Joonas Nättilä

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Sex: Male
Born: June 25th, 1989, Tornio, Finland
Nationality: Finnish citizen
Languages: Finnish (native), English, Swedish

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Research interests

High-energy astrophysics: accretion (accretion disks); compact objects (neutron stars, black holes)
Nuclear physics: equation of state of cold ultra-dense matter
General relativity: ray tracing
Statistics: Bayesian inference; Monte Carlo methods

Employment

2018 –2019	**Nordita Fellow**, Nordita, Stockholm, Sweden.

Education

2014–2017	**Ph.D. in Astrophysics (with honours)**, University of Turku, Finland. Supervisor: Prof. Juri Poutanen, Director of Tuorla Observatory. Title: X-ray bursts as a tool to constrain the equation of state of the ultra-dense matter inside neutron stars
2012–2013	**M.Sc. in Astronomy**, University of Oulu, Finland.
2008–2012	**B.Sc. in Physics**, University of Oulu, Finland.

Awards & Recognitions

2018	Turku Finnish University Society Prize for best doctoral dissertation
2018	Väisälä Prize 2018: Prize for outstanding thesis in Astronomy
2018	PCS Best Doctoral Thesis of 2017 Prize
2016	Nordita Visiting Ph.D. Fellow

Presentations & Talks (selected)

2018	**Astroplasmas: Particle acceleration and transport**, Rende, Italy.
2018	*Invited:* **Time for Accretion**, Sigtuna, Sweden.
2018	**Astroplasmas seminar**, Princeton, USA.
2018	*Invited:* **Fire and Ice: Hot QCD meets cold and dense matter**, Saariselkä, Finland.
2017	*Invited:* **Holographic dense QCD and neutron stars**, ENS, Paris, France.
2016	*Invited:* **From quarks to gravitational waves**, CERN.
2016	*Invited:* **JINA-CEE Symposium: Neutron Stars in the Multi-Messenger Era**, Ohio, USA.

In total 7 invited, 19 contributed.

Professional Societies and Services

2018–	IAU Junior member
2016–	eXTP Dense Matter science working group
2015–	ESA XIPE satellite Science Team (SWG2.2 Accreting Millisecond Pulsars)
2013–	Member of JuliaLang organization (Open source community for Julia programming language)
2012–	Member of Finnish Astronomical Society

In addition, referee for Monthly Notices of the Royal Astronomical Society and Astronomy & Astrophysics since 2016.

Public outreach

My research has been presented in various local (Finnish) media: tiedetuubi.fi (30.11.2016), Turun Sanomat (10.11.2017), Turkulainen (10.11.2017), Tähdet & Avaruus (25.11.2017), Aamuset (8.12.2017), Tekniikka & Talous (8.12.2017), Verkkouutiset (8.12.2017); And in international media: Cosmos 27.11.2017.

December 10, 2018

Publications — Joonas Nättilä

15 refereed publications, 227 citations; h-index 7, g-index 15, i10-index 7 (ADS).

Peer-reviewed scientific articles

[15] J. J. M. in't Zand, E. Bozzo, J. Qu, X.-D. Li, L. Amati, Y. Chen, I. Donnarumma, V. Doroshenko, S. A. Drake, and et al. (incl. **J**. **Nättilä**). Observatory science with eXTP. *Science China Physics, Mechanics, and Astronomy*, 62:29506, February 2019.

[14] Z. Li, V. F. Suleimanov, J. Poutanen, T. Salmi, M. Falanga, **J**. **Nättilä**, and R. Xu. Evidence for the Photoionization Absorption Edge in a Photospheric Radius Expansion X-Ray Burst from GRS 1747−312 in Terzan 6. *ApJ*, 866:53, October 2018, [arXiv:1809.00098].

[13] T. Salmi, **J**. **Nättilä**, and J. Poutanen. Bayesian parameter constraints for neutron star masses and radii using X-ray timing observations of accretion-powered millisecond pulsars. *A&A, in press*, May 2018, [arXiv:1805.01149].

[12] P. Pihajoki, M. Mannerkoski, **J**. **Nättilä**, and P. H. Johansson. General purpose ray-tracing and polarized radiative transfer in General Relativity. *ApJ*, 863:8, August 2018, [arXiv:1804.04670].

[11] **J**. **Nättilä** and P. Pihajoki. Radiation from rapidly rotating oblate neutron stars. *A&A*, 615:A50, July 2018, [arXiv:1709.07292].

[10] **J**. **Nättilä**, M. C. Miller, A. W. Steiner, J. J. E. Kajava, V. F. Suleimanov, and J. Poutanen. Neutron star mass and radius measurements from atmospheric model fits to X-ray burst cooling tail spectra. *A&A*, 608:A31, December 2017, [arXiv:1709.09120].

[9] V. F. Suleimanov, J. J. E. Kajava, S. V. Molkov, **J**. **Nättilä**, A. A. Lutovinov, K. Werner, and J. Poutanen. Basic parameters of the helium-accreting X-ray bursting neutron star in 4U 1820-30. *MNRAS*, 472:3905–3913, December 2017, [arXiv:1708.09168].

[8] J. J. E. Kajava, K. I. I. Koljonen, **J**. **Nättilä**, V. Suleimanov, and J. Poutanen. Variable spreading layer in 4U 1608-52 during thermonuclear X-ray bursts in the soft state. *MNRAS*, 472:78–89, November 2017, [arXiv:1707.09479].

[7] J. Kuuttila, J. J. E. Kajava, **J**. **Nättilä**, S. E. Motta, C. Sánchez-Fernández, E. Kuulkers, A. Cumming, and J. Poutanen. Flux decay during thermonuclear X-ray bursts analysed with the dynamic power-law index method. *A&A*, 604:A77, August 2017, [arXiv:1705.05653].

[6] V. F. Suleimanov, J. Poutanen, **J**. **Nättilä**, J. J. E. Kajava, M. G. Revnivtsev, and K. Werner. The direct cooling tail method for X-ray burst analysis to constrain neutron star masses and radii. *MNRAS*, 466:906–913, April 2017, [arXiv:1611.09885].

[5] J. J. E. Kajava, **J**. **Nättilä**, J. Poutanen, A. Cumming, V. Suleimanov, and E. Kuulkers. Detection of burning ashes from thermonuclear X-ray bursts. *MNRAS*, 464:L6–L10, January 2017, [arXiv:1608.06801].

[4] **J**. **Nättilä**, A. W. Steiner, J. J. E. Kajava, V. F. Suleimanov, and J. Poutanen. Equation of state constraints for the cold dense matter inside neutron stars using the cooling tail method. *A&A*, 591:A25, June 2016, [arXiv:1509.06561].

[3] **J**. **Nättilä**, V. F. Suleimanov, J. J. E. Kajava, and J. Poutanen. Models of neutron star atmospheres enriched with nuclear burning ashes. *A&A*, 581:A83, September 2015, [arXiv:1507.01525].

[2] J. J. E. Kajava, **J**. **Nättilä**, O.-M. Latvala, M. Pursiainen, J. Poutanen, V. F. Suleimanov, M. G. Revnivtsev, E. Kuulkers, and D. K. Galloway. The influence of accretion geometry on the spectral evolution during thermonuclear (type I) X-ray bursts. *MNRAS*, 445:4218–4234, December 2014, [arXiv:1406.0322].

[1] J. Poutanen, **J**. **Nättilä**, J. J. E. Kajava, O.-M. Latvala, D. K. Galloway, E. Kuulkers, and V. F. Suleimanov. The effect of accretion on the measurement of neutron star mass and radius in the low-mass X-ray binary 4U 1608-52. *MNRAS*, 442:3777–3790, August 2014, [arXiv:1405.2663].

Proceedings

[1] P. Soffitta, R. Bellazzini, E. Bozzo, V. Burwitz, A. Castro-Tirado, E. Costa, T. Courvoisier, H. Feng, S. Gburek, R. Goosmann, and et al. (incl. **J**. **Nättilä**) XIPE: the x-ray imaging polarimetry explorer. In *Space Telescopes and Instrumentation 2016: Ultraviolet to Gamma Ray*, volume 9905 of *Proc. SPIE*, page 990515, July 2016.

Theses

[3] **J. Nättilä**. X-ray bursts as a tool to constrain the equation of state of the ultra-dense matter inside neutron stars. PhD thesis, University of Turku, Finland, 2017. `ISBN:978-951-29-7057-5`.

[2] **J. Nättilä**. Mass and radius constraints for neutron stars using the cooling tail method. Master's thesis, University of Oulu, Finland, 2013. `oulu-201312041966`.

[1] **J. Nättilä**. Spectral analysis of X-ray bursts from neutron stars: IGR J1747–2721 (*Neutronitähtien röntgenpurkaukset ja niiden spektrianalyysi: IGR J1747–2721*). Bachelor's thesis, University of Oulu, Finland, 2012.

Open source software

[6] **PlasmaBox**, Modern C++14/python3 toolbox for kinetic plasma simulations. `https://github.com/natj/plasmabox`

[5] **CORGI**, C++14 grid infrastructure for massively parallel multi-physics simulations. `https://github.com/natj/corgi`

[4] **mpi4cpp**, User-friendly C++14 MPI headers with template metaprogramming. `https://github.com/natj/mpi4cpp`

[3] **Bender, ray tracing code**, General relativistic ray tracing code for computing radiation from rapidly rotating oblate neutron stars in Julia/python3. `https://github.com/natj/bender`

[2] **Hydro, modular 2D hydrodynamical code** with unsplitted HLLC Rieman solver, second order Runge-Kutta time-stepping, and linear piecewise reconstruction written in pure Julia. `https://github.com/natj/hydro`

[1] **CellularAutomata.jl**, Julia library for 1/2D elementary and totalistic Cellular automata modeling. `https://github.com/natj/CellularAutomata.jl`

+ Smaller libraries and software available at `https://github.com/natj`.