	--	
14:00 – 14:30	The Long Baseline pipeline	Marco Iacobelli	ASTRON
14:30 – 15:00	Introduction to hands-on sessions, identification of work	Alexander Drabent	University of Tautenburg
15:00 – 16:00	Working time	--	

20 May

	Title	Speaker	Institute
09:00 – 09:20	Building phase screens with Bayesian methods	Josh Albert	Leiden University
09:20 – 10:00	Working time		
10:00 – 10:30	Coffee/tea break		
11:00 – 12:30	Working time		
12:30 – 14:00	Lunch @Snellius restaurant		
14:00 – 14:30	The CASA Fringe-fitter	Ilse van Bemmel	JIVE
14:30 – 17:00	Working time		

21 May

	Title	Speaker	Institute
09:00 – 10:00	Science Results: high-resolution imaging of the Extended Groth Strip	Etienne Bonnasieux	Paris Observatory
10:00 – 10:30	Coffee/tea break		
10:30 – 12:30	Working time		
12:30 – 14:00	Lunch @Snellius restaurant		
14:00 – 17:00	Working time		

22 May

	Title	Speaker	Institute
09:00 – 10:00	Working time		
10:00 – 10:30	Coffee/tea break		
10:30 – 11:30	Discussion of progress 1-slide presentations of results		
11:30 – 12:30	Feedback session: pipeline functionality, documentation	Leah Morabito	University of Oxford
12:30 – 14:00	Lunch @Snellius restaurant		
14:00 – 14:45	LOFAR Two-metre Sky Survey: status + lessons learned	Tim Shimwell	ASTRON, Leiden University
14:45 – 15:15	High resolution processing of LoTSS	Leah Morabito	University of Oxford
15:15 – 15:45	Coffee/tea break		
15:45 – 17:00	Working time		
19:00:00	Workshop dinner		

23 May

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	Title	Speaker	Institute
09:30 – 10:30	Imaging strategies / products	Neal Jackson	University of Manchester
10:30 – 11:00	Coffee/tea break		
11:00 – 12:30	Round table discussion: imaging strategies, sky coverage, data products	Leah Morabito	University of Oxford
12:30 – 14:00	Lunch @Snellius restaurant		
14:00 – 14:30	Radio observatory perspective	Emanuela Orru	ASTRON
14:30 – 15:00	Automating workflows	Alex Mechev	Leiden University
15:00 – 15:30	Coffee/tea break		
15:30 – 16:00	Working time		
16:00 – 17:00	Wrap up: summary of discussions and way forward	Leah Morabito	University of Oxford

3 PARTICIPANTS

The participants came from eight different countries spread across Europe. The majority were from the Netherlands and the United Kingdom, but we also had participants from Latvia, which is joining the International LOFAR collaboration. There were 10 women and 16 men, for a gender balance of 38 per cent women and 62 per cent men. Fifteen participants were young researchers (Master's and PhD students or postdocs within 2 years of earning their PhD), and this included several invited experts. RadioNet support went to young researchers, with preference given to critical people (invited speakers and tutors for working time) first and then given to minorities (women). Participants list can be seen on the event page: https://www.lorentzcenter.nl/lc/web/2018/983/participants.php3?wsid=983&venue=Snellius

4 RADIONET FINANCIAL CONTRIBUTION

The funding covered travel costs of 8 early-career researchers from RadioNet participating countries. Priority was given first to those who were active contributors (i.e., speakers or tutors). Total amount of funding: 2000€

5 PUBLICATIONS

No publications have yet resulted from the work carried out at this workshop, but those who received RadioNet have been made aware that they should include the following acknowledgment: "The project leading to this publication has received funding from the EU's Horizon 2020 research and innovation programme under the grant agreement No 730562