

Vera Gluscevic

Curriculum Vitae

University of Southern California
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Research Interests

Cosmological and astrophysical probes of new physics; fundamental nature of dark matter and dark energy; dark matter direct detection; cosmic microwave background theory and analysis; near-field cosmology; 21-cm cosmology; forward modeling and inference in physics.

Appointments

- 2019–Present **University of Southern California, Department of Physics and Astronomy, Los Angeles, CA.**
- Gabilan Assistant Professor
- 2018–2019 **University of Florida, Department of Physics, Gainesville, FL.**
- Assistant Professor (on leave)
- 2018–2019 **Princeton University, Department of Physics, Princeton, NJ.**
- Visiting Research Scholar
- 2013–2018 **Institute for Advanced Study, Princeton, NJ.**
- Postdoctoral Member
 - Eric Schmidt Fellow (2016–2018)
 - Maternity leave (summer 2013; spring 2017)

Education

- June 2013 **Ph.D. in Astrophysics, California Institute of Technology, Pasadena, CA.**
- Thesis: *CMB as a Probe of New Physics and Old Times*.
 - Adviser: Prof. Marc Kamionkowski.
- June 2007 **B.S. in Astrophysics, University of Belgrade, Belgrade, Serbia.**
- Award “Prof. Zaharije Brkic” (for the best student in class of 2007).
 - Faculty for Mathematics Award for Excellence in Studies (2004; 2005).
 - Serbian Ministry of Education and Faculty for Mathematics Excellence Award (2006).

Service and Leadership

- 2018–Present **Simons Observatory Collaboration.**
- Analysis pipeline development co-lead
 - Likelihood and Theory working group co-lead

- 2018–2020 **CMB-S4 Collaboration**, *community-wide effort to design the next-generation ground-based cosmic microwave background experiment.*
- Member of the Science Council (2018-2020)
 - Lead of the Dark Matter working group (2018-2020)
- 2020 **Snowmass21**, *particle physics community planning process.*
- **Principal author of a Letter of Interest** “Cosmic Probes of Dark Matter Interactions: Challenges for Theory and Analysis”, submitted to Snowmass Cosmic Frontiers working group, August 2020.
- 2019 **Astro2020 Decadal Survey**, *community input coordination.*
- **Principal author of science white paper** “Cosmological Probes of Dark Matter Interactions: The Next Decade”, submitted to the National Academies, March 2019 [ArXiv:1903.05140].
 - Key contributor to four science white papers, submitted to the National Academies, March 2019. (https://sites.nationalacademies.org/SSB/CurrentProjects/SSB_185159)
 - Key contributor to three project white papers (Simons Observatory, CMB-S4, PICO).
- 2019/2020 **USC Diversity, Equity, and Inclusion Caucus**, member.
- 2015–2018 **IAS Committee on Diversity**, member.
- 2016, 2020 **NSF astrophysics grant proposal review**, panelist.
- 2020 **NASA grant proposal review**, panelist.
- 2013–Present **Journal referee**: Physical Review D, Physical Review Letters, Journal of Cosmology and Astroparticle Physics.

Organization

- 2019–Present USC Women in Physics, founder.
- 2019–Present USC CosmoLab, founder and organizer.
- 2019/2020 USC Physics and Astronomy Colloquium, organizer.
- 2019 COSMO19 conference in Aachen, Germany, co-convener.
- 2019 AAS meeting-in-a-meeting on Dark Matter, St. Louis, MO, organizer.
- 2014-2015 IAS Informal Seminar, organizer.
- 2012-2013 “CMB Tea” meetings for Caltech Cosmology Group, founder and organizer.

Teaching

- Spring 2020 **Cosmology (ASTR 424)**, *Upper-division course for undergraduates*, Department of Physics and Astronomy, University of Southern California, CA.
- Summer 2010 **Forces and Rocketry**, *Summer course*, Wilson Middle School in Pasadena, CA.

- 2008–2011 **Teaching assistant**, *California Institute of Technology*.
- Ay101: *Physics of Stars*, Fall 2008, Prof. L. Hillenbrand.
 - Prepared solutions, held office hours, graded problem sets.
 - Ay21: *Galaxies and Cosmology*, Winter 2008, Prof. C. Steidel.
 - Held office hours, graded problem sets, organized material reviews.
 - Ay1: *The Evolving Universe*, Spring 2009, Prof. N. Scoville.
 - Section Instructor: *Astrobiology*.
 - Ph1: *Introductory Course in Newtonian Mechanics*, Fall 2009, Prof. J. Zmuidzinas.
 - Graded problem sets and quizzes.
 - Ph1: *Introductory Course in Newtonian Mechanics*, Fall 2010, Prof. J. Zmuidzinas.
 - Section instructor.

Student Mentoring

- 2019–Present **Ph.D. thesis adviser**.
 Isabella Johansson (USC, thesis student), Aryan Rahimieh (USC, thesis student), George (Trey) Driskell (USC), Jack Lonergan (USC)
- 2019–Present **Undergraduate student project advisor**.
 Karime Maamari (USC, class of 2020), Dimple Sarnaaik (USC, class of 2021), David Nguyen (USC, class of 2021), Brenda Zhou (USC, class of 2021), Resherle Verna (USC, class of 2020), Christian Glover (USC, class of 2020), Connor Powers (USC, class of 2021), Francisco Silva Pavon (USC, class of 2021), Praayas Aggarwal (USC, class of 2021)
- 2016–2020 **External project advisor (graduate students)**.
 Jack Lashner (USC, 2020), Ethan Nadler (Stanford, 2019), Zack Li (Princeton, 2017/18), Samuel Witte (UCLA, 2016)
- Summer 2015–2018 **Undergraduate Summer Research Program (USRP)**, *Department of Astrophysical Sciences, Princeton University*, Student Project Adviser.
 ○ Aizhan Akhmetzhanova (*Non-linearities in interacting cosmologies*; Summer/Fall 2018.)
 ○ Emery Trott (*CMB- S_4 sensitivity to dark matter interactions*; Summer 2017.)
 ○ Katelyn Neese (*Annual modulation as a model-selection tool*; Summer/Fall 2015.)
- 2011–2013 **Astronomy peer mentoring program**, *California Institute of Technology*.
 ○ Mentored junior grad students: Melodie Kao, Io Kleiser.
- Summer 2010 **Summer Undergraduate Research Fellowship (SURF) Program**, *California Institute of Technology*.
 ○ Co-advised student: Jason Sanders (*Constraining cosmic birefringence with AGN*.)

Outreach

- June 2020 Physics Festival, USC, panelist
- January 2020 Students for the Exploration and Development of Space, USC, talk: *The cosmological hunt for dark matter*.
- March 2018 IAS After Hours Conversations, talk: *Did we discover evidence for dark matter collisions at the dawn of first stars?*
- October 2016 Lunch with a Member, talk for the Friends of the IAS: *Cosmic microwave background: a cosmologist's discovery tool*.

- March 2016 IAS After Hours Conversations, talk: *What is dark matter?*
- September 2015 IAS Staff Welcome Reception, presentation on current research.
- December 2014 Princeton Amateur Astronomer's Association (AAAP), public talk: *How do you "catch" dark matter?*
- August 2013 Public lecture, Belgrade Planetarium, Serbia: *Glow of the past: Story of the CMB (Sjaj prošlosti: Prica o mikrotalasnoj kosmičkoj pozadini).*
- Spring 2012 "The 2012 Venus Transit at Caltech" public outreach program: volunteer.
- Summer 2009 "Letenka" astronomy summer camp, Fruska Gora, Serbia: Invited consultation session for Serbian undergraduates interested in studying abroad.
- 2003-2013 Magazine "Astronomija" for popularization of Astronomy and Science, Novi Sad, Serbia: columnist and foreign correspondent.
- 2001-2003 Belgrade Public Observatory and Planetarium, Serbia: junior assistant.

Invited Talks/Workshops (Recent)

- Aug. 2020 Cosmology Seminar, Fermilab; Title: *Dark matter interactions.*
- Jul. 2020 Invited follow-on visit, KITP, Santa Barbara (cancelled due to COVID); Title: *Millicharged dark matter on small scales.*
- Jun. 2020 News from the Dark, Workshop (by invitation), Strasbourg, France (via Zoom, due to COVID); Title: *Dark matter interactions throughout cosmic history.*
- May 2020 Invited plenary talk, 32nd Rencontres de Blois - Particle Physics and Cosmology Conference, Chateau de Blois, France (cancelled due to COVID); Title: *Astrophysical Probes of Dark Matter.*
- Mar. 2020 UCLA Dark Matter 2020 conference (cancelled due to COVID); Title: *Astrophysical probes of dark matter.*
- Mar. 2020 Cosmology/Astrophysics Seminar, South Methodist University (via Zoom, due to COVID); Title: *Dark matter throughout cosmic history.*
- Mar. 2020 Invited participant, Lighting new Lampposts for Dark Matter and Beyond the Standard Model, Simons Center Program (cancelled trip due to COVID)
- Feb. 2020 Colloquium, Mitchell Institute, Texas A&M University; Title: *Dark matter throughout cosmic history.*
- Feb. 2020 Theory Thursday, Carnegie Observatories, Pasadena; Title: *Satellites as probes of dark matter.*
- Dec. 2019 KITP Seminar, UCSB; Title: *Dark matter throughout cosmic history.*
- Nov. 2019 Astronomy Colloquium, UCLA; Title: *Dark matter throughout cosmic history.*
- Oct. 2019 2nd Global 21-cm signal, Workshop, McGill University; Title: *Dark matter throughout cosmic history.*

- Oct. 2019 Working group lead status report, CMB-S4 collaboration meeting; Title: *Dark Universe*.
- Aug. 2019 LSST Dark Matter Workshop, University of Chicago; Title: *Cosmological probes of dark matter interactions*.
- Jun. 2019 New Directions in the Search for Light Dark Matter Particles, Conference, Fermilab; Title: *Cosmological probes of dark matter interactions*.
- Jan. 2019 Dunlap Institute Colloquium, University of Toronto; Title: *Dark matter throughout cosmic history*.

Computer Skills and Code

Proficient in Python, Cython, C, Mathematica, MATLAB. Experience with MultiNest, HEALPix, CAMB, 2lCMFast, CosmoMC, CLASS, Monte Python. Open source code available at <https://github.com/veragluscevic/>.

External funding

- NSF Astro-particle and Cosmology solicitation. Single-PI Proposal entitled "Probing Dark Matter throughout Cosmic History" awarded \$225,000 for 3 years, starting Fall 2020; Grant No. PHY-2013951.

Manuscripts in preparation

- Karime Maamari, **Vera Gluscevic**, Kimberly K. Boddy, Ethan O. Nadler, Risa H. Wechsler, "Bounds on velocity-dependent dark matter–proton scattering from Milky Way satellite abundance" (informal peer review under way; to be submitted to ApJ Letters in early October 2020) [VG contribution: project idea and method development, paper writing; advising USC undergraduate student Maamari on conducting the analysis]
- Zack Li, **Vera Gluscevic**, and the ACT collaboration, *Searching for dark matter with the Atacama Cosmology Telescope*. (expected submission: early November 2020) [VG contribution: project idea, code, analysis interpretation; mentoring Princeton graduate student Li on completing the project]
- Isabella Johansson, Zack Li, **Vera Gluscevic**, *Forecasts for dark matter-baryon scattering searches with next-generation CMB experiments*. (expected submission: November 2020) [VG contribution: advising USC graduate student Johansson]

Selected Publications (chronological order)

- ACT collaboration (including **Vera Gluscevic**). *The Atacama Cosmology Telescope: A Measurement of the Cosmic Microwave Background Power Spectra at 98 and 150 GHz* submitted (2020). [ArXiv:2007.07289]
- ACT collaboration (including **Vera Gluscevic**). *The Atacama Cosmology Telescope: DR4 Maps and Cosmological Parameters* submitted (2020). [ArXiv:2007.07288]
- ACT collaboration (including **Vera Gluscevic**). *The Atacama Cosmology Telescope: Constraints on Cosmic Birefringence* accepted for publication in PRD (2020). [ArXiv:2001.10465]

- DES collaboration (including external collaborator **Vera Gluscevic**, contribution: dark matter baryon scattering method and code). *Milky Way Satellite Census. III. Constraints on Dark Matter Properties from Observations of Milky Way Satellite Galaxies* submitted to PRL (2020). [ArXiv:2008.00022]
- Ethan O. Nadler, **Vera Gluscevic**, Kimberly K. Boddy, and Risa H. Wechsler. *Constraints on Dark Matter Microphysics from the Milky Way Satellite Population*. The Astrophysical Journal Letters, Volume 878, Issue 2, article id. L32, 6 pp. (2019). [ArXiv:1904.10000]
- Ethan O. Nadler, **Vera Gluscevic**, Kimberly K. Boddy, and Risa H. Wechsler. *Constraints on Dark Matter Microphysics from the Milky Way Satellite Population*. The Astrophysical Journal Letters, Volume 878, Issue 2, article id. L32, 6 pp. (2019). [ArXiv:1904.10000]
- Alex Drlica-Wagner et al (including key contribution from **Vera Gluscevic**). *Probing the Fundamental Nature of Dark Matter with the Large Synoptic Survey Telescope*. White paper (2019) [ArXiv:1902.01055]
- Principal author: **Vera Gluscevic**. *Cosmological Probes of Dark Matter Interactions: The Next Decade*. Astro2020 Decadal Survey Science White Paper, submitted to the National Academies (2019) [ArXiv:1903.05140]
- The Simons Observatory: Science goals and forecasts (including **Vera Gluscevic**). Journal of Cosmology and Astroparticle Physics, Issue 02, article id. 056 (2019) [ArXiv:1808.07445]
- Kimberly K. Boddy, **Vera Gluscevic**, Vivian Poulin, Ely D. Kovetz, Marc Kamionkowski, and Rennan Barkana. *A Critical Assessment of CMB Limits on Dark Matter-Baryon Scattering: New Treatment of the Relative Bulk Velocity*. Physical Review D, Volume 98, Issue 12, id.123506 (2018) [ArXiv:1808.00001]
- Ely D. Kovetz, Vivian Poulin, **Vera Gluscevic**, Kimberly K. Boddy, Marc Kamionkowski, and Rennan Barkana. *Tighter Limits on Dark Matter Explanations of the Anomalous EDGES 21cm Signal*. Physical Review D, Volume 98, Issue 10, id.103529 (2018) [ArXiv:1807.11482]
- Kimberly K. Boddy and **Vera Gluscevic**. *First Cosmological Constraint on Dark Matter Effective Theory*. Physical Review D, Volume 98, Issue 8, id.083510 (2018) [ArXiv:1801.08609]
- **Vera Gluscevic** and Kimberly K. Boddy. *Constraints on Scattering of keV-TeV Dark Matter with Protons in the Early Universe*. Physical Review Letters, Volume 121, Issue 8, id.081301 (2018). [ArXiv:1712.07133]
- CMB-S4 collaboration (including key contribution from **Vera Gluscevic**). *CMB-S4 Science Book, First Edition*. White paper (2016) [ArXiv:1610.02743]
- **Vera Gluscevic**, Tejaswi Venumadhav, Xiao Fang, Christopher M. Hirata, Antonija Oklopčić, and Abhilash Mishra. *A new probe of magnetic fields in the pre-reionization epoch: II. Detectability*. Physical Review D, Volume 95, Issue 8, id.083011 (2017). [ArXiv:1604.06327]
- **Vera Gluscevic**, Moira I. Gresham, Samuel D. McDermott, Annika H. G. Peter, and Kathryn M. Zurek. *Identifying the Theory of Dark Matter with Direct Detection*. Journal of Cosmology and Astroparticle Physics, Issue 12, article id. 057 (2015). [ArXiv:1506.04454]
- **Vera Gluscevic** and Annika H.G. Peter. *Understanding WIMP-baryon interactions with direct detection: a roadmap*. Journal of Cosmology and Astroparticle Physics, Issue 09, article id. 040, (2014). [ArXiv:1406.7008]
- Annika H.G. Peter, **Vera Gluscevic**, Anne M. Green, Bradley J. Kavanagh, and Samuel K. Lee. *WIMP physics with ensembles of direct-detection experiments*. Physics of the Dark Universe, Volume 5, p. 45-7 (2014) [ArXiv:1310.7039]

- **Vera Gluscevic**, Duncan Hanson, Marc Kamionkowski, and Christopher M. Hirata. *First CMB Constraints on Direction-Dependent Cosmological Birefringence from WMAP-7*. Physical Review D, vol. 86, Issue 10, id. 103529 (2012). [ArXiv:1206.5546]
- Robert Caldwell, **Vera Gluscevic**, and Marc Kamionkowski. *Cross-correlation of cosmological birefringence with CMB temperature*. Physical Review D, vol. 84, Issue 4, id. 043504 (2011) [pages 1-9]. [ArXiv:1104.1634]
- **Vera Gluscevic** and Marc Kamionkowski. *Testing parity-violating mechanisms with cosmic microwave background experiments*. Physical Review D, vol. 81, Issue 12, id. 123529 (2010) [ArXiv:1002.1308]
- **Vera Gluscevic**, Marc Kamionkowski, and Asantha Cooray. *Derotation of the cosmic microwave background polarization: Full-sky formalism*. Physical Review D, vol. 80, Issue 2, id. 023510 (2009) [ArXiv:0905.1687]

References

Prof. Marc Kamionkowski (kamion@pha.jhu.edu)

Prof. Jo Dunkley (jdunkley@princeton.edu)

Prof. Annika Peter (peter.33@osu.edu)

Prof. Robert Caldwell (robert.r.caldwell@dartmouth.edu)