

**WILLIAM LOTKO***Curriculum Vitae**Professor of Engineering Science*Thayer School of Engineering  
Dartmouth College  
Hanover, NH 03755 USA

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1-603/646-3485  
wlotko@dartmouth.edu**Education**

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|---|------|
| <b>Ph.D.</b> <i>Plasma Physics</i> , University of California at Los Angeles      | 1981 |
| Dissertation: "Ion Acoustic Soliton Propagation and Dynamics in Auroral Plasma"   |      |
| Adviser: Charles F. Kennel  |      |
| <b>M.S.</b> <i>Condensed Matter Physics</i> , University of Missouri, Kansas City | 1976 |
| Thesis: "Electrical Resistivity in Liquid Sodium and Potassium"                   |      |
| Adviser: Richard D. Murphy  |      |
| <b>B.S.</b> <i>Engineering Physics</i> , University of Kansas                     | 1973 |

**Appointments & Employment**

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|---|---------|
| Interim Dean, <i>Thayer School of Engineering</i>                                     | 2004-05 |
| Senior Associate Dean, <i>Thayer School of Engineering</i>                            | 1999-04 |
| Director of MS/PhD Program, <i>Thayer School of Engineering</i>                       | 1996-99 |
| Professor of Engineering Science, <i>Dartmouth College</i>                            | 1995-   |
| Associate Professor of Engineering Science, <i>Dartmouth College</i>                  | 1989-95 |
| Research Asst/Assoc Professor of Engineering, <i>Thayer School of Engineering</i>     | 1984-89 |
| Assistant/Associate Research Physicist, <i>Space Sciences Laboratory, UC Berkeley</i> | 1981-84 |
| Teaching/Research Assistant, <i>Department of Physics, UCLA</i>                       | 1976-81 |
| Electrical Engineer, <i>Libby Power Systems, Kansas City, MO</i>                      | 1973-75 |

**Visiting Scientist**

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| National Center for Atmospheric Research, High Altitude Observatory, Boulder | 2006-07 |
| Laboratory for Atmospheric and Space Physics, U. Colorado, Boulder           | 2006-07 |
| Max-Planck-Institut für Extraterrestrische Physik, Munich                    | 1996    |
| Space Sciences Laboratory, University of California, Berkeley                | 1995-96 |
| Los Alamos National Laboratory   | 1983    |

**Editorial Service**

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| Editor-in-Chief, <i>Journal of Atmospheric and Solar-Terrestrial Physics</i> | 2005-   |
| Associate Editor, <i>Geophysical Research Letters</i>                        | 1992-97 |
| Associate Editor, <i>Journal of Geophysical Research, Space Physics</i>      | 1990-92 |

**WILLIAM LOTKO***Curriculum Vitae***National Service**

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Steering Committee, Targeted Research & Technology, NASA LWS Program	2004-06
Steering Committee, New Hampshire Space Grant Consortium	1990-00
Steering Committee (Chair), NSF Program on Geospace Environment Modeling	1991-94
Steering Committee, NSF Polar Cap Observatory	1992
Advisory Committee, NSF Space Weather Research Initiative	1993-94
Fellows Selection Committee, American Geophysical Union	2007-09
Committee of Visitors, External Review of DOE Office of Fusion Energy Sciences	2009
Panelist – Theory, Computation, Data Exploration Survey, NRC Space Studies Board	2001
Working Group (Chair), NASA Geospace Management and Operations	2007-09
Working Group (Member), NASA Geospace Management and Operations	2003-07
Working Group (Chair), NSF Program on Geospace Environment Modeling	1989-08
Working Group, Int'l Space Science Institute, Auroral Plasma Physics Project	1999-01
Review Panels, NSF Geospace Environment Modeling Program	
Review Panels, NASA Supporting Research and Technology Program	
Review Panels, NASA Living With a Star, Targeted Research and Technology Program	

**Conference Organization** (since 2000)

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Co-Convener, LWS/TR&T Workshop, NCAR/HAO, Boulder	2008, 2009
Co-Convener, Prospectus - GEM Focus Group on Geospace System, Snowmass	2009
Lead Convener, IAGA DIVIII03 Symposium on MI Interactions and Aurora, Sopron	2009
Lead Convener, IAGA DIVIII03 Symposium on MI Interactions and Aurora, Perugia	2007
Program Committee, Third Alfvén Conference, Steamboat Springs	2004
Co-Convener, Geospace Environment Modeling Workshops	2000-08
Co-Convener, AGU Session on Electrodynamics of M-I Coupling, San Francisco	2000

**Professional Membership**

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American Association for the Advancement of Science  
 American Geophysical Union  
 American Society for Engineering Education

**Awards and Honors**

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A.M. (Honorary Degree), Dartmouth College, 1996  
 Fellow, American Geophysical Union, 2007  
 Phi Beta Kappa (Honorary Member), Alpha of New Hampshire Chapter, 2008

**WILLIAM LOTKO***Curriculum Vitae***Research & Educational Interests**

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*Geospace environment; Space plasma physics, modeling, simulation; EM fields & waves*

My research within the broader field of space science focuses on system-level studies of the solar wind-magnetosphere-ionosphere interaction, its plasma electrodynamics, magnetohydrodynamics, and collisionless transport processes, with applications to space weather prediction. With students and research collaborators, I am currently investigating and developing simulation models for ionospheric outflows into the magnetosphere; electron precipitation and electromagnetic power deposition into the high-latitude ionosphere and thermosphere; plasma kinetics that enable superfluent ion outflows and electron precipitation; and the effects of all of these processes on global geospace dynamics. My research has been sponsored by NSF, NASA, NOAA and the Air Force. I currently serve as Principal Investigator for Dartmouth's Heliophysics Theory Group sponsored by NASA, Team Leader for one of NASA's Living With a Star Targeted Research and Technology projects focusing on geospace dynamics during storms, and co-investigator with the Center for Integrated Space Weather Modeling, a multi-institutional Science and Technology Center sponsored by NSF. I led NSF's Geospace Environment Modeling program as steering committee chair during its early years as a funded program, and, in that capacity, with five colleagues and partners from federal agencies we successfully advocated for the creation of the U.S. National Space Weather Program. I have served the Thayer School of Engineering as Professor, Director of the MS/PhD Program, Senior Associate Dean and Interim Dean. I teach courses on engineering design, applied mathematics, EM fields and waves, magnetohydrodynamics and plasma physics, and issues in technology and society.

**Research Supervision**

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**MS Students**

Jianou Shi, M.S. 1990  
 Jianhong Sun, M.S. 1992  
 Katyoun Vatan, M.S. 1993  
 Igor G. Kouznetsov, M.S. 1994  
 Shireen D. Geimer, M.S. 1995  
 Elizabeth A. Packmayer, M.S. 2001  
 Zhigang Chen, M.S. 2001  
 John R. Gagne, M.S. 2005  
 Paul D. Melanson, M.S. 2007  
 Jonathan C. Watts, M.S. 2009

**Postdoctoral Fellows,  
Research Scientists &  
Research Faculty**

Mei-Mei Shen, 1987-89  
 Rick L. Richard, 1989-91  
 John R. Manuel, 1993-95  
 Anatoly V. Streltsov, 1995-97  
 Marc R. Lessard, 1999-2001  
 Simon G. Shepherd, 2001-03  
 David Murr, 2003-07  
 Peter A. Damiano, 2007-

**PhD Students**

Anatoly V. Streltsov, Ph.D. 1995  
 Dimitri Pokhotelov, Ph.D. 2002  
 Oliver J. Brambles, Ph.D. Candidate  
 Sheng Xi, Ph.D. Candidate  
 Binzheng Zhang, Ph.D. Candidate

## WILLIAM LOTKO

### *Publications*

- Magnetospheric cavity modes driven by solar wind dynamic pressure fluctuations  
S.G. Claudepierre, M. Wiltberger, S.R. Elkington, W. Lotko, and M.K. Hudson, *Geophys. Res. Lett.* 36, L13101, DOI: 10.1029/2009GL039045, 2009
- 2009** Modeling seasonal variations of auroral particle precipitation in global-scale MI simulation  
M. Wiltberger, R.S. Weigel, W. Lotko, and J.A. Fedder, *J. Geophys. Res.-Space Physics* 114, A01204, DOI: 10.1029/2008JA013108, 2009
- A multidisciplinary approach to introductory engineering design  
P.J. Robbie, I. Baker, W. Lotko, and J.P. Collier, *2008 IEEE Frontiers in Education Conference*, F1F-1-6, DOI: 10.1109/FIE.2008.4720310, 2008
- Nonlinear finite-Larmor-radius effects in reduced fluid models  
A.J. Brizard, R.E. Denton, B. Rogers, and W. Lotko, *Phys. Plasmas* 15(8), 082302-1-15, DOI: 10.1063/1.2965827, 2008
- Coupling between density structures, EM waves and ionospheric feedback in the auroral zone  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.-Space Physics* 113(A5), A05212, DOI: 10.1029/2007JA012594, 2008
- Effect of the radial boundary condition on Alfvén wave dynamics in reduced magnetohydrodynamics  
R. E. Denton, B. Rogers, W. Lotko, and A.V. Streltsov, *Phys. Plasmas* 15(3), 032106-1-7, DOI: 10.1063/1.2898409, 2008
- Reduced magnetohydrodynamic equations with coupled Alfvén and sound wave dynamics  
R. E. Denton, B. Rogers, and W. Lotko, *Phys. Plasmas* 14(10), 102906-1-7, DOI: 10.1063/1.2786060, 2007
- Ground and satellite observations of the evolution of growth phase auroral arcs  
M.R. Lessard, W. Lotko, J. LaBelle, W. Peria, C.W. Carlson, F. Creutzberg, and D.D. Wallis, *J. Geophys. Res.-Space Physics* 112(A9), A09304-1-17, DOI: 10.1029/2006JA011794, 2007
- 2007** The magnetosphere-ionosphere system from the perspective of plasma circulation: A Tutorial  
W. Lotko, *J. Atmos. Sol.-Terr. Phys.* 69(3), 191-211, doi:10.1016/j.jastp.2006.08.011, 2007
- Localized parallel electric fields associated with inertial Alfvén waves  
R.E. Ergun, L. Andersson, Y.-J. Su, D.L. Newman, M.V. Goldman, W. Lotko, C.C. Chaston and C.W. Carlson, *Phys. Plasmas* 12, 072901, 2005
- Some properties of Alfvén waves: Observations in the tail lobes and the plasma sheet boundary layer  
A. Keiling, G.K. Parks, J.R. Wygant, J. Dombeck, F.S. Mozer, C.T. Russell, A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 110, A10S11, doi:10.1029/2004JA010907, 2005
- Simulations of ULF field-aligned currents generated by HF heating of the ionosphere  
A.V. Streltsov, W. Lotko and G.M. Milikh, *J. Geophys. Res.* 110, A04216, doi:10.1029/2004JA010629, 2005
- Ultralow-frequency electrodynamics of the magnetosphere-ionosphere interaction  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 110, A08203, doi:10.1029/2004JA010764, 2005
- Multiscale electrodynamics of the ionosphere-magnetosphere system  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 109, A09214, doi:10.1029/2004JA010457, 2004
- Inductive magnetosphere-ionosphere coupling  
W. Lotko, *J. Atmos. Solar-Terr. Phys.*, 66/15-16, 1443-1456, doi:10.1016/j.jastp.2004.03.027, 2004
- 2004** Simulations of resonant Alfvén waves generated by artificial HF heating of the auroral ionosphere  
D. Pokhotelov, W. Lotko and A.V. Streltsov, *Ann. Geophys.* 22, 2943, doi:1432-0576/ag/2004-22-2943, 2004

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### *Publications*

*Auroral Plasma Physics* (International Space Science Institute, vol. 15)

W. Lotko (contributing author) ed. by G. Paschmann, S. Haaland and R. Treumann, Kluwer Academic Publishers, 2003

*The Sun to Earth and Beyond: Panel Report on Theory, Modeling, and Data Exploration*

W. Lotko (contributing author), National Academy Press, p.183-210, 2003

Small-scale electric fields in downward auroral current channels

A.V. Streltsov and W. Lotko, *J. Geophys. Res.*, 108(A7), 1289, doi:10.1029/2002JA009806, 2003

Reflection and absorption of Alfvénic power in the low-altitude magnetosphere

A.V. Streltsov and W. Lotko, *J. Geophys. Res.*, 108(A4), 8016, doi:10.1029/2002JA009425, 2003  
(Erratum: *J. Geophys. Res.* 110, A04217, 2005)

Harmonic structure of field line eigenmodes generated by ionospheric feedback instability

D. Pokhotelov, W. Lotko and A.V. Streltsov, *J. Geophys. Res.* 107(A11), 1363,  
doi:10.1029/2001JA000134, 2002

Ultra-low-frequency magnetohydrodynamics in boundary-constrained geomagnetic flux coordinates

J.A. Proehl, W. Lotko, I. Kouznetsov and S.D. Geimer, *J. Geophys. Res.* 107(A9), 1225,  
doi:10.1029/2001JA000135, 2002

Evidence for kinetic Alfvén waves and parallel electron energization at 4-6 RE altitudes ...

J.R. Wygant, A. Keiling, C.A. Cattell, M. Temerin, F.S. Mozer, C.A. Kletzing, J.D. Scudder, A.V. Streltsov, W. Lotko and C.T. Russell, *J. Geophys. Res.* 107(A8), 1201, doi:10.1029/2001JA900113, 2002

Numerical modeling of Alfvén waves observed by Polar in the nightside plasmasheet boundary layer

A.V. Streltsov, W. Lotko, A. Keiling and J. R. Wygant, *J. Geophys. Res.* 107(A8), 1173,  
doi:10.1029/2001JA000233, 2002

**2002** Effects of seasonal asymmetry in ionospheric conductance on the appearance of discrete aurora

D. Pokhotelov, W. Lotko and A.V. Streltsov, *Geophys. Res. Lett.* 29(10), 1437,  
doi:10.1029/2001GL014010, 2002

Large Alfvén wave power in the plasma sheet boundary during the expansion phase of substorms

A. Keiling, J.R. Wygant, C. Cattell, M. Temerin, F.S. Mozer, C.A. Kletzing, J. Scudder, C.T. Russell, W. Lotko and A.V. Streltsov, *Geophys. Res. Lett.* 27, 3169, 2000

Possible evidence of damped cavity mode oscillations stimulated by the Jan 11 1997 magnetic cloud ...

J. Goldstein, M.K. Hudson and W. Lotko, *Geophys. Res. Lett.* 26, 3589, 1999

Numerical cavity mode simulation and Polar data from the January, 1997 magnetic cloud event

J. Goldstein, R.E. Denton, M.K. Hudson, W. Lotko and J.G. Lyon, in *Sun-Earth Plasma Connections* (Geophysical Monograph vol. 109), ed. by J.L. Burch, R.L. Carovillano and S.K. Antiochos, American Geophysical Union, Washington D.C., p. 77, 1999

Small-scale, "electrostatic" auroral structures and Alfvén waves

A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 104, 4411, 1999

Discrete auroral arc, electrostatic shock, and suprathermal electrons powered by dispersive, resistive FLR

W. Lotko, A.V. Streltsov and C.W. Carlson, *Geophys. Res. Lett.* 25, 4449, 1998

**1998** Small-scale dispersive field line resonances in the hot magnetospheric plasma

A.V. Streltsov, W. Lotko, J.R. Johnson and C.Z. Cheng, *J. Geophys. Res.* 103, 26,559, 1998

Magnetospheric resonance, auroral structure, and multipoint measurements

W. Lotko and A.V. Streltsov, *Adv. Space Res.* 20, 1067, 1997

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### *Publications*

- Dispersive nonradiative field line resonances in dipolar magnetic field geometry  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 102, 1997
- Influence of the finite ionospheric conductivity on dispersive, nonradiative field line resonances  
A.V. Streltsov and W. Lotko, *Ann. Geophys.* 15, 625, 1997
- Modeling the low-latitude boundary layer with finite field-aligned potential drops ...  
C.Q. Wei, B.U.O. Sonnerup and W. Lotko, *J. Geophys. Res.* 101, 21,463, 1996
- On the kinetic dispersion relation for shear Alfvén waves  
R.L. Lysak and W. Lotko, *J. Geophys. Res.* 101, 5085, 1996
- Fine structure of dispersive nonradiative field line resonance layers  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 101, 5343, 1996
- Dispersive field line resonances on auroral field lines  
A.V. Streltsov and W. Lotko, *J. Geophys. Res.* 100, 19,457, 1995
- The low-latitude boundary layer on closed field lines  
W. Lotko and B.U.O. Sonnerup, in *Physics of the Magnetopause* (American Geophysical Union Monograph), ed. by P. Song, B. Sonnerup, and M. Thomsen, Washington D.C., p. 371-383, 1995
- Radial energy transport by magnetospheric ULF waves: Effects of magnetic curvature ...  
I. Kouznetsov and W. Lotko, *J. Geophys. Res.* 100, 7599, 1995
- 1995** Modeling mesoscale processes in the global geospace system  
M.K. Hudson, C.A. Cattell, W. Lotko, R.L. Lysak, I. Roth and M. Temerin, *Space Sci. Rev.* 71, 623, 1995
- Developing service promises accurate space weather forecasts in the future  
G. Siscoe, E. Hildner, T.L. Killeen, L.J. Lanzerotti and W. Lotko, *EOS Trans. Am. Geophys. Union* 75, 353+365-366, 1994
- Self-consistent steady-state model of the low-latitude boundary layer  
E. Drakou, B.U.O. Sonnerup and W. Lotko, *J. Geophys. Res.* 99, 2351, 1994
- Milestones in Geospace Environment Modeling  
W. Lotko, *EOS Trans. Am. Geophys. Union*, 74, 618-619+622, 1993
- Acoustic double layers in multispecies plasma  
P.C. Gray, M.K. Hudson and W. Lotko, *IEEE Trans. Plasma Sci.* 20, 745, 1992
- 1992** Decay of ion beam driven acoustic waves into ion holes  
P.C. Gray, M.K. Hudson, W. Lotko and R. Bergmann, *Geophys. Res. Lett.* 18, 1675, 1992
- Report of the Working Group on Modeling and Theory  
W. Lotko and W. Burke in *Geospace Environment Modeling Workshop Report on Intercalibrating Cusp Signatures*, ed. by N. Crooker, NSF Magnetospheric Physics Program, Washington D.C., p. 125-126, 1991
- Magnetic field draping at the low-latitude boundary magnetopause  
R.L. Richard and W. Lotko, *J. Geophys. Res.* 96, 15,779, 1991
- On large-scale rotational motions and energetics of auroral shear layers  
W. Lotko and M.-M. Shen, *J. Geophys. Res.* 96, 9549, 1991
- A high-latitude, low-latitude boundary layer model of the convection current system  
G.L. Siscoe, W. Lotko and B.U.O. Sonnerup, *J. Geophys. Res.* 96, 3487, 1991
- Self-consistent model of the low-latitude boundary layer  
T.D. Phan, B.U.O. Sonnerup and W. Lotko, *J. Geophys. Res.* 94, 1281, 1989

## WILLIAM LOTKO

### *Publications*

- Report of the Working Group on Ionospheric Signatures  
W. Lotko, in *Report of the Geospace Environment Modeling Workshop, Theory Campaign on Magnetopause and Boundary Layer Physics*, ed. by M. Ashour-Abdalla, NSF Magnetospheric Physics Program, Washington D. C., p. 61-68, 1989
- 1989** Oxygen acoustic solitary waves in magnetized plasma  
 S. Qian, W. Lotko and M.K. Hudson, *J. Geophys. Res.* 94, 1339, 1989
- Dynamics of localized ion acoustic waves in a magnetized plasma  
 S. Qian, W. Lotko and M.K. Hudson, *Phys. Fluids* 31, 2190, 1988
- Internal shear layers in auroral dynamics  
W. Lotko and C.G. Schultz, in *Magnetosphere-Ionosphere Plasma Models* (Geophysical Monograph Series, v. 44), ed. by T.E. Moore and J.H. Waite, Jr., p. 121, AGU, Washington D. C., 1988
- 1987** Nonsteady boundary layer flow including ionospheric drag and parallel electric fields  
W. Lotko, B. Sonnerup and R.L. Lysak, *J. Geophys. Res.* 92, 8635, 1987
- Weak double layers in the auroral ionosphere  
 M.K. Hudson, T.L. Crystal, W. Lotko and C. Barnes, *Laser and Particle Beams* 5, 295, 1987
- Evidence for nonlinear wave-wave interactions in solar type III radio bursts  
 R.P. Lin, W.K. Levedahl, W. Lotko, D.A. Gurnett and F.L. Scarf, *Astrophys. J.* 308, 954, 1986
- Transition to unstable ion flow in parallel electric fields  
 R. Bergmann and W. Lotko, *J. Geophys. Res.* 91, 7033, 1986
- Production of flickering aurora and field-aligned electron flux by electromagnetic ion cyclotron waves  
 M. Temerin, J. McFadden, M. Boehm, C.W. Carlson and W. Lotko, *J. Geophys. Res.* 91, 5769, 1986
- Diffusive acceleration of auroral primaries  
W. Lotko, *J. Geophys. Res.* 91, 191, 1986
- Particle energization in stochastic double layers  
W. Lotko, in *Unstable Current Systems and Plasma Instabilities in Astrophysics*, ed. by M.R. Kundu and G.D. Holman, IAU, D. Reidel Publ. Co., Dordrecht, Holland, p. 125, 1985
- 1985** Weak double layers in ion-acoustic turbulence  
 C. Barnes, M.K. Hudson and W. Lotko, *Phys. Fluids* 28, 1055, 1985
- The evolution of double layers in one and two dimensions  
 C. Barnes, M.K. Hudson and W. Lotko, in *Proceedings of the Second Symposium on Plasma Double Layers and Related Topics*, ed. by R. Schrittwieser and G. Eder, Institute for Theoretical Physics, University of Austria, Innsbruck, Austria, p. 284, 1984
- Spiky ion acoustic waves in collisionless auroral plasma  
W. Lotko and C.F. Kennel, *J. Geophys. Res.* 88, 381, 1983
- Solitary waves and double layers on auroral field lines  
 M.K. Hudson, W. Lotko, I. Roth and E. Witt, *J. Geophys. Res.* 88, 916, 1983
- Observations of double layers and solitary waves in the auroral plasma  
 M.K. Temerin, K. Cerny, W. Lotko and F.S. Mozer, *Phys. Rev. Lett.* 48, 48, 1982
- Ion acoustic solitary waves in a magnetized plasma with arbitrary electron equation of state  
 E. Witt and W. Lotko, *Phys. Fluids* 26, 2176, 1983
- Reflection dissipation of an ion acoustic soliton  
W. Lotko, *Phys. Fluids* 26, 1771, 1983

**WILLIAM LOTKO***Publications*

- 1982** Formation of double layers on auroral field lines  
R.L. Lysak, M.K. Hudson, W. Lotko and E. Witt, in *Proceedings of the Symposium on Plasma Double Layers*, ed. by P. Michelsen and J.J. Rasmussen, RISO National Laboratory, Roskilde, Denmark, p. 274, 1982
- Ion-acoustic soliton propagation and dynamics in auroral plasma  
W. Lotko, Ph.D. dissertation, University of California, Los Angeles, 1981
- Stationary electrostatic solitary waves in the auroral plasma  
W. Lotko and C.F. Kennel, in *Physics of Auroral Arc Formation, Geophysical Monograph Series, vol. 25*, ed. by S.I. Akasofu and J.R. Kan, American Geophysical Union, Washington D. C., p. 437, 1981
- Amplification of electrostatic noise in cyclotron resonance with an adiabatic auroral beam  
W. Lotko and J.E. Maggs, *J. Geophys. Res.* 86, 3449, 1981
- Altitude dependent model of auroral beam and beam generated electrostatic noise  
J.E. Maggs and W. Lotko *J. Geophys. Res.* 86, 3439, 1981
- 1979** Damping of electrostatic noise by warm auroral electrons  
W. Lotko and J.E. Maggs, *Planet. Space Sci.* 2, 1491, 1979
- Theoretical calculation of static resistivity in liquid sodium and potassium  
W. Lotko and R.D. Murphy, *Fluid Phase Equil.* 1, 277, 1977
- 1976** Theoretical calculation of static resistivity in liquid sodium and potassium  
W. Lotko, M.S. thesis, University of Missouri, Kansas City, 1976