Kathryn Volk

Associate Staff Scientist
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Education

Ph.D. Planetary Sciences, The University of Arizona, 2013
B.S. Physics, Russian Area Studies, Wittenberg University, 2006 *Summa Cum Laude*.

Positions

Associate Staff Scientist, University of Arizona **2018–present**

Postdoctoral Research Associate, University of Arizona 2015–2018
Supervisor: Renu Malhotra

Postdoctoral Research Fellow, University of British Columbia 2013–2015
Supervisor: Brett Gladman

Graduate Research Associate, University of Arizona 2006–2013
Advisor: Renu Malhotra
Dissertation: Dynamical Studies of the Kuiper Belt and the Centaurs

Grants and Fellowships

PI, "Constraining Neptune's migration using the surface properties of resonant trans-Neptunian objects", NASA Emerging Worlds (2021-2024)

PI, "Dynamics of sticky resonances and detached Kuiper belt objects", NASA Solar System Workings (2019-2022)

Co-I, "Distribution of planet masses, planet-planet separations and dynamical lifetimes of planetary systems", NASA Exoplanet Research Program (2018-2021, PI: R. Malhotra)

Co-I, "Kuiper Belt Dynamics with a Distant Unseen Planet", NSF (2018-2021, PI: R. Malhotra)

Co-I/Science PI, "Current dynamics of Neptune's distant mean motion resonances", NASA Solar System Workings (2015-2019, PI: R. Murray-Clay)

Canadian Institute for Theoretical Astrophysics National Fellow (2013-2015)

Professional Leadership

Chair of the American Astronomical Society (AAS) Division on Dynamical Astronomy (DDA) (2020-2021)
DDA Meeting Scientific/Virtual Organizing Committee Chair (2020)
Member of the AAS Strategic Assembly (2020)
Vice-Chair of the DDA (2019-2020)
DDA committee member (2017-2019)
AAS Division for Planetary Sciences Meeting Scientific Organizing Committee member (2017)

Spacecraft Mission Proposal Involvement

Co-I, "Chimera: Orbital Exploration of 29P/Schwassmann-Wachmann as a Gateway to the Centaurs and the Secrets of Small Body Formation" (proposed in resposnse to the 2019 NASA Discovery Mission Announcement of Opportunity, PI Walt Harris, University of Arizona – not selected)

Publications

Abedin et al. (2020), "Collision Probabilities in the Edgeworth-Kuiper belt", in prep

Kareta et al. (2020), "Contemporaneous Multi-Wavelength and Precovery Observations of Active Centaur P/2019 LD2 (ATLAS)", submitted to PSJ

Fink, Harris, Doose, **Volk**, Woodney, Farnham, & Womack (2020), "Dust outburst dynamics and hazard assessment for close spacecraft-comet encounters", submitted to PSJ

Lin, Chen, **Volk**, et al. (2020), "OSSOS: The Bimodal Eccentricity and Inclination Distributions of the Stable Neptunian Trojans", submitted to Icarus.

Steckloff, Sarid, **Volk**, et al. (2020), "P/2019 LD2 (ATLAS): An Active Centaur in Imminent Transition to the Jupiter Family", ApJ Letters.

Volk & Malhotra (2020), "Dynamical instabilities in systems of multiple short-period planets are likely driven by secular chaos: a case study of Kepler-102", AJ.

Harris, Fernandez, Sarid, Steckloff, **Volk**, Womack, & Woodney (2020), "Active Primordial Bodies: Exploration of the primordial composition of ice-rich planetesimals and early-stage evolution in the outer solar system", White Paper submitted for the Planetary Science and Astrobiology Decadal Survey 2023-2032

Woodney, Rivkin, Harris, et al. (2020), "Strength In Diversity: Small Bodies as the Most Important Objects in Planetary Sciences", White Paper submitted for the Planetary Science and Astrobiology Decadal Survey 2023-2032

Smullen & **Volk** (2020), "Machine Learning Classification of Kuiper Belt Populations", MNRAS.

Kareta, **Volk**, et al. (2020). "An Extremely Temporary Co-orbital: The Dynamical State of Active Centaur 2019 LD2", RNAAS.

Nesvorny et al. (2020). "OSSOS XX: The Meaning of Kuiper Belt Colors", AJ.

Ashton et al. (2020), "OSSOS: XI. An upper limit on the number of distant planetary objects in the Solar System", Icarus.

Marsset et al. (2020), "COL-OSSOS: Compositional homogeneity of three binaries found in the Outer Solar System Origins Survey", PSJ.

Kareta et al. (2020), "Carbon Chain Depletion of 2I/Borisov", ApJ Letters.

Pike et al. (2020), "OSSOS XVI: The missing small members of the Haumea family", Nature Astronomy.

Kareta et al. (2019), "Physical Characterization of the December 2017 Outburst of the Centaur 174P/Echeclus", AJ.

Chen, Gladman, **Volk**, et al. (2019), "OSSOS: constraining migration models with the 2:1 resonance using the outer solar system origin survey", AJ.

Sarid, **Volk**, Steckloff, Harris, Womack, & Woodney (2019), "29P/Schwassmann-Wachmann 1, A Centaur in the Gateway to the Jupiter-Family Comets", ApJ Letters.

Alexandersen et al. (2019), "OSSOS: XII. Variability studies of trans-Neptunian objects using the Hyper-Suprime Camera", ApJS.

Nesvorny et al. (2019), "OSSOS XIX: Testing Early Solar System Dynamical Models using OSSOS Centaur Detections", AJ.

Volk & Malhotra (2019), "Not a simple relationship between Neptune's migration speed and Kuiper belt inclination excitation", AJ.

Van Laerhoven, Gladman, **Volk**, et al. (2019), "OSSOS XIV : The Plane of the Kuiper Belt", AJ.

Schwamb et al. (2019), "Col-OSSOS: the colours of the Outer Solar System Origin Survey", ApJS.

Lawler et al. (2019), "OSSOS: XIII. Fossilized resonant dropouts tentatively confirm Neptune's migration was grainy and slow", AJ.

Marsset et al. (2019), "Col-OSSOS: a distinct inclination distribution for each color seen in the dynamically excited trans-neptunian populations", AJ.

Cabral et al. (2019), "OSSOS: XV. No active Centaurs in the Outer Solar System Origins Survey", A&A.

Schwamb et al. on behalf of the LSST Solar System Science Collaboration (2019), "A Software Roadmap for Solar System Science with the Large Synoptic Survey Telescope", RNAAS.

Schwamb, **Volk**, Lin, et al. (2018), "A Northern Ecliptic Survey for Solar System Science", LSST Cadence Optimization White Paper (arXiv:1812.01149).

Volk et al. (2018), "The Effects of Filter Choice on Outer Solar System Science with LSST", LSST Cadence Optimization White Paper (arXiv:1812.01149).

Malhotra, Lan, **Volk**, & Wang (2018), "Neptune's 5:2 Resonance in the Kuiper Belt", AJ.

Yu, Murray-Clay, & **Volk** (2018), "Trans-Neptunian Objects Transiently Stuck in Neptune's Mean Motion Resonances: Numerical simulations of the current population", AJ.

Volk et al. (2018), "OSSOS IX : two objects in Neptune's 9:1 resonance – implications for resonance sticking in the scattering population", AJ.

Lawler et al. (2018), "OSSOS VIII – two size distribution slopes in the scattering disk", AJ.

Bannister, Gladman, Kavelaars, Petit, **Volk**, Chen, Alexandersen, Gwyn, & the OSSOS collaboration (2018), "OSSOS: 800+ tans-Neptunian objects – the complete data release", ApJS.

Volk & Malhotra (2017), "The curiously warped mean plane of the Kuiper belt", AJ.

Pike et al. (2017), "Col-OSSOS: z band photometry reveals three distinct TNO surface types", AJ.

Shankman et al. (2017), "OSSOS VI. Striking biases in the detection of large semimajor axis trans-Neptunian objects", AJ.

Bannister, Shankman, **Volk**, et al. (2017), "OSSOS: V. Diffusion in the orbit of a high-perihelion distant Solar System object". AJ.

Fraser et al. (2017), "All planetesimals born near the Kuiper belt formed as binaries", Nature Astronomy.

Bannister et al. (2016), "OSSOS: IV. Discovery of a dwarf planet candidate in the 9:2 resonance with Neptune", AJ.

Volk et al. (2016), "OSSOS III - Resonant Trans-Neptunian Populations: Constraints from the first quarter of the Outer Solar System Origins Survey", AJ.

Malhotra, **Volk**, & Wang (2016), "Corralling a distant planet with extreme resonant Kuiper belt objects", ApJ Letters.

Bannister et al. (2016), "The Outer Solar System Origins Survey I: design and first-quarter discoveries", AJ.

Shankman et al. (2015), "OSSOS II: A sharp transition in the absolute magnitude distribution of the Kuiper belt's scattering population", AJ.

Volk & Gladman (2015), "Consolidating and Crushing Exoplanets: Did it Happen Here?", ApJ Letters.

Pike, Kavelaars, Petit, **Volk**, & Shankman (2015), "The 5:1 Neptune Resonance as Probed by CFEPS: Dynamics and Population", AJ.

Volk & Malhotra (2013), "Do Centaurs preserve their source inclinations?", Icarus.

Volk & Malhotra (2012), "Long-term dynamical stability of the Haumea (2003 EL61) collisional family", Icarus.

Volk & Malhotra (2011), "Inclination mixing in the classical Kuiper belt", ApJ.

Volk & Malhotra (2008), "The scattered disk as the source of the Jupiter family comets", ApJ.

Cui, Yelle, & **Volk** (2008), "Distribution and escape of molecular hydrogen in Titan's thermosphere and exosphere", JGR.

Recent Seminars and Invited Talks

"Active Centaurs in context: understanding future members of the Jupiter family comets", Invited Plenary Talk, DPS Virtual Meeting, October 2020.

"Combining theory and observations of trans-Neptunian objects to pin down Neptune's migration history", Theoretical Astrophysics Program Colloquium, October 2019, Tucson, AZ.

"Solar System Shake-up: how planet migration rearranged our system", invited talk, Breakthrough Discuss Conference, April 2019, Berkeley, CA.

"Combining theory and observations of trans-Neptunian objects to pin down Neptune's migration history", Academica Sinica Institute of Astronomy and Astrophysics Colloquium, March 2019, Taipei, Taiwan.

"Our evolving picture of the Kuiper belt: unexpectedly warped mean planes and new observations of resonant populations", Southwest Research Institute Colloquium, December 2017, Boulder, CO.

"The curiously warped mean plane of the Kuiper belt", Lunar and Planetary Institute Seminar, September 2017, Houston, TX.

Selected Recent Conference Proceedings

2020: K. Volk & R. Malhotra. "Characterizing and predicting dynamical instabilities in multiplanet systems". DPS, Virtual meeting.

2020: K. Volk & R. Malhotra. "Dynamical instabilities in systems of multiple short-period planets are likely driven by secular chaos: a case study of Kepler-102". DDA, Virtual meeting.

2020: K. Volk & R. Malhotra. "Kepler-102: a case study for using dynamical constraints to characterize exoplanet systems". AAS, Honolulu, HI.

2019: K. Volk & R. Malhotra. "Not a simple relationship between Neptune's migration speed and Kuiper belt inclination excitation". DDA, Boulder, CO.

2018: K. Volk & R. Malhotra. "A statistical exploration of dynamical stability in Kepler and K2 multi-planet systems". DPS, Knoxville, TN.

2018: K. Volk et al. "Two objects in Neptune's 9:1 resonance – implications for resonance sticking in the scattering population". DDA, San Jose, CA.

Telescope Time Awarded

PI, Large Binocular Telescope (MODS), 0.5 nights in 2019B, 'Searching for Cold Classical Interlopers in the 3:2 Neptune Resonance"

Co-I, Large Binocular Telescope (MODS, LBC), 7 nights in 2018A-2019B, "Constraining Neptune's Migration: Surfaces of Resonant TNOs" (PI: R. Murray-Clay)

PI, Large Binocular Telescope (LBC), 1.5 nights in 2018A, "Constraining Neptune's Migration: Surfaces of Resonant TNOs"

Teaching

Instructor, University of Arizona, Fall 2015 – PTYS/ASTR 170B2 The Universe and Humanity: Origins and Destiny (general education introductory astronomy course; $\sim$ 120 students)

Graduate Teaching Assistant Instructor/Co-Instructor, University of Arizona, Fall 2009, Spring 2010, Fall 2012 – LASC 297a: Letters, Arts, and Science Specialty Training Workshop (9-week course to improve scientific literacy and help students become peer mentors in their science classes; $\sim$ 20 students per class)

Graduate Teaching Assistant, University of Arizona, Fall 2006, Spring 2008, Spring 2009 – various general education astronomy/planetary science undergraduate courses

Professional Service

Referee for Icarus, Science, A&A, MNRAS, Nature Astronomy, AAS journals, CelMech&DA
External grant reviewer for NASA Research Programs
Panelist for NASA Research Program grant reviews
Panelist for NSF Astronomy grant review
Reviewer for telescope proposal calls (Gemini, K2)
2019-2020 Staff Representative, Dept. of Planetary Sciences, University of Arizona
2018-2019 LPL representative on the Steward Observatory Telescope Allocation Committee

Recent Outreach Activities

2019, 2017, 2015 speaker for Astronomy on Tap, Tucson
2018 speaker for Astronomy on Tap, Seattle
2015-2018 invited speaker at several local amateur astronomy associations
2018 Phoenix Comic Fest panelist
2015-2017 volunteer for various Lunar & Planetary Lab outreach events
2016-2017 guest lecturer for the University of Arizona's Osher Lifelong Learning Institute
2017, 2016 Judged the Southern Arizona Research, Science & Engineering Foundation Science Fair

Selected Honors & Awards

2013 College of Science Outstanding Scholarship Award, University of Arizona
2013 Gerard P. Kuiper Memorial Award, University of Arizona
2011, 2009 Galileo Circle Scholar, University of Arizona
2010 Department of Planetary Sciences Service Award, University of Arizona
2007 College of Science Graduate Teaching Assistant Award, University of Arizona
2006 Department of Planetary Sciences Graduate Teaching Award, University of Arizona
2006 Departmental Honors in Physics, Wittenberg University
2006 Award for Excellence in the Russian Studies Program, Wittenberg University