

Richard E. Denton

Richard E. Denton
Research Professor
Dartmouth College
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Education:

Ph.D. Department of Physics, University of Maryland, 1986
M.A. Department of Physics, SUNY at Stony Brook, 1979
B.S. Department of Physics, College of William and Mary, 1977

Positions:

2004-Present, Research Professor, Dartmouth College
1995-2004, Research Associate Professor, Dartmouth College
1990-1995, Research Assistant Professor, Dartmouth College
1990, Research Associate, Center for Atomic Energy Research, France
1988-1990, Research Associate, Institute for Fusion Studies, University of Texas, Austin
1987-1988, Research Associate, University of Maryland
1982-1984, Research Associate, Naval Research Laboratory

Management Experience:

PI, Determining the orientation and velocity of reconnecting structures, NASA 04/19-03/22
PI, Orientation, Velocity, and Structure of Reconnecting Regions, NASA, 10/13-09/17
PI, Distribution and Effects of Electromagnetic Ion Cyclotron Waves, NASA, 01/13-12/17
PI, Grad Student Support for Hybrid Code Simulation of Whistler Chorus, NSF, 02/12-01/17
PI, Collaborative Research: Magnetospheric Mass Density, NSF, 09/12-08/17.
PI, Magnetospheric Electron Density, NSF, 9/09-8/12.
PI, Magnetospheric Mass Density REU Supplement, NSF, 09-09-08/10
PI, Grad Student Support for Development of Dipole Coordinate Hybrid Code, NSF, 05/09-10/10
PI, Investigation of Magnetic Reconnection Geometry and Other Applications Involving Multiple Spacecraft, NASA, 10/08-09/13
PI, Magnetospheric Mass Density Model, NSF, 12/06-11/10
PI, Investigation of Magnetic Reconnection and Anisotropic Pressure Evolution, NASA, 09/07-08/08
PI, Investigations of Magnetospheric Magnetic Reconnection, NASA, 02/06-01/07
PI, Magnetospheric Density and Pressure, NSF, 07/03-06/06
PI, Investigation of Plasma Mass Density, NASA, 05/05-04/06
PI, Mass Density Along Field Lines, NASA, 03/02-03/06
PI, Magnetospheric Hydromagnetic Waves, NSF, 04/00-03/03

Courses Taught:

Computational Plasma Physics (Dartmouth Phys118, 2007, 2009, 2011, 2013)
Engineering Electrodynamics (Dartmouth ES120, 2008)
Plasma Kinetic Theory (Dartmouth Phys111, 1999)
Graduate Level Electrodynamics (Dartmouth Phys106, 1996, 1997)
Undergraduate Level Electrodynamics (Dartmouth Phys66, 1991)
University Physics (Northern Virginia Community College Phy241, Phy242, Phy243, 1979-1980)

Professional Service:

Serve on one to three thesis committees per year
Have advised nine Dartmouth Women in Science Program (WISP) students and have hired 12 undergraduates, two graduate students, two undergrads from other colleges, and two high school students to do research
Review about a half a dozen journal articles and several proposals per year
Served on review panels for NASA (1998, 2002, 2009, 2017, 2020) and NSF (2005, 2010, 2012, 2013, 2014)
Co-convener of special sessions at American Geophysical Union (AGU) meetings (2002, 2004, 2015)
Co-convener of AGU Chapman Conference on ULF Waves (2005)
Co-editor of AGU monograph *Ultra-low Frequency Waves in the Magnetosphere* and special issue of *Planetary and Space Science* by the same title (2006)
Taught aerospace education at the Lebanon Squadron of the Civil Air Patrol (2000-2011).
Have participated on several Dartmouth panels discussing science and religion. Helped organize Veritas Forum at Dartmouth bringing together speakers with different points of view (2010-2014). Publish video series on Youtube.
Invited Dartmouth students to my house for dinner several times per term (1990-2014)

Member:

American Geophysical Union

Refereed Publications:

Hasegawa, H., R. E. Denton, K. J. Genestreti, T. K. M. Nakamura, T. D. Phan, R. Nakamura, K.-J. Hwang, N. Ahmadi, Q. Q. Shi, M. Hesse, J. L. Burch, J. M. Webster, R. B. Torbert, B. L. Giles, D. J. Gershman, C. T. Russell, R. J. Strangeway, H. Y. Wei, P.-A. Lindqvist, Y. V. Khotyaintsev, R. E. Ergun, and Y. Saito (2021), Fast Magnetic Field Annihilation in Collisionless Electron-scale Current Sheet, in preparation.

Nakamura T.K.M., H. Hasegawa, K. J. Genestreti, R. E. Denton, T. D. Phan, J. E. Stawarz, and R. Nakamura (2021), Fast cross-scale energy transfer during turbulent magnetic reconnection, in preparation.

Toledo-Redondo, S., J. H. Lee, S. K. Vines, D. L. Turner, R. C. Allen, M. Andre, S. A. Boardsen, J. L. Burch, R. E. Denton, H. S. Fu, S. A. Fuselier, D. J. Gershman, B. Giles, D. B. Graham, N. Kitamura, Yu.V. Khotyaintsev, B. Lavraud, O. LeContel, W. Y. Li, T. E. Moore, E.A. Navarro, J. Porti, A. Salinas, and A. Vinas (2020), Kinetic interaction of cold and hot protons with an oblique EMIC wave near the dayside reconnecting magnetopause, *Geophys. Res. Lett.*, submitted.

Takahashi, K., and R. E. Denton (2020), Nodal Structure of Toroidal Standing Alfvén Waves and Its Implication for Field Line Mass Density Distribution, *J. Geophys. Res. Space Physics*, in press.

Shuster, J. R., D. J. Gershman, J. C. Dorelli, B. L. Giles, S. Wang, N. Bessho, L.-J. Chen, V. Uritsky, W. R. Paterson, P. A. Cassak, S. J. Schwartz, R. E. Denton, C. Schi, A. F. Viñas, J. Ng, L. A. Avanov, D. E. da Silva, and R. B. Torbert (2021), MMS Observations of electron phase space density gradients at the magnetopause, *Nature Physics*, in press.

Denton, R. E., R. B. Torbert, H. Hasegawa, K. J. Genestreti, R. Manuzzo, G. Belmont, L.

Rezeau, F. Califano, R. Nakamura, J. Egedal, O. Le Contel, J. L. Burch, D. J. Gershman, I. Dors, M. R. Argall, C. T. Russell, R. J. Strangeway, and B. L. Giles (2021), Two-dimensional velocity of the magnetic structure observed on 11 July 2017 by the Magnetospheric Multiscale spacecraft, *J. Geophys. Res. Space Physics*, doi:10.1029/2020JA028705.

Turner, D., I. Cohen, S. Bingham, G. Stevens, M. Sitnov, B. Mauk, R. Denton, T. Leonard, J. Fennell, J. Blake, R. Torbert, and J. Burch (2021), Characteristics of Energetic Electrons Near Active Magnetotail Reconnection Sites: Tracers of a Complex Magnetic Topology and Evidence of Localized Acceleration, *Geophys. Res. Lett.*, doi:10.1029/2020GL090089.

Burch, J., J. Webster, M. Hesse, K. Genestreti, R. Denton, T.-D. Phan, H. Hasegawa, P. Cassak, R. Torbert, B. Giles, D. Gershman, R. Ergun, C. Russell, R. Strangeway, O. Le Contel, K. Prichard, A. Marshall, K.-J. Hwang, K. Dokgo, S. Fuselier, L.-J. Chen, S. Wang, M. Swisdak, J. Drake, M. Argall, K. Trattner, M. Yamada, G. Paschmann (2020), Electron Inflow Velocities and Reconnection Rates at Earth's Magnetopause and Magnetosheath, *Geophys. Res. Lett.*, <http://dx.doi.org/10.1029/2020GL089082>.

Min, K., K. Liu, R. E. Denton, F. Nemec, S. A. Boardsen, Y. Miyoshi (2020), Two-dimensional particle-in-cell simulations of magnetosonic waves in the dipole magnetic field: On a constant L-shell, *J. Geophys. Res. Space Physics*, doi:10.1029/2020JA028414.

Vines, S. K., B. J. Anderson, R. C. Allen, R. E. Denton, M. J. Engebretson, J. R. Johnson, S. Toledo-Redondo, J. H. Lee, D. L. Turner, R. E. Ergun, R. J. Strangeway, C. T. Russell, H. Wei, R. B. Torbert, S. A. Fuselier, B. L. Giles, J. L. Burch (2020), Determining EMIC wave vector properties through multi-point measurements: The wave curl analysis, *J. Geophys. Res. Space Physics*, doi:10.1029/2020JA028922.

Genestreti, K. J., T.-D. Phan, R. E. Denton, R. B. Torbert, J. L. Burch, J. M. Webster, S. Wang, K. J. Trattner, M. R. Argall, L.-J. Chen, S. A. Fuselier, N. Ahmadi, R. E. Ergun, B. L. Giles, C. T. Russell, R. J. Strangeway, S. Eriksson (2020), Multi-scale coupling during magnetopause reconnection: the interface between the electron and ion diffusion regions, *J. Geophys. Res. Space Physics*, doi:10.1029/2020JA027985.

Wang, Shan, Li-Jen Chen, Naoki Bessho, Michael Hesse, Lynn B. Wilson III, Richard Denton, Jonathan Ng, Barbara Giles, Roy Torbert, and James Burch (2020), Ion-scale current structures in Short Large-Amplitude Magnetic Structures, *Astrophysical Journal*, 898(2), doi:10.3847/1538-4357/ab9b8b.

Paschmann, G., B.U.O. Sonnerup, S. E. Haaland, T. -D. Phan, R. E. Denton (2020), Comparison of Quality Measures for Walen Relation, *J. Geophys. Res. Space Physics*, 125, e2020JA028044. <https://doi.org/10.1029/2020JA028044>.

Denton, R. E., R. B. Torbert, H. Hasegawa, I. Dors, K. J. Genestreti, M. R. Argall, D. Gershman, O. Le Contel, J. L. Burch, C. T. Russell, R. J. Strangeway, B. L. Giles, and D. Fischer (2019), Polynomial reconstruction of the reconnection magnetic field observed by multiple spacecraft, *J. Geophys. Res. Space Physics*, doi:10.1029/2019JA027481.

Manuzzo, R., G. Belmont, L. Rezeau, F. Califano, and R. E. Denton (2019), Crossing of plasma structures by spacecraft: A path calculator, *J. Geophys. Res. Space Physics*, 124, doi:1029/2019JA026632.

Denton, R. E., L. Ofman, Y. Y. Shprits, J. Bortnik, R. M. Millan, C. J. Rodger, C. L. da Silva, B. N. Rogers, M. K. Hudson, K. Liu, K. Min, A. Glozer, and C. Komar (2019), Pitch angle scattering of sub-

Mev relativistic electrons by electromagnetic ion cyclotron waves, *J. Geophys. Res. Space Physics*, doi:10.1029/2018JA026384.

Shuster, J. R., D. J. Gershman, L.-J. Chen, S. Wang, N. Bessho, J. C. Dorelli, D. E. da Silva, B. L. Giles, W. R. Paterson, R. E. Denton, S. J. Schwartz, C. Norgren, F. D. Wilder, P. A. Cassak, M. Swisdak, V. Uritsky, C. Schiff, A. C. Rager, S. Smith, L. A. Avano, and A. F. Viñas (2019), MMS measurements of the Vlasov equation: Probing the electron pressure divergence within thin current sheets, *Geophys. Res. Lett.*, DOI:10.1029/2019GL083549.

Min., K., F. Nemeč, K. Liu, R. E. Denton, and S. A. Boardsen (2019), Equatorial propagation of the magnetosonic mode across the plasmopause: 2-D PIC simulations, *J. Geophys. Res. Space Physics*, 124, doi:10.1029/2019JA026567.

Nakamura, R., K. J. Genestreti, T. Nakamura, W. Baumjohann, A. Varsani, T. Nagai, N. Besso, J. L. Burch, R. E. Denton, J. P. Eastwood, R. E. Ergun, D. J. Gershman, B. L. Giles, H. Hasegawa, M. Hesse, P.-A. Lindqvist, C. T. Russell, J. E. Stawarz, R. J. Strangeway, R. B. Torbert (2018), Structure of the current sheet in the 2017/07/11 electron 2 diffusion region event, *J. Geophys. Res. Space Physics*, doi: 10.1029/2018JA026028.

Min., K., S. A. Boardsen, R. E. Denton, and K. Liu (2018), Equatorial evolution of the fast magnetosonic mode in the source region: Observation-simulation comparison of the preferential propagation direction, *J. Geophys. Res. Space Physics*, 123, doi: 10.1029/2018JA026037.

Hasegawa, H., R. E. Denton, R. Nakamura, K. J. Genestreti, T. K. M. Nakamura, K.-J. Hwang, T. D. Phan, R. B. Torbert, J. L. Burch, B. L. Giles, D. J. Gershman, C. T. Russell, R. J. Strangeway, P.-A. Lindqvist, Y. V. Khotyaintsev, R. E. Ergun, N. Kitamura, and Y. Saito (2018), Reconstruction of the Electron Diffusion Region of Magnetotail Reconnection Seen by the MMS Spacecraft on 11 July 2017, *J. Geophys. Res. Space Physics*, <https://doi.org/10.1029/2018JA026051>.

Genestreti, K., T. Nakamura, R. Nakamura, R. E. Denton, R. Torbert, J. Birch, F. Plaschke, S. Fuselier, R. Ergun, B. Giles, and C. T. Russell (2018), How accurately can we measure the reconnection rate E_M for the MMS diffusion region event of 2017-07-11?, *J. Geophys. Res. Space Physics*, 123, doi:10.1029/2018JA025711.

Sonnerup, B. U. O., S. E. Haaland, G. Paschmann, and R. E. Denton (2018), Quality measure for the Walen relation, *J. Geophys. Res. Space Physics*, 123, doi: 10.1029/2018JA025677.

Takahashi, K., R. E. Denton, T. Motoba, A. Matsuoka, Y. Kasaba, Y. Kasahara, M. Teramoto, M. Shoji, N. Takahashi, Y. Miyoshi, M. Nosé, A. Kumamoto, F. Tsuchiya, R. J. Redmon, and J. V. Rodriguez (2018), Impulsively excited nightside ultralow frequency waves simultaneously observed on and off the magnetic equator, *Geophys. Res. Lett.*, 45, doi:10.1029/2018GL078731

Min., K., K. Liu, R. E. Denton, and S. A. Boardsen (2018), Particle-in-cell simulations of the fast magnetosonic mode in a dipole magnetic field: 1D along the radial direction, *J. Geophys. Res. Space Physics*, doi:10.1029/2018JA025666.

Teh, W.-L., and R. E. Denton (2018), Grad-Shafranov reconstruction with pressure anisotropy: Mirror structures in the Earth's magnetosheath, submitted to *J. Geophys. Res. Space Physics*.

da Silva, C. L., R. E. Denton, M. K. Hudson, R. M. Millan, K. Liu, J. Bortnik (2018), Test-particle simulations of linear and nonlinear interactions between a whistler-mode wave packet and radiation belt

electrons, *Geophys. Res. Lett.*, doi:10.1029/2018GL077877.

Goldstein, J., C. R. Chappell, M. W. Davis, M. H. Denton, R. E. Denton, D. L. Gallagher, G. R. Gladstone, M. B. Leckoe, B. R. Sandel, D. L. Windt (2018), Imaging the Global Distribution of Plasmaspheric Oxygen, *J. Geophys. Res. Space Physics*, 123, doi:10.1002/2017JA024531.

Denton, R. E. (2018), Electromagnetic Ion cyclotron wave fields in a realistic dipole field, *J. Geophys. Res. Space Physics*, 123, doi: 10.1002/2017JA024886.

Burch, J. L., R. E. Ergun, P. A. Cassak, J. M. Webster, R. B. Torbert, B. L. Giles, J. C. Dorelli, A. C. Rager, K.-J. Hwang, T. D. Phan, K. J. Genestreti, R. C. Allen, L.-J. Chen, S. Wang, D. Gershman, O. Le Contel, C. T. Russell, R. J. Strangeway, F. D. Wilder, D. B. Graham, M. Hesse, J. F. Drake, M. Swisdak, L. M. Price, M. A. Shay, P.-A. Lindqvist, C. J. Pollock, R. E. Denton, and D. L. Newman (2018), Localized Oscillatory Energy Conversion in Magnetopause Reconnection, *Geophys. Res. Lett.*, 45. <https://doi.org/10.1002/2017GL076809>.

Bortnik, J., X. Chu, Q. Ma, W. Li, X. Zhang, R. M. Thorne, V. Angelopoulos, R. E. Denton, C. A. Kletzing, G. B. Hospodarsky, H. E. Spence, G. D. Reeves, S. G. Kanekal, D. N. Baker (2018), Artificial Neural Networks for determining magnetospheric conditions, in "Machine Learning Techniques for Space Weather", edited by Enrico Camporeale, Simon Wing and Jay Johnson, ISBN 9780128117897.

Min, K., K. Liu, X. Wang, L. Chen, and R. E. Denton (2018), Fast magnetosonic waves observed by the Van Allen Probes: Testing local wave excitation mechanism, *J. Geophys. Res. Space Physics*, 123, doi:10.1002/2017JA024867.

Denton, R. E., Sonnerup, B. U. Ö., Russell, C. T., Hasegawa, H., Phan, T. - D., Strangeway, R. J., et al. (2018). Determining L - M - N current sheet coordinates at the magnetopause from Magnetospheric Multiscale data. *Journal of Geophysical Research: Space Physics*, 123. <https://doi.org/10.1002/2017JA024619>.

Teh, W.L., R.E. Denton, B.U.O. Sonnerup, and C. Pollock (2017), MMS observations of oblique small-scale magnetopause flux ropes near the ion diffusion region during weak guide-field reconnection, *Geophys. Res. Lett.*, 44 (13), doi:10.1002/2017gl074291.

Chu, X., J. Bortnik, W. Li, Q. Ma, R. Denton, C. Yue, V. Angelopoulos, R. M. Thorne, J. Menietti, Y. Wang, F. Darrouzet, P. Ozhogin, and C. A. Kletzing (2017), A neural network model for three-dimensional dynamic electron density in the inner magnetospheric, 122, doi:10.1002/2017JA024464.

Ofman, L., R. E. Denton, J. Bortnik, X. An, A. Glocher, and C. Komar (2017), Growth and Nonlinear Saturation of Electromagnetic Ion Cyclotron Waves In Multi-Ion Species Magnetospheric Plasma, *J. Geophys. Res. Space Physics*, 122, doi:10.1002/2017JA024172.

Min, K., R. E. Denton, K. Liu, S. P. Gary, and H. E. Spence (2017), Ion Bernstein instability as a possible source for oxygen ion cyclotron harmonic waves, *J. Geophys. Res. Space Physics*, 122, 5449–5465, doi:10.1002/2017JA023979.

Hasegawa, H., B. U. Ö. Sonnerup, R. E. Denton, T.-D. Phan, T. K. M. Nakamura, B. L. Giles, D. J. Gershman, J. C. Dorelli, J. L. Burch, R. B. Torbert, C. T. Russell, R. J. Strangeway, P.-A. Lindqvist, Y. V. Khotyaintsev, R. E. Ergun, P. A. Cassak, N. Kitamura, and Y. Saito (2017), Reconstruction of the electron diffusion region observed by the Magnetospheric Multiscale spacecraft: First results, *Geophys.*

Res. Lett., 44(10), doi: 10.1002/2017GL073163.

Tetrick, S. S., M. J. Engebretson, J. L. Posch, C. N. Olson, C. W. Smith, R. E. Denton, S. A. Thaller, J. R. Wygant, G. D. Reeves, E. A. MacDonald, and J. F. Fennell (2017), Location of intense ion cyclotron (EMIC) wave events relative to the plasmopause: Van Allen Probes observations, *J. Geophys. Res. Space Physics*, 122, , doi: 10.1002/2016JA023392.

da Silva, C. L., S. Wu, R. E. Denton, M. K. Hudson, R. A. Millan (2017), Hybrid Fluid-Particle Simulation of Whistler-Mode Waves in a Compressed Dipole Magnetic Field: Implications for Dayside High-Latitude Chorus, *J. Geophys. Res. Space Physics*, 122 (1), doi:10.1002/2016JA023446, 432-448.

Krall, J., J. D. Huba, D. P. Drob, G. Crowley, and R. E. Denton, "Day-to-Day Variability of the Quiet-Time Plasmasphere Caused by Thermospheric Winds", in *Magnetosphere-Ionosphere Coupling in the Solar System*, C. R. Chappell, R. W. Schunk, P. M. Banks, J. L. Burch and R. M. Thorne (eds.), Geophysical Monograph Series 222, (American Geophysical Union, Washington, DC, 2016), pp. 235--241, ISBN 978-1-119-06677-4.

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Denton, R.E., B.U.O. Sonnerup, H. Hasegawa, T.D. Phan, C.T. Russell, R.J. Strangeway, B.L. Giles, D. Gershman, and R.B. Torbert (2016), Motion of the MMS spacecraft relative to the magnetic reconnection structure observed on 16 October 2015 at 1307UT, *Geophys. Res. Lett.*, 43 (11), doi:10.1002/2016gl069214.

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Denton, R. E., K. Takahashi, J. Amoh Jr., and H. J. Singer (2016), Mass density at geostationary orbit and apparent mass refilling, *J. Geophys. Res. Space Physics*, 121, 2962–2975, doi:10.1002/2015JA022167.

Denton, R. E., K. Takahashi, J. Lee, C.K. Zeitler, N.T. Wimer, L.E. Litscher, H.J. Singer, and K. Min (2015), Field line distribution of mass density at geostationary orbit, *J. Geophys. Res.*, doi: 10.1002/2014JA020810.

Denton, R. E., V. K. Jordanova, and J. Bortnik (2015), Resonance of relativistic electrons with relectromagnetic ion cyclotron waves, *Geophys. Res. Lett.*, 42, 8263–8270, doi:10.1002/2015GL064379.

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