

Curriculum Vitae

Dr. Hubertus T. Intema (Huib)

General information

Address	National Radio Astronomy Observatory 520 Edgemont Road Charlottesville, VA 22903, USA	Tel: +1 434 244 6805 (office) +1 434 409 0775 (cell) E-mail: hintema@nrao.edu
Birth	April 2, 1971, Leiden, The Netherlands	
Nationality	Dutch	
Languages	English (excellent), Dutch (fluent), German (basic)	

Research interests

Low-frequency radio interferometry

Wide-field calibration and imaging techniques, automated data reduction techniques, algorithm development, the ionosphere

Merging galaxy clusters

Diffuse radio sources (halos, relics), tailed radio galaxies, ICM physics

Radio sky surveys

Low-frequency radio sky, high-redshift radio galaxies

Current and previous positions

2009 – 2012 *Jansky postdoctoral research fellow*
NRAO, Charlottesville, VA, USA

Study the evolution of galaxy clusters using low-frequency (LF) radio interferometry. Targets include diffuse radio halos & relics, and tailed radio galaxies. Duties include writing successful observing proposals, planning and executing observations, (extensive) processing of observational data, and analyzing the resulting images. Develop data processing software to improve and extend direction-dependent (including ionospheric) calibration, to mitigate RFI and bad data, and for semi-automated reduction of LF [E]VLA and GMRT observations. Study the ionosphere by means of, and in support of, LF radio interferometric observations.

2005 – 2009 *Ph.D. candidate in radio astronomy*
Leiden Observatory, Leiden University, The Netherlands

Within the LOFAR survey project, development of direction-dependent (ionospheric) calibration and imaging software for LF interferometric observations. Application of existing and new data reduction techniques to LF VLA and GMRT observations, aimed at constantly improving the image fidelity. Support implementation into the LOFAR reduction pipeline. Study steep-spectrum radio sources, with a focus on identifying possible high-redshift radio galaxies and detecting and studying diffuse radio sources in merging galaxy clusters.

1996 – 2000 *Senior software engineer*
High Tech Automation, Bilthoven, The Netherlands

Design, development, testing, maintenance and documenting of software in military and industrial applications. Projects include training software for a tank simulator, measurement software for a wafer stepper, and control software for a digital video broadcasting system.

Education

- 2005-2009 Ph.D. in Astronomy, Leiden University, The Netherlands
Ph.D. thesis: *A sharp view on the low-frequency radio sky*
Ph.D. advisors: Prof. Dr. H.J.A. Röttgering & Prof. Dr. G.K. Miley
- 2000-2004 Combined B.Sc. & M.Sc. in Astronomy, Leiden University, The Netherlands
(8.3 / 10 grade point average for M.Sc.)
M.Sc. thesis: *Large scale structure at $z = 4$: Lyman-break galaxies in a wide field around radio galaxy TN J1338-1942*
M.Sc. advisor: Dr. H.J.A. Röttgering
B.Sc. thesis: *Hydrodynamical modeling of spherical gravitational collapse*
B.Sc. advisor: Dr. G. Mellema
- 1994-1996 B.Sc. in Electronics, Hogeschool Utrecht, The Netherlands
B.Sc. thesis: *Application of CDMA for PC communication* (in Dutch)
- 1989-1992 Combined B.Sc. & M.Sc. in Electronics, Delft University of Technology, The Netherlands
Completed 2 years of the curriculum

Extracurricular courses

- 2006 Research management training, Leiden University
- 1999 Professional effectivity training, FranklinCovey
- 1998 Structured analysis & design for real-time systems, Philips CTT
- 1997 OS-9 workshop, High Tech Automation
- 1997 Design of technical systems, ISES International

Professional experience

Research fellowships

- 2009 – 2012 Jansky Fellow, NRAO, Charlottesville, VA
- June 2011 Visiting scientist, Observatoire de la Cote d'Azur, Nice, France

Technical experience

Extensive data processing experience of radio interferometric observations (AIPS)
Data processing experience of optical & near-infrared observations (IRAF)
Extensive programming experience (C, Python, IDL, Maple and assembly)
Extensive experience with generic software for different operating systems (Windows, Linux, MS Office, OpenOffice, LaTeX, Adobe software, etc.)
Digital and analog hardware design experience

- Observations* PI of 2 GMRT proposals, co-PI on 6 proposals
PI of 2 [E]VLA proposals, co-PI on 6 proposals

Teaching experience

- 2007 Course assistant for Modern Research by Dr. H. Linnartz, Leiden University
- 2006 Course assistant for Radio Astronomy by Prof. Dr. R.T Schilizzi, Leiden University

Service and support

- 2011 GMRT proposal referee since cycle 20
- 2011 LOC member of the NRAO postdoc symposium
- 2010 – 2011 Lunch talk organizer, NRAO
- 2007 – 2008 Invited speaker for the royal Dutch amateur astronomy organization (KNVWS)
- June 2007 Ionosphere meeting organizer, Leiden University
- 2006 Radio astronomy lunch talk organizer, Leiden University
- 2005 – 2009 Member of the LOFAR survey team, ASTRON / Leiden University
- 2005 – 2009 Member of the LOFAR ionosphere & simulations (LIONS) team, ASTRON / Leiden University
- 2005 – 2007 Member of the astrophysics education committee, Leiden University

Publications

Refereed journals

- H.T. Intema**, R.J. van Weeren, H.J.A. Röttgering and D.V. Lal, 2011, *A&A*, accepted, arXiv:1109.5906
Deep Low-Frequency Radio Observations of the NOAO Boötes Field I. Data Reduction and Catalog Construction
- H.T. Intema**, R.J. van Weeren, H.J.A. Röttgering, et al., 2011, *A&A*, submitted
Low-frequency radio images of the galaxy cluster Abell 2256
- H.T. Intema**, R.J. van Weeren, H.J.A. Röttgering, et al., 2011, in preparation
A Two-meter Radio Mini Survey (T-RaMiSu) around Abell 2256 I. Data Reduction and Catalog Construction
- R.J. van Weeren, H.J.A. Röttgering, **H.T. Intema**, et al., 2011, in preparation
The “toothbrush-relic”: evidence for a coherent linear 2-Mpc scale shock wave in a massive merging galaxy cluster
- C. Ferrari, **H.T. Intema**, E. Orrù, et al., 2011, *A&A*, accepted, arXiv:1107.5945
Discovery of the correspondence between intra-cluster radio emission and a shock heated region detected through the Sunyaev-Zel'dovich effect
- R.J. van Weeren, M. Brüggen, H.J.A. Röttgering, M. Hoeft, S.E. Nuza, **H.T. Intema**, 2011, *A&A*, 533A, 35
Radio continuum observations of new radio halos and relics from the NVSS and WENSS surveys: Relic orientations, cluster X-ray luminosity, and redshift distributions
- J. Helmboldt, J. Lazio, **H. Intema**, K. Dymond, 2011, *Radio Science*, submitted (2011RS004883)
High-precision Measurements of Ionospheric TEC Gradients with the Very Large Array VHF System
- J. Helmboldt, J. Lazio, **H. Intema**, K. Dymond, 2011, *Radio Science*, submitted (2011RS004787)
A New Technique for Spectral Analysis of Ionospheric TEC Fluctuations Observed with the Very Large Array VHF System: From QP Echoes to MSTIDs
- R.J. van Weeren, M. Hoeft, H.J.A. Röttgering, M. Brüggen, **H.T. Intema**, S. van Velzen, 2011, *A&A*, 528A, 38
A double radio relic in the merging galaxy cluster ZwCl 0008.8+5215
- H.T. Intema**, S. van der Tol, W.D. Cotton, et al., 2009, *A&A*, 501, 1185
Ionospheric Calibration of Low Frequency Interferometric Observations using the Peeling Scheme: I. Method Description and First Results
- R.J. van Weeren, **H.T. Intema**, J.B.R. Oonk, H.J.A. Röttgering and T.E. Clarke, 2009, *A&A*, 508, 1269
The discovery of diffuse steep spectrum sources in Abell 2256
- R.J. van Weeren, H.J.A. Röttgering, J. Bagchi, S. Raychaudhury, **H.T. Intema**, et al., 2009, *A&A*, 506, 1083
Radio observations of ZwCl 2341.1+0000: a double radio relic cluster
- H.T. Intema**, B.P. Venemans, J.D. Kurk, M. Ouchi, et al., 2006, *A&A*, 456, 433
Large-scale structure of Lyman break galaxies around a radio galaxy protocluster at $z\sim 4$

Proceedings

T.E. Clarke, T. Enßlin, A. Finoguenov, **H. Intema**, et al., arXiv:1102.5539
The Curious Case of Abell 2256

J. Bagchi, R.J. van Weeren, S. Raychaudhury, H.J.A. Röttgering, **H.T. Intema**, et al., arXiv:1101.4629
A deep radio and X-ray view of cluster formation at the crossroads of filaments

R.J. van Weeren, **H.T. Intema**, H.J.A. Röttgering, M. Bruggen, M. Hoeft, arXiv:1101.5161
Low-frequency radio observations of the galaxy cluster CIZA J2242.8+5301

J. Bagchi, R.J. van Weeren, S. Raychaudhury, H.J.A. Röttgering, **H.T. Intema**, et al., arXiv:1101.4629
A deep radio and X-ray view of cluster formation at the crossroads of filaments

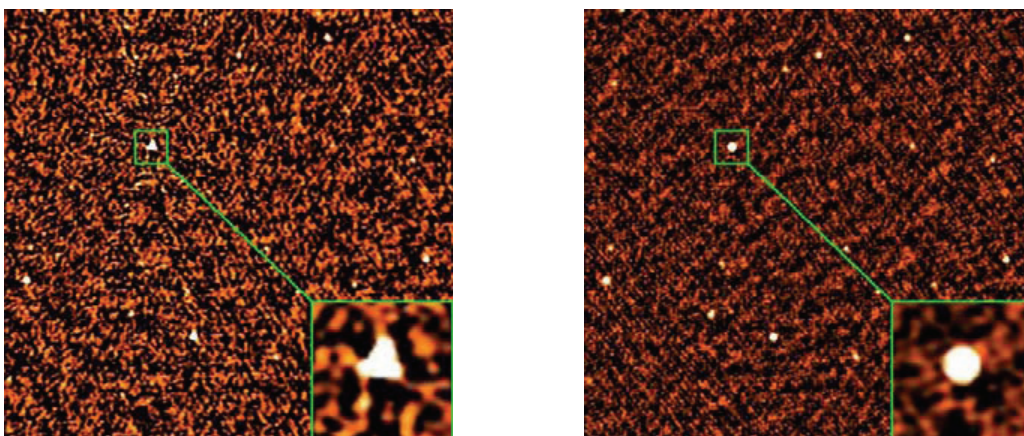
E.O. Orru, **H. Intema**, PoS(ISKAF2010)075
The case of 3C326: VLA 74 MHz observations during a geomagnetic storm

T.E. Clarke, A. Cohen, T. Enßlin, W. Peters, **H.T. Intema**, et al., Bulletin of the AAS, 42, 389
Tracing Diffuse Emission in Galaxy Clusters at Low Frequencies

H.T. Intema, W.D. Cotton, A.S. Cohen, et al., PoS(MRU2007)101
Ionospheric Calibration of Low Frequency Arrays using the Peeling Scheme

H.J.A. Röttgering, **H.T. Intema**, D.V. Lal, G.K. Miley, A.P. Rao and I.A.G. Snellen, 2005, AN, 326, 621
150 MHz observations with the Westerbork and GMRT radio telescopes of Abell 2256 and the Boötes field: ultra-steep spectrum radio sources as probes of cluster and galaxy evolution

H.J.A. Röttgering, **H.T. Intema** and D.V. Lal, 2005,
Low frequency observations of diffuse radio emission combined with high spectral resolution X-ray and optical surveys: a powerful tool for studying the Warm Hot Intergalactic Medium
Proceedings of “Measuring the Diffuse Intergalactic Medium”, Japan



Examples of two ionosphere- corrected images (4 deg^2) using the same 74 MHz VLSS data set but different calibration methods. *Left*: Result from field-based calibration (Cotton et al. 2004). *Right*: Result from SPAM (Intema et al. 2009). In comparison, the latter yields a 42 percent reduction in RMS background noise, an average 7 percent increase in peak flux and a significant reduction of source shape distortions. The boxed source is magnified in the bottom-right corner.

Presentations (from 2008 onwards)

- May 2011 *Low-frequency radio astronomy during a geomagnetic storm*
Space Science & Remote Sensing Divisions Joint Colloquium Series
Naval Research Lab, Washington, DC
- April 2011 *The GMRT experience*
2011 NRAO postdoc symposium, Charlottesville, VA
- May 2011 *Recent progress in ionospheric modeling for calibrating radio interferometers*
13th International Ionospheric Effects Symposium, Alexandria, VA
Session 4B: Radio Diagnostics of the Ionosphere including Low Frequency Arrays
- Jan. 2011 2011 USNC-URSI National Radio Science Meeting, Boulder, CO
Session GJ1: Low Frequency Arrays and the Ionosphere
- Aug. 2010 *Characterizing small-scale ionospheric fluctuations with low-frequency radio interferometers*
CALIM 2010: The 5th SKA Workshop on Calibration and Imaging
Dwingeloo, The Netherlands
- June 2010 *The case of 3C 326: VLA 74 MHz observations during a geomagnetic storm (poster)*
International SKA forum 2010, Assen, The Netherlands
- April 2010 *Reduction of 74 MHz VLA observations using SPAM*
2010 NRAO postdoc symposium, Green Bank, WV
- Feb. 2010 NRAO AOC Wednesday Lunch Series, Socorro, NM
- Jan. 2010 *Radio interferometry beyond metre-wavelengths: wide fields, ionosphere and interference*
Ph.D. colloquium, Leiden University, The Netherlands
- June 2009 *Low-frequency, high-resolution radio images of the Abell 2256 cluster*
Galaxy cluster meeting, Leiden University, The Netherlands
- June 2009 *Ionospheric calibration of low radio frequency interferometric observations using SPAM*
Presentation for the supervisory board of Leiden University, The Netherlands
- Jan. 2009 NRAO AOC Wednesday lunch talk series, Socorro, NM
- Jan. 2009 PandA lunch talk, University of New Mexico, Albuquerque, NM
- Nov. 2008 Remote Sensing Divisions lunch talk, Naval Research Lab, Washington, DC
- Nov. 2008 NRAO CV TUNA lunch talk series, Charlottesville, VA
- Sep. 2008 *LOFAR and the challenge of calibrating out the ionosphere*
Sterrewacht Science Day, Leiden University, The Netherlands
- Aug. 2008 *Ionospheric calibration with SPAM*
2nd Million source shallow survey meeting, ASTRON, Dwingeloo, The Netherlands
- May 2008 LIONS meeting, Leiden University, The Netherlands
- May 2008 LOFAR survey team meeting, Leiden University, The Netherlands
- May 2008 *A new method for ionospheric calibration of low frequency arrays*
Dutch astronomical conference, Dalfsen, The Netherlands
- April 2008 Deep Surveys with SKA Pathfinders conference, Perth, Australia

Referee contact information

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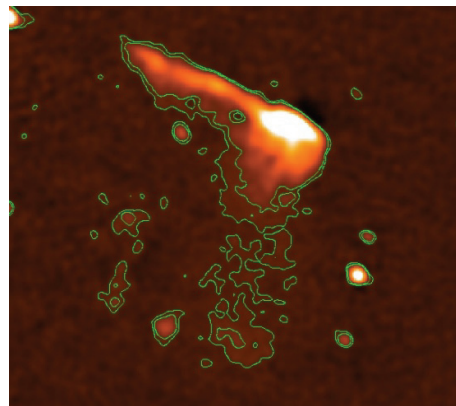
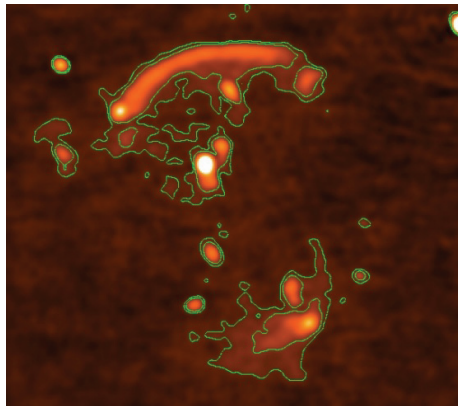
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Two examples of Mpc-scale diffuse radio sources in merging galaxy clusters. *Left*: the ‘sausage’, and *right*: the ‘toothbrush’ (both van Weeren et al., in prep.). Both images were recently created from GMRT 150 MHz observations in a semi-automated way, using Python scripts that are part of the SPAM reduction package (Intema et al. 2009). The bright elongated structures are relics, and are generally found to coincide with the locations of merger shocks. Traces of faint halo emission are visible in the center, and roughly follow the hot (X-ray) ICM gas.