

**PROMOTION RECOMMENDATION**  
The University of Michigan  
College of Engineering

Approved by the Regents  
May 15, 2008

Nilton O. Renno, associate professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering, is recommended for promotion to professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering.

Academic Degrees:

Ph.D. 1992 Massachusetts Institute of Technology, Atmospheric Sciences, Cambridge, MA  
BS 1983 Unicamp, Civil and Environmental Engineering, Campinas, Brazil

Professional Record:

2005-present Associate Professor (with tenure), Department of Atmospheric, Oceanic and Space Sciences, University of Michigan  
2002-2005 Associate Professor (without tenure), Department of Atmospheric, Oceanic and Space Sciences, University of Michigan  
2001-2002 Associate Professor (with tenure), Department of Atmospheric and Planetary Sciences, University of Arizona, Tucson, AZ  
1995-2001 Assistant Professor, Department of Atmospheric and Planetary Sciences, University of Arizona, Tucson, AZ  
1994-1995 Research Fellow in Planetary Sciences, California Institute of Technology, Pasadena, CA  
1993-1994 Postdoctoral Scholar, Lawrence Livermore National Laboratory, Livermore, CA  
1992-1993 Postdoctoral Associate, Massachusetts Institute of Technology, Cambridge, MA

Summary of Evaluation:

Teaching: Professor Renno's teaching is innovative and exemplary. His lectures are excellent and he is a popular classroom teacher, but his most important contribution comes from creating exciting hands-on classes for undergraduates. Professor Renno initiated a new ENG-450 course "Bridging the Gap between Human and Robotic Mars Exploration." Professor Renno's close scientific ties with the management of the Mars Science Laboratory (MSL) mission, managed by NASA JPL and set to be launched in 2009, led to close cooperation with the leadership of the MSL project and his ENG-450 class being organized around the real-life design challenges of the mission. Teams of JPL engineers visited AOSS on a weekly basis to lecture and mentor students. The students designed some major components of the mission, with the JPL engineers evaluating and advising the student teams as the projects progressed. In the end, JPL actually used some elements of the student designs. This class was a huge success among students, and also attracted praise from JPL Director, Charles Elachi, and from NASA's upper management. Professor Renno's talent, dedication and organizational skills are the main factors responsible for the huge success of this course. Another example of Professor Renno's success with student projects is the development of a CubeSat mini-satellite for ionospheric electric field measurements. The main goal of this project is to expose science and engineering students to the end-to-end process of designing, fabricating and testing space flight hardware. Graduate and undergraduate students from space science, computer science, aerospace engineering, electrical, and mechanical engineering are working together on space flight hardware.

Research: Professor Renno joined AOSS in 2002. In the five years since he came to Michigan his scientific career has taken off spectacularly. During this period he published more than 10 first authored

peer-reviewed papers and a number of others where his students were first authors. His research is well funded and balanced between theoretical and experimental work. Professor Renno is an outstanding scientist who thinks “outside the box” and generates quite a buzz with his new ideas. His idea for a miniature electric field sensor that works in a dusty environment is revolutionary. His idea of how to inflate balloons that are released from a descending spacecraft (for Mars probes) quickly caught on and has been adopted by industry and NASA. His innovative demonstration, that the original design of the “spoon” on the Mars Scout mission (Phoenix) that scoops up dust and lifts it to the “mouth” of the onboard analyzer was fatally flawed due to the prevailing winds, saved the Phoenix mission from an embarrassing failure. In short, Professor Renno has really blossomed in the last five years and he is a widely recognized leader in planetary meteorology. Professor Renno is a co-investigator of Phoenix, NASA’s 2007 mission to Mars that was successfully launched earlier this year. The main objective of Phoenix is to “follow the Martian water” and study climate and the potential for life on the planet. Professor Renno leads the Phoenix Atmospheric Science Theme Group (ASTG), which will study atmospheric processes and surface-atmosphere interaction with various instrument packages. Professor Renno developed the mission’s atmospheric science requirements and is leading the development of the mission operation and data analysis strategies. Moreover, he is conducting laboratory experiments to assess the performance of various systems of the Phoenix spacecraft. One of his most interesting ideas led to the discovery of multiple climate equilibria in radiative-convective atmospheres. He found that finite amplitude instabilities due to water vapor feedbacks cause multiple-equilibria and runaway greenhouse in radiative-convective models. Professor Renno’s study spearheaded an entirely new direction in climate physics and pioneered a growing field of research.

#### Recent and Significant Publications:

Kok, J.F., and N.O. Renno, “Electrostatics in wind-blown sand,” *Physical Review Letters*, 100, 014501, doi:10.1103/PhysRevLett.100.014501, 2008.

Kok, J.F., and N.O. Renno, “The effects of electric fields on dust lifting,” *Geophysical Research Letters*, 33, L19S10, doi:10.1029/2006GL026284, 2006.

Koch, J. and N.O. Renno, “The role of convective plumes and vortices on the global aerosol budget,” *Geophysical Research Letters*, 32, doi:10.1029/2005GL023420, 2005.

Adams, D.K., and N.O. Renno, “Thermodynamic efficiencies of an idealized global climate model,” *Climate Dynamics*, 25, doi:10.1007/s00382-005-0071-y, 2005.

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, “MATADOR 2002: A Field Experiment on Convective Plumes and Dust Devils,” *Journal of Geophysical Research*, 109, E07001, doi:10.1029/2003JE002219, 2003.

Renno, N.O., A.S. Wong, S.K. Atreya, I. de Pater, M. Roos-Serote, “Electrical Discharges and Broadband Radio Emission by Martian Dust Devils and Dust Storms,” *Geophysical Research Letters*, 30, doi:10.1029/2003GL017879, 2003.

Service: Professor Renno’s service activities are very commendable. He has made significant contributions at the department level through his service as an active member of the AOSS Executive Committee, two faculty search committees and as co-chair of the AOSS STEP Committee. He also participated in several College committees. In addition, Professor Renno is active in a number of international professional societies, including the American Institute of Aeronautics and Astronautics Organization Scientifique et Technique Internationale du vol a Voile, American Astronomical Society, American Geophysical Union, and American Meteorological Society. He has served on advisory committees and proposal review panels for NASA, DoE, NSF, and the Institut de Radioprotection et de Sureté Nucléaire. Professor Renno has also been involved with many visible outreach activities. His involvement with the Ann Arbor Hands-On Museum, the Detroit Science Center, and lecturing in elementary schools and clubs are particularly noteworthy.

External Reviewers:

Reviewer A: "Nilton has established himself as a world-class researcher focusing on a deep physical and quantitative understanding of atmosphere-surface dynamics on Earth and also on other planets with atmospheres."

Reviewer B: "He has a sustained record of achievement in research, teaching, and service and shows promise for continued growth. You are fortunate to have him as a member of your faculty."

Reviewer C: "Nilton has done first-rate work on atmospheric convection and planetary atmospheres and I expect that he will continue to be a leader in atmospheric research and in the education of the next generation of atmospheric scientists."

Reviewer D: "In my opinion, thanks to its [sic] expertise in fundamental atmospheric thermodynamics, Nilton Renno provides a unique expertise in Mars atmospheric Science (an [sic] possibly Earth), with no other equivalent."

Reviewer E: "Nilton's research in planetary atmospheres is regarded by the community as leading-edge, and his opinions are widely sought in planning missions to Mars."

Reviewer F: "Nilton's work has consistently been of exceptionally high quality, in a broad range of technical thrusts, so he has demonstrated both scientific depth and breadth in areas of critical importance to planetary science as well as to future human exploration."

Reviewer G: "Overall, he has evidently established himself as an internationally leading authority on atmospheric convection and its role in terrestrial and planetary climate systems."

Reviewer H: "Overall I would place Nilton right at the top of his peer group. His accomplishments are on a par with the accomplishments of those who get tenure at [my institution]. Nilton amply deserves promotion to Full Professor."

Summary of Recommendation: Professor Renno is a prominent and very productive atmospheric scientist who has made significant contributions to the study of climate and planetary atmospheres. He is an excellent teacher and mentor; and he is a leader who contributes to both external and internal service. It is with the support of the College of Engineering Executive Committee that I recommend Nilton O. Renno for promotion to professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering.



David C. Munson, Jr.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

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