

CURRICULUM VITAE

Nilton O. Renno

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EDUCATION

1994-1995 **Caltech**, Pasadena, CA. Research Fellow in Planetary Sciences
1993-1994 **LLNL**, Livermore, CA. Postdoctoral Scholar
1992-1993 **MIT**, Cambridge, MA. Postdoctoral Associate
1986-1992 **MIT**, Cambridge, MA. Ph.D. in Atmospheric Sciences
1979-1983 **UNICAMP**, Campinas, Brazil. BS in Civil and Environmental Engineering

EMPLOYMENT

2008-Present **Professor**, Atmospheric, Oceanic & Space Sciences, U. Michigan
2002-2008 **Associate Professor**, Atmospheric, Oceanic & Space Sciences, U. Michigan
2006 **Visiting Scholar** (June-Dec.), Department of Physics, U. Oxford, UK
2002-2005 **Adjunct Professor**, Department of Planetary Sciences, U. Arizona
2001-2002 **Associate Professor**, Department of Planetary Sciences, U. Arizona
2001-2002 **Associate Professor**, Department of Atmospheric Sciences, U. Arizona
1995-2001 **Assistant Professor**, Department of Atmospheric Sciences, U. Arizona

SERVICE

2009-2011 **Member**, CoE International Programs in Engineering
2007-2011 **Member**, CoE Multidisciplinary Design Minor Steering Committee
2007-2008 **Member**, NASA Student Collaboration Program Definition Team
2001-2007 **Member**, NRC Research Associateship Review Committee
2001-2003 **Member**, Mars Exploration Rovers Atmospheric Sciences Advisory Committee
2000-2002 **Associate Director**, Arizona Space Grant Consortium
2000-2002 **Chair**, University of Arizona Student Satellite Program Steering Committee
2001-2002 **Co-Chair**, NASA National Space Grant Student Satellite Program Steering Committee

MEMBERSHIPS

American Astronomical Society (**AAS**)
American Geophysical Union (**AGU**)
American Institute of Aeronautics and Astronautics (**AIAA**)
Institute of Physics, UK (**IOP**)
International Society for Optics and Photonics (**SPIE**)
American Meteorological Society (**AMS**)
Organization Scientifique et Technique Internationale du vol a Voile (**OSTIV**)

MISSION INVOLVEMENT

Phoenix 2007 NASA Mars Scout Mission, Co-Investigator and Lead of the
Atmospheric Science Theme Group
MSL 2009 NASA Mars Mission, Co-Investigator

MetNet Mars Missions, Co-Investigator
ExoMars EDM, Co-Investigator

INVENTIONS

Balloon Deployment Systems
Controller for Atmospheric Vortex Engine
Miniature Electric Field Sensor for Measurements in Dusty Environments
Prandtl system for atmospheric static and stagnation pressure measurements
Picosatellite for Electric Field Measurements

AWARDS (including awards to students)

2012 President's Postdoctoral Fellowship to Christine Hartzell
2012 National Academies Christine Mirzayan Science and Technology Policy
Graduate Fellowship to Chase Estrin
2010-2011 Monroe-Brown Foundation Research Excellence Award "For his many accomplishments as a multidisciplinary scientist that include being the leader of the Phoenix Mars Mission's Atmospheric Science Theme Group that found liquid water on Mars; his work with dust devils that has led to his invention of miniature field sensors used in climate studies; and his outstanding work with both undergraduate and graduate students. Nilton's Mars atmospheric research has brought him international recognition in both the theoretical and experimental communities."
2009 NASA Group Achievement Award as member of the Phoenix Project Science Development Team "For outstanding performance in the planning for the execution of the science for the Phoenix mission"
2009 NASA Group Achievement Award as member of the Phoenix Development and Mission Team "For outstanding achievement in the development and operation of the Phoenix spacecraft leading to the first landing in the Martian arctic"
2009 Ph.D. Student Jasper Kok was selected to be the University of Michigan's Single Nominee for the National "Council for Graduate Schools/University Microfilms International (UMI) Distinguished Dissertation Award" in Mathematics, Physical Sciences, and Engineering
2009 Ph.D. Student Jasper Kok received the University of Michigan Rackham Graduate School Distinguished Dissertation Award (8 Ph.D. dissertations out of about 800 receives this honor)
1st Place on the AFRL OSU-UM 2009 Challenge as Mentor to the Eng 450 Team
2009 John L. "Jack" Swigert, Jr., Award for Space Exploration as member of the Phoenix Mars Mission Team
2008 Popular Mechanics Magazine Breakthrough Award for Innovation as member of the Phoenix Mars Mission Team
2008 Popular Science Magazine's 2008 "Best of What's New" Grand Award in the aviation and space category as member of the Phoenix Mars Mission Team
2008 National Space Club Astronautics Engineer Award as member of the Phoenix Mars Mission Team

2008 Civil Space Award from the California Space Authority as member of the
Phoenix Mars Mission Team
2008 Rackham Predoctoral Fellowship (to Jasper Kok)
2007 and 2008 Arizona Governor's Innovator of the Year Award as member of the
Phoenix Mars Mission Team
2007 AGU Fall Meeting, Outstanding Student Paper Award as mentor to Jasper Kok
1st Place on NASA RASC-AL 2007 as Mentor to the Eng 450 Mars Balloon Team
2006 UM/MGU, 1st place as mentor to Jasper Kok
2nd Place on NASA RASC-AL 2006 as Mentor to the Eng 450 Mars Balloon Team
NASA Institute of Advanced Concepts 2005 as mentor to Aimee Covert
2nd Place on NASA RASC-AL 2005 as Mentor to the UM Mars Rover Team
2005 UM/MGU, 1st place on oral presentation as mentor to Jasper Kok
2005 UM/MGU, 1st place on poster presentation as mentor to Jacquelin Koch

STUDENTS SPONSORED

Ph.D. Students

1. Dr. Enio P. Souza (Professor, UFPb, Brazil)
2. Dr. David K. Adams (Visiting Professor, University of Manaus, Brazil)
3. Dr. Nadia Vinogradova (Artist)
4. Dr. Jacquelin Koch (Lecturer, Hope College, MI)
5. Dr. Pierre-Yves Meslin (Postdoctoral Fellow, University of Paris)
6. Dr. Jasper Kok (Postdoctoral Fellow, NCAR)
7. Dr. Manish Mehta (NASA MSFC)
8. Shintaro Taniguchi (U. Hawaii)
9. Douglas Gossiaux (Current)
10. Audelia Wittbrodt (Current)
11. Harvey Elliott (Current)

Master Students

1. Matthew Burkett (High School Teacher, Phoenix, AZ)
2. Ronald A. Mastaler (Research Associate, U. Arizona)
3. Daniel Rovey (Raytheon)
4. Charles Yana (CNES)
5. Brian Russell (California Environmental Protection Agency)
6. Kevin Rogers (Lockheed Martin)
7. Rachael McKay (Lockheed Martin)
8. Bruno Scarpelli (Private Industry in Brazil)
9. Shintaro Taniguchi (UM PhD, transferred to U. Hawaii)
10. Josh Adamson (Northrop Grumman)
11. Fernando Saca (UM)
12. Harvey Elliott (UM PhD Student)
13. Chase Estrin (Current)
14. Neeti Banerjee (Current)
15. Erik Fischer (Current)

Undergraduate Students

Dozens of UROP and REU Students

GRADUATE AND POSTDOCTORAL ADVISORS

Kerry A. Emanuel and Peter H. Stone, MIT
Andrew Ingersoll, Caltech

JOURNAL PUBLICATIONS

1. **Rennó, N. O.**, E. Williams, D. Rosenfeld, D. G. Fischer, J. Fischer, T. Kremic, A. Agrawal, M. O. Andreae, R. Bierbaum, R. Blakeslee, A. Boerner, N. Bowles, H. Christian, J. Dunion, A. Horvath, X. Huang, A. Khain, S. Kinne, M. C. Lemos, J. E. Penner, U. Pöschl, J. Quaas, E. Seran, B. Stevens, T. Walati, T. Wagner, 2012. CHASER: An Innovative Satellite Mission Concept to Measure the Effects of Aerosols on Clouds and Climate. Submitted to the *Bull. Amer. Meteor. Soc.* on Jan 2012.
2. Rosenfeld, D., E. Williams, M. O. Andreae, E. Freud, **N. O. Rennó**, U. Puschl, 2012. The scientific basis for a satellite mission to retrieve CCN and its impacts on convective clouds, Submitted to *J. Atmos. and Ocean. Tech.* on Jan 2012.
3. Haleaux, D. and **N. O. Rennó**, 2012. Atmospheric vortices. Submitted to *Nature* on Feb 2012.
4. Petrosyan, Arakel, Boris Galperin, S. E. Larsen, Stephen Lewis, Anni Maattanen, **Nilton Rennó**, Peter Rogberg, Hannu Savijärvi, Tero Siili, Aymeric Spiga, Anthony Toigo, Luis Vazquez, **2011**. The Martian Atmospheric Boundary Layer. *Reviews of Geophysics*, 49, RG3005, doi:10.1029/2010RG000351.
5. Bister, M., **N. Renno**, O. Pauluis, and K. Emanuel, **2011**. Comments on "A critique of some modern applications of the Carnot heat engine concept: the dissipative heat engine cannot exist" *Proc. R. Soc. A.*, doi:10.1098/rspa.2010.0087.
6. Mehta, M., **N.O. Renno**, J. Marshall, M.R. Grover, A. Sengupta, N.A. Rusche, J.F. Kok, R.E. Arvidson, W.J. Markiewicz, M. Lemmon, P.H. Smith, **2011**. Explosive erosion exposes the subsurface ice on Mars. *Icarus*, 211, 172-194, doi:10.1016/j.icarus.2010.10.003.
7. Nelli, S.M., **N.O. Renno**, J.R. Murphy, and W.C. Feldman, **2010**. Simulations of Atmospheric Phenomena at the Phoenix Landing Site with the Ames GCM. *Journal of Geophysical Research*, Special Issue on Phoenix, 115, E00E21, doi:10.1029/2010JE003568.
8. Carol R. Stoker, C. R., A. Zent, D. Catling, S. Douglas, J. Marshall, P. H. Smith, D. Archer, R. Quinn, B. Clark, **N.O. Renno**, V. Hipkin, S. Kounaves, S. Young, M. Hecht, M. Lemmon, and D. Fisher, **2010**. Habitability of the Phoenix Landing Site. *Journal of Geophysical Research*, 115, E00E20, doi:10.1029/2009JE003421.
9. Zuchowski, L.C., P.L. Read, Y.H. Yamazaki, and **N.O. Renno**, **2009**. A heat engine based moist convection parametrization for Jupiter. *Plan. Space Sci.*, 57(13), 1525-1537, doi:10.1016/j.pss.2009.05.008.

10. Kok, J. F., and **N. O. Renno**, 2009. A comprehensive numerical model of steady state saltation (COMSALT), *Journal of Geophysical Research*, 114, D17204, doi:10.1029/2009JD011702.
11. **Renno, N.O.**, B.J. Bos, D. Catling, B.C. Clark, L. Drube, D. Fisher, W. Goetz, S.F. Hviid, H. Keller, J.F. Kok, S.P. Kounaves, K. Leer, M. Lemmon, M. Bo Madsen, W. Markiewicz, J. Marshall, C. McKay, M. Mehta, M. Smith, M.P. Zorzano, P.H. Smith, C. Stoker, S.M.M. Young, 2009. Possible Physical and Thermodynamical Evidence for Liquid Water on Mars. *Journal of Geophysical Research*, Special Issue on Phoenix, 114, E00E03, doi:10.1029/2009JE003362.
12. Zorzano, M.-P, E. Mateo-Martí, Olga Prieto-Ballesteros, S. Osuna-Esteban, **N.O. Renno**, 2009. The stability of liquid saline water on Mars. *Geophysical Research Letters*, 36, L20201, doi:10.1029/2009GL040315.
13. Whiteway, J. A., L. Komguem, C. Dickinson, C. Cook, M. Illnicki, J. Seabrook, V. Popovici, T.J. Duck, R. Davy, P.A. Taylor, J. Pathak, D. Fisher, A. I. Carswell, M. Daly, V. Hipkin, L. Tamppari, **N. Renno**, J. Moores, M. Lemmon, F. Daerden, P. H. Smith, 2009. Mars Water Ice Clouds and Precipitation. *Science*, 325, 68-70, doi:10.1126/Science/1172344.
14. Smith, P.H., L.K. Tamppari, R.E. Arvidson, D. Bass, D. Blaney, W.V. Boynton, A. Carswell, D.C. Catling, B.C. Clark, T. Duck, E. DeJong, D. Fisher, W. Goetz, H.P. Gunnlaugsson, M.H. Hecht, V. Hipkin, J. Hoffman, S.F. Hviid, H.U. Keller, S.P. Kounaves, C.F. Lange, M.T. Lemmon, M.B. Madsen, M. Malin, W.J. Markiewicz, J. Marshall, C.P. McKay, M.T. Mellon, D.W. Ming, R.V. Morris, **N. Renno**, W.T. Pike, U. Staufer, C. Stoker, P. Taylor, J. Whiteway, A.P. Zent, 2009. Water at the Phoenix landing site. *Science*, 325, 58-61, doi:10.1126/Science.1172339.
15. Ruf, C., **N.O. Renno**, J.F. Kok, E. Bandelier, M.J. Sander, S. Gross, L. Skjerve, and B. Cantor, 2009. The Emission of Non-Thermal Microwave Radiation by a Martian Dust Storm. *Geophysical Research Letters*, 36, L13202, doi:10.1029/2009GL038715.
16. Kok, J.F., and N.O. Renno, 2009. Electrification of wind-blown sand on Mars and its implications for atmospheric chemistry. *Geophysical Research Letters*, 36, L05202, doi:10.1029/2008GL036691.
17. Wang, J., F.J.F. Chagnon, E.R. Williams, A.K. Betts, **N.O. Renno**, L.A.T. Machado, G. Bisht, R. Knox, R.L. Bras, 2009. Why Clouds Follow Deforestation Over the Amazon? Proceedings of the National Academy of Sciences, doi: 10.1073/pnas.0810156106.
18. Simões, F., M. Rycroft, **N. Renno**, Y. Yair, K.L. Aplin, Y. Takahashi, 2008. Schumann resonances as a tool for investigating planetary electromagnetic environments. *Space Science Review*, 137, 455–471.
19. **Renno, N.O.** and J.F. Kok, 2008. Electric activity and dust lifting on earth and beyond. *Space Science Review*, 137, 419-434.
20. Yair, Y., G. Fischer, F. Simoes, **N. Renno**, P. Zarka, 2008. Updated Review of Planetary Atmospheric Electricity. *Space Science Review*, 137, 29–49
21. Smith, P., L. Tamppari, R. Arvidson, D. Blaney, B. Clark, C. McKay, M. Mellon, R. Morris, M. Lemmon, E. DeJong, U. Keller, M. Malin, C. Stoker,

- W. Boynton, J. Hoffman, D. Ming, A. Zent, M. Hecht, S. Kounaves, J. Marshall, U. Staufer, A. Carswell, D. Catling, **N. Renno**, **2008**. Introduction to special section on the Phoenix Mission: Landing Site Characterization Experiments, Mission Overviews, and Expected Science, *Journal of Geophysical Research*, 113, E00A18, doi:10.1029/2008JE003083.
22. Plemmons, D., B. C. Clark, S. P. Kounaves, M. Mehta, L. L. Peach, **N. O. Renno**, L. Tamppari, and S. M. M. Young, **2008**. Effects of the Phoenix Lander descent thruster plume on the Martian surface. *Journal of Geophysical Research*, 113, E00A11, doi:10.1029/2007JE003059.
23. Holstein-Rathlou, C., J. P. Merrison, S. Knak Jensen, C. F. Lange, S. E. Larsen, M. B. Madsen, P. Nørnberg, H. Bechtold, E. Hald, J. J. Iversen, P. Lange, F. Lykkegaard, F. Rander, **N. Renno**, P. Taylor, P. Smith, **2008**. Telltale wind indicator for the Mars Phoenix lander. *Journal of Geophysical Research*, 113, E00A04, doi:10.1029/2007JE003008.
24. **Renno, N.O., 2008**. A general theory for convective plumes and vortices. *Tellus*, 60A, 688–699.
25. Kok, J.F., and **N.O. Renno**, **2008**. Electrostatics in wind-blown sand. *Physical Review Letters*, 100, 014501.
26. Renno, N.O., J. F. Kok, H Kirkham, and S Rogacki, **2007**. A miniature sensor for electrical field measurements in dusty planetary atmospheres. *Journal of Physics (Conference Series)*, **142** (2008) 012075.
27. Kok, J.F., **N.O. Renno**, **2007**. The effects of electric forces on dust lifting: Preliminary studies with a numerical model. *Journal of Physics (Conference Series)*, **142** (2008) 012047.
28. Kok, J.F., and **N.O. Renno**, **2006**. The effects of electric fields on dust lifting. *Geophysical Research Letters*, **33**, L19S10, doi:10.1029/2006GL026284.
29. Farrell, W. M., N. Renno, G. T. Delory, S. A. Cummer, and J. R. Marshall, **2006**. The Integration of Electrostatic and Fluid Dynamics within a Dust Devil. *Journal of Geophysical Research*, 111, doi:10.1029/2005JE002527.
30. Atreya, S.K., A.-H. Wong, **N.O. Renno**, W.M. Farrell, G.T. Delory, D.D. Sentman, S.A. Cummer, J.R. Marshall, S.C.R. Rafkin, D. Catling, **2006**. Oxidant Enhancement in Martian Dust Devils and Storms: Implications for Life and Habitability. *Astrobiology Magazine*, **6**, 439-450.
31. Delory, G.T., W.M. Farrell, S.K. Atreya, **N.O. Renno**, A.-S. Wong, S.A. Cummer, D.D. Sentman, J.R. Marshall, S.C.R. Rafkin, D. Catling, **2006**. Oxidant Enhancement in Martian Dust Devils and Storms: Storm Electric Fields and Electron Dissociative Attachment. *Astrobiology Magazine*, **6**, 451-462.
32. Mastaler, R.A., and **N.O. Renno**, **2005**. The Froude number as a predictor of mountain lee wave phenomenon. *Technical Soaring*, **29** (July Issue) 78-87.
33. Koch, J. and **N.O. Renno**, **2005**. The role of convective plumes and vortices on the global aerosol budget, *Geophysical Research Letters*, **32**, doi:10.1029/2005GL023420.
34. Adams, D.K., and **N.O. Renno**, **2005**. Thermodynamic efficiencies of an idealized global climate model. *Climate Dynamics*, **25**, doi:10.1007/s00382-005-0071-y.

35. Lorenz, R.D., Caitlin A. Griffith, J.I. Lunine, Christopher P. McKay, **N.O. Renno**, 2005. Convection, Clouds and the surface energy balance on Titan. *Geophysical Research Letters*, 32, doi10.1029/2004GL021415.
36. Renno, N.O., V. Abreu, J. Koch, P.H. Smith, O. Hartogenesis, H.A.R. de Bruin, D. Burose, G.T. Delory, W.M. Farrell, M. Parker, C.J. Watts, A. Carswell, 2004. MATADOR 2002: A field experiment on convective plumes and dust devils, *Journal of Geophysical Research*, **109**, E07001, doi:10.1029/2003JE002219.
37. Farrell, W.M., P.H. Smith, G.T. Delory, G.B. Hillard, J.R. Marshall, D. Catling, M. Hecht, D.M. Tratt, **N. Renno**, M.D. Desch, S.A. Cummer, J.G. Houser, and B. Johnson, 2004. Electric and magnetic signatures of dust devils from 2000-2001 MATADOR desert tests, *Journal of Geophysical Research*, **109**, doi:10.1029/2003JE002088.
38. Ferri, F, P.H. Smith, M. Lemmon, **N. Renno**, 2003. Dust devils as observed by Mars Pathfinder, *Journal of Geophysical Research*, **108**, doi:10.1029/2000JE001421.
39. **Renno, N.O.**, A.S. Wong, S.K. Atreya, I. de Pater, M. Roos-Serote, 2003. Electrical Discharges and Broadband Radio Emission by Martian Dust Devils and Dust Storms. *Geophysical Research Letters*, **30**, doi:10.1029/2003GL017879.
40. David K. Adams, and **N.O. Renno**, 2003. Remarks on quasi-equilibrium theory. *Journal of the Atmospheric Science*, **60**, 178-181.
41. Lorenz, R.D., and N.O. Renno, 2002. Work output on planetary atmospheric engines: Dissipation in clouds and rain. *Geophysical Research Letters*, **29**, 13771.
42. Williams, E.R., ...and **N.O. Renno**, 2002. Contrasting convective regimes over the Amazon: Implications for cloud electrification. *Journal Geophysical Research*, **107**, 8082-8101.
43. **Renno, N.O.** and H. B. Bluestein, 2001. A simple theory for waterspouts. *Journal of the Atmospheric Science*, **58**, 927-932.
44. Souza, E.P., **N.O. Renno**, and M. A. F. Silva Dias, 2000. Convective circulations induced by surface heterogeneities. *Journal of the Atmospheric Sciences*, **57**, 2915-2922.
45. **Renno, N.O.**, A A. Nash, J. Lunine, and J. Murphy, 2000. Martian and terrestrial dust devils: Test of a scaling theory using Pathfinder data. *Journal of Geophysics Research (Planets)*, **105 E1**, 1859-1865.
46. **Renno, N.O.**, M.L. Burkett, and M. P. Larkin, 1998. A simple theory for dust devils. *Journal of the Atmospheric Sciences*, **55**, 3244-3252.
47. **Renno, N.O.**, 1997. Multiple-equilibria in radiative-convective atmospheres. *Tellus*, **49A**, 423-438.
48. **Renno, N.O.** and A.P. Ingersoll, 1996. Natural convection as a heat engine: A theory for CAPE. *Journal of the Atmospheric Sciences*, **53**, 572-585.
49. Slingo, J.M., ...and **N. Renno**, 1996. Intraseasonal oscillations in 15 atmospheric general circulation models: Results from an AMIP diagnostic subproject. *Climate Dynamics*, **12**, 325-357.

50. **Renno, N.O.** and E.R. Williams, **1995**. Quasi-Lagrangian measurements in convective boundary layer plumes. *Monthly Weather Review*, **123**, 2733-2742.
51. **Renno, N.O.**, P.H. Stone, and K.A. Emanuel, **1994**. A radiative-convective model with an explicit hydrological cycle: 2.Sensitivity to large changes in solar forcing. *Journal of Geophysical Research*, **99**, 17001-17020 .
52. **Renno, N.O.**, K.A. Emanuel and P.H. Stone, **1994**. A Radiative-convective model with an explicit hydrologic cycle: 1.Formulation and sensitivity to model parameters. *Journal of Geophysical Research*, **99**, 14,429-14,441.
53. Williams, E.R., and **N.O. Renno**, **1993**. An analysis of the conditional instability of the tropical atmosphere. *Monthly Weather Review*, **121**, 21-36.
54. Williams, E.R., S.A. Rutledge, S.G. Geotis, **N. Renno**, E. Rasmussen, T. Rickenback, **1992**. A radar study of tropical “Hot Towers.” *Journal of the Atmospheric Sciences*, **49**, 1386-1395.

SHORT COMMUNICATIONS IN REFERRED PUBLICATION

55. **Renno, N.O.**, **2001**. Comments on “Frictional dissipation in a precipitating atmosphere.” *Journal of the Atmospheric Sciences*, **58**, 1173-1177.
56. **Renno, N.O.**, **1997**. Reply: Remarks on natural convection as a heat engine. *Journal of the Atmospheric Sciences*, **54**, 2780-2782.

BOOKS ARTICLES AND CHAPTERS

57. **Renno, N.O.**, 2011. Dust devils. Peter T. Bobrowsky (ed.), Encyclopedia of Natural Hazards, DOI 10.1007/978-1-4020-4399-4.
58. **Renno, N.O.**, 2011. Dust storms. Peter T. Bobrowsky (ed.), Encyclopedia of Natural Hazards, DOI 10.1007/978-1-4020-4399-4.
59. **Renno, N.O.** and J.F. Kok, **2008**. Electric activity and dust lifting on earth and beyond. A chapter of a book from “Space Sciences Series of the International Space Science Institute (ISSI) by Springer Verlag.” ISSI Series, 30. (Also published in Special Issue of *Space Science Review*).
60. Yair, Y., G. Fischer, F. Simoes, **N. Renno**, P. Zarka, **2008**. Updated Review of Planetary Atmospheric Electricity. A chapter of a book from “Space Sciences Series of the International Space Science Institute (ISSI) by Springer Verlag.” ISSI Series, 30. (Also published in Special Issue of *Space Science Review*).
61. Simões, F., M. Rycroft, **N. Renno**, Y. Yair, K.L. Aplin, Y. Takahashi, **2008**. Schumann resonances as a tool for investigating planetary electromagnetic environments. A chapter of a book from “Space Sciences Series of the International Space Science Institute (ISSI) by Springer Verlag.” ISSI Series, 30 (Also published in Special Issue of *Space Science Review*).
62. Titov, D.V., M. Bullock, D. Crispy, **N.O. Renno**, F.W. Taylor, L.V. Zasova, **2007**. Radiation in the atmosphere of Venus. A chapter of the book “Venus as a Terrestrial Planet.” American Geophysical Union.
63. **Renno, N.O.**, and D.K. Adams, **2001**. The convective heat engine. In Recent Developments in Atmospheric Sciences, S. Pandalai, Ed. *Recent Research Developments in Atmospheric Sciences*, 1-14.

INVITED NEWS AND MAGAZINE PUBLICATIONS

64. Michaud, L. and **N. Renno**, 2011. The Sky's the Limit. *Mechanical Engineering*, 133, April 2011, 42-43.
65. **Renno, N.**, 2010. Searching for sources and links of methane on Mars. 10 July 2010 SPIE Newsroom, doi:10.1117/2.1201006.003140.
66. **Renno, N.**, 2009. Liquid saline water on Mars. 18 June 2009, SPIE Newsroom, doi: 10.1117/2.1200906.1661.

REFEERED CONFERENCE ARTICLES

67. Rennó, N. O., M. Mehta, 2010. The discovery of liquid saline water on Mars and its implications. *Proc of 61st Astronautical Congress*, Prague, 9/27-10/1 2010, IAC-10.A3.3A.2.
68. De Paula, R. P., N. O. Renno, R. W. Zurek, M. A. Meyer, and R. A. Fogel, 2010. Overview of the discoveries of MRO and Phoenix and their impact on future Mars exploration. 61st International Astronautical Congress, Prague. Article IAC-10-A3.3A.1.
69. Rennó, N. O., M. Mehta, 2010. Deliquescence, liquid water and the search for sources and sinks of methane on Mars. *Proc. SPIE* Vol. 7819, 78190G, doi: 10.1117/12.863653 (Invited Paper).
70. Rennó, N. O., M. Mehta, B. P. Block; S. Braswell, 2009. The discovery of liquid water on Mars and its implications for astrobiology. *Proc. SPIE*, Vol. 7441, 74410C (2009); doi:10.1117/12.832195 (Invited Paper).
71. Renno, N.O., and M. Mehta, 2010. Deliquescence, liquid water, and the search for sources and sinks of methane on Mars. *Proc. SPIE*, 2010.
72. Mehta, M., N.O. Renno, A.J. Cotel, and R.M. Grover III, 2007. Characterization of the Impingement Dynamics of Rocket Plumes with the Ground at Low Ambient Pressure. AIAA/ASME/ASEE/SAE 43rd Joint Propulsion Conference Proceedings.
73. Renno, N.O., and J.F. Kok, 2007. Dust Electrification on Earth and Beyond. ISSI Workshop on Planetary Atmospheric Electricity, Bern, Switzerland.
74. Liu, T.M., C.A. Deline, R. Ramos, S.D. Sandoval, A.L. Smetana, B.E. , Y. Li, R. Redick, J. Bellerose, B. Oaida, Gilchrist, P.D. Washabaugh, N.O. Renno, 2007. Challenges Facing the Student Space Systems Fabrication Laboratory and Lessons Learned. *2007 ASEE Annual Conference & Exposition*, Honolulu, HI, paper 2007-1409.
75. Liu, T.M., R. Ramos, C.A. Deline, S.D. Sandoval, A.L. Smetana, B.E. Gilchrist, P.D. Washabaugh, N.O. Renno, 2006. The Student Space Systems Fabrication Laboratory: An Approach to Space Systems Engineering Education. *2006 ASEE Annual Conference & Exposition*, Chicago, IL, paper 2006-1917.
76. Mehta, M., N.O. Renno, P G Huseman, D S Gulick, A Cotel, 2006. The interaction dynamics of pulsed retro-rocket plumes with the ground during spacecraft descent on Mars. *International Planetary Probe Workshop*, Pasadena, 2006. NASA Report.

77. Renno, N.O., C. Ruf, L.T. Thompson, M.J. Sander, T.D. Linick, **2004**. ENG 450: A Multidisciplinary Design Experience. Proceedings of the AIAA Space 2004 Conference, Session Number 39-EDU-3, San Diego, CA.
78. Renno, N.O., **2000**. Atmospheric Convection as an Irreversible Heat Engine. Preprints of the AMS 24th Conference on Hurricanes and Tropical Meteorology, Miami, FL.
79. Adams, D.K., and N.O. Renno, **2000**. Remarks on Arakawa-Schubert's Quasi-Equilibrium Theory. Preprints of the AMS 24th Conference on Hurricanes and Tropical Meteorology, Miami, FL.
80. Renno, N.O., **1997**. Scaling Theories of Convection. Preprints of the AMS 22nd Conference on Hurricanes and Tropical Meteorology, Fort Collins, CO.
81. Renno, N.O., M.L. Burkett, and M.P. Larkin, **1997**. On the Thermodynamics of Dust Devils. Preprints of the AMS 22nd Conference on Hurricanes and Tropical Meteorology, Fort Collins, CO.
82. Renno, N.O., and A.P. Ingersoll, **1995**. Natural Convection as a Heat Engine: A Theory for CAPE. Preprints of the AMS 21st Conference on Hurricanes and Tropical Meteorology, Miami, FL.
83. Renno, N.O., K.A. Emanuel, and P.H. Stone, **1993**. Cumulus Convection Parameterization and Numerical Modeling of Moist Atmospheres. Preprints of the AMS 20th Conference on Hurricanes and Tropical Meteorology, San Antonio, TX.

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84. Renno, N.O., and M. Mehta, **2011**. Photometric and spectral evidence for deliquescence and liquid saline water on Mars. European Geophysical Union General Assembly, Vienna, Austria.
85. Elliott H., N. Renno, E. Williams, M. Balme, S. Metzger, A. Pathare, S. Rogacki, R. Gillespie and S. Musko, **2011**. Diagnosing the Electrical Structure of Dust Devils. European Geophysical Union General Assembly, Vienna, Austria.
86. Renno, N.O., M. Mehta, **2011**. Spectral evidence for liquid water on Mars. 42nd Lunar and Planetary Science Conference (LPSC), Woodland, Texas. Article #1537.
87. Renno, N. O. Renno, D. G. Gossiaux, F. Saca, S. Rogack, R. Gillespie, and Stephen Musko, 2009. A Generalization of Bernoulli's equation to convective vortices. 41st Lunar and Planetary Science Conference (LPSC).
88. Renno, N.O., **2007**. A Thermodynamically General Theory for Convective Circulations and Vortices. AGU Fall Meeting (Invited).
89. Renno, N.O., and J.F. Kok, **2007**. Electrical activity and dust lifting on Earth and Mars. AGU Fall Meeting.
90. Kok, J F, N O Renno, **2007**. Physically Based Numerical Model of Wind-Blown Sand Suggests Deficiencies in Classical Saltation Theory. AGU Fall Meeting.
91. Mehta, M, N O Renno, A Cotel, M R Grover, **2007**. Characterization of the Dynamics of the Impingement of Pulsed Rocket Plumes with the Ground at Low Ambient Pressure. AIAA 43rd Jet Propulsion Conference.

- 92. Kok, J F, N O Renno, **2006**. A Dust Lifting Model that Includes the Effects of Electric Fields. Proceedings of the AGU Fall Meeting.
- 93. Wong, A.S., S.K. Atreya, and N.O. Renno, **2003**. Chemistry Related to Possible Outgassing Sources on Mars. 6th International Mars Conference.
- 94. Renno, N.O., A.S. Wong, S.K. Atreya, **2003**. Electrical Discharges in Martian Dust Devils and Storms. 6th International Mars Conference.
- 95. Renno, N.O., **1995**. Proceedings of the 21st Conf. on Hurricanes and Tropical Meteorology.
- 96. Renno, N.O., **1994**. Climate and Global Change. Proceedings of the AGU Fall Meeting.
- 97. Renno, N.O., **1994**. Multiple Equilibria in Radiative-Convective Atmospheres. Proceedings of the AGU Fall Meeting.

NON-REFEREED REPORTS

- 98. Renno, N.O., L. Schade, M. Morgan, M. Bister, C.-C. Wu, D. Reilly, **1991**. Texmex: Tropical Experiment in Mexico. EAPS, MIT.
- 99. Williams, E., and N. Renno, **1991**. The Role of Ice in the Conditional Instability of the Tropical Atmosphere. MIT Center for Global Change. Report No. 9, November 1991.
- 100. Slingo, J. M., K. Sperber, J. Boyle, J.-P. Ceron, M. Dix, B. Dugass, W. Ebisuzaki, J. Fyfe, D. Gregory, J.-F. Gueremy, J. Hack, A. Harzallah, P. Innes, A. Kitoh, W. K.-M. Lau, B. McAvaney, R. Madden, A. Matthews, T. Palmer, C.-K. Park, D. Randall, N. Renno, **1995**: Intraseasonal oscillations in 15 atmospheric general circulation models: Results from an AMIP diagnostic subproject. WCRP-88, WMO/TD-No. 661, World Climate Research Programme Report, Geneva, 32 pp.
- 101. Renno, N.O., **1992**. Cumulus Convection Parameterization and Numerical Modelling of Moist Atmosphere. Ph.D. Thesis, MIT, 297 pp.

CURRENT & RECENT RESEARCH PROJECTS

1. The brines of the Phoenix landing site, the potential for life to adapt to them, and the implications for life elsewhere

Principal Investigator: Nilton Renno

Co-I: Bruce P. Block.

Sponsor: NASA/Exobiology

Funding Period: January 1st, 2011 to December 31st, 2014

Total funding: \$1,050,000 (One GSRA)

2. Aerosols-Climate Interactions: Characterization of Saltation, Dust Lifting, and Dust Electrification in Important Dust Source Regions

Principal Investigator: Nilton Renno

Sponsor: NSF

Funding Period: July 1st, 2011 to June 30th, 2014

Total funding: \$626,000 (One GSRA)

- 3. Mars Science Laboratory Phase E**
Principal Investigator: Nilton Renno
Sponsor: NASA
Funding Period: November 1st, 2011 to December 24th, 2014
Total funding: \$500,000 (TBC)
- 4. DREAMS: Dust characterization, Risk assessment and Environment Analyser on the Martian Surface)**
Principal Investigator: Nilton Renno (**Italian PI:** Dr. Francesca Esposito)
Sponsor: ESA/NASA
Funding Period: November 1st, 2011 to December 31st, 2017
Total funding: TBD
- 5. Experiment on a long duration stratospheric balloon**
Principal Investigator: Nilton Renno
Co-I: None
Sponsor: NASA/PIDDP
Funding Period: September 1st, 2010 to August 31st, 2011
Total funding: \$145,000
- 6. A Prototype System for Electrical and Meteorological Measurements in Convective Vortices**
Principal Investigator: Nilton Renno
Co-I: None.
Sponsor: NSF/EAGER
Funding Period: September 1st, 2009 to August 31st, 2010
Total funding: \$85,000 (One GSRA)
- 7. An Electric Field Sensor for Dusty Environments**
Principal Investigator: Nilton Renno
Co-I: Harold Kirkham (JPL)
Sponsor: NASA/PIDDP
Funding Period: June 1st, 2007 to May 31st, 2010
Total funding: \$681,167 (One GSRA)
- 8. Monitoring Microdischarges from Martian Dust Storms During DSN Downlinks**
Principal Investigator: Nilton Renno
Sponsor: JPL
Funding Period: August 1st, 2009 to July 31st, 2010
Total funding: \$46,000
- 9. Threshold Electric Field Detector**
Principal Investigator: Nilton Renno
Sponsor: State of Michigan (MUCI)
Funding Period: September 1st, 2008 to August 31st, 2009

Total funding: \$38,000

**10. In-Situ Studies of Terrestrial Dust Devils and Ambient Meteorology:
Applications to Mars Climate**

Principal Investigator: Nilton Renno

Sponsor: NASA/MFRP

Funding Period: April 1st, 2008 to March 31st, 2011

Total funding: \$110,000

11. MSL MLE Site-Alteration and Dust Lifting Test Program

Principal Investigator: Nilton Renno

Sponsor: JPL

Funding Period: August 1st, 2008 to July 31st, 2009

Total funding: \$35,000

**12. Multidisciplinary System Engineering: Development of a Balloon Payload
for Electric Field Measurements in the Stratosphere**

Principal Investigator: Nilton Renno

Co-I: Jeffrey L Hall (JPL)

Sponsor: JPL

Funding Period: September 1st, 2008 to August 31st, 2009

Total funding: \$25,000

**13. A Miniature Sensor for Electrical Field Measurements in Dusty
Environments**

Principal Investigator: Nilton Renno

Co-I: Harold Kirkham (JPL)

Sponsor: JPL

Funding Period: September 1st, 2007 to August 31st, 2008

Total funding: \$25,000

**14. Multidisciplinary System Engineering: The Development of Parametric
Models and Laboratory Testbeds for Space Exploration**

Principal Investigator: Robert Easter (JPL)

Co-I: Nilton Renno

Sponsor: JPL

Funding Period: January 1st, 2007 to December 31st, 2007

Total funding: \$50,000

UM funding: \$25,000

**15. Plume-Ground Soil Interaction Study due to Pulse-Modulated Descent
Engines at Low Ambient Pressure**

Principal Investigator: Nilton Renno

Co-I: None

Sponsor: Lockheed Martin Corporation

Funding Period: January 1st, 2007 to December 31st, 2007

Total funding: \$50,000

16. Practicum in a Multi-Disciplinary World: A Proposal for an Interdisciplinary Practicum Concentration Initiative

Principal Investigator: Brian Gilchrist

Co-I: Nilton Renno (Lead of the Space Exploration Concentration)

Sponsor: UM Provost

Funding Period: January 1st, 2007 to December 31st, 2008

Total funding: \$500,000 (One GSRA)

17. Aerosol-Climate Interactions: Development and Tests of a Dust Lifting Model

Principal Investigator: Nilton Renno

Co-I: None.

Sponsor: NSF

Funding Period: December 1st, 2006 to November 30th, 2009

Total funding: \$434,580 (One GSRA)

18. Plume-Ground Soil Interactions Study Due to Pulse-Modulated Descent Engines at Low Ambient Pressure

Principal Investigator: Nilton Renno

Co-I: None.

Sponsor: NASA/GSRP

Funding Period: September 12th, 2006 to September 11th, 2007 (1st year)

Total funding: \$125,700 (One GSRA with UM cost share)

19. Concept Development Toolkit

Principal Investigator: Robert Easter

Co-I: Nilton Renno

Sponsor: JPL

Funding Period: December 1st, 2005 to September 30th, 2006

Total funding: \$8,500

20. University Nanosat Program: Teather System Assessment Through Teaming (TSATT)

Principal Investigator: Brian Gilchrist

Co-I: Peter D. Washabaugh and Nilton Renno

Sponsor: DOD –Air Force

Funding Period: October 1st, 2005 to September 30th, 2007

Total funding: \$200,000

21. A Mars Whole Atmospheric Climate Model: Development and Applications

Principal Investigator: Stephen Bougher

Co-I: Nilton Renno

Sponsor: NSF

Funding Period: October 1st, 2005 to September 31st, 2010
Total funding: \$573,078 (One GSRA)

22. Aerosol-Climate Interactions: The Relationship between Desert Dust and Atmospheric Convection

Principal Investigator: Nilton Renno

Co-I: Vincent Abreu

Sponsor: NSF

Funding Period: August 1st, 2004 to July 31st, 2007

Total funding: \$466,731 (One GSRA)

23. Atmospheric Studies in Support of the Phoenix Mission

Principal Investigator: Nilton Renno (Phoenix Mission Co-Investigator)

Co-Is: None

Sponsor: NASA

Funding Period: September 2003 – September 2009

Total funding: \$700,000 (One GSRA)

24. Rover Environmental Monitoring Station (REMS)

Sponsor: Spanish Ministry of Science and Technology and NASA

Principal Investigator: Luis V. Martínez, CAB, Madrid, Spain

Co-Is: A.-M. Harri (Finish Meteorological Institute, Finland), R. Haberle (NASA/Ames), J. Martinez-Friaz (Centro de Astrobiología, Spain), N. Renno (UM), M. Richardson (Caltech), F. Valero (Universidad Complutense, Spain)

Sponsor: NASA/Spanish Minister of Science and Technology

Funding Period: October 1st, 2005 to December 31st, 2011

Total funding: \$10,000,000 (Contribution from the Spanish Government)

Renno budget: 60,000/year (negotiable on a year by year basis)

25. Bridging the Gap between Robotic and Human Exploration of Mars

Principal Investigator: Nilton Renno

Co-I: None

Sponsor: NASA/JPL

Funding Period: January 1st, 2004 to December 31st, 2005

Total funding: \$155,000 (One GSRA)

26. Aerosols-Climate Interactions: The Relationship Between Desertification, Aerosols and Climate in the Caucasus

Principal Investigator: Gocha Didebulidze (Georgian Academy of Sciences)

Co-Is: Vincent Abreu and Nilton Renno

Sponsor: ISTC (State Department)

Funding Period: January 1st, 2005 to December 1st, 2005

Total funding: \$200,000.

UM funding: \$68,000

27. A Student Get-Away Special Space Shuttle Experiment to Demonstrate Cold-Cathode Field Emitter Technology in Space (FEGI)

Principal Investigator: Brian Gilchrist

Co-Is: Nilton Renno and Peter D. Washabaugh

Sponsor: DOD –Air Force

Funding Period: January 2003 to February 2005

Total funding: \$99,991

28. University of Michigan Meteorology Instrument for the Phoenix Mars Mission

Principal Investigator: Nilton Renno

Co-Is: None

Sponsor: NASA

Funding Period: December 2002 to May 2003

Total funding: \$30,000 from NASA, \$20,000 in matching funds

29. Simultaneous Observations of Martian Dust Events with the Very Large Array (VLA) and Mars Global Surveyor (MGS) Instruments.

Principal Investigator: Nilton Renno

Co-I: S. Atreya, A.-S. Wong, I. dePater, G. Delory, R.J. Sault, B. Cantor,

Sponsor: NRAO

Funding Period: Oct. 1st, 2005 to Dec. 31st, 2005

Total funding: N/A –48 hours of observation time with the VLA

30. Educational Program –Gifts & discretionary funds to support my educational activities

Sponsors: Northrop Grumman (NG), General Motors (GM), College of Engineering

Funding Period: Unlimited (Donation)

Total funding: \$50,000 from NG, \$20,000 from GM, and \$20,000 from CoE, \$150,000 from Ford, \$20,000 from Aerospace Corp.

31. Campaign Methodologies for Exploration-Driven System-of-Systems Architectures

Principal Investigator: M. Marshall, Aerospace Corporation, El Segundo, CA

Sponsor: NASA

Funding Period: May 14, 2005 to May 14, 2007

Total funding: \$3,798,269

Renno budget: \$449,286 (The NASA program was cancelled)

PENDING PROPOSALS (as of February 2012)

32. CHASER: Clouds, Hazards and Aerosols Survey for Earth Researchers

Principal Investigator: Nilton Renno

Sponsor: NASA/ESSP

Funding Period: May 1st, 2011 to December 31st, 2018

Total funding: \$170,000,000

33. Phase 2 of a Miniature Electrical Field Sensor for Measurements in Dusty Environments

Principal Investigator: Nilton Renno

Sponsor: NASA/PIDDP

Funding Period: February 28, 2012 to February 27, 2015

Total funding: \$500,041

34. A Miniature Sensor for Measuring Soil Wetness and Searching for Brines on Mars and Beyond

Principal Investigator: Nilton Renno

Sponsor: NASA/ASTID

Funding Period: January 10, 2012 to September 30, 2012

Total funding: \$859,510

35. Habitability of Brine-rich Systems on Earth, Mars, and Beyond

Principal Investigator: Nathan Sheldon

Co-I: Nilton Renno,

Sponsor: NASA/NAI

Funding Period: October 2012 to October 2017

Total funding: ~\$7,000,000

Renno budget: ~\$1,600,00

RECENT AND UPCOMING TALKS

Presentations at National and International Conferences

“The Phoenix discoveries and its astrobiological implications” Keynote talk at the Sao Paulo Advanced School of Astrobiology, Sao Paulo, Brazil, December 16, 2011.

“The brines of Mars and its astrobiological implications” Invited Presentation, LSA Honors Lunch, Ann Arbor, MI, November 7, 2011.

“Water and Life – On Mars and Beyond” Science Café, Conor O’Neill’s Traditional Irish Pub, Ann Arbor, MI, November 16, 2011.

“Evidence for deliquescence and liquid water on Mars” Invited presentation at the Sixth Annual Conference on the Physics, Chemistry and Biology of Water, West Dover, VT, October 21, 2011.

“Spectral Evidence for Liquid Water on Mars” EGU 2011, Vienna, Austria, April 6, 2011.

“Spectral Evidence for Liquid Water on Mars” LPSC 2011, Woodland, Texas, March 10, 2011.

“The Discovery of Liquid Water on Mars and Its Implications” Prague, Czech Republic, September 29, 2010.

“Following the Water and Finding Liquid Brines on Mars” Prague, Czech Republic, September 29, 2010.

“Electrical Activity and Dust Lifting on Earth, Mars and Beyond” Keynote Speaker at the 32nd Annual International EOS/ESD Symposium and Exhibits, Reno, NV, October 5th, 2010.

“Deliquescence, Liquid Water, and the Search for Sources and Sinks of Methane on Mars” SPIE Conference on Instruments, Methods, and Missions for Astrobiology XIII, San Diego, CA, August 4th, 2010.

“Deliquescence and Liquid Water on Mars” El Escorial Summer School, Madrid, Spain, July 15, 2010.

“Do Brines Make The Viking 2 Landing Site Habitable?” Astrobiology Science Conference, League City, TX, April 26-29, 2010.

“To Search For Life on Mars: Follow the Brines” Astrobiology Science Conference, League City, TX, April 26-29, 2010.

“A Portable Instrument for Atmospheric Measurements” 41st Lunar and Planetary Science Conference, Woodlands, TX, March 1-5, 2010.

“A Generalization of Bernoulli's Equation to Convective Vortices” 41st Lunar and Planetary Science Conference, Woodlands, TX, March 1-5, 2010.

“The Discovery of Liquid Water on Mars and its Implications for Astrobiology.” Keynote Speaker at the International Electric Propulsion Conference (IEPC), Ann Arbor, Michigan, September 23, 2009.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” American Chemical Society, National Meeting, Washington, DC, August 16, 2009.

“The Discovery of Liquid Water on Mars and its implications for Astrobiology.” SPIE Conference on Instruments, Methods, and Missions for Astrobiology XII, San Diego, CA, August 5th, 2009.

“Independent Physical and Thermodynamical Evidence for Liquid Water on Mars.” Third International Workshop on the Mars Atmosphere: Modeling and Observations, Williamsburg, November 11, 2008.

“Detecting Thermals Remotely.” OSTIV Congress, Berlin, Germany, August 12, 2008.

“Electrostatics and Dust Lifting on Earth, Mars, and Beyond.” Keynote speaker at the Electrostatics Society of America Annual Meeting, Minneapolis, June 17-19, 2008.

“Evidence for deliquescence and liquid water on Mars” AGU Fall Meeting, December 15, 2008.

“Brines on Mars” Phoenix Science Team Meeting #16, December 13, 2008.

“Evidence for deliquescence and liquid water on Mars: Reply to Mike Hecht’s Critique” Phoenix Eng of Sol Meeting, November 20, 2008.

“Evidence for deliquescence and liquid water on Mars” Center for Astrobiology, Madrid, Spain, November 17, 2008.

“Salts in Mars Meteorites and Antarctica” Phoenix End of Sol Meeting, November 12, 2008.

“Evidence for deliquescence and liquid water on Mars” AOSS Department Seminar, Ann Arbor, MI October 23, 2008.

“The Evidence for Liquid Water on Mars” Michigan Space Grant Consortium Annual Meeting, Ann Arbor, MI, October 18, 2008.

“Evidence for Deliquescence and Liquid Water on Mars” EAPS/MIT Department Seminar, Cambridge, MA, September 10, 2008.

“Physical and Thermodynamical Evidence for Deliquescence and Liquid Water on Mars” Department Seminar, University of Paris VI, Paris, France, August 19, 2008.

“Physical and Thermodynamical Evidence for Deliquescence and Liquid Water on Mars” Department Seminar, University of Oxford, Oxford, UK, August 5, 2008.

“Evidence de Agua Liquida em Marte” Ipuá, Brazil, July 26, 2008.

“Deliquescent Salts at the Phoenix Landing Site –A Testable Hypothesis” Phoenix End of Sol Meeting #49, Tucson, AZ, 2008.

“Should we Test the Hypothesis that the Ice Has Been Melting” Phoenix End of Sol Meeting #34, Tucson, AZ, 2008.

“Understanding Dodo’s Ice” Phoenix End of Sol Meeting, Tucson, AZ, 2008.
“Do We Have Evidence of Ice that Melted” Phoenix End of Sol Meeting #26, Tucson, AZ, 2008.

“How Can we Maximize the Probability of (Mission) Success” Phoenix End of Sol Meeting #26, Tucson, AZ, 2008.

“Scaling in Comparative Planetary Sciences.” Symposium in honor of Professor Peter H. Stone. MIT, Cambridge, MA, December 7, 2007.

Presentations at Special Events

“The Phoenix discoveries and its astrobiological implications” CATP Virtual Seminar, Canadian Astrobiology Group, February 8, 2012.

“How does finding water on Mars help us solve problems on Earth” University of Michigan –College of Engineering Bay Area Event, San Francisco, CA, October 14, 2011.

“Deliquescence and Liquid Water on Mars” Saturday Morning Physics, University of Michigan, Ann Arbor, MI, February 19, 2011.

“Deliquescence and Liquid Water on Mars” Saturday Morning Physics, University of Michigan, Ann Arbor, MI, February 19, 2011.

“Deliquescence and Liquid Water on Mars” Greenhills School, Ann Arbor, MI, February 11, 2011.

“Deliquescence and Liquid Water on Mars” Milan High School, Milan, MI, December 9, 2010.

“Electric Activity and Dust Lifting on Earth, Mars and Beyond” Feira do Joven Empreendedor, Sao Jose dos Campos, SP, Brazil, October 21, 2010.

“A Descoberta de Agua Liquida em Marte” Feira do Joven Empreendedor, Sao Jose dos Campos, SP, Brazil, October 21, 2010.

A Descoberta de Água Liquida em Marte, EMFE Vera Babo, São Jose dos Campos, Brazil, October 22, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” Seniors, Colégio Engenheiro Juarez de Siqueira Britto Wanderley, Eugenio de Melo, Brazil, August 16, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” Juniors, Colégio Engenheiro Juarez de Siqueira Britto Wanderley, Eugenio de Melo, Brazil, August 13, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” Instituto Pandavas, Monteiro Lobato, Brazil, August 12, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” Colégio Poliedro, São José dos Campos, Brazil, August 6, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” TV Vanguarda, São José dos Campos, Brazil, July 28, 2010.

“Exploração Espacial: A Descoberta de Água em Marte” CEDEMP Centro de Educação Empreendedora, São José dos Campos, Brazil, July 28, 2010.

“Finding Liquid Water on Mars.” Keynote Speaker, Ann Arbor Flyers Annual Meeting. Ann Arbor, March 10, 2010.

“The Truth is Out There: Finding Water on Mars.” The University of Michigan MLibrary Spotlight Series, Ann Arbor, March 8, 2010.

“The Science and Engineering of Space Exploration.” The University of Michigan, College of Engineering, Tech Day. November 2009.

“Light in the Cosmos.” Presentation and Panel Discussion at the Art College Berlin-Weißensee, Berlin Germany, October 22, 2009.

“Evidence for Deliquescence and Liquid Water on Mars.” Life in the Cosmos Panel, SPIE Conference on Instruments, Methods, and Missions for Astrobiology XII, San Diego, CA, August 4, 2009.

“Phoenix and the Discovery of Evidence for Liquid Water on Mars.” Lecture at El Escorial Summer School, San Lorenzo de El Escorial, Spain, June 13-17, 2009.

“A Descoberta de Agua Liquida em Marte.” University Seminar, Universidade do Estado do Amazonas, Manaus, Brazil, July 6, 2009.

“Engenharia e Ciencia: Um Exemplo de Carreira Multidisciplinar.” Colegio Engenheiro Juarez de Siqueira Britto Wanderley, Sao Jose dos Campos, Brazil, June 22, 2009.

“Engenharia e Ciencia para Exploracao Espacial.” Colegio Engenheiro Juarez de Siqueira Britto Wanderley, Sao Jose dos Campos, Brazil, June 22, 2009.

“The Science and Engineering of Space Exploration” Speaker at the College of Engineering Tech Day, November 8, 2008.

“Evidence for Liquid Water on Mars” Keynote speaker at the Thirteenth Annual Michigan Space Grant Conference, October 18, 2008.

Panelist on “Education and Space Exploration” at the SPRL at 60 Celebration. University of Michigan, October 17, 2008.

“Evidence for Liquid Water on Mars” Keynote speaker at the CVV-CTA dinner in Ipuã, Brazil, June 26, 2008.

“Exploring the atmosphere of the earth and other planets” Keynote speaker at the celebration of 50th Anniversary of the CVV-CTA and the 25th Anniversary of Ipuã, Brazil, August 18th, 2007.

Department Seminars and Colloquia

“Dust lifting and the effects of aerosols on clouds and climate” Earth and Environmental Science, University of Pennsylvania, March 1, 2012.

“Dust lifting and the effects of aerosols on clouds and climate” Applied Physics, University of Michigan, January 18, 2012.

“Deliquescence and Liquid Water on Mars” Astro-AOSS-GeoSci Symposium, University of Michigan, April 20, 2011.

“Electric Activity and Dust Lifting on Earth, Mars and Beyond” NASA Glenn Research Center, Cleveland, OH, January 11, 2011.

“Deliquescence and Liquid Water on Mars”, Seminário na Divisão de Astrofísica do INPE, São Jose dos Campos, October 19, 2010.

“Deliquescence and Liquid Water on Mars” Cursos de Verano de la Universidad Complutense de Madrid, San Lorenzo de El Escorial, Spain, July 15, 2010.

“Evidence for Liquid Saline Water on Mars” ESTEC/ESA (European Space Agency), Noordwijk, Netherlands, July 9, 2010.

“Deliquescence and Liquid Saline Water on Mars.” Adlershofer Planetenseminar, DLR Institut für Planetenforschung, Berlin, Germany, October 26, 2009.

“Deliquescence and Liquid Saline Water on Mars.” Applied Physics Seminar, University of Michigan, Ann Arbor, MI, September 30, 2009.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Southwest Research Institute, Boulder, CO, May 5, 2009.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Science Lecture Series, NASA Headquarters, Washington DC, April 22, 2009.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Alumni/Shell Oil Company Distinguished Lecture Series, Department of Geological Sciences, Michigan State University, April 2, 2009.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Centro de Astrobiology, Madrid, Spain, November 17, 2008.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, October 23, 2008.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Department of Atmospheric, Oceanic and Planetary Sciences, MIT, September 10, 2008.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Institut Pierre Simon Laplace, Université Paris 6, France, August 19, 2008.

“Physical and Thermodynamical Evidence for Liquid Water on Mars.” Subdepartment of Atmospheric, Oceanic and Planetary Physics, University of Oxford, UK, August 5, 2008.

“Exploring the Martian Atmosphere.” Department of Physics, University of Michigan, Ann Arbor, MI, November 12, 2007.

“Atmospheric Vortices: Theory, Dust Transport and Electrification.” Division of Planetary Sciences, Caltech, Pasadena, CA, February 27, 2007.

“Atmospheric Vortices: Theory, Dust Transport and Electrification.” Department of Physics and Astronomy, Open University, UK, December 14, 2006.

“Atmospheric Heat Engines.” Subdepartment of Atmospheric, Oceanic and Planetary Physics, University of Oxford, UK, November 9, 2006.

“Atmospheric Vortices: Theory, Dust Transport, and Electrification.” Mars Simulation Laboratory, University of Aarhus, Denmark, October 30, 2006.

“Multiple Equilibria and the Runaway Greenhouse in Moist Atmospheres.” Non-Linear GFD Seminar, University of Oxford, October 24, 2006.

“Atmospheric Vortices: Theory, Dust Transport, and Electrification.” Department of Meteorology, University of Reading, UK, October 9, 2006.

“Atmospheric Sciences and Engineering Design: A Few Highlights.” Annual Retreat, Subdepartment of Atmospheric, Oceanic and Planetary Physics, University of Oxford, UK, September 29, 2006.

Presentations at Workshops and Project Meetings

“Trace Gas Microwave Radiometer (TGMR).” Proposal Review at CoE. Ann Arbor, April 9, 2010.

“Trace Gas Microwave Radiometer (TGMR).” Proposal Review at JPL. Pasadena, March 11, 2010.

“The University of Michigan Electric Field Sensor and Balloon Payload” Lunar dust, plasma and atmosphere: The next steps" January 29, 2010, Boulder, CO.

“Dust, Salts, Clouds and Water: Some Results from Phoenix and Implications for MSL” REMS Science Team Meeting, Madrid, Spain, November 18, 2008.

“Deliquescent Salts at the Phoenix Landing Site? -A Testable Hypothesis” Phoenix End-of-Sol Presentation, Tucson, August 26, 2008.

“Should we Test the Hypothesis that Ice has been Melting at the Landing Site?” Phoenix End-of-Sol Presentation, Tucson, June 29, 2008.

“Do We Have Evidence of Ice That Melted?” Phoenix End-of-Sol Presentation, Tucson, June 21, 2008.

“How Can We Maximize The Probability of (Mission) Success?” Phoenix End-of-Sol Presentation, Tucson, June 20, 2008.

“ASTG Request for Sol 21” Phoenix End-of-Sol Presentation, Tucson, June 13, 2008.

“ASTG’s Campaigns” Phoenix End-of-Sol Presentation, Tucson, June 11, 2008.

“Is Martian Saltation Giant?” Phoenix End-of-Sol Presentation, Tucson, June 9, 2008.

“More on Cratering & Splashing During Landing (Phoenix)” Phoenix End-of-Sol Presentation, Tucson, June 8, 2008.

“Cratering & Splashing During Landing (Phoenix)” Phoenix End-of-Sol Presentation, Tucson, June 7, 2008.

“Dust lifting on Mars, Earth and beyond” Workshop on *Mars’ Planetary Boundary Layer* organized by the International Space Science Institute (ISSI). Bern, Switzerland, 13-18 May, 2008.

“Atmospheric Science Campaigns for REMS” REMS Science Team Meeting, Madrid, April 2008.

“Electrostatics and Thermal Effects on the Lunar Surface” UCLA-JPL Lunar Science Workshop, February 25, 2008.

“Electric activity and dust lifting on earth and beyond” Workshop on *Planetary Atmospheric Electricity* jointly organized by the Europlanet Network and the International Space Science Institute (ISSI). Bern, Switzerland, 23-27 July 2007.

“A miniature sensor for electrical field measurements in dusty planetary atmospheres.” Electrostatics 2007, Oxford, UK, March 25-29, 2007.

“TECP Calibration.” Phoenix 10th Science Team Meeting. Tucson, AZ, October 16-17, 2006. Sample Delivery Experiments. Phoenix 10th Science Team Meeting. Tucson, AZ, October 16-17, 2006.

“Mars Balloon Mission: Science Goals and Requirements.” Lockheed Martin Corporation, Waterton, CO, October 19, 2006.

“Wind and temperature measurements at the surface of Mars: Primary science objectives.” REMS 3rd Science Team Meeting, CAB, Madrid, November 28-29, 2006.

TEACHING (at University of Michigan only)

Teaching Evaluation

Q1 = Overall, this was an excellent course

Q2 = Overall, the instructor was an excellent teacher

Maximum score = 5.0

Winter 2010

- ENG 450, Multidisciplinary Design, 26 students, 4 credits
Teacher Evaluation: *Q1*: 4.75, *Q2*: 4.75
- ENG 455, Multidisciplinary Design, 4 students, 4 credits
Teacher Evaluation: *Q1*: 5.00, *Q2*: 4.75

Fall 2009

- ENG 450, Multidisciplinary Design, 16 students, 4 credits
Teacher Evaluation: *Q1*: 4.75, *Q2*: 4.75

Winter 2009

- ENG 450, Multidisciplinary Design, 21 students, 4 credits

- Teacher Evaluation: *Q1*: 4.33, *Q2*: 4.33
- AOSS 749, A&S Seminar, 8 students, 1 credit
Teacher Evaluation: *Q1*: 4.33, *Q2*: 4.50
 - AOSS 499, Directed Study, 1 student

Fall 2008

- AOSS 749, A&S Seminar, 14 students, 1 credit
Teacher Evaluation: *Q1*: 4.63, *Q2*: 4.75
- ENG 390, Multidisciplinary Design, 9 students, 4 credits
Teacher Evaluation: *Q1*: NA, *Q2*: NA
- AOSS 499, Directed Study, 1 student

Winter 2008

- ENG 450, Multidisciplinary Design, 21 students, 4 credits
Teacher Evaluation: *Q1*: 4.71, *Q2*: 4.58
- AOSS 749, A&S Seminar, 23 students, 1 credit
Teacher Evaluation: *Q1*: 3.80, *Q2*: 3.67
- AOSS 499, Directed Study, 3 students, 3 credits
- AOSS 701, Special Problems, 3 students, 3 credits
Teacher Evaluation: *Q1*: NA, *Q2*: NA

Fall 2007

- AOSS 411, Clouds and Precipitation, 13 students, 3 credits
Teacher Evaluation: *Q1*: 3.60, *Q2*: 3.75
- ENG 390, Special Topics: Multidisciplinary Design, 10 students, 3 credits
Teacher Evaluation: *Q1*: NA, *Q2*: NA
- AOSS 749, A&S Seminar, 27 students, 1 credit
Teacher Evaluation: *Q1*: 3.95, *Q2*: 3.93
- AOSS 499, Directed Study, 1 student
- AOSS 995, Dissertation Candidate, 1 student
- APPPHYS 995, Dissertation Candidate, 1 student

Winter 2007

- ENG 450, Multidisciplinary Design, 21 students, 4 credits
Teacher Evaluation: *Q1*: 4.95, *Q2*: 4.75
- AOSS 499, Directed Study, 2 students
- AOSS 990, Dissertation Pre-Candidate, 1 student
- APPPHYS 995, Dissertation Candidate, 1 student

Fall 2006 (Sabbatical)

- AOSS 701, Special Problems, 1 student
- APPPHYS 995, Dissertation Candidate, 1 student
- AOSS 499, Directed Study, 4 students

Winter 2006

- ENG 450, Multidisciplinary Design, 19 students, 4 credits
Teacher Evaluation: *Q1*: 4.69, *Q2*: 4.69
- APPPHYS 995, Dissertation Candidate, 1 student
- AOSS 990, Dissertation Pre-Candidate, 1 student
- AOSS 499, Directed Study, 4 students

Fall 2005

- AOSS 414, Weather Systems, 9 students, 4 credits
Teacher Evaluation: *Q1*: 4.25, *Q2*: 4.17
- AOSS 499, Directed Study, 8 students
- AOSS 499, Direct Study, 1 student

Winter 2005

- ENG 450, Multidisciplinary Design, 26 students, 4 credits
Teacher Evaluation: *Q1*: 4.54, *Q2*: 4.40
- AOSS 701, Special Problems, 3 students
- AOSS 321, Earth Systems Dynamics, 25 students, 4 credits
Teacher Evaluation: *Q1*: 3.38, *Q2*: 4.00

Fall 2004

- AOSS 414, Weather Systems, 11 students, 4 credits
Teacher Evaluation: *Q1*: 4.70, *Q2*: 4.93

Winter 2004

- ENG 450, Multidisciplinary Design, 18 students, 4 credits
Teacher Evaluation: *Q1*: 4.79, *Q2*: 4.30
- AOSS 411, Cloud and Precipitation, 12 students, 4 credits
Teacher Evaluation: *Q1*: 4.25, *Q2*: 4.40
- AOSS 499, Directed Study, 1 student
- EECS 599, Directed Study, 1 student
- AOSS 990, Dissertation Pre-Candidate, 2 students

Fall 2003

- AOSS 414, Weather Systems, 7 students, 4 credits (check)
Teacher Evaluation: *Q1*: 4.25, *Q2*: 4.50
- AOSS 605, Current Topics, 4 students, 4 credits (check)
Teacher Evaluation: *Q1*: 4.50, *Q2*: 5.00
- EECS 599, Directed Study, 1 student
AOSS 990, Dissertation Pre-Candidate, 2 students

Winter 2003

- AOSS 701, Special Problems, 3 students
AOSS 990, Dissertation Pre-Candidate, 2 students

Fall 2002

- AOSS 414, Weather Systems, 15 students, 4 credits
Teacher Evaluation: *Q1*: 3.94, *Q2*: 4.69

Fall 1995 to Summer 2002

- I thought a variety of undergraduate and graduate courses at the University of Arizona. Student feedbacks were similar to the ones I have been getting at the University of Michigan.

SAMPLE STUDENT COMMENTS (on teacher evaluation forms)

- “It’s the best class.”
- “Best teacher that I had at the University of Michigan.”
- “Excellent teacher. Gave clear explanations, was always willing to meet outside of class, and was very, very helpful. In all honesty one of the best teachers I ever had!!”
- “Seemed to have great knowledge of the subject matter.”
- “The instructor was very approachable with questions and very thorough with explanations.”
- “The professor was well prepared for every class. Made sure we understood everything before moving on. He had office hours and would meet at any other time to help with assignments and answer questions, very helpful.”
- “Prof. Renno got me to like dynamics... if that isn’t a miracle, I don’t know what it is. He is very patient and understanding, clear, and extremely accessible...”
- “Willing to take the time to make things clear and be helpful.”