Bruce Tadashi Tsurutani

Education

- B.A., Physics, University of California at Berkeley
- Ph.D., Physics, University of California at Berkeley (1972)

Research Interests

- Space Weather: Magnetic Storms and Substorms, Solar and Interplanetary Causes thereof
- Nonlinear Plasma Waves (Evolution, Turbulence, Stochastic Particle Acceleration)
- Plasma Physics (Instabilities and Wave-Particle Interactions)
- Ionospheric Physics/Aeronomy: The Dayside Superfountain Effect, Solar Flare Effects
- Auroral and Magnetospheric Physics (Energetic Particle Precipitation, Auroras, Relativistic Electron Acceleration and Precipitation)
- Solar Wind Interaction with Magnetospheres (Upstream Waves and Particles, Viscous Interaction)
- Geomagnetism
- Solar Corona Physics (Heating)
- Astrophysics (X-Ray Bursters)

Professional Experience

- Jet Propulsion Laboratory (1972-Present)
    - Principal Scientist (2001- Present)
    - Senior Research Scientist (1986-Present)
    - Research Scientist (1972-1985)
    - Past Manager of the Space Physics and Astrophysics Section (1985-1987)
    - Past Leader of space plasma physics group (1987-2004)
- Visiting Professor, Kyoto University (Oct. 2006- April 2007)
- Visiting Professor, Kyoto University (August- Nov 2005)
- Adjunct Professor, Physics and Astronomy Department, University of Southern California (2004-2007)
- Visiting Associate, California Institute of Technology, Solar Physic Group (1996-2002)
- Visiting Scientist, National Oceanic & Atmospheric Administration SEL, Boulder CO (July-Aug, 1993)
- Visiting Professor University of Alaska, Geophysical Institute (July-Aug, 1992)
- Visiting Professor Kyoto University (Mar-July, 1988)
- PhD, 1972, University of California at Berkeley (K. A. Anderson, thesis advisor): Energetic Electron Precipitation and Substorms

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Selected Awards

- John A. Fleming Medal (for outstanding original research and technical leadership in geomagnetism, aeronomy, space physics and plasma physics), AGU, 2009
- AGU Fellow, 2009
- The University of Santa Maria, Rio Grande do Sul, Brazil University Medal, 2009
- AGU Excellence in Refereeing awards (2007-JGR; 2003-GRL; 1984-GRL)
- Latin American Geophysical Society (ALAGE) Gold Medal, inaugural awardee (2001)
- Von Humboldt (Germany) Research Fellow (1993-1994), spent at Technical University of Braunschweig and Cologne University, Germany
- Brazilian National Space Medal (1992). Other awardees include: W. Von Braun, V. Suomi and Y. Gagarin. Only six awardees to date.
- President-Elect/President, AGU Space Physics and Aeronomy Section (1988-1992)
- Kyoto University International Scholarship (Oct, 1989)
- Secretary, AGU Solar Interplanetary Physics section (1982-1986)
- NASA awards (Exceptional Service Medals: 1985; 2001) and ~10 space flight team achievement awards

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Listed as one of the top 250 highly cited authors in the field of space physics and geophysics (includes astrophysics, space plasma physics and planetology) as compiled by Thomson Reuters ISI Web of Knowledge.

Selected Publications
From over 550 publications

1. **Tsurutani, B.T.,** K. Shibata, S.-I. Akasofu, and M. Oka, A two-step scenario for both solar flares and magnetospheric substorms: Short duration energy storage, *Earth, Planets Space*, *61*, 555, 2009.

2. **Tsurutani, B.T.**, F. L. Guarnieri, E. Echer, G.S. Lakhina and O.P. Verkhoglyadova, Magnetic decreases (MD) formation from < 1 AU to ~ 5 AU: CIR reverse shocks, *114*, doi:10.1029/2008JA013927, *J. Geophys. Res.*, *114*, A08105, doi:10.1029/2008HA013927, 2009.

3. **Tsurutani, B.T.,** O.P. Verkhoglyadova, A.J. Mannucci, G.S. Lakhina, G. Li and G.P. Zank, A brief review of "solar flare effects" on the ionosphere, *Radio Science*, *44*, RSOA17, doi:10.1029/2008RS004029, 2009.

4. **Tsurutani, B.T**., O.P. Verkhoglyadova, G.S. Lakhina and S. Yagitani, Properties of dayside outer zone (DOZ) chorus during HILDCAA events: Loss of energetic electrons, *J. Geophys. Res.*, *114*, A03207, doi:10.1029/2008JA013353, 2009.

5. **Tsurutani, B.T**., O.P. Verkhoglyadova, A.J. Mannucci, A. Saito, T. Araki, K. Yumoto, T. Tsuda, M.A. Abdu, J.H.A. Sobral, W.D. Gonzalez, H. McCreadie, G.S. Lakhina, and V.M. Vasyliunas, Prompt penetration electric fields (PPEFs) and their ionospheric effects during the great magnetic storm of October 30-31, 2003, *J. Geophys. Res.*, *113*, A5, A05311, doi:10.1029/2007HA012879, 2008.

6. **Tsurutani, B.T**., E. Echer, F. L. Guarnieri and O.P. Verkhoglyadova, Interplanetary causes of middle latitude ionospheric disturbances, in *Mid-Latitude Ionospheric Dynamics and Disturbances*, edited by P. Kintner Jr., A.J. Coster, T. Fuller-Rowell, A.J. Mannucci, M. Mendillo and R. Heelis, Amer. Geophy. Un. Press, Wash. D.C., *181*, 99, 2008.
7. **Tsurutani, B.T.**,E. Echer, F.L. Guarnieri and J.U. Kozyra, CAWSES Novmerber 7-8, 2004 superstorm: Complex solar and interplanetary features in the post-solar maximum phase, Geophys. Res. Lett., 35, L06S05, doi:10.1029/2007GL031473, 2008.
8. **Tsurutani, B.T.**, W.D. Gonzalez, A.L.C. Gonzalez, F.L. Guarnieri, N. Gopalswamy, M. Grande, Y. Kamide, Y. Kasahara, G. Lu, I. Mann, R. McPherron, F. Soraas and V. Vasyliunas., Corotating solar wind streams and recurrent geomagnetic activity: A review, *J. Geophys. Res*., 111, A07S01, doi:10.1029/2005JA011273, 2006.
9. **Tsurutani, B.T.**, G.S. Lakhina, J.S. Pickett, F.L. Guarnieri, N. Lin, and B.E. Goldstein, Nonlinear Alfvén waves, discontinuities, proton perpendicular acceleration, and magnetic holes/decreases in interplanetary space and the magnetosphere: Intermediate shocks?, *Nonlinear Proc. Geophys*.,12 (3),321, 2005.
10. **Tsurutani, B.T.**, D.L. Judge, F.L. Guarnieri, et al., The October 28, 2003 extreme EUV solar flare and resultant extreme ionospheric effects: Comparison to other Halloween events and the Bastille day event, *Geophys. Res. Lett*., 32, 3 L03S09, doi:10.1029/2004GL021475, 2005.
11. **Tsurutani, B. T.**, D. R. Clay, L. D. Zhang, B. Dasgupta, D. Brinza, M. Henry, A. Mendis, J. K. Arballo, S. Moses, and A. Mendis, Plasma clouds associated with Comet P/Borrelly dust impacts, *Icarus*, 167, 89, 2004.
12. **Tsurutani, B.T.**, X.-Y. Zhou, and W.D. Gonzalez, A lack of substorm expansion phases during magnetic storms induced by magnetic clouds, in *Storm-Substorm Relationship*, edited by S. Sharma, Y. Kamide and G. Lakhina, Amer. Geophys. Un. Press, Wash. D.C., 142, 23, 2004.
13. **Tsurutani, B.T.**, A. Mannucci, B. Iijima, M.A. Abdu, J.H.A. Sobral, W.D. Gonzalez, F. Guarnieri, T. Tsuda, A. Saito, K. Yumoto, B. Fejer, T.J. Fuller-Rowell, J. Kozyra, J.C. Foster, A. Coster and V.M. Vasyliunas, Global dayside ionospheric uplift and enhancement associated with interplanetary electric fields, *J. Geophys. Res*.,109, A08302, doi:10.1029/2003JA010342, 2004.
14. **Tsurutani, B.T.** and G.S. Lakhina, Cross-field particle diffusion in a collisionless plasma: A nonresonant and a resonant mechanism, *Plasmas in the Laboratory and in the Universe*, editors: G. Bertin, D. Farina and R. Pozzoli, Amer. Inst. Phys., 703, 123, 2003.
15. **Tsurutani, B.T.**, W.D. Gonzalez, G.S. Lakhina and S. Alex, The extreme magnetic storm of September 1-2, 1859, *J. Geophys. Res*., 108, SSH 1-1, doi:10.1029/2002JA009504, 2003
16. **Tsurutani, B.T.**, L.D. Zhang, G.M. Mason, G. Lakhina, T. Hada, J.K. Arballo, and R.D. Zwickl, Particle transport in ^{3}He-rich events: Wave-particle interactions and particle anisotropy measurements, *Annales Geophysicae*, 20, 427, 2002.
17. Suess, S.T. and **B.T. Tsurutani**, Solar Winds, *Encyclopedia of Atmospheric Sciences*, Academic Press, London, 2078, 2002.
18. Zhou, X.-Y. and **B.T. Tsurutani**, Interplanetary shock triggering of nightside geomagnetic activity: Substorms, pseudobreakups and quiescent events, *J. Geophys. Res*., 106, 18957, 2001.

19. **Tsurutani, B.T.**, X.-Y. Zhou, V.M. Vasyliunas, G. Haerendel, J.K. Arballo, and G.S. Lakhina, Interplanetary shocks, magnetopause boundary layers and dayside auroras: The importance of a very small magnetospheric region, *Surveys in Geophys*., 22, 101, 2001.
20. Lakhina, G.S., **B.T. Tsurutani**, H. Kojima and H. Matsumoto, Broadband plasma waves in the boundary layers, *J. Geophys. Res.*, 105, 27791, 2000.
21. **Tsurutani, B.T.**, G.S. Lakhina, D. Winterhalter, J.K. Arballo, C. Galvan and R. Sakurai, Energetic particle cross-field diffusion: Interaction with magnetic decreases (MDs), *Nonlinear Proc. in Geophysics*, 6, 235, 1999.
22. **Tsurutani, B.T.** and C.M. Ho, A review of discontinuities and Alfvén waves in interplanetary space: Ulysses results, *Rev., Geophysics*, 37, 517, 1999.
23. Kamide, Y., W. Baumjohann, I. A. Daglis, W. D. Gonzalez, M. Grande, J. A. Joselyn, R. L. McPherron, J. L. Phillips, E.G.D. Reeves, G. Rostoker, A. S. Sharma, H. J. Singer, **B. T. Tsurutani** and V. M. Vasyliunas, Current understanding of magnetic storms; storm/substorm relationships, *J. Geophys. Res*., 103, 17705, 1998.
24. **Tsurutani, B. T.** and G. S. Lakhina, Some basic concepts of wave-particle interactions in collisionless plasmas, *Rev. Geophys*, 35, 491, 1998.
25. **Tsurutani, B. T.** and W. D. Gonzalez, The interplanetary causes of magnetic storms: A review, in *Magnetic Storms*, edited by B. T. Tsurutani, W. D. Gonzalez, Y. Kamide, and J.K. Arballo, AGU Monograph, Wash. D.C.,98, 77, 1997.
26. **Tsurutani, B. T.**, K.-H. Glassmeier and F. M. Neubauer, A review of nonlinear low frequency (LF) wave observations in space plasmas: On the development of plasma turbulence, *Nonlinear Waves and Chaos in Space Plasmas*, edited by T. Hada and H. Matsumoto, Terra, Sci. Publ., Tokyo, 1, 1996. Kyoto, Japan, 1996.
27. Ho. C. M., **B. T. Tsurutani**, E. J. Smith and W. C. Feldman, Properties of slow-mode shocks in the distant (>200 R_e) geomagnetic tail, *J. Geophys. Res.*, 101, 15277, 1996.
28. **Tsurutani, B. T.**, K.-H. Glassmeier and F. M. Neubauer, An intercomparison of plasma turbulence at three comets: Grigg-Skjellerup, Giacobini-Zinner, and Halley, *Geophys. Res. Lett.*, 22, 1149, 1995.
29. **Tsurutani, B. T.**, W. D. Gonzalez, A.L.C. Gonzalez, F. Tang, J. K. Arballo, and M. Okada, Interplanetary Origin of geomagnetic activity in the declining phase of the solar cycle, *J. Geophys. Res.*, 100, 21717, 1995.
30. **Tsurutani, B. T.**, C. M. Ho, E. J. Smith, M. Neugebauer, B. E. Goldstein, J. S. Mok, J. K. Arballo, A. Balogh, D. J. Southwood, and W. C. Feldman, The relationship between interplanetary discontinuities and Alfvén waves:Ulysses observations, *Geophys. Res. Lett*., 21, 2267, 1994.
31. Gonzalez, W. D., J. A. Joselyn, Y. Kamide, H W. Kroehl, G. Rostoker, **B. T. Tsurutani** and V. M. Vasyliunas, What is a geomagnetic storm?, *J. Geophys. Res*., 99, 5771, 1994.
32. **Tsurutani, B. T.** and W. D. Gonzalez, F. Tang, and Y. T. Lee, Great magnetic storms, *Geophys. Res. Lett*., 19, 73, 1992.
33. **Tsurutani, B. T.**, M. Sugiura, T. Iyemori, B. E. Goldstein, W. D. Gonzalez, S. I. Akasofu, and E. J. Smith, The nonlinear response of AE to the IMF B_s driver: A spectral break at 5 hours, *Geophys. Res. Lett.*, 17, 279, 1990.
34. Brinca, A.L., **B.T. Tsurutani** and F.L. Scarf, Local generation of electrostatic bursts at Comet Giacobini-Zinner: modulation by steepened magnetosonic waves, *J. Geophys. Res*., 94, 60, l989.

35. **Tsurutani, B.T.**, R.M. Thorne, E.J. Smith, A.L. Brinca and H. Matsumoto, Properties of whistler mode wave packets at the leadingedge of steepened magnetosonic waves: Comet Giacobini-Zinner, *Planetary Space Sciences*, 37, l67, l989.
36. **Tsurutani, B.T.**, W.D. Gonzalez, F. Tang, S.-I. Akasofu, and E.J. Smith, Solar wind southward B_z features responsible for major magnetic storms of l978-l979, *J. Geophys. Res*., 93, 8519, 1988.
37. **Tsurutani, B.T.**, R. M. Thorne, E. J. Smith, Jr., J.T. Gosling and H. Matsumoto, Steepened magnetosonic waves at Comet Giacobini-Zinner, *J. Geophys. Res*., 92, 11079, l987.
38. Brinca, A.L., and **B.T. Tsurutani**, On the polarization, Ccompression and non-oscillatory behavior of hydromagnetic waves associated with pickup ions, *Geophys. Res. Lett*., l4, 495, 1987.
39. **Tsurutani, B.T.** and W.D. Gonzalez, The cause of high-intensity long duration continuous AE activity (HILDCAAs): interplanetary Alfvén wave trains, *Planet. Spa. Sci*., 35, 405, 1987.
40. **Tsurutani, B. T.**, B. E. Goldstein, M. E. Burton, and D. E. Jones, A Review of the ISEE-3 Geotail magnetic field results, *Planet Space Sci*., 34, 931, 1986.
41. **Tsurutani, B. T.**, I. G. Richardson, R. M. Thorne, W. Butler, E. J. Smith, S. W. H. Cowley and R. D. Zwickl, Observations of the resonant ion beam instability in the distant plasmasheet boundary layer, *J. Geophys. Res*., 90, 12159, 1985.
42. **Tsurutani, B. T.**, and R. P. Lin, Acceleration of >47 keV ions and >2 keV electrons by interplanetary shocks at l AU, *J. Geophys. Res*., 90, l, l985.
43. **Tsurutani, B.T.**, J.A. Slavin, E.J. Smith, R. Okida, and D.E. Jones, Magnetic structure of the distant geotail from -60 to -220 Re: ISEE-3, *Geophys. Res. Lett*., 11, 1, 1984.
44. Pesses, M. E., J. A. Van Allen, **B. T. Tsurutani**, E. J. Smith and J. H. Wolfe, High time resolution observations of CIR proton events by Pioneer 11, *J. Geophys. Res*., 89, 37, l984.
45. Cowley, S. W. H., R. J. Hynds, I. G. Richardson, P. W. Daly, **B. T. Tsurutani**, and J. A. Slavin, Energetic ion regimes in the deep geomagnetic tail: ISEE-3, *Geophys. Res. Lett*., 11, 275, l984.
46. Hones, E. W., Jr., J. Birn, D. N. Baker, S. J. Bame, W. C. Feldman, D. J. McComas, R. D. Zwickl, J. A. Slavin, E. J. Smith and **B. T. Tsurutani**, Detailed examination of a plasmoid in the distant magnetotail with ISEE-3, *Geophys. Res. Lett*., 11, 1046, 1984.
47. **Tsurutani, B. T.**, D. E. Jones and D. G. Sibeck, The two-lobe structure of the magnetotail, from X = -60 to -240 Re, *Geophys. Res. Lett*,., 11, 1066, 1984.
48. Kennel, C. F., J. P. Edmiston, F. L. Scarf, F. V. Coroniti, C. T. Russell, E. J. Smith, **B. T. Tsurutani**, J. D. Scudder, W. C. Feldman, R. R. Anderson, F. S. Mozer, and M. Temerin, Structure of the November l2, l978 quasiparallel interplanetary shock, *J. Geophys. Res*., 89, 5436, 1984
49. **Tsurutani, B. T.**, E. J. Smith, and D. E. Jones, Upstream waves associated with interplanetary shocks, *J. Geophys Res*., 88, 5645, l983.
50. **Tsurutani, B. T.**, E. J. Smith, R. R. Anderson, K. W. Ogilvie, J. D. Scudder, D. N. Baker, and S. J. Bame, Lion Roars and non-oscillatory drift mirror waves in the magnetosheath, *J. Geophys. Res*., 87, 6060, l982.

51. **Tsurutani, B. T.**, E. J. Smith, K. R. Pyle, and J. A. Simpson, Energetic protons accelerated at co-rotating shocks: Pioneer l0 and 11 observations from l to 6 AU, *J. Geophys. Res*., 87, 7389, l982.
52. **Tsurutani, B. T.**, and R. M. Thorne, Diffusion Processes in the magnetopause boundary layer, *Geophys. Res. Letts*., 9, l247, l982.
53. **Tsurutani, B. T.**, and P. Rodriguez, Upstream waves and particles: An overview of ISEE results, *J. Geophys. Res*., 86, 43l7, l98l.
54. **Tsurutani, B. T.**, and E. J. Smith, Interplanetary discontinuities: Temporal variations and the radial gradient from l to 8.5 AU, *J. Geophys. Res*., 84, 2773, l979.
55. **Tsurutani, B. T.**, and D. N. Baker, Substorm warnings: An ISEE-3 real time data system, *EOS*, 60, 702, l979.
56. Smith, E. J., **B. T. Tsurutani**, and R. L. Rosenberg, Observations of the interplanetary sector structure up to heliographic latitudes of l6□: Pioneer 11, *J. Geophys. Res*., 83, 7l7, l978.
57. Neugebauer, M., and **B. T. Tsurutani**, Can x-tay bursts be caused by substorms at a neutron star?, *Astrophys. J*., 226, 494, l978.
58. **Tsurutani, B. T.**, and E. J. Smith, Two types of ELF chorus in the outer magnetosphere and their substormdependences, *J. Geophys. Res*., 82, 5112, l977.
59. **Tsurutani, B. T.**, E. J. Smith, and R. M. Thorne, Electromagnetic hiss and relativistic electron losses in the inner zone, *J. Geophys. Res*., 80, 600, 1975.
60. **Tsurutani, B. T.**, and E. J. Smith, Postmidnight chorus: A substorm phenomenon, *J. Geophys. Res,*., 79, 118, l974.

Editor of Books

1. *Recurrent Magnetic Storms: Corotating Solar Wind Streams*, edited by **B.T. Tsurutani**, R.L. McPherron, W.D. Gonzalez, G. Lu, J.H.A. Sobral, and N. Gopalswamy, Amer. Geophys. Un. Press, Wash. D.C., *167*, 2006.
2. *From the Sun: Auroras, Magnetic Storms, Solar-Flares and Cosmic Rays*, edited by S. Suess and **B.T. Tsurutani**, Amer. Geophys. Un. Press, Wash. D.C., 1998.
3. *Magnetic Storms*, AGU monograph *98*, edited by **B.T. Tsurutani**, W.D. Gonzalez, Y. Kamide, J.K. Arballo, 1997.
4. *Proceedings if the First U.S.-Russian Workshop on FIRE Environment*, IKI - Moscow, edited by O. Vaisberg and **B. Tsurutani**, Dec. 1995.
5. *Small Instruments for Space Physics*, NASA, Washington D.C., edited by **B. T. Tsurutani**, November 1993.
6. *Plasma Waves and Instabilities at Comets and in Magnetospheres*, edited by **B. T. Tsurutani** and H. Oya, Amer. Geophys. Un. Press, Wash. D.C., *53*, 1989
7. *Collisionless Shocks in the Heliosphere: A Tutorial Review*, edited by R. G. Stone and **B. T. Tsurutani**, Amer. Geophys. Un. Press, Wash. D.C., *34*, 1985
8. *Collisionless Shocks in the Heliosphere: Review of Current Research*, edited by **B. T. Tsurutani** and R. G. Stone, Amer. Geophys. Un. Press, Wash. D.C., *35*, 1985