

PROFESSOR MARY K. HUDSON

Contact

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Dartmouth College
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Appointments and Research Experience

1967	Mathematician	McDonnell Douglas Corporation
1968	NSF Trainee, Physics	University of California, Los Angeles
1969 - 1971	Associate Staff	Space Sci Lab, The Aerospace Corporation
1972 - 1974	Research Assistant, Physics	University of California, Los Angeles
1974 - 1986	Research Physicist	University of California, Berkeley
1980 - 1985	Senior Fellow	University of California, Berkeley
1984 - 1990	Associate Professor of Physics	Dartmouth College
1984 - 2005	Visitor	UC Berkeley Space Sciences Laboratory
1990	Visiting Associate Professor	Stanford University
1990 - present	Professor of Physics & Astron.	Dartmouth College
1996 - 2004	Department Chair	Dartmouth Physics and Astronomy Dept
2010 - present	Affiliate Scientist, Sr Res Assoc	NCAR High Altitude Observatory

Education

B.S.	1969	University of California, Los Angeles
M.S.	1971	University of California, Los Angeles
Ph.D	1974	University of California, Los Angeles

Biographical Sketch

MARY K. HUDSON is the Eleanor and A. Kelvin Smith Professor Emerita, now Research Professor, and served for eight years as chair of physics and astronomy at Dartmouth College. Professor Hudson has studied a wide range of space plasma physics phenomena, including ionospheric plasma instabilities, the aurora, and magnetospheric waves, especially their interaction with the energetic protons and electrons of the Van Allen radiation belts. Her current research focuses on the evolution of the radiation belts; how the ionized particle outflow known as the solar wind and the magnetic field of the Sun interact with the magnetic field of the Earth, producing electrical currents in the ionosphere; trapping and energizing radiation belt protons and electrons and modeling their loss as well. Professor Hudson is funded through AFOSR to study solar cosmic rays and their access to the atmosphere and contribution to trapped inner zone protons.

Professor Hudson has been a Co-Investigator on two experiments on NASA's Van Allen Probes mission designed to study Earth's radiation belts. She served as the Magnetosphere Co-director for the Center for Integrated Space Weather Modeling (CISM), an NSF Science and Technology Center studying the impact on the near-Earth space environment of solar activity. In 1984 she was named an AGU Fellow and received the James Macelwane Medal, gave the AGU James A. Van Allen Lecture in 2006 and received the John Adam Fleming Medal in 2017. She contributed to the first two Decadal Surveys in Heliophysics as panel co-chair and steering committee member and served as NSF Geospace Environment Modeling program steering committee chair. She is currently an Editor of AGU Advances.

Honors

Woodrow Wilson Fellow	
National Defense Education Act (NDEA) IV Fellow	
Phi Beta Kappa	
Regents Scholar	
AGU James B. Macelwane Medal	1984
Fellow, American Geophysical Union	1984
Eleanor and A. Kelvin Smith Professor in the Arts and Sciences	1990
Pizzagalli Prize	2000
Van Allen Lecture, American Geophysical Union	2006
AIAA James A. Van Allen Space Environments Award	2012
AGU John Adam Fleming Medal	2017
AIAA Associate Fellow	2022

Memberships

American Geophysical Union	since 1973
AIAA	since 2012

Service to the Community

Editor, AGU <i>Advances</i>	2019-2024
Co-Chair NASEM Workshop: Planning Future Space Weather Ops & Research Infrastructure Phase 1 and Phase 2	2020 - 2022
Co-Chair NRC Committee on Solar and Space Physics	2012 - 2016
Member NRC Decadal Survey Steering Committee	2010 - 2012
Chair, NSF Geospace Environment Modeling Steering Committee	2000 - 2003
Member, National Academy of Sciences Committee on Solar and Space Physics	2000 - 2003
Vice Chair, NRC Decadal Survey Magnetosphere-Ionosphere-Atmosphere Panel	2001 - 2003
Member, NASA Sun - Earth Connections Advisory Committee	1996 - 2000
Member, NASA Living With a Star, Geospace Mission Definition Team	2001 - 2003
Member, NASA Living with a Star Steering Committee	2003
Member, Heliophysics Subcommittee of the NASA Advisory Committee (NAC)	2007 - 2010
American Geophysical Union SPA Secretary	
Member AGU SPA Education and Public Outreach Committee	
Member, American Geophysical Union Fellows Committee	1999 - 2000 2002 - 2003

Thesis Advisor

Ph.D students:	Robert L. Lysak	Earl F. Witt	Rachelle A. Bergmann	Perry Gray
	Xinlin Li	Victor Marchenko	Elena Belova	Marc Lessard
	Scot Elkington	Jerry Goldstein	Shawn Young	Kara Perry
	Thiago Brito	Zhao Li	Miles Engel	Maulik Patel
	Wonde Eshetu	Murong Qin		

M.S. students: Xiaomei Zhu, Evguenia Miftakhova, Alicia E. Sanchez, Feifei Chu, Yelena Goryunova

Current postdocs Zhao Li, Maulik Patel

Recent Publications:

Hudson M.K., A.N Jaynes, B.T. Kress, Z. Li, M. Patel, X.-C. Shen, S.A. Thaller, M. Wiltberger, and J. Wygant (2017), Simulated prompt acceleration of multi-MeV electrons by the 17 March 2015 interplanetary shock, *J. Geophys. Res.*, 122, [doi:10.1002/2017JA024445](https://doi.org/10.1002/2017JA024445).

Li, Z., **M. K. Hudson**, M. Patel, M. Wiltberger, A. Boyd, and D. Turner (2017), ULF wave analysis and radial diffusion calculation using a global MHD model for the 17 March 2013 and 2015 storms, *J. Geophys. Res. Space Physics*, 122, doi:[10.1002/2016JA023846](https://doi.org/10.1002/2016JA023846).

Qin, M., **Hudson, M.**, Kress, B., Selesnick, R., Engel, M., Li, Z., & Shen, X. (2019). Investigation of Solar Proton Access into the inner magnetosphere on 11 September 2017. *Journal of Geophysical Research: Space Physics*, 124. <https://doi.org/10.1029/2018JA026380>

Qin, M., **Hudson, M.**, Li, Z., Millan, R., Shen, X., Shprits, Y., et al (2019). Investigating loss of relativistic electrons associated with EMIC waves at low L values on 22 June 2015. *Journal of Geophysical Research: Space Physics*, 124. <https://doi.org/10.1029/2018JA025726>

Patel, M., Li, Z., **Hudson, M.**, Claudepierre, S., & Wygant, J. (2019). Simulation of prompt acceleration of radiation belt electrons during the 16 July 2017 storm. *Geophysical Research Letters*, 46, 7222– 7229. <https://doi.org/10.1029/2019GL083257>

Li, W., & **Hudson, M. K.** (2019). Earth's Van Allen radiation belts: From discovery to the Van Allen Probes era. *Journal of Geophysical Research: Space Physics*, 124, 8319– 8351. <https://doi.org/10.1029/2018JA025940>

Qin, M., **Hudson, M.**, Millan, R., Woodger, L., & Shen, X. (2020). Statistical dependence of EMIC wave scattering on wave and plasma parameters. *Journal of Geophysical Research: Space Physics*, 125, e2020JA027772. <https://doi.org/10.1029/2020JA027772>

Hudson, M. K., S. R. Elkington, Z. Li, and M. Patel (2020), Drift echoes and flux oscillations: A signature of prompt and diffusive changes in the radiation belts, *Journal of Atmospheric and Solar-Terrestrial Physics*, 207, doi:10.1016/j.jastp.2020.105332. 159.

Li, Z., S. Elkington, **M. Hudson**, M. Patel, A. Boyd, and J. Wygant (2021), Modeling advective transport of radiation belt electrons, *Journal of Atmospheric and Solar-Terrestrial Physics*, 214, doi:10.1016/j.jastp.2020.105509.

Li, Z., Engel, **M.**, **Hudson, M.**, Kress, B., Patel, M., Qin, M., & Selesnick, R. (2021). Solar Energetic Proton Access to the Inner Magnetosphere during the 7-8 September 2017 event. *Journal of Geophysical Research: Space Physics*, 126, e2021JA029107. <https://doi.org/10.1029/2021JA029107>

Hudson, Mary, Elkington, S. R., Li, Z., Patel, M., Pham, K., Sorathia, K., et al. (2021). MHD-test particles simulations of moderate CME and CIR-driven geomagnetic storms at solar minimum. *Space Weather*, 19, e2021SW002882. <https://doi.org/10.1029/2021SW002882>.

Drozdov, A. Y., Blum, L. W., Hartinger, M., Zhao, H., Lejosne, S., **Hudson, M. K.**, et al. (2022). Radial transport versus local acceleration: The long-standing debate. *Earth and Space Science*, 9, e2022EA002216. <https://doi.org/10.1029/2022EA002216>

Bregou, E. J., **Hudson, M. K.**, Kress, B. T., Qin, M., & Selesnick, R. S. (2022). Gleissberg Cycle Dependence of Inner Zone Proton Flux. *Space Weather*, 20, e2022SW003072. <https://doi.org/10.1029/2022SW003072>

Barani, M., Tu, W., **Hudson, M. K.**, & Sarris, T. (2022). High-fidelity Analysis of ULF Wave Mode Structure Following Interplanetary Shock Compression of the Dayside Magnetopause

Using MMS Multi-Point Observations. *Journal of Geophysical Research: Space Physics*, 127, e2021JA030116. <https://doi.org/10.1029/2021JA030116>

Lejosne S, Allison HJ, Blum LW, Drozdov AY, Hartinger MD, **Hudson MK**, Jaynes AN, Ozeke L, Roussos E and Zhao H (2022) Differentiating Between the Leading Processes for Electron Radiation Belt Acceleration. *Front. Astron. Space Sci.* 9:896245. [doi: 10.3389/fspas.2022.896245](https://doi.org/10.3389/fspas.2022.896245)

Hudson, M. K., Engel, M. A., Kress, B. T., Li, Z., Patel, M., & Selesnick, R. S. (2023). Simulated trapping of solar energetic protons for the 8–10 March 2012 geomagnetic storm: Impact on inner zone protons as measured by Van Allen Probes. *Journal of Geophysical Research: Space Physics*, 128, e2022JA031106.

da Silva, D. E., Elkington, S. R., Li, X., Murphy, J., **Hudson, M. K.**, Wiltberger, M. J., & Chan, A. A. (2024). Numerical calculations of adiabatic invariants from MHD-driven magnetic fields. *Journal of Geophysical Research: Space Physics*, 129, e2023JA032397. <https://doi.org/10.1029/2023JA032397>

da Silva DE, Elkington SR, Li X, **Hudson MK**, Boyd AJ, Jaynes AN and Wiltberger M (2024), Radiation belt phase space density: calculation analysis and model dependence. *Front. Astron. Space Sci.* 11:1423545. doi: 10.3389/fspas.2024.1423545

da Silva DE, Elkington SR, Li X and **Hudson MK** (2024), Quantifying adiabatic motion in the outer radiation belt and ring current with invariant matching. *Front. Astron. Space Sci.* 11:1373019. doi: 10.3389/fspas.2024.1373019

Li, Z., Engel, M., **Hudson, M.**, Kress, B., Patel, M., & Selesnick, R. (2024). The Impact of the 8–10 March 2012 geomagnetic storm on inner zone protons as measured by Van Allen Probes. *Journal of Geophysical Research: Space Physics*, 129, e2024JA032800. <https://doi.org/10.1029/2024JA032800>

Patel, M., **Hudson, M.K.**, Kress, B.T. and Qin, M. (2024), Simulation of ULF wave modulated electron precipitation during the 17 March 2015 storm, *J. Geophysical Research*, submitted.

Adams, K. N., Bregou, E. J., **Hudson, M. K.**, Kress, B. T., Selesnick, R. S. (2024). Turnover in Gleissberg Cycle Dependence of Inner Zone Proton Flux, *Space Weather*, in preparation.

Presentations/Discussion Leader at:

AGU Fall Meetings 2022 – 2024

NSF Geospace Environment Modelling Workshops 2022 – 2024;

Whole Heliosphere and Planetary Interactions Colloquium, Boulder, CO 2022

International Magnetosphere Workshop, Potsdam, Germany 2024

AFOSR Space Physics Program Review 2023 – 2024

Recent Research Seminars:

Laboratory for Atmospheric and Space Physics, University of Colorado, 2023

Department of Earth Sciences, Hong Kong University, 2024

Current Research Funding through Dartmouth College

Solar Energetic Proton Access and Trapping in the Inner Magnetosphere
September 15, 2023 – September 14, 2026
Air Force Office of Scientific Research: FA9550-23-1-0629