

LOFAR SOURCE FINDERS

WORKING GROUP

- LSM, 14 NOVEMBER 2012 -

C. FERRARI

WITH :

R. BRETON, D. CARBONE, P. CARROLL, A. DABBECH, H. GARS DEN,

A. VAN DER HORST, A. MINTS, R. PALADINO, D. RAFFERTY,

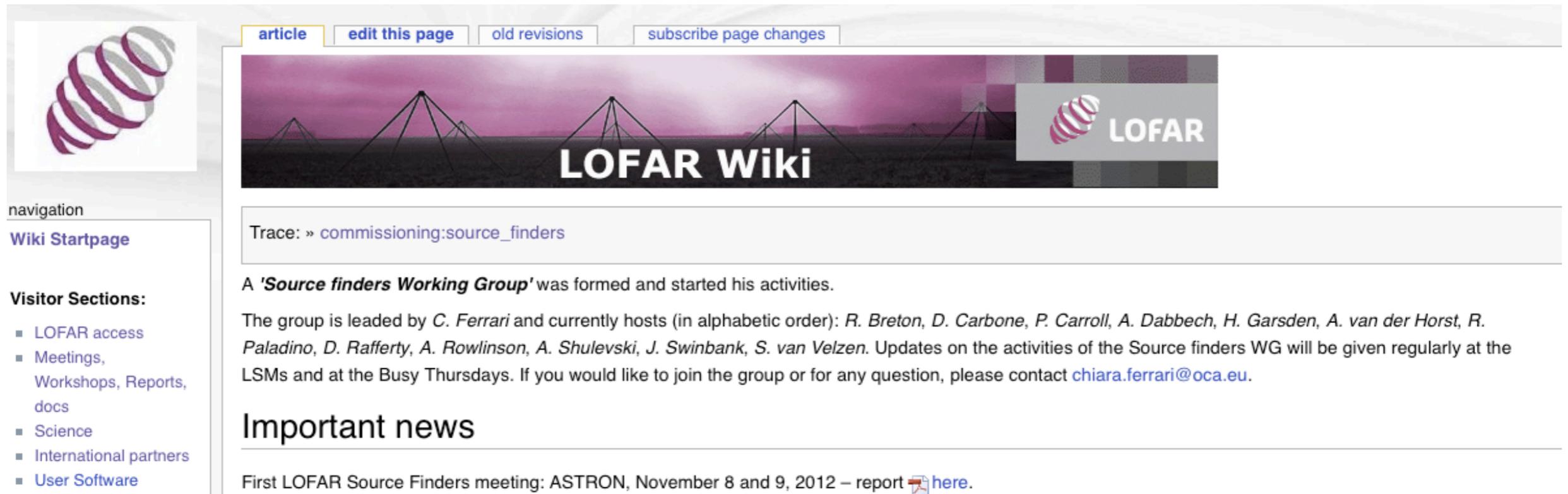
A. ROWLINSON, A. SHULEVSKI, J. SWINBANK, S. VAN VELZEN

AND THE COLLABORATION OF :

G. HEALD, E. ORRÙ, R. PIZZO, M. WISE, S. YATAWATTA

LOFAR SOURCE FINDERS WIKI PAGE

http://www.lofar.org/wiki/doku.php?id=commissioning:source_finders



The screenshot shows the LOFAR Wiki page for 'commissioning:source_finders'. At the top, there are navigation buttons: 'article', 'edit this page', 'old revisions', and 'subscribe page changes'. Below these is a banner image with the text 'LOFAR Wiki' and the LOFAR logo. The main content area starts with a breadcrumb trail: 'Trace: » [commissioning:source_finders](#)'. The text describes the formation of the 'Source finders Working Group' and lists its members: C. Ferrari, R. Breton, D. Carbone, P. Carroll, A. Dabbech, H. Garsden, A. van der Horst, R. Paladino, D. Rafferty, A. Rowlinson, A. Shulevski, J. Swinbank, and S. van Velzen. It also mentions that updates will be given at LSMs and Busy Thursdays, and provides contact information for chiara.ferrari@oca.eu. Below this is a section titled 'Important news' with a link to a report from the first LOFAR Source Finders meeting at ASTRON on November 8 and 9, 2012.

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Trace: » [commissioning:source_finders](#)

A '**Source finders Working Group**' was formed and started his activities.

The group is leaded by *C. Ferrari* and currently hosts (in alphabetic order): *R. Breton, D. Carbone, P. Carroll, A. Dabbech, H. Garsden, A. van der Horst, R. Paladino, D. Rafferty, A. Rowlinson, A. Shulevski, J. Swinbank, S. van Velzen*. Updates on the activities of the Source finders WG will be given regularly at the LSMs and at the Busy Thursdays. If you would like to join the group or for any question, please contact chiara.ferrari@oca.eu.

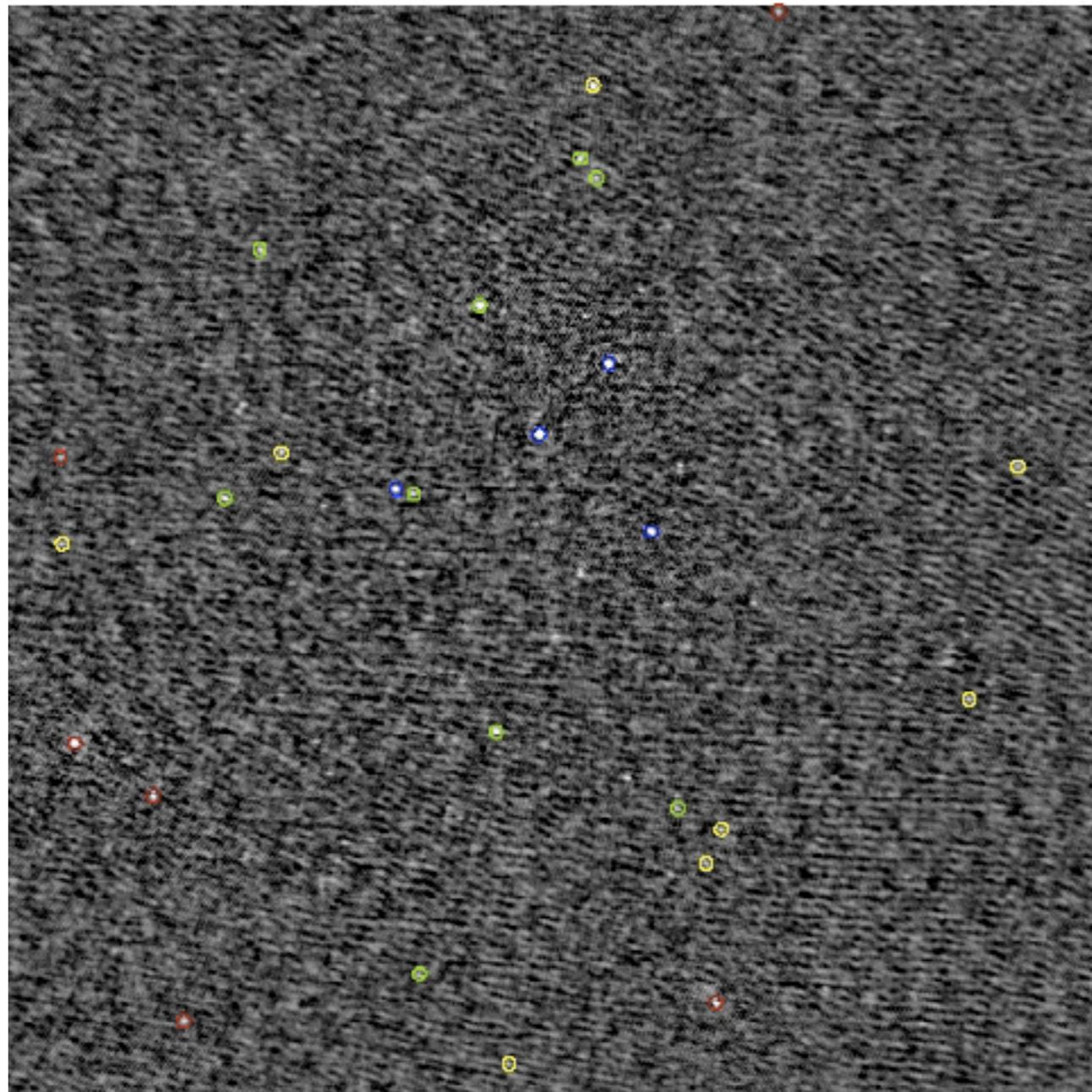
Important news

First LOFAR Source Finders meeting: ASTRON, November 8 and 9, 2012 – report [here](#).

Main current aims

- ▶ report bugs and needs to developers of available source finders
- ▶ provide support to LOFAR users
- ▶ identify the best settings for automatically run source finders in LOFAR / MSSS pipelines
- ▶ LOFAR representative in the international radio source finding joint discussion

TESTS AND DEVELOPMENTS



Circles: objects both in the VLSS and the LOFAR catalogs
(extracted with PyBDSM and/or PySE)

Colors correspond to differences between VLSS and LOFAR fluxes.

Differences :

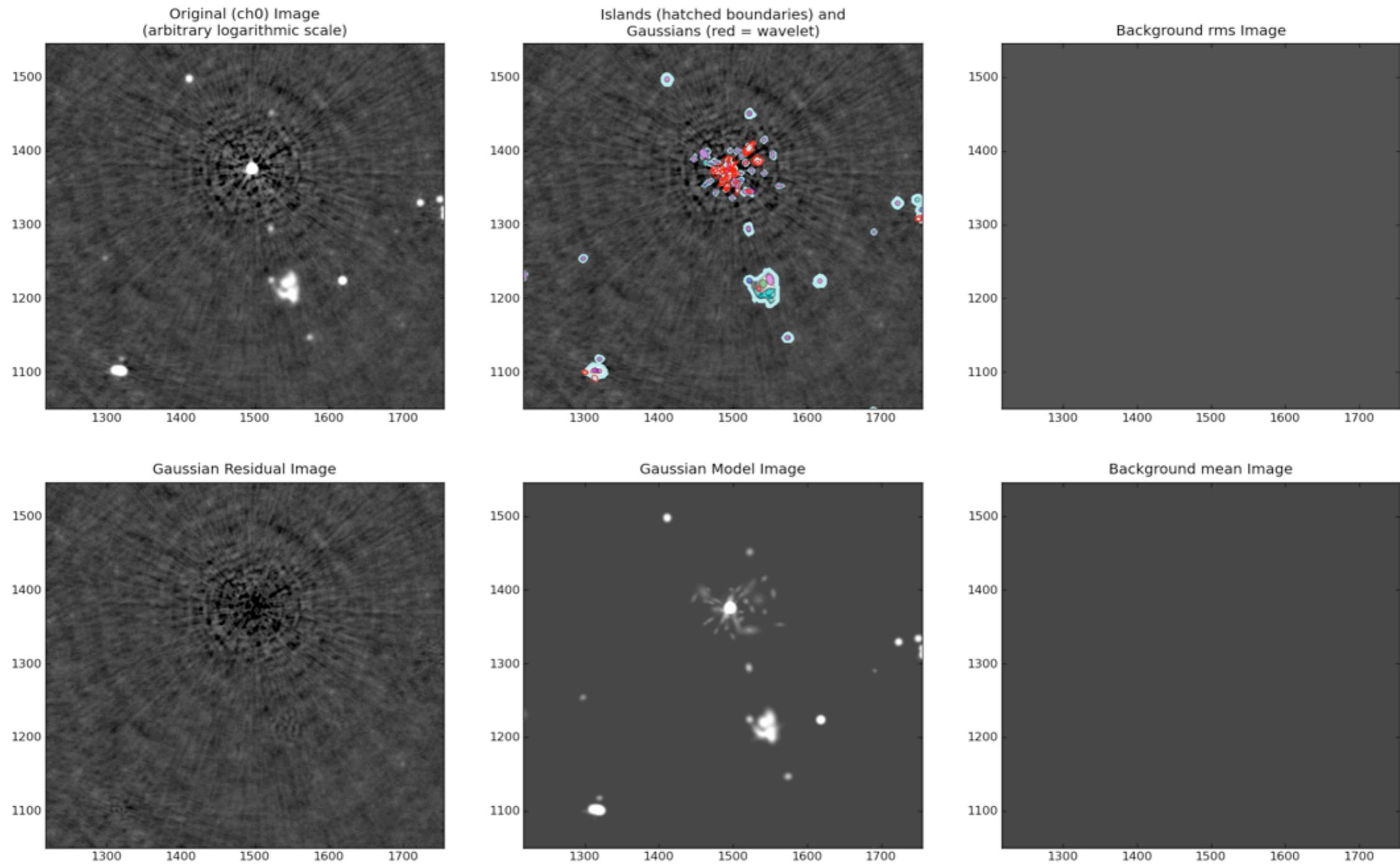
< 40%

< 70%

< 80%

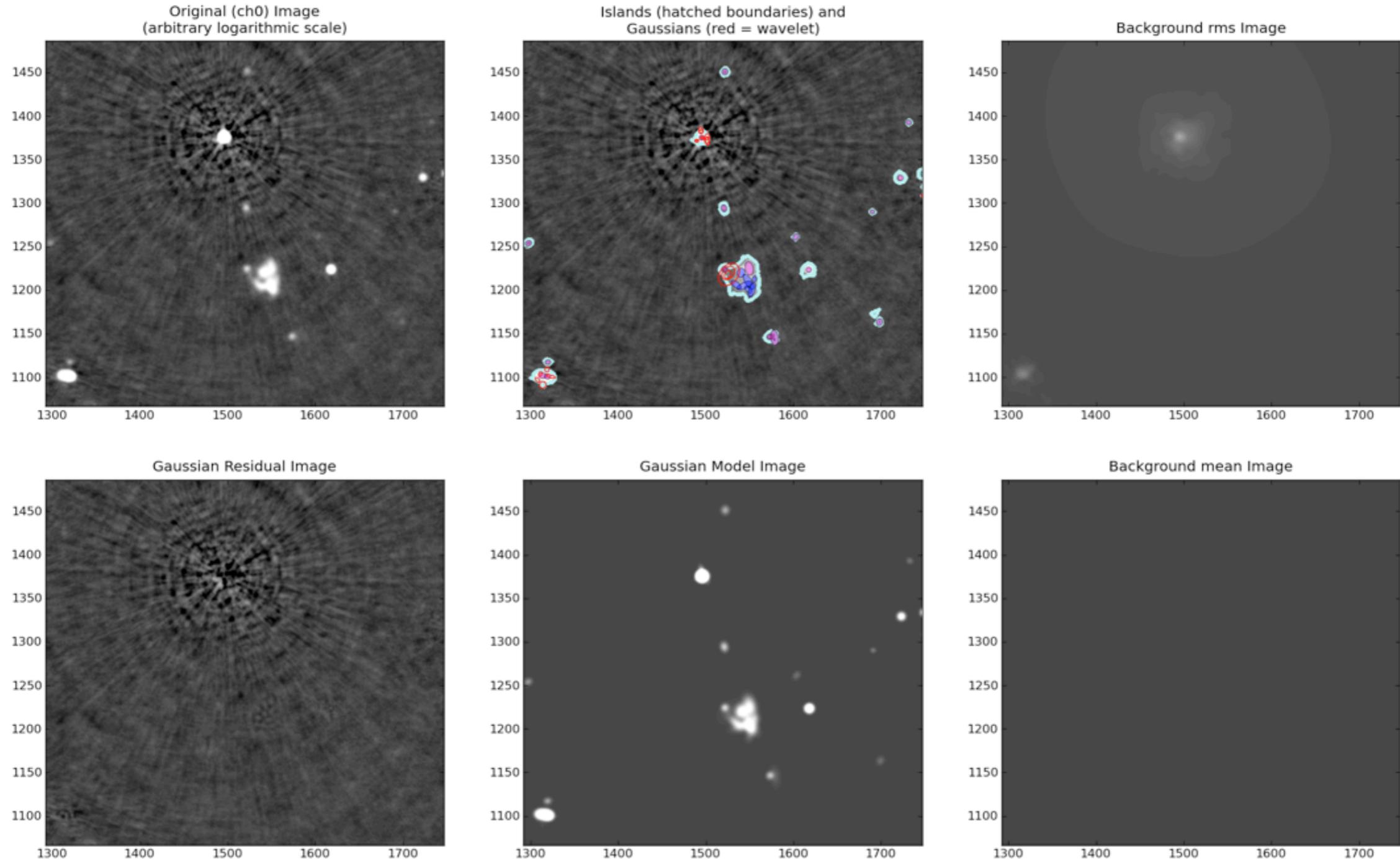
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TESTS AND DEVELOPMENTS

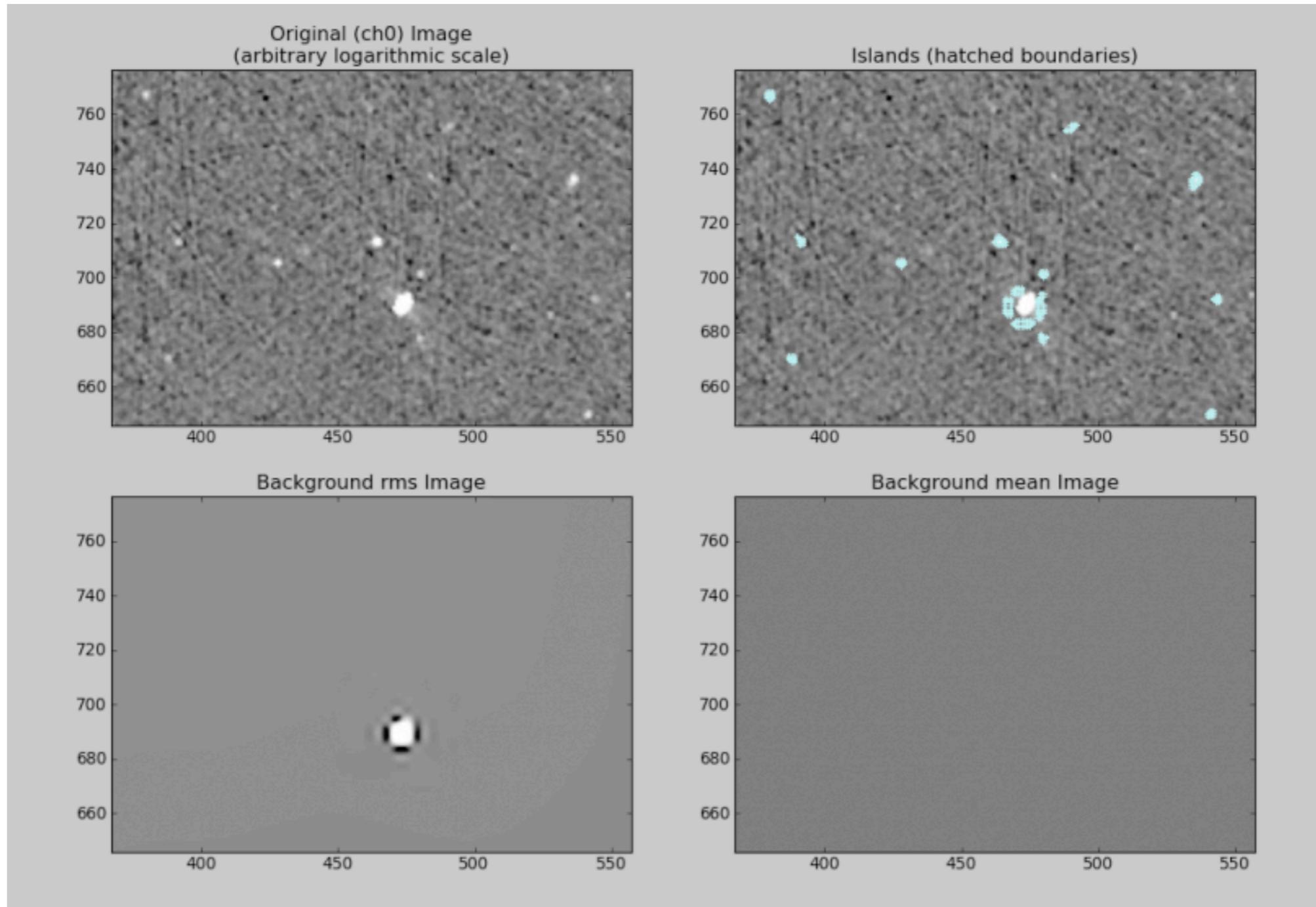


ATCA map (Ferrari et al. 2006)

TESTS AND DEVELOPMENTS

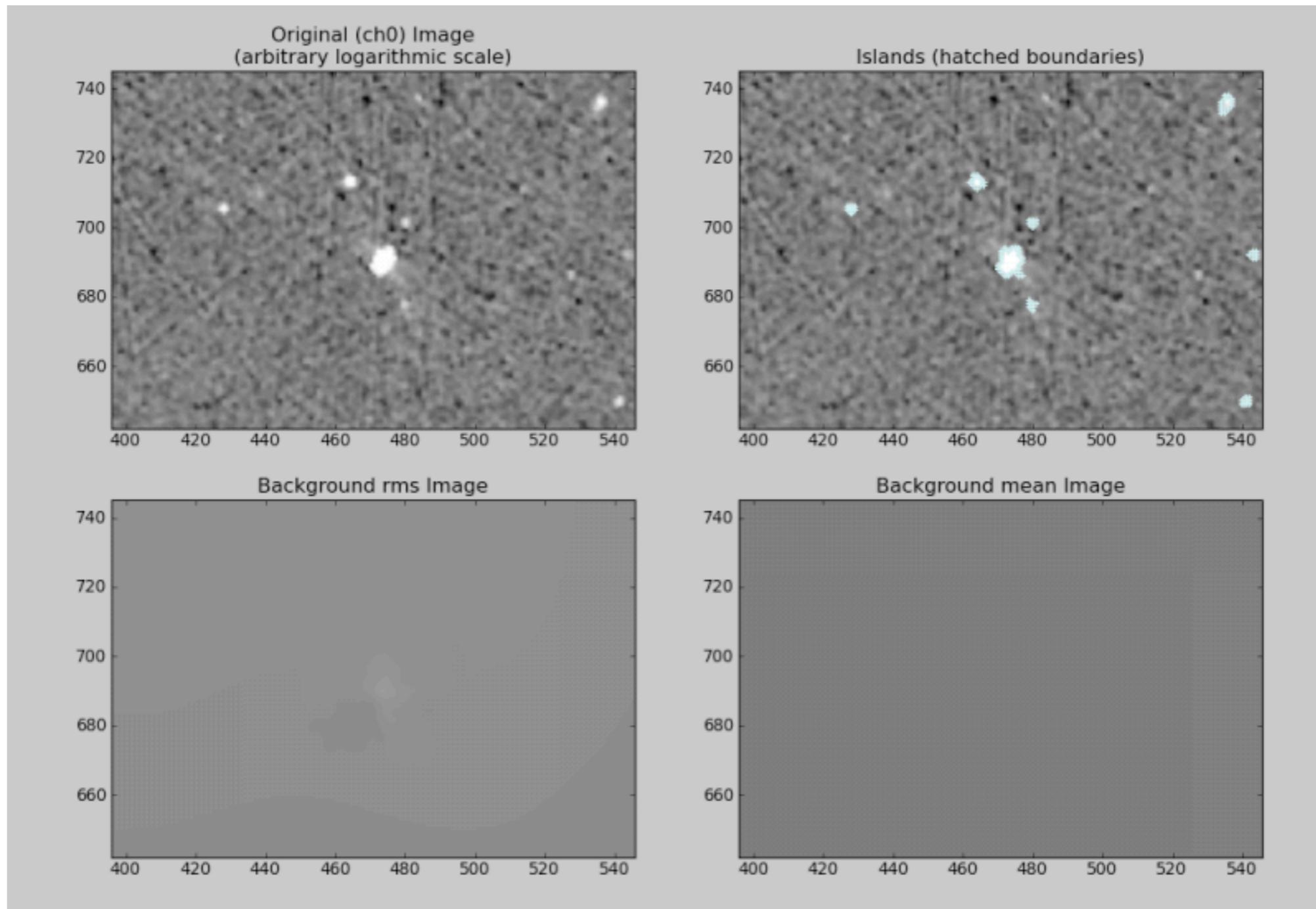


TESTS AND DEVELOPMENTS



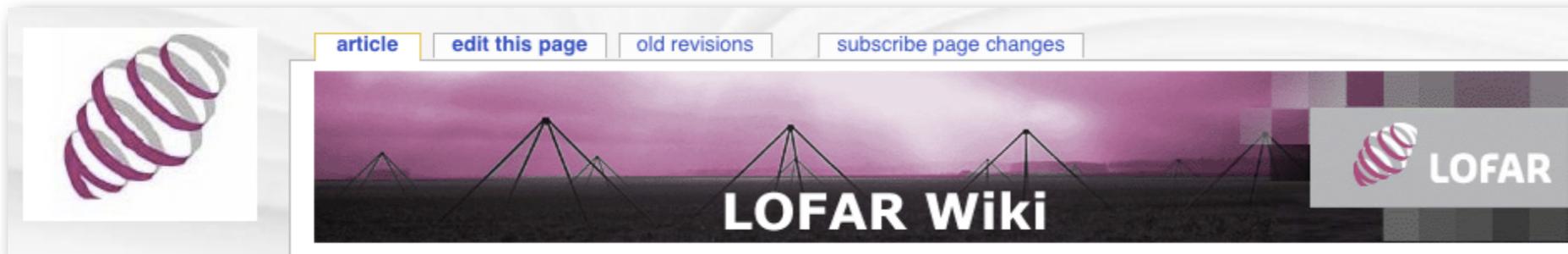
WENSS map posted by [R. Pizzo](#)

TESTS AND DEVELOPMENTS



Test and source finders development by [D. Rafferty](#) and [C. Ferrari](#)

SUPPORT TO LOFAR USERS



2) Identify statistics to state if automatic source extraction was successful or not [\[edit\]](#)

Recent results about a possible automatic strategy for source extraction with PyBDSM are reported [here](#)

Results: [\[edit\]](#)

Problematic cases to be tested by the group: [\[edit\]](#)

Case 1)

I found out that I ran PyBDSM with the `atrous_do=True` on the LOFAR map of GRS1915 more than 2 months ago. It didn't improve the source extraction and I had put in an angle. I ran it again after our meeting and it worked differently... It worked pretty well with the `detection_threshold` set to 5. It didn't work with the detection threshold set to 10, neither running it again on the residual map. Moreover, PyBDSM keeps crashing when I try to run it with `atrous_do=True` on the WSRT map.

You can find the `.fits` file of the LOFAR image & the DS9 `.reg` files of the PyBDSM runs I made today with `atrous_do=True` on my home on CEP2: `/home/carbone/GRS1915/PYBDSM`

DARIO

I have now tested Dario's LOFAR image of GRS1915, and have found it to be very difficult to pick up the faint extended emission, as its brightest peak is <5 sigma when a smaller `rms_box` (< 200 pixels) is used. I had the best results using the new adaptive `rms_box` scaling.

Here are the parameters that gave the best fit (some of these parameters are only available in the newest version, available in `/home/rafferty/PyBDSM` or in the LUS build starting on 20/4/2012):

- `adaptive_rms_box = T` (to use smaller `rms_box` near bright sources to avoid detecting artifacts while still allowing a large `rms_box` everywhere else to pick up diffuse sources)
- `adaptive_thresh = 50` (to set compact sources with peaks above 50 sigma as bright sources, around which the smaller `rms_box` will be used)
- `rms_box = (500,200)` (this sets the large-scale box size that is used far from bright sources; the small scale box size is calculated internally, but can be set using `rms_box_bright`)
- `atrous_do = T` (to pick up extended emission missed in initial fitting)
- `thresh_isl = 2` (needed to detect enough of the extended emission to get good fits)

Below are some plots of the fit (red Gaussians are from fits to wavelet images)

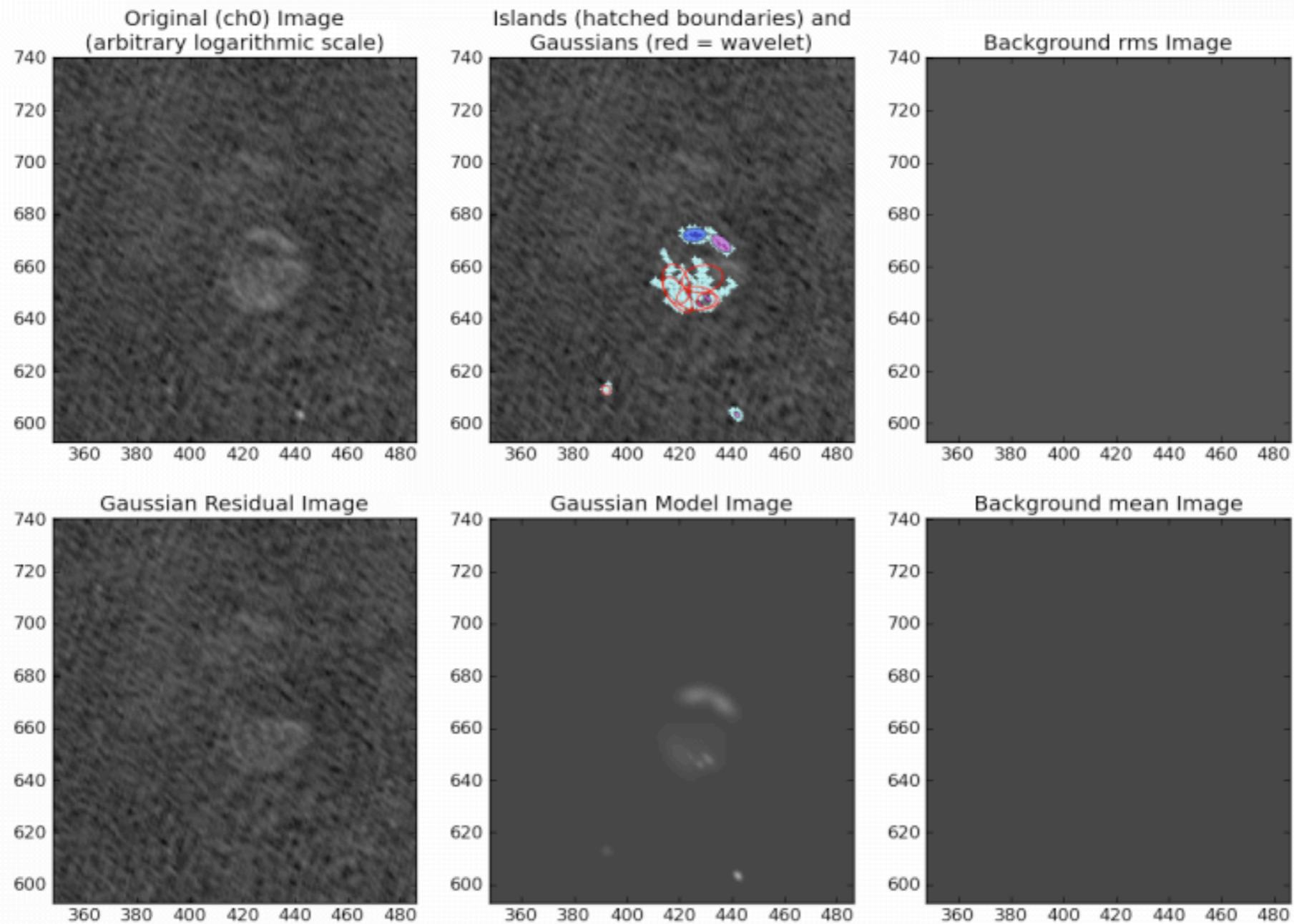
DAVID

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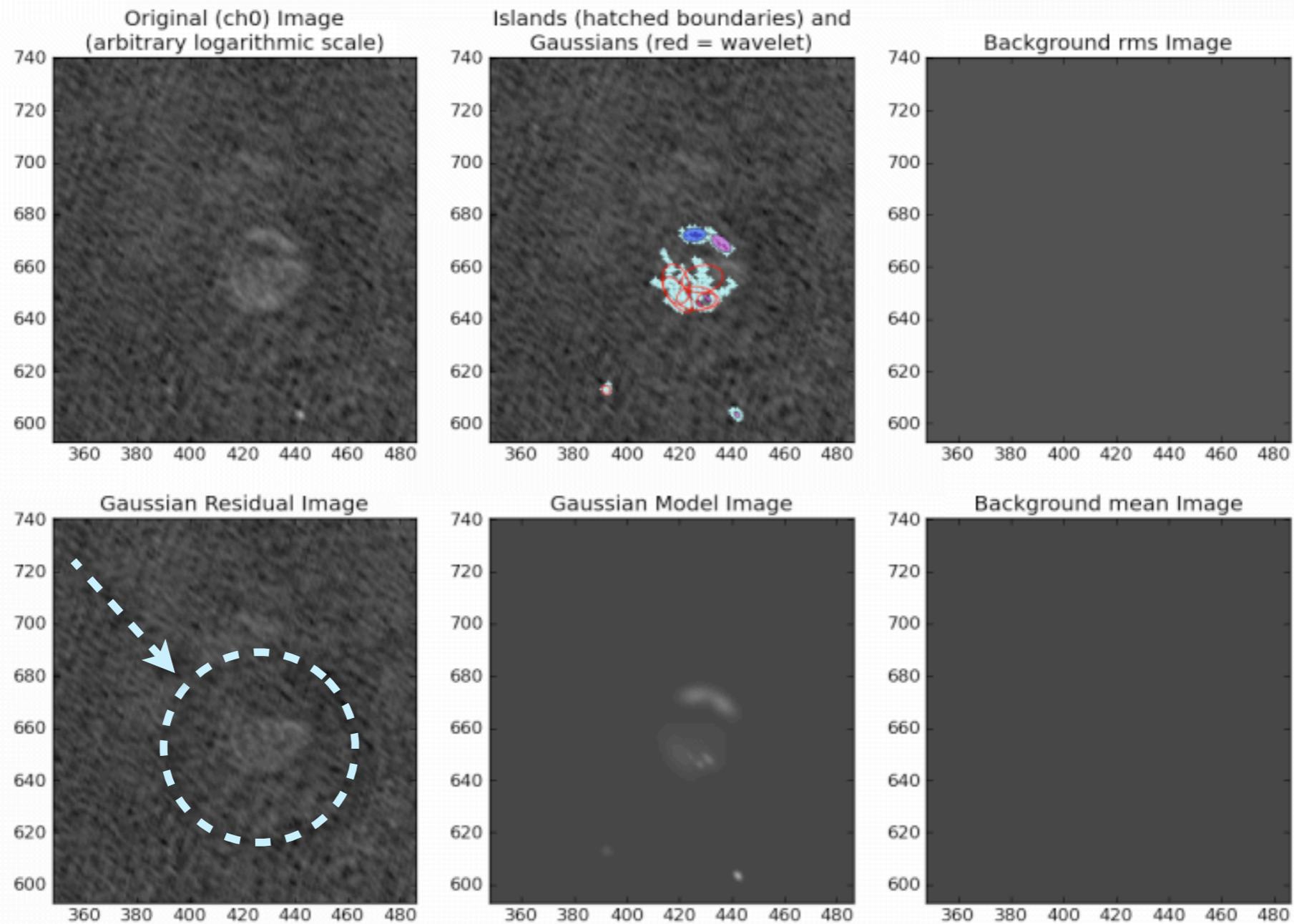
[Example extracted from the Source Finders wiki page](#)

SUPPORT TO LOFAR USERS

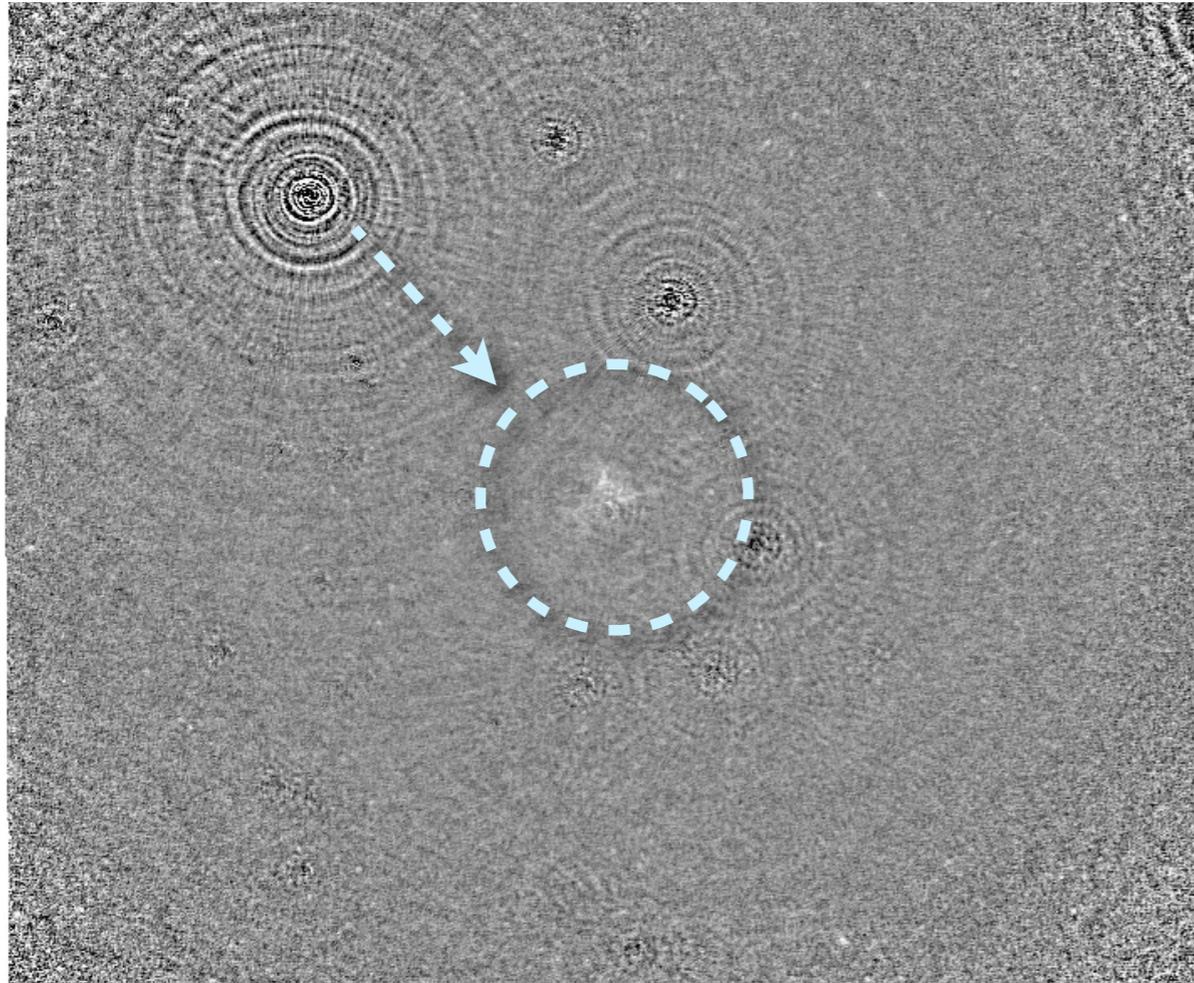


LOFAR map of GRS1915 posted by [D. Carbone](#)
Source extraction by [D. Rafferty](#)

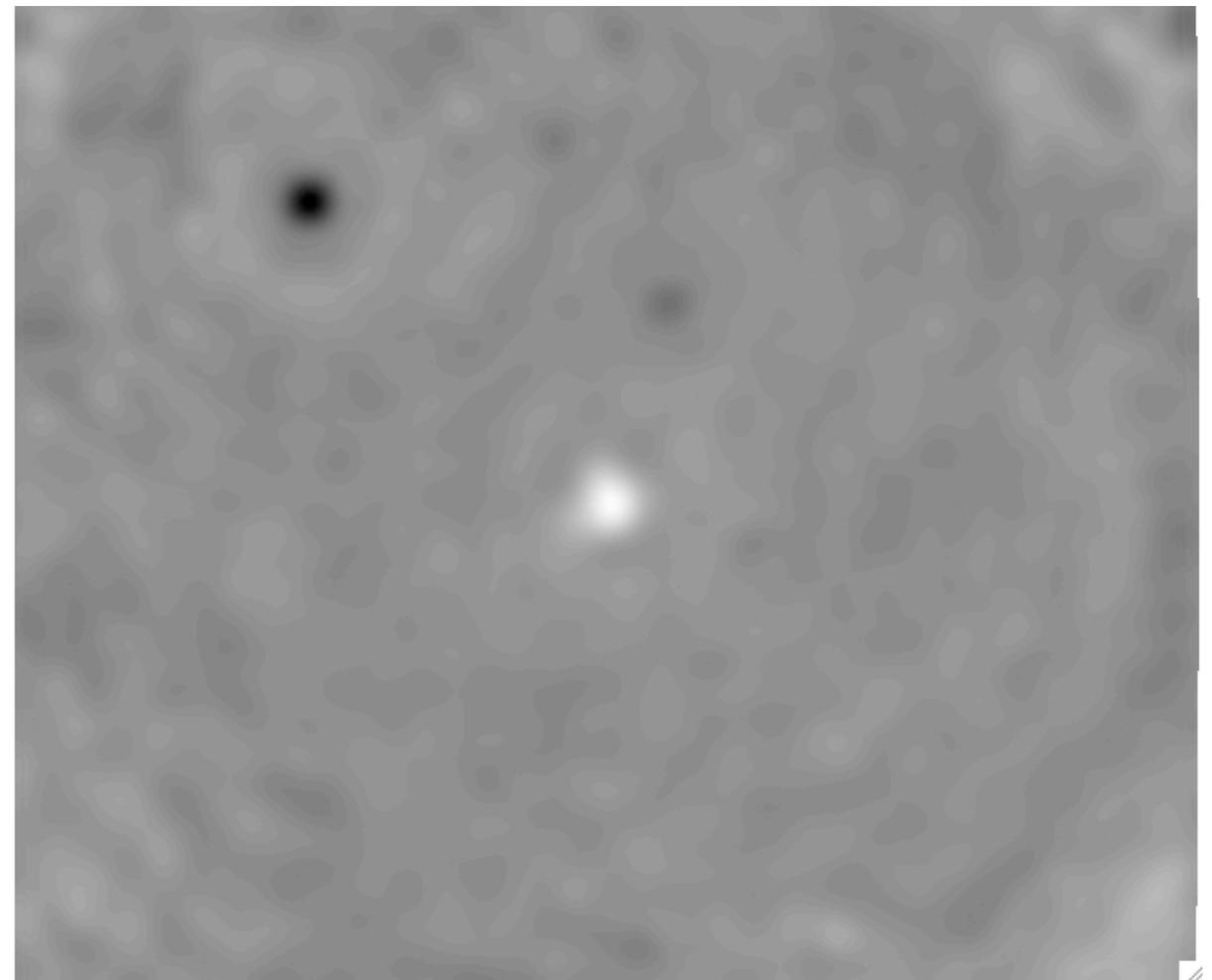
AUTOMATIC DIAGNOSTICS OF NON-DETECTIONS



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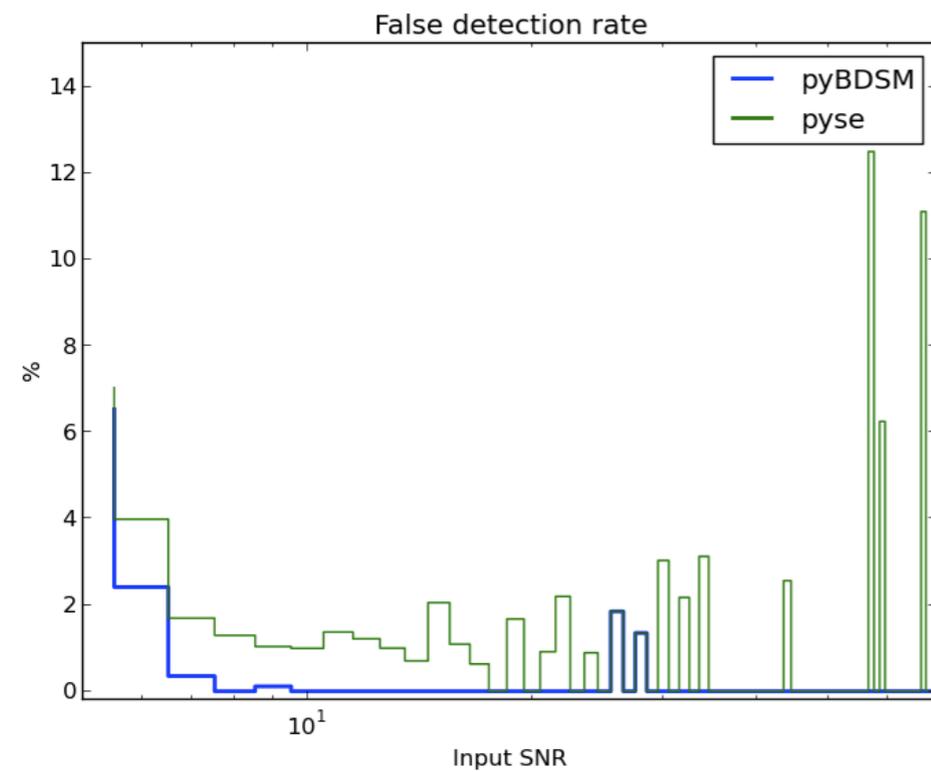
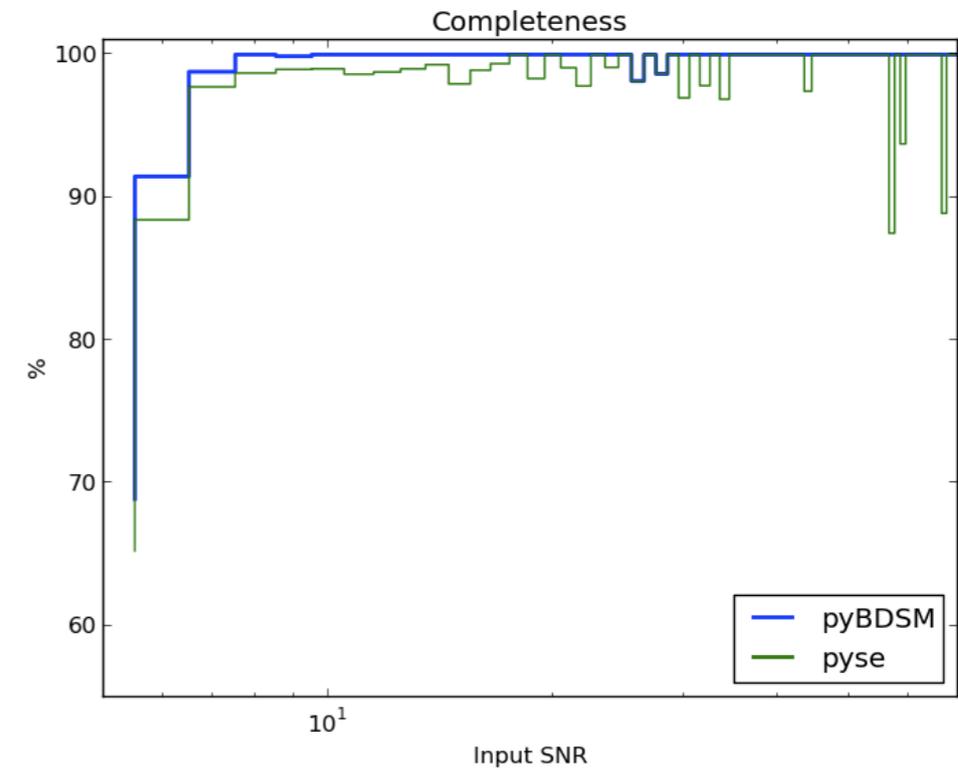
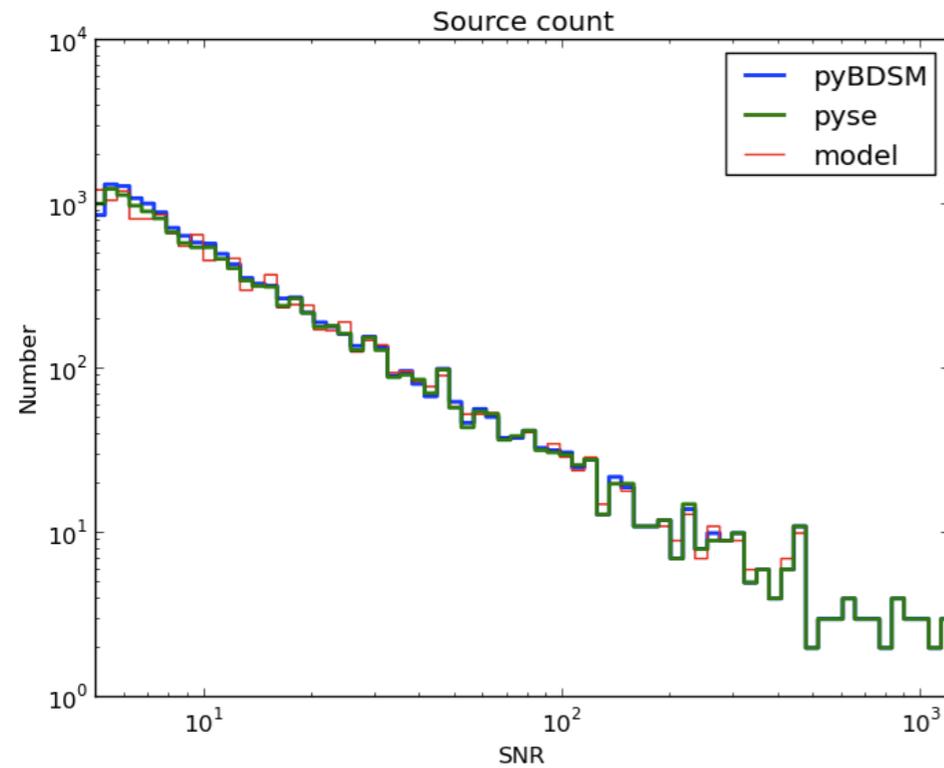


Residuals after PyBDSM source extraction on A2256 LOFAR map (van Weeren et al. 2012)



Smoothed residual map after wavelet transform of A2256 map:
positive skewness
(see C. Ferrari report, July 2012)

STATISTICS ON SOURCE DETECTION



Tests on simulated maps
(Hancock et al. 2012) performed
by R. Paladino

CONCLUSIONS OF THE FIRST SOURCE FINDERS MEETING @ ASTRON (NOV. 12)

Main current open questions for the Working Group

- ▶ Which source finders should we keep testing ?
- ▶ Which are the parameters that are important to set for optimizing source finders ?
- ▶ Which corrections should we introduce in theoretical error bars given by the source finder tools ?
- ▶ Which source association tools and strategy should we use in order to combine and compare different catalogs ?
- ▶ Which source extraction and association strategy should we use for multi-band LOFAR catalogs ?

→ *Need of simulated LOFAR maps*