

Nastasha Anna Wijers

e-mail nastasha.wijers@northwestern.edu
interests circumgalactic medium; intergalactic medium; missing baryons; the baryon cycle; galaxy formation; cosmological simulations; X-ray and UV spectra; forward-modeling for (UV/X-ray) observations

Education and work experience

- 2021–now **CIERA fellow**, *CIERA, Northwestern University*.
working with prof.dr. Claude-André Faucher-Giguère on the circumgalactic medium in the FIRE simulations
- 2016–2021 **PhD student**, *Leiden Observatory*.
with prof.dr. J. Schaye. X-raying Extragalactic Gas: warm-hot gas in the EAGLE simulations
- 2015–2016 **MSc Astronomy and Astrophysics, GRAPPA track (Gravitation Astroparticle Physics Amsterdam)**, *University of Amsterdam*.
MSc thesis with prof.dr. S. Ando, day-to-day supervisor dr. M. Fornasa
- 2014–2015 **Master of Advanced Studies (Part III of the Mathematical Tripos)**, *University of Cambridge*,
passed with distinction (the highest pass category).
- 2011–2014 **double BSc in (Astro)physics and Mathematics**, *University of Amsterdam*, cum laude and
with honours, GPA: 9.2 out of 10.

Invited talks

- 2022 **Multi-phase, Multi-temperature and Complex: how AGN feedback shapes the nature of the circum-galactic and halo gas in galaxy groups**, *Garching, Germany*, review.
talk: 'The baryon cycle and how to study it'
- 2022 **LEM Science Workshop (online)**.
talk: 'X-ray line emission from the CGM'
- 2022 **Athena Science Conversation (online)**.
talk: 'Prospective Athena measurements of the warm/hot circumgalactic medium'
- 2020 **AtomDB Workshop and Advanced Spectroscopy School (online)**.
talk: 'Simulating IGM/CGM from Cosmological Simulations'
- 2020 **AAS summer meeting (online)**, special session 'Diffuse X-Ray Emission from the Milky Way'.
talk: 'O VII and O VIII in the CGM of simulated Milky Way mass galaxies'

Contributed talks (selection)

- 2023 **New Views on Feedback & the Baryon Cycle in Galaxies**, *Healesville, Australia*.
talk: 'Constraining feedback physics in FIRE using observed Ne VIII absorption'
- 2019 **What matter(s) between galaxies**, *Spineto, Italy*.
talk: 'The abundance and physical properties of O VII and O VIII absorption systems in the EAGLE simulations'
- 2017 **Dutch Astronomy Conference**, *Nijmegen, the Netherlands*, plenary.
talk: 'UV line absorption around galaxy groups and clusters using the EAGLE simulations'

Awards and prizes

- 2023 **Co-I on ESO period 112 MUSE Proposal 112.25WH**, 'Solving the decades-long missing baryons and missing metals problems in galaxy halos', PI dr. Sayak Dutta, awarded filler time.

- 2020 **LKBF subsidy**, *Stichting Het Leids Kerkhoven-Bosscha Fonds*.
partial travel funding (€1000) for participation in the AAS Summer meeting
- 2015–2016 **Amsterdam Science Talent Scholarship**, *University of Amsterdam*.
full funding (€10,000) for one year MSc studies
- 2014–2015 **the Hawkes Henderson Studentship in Astrophysics and Cosmology**, *Clare College, Cambridge*.
full funding (£19,890) for one year MSc studies
- 2012 **Encouragement prize for young talent in Mathematics and Technical Mathematics**, Koninklijke Hollandsche Maatschappij der Wetenschappen.
for the best results in the first year of the BSc Mathematics at the University of Amsterdam
- 2007–2014 **various olympiads and other competitions (selection)**.
Silver at the International Mathematics Competition for University Students in 2014; 2nd place at the Dutch National Physics Olympiad and an honourable mention at the International Physics Olympiad in 2011; 1st place in 2011 and 3rd place in 2010 at the Dutch National Astronomy Olympiad

Teaching, mentorship, and outreach

- 2022–2023 **mentor for Emma Kaufman (PhD student) in the CIERA network**, *Northwestern University*.
- 2022–2023 **various CIERA outreach events**, *Northwestern University*.
helped at the CIERA Annual Public Lecture and the CIERA Astronomy Night Out, and gave an Astronomer Evening presentation at Dearborn Observatory
- 2020 **daily supervisor for Xinrui Shan's BSc thesis**, *Leiden Observatory*.
- 2018–2019 **daily supervisor for Brian Cook's first, half-year MSc thesis**, *Leiden Observatory*.
- 2016–2018 **teaching assistant**, *Leiden Observatory*.
'Astronomical Relativity'; helped with exercises, explained solutions, marked exams, and graded homework
- 2017, 2018 **assistant at a Leiden Observatory open day and science popularisation event**.
- 2013–2015 **teaching assistant**, *Faculty of Science, University of Amsterdam*.
helped with exercises, explained solutions, and marked exams
- 2011–2015 **assistant at Amsterdam Faculty of Science open days and a science popularisation event**.
- 2011–2012 **private tutor**, high school Greek, university Algebra.

Service

- 2022–2023 **CIERA Seminar Committee member**, *Northwestern University*, helped select & hosted speakers.
- 2021–2023 **Referee**, for papers submitted to MNRAS, ApJ Letters, and Nature.

Software en programming languages

I mostly work with python, including past analysis of large datasets from the EAGLE simulation ($\sim 10^9$ resolution elements) and current work with FIRE simulation data, where good use of `NUMPY` is required. I have used C and OpenMP for parts of this data processing, and I have used and made some modifications to `FORTRAN90` code (`SPECWIZARD`) to generate virtual absorption spectra.

References

- prof. Claude-André Faucher-Giguère**, CIERA, Northwestern University, Evanston, IL, USA.
e-mail: cgiguere@northwestern.edu
- prof. Joop Schaye**, Leiden Observatory, Leiden University, Leiden, the Netherlands.
e-mail: schaye@strw.leidenuniv.nl
- dr. Benjamin D. Oppenheimer**, CASA, University of Colorado Boulder, Boulder, CO, USA.
e-mail: benjamin.oppenheimer@colorado.edu

Publications

ORCID [0000-0001-6374-7185 \(link\)](#)

NASA ADS [publication list \(link\)](#)

google [scholar profile \(link\)](#)

First-author papers (refereed)

- 1 **Nastasha A. Wijers**, Joop Schaye, and Benjamin D. Oppenheimer. “The warm-hot circumgalactic medium around EAGLE-simulation galaxies and its detection prospects with X-ray and UV line absorption”.
In: *MNRAS* 498.1 (Aug. 2020), pp. 574–598. DOI: [10.1093/mnras/staa2456](#). arXiv: [2004.05171 \[astro-ph.GA\]](#)
- 2 **Nastasha A. Wijers**, Joop Schaye, Benjamin D. Oppenheimer, Robert A. Crain, and Fabrizio Nicastro. “The abundance and physical properties of O VII and O VIII X-ray absorption systems in the EAGLE simulations”.
In: *MNRAS* 488.2 (Sept. 2019), pp. 2947–2969. DOI: [10.1093/mnras/stz1762](#). arXiv: [1904.01057 \[astro-ph.GA\]](#)
- 3 **Nastasha A. Wijers** and Joop Schaye. “The warm-hot circumgalactic medium around EAGLE-simulation galaxies and its detection prospects with X-ray-line emission”.
In: *MNRAS* 514.4 (Aug. 2022), pp. 5214–5237. DOI: [10.1093/mnras/stac1580](#). arXiv: [2108.04847 \[astro-ph.GA\]](#)

First-author paper (in prep.)

Nastasha A. Wijers, Claude-Andr  Faucher-Gigu re, Jonathan Stern, Lindsey Byrne, and Imran Sultan. “Ne VIII in the warm-hot circumgalactic medium of FIRE-2 and FIRE-3 simulations and in observations”. Current version: https://nastasha-w.github.io/neviii_current_version.pdf

Observational papers (refereed): provided EAGLE predictions and contributed to comparison and/or interpretation

- co-1 David Spence, Massimiliano Bonamente, Jukka Nevalainen, Toni Tuominen, Jussi Ahoranta, Jelle de Plaa, Wenhao Liu, and **Nastasha Wijers**. “A search for the missing baryons with X-ray absorption lines towards the blazar 1ES 1553+113”.
In: *MNRAS* 523.2 (Aug. 2023), pp. 2329–2350. DOI: [10.1093/mnras/stad1345](#). arXiv: [2305.01587 \[astro-ph.CO\]](#)
- co-2 J. Dorigo Jones, S. D. Johnson, Sowgat Muzahid, J. Charlton, H. -W. Chen, A. Narayanan, Sameer, J. Schaye, and **N. A. Wijers**. “Improving blazar redshift constraints with the edge of the Ly α forest: 1ES 1553+113 and implications for observations of the WHIM”.
in: *MNRAS* 509.3 (Jan. 2022), pp. 4330–4343. DOI: [10.1093/mnras/stab3331](#). arXiv: [2111.06927 \[astro-ph.GA\]](#)
- co-3 Jussi Ahoranta, Alexis Finoguenov, Massimiliano Bonamente, Evan Tilton, **Nastasha Wijers**, Sowgat Muzahid, and Joop Schaye. “Discovery of a multiphase O VI and O VII absorber in the circumgalactic/intergalactic transition region”.
In: *A&A* 656, A107 (Dec. 2021), A107. DOI: [10.1051/0004-6361/202038021](#). arXiv: [2109.12146 \[astro-ph.GA\]](#)
- co-4 Jussi Ahoranta, Jukka Nevalainen, **Nastasha Wijers**, Alexis Finoguenov, Massimiliano Bonamente, Elmo Tempel, Evan Tilton, Joop Schaye, Jelle Kaastra, and Ghassem Gozaliasl. “Hot WHIM counterparts of FUV O VI absorbers: Evidence in the line-of-sight towards quasar 3C 273”.
In: *A&A* 634, A106 (Feb. 2020), A106. DOI: [10.1051/0004-6361/201935846](#). arXiv: [1912.06659 \[astro-ph.GA\]](#)

- co-5 Sean D. Johnson, John S. Mulchaey, Hsiao-Wen Chen, **Nastasha A. Wijers**, Thomas Connor, Sowgat Muzahid, Joop Schaye, Renyue Cen, Scott G. Carlsten, Jane Charlton, Maria R. Drout, Andy D. Goulding, Terese T. Hansen, and Gregory L. Walth. “The Physical Origins of the Identified and Still Missing Components of the Warm-Hot Intergalactic Medium: Insights from Deep Surveys in the Field of Blazar 1ES1553+113”.
In: *ApJ* 884.2, L31 (Oct. 2019), p. L31. DOI: 10.3847/2041-8213/ab479a. arXiv: 1909.11667 [astro-ph.GA]
- co-6 F. Nicastro, J. Kaastra, Y. Krongold, S. Borgani, E. Branchini, R. Cen, M. Dadina, C. W. Danforth, M. Elvis, F. Fiore, A. Gupta, S. Mathur, D. Mayya, F. Paerels, L. Piro, D. Rosa-Gonzalez, J. Schaye, J. M. Shull, J. Torres-Zafra, **N. Wijers**, and L. Zappacosta. “Observations of the missing baryons in the warm-hot intergalactic medium”.
In: *Nature* 558.7710 (June 2018), pp. 406–409. DOI: 10.1038/s41586-018-0204-1. arXiv: 1806.08395 [astro-ph.GA]
- [Theoretical papers \(refereed\): contributed or helped with EAGLE analysis, supplied other data \(e.g., minimum detectable surface brightness\), or participated in discussions](#)
- co-7 Lýdia Štofanová, Aurora Simionescu, **Nastasha A. Wijers**, Joop Schaye, Jelle S. Kaastra, Yannick M. Bahé, and Andrés Arámburo-García. “Prospects for detecting the circum- and intergalactic medium in X-ray absorption using the extended intracluster medium as a backlight”.
In: *MNRAS* (Nov. 2023). DOI: 10.1093/mnras/stad3554. arXiv: 2311.10062 [astro-ph.CO]
- co-8 M. Arabsalmani, L. Garratt-Smithson, **N. Wijers**, J. Schaye, A. Burkert, C. D. P. Lagos, E. Le Floc'h, D. Obreschkow, C. Peroux, and B. Schneider. “A Comprehensive Study on the Relation between the Metal Enrichment of Ionized and Atomic Gas in Star-forming Galaxies”.
In: *ApJ* 952.1, 67 (July 2023), p. 67. DOI: 10.3847/1538-4357/acd4b7. arXiv: 2301.07738 [astro-ph.GA]
- co-9 Dylan Nelson, Chris Byrohl, Anna Ogorzalek, Maxim Markevitch, Ildar Khabibullin, Eugene Churazov, Irina Zhuravleva, Akos Bogdan, Priyanka Chakraborty, Caroline Kilbourne, Ralph Kraft, Annalisa Pillepich, Arnab Sarkar, Gerrit Schellenberger, Yuanyuan Su, Nhut Truong, Stephan Vladutescu-Zopp, and **Nastasha Wijers**. “Resonant scattering of the O VII X-ray emission line in the circumgalactic medium of TNG50 galaxies”.
In: *MNRAS* 522.3 (July 2023), pp. 3665–3678. DOI: 10.1093/mnras/stad1195. arXiv: 2306.05453 [astro-ph.GA]
- co-10 T. Tuominen, J. Nevalainen, P. Heinämäki, E. Tempel, **N. Wijers**, M. Bonamente, M. A. Aragon-Calvo, and A. Finoguenov. “Cosmic metal invaders: Intergalactic O VII as a tracer of the warm-hot intergalactic medium within cosmic filaments in the EAGLE simulation”.
In: *A&A* 671, A103 (Mar. 2023), A103. DOI: 10.1051/0004-6361/202244508. arXiv: 2301.07771 [astro-ph.CO]
- co-11 Lýdia Štofanová, Aurora Simionescu, **Nastasha A. Wijers**, Joop Schaye, and Jelle S. Kaastra. “Galaxy cluster photons alter the ionization state of the nearby warm-hot intergalactic medium”.
In: *MNRAS* 515.3 (Sept. 2022), pp. 3162–3173. DOI: 10.1093/mnras/stac1854. arXiv: 2207.10069 [astro-ph.CO]
- co-12 Adam J. Batten, Alan R. Duffy, Chris Flynn, Vivek Gupta, Emma Ryan-Weber, and **Nastasha Wijers**. “Fast radio bursts as probes of feedback from active galactic nuclei”.
In: *MNRAS* (Mar. 2022). DOI: 10.1093/mnras/stab3020. arXiv: 2109.13472 [astro-ph.GA]
- co-13 Adam J. Batten, Alan R. Duffy, **Nastasha A. Wijers**, Vivek Gupta, Chris Flynn, Joop Schaye, and Emma Ryan-Weber. “The cosmic dispersion measure in the EAGLE simulations”.
In: *MNRAS* 505.4 (Aug. 2021), pp. 5356–5369. DOI: 10.1093/mnras/stab1528. arXiv: 2011.14547 [astro-ph.CO]

- co-14 T. Tuominen, J. Nevalainen, E. Tempel, T. Kuutma, **N. Wijers**, J. Schaye, P. Heinämäki, M. Bonamente, and P. Ganeshaiah Veena. “An EAGLE view of the missing baryons”.
In: *A&A* 646, A156 (Feb. 2021), A156. DOI: 10.1051/0004-6361/202039221. arXiv: 2012.09203 [astro-ph.CO]
- co-15 Sarah Walsh, Sheila McBreen, Antonio Martin-Carrillo, Thomas Dauser, **Nastasha Wijers**, Jörn Wilms, Joop Schaye, and Didier Barret. “Detection capabilities of the Athena X-IFU for the warm-hot intergalactic medium using gamma-ray burst X-ray afterglows”.
In: *A&A* 642, A24 (Oct. 2020), A24. DOI: 10.1051/0004-6361/202037775. arXiv: 2007.10158 [astro-ph.IM]
- co-16 Benjamin D. Oppenheimer, Ákos Bogdán, Robert A. Crain, John A. ZuHone, William R. Forman, Joop Schaye, **Nastasha A. Wijers**, Jonathan J. Davies, Christine Jones, Ralph P. Kraft, and Vittorio Ghirardini. “EAGLE and Illustris-TNG Predictions for Resolved eROSITA X-Ray Observations of the Circumgalactic Medium around Normal Galaxies”.
In: *ApJ* 893.1, L24 (Apr. 2020), p. L24. DOI: 10.3847/2041-8213/ab846f. arXiv: 2003.13889 [astro-ph.GA]
- co-17 Benjamin D. Oppenheimer, Jonathan J. Davies, Robert A. Crain, **Nastasha A. Wijers**, Joop Schaye, Jessica K. Werk, Joseph N. Burchett, James W. Trayford, and Ryan Horton. “Feedback from supermassive black holes transforms centrals into passive galaxies by ejecting circumgalactic gas”.
In: *MNRAS* 491.2 (Jan. 2020), pp. 2939–2952. DOI: 10.1093/mnras/stz3124. arXiv: 1904.05904 [astro-ph.GA]
- co-18 Deborah Lokhorst, Roberto Abraham, Pieter van Dokkum, **Nastasha Wijers**, and Joop Schaye. “On the Detectability of Visible-wavelength Line Emission from the Local Circumgalactic and Intergalactic Medium”.
In: *ApJ* 877.1, 4 (May 2019), p. 4. DOI: 10.3847/1538-4357/ab184e. arXiv: 1904.07874 [astro-ph.GA]

White papers: provided or contributed to EAGLE predictions

- co-19 F. Nicastro, J. Kaastra, C. Argiroffi, E. Behar, S. Bianchi, F. Bocchino, S. Borgani, G. Branduardi-Raymont, J. Bregman, E. Churazov, M. Diaz-Trigo, C. Done, J. Drake, T. Fang, N. Grosso, A. Luminari, M. Mehdipour, F. Paerels, E. Piconcelli, C. Pinto, D. Porquet, J. Reeves, J. Schaye, S. Sciortino, R. Smith, D. Spiga, R. Tomaru, F. Tombesi, **N. Wijers**, and L. Zappacosta. “The Voyage of Metals in the Universe from Cosmological to Planetary Scales: the need for a Very High-Resolution, High Throughput Soft X-ray Spectrometer”.
In: *Experimental Astronomy* 51.3 (June 2021), pp. 1013–1041. DOI: 10.1007/s10686-021-09710-2
- co-20 Aurora Simionescu, Stefano Ettori, Norbert Werner, Daisuke Nagai, Franco Vazza, Hiroki Akamatsu, Ciro Pinto, Jelle de Plaa, **Nastasha Wijers**, Dylan Nelson, Etienne Pointecouteau, Gabriel W. Pratt, Daniele Spiga, Giuseppe Vacanti, Erwin Lau, Mariachiara Rossetti, Fabio Gastaldello, Veronica Biffi, Esra Bulbul, Maximilien J. Collon, Jan-Willem den Herder, Dominique Eckert, Filippo Fraternali, Beatriz Mingo, Giovanni Pareschi, Gabriele Pezzulli, Thomas H. Reiprich, Joop Schaye, Stephen A. Walker, and Jessica Werk. “Voyage through the hidden physics of the cosmic web”.
In: *Experimental Astronomy* 51.3 (June 2021), pp. 1043–1079. DOI: 10.1007/s10686-021-09720-0. arXiv: 1908.01778 [astro-ph.CO]
- co-21 Benjamin Oppenheimer, Juna Kollmeier, Andrey Kravtsov, Joel Bregman, Daniel Angles-Alcazar, Robert Crain, Romeel Dave, Lars Hernquist, Cameron Hummels, Joop Schaye, Grant Tremblay, G. Mark Voit, Rainer Weinberger, Jessica Werk, **Nastasha Wijers**, John A. ZuHone, Akos Bogdan, Ralph Kraft, and Alexey Vikhlinin. “Imprint of Drivers of Galaxy Formation in the Circumgalactic Medium”.
In: *BAAS* 51.3, 280 (May 2019), p. 280. arXiv: 1903.11130 [astro-ph.GA]

- co-22 Joel Bregman, Edmund Hodges-Kluck, Benjamin D. Oppenheimer, **Nastasha Wijers**, Laura Brenneman, Juna Kollmeier, Jelle Kaastra, Jiangtao Li, Eric D. Miller, Andrew Ptak, Randall Smith, Pasquale Temi, Feryal Ozel, and Alexey Vikhlinin. "A Survey of Hot Gas in the Universe". In: *BAAS* 51.3, 450 (May 2019), p. 450. arXiv: 1903.11630 [astro-ph.GA]