DR. CHARLES P. MALONE — *FULL CV*

Jet Propulsion Laboratory
California Institute of Technology
Mail Stop 183-601
4800 Oak Grove Drive
Pasadena, CA 91109-8099, USA

Tel: +1 (818) 653-4268
e-mail: Charles.Malone -A-T- jpl.nasa.gov
http://science.jpl.nasa.gov/people/Malone/

Home:
418 Mel Canyon Rd.
Duarte, CA 91010-1531, USA

Tel: +1 (626) 531-6432
e-mail: cpmalone -A-T- charter.net

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Education

- Ph.D., Physics, October 2003, University of Windsor, Windsor ON, Canada
  - Thesis: Electron-Cluster Interactions—excitation of neutral fragments in rare gases and simple molecules
- B.Sc.(honours), Physics, June 1999, University of Windsor, Windsor ON, Canada
  - Thesis: $O(^1S)$ production following electron impact breakup of SO_2
  - Graduated with First Class Honours (Dean's List) in Physics with a Minor in Mathematics

Professional Experience

NASA PIV Credentialed / U.S. Security Clearance Eligible

- *Research Scientist*: Science Division, Jet Propulsion Laboratory, Caltech (2015-present)
  - Scientist, Planetary Ices Group (2016-present)
  - Technologist, Planetary Ices Group (2015-2016)
- *Research Scientist*: Department of Physics, California State University, Fullerton (2007-2015)
  - ASC researcher at JPL (2007-2015)
  - Research Professor, Physics Department, California State University, Fullerton (2009-2015)
  - Lecturer, Physics Department, Cal State Fullerton (2008-2009)
- *Postdoctoral Fellow*: Science Division, Jet Propulsion Laboratory, Caltech (2004-2007)
  - NASA Postdoctoral Fellow at JPL (2006-2007)
  - National Academy of Sciences/National Research Council Postdoctoral Research Associate at JPL (2004-2005)
- *Teaching Assistant*: University of Windsor (1999-2003)

Research Interests

- UV/visible/near-IR spectroscopy of planetary atmospheres, particularly airglow and auroral physics of, for instance, Titan, Earth, Io, Mars, Europa, Jupiter, and Saturn.
- Laboratory studies of electron collisions with atomic and molecular species, using electron impact induced emission spectroscopy, electron energy-loss spectroscopy, time-of-flight (metastable) spectroscopy, and TOF mass spectrometry to investigate fragmentation dynamics, cross sections, and predissociation yields, relevant to planetary atmospheres and astrophysical environments, radiation damage in biological materials, and environmental pollution.
- Photoabsorption of molecular targets, using synchrotrons (e.g., SOLEIL DESIRS) and resonance lamps, for ro-vibrationally resolved determinations of *f*-values, transition probabilities, predissociation yields, etc.
- Development of non-standard target production (i.e., neutral, ground state H, $H_2(v)$, O, S, OH, etc.) and methods in cross section determinations, such as complete glow imaging (e.g., using the Cassini UVIS, MAVEN IUVS, and GOLD engineering flight spares at LASP, CU-Boulder), differential surfaces, and molecule trapping.
- Electron- and photon-cluster interactions involving excitation of neutral fragments in rare gases and simple molecules such as water, including large molecule doping and pick-up, as well as extension to thin-films.

Awards / Honors

- Volunteering Excellency Award (2014/15), Jet Propulsion Laboratory. *Institutional award.*
- NASA Group Achievement Award (2011), Electron Collisions Team, Jet Propulsion Laboratory. *"For measuring the cross sections for the Lyman-Birge-Hopfield (LBH) band system of nitrogen with high impact on Earth, outer planet, and Titan atmospheric climate models." National award.*
- National Research Council, Resident Research Fellowship Award (2004-2005) *and continuing as* NASA, Postdoctoral Fellowship Award (2006-2007). *International award.*
- Natural Sciences and Engineering Research Council (NSERC) of Canada Post Graduate Scholarship (2000-2003). *National award.*
- University of Windsor Post Graduate Scholarship (1999-2003). *Institutional award.*
- Natural Sciences and Engineering Research Council (NSERC) of Canada Summer Research Award (1998). *National award.*
- University of Windsor, Nicholas Copernicus Scholarship in Physics (1996-1999). *Institutional award: awarded annually to the top two to three undergraduate physics students.*
- Ste.-Anne's Christian Leadership Award (1995). *Institutional award: awarded annually to one graduating student.*

Professional Activities

- *Memberships*:
  - American Physical Society (APS)
  - Canadian Association of Physicists (CAP)
  - American Geophysical Union (AGU)
- *Referee – Journals and Proceedings*:
  - Journal of Physics B: Atomic, Molecular, and Optical Physics (2005-present)
  - Journal of Physics: Conference Series (2009-present)

- Measurement Science and Technology (2010-present)
- Journal of Chemical Physics (2010-present)
- Physica Scripta (2014-present)
- Review of Scientific Instruments (2016-present)

- *Proposal Reviewer*:
  - NASA, Solar System Workings (SSW; 2018)
  - NSF, Planetary Astronomy (AST; 2018)
  - NASA, Emerging Worlds (EW; 2017)
  - NASA, Exoplanets Research Program (XRP; 2015)
  - NASA, Planetary Atmospheres (PATM) Program (2007, 2012)
  - NSERC (Canada), Discovery Grants (2010, 2012)
  - JPL, Research and Technology Development Fund (R&TD) proposals (2012)
  - NASA, Small Business Innovation Research (SBIR) Program (2009)
  - National Science Foundation, ATM–Aeronomy (2007), co-reviewer with Dr. Johnson
- *Guest Lecturer and Presenter*: contributor in the "Professor for a Day" program at CSU Fullerton (3/18/2008), taught Electricity & Magnetism course (Phys-330) for physics majors *and* engaged the students by discussing NASA related research and career opportunities
- *Committee Work*:
  - *Member of Tenure Review Committee* (Physics), University of Windsor (2002-2003), Adjudicated *two* faculty positions
  - *Member of General Appointments Committee* (Physics), University of Windsor (1999-2003), Adjudicated *four* faculty positions
  - *Graduate Representative* (Physics), University of Windsor (1999-2003), student meetings chair
  - *Member of Program Development Committee* (Physics and High Technology), University of Windsor (1998-2000)
  - *Member of Executive Council* (School of Physical Sciences), University of Windsor (1998-1999)
  - *Undergraduate Representative* (Physics), University of Windsor (1998-1999)
- *Science Competitions:*
  - *Judge*, Valley View Elementary School Science Fair (Spring, 2014)
  - *Scorekeeper*, National Science Bowl Competition, JPL Regional (2014)
  - *Senior Judge*, Windsor Regional Secondary School Science Fair (Spring, 2002)

Mentoring / Advising

- Co-mentor to Mr. Collin Tiessen, a NASA Visiting Student Research Program participant at JPL while a graduate student at University of Ottawa (Summer 2016).
- Co-mentor to Mr. Collin Tiessen, a NASA Undergraduate Student Research Program (USRP) participant at JPL while an undergraduate student at University of Windsor (Summer 2015).
- Co-mentor to Dr. Jeffrey D. Hein, a NASA Postdoctoral Fellow (NPP) at JPL (2012-2015).
- Co-mentor to Mr. Brandon Grisanti, an undergraduate student at Cal State University, Fullerton (2012-2013), and a NASA Undergraduate Student Research Program (USRP) participant at JPL while an undergrad at CSUF (Summer 2013).
- Co-mentor to Dr. Jason A. Young, a Caltech postdoctoral scholar at JPL (2008-2010) and recipient of the ***JPL Postdoctoral Research Award*** (2010).
- Co-mentor to Mr. Colin Fitzgerald, a NASA Undergraduate Student Research Program (USRP) participant at JPL while an undergraduate student at University of Colorado at Boulder (Fall 2009).

- Co-mentor to Ms. Bahareh Ajdari, an undergraduate and graduate student at Cal State University, Fullerton (2007-2011).

Teaching Experience

- Lecturer, Physics Department, Cal State Fullerton (2008-2009)
  - Performed *all* standard, full-duty teaching activities for the *following courses*. Responsible for *all* lecturing, planning, grading, office-hours, and administrative duties.
    1) *Fundamentals of Physics—Electricity & Magnetism*: [Phys-226; Spring 2009] (Text: Halliday, Resnick, & Walker) Calculus based lecture course (2× 1.25 hour classes) for science and engineering students, primarily physics majors and engineers.
    2) *Fundamentals of Physics—Electricity & Magnetism*: [Phys-226L; Spring 2009] Calculus based laboratory course (3 hour class) for science and engineering students, primarily physics majors and engineers.
    3) *Fundamentals of Physics—Mechanics*: [Phys-225; Fall 2008] (Text: Halliday, Resnick, & Walker) Calculus based lecture course (2× 1.25 hour classes) for science and engineering students, primarily physics majors and engineers.
    4) *Survey of Physics*: [Phys-101L; Fall 2008] Algebra based laboratory course (3 hour class), with an emphasis on conceptual understanding, for non-science students.
    5) *Elementary Physics—Mechanics*: [Phys-211L; Spring 2008] Non-calculus based laboratory course (3 hour class) for science students, primarily pre-med.
  - Guest Lecturer, CSUF Professor for a Day Program: *Electricity & Magnetism*: [Phys-330; Spring 2008] (Text: Griffiths) Multivariable calculus based lecture course for physics majors. Lectured for a 2.5 hour class and performed all lesson planning (see Professional Activities).
- Teaching Assistant, University of Windsor, Canada (1999-2003)
  - Assisted with various undergraduate physics courses (*see the following*), involving the preparation of laboratory equipment, supervising experimental and computer laboratory sessions, instruction of physical and mathematical concepts for problem solving and data analysis, providing office hours, supervising tests and exams, and grading laboratory reports, assignments, and examinations.
    1) *Introductory Physics I & II* [Phys-140 & Phys-141]
    2) *Introduction to Theoretical Methods* [Phys-151] Maple based course.
    3) *Introduction to Astronomy* [Phys-190]
    4) *Introduction to Electromagnetism* [Phys-220] (Text: Griffiths)
    5) *Classical Mechanics* [Phys-350] (Text: Marion & Thornton / Chow)
    6) *Quantum Physics and Chemistry* [Phys-310] (Text: Eisberg & Resnick)
- Tutor/Grader, Windsor, Canada (1996-1999)
  - Graded high school physics and mathematics tests and final exams.
  - Tutored students in the first year introductory physics course (calculus based) as part of the Tutor Link program organized by the University of Windsor.

Refereed Publications (30 total)

Researcher ID: A-6294-2010 [Formatting Note: **self**; student work; postdoc.]

1. X. Liu, D. E. Shemansky, J. Yoshii, M. J. Liu, P. V. Johnson, **C. P. Malone**, and M. A, Khakoo, H_2 $X\,^1\Sigma_g^+ - c\,^3\Pi_u$ Excitation by Electron Impact: Energies, Spectra, Emission Yields, Cross-sections, and H(1*s*) Kinetic Energy Distributions, *The Astrophysical Journal Supplement Series*, **232**, 19 (2017).
2. J. M. Ajello, **C. P. Malone**, G. M. Holsclaw, A. C. Hoskins, R. W. Eastes, W. E. McClintock, and P. V. Johnson, Electron Impact Study of the 100eV Emission Cross Section and Lifetime of the

Lyman-Birge-Hopfield Band System of N_2: Direct Excitation and Cascade, *Journal of Geophysical Research: Space Physics*, **122**, 6776-6790 (2017), doi:10.1002/2017JA024087.

3. X. Liu, D. E. Shemansky, J. Yoshii, M. J. Liu, P. V. Johnson, and **C. P. Malone**, Energies, Transition Probabilities, Predissociation Rates, and Lifetimes of the H_2, HD, and D_2 $c\ ^3\Pi_u^-$ State, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **50**, 035101 (2017).
4. X. Liu, D. E. Shemansky, J. Yoshi, P. V. Johnson, **C. P. Malone**, and J. M. Ajello, Spectra, Emission Yields, Cross Sections, and Kinetic Energy Distributions of Hydrogen Atoms from H_2 $X\ ^1\Sigma_g^+$–$d\ ^3\Pi_u$ Excitation by Electron Impact, *The Astrophysical Journal*, **818**, 120 (2016).
5. **C. P. Malone**, P. V. Johnson, X. Liu, B. Ajdari, I. Kanik, and M. A. Khakoo, Integral Cross Sections for the Electron Impact Excitation of the $b\ ^1\Pi_u$, $c_3\ ^1\Pi_u$, $o_3\ ^1\Pi_u$, $b'\ ^1\Sigma_u^+$, $c_4'\ ^1\Sigma_u^+$, $G\ ^3\Pi_u$, and $F\ ^3\Pi_u$ States of N_2, *Physical Review A: Atomic, Molecular, and Optical Physics*, **85**, 062704 (2012).
6. X. Liu, D. E. Shemansky, P. V. Johnson, **C. P Malone**, and M. A. Khakoo, Electron and Photon Dissociation Cross Sections of the D_2 Singlet Ungerade Continua, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **45**, 105203 (2012).
7. A. N. Heays, B. R. Lewis, S. T. Gibson, **C. P. Malone**, P. V. Johnson, I. Kanik, and M. A. Khakoo, Tuning Out Vibrational Levels in Molecular Electron Energy-Loss Spectra, *Physical Review A: Atomic, Molecular, and Optical Physics*, **85**, 012705 (2012).
8. X. Liu, D. E. Shemansky, P. V. Johnson, **C. P Malone**, M. A. Khakoo, and I. Kanik, Electron and Photon Dissociation Cross Sections of the H_2 Singlet Ungerade Continua, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **45**, 015201 (2012).
9. J. A. Young, **C. P. Malone**, P. V. Johnson, J. M. Ajello, X. Liu, and I. Kanik, Lyman-Birge-Hopfield emissions from electron impact excited N_2, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **43**, 135201 (2010).
   Selected as a Highlight of 2010.
   An *IOPselect* article with an Institute of Physics press release http://www.iop.org/News/news_41426.html
   Plus press in, e.g., *EARTH magazine* http://www.earthmagazine.org/
   Europhysics News (EPN) http://www.europhysicsnews.org/
   ScienceNOW http://news.sciencemag.org/sciencenow/2010/06/new-experiments-rattle-space-wea.html
10. X. Liu, P. V. Johnson, **C. P. Malone**, J. A. Young, D. E. Shemansky, and I. Kanik, Kinetic Energy Distribution of H(1*s*) from H_2 $X\ ^1\Sigma_g^+$–$a\ ^3\Sigma_g^+$ Excitation and Lifetimes and Transition Probabilities of $a\ ^3\Sigma_g^+$ (v, J), *The Astrophysical Journal*, **716**, 701-711 (2010).
11. **C. P. Malone**, P. V. Johnson, J. A. Young, B. Ajdari, M. A. Khakoo, X. Liu, and I. Kanik, Integral Cross Sections for the Electron-Impact Excitation of the $C\ ^3\Pi_u$, $E\ ^3\Sigma_g^+$, and $a''\ ^1\Sigma_g^+$ States of N_2, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **42**, 225202 (2009).
12. J. A. Young, **C. P. Malone**, P. V. Johnson, J. M. Ajello, and I. Kanik, Dissociative Excitation of NO_2 by Electron Impact, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **42**, 185201 (2009).
13. X. Liu, P. V. Johnson, **C. P. Malone**, J. A. Young, D. E. Shemansky, and I. Kanik, Electron Impact Excitation and Emission Cross Sections of the H_2 $B'\ ^1\Sigma_u^+$ and $D\ ^1\Pi_u$ States and Rotational Dependence of Photodissociation Cross Sections of the $B'\ ^1\Sigma_u^+$ and $D\ ^1\Pi_u$ Continua, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **42**, 185203 (2009).
14. **C. P. Malone**, P. V. Johnson, I. Kanik, B. Ajdari, and M. A. Khakoo, Electron Impact Excitation of Molecular Nitrogen. I. Excitation of the $C\ ^3\Pi_u$, $E\ ^3\Sigma_g^+$, and $a''\ ^1\Sigma_g^+$ States, *Physical Review A: Atomic, Molecular, and Optical Physics*, **79**, 032704 (2009).
15. **C. P. Malone**, P. V. Johnson, I. Kanik, B. Ajdari, S. S. Rahman, S. S. Bata, A. Emigh, and M. A. Khakoo, Electron Impact Excitation of Molecular Nitrogen. II. Vibrationally-Resolved Excitation

of the $C\ ^3\Pi_u$ (v') State, *Physical Review A: Atomic, Molecular, and Optical Physics*, **79**, 032705 (2009).

16. **C. P. Malone**, P. V. Johnson, J. W. McConkey, and I. Kanik, Dissociative Cross Sections for the O II (83.4 nm) Emission from Electron Impact on O_2, *Journal of Geophysical Research: Space Physics*, **113**, A06309 (2008), doi:10.1029/2008JA013160.
17. J. W. McConkey, **C. P. Malone**, P. V. Johnson, C. E. Winstead, V. McKoy, and I. Kanik, Electron Impact Dissociation of Oxygen-Containing Molecules—A Critical Review, *Physics Reports*, **466**, 1-103 (2008), doi:10.1016/j.physrep.2008.05.001.
18. **C. P. Malone**, P. V. Johnson, J. W. McConkey, J. M. Ajello, and I. Kanik, Dissociative Excitation of N_2O by Electron Impact, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **41**, 095201 (2008).
19. J. M. Ajello, J. Gustin, I. Stewart, K. Larsen, L. Esposito, W. Pryor, W. McClintock, M. H. Stevens, **C. P. Malone**, and D. Dziczek, Titan Airglow Spectra from the Cassini Ultraviolet Imaging Spectrograph: FUV Disk Analysis, *Geophysical Research Letters*, **35**, L06102 (2008), doi:10.1029/2007GL032315.
20. X. Liu, D. E. Shemansky, **C. P. Malone**, P. V. Johnson, J. M. Ajello, I. Kanik, A. N. Heays, B. R. Lewis, S. T. Gibson, and G. Stark, Experimental and Coupled-Channels Investigation of the Radiative Properties of the N_2 $c_4'\ ^1\Sigma_u^+ - X\ ^1\Sigma_g^+$ Band System, *Journal of Geophysical Research: Space Physics*, **113**, A02304 (2008), doi:10.1029/2007JA012787.
21. M. A. Khakoo, **C. P. Malone**, P. V. Johnson, B. R. Lewis, R. Laher, S. Wang, V. Swaminathan, D. Nuyujukian, and I. Kanik, Electron Impact Excitation of $X\ ^1\Sigma_g^+$ (v''=0) to the $a''\ ^1\Sigma_g^+$, $b\ ^1\Pi_u$, $c_3\ ^1\Pi_u$, $o_3\ ^1\Pi_u$, $b'\ ^1\Sigma_u^+$, $c_4'\ ^1\Sigma_u^+$, $G\ ^3\Pi_u$, and $F\ ^3\Pi_u$ States of Molecular Nitrogen, *Physical Review A: Atomic, Molecular, and Optical Physics*, **77**, 012704 (2008).
22. M. A. Khakoo, S. Wang, R. Laher, P. V. Johnson, **C. P. Malone**, and I. Kanik, Direct Evidence for Channel-Coupling Effects in Molecules: Electron Impact Excitation of the $a''\ ^1\Sigma_g^+$ state of N_2, *Journal of Physics B: Atomic, Molecular, and Optical Physics – Fast Track Communication*, **40**, F167-F173 (2007).
    Selected as a Highlight of 2007.
23. S. Wang, P. V. Johnson, **C. P. Malone**, I. Kanik, and M. A. Khakoo, Transmission Effects in Unfolding Electronic-Vibrational Electron-Molecule Energy Loss Spectra, *Physical Review A: Atomic, Molecular, and Optical Physics*, **73**, 034702 (2006).
24. P. V. Johnson, **C. P. Malone**, I. Kanik, and M. A. Khakoo, Integral Cross Sections for the Direct Excitation of the $A\ ^3\Sigma_u^+$, $B\ ^3\Pi_g$, $W\ ^3\Delta_u$, $B'\ ^3\Sigma_u^-$, $a'\ ^1\Sigma_u^-$, $a\ ^1\Pi_g$, $w\ ^1\Delta_u$, and $C\ ^3\Pi_u$ Electronic States in N_2 by Electron Impact, *Journal of Geophysical Research: Space Physics*, **110**, A11311 (2005), doi:10.1029/2005JA011295.
25. **C. P. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of Xenon Clusters, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **36**, 3607-3620 (2003).
26. **C. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of Krypton Clusters, *The European Physical Journal D: Atomic, Molecular and Optical Physics*, **18**, 87-92 (2002).
27. W. Kedzierski, **C. Malone**, and J. W. McConkey, *Erratum*: Dissociative Excitation of SO_2 by Electron Impact, *Canadian Journal of Physics*, **78**, 1113-1114 (2000).
28. **C. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of N_2O Clusters, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **33**, 4863-4871 (2000).
29. W. Kedzierski, **C. Malone**, and J. W. McConkey, Dissociative Excitation of SO_2 by Electron Impact, *Canadian Journal of Physics*, **78**, 617-624 (2000).

30. W. Kedzierski, J. Derbyshire, **C. Malone**, and J. W. McConkey, Isotope Effects in the Electron Impact Break-Up of Water, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **31**, 5361-5368 (1998).

Papers in Preparation

details are subject to change [Formatting Note: **self**; student work; postdoc.]

- ***Numerous*** manuscripts in preparation and planned to focus on our ongoing H_2 and N_2 research, as well as $O(^1S)$ and $O(^1D)$ detection from several oxygen-containing molecules.

Refereed Conference Proceedings & Book Chapters

[Formatting Note: **self**; student work; postdoc.]

1. X. Liu, D. E. Shemansky, P. V. Johnson, **C. P. Malone**, H. Melin, J. A. Young, and I. Kanik, The Saturn Hot Atomic Hydrogen Plume: Quantum Mechanical Investigation of H_2 Dissociation Mechanisms, *Asia Oceanic Geosciences Society 6th Annual General Meeting (2009 AOGS, Singapore, 11-15 August 2009), Advances in Geosciences, Volume 19 (Planetary Science)*, p.405, edited by A. Bhardwaj (World Scientific, 2010).
2. P. V. Johnson, J. A. Young, **C. P. Malone**, M. A. Khakoo, X. Liu, and I. Kanik, Electron Impact Processes in Nitrogen Rich Atmospheres of the Outer Solar System, *2009 Electron Molecule Symposium (EMS-POSMOL 2009, Toronto, Canada, July 2009), Journal of Physics: Conference Series*, **210**, 012003 (2010).
3. **C. P. Malone**, P. V. Johnson, J. A. Young, I. Kanik, B. Ajdari, and M. A. Khakoo, Electron Impact Excitation Cross Sections of N_2, *26th International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC 2009, Kalamazoo, MI, USA, 22-28 July 2009), Journal of Physics: Conference Series*, **194**, 052020 (2009).
4. P. V. Johnson, **C. P. Malone**, M. A. Khakoo, J. W. McConkey, and I. Kanik, Electron Collisions with Constituents of Planetary Atmospheres, *25th International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC 2007, Freiburg, Germany, 25-31 July 2007), Journal of Physics: Conference Series*, **88**, 012069 (2007).

Invited Talks

[Formatting Note: **self**; student work; postdoc.]

- Atomic and Molecular Parameters for Aeronomy and Planetary Science: Cross Sections, *f*-values, Predissociation Yields, and Photolyzed Ice Chemistry, *2013 Advanced Light Source (ALS) User Meeting: Current and Future Directions for AMO and Chemical Physics Research at the ALS*, October 8-9, 2013, Lawrence Berkeley National Laboratory, Berkeley, California, USA.
  Personal invite: presented by **C. P. Malone**.
- Cassini UVIS Observations of Titan Ultraviolet Airglow Spectra with Laboratory Modeling from Electron- and Proton-Excited N_2 Emission Studies, *2011 American Geophysical Union (AGU) Fall Meeting*, December 5-9, 2011, San Francisco, California, USA, (*Eos Trans. AGU*, **92** (52), Fall Meet. Suppl., Abstract SA11A.05, 2011).
  Group invite: presented by J. M. Ajello.
  Authors: J. M. Ajello, R. A. West, **C. P. Malone**, J. Gustin, L. W. Esposito, W. E. McClintock, G. M. Holsclaw, and M. H. Stevens.
- Low Energy Electron Collision Parameters for Modeling Auroral / Dayglow Phenomena, *64th Gaseous Electronics Conference (GEC)*, November 14-18, 2011, Salt Lake City, Utah, USA, (*Bulletin of the APS*, **56** (15), Abstract JW2.6, 2011).
  Personal invite: presented by **C. P. Malone**.

- Electron-Molecule Processes Relevant to Planetary Atmospheres, *62nd Gaseous Electronics Conference (GEC)*, October 20-23, 2009, Saratoga Springs, New York, USA, (*Bulletin of the APS*, **54** (12), Abstract LW2.2, 2009).
  Group invite: presented by P. V. Johnson.
  Authors: P. V. Johnson, **C. P. Malone**, and M. A. Khakoo.
- Electron Impact Measurements of Molecular Nitrogen, *Asia Oceanic Geosciences Society (AOGS) 6th Annual General Meeting*, August 11-15, 2009, Singapore.
  Personal invite: presented by J. A. Young.
  Authors: **C. P. Malone**, P. V. Johnson, J. A. Young, X. Liu, B. Ajdari, M. A. Khakoo, and I. Kanik.
- Electron Impact Processes in Atmospheres of the Outer Solar System, *XVI International Symposium on Electron-Molecule Collisions and Swarms (EMS) – POSMOL 2009*, July 29-August 1, 2009, Toronto, Ontario, Canada.
  Personal invite: presented by P. V. Johnson.
  Authors: **C. P. Malone**, P. V. Johnson, J. A. Young, M. A. Khakoo, and I. Kanik.
- Electron Collisions with Constituents of Planetary Atmospheres, *XXV International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 25-31, 2007, Freiburg, Germany.
  Group invite: presented by P. V. Johnson.
  Authors: P. V. Johnson, **C. P. Malone**, M. A. Khakoo, J. W. McConkey, and I. Kanik.
- Electron Collisions with Atoms and Molecules Relevant to Industrial, Planetary, and Astrophysical Plasmas, *59th Gaseous Electronics Conference (GEC)*, October 10-13, 2006, Columbus, Ohio, USA, (*Bulletin of the APS*, **51** (5), Abstract QR2.2).
  Group invite: presented by P. V. Johnson.
  Authors: P. V. Johnson, **C. P. Malone**, M. A. Khakoo, and I. Kanik.
- Electron Impact Emission and Integral Cross Sections of Gases Relevant to Planetary Atmospheres, *National Research Council (NRC) Research Associateship Programs (RAP) JPL Site Visit*, Jet Propulsion Laboratory, April 28, 2005, Pasadena, California, USA.
  Personal invite: presented by **C. P. Malone**.

Conference Abstracts & Talks

[Formatting Note: **self**; student work; postdoc.]

1. J. M. Ajello, **C. P. Malone**, W. E. McClintock, R. Eastes, J. S. Evans, G. Holsclaw, N. M. Schneider, S. Jain, J.-C. Gerard, and A. Hoskins, Mars, Venus, Earth, and Titan UV Laboratory Aeronomy by Electron Impact, *2017 American Geophysical Union (AGU) Fall Meeting*, December 11-15, 2017, New Orleans, Louisiana, USA. (*Eos Trans. AGU*, **98**, Fall Meet. Suppl., Abstract P51C.2609, 2017).
2. **C. P. Malone**, J. M. Ajello, A. C. Hoskins, W. E. McClintock, and P. V. Johnson, Electron Impact of CO, CO_2, and N_2 using the MAVEN IUVS Flight Spare, *68th Annual Gaseous Electronics Conference (GEC) / 9th International Conference on Reactive Plasmas / 33rd Symposium on Plasma Processing*, October 12-16, 2015, Honolulu, Hawaii, USA. (*Bulletin of the APS*, **60** (9), Abstract GT1.8, 2015).
3. P. V. Johnson, X. Liu, **C. P. Malone**, J. D. Hein, M. A. Khakoo, Excitation of Atmospheric Species by Electron Impact, *68th Annual Gaseous Electronics Conference (GEC) / 9th International Conference on Reactive Plasmas / 33rd Symposium on Plasma Processing*, October 12-16, 2015, Honolulu, Hawaii, USA. (*Bulletin of the APS*, **60** (9), Abstract LW1.3, 2015).
4. J. D. Hein, **C. P. Malone**, P. V. Johnson, and I. Kanik, Metastable Oxygen Production by Electron-Impact of Oxygen, *XXIX International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 22-28, 2015, Toledo, Spain. (Abstract 892xxxFr048).

5. J. D. Hein, **C. P. Malone**, P. V. Johnson, and I. Kanik, Metastable Oxygen Production by Electron-Impact of Oxygen, *2014 American Geophysical Union (AGU) Fall Meeting*, December 15-19, 2014, San Francisco, California, USA. (*Eos Trans. AGU*, **95**, Fall Meet. Suppl., Abstract SA43A.4096, 2014).
6. P. V. Johnson, X. Liu, **C. P. Malone**, J. D. Hein, and M. A. Khakoo, The $a\ ^3\Sigma_g^+ - b\ ^3\Sigma_u^+$ Continuum Emission from Electron Impact of Molecular Hydrogen in Saturn's Atmosphere, *2014 American Geophysical Union (AGU) Fall Meeting*, December 15-19, 2014, San Francisco, California, USA. (*Eos Trans. AGU*, **95**, Fall Meet. Suppl., Abstract P23A.3982, 2014).
7. J. D. Hein, P. V. Johnson, I. Kanik, and **C. P. Malone**, Metastable Oxygen Production by Electron-Impact of Oxygen, *45th Meeting of the Division of Atomic, Molecular and Optical Physics (DAMOP) of the American Physical Society (APS)*, June 2-6, 2014, Madison, Wisconsin, USA. (*Bulletin of the APS*, **59** (8), Abstract K1.48, 2014).
8. **C. P. Malone**, P. V. Johnson, J. D. Hein, B. Grisanti, and M. A. Khakoo, Near Threshold Excitation of Molecular Nitrogen: Benchmarking Cross Sections for Upper Atmospheres, *2013 American Geophysical Union (AGU) Fall Meeting*, December 9-13, 2013, San Francisco, California, USA. (*Eos Trans. AGU*, **94** (52), Fall Meet. Suppl., Abstract SA51A.2066, 2013).
9. J. D. Hein, **C. P. Malone**, I. Kanik, and P. V. Johnson, Metastable Oxygen Production by Electron-Impact of Oxygen, *2013 American Geophysical Union (AGU) Fall Meeting*, December 9-13, 2013, San Francisco, California, USA. (*Eos Trans. AGU*, **94** (52), Fall Meet. Suppl., Abstract SA51A.2068, 2013).
10. **C. P. Malone**, P. V. Johnson, J. D. Hein, B. Grisanti, and M. A. Khakoo, Near-Threshold Electron Impact Excitation of Molecular Nitrogen, *44th Meeting of the Division of Atomic, Molecular and Optical Physics (DAMOP) of the American Physical Society (APS) Joint with the Division of Atomic, Molecular and Optical Physics Canada (DAMOPC) of the Canadian Association of Physicists (CAP)*, June 3-7, 2013, Quebec City, Quebec, Canada. (*Bulletin of the APS*, **58** (6), Abstract Q1.111, 2013).
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12. **C. P. Malone**, P. V. Johnson, I. Kanik, X. Liu, B. Ajdari, and M. A. Khakoo, Integral Cross Sections for Electron Impact Excitation of Rydberg and Valence States of Molecular Nitrogen, *43rd Annual Meeting of the Division of Atomic, Molecular, and Optical Physics (DAMOP) of the American Physical Society (APS)*, June 4-8, 2012, Anaheim, California, USA. (*Bulletin of the APS*, **57** (5), Abstract Q1.51, 2012).
13. J. A. Young, **C. P. Malone**, and P. V. Johnson, Electron Impact Induced VUV Emission from Argon, *64th Gaseous Electronics Conference (GEC)*, November 14-18, 2011, Salt Lake City, Utah, USA. (*Bulletin of the APS*, **56** (15), Abstract QRP1.27, 2011).
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15. P. V. Johnson, **C. P. Malone**, M. A. Khakoo, J. A. Young, B. Ajdari, X. Liu, J. M. Ajello, and I. Kanik, Electron-Nitrogen Collision Processes Relevant to Planetary Atmospheres, *European Geosciences Union (EGU) General Assembly 2011*, April 3-8, 2011, Vienna, Austria. (*Geophysical Research Abstracts*, Vol. 13, EGU2011-2321, 2011).

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18. **C. P. Malone**, J. A. Young, P. V. Johnson, X. Liu, I. Kanik, B. Ajdari, and M. A. Khakoo, Electron-Impact Excitation of Atmospheric Gases, *41st Annual Meeting of the Division of Atomic, Molecular, and Optical Physics (DAMOP) of the American Physical Society (APS) Joint with the Division of Atomic and Molecular Physics and Photonic Interactions (DAMPhi) of the Canadian Association of Physicists (CAP)*, May 25-29, 2010, Rice University in Houston, Texas, USA. (*Bulletin of the APS*, **55** (5), Abstract M1.158, 2010).
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23. X. Liu, A. N. Heays, B. R. Lewis, **C. P. Malone**, P. V. Johnson, D. E. Shemansky, S. T. Gibson, G. Stark, P. D. Feldman, and I. Kanik, Experimental and Coupled-Channels Investigation of Molecular Nitrogen Carroll-Yoshino Band System and Application to the Analysis of Terrestrial-Thermospheric Dayglow Emission Observed by FUSE, *Asia Oceanic Geosciences Society (AOGS) 6th Annual General Meeting*, August 11-15, 2009, Singapore. (Abstract PS12-A017).
24. **C. P. Malone**, P. V. Johnson, J. A. Young, I. Kanik, B. Ajdari, and M. A. Khakoo, Electron Impact Excitation Cross Sections of N_2, *XXVI International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 22-28, 2009, Kalamazoo, Michigan, USA. (Abstract Mo074).
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26. **C. P. Malone**, P. V. Johnson, J. W. McConkey, and I. Kanik, EUV Emission from Electron Impact of Molecular Oxygen, *2008 American Geophysical Union (AGU) Fall Meeting*, December 15-19, 2008, San Francisco, California, USA. (*Eos Trans. AGU*, **89** (52), Fall Meet. Suppl., Abstract SA31A.1598, 2008).

27. **C. P. Malone**, P. V. Johnson, J. W. McConkey, J. M. Ajello, and I. Kanik, Excitation Probabilities and Pathways in e–N_2O Collisions, *39th Annual Meeting of the Division of Atomic, Molecular, and Optical Physics (DAMOP) of the American Physical Society (APS)*, May 27-31, 2008, State College, Pennsylvania, USA. (*Bulletin of the APS*, **53** (9), Abstract E1.70, 2008).
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32. **C. P. Malone**, P. V. Johnson, I. Kanik, S. Wang, and M. A. Khakoo, Integral Cross Sections for the Electron Impact Excitation of Molecular Nitrogen, *60th Gaseous Electronics Conference (GEC)*, October 2-5, 2007, Arlington, Virginia, USA. (*Bulletin of the APS*, **52** (9), Abstract MWP1.34, 2007).
33. **C. P. Malone**, P. V. Johnson, J. W. McConkey, J. M. Ajello, and I. Kanik, Dissociative Excitation of N_2O in the VUV Spectral Region, *XXV International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 25-31, 2007, Freiburg, Germany. (Abstract Fr118).
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35. **C. P. Malone**, P. V. Johnson, M. A. Khakoo, and I. Kanik, Integral Cross Sections for the Electron Impact Excitation of Molecular Nitrogen, *XXV International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 25-31, 2007, Freiburg, Germany. (Abstract Fr094).
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37. M. A. Khakoo, S. Wang, P. V. Johnson, **C. P. Malone**, and I. Kanik, Differential Cross Sections for the Electron Impact Excitation of Several Dipole-Allowed States of Molecular Nitrogen, *XXV International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 25-31, 2007, Freiburg, Germany. (Abstract Fr095).
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41. P. V. Johnson, **C. P. Malone**, M. A. Khakoo, S. Wang, V. Swaminathan, D. Nuyujukian, and I. Kanik, Integral Cross Sections for the Electron Impact Excitation of Molecular Nitrogen, *2006 American Geophysical Union (AGU) Fall Meeting*, December 11-15, 2006, San Francisco, California, USA. (*Eos Trans. AGU*, **87** (52), Fall Meet. Suppl., Abstract SA33A.0255, 2006).
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43. **C. P. Malone**, P. V. Johnson, J. W. McConkey, M. A. Khakoo, J. M. Ajello, and I. Kanik, Excitation of Atmospheric Species by Electron Impact, *59th Gaseous Electronics Conference (GEC)*, October 10-13, 2006, Columbus, Ohio, USA. (Abstract FPT1.33).
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48. **C. P. Malone**, P. V. Johnson, J. M. Ajello, and I. Kanik, Emission Cross Sections of the Lyman-Birge-Hopfield Band System in N_2 Induced by Electron Impact Excitation, *2005 American Geophysical Union (AGU) Fall Meeting*, December 5-9, 2005, San Francisco, California, USA. (*Eos Trans. AGU*, **86** (52), Fall Meet. Suppl., Abstract SA11A.0213, 2005).
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51. **C. P. Malone**, W. Kedzierski, and J. W. McConkey, Electron-Impact Dissociation of Xenon Clusters, *XXIII International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 23-29, 2003, Stockholm, Sweden. (Abstract Th161).
52. **C. P. Malone**, W. Kedzierski, and J. W. McConkey, Fragmentation of Rare Gas Clusters by Electron Impact, *International Symposium on Atomic Cluster Collisions (ISACC): fission, fusion, electron, ion and photon impact*, July 18-21, 2003, St. Petersburg, Russia.
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54. **C. P. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of Krypton and Xenon Clusters, *Canadian Association of Physicists (CAP) Annual Congress*, June 2-6, 2002, Quebec City, Quebec, Canada.
55. **C. Malone**, W. Kedzierski, and J. W. McConkey, Electron-Impact Dissociation of Krypton Clusters, *XXII International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 18-24, 2001, Santa Fe, New Mexico, USA. (Abstract p.264).
56. **C. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of Krypton Clusters, *32nd Meeting of the Division of Atomic, Molecular and Optical Physics (DAMOP) of the American Physical Society (APS) Joint with the Division of Atomic and Molecular Physics (DAMP) of the Canadian Association of Physicists (CAP)*, May 16-19, 2001, London, Ontario, Canada. (*Bulletin of the APS*, **46** (3), Abstract M5.028, 2001).
57. **C. Malone**, W. Kedzierski, and J. W. McConkey, Electron Impact Excitation of N_2O Clusters, *31st Meeting of the Division of Atomic, Molecular and Optical Physics (DAMOP) of the American Physical Society (APS)*, June 14-17, 2000, Storrs, Connecticut, USA. (*Bulletin of the APS*, **45** (3), Abstract R9.49, 2000).
58. **C. Malone**, W. Kedzierski, and J. W. McConkey, Fragmentation of N_2O Clusters Following Electron Impact, *Canadian Association of Physicists (CAP) Annual Congress*, June 4-7, 2000, Toronto, Ontario, Canada.
59. **C. Malone**, W. Kedzierski, and J. W. McConkey, $O(^1S)$ Production Following Electron Impact Dissociative Excitation of SO_2, *American Physical Society (APS) Centennial Meeting*, March 20-26, 1999, Atlanta, Georgia, USA. (*Bulletin of the APS*, **44** (3), Abstract RP01.210, 1999).
60. W. Kedzierski, **C. Malone**, and J. W. McConkey, Dissociation of SO_2 into Metastable Fragments Following Electron Impact, *XXI International Conference on Photonic, Electronic, and Atomic Collisions (ICPEAC)*, July 20-27, 1999, Sendai, Japan. (Abstract TH053, p.334).

Research Grants: Past (total ~ $5.26^{+} M)

- *Emission and Integral Cross Sections of Gases of Astrophysical Interest by Electron Impact*
  Charles P. Malone (PI), Jet Propulsion Laboratory
  Source of Support: NRC Resident Research Associateship & NASA Postdoctoral Program
  Contact Person: Dr. Isik Kanik, (818) 354-7233, Isik.Kanik@jpl.nasa.gov
  Total Award: $187.5 k

Performance Period: 7/6/2004 – 7/5/2007
Contributing Role: PI (1.00 wy) [Science PI]

- *Electron Impact Studies of Molecular Nitrogen Relevant to the Atmospheres of Titan and Triton*
  Paul V. Johnson (PI), Jet Propulsion Laboratory
  Source of Support: NASA Outer Planets Research (OPR) Program
  Contact Person: Dr. Curt Niebur, (202) 358-0390, Curt.Niebur@nasa.gov
  Total Award: $299.1 k
  Performance Period: 10/1/2005 – 9/30/2008
  Contributing Role: Co-I/PD Scholar (0.25 wy)
- *Electron-Impact Studies of N_2 and Atomic S*
  Isik Kanik (PI), Jet Propulsion Laboratory
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Philippe Crane, (202) 358-0716, Philippe.Crane@nasa.gov
  Total Award: $410.1 k
  Performance Period: 10/1/2007 – 9/30/2010
  Contributing Role: Co-I (0.25 wy) [Science co-PI]
- *Predissociation Yields and Electron Impact Cross Sections of Selected Transitions Relevant to Nitrogen-Rich Atmospheres*
  Paul V. Johnson (PI), Jet Propulsion Laboratory
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Philippe Crane, (202) 358-0716, Philippe.Crane@nasa.gov
  Total Award: $412.0 k
  Performance Period: 10/1/2008 – 9/30/2011
  Contributing Role: Co-I (0.50 wy)
- *UV Emission Processes in Planetary Atmospheres by Electron Impact*
  Joseph M. Ajello (PI), Jet Propulsion Laboratory
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Philippe Crane, (202) 358-0716, Philippe.Crane@nasa.gov
  Total Award: $430.6 k
  Performance Period: 10/1/2009 – 9/30/2012
  Contributing Role: Co-I (0.20 wy)
- *Total Dissociation Cross Sections Critically Needed for Astrophysical and Planetary Plasma Systems*
  Paul V. Johnson (PI), Jet Propulsion Laboratory
  Source of Support: JPL Innovative Spontaneous Concept (ISC-R&TD) Proposal
  Contact Person: Dr. Moustafa Chahine, Moustafa.T.Chahine@jpl.nasa.gov
  Total Award: $30.0 k
  Performance Period: 1/1/2011 – 12/31/2011
  Contributing Role: Co-PI (0.04 wy)
- *Excitation and Emission Properties of Molecular Nitrogen for Earth's Thermosphere*
  Xianming Liu (PI), Space Environment Technologies
  Source of Support: NSF GEO/ATM – Aeronomy
  Contact Person: Dr. Farzad Kamalabadi, (703) 292-8529, fkamalab@nsf.gov
  PREVIOUSLY – Dr. Cassandra Fesen, cfesen@nsf.gov
  Total Award: $361.7 k
  Performance Period: 8/1/2010 – 7/31/2013
  Contributing Role: Co-I (0.08 wy) [CSUF PI]

- *Electron Impact Cross Section Measurements from Atomic Oxygen Transitions Relevant to Geospace Science*
  Isik Kanik (PI), Jet Propulsion Laboratory
  Source of Support: NASA Heliophysics Research–Geospace Science (GEO) Program
  Contact Person: Dr. Mona Kessel, (202) 358-0064, Mona.Kessel@nasa.gov
  Total Award: $378.2 k
  → Budget Constraints → *AWARDED: $50.0 k for 2012*
  Performance Period: 1/1/2012 – 12/31/2014
  Contributing Role: Co-I (0.40 wy) [Science PI]

- *Laboratory Measurements and Models of Photoabsorption Cross Sections in the Ultraviolet & Planetary Atmospheres Applications*
  Glenn Stark (PI), Wellesley College
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Kelly Fast, (202) 358-0768, Kelly.E.Fast@nasa.gov
  Total Award: $353.3 k
  → Budget Constraints → *AWARDED: $322.0 k*
  Performance Period: 1/1/2012 – 12/31/2014
  Contributing Role: Co-I (0.04 wy) [travel costed for SOLEIL]

- *Electron-Impact Excitation of Metastable Species Relevant to Atmospheres of Outer Planetary Bodies—Measurement and Modeling*
  Isik Kanik (PI), Jet Propulsion Laboratory
  Source of Support: NASA Outer Planets Research (OPR) Program
  Contact Person: Dr. Terry Hurford, (202) 358-0780, Terry.A.Hurford@nasa.gov
  Total Award: $596.5 k
  Performance Period: 8/1/2011 – 7/31/2015
  Contributing Role: Co-I (0.22 wy) [Science PI]

- *Electron Impact Induced Oxygen and Sulfur Metastable Emission Studies Important to the Jovian Satellites*
  Isik Kanik (PI), Jet Propulsion Laboratory
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Kelly Fast, (202) 358-0768, Kelly.E.Fast@nasa.gov
  Total Award: $609.4 k
  Performance Period: 1/1/2012 – 12/31/2015
  Contributing Role: Co-I (0.45 wy) [Science PI]

- *Mars Laboratory Aeronomy by Electron Impact for Modeling and Planning MAVEN UV Observations of the Upper Atmosphere*
  Joseph M. Ajello (PI), Jet Propulsion Laboratory
  Source of Support: NASA Mars Fundamental Research Program (MFRP)
  Contact Person: Dr. Mitchell Schulte, (202) 358-2127, HQ-MFRP@nasa.gov
  Total Award: $448.3 k
  Performance Period: 2/1/2013 – 1/31/2016
  Contributing Role: Co-I (0.20 wy) [Science co-PI]

- *Study of Electron-Hydrogen Collisions in the Jovian and Saturnian Atmospheres*
  Paul V. Johnson (PI), Jet Propulsion Laboratory
  Source of Support: NASA Planetary Atmospheres (PATM) Program
  Contact Person: Dr. Philippe Crane, (202) 358-0716, Philippe.Crane@nasa.gov
  Total Award: $586.3 k
  Performance Period: 2/1/2011 – 1/31/2015

Contributing Role: Co-I (0.20 wy)

- *Near Threshold Electron Impact Excitation of N_2 (a, a', and w) and O (^5S, ^1S, and ^1D)*
  Paul Johnson (PI), Jet Propulsion Laboratory
  Source of Support: NASA Heliophysics Research–Geospace Science (GEO) Program
  Contact Person: Dr. Mona Kessel, (202) 358-0064, Mona.Kessel@nasa.gov
  Total Award: $367.0 k
  Performance Period: 1/1/2012 – 12/31/2014
  Contributing Role: Co-I (0.40 wy) [Science co-PI]
- *Cross Section Measurements Important To Mars Airglow*
  Isik Kanik (PI), Jet Propulsion Laboratory
  Source of Support: NASA Mars Fundamental Research Program (MFRP)
  Contact Person: Dr. Mitchell Schulte, (202) 358-2127, HQ-MFRP@nasa.gov
  Total Award: $463.5 k
  Performance Period: 1/1/2014 – 12/31/2016
  Contributing Role: Co-I (0.10 wy)

Research Grants: Current (total ~ 2.22^+$ M)

- *Electron Impact Cross Sections for Excitation to Vibrational Levels of the H_2 Ground State: Elucidating the Origin of Warm H_2 in Protoplanetary Disks*
  Paul Johnson (PI), Jet Propulsion Laboratory
  Source of Support: NASA Astrophysics Research and Analysis (APRA) Program
  Contact Person: Dr. Glenn M. Wahlgren, (202) 358-1551, Glenn.M.Wahlgren@nasa.gov
  Total Award: $437.5 k
  Performance Period: 1/1/2015 – 12/31/2017 ***EXTENDED***
  Contributing Role: Co-I (0.21 wy)
- *Cassini UVIS Observations of Titan Airglow: Spectral Analysis and Model Development*
  Joseph M. Ajello (PI), Laboratory for Atmospheric and Space Physics
  Source of Support: NASA Cassini Data Analysis Program (CDAPS)
  Contact Person: Dr. Jared Leisner, (202) 358-2016, HQ-CDAP@nasa.gov
  Total Award: $515.8 k
  Performance Period: 4/1/2016 – 3/31/2019
  Contributing Role: Co-I (0.15 wy) [Science co-PI; JPL PI]
- *Laboratory Measurements of O and N_2 UV Cross-Sections by Particle Impact for Remote Sensing of Thermosphere O / N_2 Variation*
  Joseph M. Ajello (PI), Laboratory for Atmospheric and Space Physics
  Source of Support: NSF Aeronomy Program
  Contact Person: Dr. John Meriwether, (703) 292-8529, jmeriwet@nsf.gov
  Total Award: $727.9 k
  Performance Period: 12/1/2016 – 11/30/2019
  Contributing Role: Co-PI (see next)
- *Emission Cross Section Laboratory Support for the GOLD Mission*
  Charles P. Malone (PI), Jet Propulsion Laboratory
  Source of Support: NASA GOLD Mission
  Contact Person: Dr. Richard Eastes, (321) 537-4363, Richard.Eastes@ucf.edu
  Total Award: $180.0 k
  Performance Period: 11/1/2016 – 10/31/2019
  Contributing Role: PI (0.15 wy)

- *Laboratory Measurements of Photoabsorption Cross Sections in the Ultraviolet for the Martian Atmosphere*
  Glenn Stark (PI), Wellesley College
  Source of Support: NASA Planetary Data Archiving, Restoration, and Tools (PDART) Program
  Contact Person: Dr. Sarah Noble, (202) 358-2492, Sarah.Noble-1@nasa.gov
  Total Award: $*tbd* k
  → Budget Constraints → *AWARDED: $322.0 k*
  Performance Period: 3/15/2017 – 3/14/2020
  Contributing Role: Collaborator [travel costed for SOLEIL]
- *Mars and Venus Laboratory Aeronomy by Electron Impact for MAVEN, Mars Express, and Venus Express*
  Joseph M. Ajello (PI), Laboratory for Atmospheric and Space Physics
  Source of Support: NASA Solar System Workings (SSW) Program
  Contact Person: SSW Caucus, HQ-SSW@nasa.gov
  Total Award: $598.0 k
  → Budget Constraints → *AWARDED: $538.2 k*
  Performance Period: 9/1/2017 – 8/31/2020
  Contributing Role: Co-I (0.15 wy) [Science co-PI; JPL PI]

Research Grants: Pending

- TBD.

Collaborators (in last 48 months)

† 2 students, pre-postdoctoral

- Abgrall, H. Observatoire de Paris
- Ajello, J. M. Laboratory for Atmospheric and Space Physics, University of Colorado
- Amme, R. Department of Physics, Denver University
- Broiles, T. Space Science Institute
- Cravens, T. University of Kansas Center for Research
- Eastes, R. W. University of Central Florida
- Esposito, L. Laboratory for Atmospheric and Space Physics, University of Colorado
- Evans, J. S. Computational Physics, Inc.
- Feldman, P. John Hopkins University
- France, K. Laboratory for Atmospheric and Space Physics, University of Colorado
- Gerard, J.-C. Department of Astrophysics, Geophysics, & Oceanography, University de Liege
- Gibson, S. T. Research School of Physical Sciences and Engineering, The Australian National University
- Heays, A. N. School of Earth and Space Exploration, Arizona State University
- Hein, J. D. Jet Propulsion Laboratory, California Institute of Technology
- Holsclaw, G. M. Laboratory for Atmospheric and Space Physics, University of Colorado
- Hoskins, A. C. Laboratory for Atmospheric and Space Physics, University of Colorado
- Jain, S. Laboratory for Atmospheric and Space Physics, University of Colorado
- Jakosky, B. Laboratory for Atmospheric and Space Physics, University of Colorado
- Johnson, P. V. Jet Propulsion Laboratory, California Institute of Technology
- Kanik, I. Jet Propulsion Laboratory, California Institute of Technology
- Keeney, B. Center for Astrophysics and Space Astronomy, University of Colorado
- Khakoo, M. A. Department of Physics, California State University Fullerton
- †Liu, M. J. N/A
- Liu, X. Planetary and Space Science Division, Space Environment Technologies
- Lyons, J. School of Earth and Space Exploration, Arizona State University
- McClintock, W. E. Laboratory for Atmospheric and Space Physics, University of Colorado

- Nahon, L. Synchrotron SOLEIL
- Parker, J. Southwest Research Institute
- Royer, E. Laboratory for Atmospheric and Space Physics, University of Colorado
- Roueff, E. Observatoire de Paris
- Sander, S. Jet Propulsion Laboratory, California Institute of Technology
- Schindhelm, E. Southwest Research Institute
- Schneider, N. Laboratory for Atmospheric and Space Physics, University of Colorado
- Shemansky, D. E. Planetary and Space Science Division, Space Environment Technologies
- Stark, G. Department of Physics, Wellesley College
- Stevens, M. Naval Research Laboratory
- Stern, A. Southwest Research Institute
- Stolte, W. University of Nevada, Las Vegas
- Sung, K. Jet Propulsion Laboratory, California Institute of Technology
- †Tiessen, C. Department of Physics, University of Ottawa
- West, R. Jet Propulsion Laboratory, California Institute of Technology
- Yelle, R. Department of Planetary Sciences, The University of Arizona
- Yoshi, J. Planetary and Space Science Division, Space Environment Technologies
- Yu, S. Jet Propulsion Laboratory, California Institute of Technology
- Yung, Y. California Institute of Technology