

NICHOLAS A. LOMBARDO

PhD Candidate in Earth and Planetary Sciences

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Education

Ph.D.	Earth and Planetary Sciences	Yale University	2025
M.Phil.	Earth and Planetary Sciences	Yale University	2021
B.S.	Physics & Mathematics (Minor: Earth Science)	Central Connecticut State University	2017

Additional Training

Mission Design School: Planetary Science (PSSS; Principal Investigator)	Caltech JPL	2024
Tracer Mixing in Fluids Across Planetary Scales Summer School	Univ. of Maryland	2024

Professional Appointments

Grad. Research/Teaching Fellow	Yale University Dept. of Earth and Planetary Sciences	2019–present
Adjunct Instructor	Central Connecticut State Univ. Dept. of Physics	2023–present
Faculty Research Assistant	UMBC at NASA Goddard Space Flight Center	2017–2019
Tutor	Central Connecticut State Univ. TRiO Office	2013–2016

Mission Involvement

Student Associate	<i>Dragonfly</i> Mission to Titan (NASA New Frontiers 4)	2019–present
Research Assistant	<i>Cassini</i> Composite Infrared Spectrometer Instrument	2016–2019

Group Affiliations

Collaborator	JWST Titan Guaranteed Time Observation Team	2022–present
Collaborator	NAI Habitability of Hydrocarbon Worlds Group	2018–present

Honors and Awards (underline – financial awards)

<u>2024</u>	Yale Estwing Hammer Prize – Outstanding Graduate Student in Earth and Planetary Sciences
<u>2019</u>	Yale Geology and Geophysics Bateman Graduate Fellowship
2018	NASA Group Achievement Award – Cassini CIRS Investigation Team for Grand Finale Orbits
2018	NASA Group Achievement Award – Cassini CIRS Team for Solstice, F-Ring, and Proximal Orbits
2017	CCSU Physics and Engineering Physics Departmental Honors
2016	CCSU John Bulman Award for Service to the Department of Physics and Engineering Physics
<u>2013</u>	CCSU-NSF Computer Science, Math, and Physics Scholarship (4 years)

Funded Grants and Fellowships

2024	Student Collaborator	NASA Solar System Observations
		<i>Winds of change: a multi-decade study of Titan's middle atmosphere across seasons</i>

Student Grants

2022	Europlanet Science Congress Student Travel Grant
2021	Titan Through Time V Student Travel Grant
2019	AAS Division for Planetary Sciences Hartmann Student Travel Grant
2016	CCSU Faculty Student Research Grant
2016	CCSU Alumni Travel Grant

Refereed Publications

1. **Lombardo, N. A.** & Lora, J. M., “Atmospheric Transport of Molecules on Titan”, *in prep for JGR: Planets*

2. Nixon, C. A., Bézard, B.†, Cornet, T.†, Coy, B. P.†, de Pater, I.†, Es-Sayeh, M.†, Hammel, H. B.†, Lellouch, E.†, **Lombardo, N. A.†**, López-Puertas, M.†, Lora, J. M.†, Rannou, P.†, Rodriguez, S.†, Teanby, N. A.†, Turtle, E. P.†, +30 others, “Titan’s Atmosphere in Late Northern Summer from JWST and Keck Observations”, *under review in Nature Astronomy*, †These authors contributed equally
3. Bézard, B., Nixon, C. A., Vinatier, S., Lellouch, E., Greathouse, T. K., Jiles, R., **Lombardo, N. A.**, Jolly, A., “The D/H ratio in Titan’s acetylene from high spectral resolution IRTF/TEXES observations”, *Icarus*, **421**, 116221 (2024)
4. Light, S., Gurwell, M., Thelen, A., **Lombardo, N. A.**, Nixon, C. A., “Measurements of Titan’s Stratospheric Winds During Equinox with the eSMA”, *The Planetary Science Journal*, **5**, 98, (2024)
5. **Lombardo, N. A.** & Lora, J. M., “The Heat and Momentum Budgets of Titan’s Middle Atmosphere”, *Journal of Geophysical Research: Planets*, **128**, e2023JE00806 (2023)
6. Lewis, N. T., **Lombardo, N. A.**, Read, P. T., Lora, J. M., “Equatorial Waves and Superrotation in the Stratosphere of a Titan General Circulation Model”, *The Planetary Science Journal*, **4**, 149 (2023)
7. Coy, B. P., Nixon, C. A., Rowe-Gurney, N., Achterberg, R. K., **Lombardo, N. A.**, Fletcher, L. N., Irwin, P. G. J. “Spitzer IRS Observations of Titan as a Precursor to JWST MIRI Observations”, *The Planetary Science Journal*, **4**, 114 (2023)
8. **Lombardo, N. A.** & Lora, J. M., “Influence of Observed Seasonally Varying Composition on Titan’s Stratospheric Circulation”, *Icarus*, **390**, 115291 (2023)
9. Steffans, B.L., Nixon, C.A, Sung, K., Irwin, P.G.J., **Lombardo, N.A.**, Pereira, E. “New Constraints on Titan’s Stratospheric n-Butane Abundance,” *The Planetary Science Journal*, **3**, 59 (2022)
10. Hewett, D., Bernath, P. F., Wong, A., Billingham, B. E., Zhao, J., **Lombardo, N. A.**, Nixon, C. A., Jennings, D. E. “N₂ and H₂ Broadened Isobutane Infrared Absorption Cross Sections and Butane Upper Limits on Titan,” *Icarus*, **344**, 113460 (2020)
11. Nixon, C. A., Ansty, T. M., **Lombardo, N. A.**, Bjoraker, G. L., Achterberg, R. K., Annex, A. M., Rice, M., Romani, P. N., Jennings, D. E., Coustenis, A., Bézard, B., Vinatier, S., Lellouch, E., Teanby, N. A., Cottini, V., Flasar, F. M. “Cassini Composite Infrared Spectrometer Observations of Titan 2004-2017,” *The Astrophysical Journal Supplement Series*, **244**, 14 (2019)
12. ***Lombardo, N A.**, Nixon, C. A., Greathouse, T. K., Bézard, B., Jolly, A., Vinatier, S., Teanby, N. A., Richter, M. J., Irwin, P. J. G., Coustenis, A., Flasar, F. M. “Detection of Propadiene on Titan,” *The Astrophysical Journal Letters*, **881**, L33 (2019) - **featured on Sci-News and NASA Astrobiology Institute homepage*
13. **Lombardo, N. A.**, Nixon, C. A., Sylvestre, M., Jennings, D. E., Teanby, N., Irwin, P. G. J., and Flasar, F. M. “Ethane in Titan’s Stratosphere from Cassini CIRS Far- and Mid-Infrared Spectra,” *The Astronomical Journal*, **157**, 160-170 (2019)
14. **Lombardo, N. A.**, Nixon, C. A., Achterberg, R. K., Sung, K., Jolly, A., Irwin, P. G. J., and Flasar, F. M. “Spatial and Seasonal Variations in C₃H_x Hydrocarbon Abundance in Titan’s Stratosphere with Cassini CIRS Observations,” *Icarus*, **317**, 454 – 469 (2019)

Professional Service

University Service

Student representative on Yale Earth and Planetary Sciences Colloquium Committee	2021–2024
Undergraduate & Graduate Student Mentor, Yale Dept. of Earth and Planetary Sciences	2020–2021
President of the Central CT State Univ. Society of Physics Students	2014–2016

Conference Activities

Science Organizing Committee (SOC) member for AAS Division for Planetary Sciences 56 th Meeting	2024
Poster Session Lead for the Titan Through Time IV Workshop	2017

Journal Referee

The Astronomical Journal, The Astrophysical Journal, The Planetary Science Journal, Yale Undergraduate Research Journal

Proposal Review Panels

Panelist, secretary, and external reviewer for NASA Planetary Science

Awarded Observing Proposals

Winds of Change: Temporal Variability of Titan's High Altitude Circulation System	2025
<i>Co-I</i> <i>PI: M. Cordiner</i> <i>Atacama Large Sub-mm Array (ALMA)</i> <i>2024.1.00027.S</i>	
Characterizing Titan's stratospheric wind profile via adaptive optics imaging of a stellar occultation	2023
<i>Collaborator</i> <i>PI: T. Marlin</i> <i>12 hr</i> <i>Hale Telescope, Palomar Observatory</i> <i>P13-5255</i>	
Constraining Titan's Stratospheric Winds near Equinox via a Stellar Occultation	2022
<i>PI</i> <i>PI: N. Lombardo</i> <i>3 hr</i> <i>Faulkes Telescope North, Las Cumbres Observatory</i> <i>DDT2022A-009</i>	
Investigating Nitrile Chemistry on Titan	2022
<i>Co-I</i> <i>PI: A. Coustenis</i> <i>12 hr</i> <i>NASA Infrared Telescope Facility</i> <i>2022B020</i>	

Invited Colloquia and Seminars

Department of Earth and Planetary Sciences Seminar, Johns Hopkins University	2024
Department of Mathematics Colloquium, Central Connecticut State University	2023
Department of Geological Sciences Seminar, Central Connecticut State University	2022
Department of Physics and Engineering Physics Seminar, Central Connecticut State University	2021
School of Physics and Astronomy Space Physics Seminar, University of Leicester	2019
Center for Research in Exploration in Space Science and Tech. Seminar, NASA GSFC	2018
Department of Geological Sciences Seminar, Central Connecticut State University	2018

University Teaching

Instructor of Record

Fall 2024	17 students	Central CT State Univ. Phys 126 University Physics II
Spring 2024	17 students	Central CT State Univ. Phys 126 University Physics II Lab
Spring 2023	17 students	Central CT State Univ. Phys 122 General Physics II Lab

Graduate Teaching Fellow

Fall 2023	120 students	Yale EPS 274 Fossil Fuels and World Energy
Fall 2019	27 students	Yale G&G 140 Introduction to Atmospheric, Ocean, and Climate Change

First-Authored Conference and Workshop Talks

1. **Lombardo, N. A.**, et al., "Measurement of Hydrogen Isocyanide in Titan's Lower Stratosphere", American Geophysical Union (2023)
2. **Lombardo, N. A.** & Lora, J.M. "Simulating the Production of Stratospheric Ice Clouds over Titan's Winter Pole with the Titan Atmospheric Model", Titan Northeast Workshop (2023)
3. **Lombardo, N. A.** & Lora, J.M. "Simulating the Production of Stratospheric Ice Clouds over Titan's Winter Pole with the Titan Atmospheric Model", 54th Division for Planetary Sciences Meeting (2023)
4. **Lombardo, N. A.** & Lora, J. M. "Titan's Stratospheric Heat and Momentum Budgets", Titan Through Time VI (2023)
5. **Lombardo, N. A.** & Lora, J.M. "Interaction of Chemical Tracers with Titan's General Circulation", American Geophysical Union (2022)
6. **Lombardo, N. A.** & Lora, J. M., "The Energy and Momentum Budgets of Titan's Stratospheric Polar Vortex", 53rd Division for Planetary Sciences Meeting (2022)

7. **Lombardo, N. A.** & Lora, J. M., “The Energy and Momentum Balance of Titan’s Stratospheric Polar Vortex as Simulated in a General Circulation Model”, Europlanet Science Congress Meeting (2022)
8. **Lombardo, N. A.**, et al., “Detection of Allene on Titan,” Europlanet Science Congress – Division for Planetary Sciences Joint Meeting (2019)
9. **Lombardo, N. A.**, et al., “Detection of Allene on Titan,” Hydrocarbon Worlds NAI Workshop (2019)
10. **Lombardo, N. A.**, et al., “Using Far-Infrared Observations to Probe Ethane Abundance in Titan’s Lower Stratosphere,” 50th Division for Planetary Sciences Meeting (2018)
11. **Lombardo, N. A.**, et al. “C₃H₄ Hydrocarbon Abundance in Titan’s Atmosphere from *Cassini* Infrared Spectra,” 49th Lunar and Planetary Science Conference (2018)
12. **Lombardo, N. A.**, et al. “Abundance Profiles for C₃ Hydrocarbons in Titan’s Atmosphere,” 49th Division for Planetary Sciences Meeting (2017)
13. **Lombardo, N. A.**, et al., “Origin of Photoluminescence in Graphene Oxide”, APS NES Fall (2015)

Select First-Authored Conference and Workshop Posters

1. **Lombardo, N.A.** & Lora, J. M., “Seasonal-Scale Transport of Heat and Momentum in Titan’s Middle Atmosphere”, 24th Conference on Atmospheric & Oceanic Fluid Dynamics (2024)
2. **Lombardo, N. A.** & Lora, J. M. “Interaction of Trace Species with Titan’s General Circulation”, 24th Conference on Atmospheric & Oceanic Fluid Dynamics (2024)
3. **Lombardo, N. A.**, et al., “Measurement of Hydrogen Isocyanide (HNC) in Titan’s Lower Stratosphere”, Titan Through Time VI (2023)
4. **Lombardo, N. A.**, et al., “Variability and Trends in Beaufort Gyre Near-Inertial Wave Activity inferred from Bottom Pressure Measurements, 2003—2021”, Ocean Sciences Meeting (2022)
5. **Lombardo, N. A.** & Lora, J.M., “Dynamical Simulations of Titan’s Stratosphere using Observationally Derived Molecular Abundance and Aerosol Opacity,” Titan Through Time V (2021)
6. **Lombardo, N. A.**, et al., “Detection of Allene in Titan’s Atmosphere,” Astrobiology Science Conf. (2019)
7. **Lombardo, N. A.**, et al., “The Search for Allene in Titan’s Stratosphere using Mid-IR Spectra from the TEXES Instrument on IRTF,” American Geophysical Union, Fall Meeting (2018)
8. **Lombardo, N. A.**, et al., “Comparison of Modeled Alkane Abundances in Titan’s Atmosphere using Different Spectral Windows with *Cassini* CIRS spectra,” Cassini Science Symposium (2018)
9. **Lombardo, N. A.**, et al., “C₃ Hydrocarbon Abundance in Titan’s Atmosphere with *Cassini* Infrared Spectra”, American Astronomical Society, AAS Meeting #231 (2018)
10. **Lombardo, N. A.**, et al., “A Sensitive Search for Allene in Titan’s Atmosphere”, Titan Through Time IV (2017)
11. **Lombardo, N. A.**, et al., “Synthesis and Characterization of CoFe_{2-x}Ni_xO₄ Magnetic Nanoparticles”, APS NES Spring (2016)
12. **Lombardo, N. A.**, et al., “Controllably Inducing and Modeling Optical Response from Graphene Oxide,” APS March Meeting (2016)

Additional Certifications

FCC Part 97 Amateur Radio Operator License, Amateur Extra Class, KB1YWZ

2012–present

Selected Public Outreach

Invited Public Speaker for astronomy at *Ward Pound Ridge Reservation* (2024), *Pound Ridge Land Conservancy* (2023), *Trailside Nature Museum* (2022)

Judge at the *Westchester Junior Science and Humanities Symposium* (2024)

Guest Instructor for astronomy at the *Trailside Museum Children’s Summer Ecology Program* (2023)

Overnight Near-to-Peer Mentor to group of 5 high school students at the *GSFC Boys Night In* (2019)

Volunteer and Exhibitor representing Cassini CIRS and Lunar Reconnaissance Orbiter (LRO); *International Observe the Moon Night* at GSFC (2018-2019); *Awesome-Con* at Washington, DC (2018-2019); *Celebrating Earth Day with NASA at Union Station* (2017-2019); *Space Night* with the Bowie Baysox minor league baseball team (2018); *US Science and Technology Expo* in Washington, DC (2019); *Science Jamboree* at GSFC (2017-2018); *Outer Space in the President's Place* in the Eisenhower Executive Office Building in Washington, DC (2017)

Volunteer Lead Organizer of the CCSU Physics Open House for local high school students (2015, 2016)

Panelist 22nd Annual Science and Technology Brain Trust, US News STEM Solutions Conference (2014)