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Professor Jim Jackson  
Chair of the Astronomy Department  
Boston University  
725 Commonwealth Avenue, room 514  
Boston, MA 02155

Dear Professor Jackson and the Astronomy Search Committee,

I am writing to you to express my interest in the advertised faculty position in the Astronomy Department at Boston University. I believe I would be a good fit in this position based on my research interests, demonstrated mentoring and teaching experience, and involvement in spaceflight missions. I believe that this position would be a good fit for me based on the university's ability to attract talented students at all levels of study and across all disciplines; the department's integration of astrophysics, space physics, and planetary science, which creates a wonderful environment for studying the boundaries between planets and space; and the opportunities for faculty members to develop and pursue long-term projects, which bring a wide range of benefits to their students, where a researcher with a funding-imposed horizon of only a few years cannot. As a NASA Early Career Fellow, I am eligible to be awarded \$100K in start-up funds when I obtain a tenure-track position.

My research interests lie in planetary science, one of the targets of your current search and a discipline that a series of internal planning documents and external reports have identified as a natural and necessary growth area for the Astronomy Department. I view my expertise and interests as complementary to, not duplicative of, those of the existing faculty, as outlined in my research plans. Copies of my scientific papers and presentations can be downloaded from <http://sirius.bu.edu/withers/>.

I have already gained relevant teaching experience by teaching Astronomy 101 here at Boston University and I currently mentor the research activities of both undergraduate (including Astronomy majors Robert Pratt and Jeff Russo) and graduate students (including Astronomy student Majd Matta, jointly mentored with Professor Mendillo), as outlined in my teaching plans. In addition, an ECE undergraduate student worked with me for one year and an ECE PhD student is currently considering working with me, which shows potential for strengthening the existing ties between the Astronomy and ECE departments. As the PI on five active grants, I am well-positioned to support students immediately.

I have a substantial track-record of involvement in spacecraft missions, including membership in several instrument teams and participation in several instrument proposals. I plan to continue this, particularly with radio science and accelerometer instruments. The few groups that have expertise with these instruments are withering through retirements without rejuvenation, which presents an excellent opportunity to augment and sustain Boston University's tradition of involvement in spaceflight projects.

Yours,  
Paul Withers

### **List of enclosed materials**

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## References

### Professor Jeffrey Forbes

Glenn Murphy Endowed Professor, Department of Aerospace Engineering Sciences, University of Colorado

Aerospace Engineering Sciences Department  
Attn: 429 UCB  
University of Colorado  
Boulder, CO 80309-0429

Email: forbes@colorado.edu  
Telephone: 303-492-4359  
Fax: 303-492-7881

Jeff Forbes is an expert on waves in planetary atmospheres and in the dynamics of upper atmospheres, and also has related interests in planetary ionospheres. His research interests overlap with some of my work on the upper atmospheres of Venus and Mars. Journals have frequently asked us to review each other's work.

### Dr David Hinson

Senior Research Scientist, Department of Electrical Engineering, Stanford University

350 Serra Mall, David Packard #333  
Stanford University  
Stanford CA 94305-9515

Email: dhinson@stanford.edu  
Telephone: 650-723-3534  
Fax: 650-723-9251

Dave Hinson is an expert on planetary radio science instruments. His work on the Mars Global Surveyor radio science instrument has also led to interests in the atmosphere and ionosphere of Mars. We have collaborated on instrumentation projects and scientific studies of the atmosphere and ionosphere of Mars.

### Professor Stephen Bougher

Research Professor, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan

AOSS Department  
Space Research Building, University of Michigan  
2455 Hayward Street  
Ann Arbor, MI 48109-2143

Email: bougher@umich.edu  
Telephone: 734-647-3585  
Fax: 734-615-9213

Steve Bougher was my PhD advisor. He studies planetary upper atmospheres, especially Venus and Mars, using general circulation models. Although primarily focused on neutral atmospheres, his work also encompasses ionospheres. He has worked closely with data from accelerometer instruments.

If additional references are required, please contact Professor Jim Murphy (dynamics of the martian atmosphere, accelerometer instruments, data archiving) at New Mexico State University (murphy@nmsu.edu, telephone: 575-646-5333, fax: 575-646-1602) or Professor Michael Mendillo (planetary ionospheres) at Boston University.

I have not asked these colleagues to send letters to you. Please contact them directly to request letters.

## Description of future research plans

My research interests lie in planetary atmospheres, particularly upper atmospheres, and ionospheres. An ionosphere is a weakly ionized plasma embedded within an upper atmosphere, generally produced by solar photoionization. The properties of an upper atmosphere and ionosphere are determined by chemistry, energetics, dynamics, coupling to the lower atmosphere and solid surface below, and coupling to the solar wind and magnetosphere above. Upper atmospheres and ionospheres form highly-integrated systems in which common processes operating in different environments produce different outcomes.

My current expertise and the plans described here complement, but do not duplicate, the strengths of the existing planetary science faculty. For example, Professor Clarke's core strengths lie in giant planets, aurorae, and UV observing and Professor Mendillo's in sodium exospheres and terrestrial aeronomy. In the near-term, my research will concentrate on the analysis of new observations from Venus and Mars. History shows that this, rather than the development of complicated numerical models, laboratory experiments, or re-analysis of old observations, is the path most likely to lead to major discoveries in planetary science. My typical approach is to probe an extensive dataset in detail, identifying both general trends and rare features, then develop simple theoretical explanations for the observed phenomena (leveraging collaborations with developers of sophisticated, complex models as needed). The volume, quality, and diversity of existing and anticipated datasets from Mars make it a natural focus for planetary science research. The atmospheres and ionospheres of Venus and Mars are so similar in their chemistry that comparative studies of both naturally follow any investigation of one, and substantial datasets from Venus Express and Pioneer Venus Orbiter are available. Venus and Mars are also close analogues to Earth, which serves as a well-studied benchmark for many aspects of planetary science. My specific plans are as follows.

### Ionospheres of Venus and Mars

**Questions:** How do atypical forcing conditions affect ionospheres? How do magnetic fields affect ionospheric processes? Which characteristics of ionospheres are controlled by planet-specific conditions?

**Data:** Mars Global Surveyor, Mars Express (Co-I), and Venus Express (Co-I) radio occultation instruments; Mars Express topside radar sounder

**Opportunities:** Japan's Venus Climate Orbiter (2010 launch); NASA's MAVEN mission (Mars, 2013)

**Selected past funding:** NSF CEDAR postdoc (2003)

**Current funding:** NASA MFRP (2007); NASA LWSTRT (2007)

**Undergraduate Students:** Bob Lombardi (AS, 2006-2007, with Mendillo); Dane Sarcone (ECE, 2008-2009); Anthony Lollo (AS, 2008-present, with Mendillo)

**Graduate Students:** Majd Matta (AS, 2007-present, with Mendillo); Nenad Bozinovic (ECE, tentative)

I want to understand how these ionospheres work. By terrestrial standards, current knowledge is so limited that we cannot give incoming graduate students a complete, high-level picture of their chemistry, energetics, dynamics, electrodynamics, and interactions with the solar wind above and the lower atmosphere below. My over-arching aim is to help the community develop such a picture so that students can learn how universal physical and chemical processes produce all three terrestrial planet ionospheres.

### Upper atmospheres of Venus and Mars

**Questions:** What modes of atmospheric motions are present? Is the upper atmosphere coupled to the lower atmosphere? What are the most important radiative and dynamical processes that control the thermal structure?

**Data:** Mars Global Surveyor, Mars Odyssey (Participating Scientist), Mars Reconnaissance Orbiter and Venus Express (Co-I) aerobraking accelerometers; Mars Express and Venus Express UV occultation instruments; Mars Reconnaissance Orbiter IR sounder

**Opportunities:** Japan's Venus Climate Orbiter (2010); NASA's Trace Gas Orbiter (Mars, 2016); NASA's SAGE mission (Venus, 1 of 3 in Phase A competition for New Frontiers, 2016)  
**Current funding:** NASA MCDP (2007); NASA MDAP (2007)  
**Undergraduate students:** Robert Pratt and Jeff Russo (AS, 2008-present)

I want to understand winds, waves and tides in these atmospheres. Current knowledge of atmospheric dynamics is relatively strong in the lower atmospheres, but weakens at higher altitudes. Conversely, the strength and significance of atmospheric motions increases upwards on Mars. My over-arching aim is to help the community develop a "whole atmosphere" picture of the generation, evolution, and dissipation of atmospheric motions in the three terrestrial planets so that students can learn how the conservation of momentum in a rotating fluid sphere produces a rich assortment of atmospheric dynamical behaviours.

### Instrumentation

Involvement in spacecraft instrument teams enables scientists to maintain a long-term focus on a scientific question and strongly influence how that question is investigated. It also offers superb opportunities for undergraduate and graduate research projects, exposes students to the true nature of the scientific process, presents many graduate school and employment opportunities to students, and brings funding and nationwide recognition to the department. Due to retirements, very few groups currently have the expertise to lead planetary radio science and accelerometer instrument projects, which creates a rare opening for an institution like Boston University to establish itself as a new centre of excellence. Radio science hardware flies on every orbiter and flyby mission and accelerometers fly on every aerobraking and landed mission, presenting frequent proposal opportunities. Both radio science and accelerometer instruments are typically facility instruments, rather than PI-provided instruments. As such, their science teams enjoy the usual benefits of defining the instrument's performance, choosing what to observe, and being extremely familiar with the dataset's properties. Yet since the hardware is provided by the spacecraft, they do not have to assume the administrative and legal (e.g., ITAR) burdens of managing the instrument's fabrication and maintaining staffing from project to project. From the key perspective of an astronomy student's education, a facility instrument is equivalent to an instrument built on campus.

I have the skills needed to bring such projects to BU. I have been a Co-Investigator or Participating Scientist on multiple radio science and accelerometer instruments, a Co-Investigator on Phase A studies for two instruments, and I am currently making major contributions to the development of instrument proposals for radio occultation experiments on NASA's Trace Gas Orbiter (2016, Mars) and Europa Orbiter (2020). Proposals for the Trace Gas Orbiter are due on 15 April, with selections anticipated this summer. My work deriving atmospheric properties from raw accelerometer measurements by Mars Odyssey, Spirit, Opportunity and Phoenix has positioned me as the US's leading scientific expert on the analysis of entry accelerometer data.

### Long-Term Themes

The near-term future in these areas is promising, especially with the launches of NASA's MAVEN mission to study the martian ionosphere in 2013 and NASA's Trace Gas Orbiter to study the martian atmosphere in 2016. These plans also lay foundations for potential studies of the atmospheres of extrasolar terrestrial planets. Progress in the field of extrasolar planets is rapid and accelerating, and the first extrasolar terrestrial planets are likely to be discovered soon. Any research program must have underlying principles that govern its evolution in response to changing conditions, such as new discoveries, a drop in the launch rate of planetary missions, or diversification of NASA's planetary exploration away from Mars. In the longer term, my research program will address how the deceptively simple laws of physics and chemistry produce the diverse phenomena found in planetary systems throughout the galaxy. The simplest possible explanations will be sought for observed characteristics, and concepts generalized beyond one environment as much as possible.

## Description of teaching plans

A university professor must be able to teach diverse types of students in a range of environments. In the classroom, these include non-majors satisfying a compulsory science requirement in a broad survey-type class, majors progressing towards an undergraduate degree in a scientific field, and graduate students discovering the limits of current knowledge as they explore potential dissertation topics. Outside the classroom, these include undergraduate research assistants working on narrowly-defined, short-term projects, and graduate students working on multi-year projects with the freedom to explore many potential aspects of a problem.

I taught Astronomy 101 “Introduction to the Solar System” at Boston University in the summer of 2006. Student evaluations can be seen at <http://sirius.bu.edu/withers/>. I drew two main conclusions from this. First, students learn better from personal discovery (active) than from rote teaching (passive). As such, class time is precious because it is the only opportunity for the teacher to guide and observe the students as they learn, not because it is where all the textbook’s material is covered. Second, students are more responsive when physical processes are taught alongside planetary examples, rather than as separate chapters. This approach is more logistically challenging for the teacher. I am interested in learning whether these conclusions also apply to higher level courses and I hope to use the resources of the Center for Excellence in Teaching to further develop my teaching skills.

As noted in my research plans, I currently mentor and support several undergraduate and graduate students. I typically spend one hour per week with those students I am directly mentoring and meet less frequently with those I jointly supervise with Prof. Mendillo. I will continue to work with undergraduate and graduate students from the Astronomy and ECE departments. I find that thorough definition of student research projects with target milestones, regular evaluation of progress followed by any necessary re-planning, and careful time management help maximize the educational benefits accrued by the student.

Of the existing courses, I am best qualified to teach AS101 for non-majors, AS202, AS311 and AS414 for majors, AS703, AS781 and AS783 for graduate students. I am also interested in supporting the integrated approach of the core curriculum by team-teaching CC105. To reverse recent decreases in the Astronomy department’s undergraduate enrollments, I propose that the department develop a suite of focused 100-level courses to complement the existing survey courses. Limiting the breadth of these courses would make students feel that they approach closer to the cutting edge of the topic and make the 3 sentence descriptions considered in seconds by catalog-browsing students more powerful and appealing. Possible topics that can compete with “Sex and Reproduction,” “Earthquakes” or “Cinema Physics” include recent discoveries at Mars, recent discoveries at Saturn, aurora, and storms in space. These courses would share a core set of scientific themes (e.g., conservation of energy and momentum, gravity, the quantum world, atomic structure), thus delivering similar scientific principles in a series of distinct, attractive packages.

I am interested in developing two graduate courses. First, a course on planetary ionospheres that would complement the existing courses on planetary atmospheres (AS781) and the terrestrial ionosphere (AS783). This could either be an entirely new course or a refocusing of AS783 onto comparative studies. Second, a course for senior graduate students that would complement the graduate research and scholarship course (AS802) for incoming students. This course would focus on proposal writing because the ability to write strong proposals is a critical skill necessary for a successful transition from dependent postdoc to independent researcher. Whatever their future direction, all students will benefit from the skills to define a project, to show how it can and why it should be completed, and to justify why this team should be funded at this time. I anticipate this course containing an overview of funding programs, deconstruction of the elements of a proposal, critique of sample proposals, development of individual proposals, and review of these proposals.

# Paul Withers

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Citizenship: British (Green Card holder)

## **Education**

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- PhD, Planetary Science, University of Arizona 2003
- MS, Physics, Cambridge University, Great Britain 1998
- BA, Physics, Cambridge University, Great Britain 1998

## **Professional Experience**

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- Senior research associate Dr. Michael Mendillo (Boston Univ.) 2007-present  
Analysis of atmospheric and ionospheric data from Venus, Earth and Mars,  
plus numerical modelling
- Research associate Dr. Michael Mendillo (Boston Univ.) 2003-2007  
Analysis of ionospheric data from Mars and Earth, plus numerical modelling
- Graduate research assistant Dr. Stephen Bougher (Univ. of Arizona) 1998-2003  
Studied tides in the martian upper atmosphere. Played an advisory role in  
mission operations for Mars Global Surveyor and Mars Odyssey aerobraking

## **Visiting and Short-Term Positions**

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- Visiting Research Fellow Open University, Great Britain 2004-2007
- Research consultant Dr. John Zarnecki (Open University) 2001(summer)  
Developed techniques to analyze atmospheric structure data from entry probes, concentrating  
on the British Beagle 2 Mars lander.
- Research assistant Dr. Greg Neumann (NASA/Goddard) 2000(summer)  
Worked with MOLA team to investigate the geology of the northern plains of Mars,  
supported by the competitive Goddard Summer Student Program.
- Research assistant Dr. Andrew Melatos (Caltech) 1997(summer)  
Modeled pulsar outflows, supported by a competitive Caltech Summer Undergraduate  
Research Fellowship
- Website designer Dr. Nicholas Walton (ING) 1996(summer)  
Worked at the Isaac Newton Group (ING) of Telescopes, La Palma, Spain

### **Fellowships, Honors, and Awards**

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- NASA Early Career Fellowship 2009
- CEDAR Postdoctoral Fellowship from NSF for upper atmospheric research 2003
- Kuiper Memorial Award from the University of Arizona for excellence in academic work and research in planetary science 2002
- Nominated for the Meteoritical Society/Geological Society of America's Best Student Paper in Planetary Sciences Award 2002
- Galileo Circle Graduate Scholarship from the University of Arizona 2001
- Highly Commended in annual British Young Science Writer Contest 2000
- Graduate Registration Fellowships from the University of Arizona 1999-2002

### **Invited Presentations (External)**

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- Results from the Phoenix Atmospheric Structure Experiment, 7th International Planetary Probe Workshop, Barcelona, Spain 2010
- Exploring planetary ionospheres, Center for Atmospheric Research, University of Massachusetts - Lowell 2009
- The effects of solar flares on planetary ionospheres, AOGS meeting, Singapore 2009
- Meteor layers in the martian and venusian ionospheres: Their connection to meteor showers, Europlanet N3 4th strategic workshop on meteor studies, Cologne 2008
- Plasma layers in the terrestrial, martian and venusian ionosphere: Their origins and physical characteristics, Europlanet N3 4th strategic workshop on meteor studies, Cologne 2008
- Variability of the ionosphere of Mars, 37th COSPAR meeting, Montreal 2008
- The Mars ionosphere: More than a Chapman layer, Armagh Observatory 2008
- The Mars ionosphere: More than a Chapman layer, University of Cologne 2007
- The top of the martian atmosphere, University College London 2007
- Determination of upper atmospheric properties on Mars and other bodies using satellite drag/aerobraking measurements, European Planetary Science Congress, Berlin 2006
- Huygens at Titan, MIT 2005
- Exploring Saturn with Cassini/Huygens, Tufts University 2004
- Oceans on Mars? Imperial College, London 2001

### **Invited Presentations (Internal)**

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- A better way of modeling ionospheric electrodynamics, Boston University's Center for Space Physics 2007
- The mean molecular mass of Titan's atmosphere, Boston University's Center for Space Physics 2007
- Analysis of aerobraking accelerometer data from Mars, Boston University's Center for Space Physics 2007
- Space physics at Mars, Boston University's Center for Space Physics 2006
- The effects of solar flares on the ionospheres of Earth and Mars, Boston University's Center for Space Physics 2005
- How does the magnetic field of Mars affect the ionosphere? Boston University's Center for Space Physics 2004
- The martian atmosphere, Professor Oliver's ENG SC566 class at Boston University 2004
- Tides in the martian upper atmosphere - and other topics, Boston University's Center for Space Physics 2003
- The martian upper atmosphere, Professor Yelle's PTYS 544 class at the University of Arizona 2003

### **Accepted Proposals**

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- NASA Early Career Fellowship (\$100K in start-up funds) **PI Withers** 2009
- "Analysis of Phoenix entry data to support future Mars landers", Unsolicited proposal to NASA (\$77K) **PI Withers** 2009
- "Venus Express Atmospheric Drag Experiment", unfunded facility instrument team proposal to ESA, PI Mueller-Wodarg, **Co-I Withers** 2008
- "Simulations of the effects of extreme solar flares on technological systems at Mars", NASA Living With a Star Targeted Research and Technology Program (\$357K) **PI Withers** 2007
- "Analysis of SPICAM stellar occultation data", NASA Mars Data Analysis Program (\$312K) **PI Withers** 2007
- "Development of a Mars ionosphere model with time-dependent solar forcing for studies of solar flare effects", NASA Mars Fundamental Research Program (\$264K) **PI Withers** 2007
- "Application of Spirit and Opportunity atmospheric density/temperature profiles and TES temperature/pressure data to provide atmospheric density/temperature profiles for MSL EDL", NASA Mars Critical Data Products AO (\$153K) **PI Withers** 2007
- "Mars ionospheric disturbances", NASA Mars Data Analysis Program (\$287K) PI Michael Mendillo, **Co-I (and lead author) Withers** 2006
- "The Great Escape", Step-1 Proposal for NASA's Mars Scout Program (~\$2M) PI Stern, **Co-I Withers** (one of two finalists) 2006

- “Analysis of Accelerometer data from aerobraking”, NASA Mars Odyssey Participating Scientist Program (\$52K) PI Mendillo, **Science PI (and lead author) Withers** 2005
- “The escape of oxygen from Mars”, NASA HST Cycle 13 Archival Research Program (\$66K) PI Wilson, **Co-I Withers** 2004
- “Studies of variability patterns and their causes in Mars' upper atmosphere”, NASA Mars Data Analysis Program (\$300K) PI Mendillo, **Co-I (and lead author) Withers** 2003
- “Comparative aeronomy: Photo-chemistry and neutral-plasma coupling at Earth and Mars”, NSF/CEDAR Postdoctoral Fellowship (\$120K) PI Mendillo, **Co-I (and lead author) Withers** 2003
- Geoplanets Summer School, Italy (~\$1K) 2002
- Graduate Scholarship, University of Arizona College of Science Galileo Circle (\$5K) 2001
- Goddard Summer Student Program (\$4K) 2000
- JPL Planetary Sciences Summer School (<\$1K) 1999
- Caltech Summer Undergraduate Research Fellowship (\$4K) 1997

#### **Pending Funding Proposals**

- “Thermospheric variability observed by past aerobraking missions and radio occultation experiments”, NASA Mars Critical Data Products AO (\$193K) **PI Withers** 2010
- “SPICAM support for aerobraking at Mars”, NASA Mars Critical Data Products AO (\$196K) **PI Withers** 2010
- “Developing a novel modeling approach for Mars’ ionospheric electrodynamics”, NASA Mars Fundamental Research Program (\$311K) PI Paty, **Collaborator Withers** 2009

#### **Planned Funding Proposals**

- “Atmospheric sounding through radio occultations”, NASA Trace Gas Orbiter instrument AO (budget pending) PI Hinson, **Co-I Withers**, submission deadline on 15 April 2010
- “Radio occultations in the Jupiter system”, NASA Europa Orbiter and ESA Ganymede Orbiter (EJSM) instrument AO, collaboration involving Paetzold and **Withers**, anticipated in 2011

#### **Selected Unsuccessful Funding Proposals**

- “The Great Escape”, Concept Study Report for NASA's Mars Scout Program (~\$450M) PI Burch, **Co-I Withers** 2008
- “Investigation of the martian upper atmosphere using MRO ACCEL data”, NASA Mars Reconnaissance Orbiter Participating Scientist Program (\$346K) **PI Withers** 2006

- “Atmospheric Structure Profiles”, NASA 2003 Mars Exploration Rovers Participating Scientist AO (\$300K) **PI Withers** 2002

### **Data Archiving Activities**

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- Delivered atmospheric entry profiles (density, pressure, temperature) for Phoenix, and associated documentation, to NASA Planetary Data System for review and archiving 2010
- Advisor to Atmospheres node of the NASA Planetary Data System 2009-present
- Delivered atmospheric entry profiles (density, pressure, temperature) for Spirit and Opportunity, and associated documentation, to NASA Planetary Data System for review and archiving 2008
- Delivered Odyssey aerobraking data (measured accelerations, derived density profiles, fitted constant altitude densities), and associated documentation, to NASA Planetary Data System for review and archiving 2008

### **Service on Panels that Review Archival Datasets**

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- Participated in NASA Planetary Data System review of MGS radio science dataset (MORS\_1102) 2007
- Participated in NASA Planetary Data System review of MRO aerobraking dataset (MROA\_0001) 2007
- Participated in ESA Planetary Science Archive review of Rosetta radio science dataset 2007
- Participated in ESA Planetary Science Archive review of Huygens surface science package, descent trajectory working group, and housekeeping datasets 2005-2006
- Participated in NASA Planetary Data System review of Spirit entry dataset (MERIMU\_1001) 2004
- Participated in NASA Planetary Data System review of Opportunity entry dataset (MERIMU\_1001) 2004
- Participated in NASA Planetary Data System review of MGS aerobraking dataset (MGSA\_0002) 2001

### **Service on Proposal Review Panels**

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- Review panel member for NASA Mars Data Analysis Program 2010
- Review panel member for NASA Planetary Mission Data Analysis Program 2009
- Review panel member for NASA Mars Fundamental Research Program 2009
- Review panel member for Senior Review of NASA Planetary Data System 2009
- Review panel member for NASA Planetary Instrument Definition and Development Program 2008

- Review panel member for NSF Astronomy and Astrophysics Research Grants Program 2007
- Review panel member for NASA Mars Fundamental Research Program 2006
- Review panel member for NSF Astronomy and Astrophysics Research Grants Program 2006
- Review panel member for NASA Mars Data Analysis Program 2005
- Review panel member for NASA Venus Express Participating Scientist Program 2005
- Review panel member for NASA Planetary Atmospheres Program 2005
- Review panel member for NASA Mars Data Analysis Program 2004

#### **External Reviewer for Proposal Review Panels**

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- External reviewer for NASA Mars Fundamental Research Program 2008
- External reviewer for NASA Moon and Mars Analogue Mission Activities Program 2008
- External reviewer for NASA Living With a Star Targeted Research and Technology Program 2007
- External reviewer for NASA Lunar Reconnaissance Orbiter Participating Scientist Program 2007
- External reviewer for NASA Mars Reconnaissance Orbiter Participating Scientist Program 2006
- External reviewer for NASA Mars Fundamental Research Program 2005

#### **Reviewer of Articles Submitted to Scientific Journals**

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- Advances in Space Research
- Annales Geophysicae
- Geophysical Research Letters
- Icarus
- Journal of Geophysical Research - Planets
- Journal of Geophysical Research - Space Physics
- Journal of Spacecraft and Rockets
- Mars
- Meteoritics and Planetary Science
- Planetary and Space Science
- Science

## **Membership of Committees and Working Groups**

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- DPS Nominating Committee 2008-present
- Mars Exploration Program Analysis Group (MEPAG) Goals Committee member 2008-present
- Mars Exploration Program Analysis Group (MEPAG) Mars Human Precursor Science Steering Group - Atmospheric Focus Team member 2004-2005

## **Spacecraft Mission Involvement**

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- Venus Express Accelerometer Instrument (Co-I)
- Venus Express Radio Science Instrument (Co-I)
- Mars Express Radio Science Instrument (Co-I)
- Ranked in top 10% of ESA astronaut applicants in 2008, invited to next stage of screening, but unable to attend due to travel conflict
- Mars Science Laboratory “Atmospheric Council” for EDL Planning
- The Great Escape (TGE) Radio Science Instrument (Co-I, Phase A Study)
- The Great Escape (TGE) Accelerometer Instrument (Co-I, Phase A Study)
- Mars Odyssey Accelerometer Instrument (Participating Scientist)
- Huygens Atmospheric Structure Instrument (ACC sub-system Team Member)
- Huygens Surface Science Package (Team Member)
- Spirit Accelerometer (Member of MER Atmospheric Advisory Team)
- Opportunity Accelerometer (Member of MER Atmospheric Advisory Team)
- Beagle 2 Accelerometer (Member of Environmental Sensor Suite Team)
- Mars Odyssey Accelerometer (Student of a Member of ODY Atmospheric Advisory Group)
- Mars Climate Orbiter Accelerometer (Student of a Member of MCO Atmospheric Advisory Group)
- Mars Global Surveyor Accelerometer (Student of a Member of MGS Atmospheric Advisory Group)
- Mars Global Surveyor Laser Altimeter (Summer student with MOLA Team)

## **Professional Societies**

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- American Geophysical Union’s Planetary Sciences Section, Member 2000-present
- American Astronomical Society’s Division for Planetary Science, Member 2000-present
- UK Planetary Forum, Member 2001-present

## **Professional Collaborations**

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- IMCCE (France) - Jeremie Vaubaillon - Orbital dynamics of comets and meteoroids
- LATMOS (France) - Jean-Loup Bertaux, Franck Montmessin - Thermal structure and dynamics of planetary upper atmospheres
- University of Cologne (Germany) - Martin Paetzold, Kirsten Peter, Silvia Tellmann - Radio science instruments, planetary ionospheres, martian surface pressure, ionospheric effects of meteoroids
- Armagh Observatory (UK) - Tolis Christou - Origins and ionospheric effects of meteoroids
- Imperial College (UK) - Marina Galand, Ingo Mueller-Wodarg - Aerobraking accelerometer instruments, thermal structure and dynamics of planetary upper atmospheres, ionization processes
- Open University (UK) - Andrew Ball (now at ESA), Brijen Hathi, Mark Leese, Stephen Lewis, Manish Patel, Martin Towner (now at Imperial College), John Zarnecki - Entry accelerometer instruments, planetary probes, atmospheric structure
- NASA-GSFC (USA) - Phil Chamberlin - Ionospheric effects of variations in solar irradiance
- New Mexico State University (USA) - Reta Beebe, Lyle Huber, Jim Murphy - Data archiving, martian atmospheric dynamics
- Stanford University (USA) - Kerri Cahoy (now at NASA-Ames), David Hinson, Dick Simpson - Radio science instruments, data archiving, martian atmosphere and ionosphere
- University of California, Berkeley (USA) - Dave Brain, Matt Fillingim, Rob Lillis, Carol Paty (now at Georgia Tech) - Space environment of Mars, electrodynamics of Mars
- University of Colorado (USA) - Jeff Forbes - Atmospheric waves and tides
- University of Iowa (USA) - Firdevs Duru, David Morgan - Martian ionosphere
- University of Michigan (USA) - Steve Bougher - Thermal structure and dynamics of planetary upper atmospheres, aerobraking accelerometer instruments
- University of Washington (USA) - David Catling - Entry accelerometer instruments

I also play an active role in the Mars Upper Atmosphere Network , a collaborative group that developed out of the four Mars Express instruments that make measurements of the upper atmosphere, ionosphere and space environment of Mars. Other participants include Olivier Witasse (ESA), Niklas Edberg and Hermann Opgenoorth (University of Uppsala, Sweden), Edik Dubinin, Markus Fraenz and Erling Nielsen (Max Planck Institute for Solar System Research, Germany), Mark Lester (University of Leicester, UK), as well as some of those listed above.

## **Community Service**

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- Host of departmental seminar series for spring semester 2010
- Organizer of community white paper (42 authors) on the ionosphere of Mars submitted to Planetary Science Decadal Survey 2009
- Convener of special session on “The atmosphere of Mars: New findings from modeling and observation” at Fall AGU meeting 2009
- Convener of special session on “Comparative meteor science - The effects of meteoroids in planetary atmospheres and ionospheres” at NSF/CEDAR meeting 2009
- Judge for student poster awards, SPA section, Spring AGU meeting 2005
- Convener of special session on “The martian atmosphere in late 2003 to early 2004: Observations, predictions, and analyses” at Spring AGU meeting 2005
- Convener of special session on “Comparative aeronomy on Earth and Mars” at NSF/CEDAR meeting 2004
- Student Representative to the Dean’s Board of Advisors, College of Science, University of Arizona 2002-2003
- Community Discussion Forum Moderator for Solar System Exploration Decadal Survey 2001

## **Media Activities**

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- Coverage of studies of meteor showers on Mars 2008  
Featured in Astronomy Now, Science Daily, Space.com, AHN News
- Coverage of studies of meteor showers on Mars 2007  
Featured in Sky and Telescope, University of Massachusetts - Lowell Sunrise Radio
- Coverage of studies of the effects of solar flares on Mars 2006  
Featured in Boston University Today, MSNBC, New Scientist, Space.com, and USA Today
- Coverage of New Horizons launch 2006  
Featured in Boston University Today
- Coverage of definition of a planet 2005  
Featured in Boston University Today and Reuters
- Coverage of Genesis landing 2004  
Featured in USA Today
- Coverage of Messenger launch 2004  
Featured in Bloomberg News
- Coverage of landings of Spirit and Opportunity Mars Rovers 2004  
Featured in Bostonia, Boston University Bridge, and USA Today
- Coverage of Mars Odyssey orbit insertion 2001  
Featured in University of Arizona News and Spacedaily.com
- Coverage of studies of lunar crater Giordano Bruno 2001  
Featured in Astronomy.com, BBC, Planetary Society News, Science, Sky and Telescope, NASA News, Spaceflightnow.com, University of Arizona News, and UPI

- Coverage of studies of martian northern plains 2001  
Featured in Astronomy.com, Arizona Daily Star, CNN, Discover, Space.com, Spacedaily.com, Spaceflightnow.com, TechTV News, University of Arizona News, and Arizona Daily Wildcat
- Winner of NASA competition to name the Deep Space 2 microprobes 1999  
Proposed names “Scott” and “Amundsen” selected from 17,000 entries. Featured in Journal of Aerospace and Defense Industry News, Arizona Daily Star, Planetary Society News, Space.com, Spacedaily.com, Spaceviews.com, and Arizona Daily Wildcat

### **Education/Public Outreach Activities**

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- Science fair judge, O’Bryant School for Mathematics and Science, Boston 2009
- Science fair judge, O’Bryant School for Mathematics and Science, Boston 2008
- Radio interview with University of Massachusetts Lowell’s Sunrise Stargazer program on meteors at Mars 2007
- Science fair judge, O’Bryant School for Mathematics and Science, Boston 2006
- “Update on Spirit and Opportunity” at Boston Museum of Science 2004
- “Successes and failures of recent Mars exploration” at Tufts University 2004
- TV interview on “Nitebeat with Barry Nolan” about Spirit and Opportunity 2004
- Presentation at Open House to celebrate orbit insertion of Mars Odyssey, University of Arizona 2001
- Member of Education and Public Outreach Community Panel for Solar System Exploration Decadal Survey 2001
- “Lunar crater Giordano Bruno” at the University of Arizona’s Student Showcase 2000
- “Exploring Mars” at the University of Arizona’s Student Showcase, awarded prize for best poster by a graduate student in the physical sciences 1999

### **Teaching Experience**

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- Taught Astronomy 101 “The Solar System” at Boston University 2006
- Participated in the University of Arizona’s Scientist-Teacher Alliance, developed teaching plans and visited classrooms with middle school teachers 2002
- Attended three national workshops on graduate student teaching 2000-2002
- Teaching assistant for 100-level classes at University of Arizona 1999-2000

## **Students Mentored**

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- Nenad Bozinovic, Boston University ECE PhD student, currently considering my offer of a PhD project on analysis of topside radar sounder data from Mars
- Majd Matta, Boston University Astronomy PhD student 2007-present  
Modelling the effects of magnetic fields on the martian ionosphere, jointly mentored with Professor Mendillo
- Dane Sarcone, Boston University ECE undergraduate research assistant 2009  
The effects of extreme solar flares on technological systems at Mars
- Jeffrey Russo, Boston University Astronomy undergraduate research 2008-present  
assistant. Comparison of SPICAM and aerobraking measurements of the martian upper atmosphere
- Robert Pratt, Boston University Astronomy undergraduate research 2008-present  
assistant. The effects of thermal tides on SPICAM measurements of the martian atmosphere
- Anthony Lollo, Boston University Astronomy undergraduate research 2008-present  
assistant. Numerical simulations of the martian ionosphere, jointly mentored with Professor Mendillo
- Bob Lombardi, Boston University Astronomy undergraduate research 2006-2007  
assistant. Comparative modelling of planetary ionospheres, jointly mentored with Professor Mendillo

## **Geological Field Experience**

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- Organized short sections of University of Arizona's planetary geology 1998-2002  
fieldtrips each semester, planning field stops and leading discussions. Participated in nine geological fieldtrips around the southwestern US and nearby Mexico
- Participated in Cambridge University geological fieldtrip to Greece 1997

## **Peer Reviewed Publications and Other Major Publications**

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- Opgenoorth, Dhillon, Rosenqvist, Lester, Edberg, Milan, **Withers** and Brain (2010) Dayside ionospheric conductivities at Mars, *Planetary and Space Science*, under review.
- **Withers** (2010) Prediction of uncertainties in atmospheric properties measured by radio occultation experiments, *Advances in Space Research*, in press.
- **Withers** and 42 colleagues (2009) The ionosphere of Mars and its importance for climate evolution, white paper submitted to Planetary Science Decadal Survey
- Hathi, Ball, Colombatti, Ferri, Leese, Towner, **Withers**, Fulchigioni and Zarnecki (2009) Huygens HASI servo accelerometer: A review and lessons learned, *Planetary and Space Science*, 57, 1321-1333
- **Withers** (2009) A review of observed variability in the dayside ionosphere of Mars, *Advances in Space Research*, 44, 277-307
- Paetzold, Tellmann, Haeusler, Bird, Tyler, Christou and **Withers** (2009) A sporadic layer in the Venus lower ionosphere of meteoric origin, *Geophysical Research Letters*, 36, L05203, doi:10.1029/2008GL035875
- **Withers**, Mendillo, Hinson, and Cahoy (2008) Physical characteristics and occurrence rates of meteoric plasma layers detected in the martian ionosphere by the Mars Global Surveyor Radio Science Experiment, *Journal of Geophysical Research*, 113, A12314, doi:10.1029/2008JA013636
- Johnson, Amend, Steele, Bougher, Rafkin, **Withers**, Plescia, Hamilton, Tripathi, and Heldmann (2008) Mars science goals, objectives, investigations, and priorities: 2008, Report from the NASA Mars Exploration Program Analysis Group (MEPAG)
- **Withers** (2008) Theoretical models of ionospheric electrodynamics and plasma transport, *Journal of Geophysical Research*, 113, A07301, doi:10.1029/2007JA012918
- Colombatti, **Withers**, Ferri, Aboudan, Ball, Bettanini, Gaborit, Harri, Hathi, Leese, Makinen, Stoppato, Towner, Zarnecki, Angrilli, and Fulchignoni (2008) Reconstruction of the trajectory of the Huygens probe using the Huygens Atmospheric Structure Instrument (HASI), *Planetary and Space Science*, 56, 586-600
- Mendillo and **Withers** (2008) Solar flare effects upon the ionospheres of Earth and Mars, in "Radio Sounding and Plasma Physics" (eds. Song, Foster, Mendillo, and Bilitza), *American Institute of Physics Conference Proceedings*, 974, 58-70
- Christou, Vaubaillon, and **Withers** (2008) The P/Halley stream: meteor showers on Earth, Venus, and Mars, *Earth, Moon, and Planets*, 102, 125-131
- Crosby, Bothmer, Facius, Griessmeier, Moussas, Panasyuk, Romanova, and **Withers** (2008) Interplanetary space weather and its planetary connection, *Space Weather*, 6, S01003, doi:10.1029/2007SW000361
- Christou, Vaubaillon, and **Withers** (2007) The dust trail complex of comet 79P/du Toit-Hartley and meteor outbursts at Mars, *Astronomy and Astrophysics*, 471, 321-329
- **Withers** (2007) A technique to determine the mean molecular mass of a planetary atmosphere using pressure and temperature measurements made by an entry probe: Demonstration using Huygens data, *Planetary and Space Science*, 55, 1959-1963

- Montabone, Lewis, Read, and **Withers** (2006) Reconstructing the weather on Mars at the time of the MERs and Beagle 2 landings, *Geophysical Research Letters*, 33, L19202, doi:10.1029/2006GL026565
- **Withers** and Smith (2006) Atmospheric entry profiles from the Mars Exploration Rovers Spirit and Opportunity, *Icarus*, 185, 133-142, doi:10.1016/j.icarus.2006.06.013
- Mendillo, **Withers**, Hinson, Rishbeth, and Reinisch (2006) Effects of solar flares on the ionosphere of Mars, *Science*, 311, 1135-1138
- Bougher, Bell, Murphy, Lopez-Valverde, and **Withers** (2006) Polar warming in the Mars thermosphere: Seasonal variations owing to changing insolation and dust distributions, *Geophysical Research Letters*, 33, L02203, doi:10.1029/2005GL024059
- **Withers** (2006) Mars Global Surveyor and Mars Odyssey Accelerometer observations of the martian upper atmosphere during aerobraking, *Geophysical Research Letters*, 33, L02201, doi:10.1029/2005GL024447
- Fulchignoni and 42 colleagues, including **Withers** (2005) In situ measurements of the physical characteristics of Titan's environment, *Nature*, 438, 785-791, doi:10.1038/nature04314
- **Withers** and Mendillo (2005) Response of peak electron densities in the martian ionosphere to day-to-day changes in solar flux due to solar rotation, *Planetary and Space Science*, 53, 1401-1418, doi:10.1016/j.pss.2005.07.010
- **Withers** (2005) What is a planet?, *Eos*, 86(36), 326, doi:10.1029/2005EO360004
- **Withers**, Mendillo, Rishbeth, Hinson, and Arkani-Hamed (2005) Ionospheric characteristics above martian crustal magnetic anomalies, *Geophysical Research Letters*, 32, L16204, doi:10.1029/2005GL023483
- Mendillo and **Withers** (2004) CEDAR workshop report on session CA1: Comparative aeronomy on Earth and Mars, *CEDAR Post*, 49 (Fall 2004), 4-5
- Farrell and 11 colleagues, including **Withers** (2004) Report from the Mars Human Precursor Science Steering Group Atmosphere Focus Team. Incorporated into: Beaty et al. (2005) An analysis of the precursor measurements of Mars needed to reduce the risk of the first human mission to Mars, MEPAG report posted online in June 2005
- **Withers** (2004) Should we believe atmospheric temperatures measured by entry accelerometers travelling at “slow” near-sonic speeds?, in *Proceedings of the Second International Planetary Probe Workshop*, NASA Ames Research Center, California, 23-27 August 2004, NASA/CP-2004-213456, p. 13-20
- **Withers**, Towner, Hathi, and Zarnecki (2004) Review of the trajectory and atmospheric structure reconstruction for Mars Pathfinder, in *Proceedings of the International Workshop Planetary Atmospheric Entry and Descent Trajectory Analysis and Science*, 6-9 October 2003, Lisbon, Portugal. Edited by A. Wilson, ESA SP-544, 163-174
- **Withers**, Bougher, and Keating (2003) The effects of topographically-controlled thermal tides in the martian upper atmosphere as seen by the MGS Accelerometer, *Icarus*, 164, 14-32
- **Withers**, Towner, Hathi, and Zarnecki (2003) Analysis of entry accelerometer data: A case study of Mars Pathfinder, *Planetary and Space Science*, 51, 541-561
- Grier and 28 colleagues, including **Withers** (2002) Defining long term goals and setting priorities for education and public outreach, in “The future of solar system exploration, 2003-2013” (ed. Sykes), *Astronomical Society of the Pacific Conference Series*, 272, 393-411

- **Withers**, Lorenz, and Neumann (2002) Comparison of Viking Lander descent data and MOLA topography reveals kilometer-scale error in Mars atmosphere profiles, *Icarus*, 159, 259-261
- Nockolds and **Withers** (2002) Comment and reply on “Meteor storm evidence against the recent formation of lunar crater Giordano Bruno” by Paul Withers, *Meteoritics and Planetary Science*, 37, 465-466
- **Withers** and Neumann (2001) Enigmatic northern plains of Mars, *Nature*, 410, 651
- **Withers** (2001) Meteor storm evidence against the recent formation of lunar crater Giordano Bruno, *Meteoritics and Planetary Science*, 36, 525 – 529
- **Withers** (2001) Atmospheric structure reconstruction using the Beagle 2 accelerometer, Technical report delivered to the Open University, Great Britain
- Lorenz, Lunine, **Withers**, and McKay (2001) Titan, Mars and Earth: Entropy production by latitudinal heat transport, *Geophysical Research Letters*, 28, 415 – 418

### **Manuscripts in preparation**

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- **Withers** and Barnes - Predictions concerning the formation of planetary satellites
- Lillis, Brain, Fillingim, England, Safaeinili and **Withers** - Total electron content in the Mars ionosphere: Temporal studies and dependence on solar EUV flux
- **Withers** and Catling - Scientific results of the Phoenix Atmospheric Structure Experiment
- Mendillo, Lollo, **Withers**, Matta, Paetzold and Tellmann - Modeling Mars’ ionosphere with constraints from same-day, multi-point observations
- **Withers**, Pratt, Russo, Bertaux and Montmessin - Observations of thermal tides in the atmosphere of Mars by the SPICAM instrument
- **Withers**, Russo, Pratt, Bertaux and Montmessin - Comparison of observations of the mesopause and lower thermosphere of Mars by the SPICAM instrument and aerobraking accelerometers to theoretical predictions
- **Withers** - Empirical predictions of martian surface pressure in support of the landing of Mars Science Laboratory

## Conference and Meeting Presentations

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### Martian Ionosphere

- **Withers** and Matta (2010) Recent results from Boston University, Workshop on coordinated upper atmospheric research at Mars, Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, 25-26 January 2010
- Dhillon, Rosenqvist, Opgenoorth, **Withers**, Brain and Lester (2009) Studies of martian ionospheric conductivities undertaken using Mars Global Surveyor and Mars Express data, Fall AGU meeting, Abstract #P23A-1242
- Opgenoorth, Rosenqvist, Dhillon, Lester, **Withers** and Brain (2009) Ionospheric conductivities at planets and planet-like bodies without internal magnetic field, Fall AGU meeting, Abstract #P11B-1225
- **Withers** (2008) Simulations of the effects of extreme solar flares on technological systems at Mars, meeting of the Living With a Star Targeted Research and Technology Focus Team on “Extreme space weather events in the solar system”, San Francisco, CA, 13 December 2009
- **Withers**, Lollo, Mendillo, Paetzold and Tellmann (2009) Comparisons and simulations of same-day observations of the ionosphere of Mars by radio occultation experiments on Mars Global Surveyor and Mars Express, DPS meeting, Abstract #54.08
- **Withers**, Espley, Lillis and Morgan (2009) The ionosphere of Mars: A community white paper for the planetary decadal survey, DPS meeting, Abstract #16.20
- Lollo, **Withers** and Mendillo (2009) Modeling Mars’ ionosphere with constraints from same-day, multi-point observations, VEX/MEX radio science team meeting, Port Townsend, WA, 27-28 August 2009
- **Withers** and Mendillo (2009) The effects of solar flares on planetary ionospheres, AOGS meeting, Abstract #PS14-A004, Singapore
- **Withers**, Espley, Lillis and Morgan (2009) The ionosphere of Mars and its importance for climate evolution, MEPAG meeting, Providence, RI, 29-30 July 2009.
- **Withers** (2009) Observations of metal ion layers across the solar system, NSF CEDAR Aeronomy Meeting, Sante Fe, NM, 28 June - 2 July 2009
- **Withers** (2009) Simulations of the effects of extreme solar flares on technological systems at Mars, meeting of the Living With a Star Targeted Research and Technology Focus Team on “Extreme space weather events in the solar system”, Melbourne, FL, 8 June 2009
- **Withers**, Christou, Mendillo, Paetzold, Peter, Tellmann and Vaubaillon (2009) Observations of the effects of meteors on the ionospheres of Venus, Earth and Mars, International Conference on Comparative Planetology: Venus-Earth-Mars, ESTEC, 11-15 May 2009
- Chamberlin, Lu, Sternovsky, **Withers** and Woods (2009) Using the Flare Irradiance Spectral Model (FISM) to study the response of the Earth, Mars and Moon to solar flares, EGU meeting, Abstract EGU2009-5970
- **Withers** (2009) Estimating uncertainties in measurements of atmospheric properties by radio occultations, VEX/MEX radio science team meeting, Cologne, 16-17 April 2009
- **Withers** (2008) Simulations of the effects of extreme solar flares on technological systems at Mars, meeting of the Living With a Star Targeted Research and Technology Focus Team on “Extreme space weather events in the solar system”, San Francisco, CA, 14 December 2008

- **Withers** (2008) Mars ionospheric research at Boston University, VEX/MEX radio science team meeting, Brussels, 15-16 September 2008
- **Withers**, Paetzold and Christou (2008) Meteor layers in the martian and venusian ionospheres: Their connection to meteor showers, Europlanet N3 4th Strategic Workshop on Meteor Studies, Cologne, September 2008
- Paetzold and **Withers** (2008) Plasma layers in the terrestrial, martian and venusian ionosphere: Their origins and physical characteristics, Europlanet N3 4th Strategic Workshop on Meteor Studies, Cologne, September 2008
- Christou, Griffiths, McAuliffe, Koschny, Paetzold, Oberst, Trigo-Rodriguez, Vaubaillon, **Withers**, Chappelow and Patel (2008) A multi-instrument ExoMars study of meteoroid effects on the martian environment, European Planetary Science Congress, Abstract EPSC2008-A-00196
- Paetzold, Tellmann, Peter, Mendillo, **Withers**, Haeusler, Hinson, and Tyler (2008) The structure of the Mars ionosphere, European Planetary Science Congress, Abstract EPSC2008-A-00348
- Paetzold, Tellmann, Peter, Mendillo, **Withers**, Haeusler, Hinson, and Tyler (2008) The structure of the Mars ionosphere, 37th COSPAR meeting, Montreal, Abstract C32-0010-08
- **Withers** (2008) Variability of the ionosphere of Mars, 37th COSPAR meeting, Montreal, Abstract C32-0011-08
- Mendillo, Niehof, Garcia, Prested, McGregor, Viall, Moore, **Withers**, Martinis, and Stephan (2008) Can Equatorial Spread-F occur on other planets? 12th International Symposium on Equatorial Aeronomy, 18-24 May 2008, Crete, Greece
- Paetzold, Tellmann, Peter, Mendillo, **Withers**, Haeusler, Hinson, and Tyler (2008) The structure of the Mars ionosphere, EGU meeting, Abstract EGU2008-A-06804
- Christou, Vaubaillon and **Withers** (2008) Present and future observations of a meteor shower in the martian atmosphere, UK National Astronomy Meeting, Abstract P15/112
- **Withers**, Mendillo, Hinson, and Cahoy (2008) Morphology of meteoric plasma layers in the ionosphere of Mars as observed by the Mars Global Surveyor Radio Science Experiment, EGU meeting, Abstract EGU2008-A-02893
- Paetzold, **Withers**, Tellmann, Mendillo, Peter, Haeusler, Hinson, and Tyler (2007) The structure of the Mars ionosphere, Fall AGU meeting, Abstract #P32A-01
- **Withers** (2007) New theoretical tools for studying ionospheric electrodynamics, Fall AGU meeting, Abstract #SA51A-0237
- Paetzold, Tellmann, Peter, Haeusler, Hinson, Tyler, Mendillo, and **Withers** (2007) The structure of the ionosphere of Mars as observed by the Mars Express Radio Science Experiment, European Mars Science and Exploration Conference: Mars Express and ExoMars, November 12-16, 2007, ESA-ESTEC, Noordwijk, The Netherlands, Abstract #1120009
- Christou, Griffiths, McAuliffe, Koschny, Paetzold, Oberst, Trigo-Rodriguez, Vaubaillon, **Withers** and Chappelow (2007) A multi-instrument ExoMars study of meteoroid effects on the martian environment, European Mars Science and Exploration Conference: Mars Express and ExoMars, November 12-16, 2007, ESA-ESTEC, Noordwijk, The Netherlands, Abstract #1119183

- **Withers**, Mendillo, Paetzold, Tellmann, Christou, and Vaubaillon (2007) Comparison of ionospheric observations and dynamical predictions of meteor showers at Mars, DPS meeting, Abstract #59.08
- Christou, Vaubaillon, and **Withers** (2007) Annual and outburst meteor activity in the atmospheres of Venus and Mars, Meteoroids 2007, June 11-15, 2007, Barcelona, Spain
- Mendillo and **Withers** (2007) Simultaneous radio sounding of the ionospheres of Earth and Mars during a solar flare, Symposium in honor of Professor Bodo Reinisch's 70th birthday, University of Massachusetts - Lowell, 29 April 2007
- **Withers**, Wroten, Mendillo, and Chamberlin (2007) Simulations of the Mars ionosphere during a solar flare, Spring AGU, Abstract SA31B-05
- **Withers**, Wroten, Mendillo, Chamberlin, and Woods (2007) Modeling the effects of solar flares on the ionosphere of Mars, EGU meeting, Abstract EGU2007-A-05089
- **Withers**, Paetzold, Mendillo, Tellmann, Haeusler, Hinson, and Tyler (2007) New observations of the topside ionosphere at Mars, EGU meeting, Abstract EGU2007-A-09435
- Paetzold, **Withers**, Tellmann, Mendillo, Haeusler, Hinson, and Tyler (2007) Correlation between third layer formation in the Martian ionosphere and meteor streams at Mars, EGU meeting, Abstract EGU2007-A-09454
- **Withers**, Mendillo, and Hinson (2006) Space weather effects on the Mars ionosphere due to solar flares and meteors, European Planetary Science Congress, Berlin, 18-22 September
- **Withers** (2006) Comparative aeronomy at Earth and Mars (Final CEDAR Postdoc Report), NSF CEDAR Aeronomy Meeting, Sante Fe, NM, 19 June - 23 June
- Mendillo and **Withers** (2006) Effects of solar flares on Earth and Mars, Spring AGU meeting, Abstract U52A-02
- **Withers**, Mendillo, and Rishbeth (2006) Ionospheric disturbances at Mars: Implications for radio propagation, EGU meeting, Abstract EGU06-A-02444
- **Withers**, Mendillo, Wroten, Rishbeth, Hinson, and Reinisch (2005) Observations of the effects of solar flares on Earth and Mars, Fall AGU meeting, Abstract SA53B-1165
- **Withers**, Mendillo, Rishbeth, Hinson, and Arkani-Hamed (2005) Ionospheric characteristics above martian crustal magnetic anomalies, DPS meeting, Abstract #33.02
- Schoendorf, Siebert, Mendillo, **Withers**, and Wilson (2005) A new model of the solar wind interaction with the Mars ionosphere, Spring AGU meeting, Abstract #P21F-06
- **Withers** and Mendillo (2005) The response of an ionosphere to changes in the solar F10.7 flux: Comparison of Venus, Earth, and Mars, Spring AGU meeting, Abstract SA41A-03
- Schoendorf, Mendillo, **Withers**, and Wilson (2004) A new model of the solar wind interaction with Mars, DPS meeting, Abstract #37.03
- **Withers**, Mendillo, and Hinson (2004) The martian ionosphere in regions of crustal magnetic fields, DPS meeting, Abstract #26.09
- Mendillo and **Withers** (2004) Mars ionospheric studies using the MGS Radio Science Experiment, 35th COSPAR Scientific Assembly, Abstract #COSPAR04-A-02002
- Mendillo, **Withers**, and MIRI Team (2004) Approaches to a Mars international reference ionosphere, 35th COSPAR Scientific Assembly, Abstract #COSPAR04-A-02072

- **Withers** (2004) The influence of solar variability on the ionospheres of Earth and Mars (Interim CEDAR Postdoc Report), NSF CEDAR Aeronomy Meeting, Sante Fe, NM, 27 June - 2 July
- **Withers** (2004) Getting your hands on Mars data and some sample science (2004) Withers, NSF CEDAR Aeronomy Meeting, Sante Fe, NM, 27 June - 2 July. Talk at Comparative Aeronomy on Earth and Mars workshop.
- **Withers** and Mendillo (2004) Testing simple parameterizations for the basic characteristics of the martian ionosphere, Spring AGU meeting, Abstract #SA24A-05
- **Withers**, Martinis, Moore, Wilson, Wroten, and Mendillo (2004) Theoretical simulations of the martian ionosphere and comparisons to observations, Spring AGU meeting, Abstract SA14A-04

#### Martian Upper Atmosphere

- **Withers**, Bertaux, Montmessin, Pratt and Russo (2009) Observations of tides and temperatures in the martian atmosphere by Mars Express SPICAM stellar occultations, EGU meeting, Abstract EGU2009-5355
- **Withers** and Matta (2009) Research at Boston University on the upper atmosphere of Mars, Workshop on coordinated upper atmospheric research at Mars, ESTEC, 17-19 March 2009
- **Withers** (2008) New data products from the Mars Odyssey Accelerometer: Report on scientific implications, data processing, validation and archiving, Third International Workshop on the Mars Atmosphere: Modeling and Observations, Williamsburg, VA, 10-13 November 2008, Abstract #9035
- **Withers**, Bendersky, Keller, and Murphy (2008) Upper atmospheric density profiles from the Mars Odyssey Accelerometer: Report on data processing, archiving plans, and scientific analysis, DPS meeting, Abstract #14.07
- **Withers** (2006) Analysis of Accelerometer data from aerobraking, Mars Odyssey Project Science Group Meeting, 14 - 17 November, 2006, Mauni Lani hotel, Big Island, Hawaii
- **Withers**, Murphy, Gueth, Bougher, and Mendillo (2006) Mars Odyssey Accelerometer results, DPS meeting, Abstract #73.03
- **Withers** (2006) Determination of upper atmospheric properties on Mars and other bodies using satellite drag/aerobraking measurements, European Planetary Science Congress (invited presentation), Berlin, 18-22 September
- Bougher, Keating, and **Withers** (2004) Mars aerobraking data and its interpretation with applications to future Mars missions, 35th COSPAR Scientific Assembly, Abstract #COSPAR04-A-00358
- **Withers**, Bougher, and Keating (2003) Identification of topographically-controlled thermal tidal modes in the martian upper atmosphere, 6th International Mars Conference, July 20 - 25, Pasadena, CA, Abstract #3069
- Bougher, Engel, and **Withers** (2003) The NCAR Mars Thermospheric General Circulation Model: A review, Mars atmosphere modelling and observations workshop, Granada, Spain, January 13-15, 2003
- **Withers**, Bougher, and Keating (2002) Winds in the martian upper atmosphere from MGS aerobraking density profiles, Fall AGU meeting, Abstract #P61C-0353

- **Withers**, Bougher, and Keating (2002) Measurements of winds in the martian upper atmosphere from the MGS Accelerometer, DPS meeting, Abstract #5.05
- **Withers**, Bougher, and Keating (2002) MGS Accelerometer-derived profiles of upper atmospheric pressures and temperatures: Similarities, differences, and winds, Spring AGU meeting, Abstract #P41A-10
- Bougher, Keating, Forbes, Murphy, Hollingsworth, Wilson, and **Withers** (2001) The upper atmospheric wave structure of Mars as determined by Mars Global Surveyor, Fall AGU meeting, Abstract #P32E-12
- **Withers**, Bougher, and Keating (2001) Unpredictable day-to-day variability in the martian upper atmosphere, DPS meeting, Abstract #19.29
- **Withers**, Bougher, and Keating (2001) Harmonic analysis of zonal density structures in martian upper atmosphere, Spring AGU meeting, Abstract #P41A-05
- **Withers** and Bougher (2001) Understanding the martian upper atmosphere with the MGS Accelerometer, 4th Lunar and Planetary Laboratory internal conference
- Keating, Tolson, Wilson, Dwyer, Bougher, **Withers**, and Forbes (2001) Persistent planetary-scale wave-2 and wave-3 density variations observed in Mars upper atmosphere from MGS accelerometer experiment, 26th EGS General Assembly, Session #PS2.02
- Keating, Dwyer, Wilson, Tolson, Bougher, **Withers**, Forbes (2000) Evidence of large global diurnal Kelvin wave in Mars upper atmosphere, DPS meeting, Abstract #50.02
- Bougher, **Withers**, Murphy, Roble, and Keating (2000) Longitude structure in the Mars upper atmosphere : Characterization and model simulations (Solicited Key Note Paper), 33rd COSPAR Scientific Assembly, Abstract #C3.2-0011
- **Withers**, Bougher, and Keating (2000) New results from the Mars Global Surveyor Accelerometer, LPSC, Abstract #1268
- **Withers**, Bougher and Keating (1999) The martian upper atmosphere during phase 2 of Mars Global Surveyor aerobraking: comparison to predictions, Fifth International Conference on Mars, Abstract #6073
- **Withers** and Bougher (1999) The Martian upper atmosphere as revealed by Mars Global Surveyor's aerobraking, 2nd Lunar and Planetary Laboratory internal conference

#### Venus

- Paetzold, Haeusler, Tellmann, Bird, Hinson, Tyler and **Withers** (2009) The ionospheres of Venus and Mars - A comparison of Venus Express and Mars Express observations, DPS meeting, Abstract #48.04
- Mueller-Wodarg, Bruinsma, Forbes, Yelle, Keating, **Withers**, and Lopez-Valverde (2008) The structure of Venus' upper atmosphere and forthcoming measurements by the Venus Express Atmospheric Drag Experiment, 37th COSPAR meeting, Montreal, Abstract C33-0023-08
- Keating, Mueller-Wodarg, Forbes, Yelle, Bruinsma, **Withers**, Lopez-Valverde, Theriot and Bougher (2008) Future drag measurements from Venus Express, 37th COSPAR meeting, Montreal, Abstract C33-0024-08

### Atmospheric Structure Profiles from Planetary Entry Probes

- **Withers** and Catling (2009) Preliminary reconstruction of martian atmospheric structure from Phoenix entry measurements, Fall AGU meeting, Abstract #P54B-08
- **Withers** (2009) A simple method for supporting future landers by predicting surface pressure on Mars, AOGS meeting, Abstract #PS08-A021, Singapore
- Tellmann, **Withers**, Paetzold, Haeusler, Tyler and Hinson (2009) The polar atmosphere as seen by the radio science experiment MaRS on Mars Express, Third International Workshop on Mars Polar Energy Balance and the CO<sub>2</sub> Cycle, Abstract #7024, Seattle, WA, 21-24 July 2009
- **Withers** and Tellmann (2009) Simplifying the martian carbon dioxide cycle: An empirical method for predicting surface pressure, Third International Workshop on Mars Polar Energy Balance and the CO<sub>2</sub> Cycle, Abstract #7009, Seattle, WA, 21-24 July 2009
- **Withers** (2009) MEX surface pressure measurements, VEX/MEX radio science team meeting, Cologne, 16-17 April 2009
- **Withers**, Barnes, Justus, Justh, Kass, Montabone and Rafkin (2008) Comparison of atmospheric observations and predictions for the atmospheric entries of Spirit and Opportunity, LPSC, Abstract #2175
- Ball, Mueller-Wodarg, Lewis, Zarnecki, Hathi, Leese, Towner, Ferri, Colombatti, Fulchignoni, and **Withers** (2006) Huygens Atmospheric Structure Instrument entry accelerometer: Application to Mars and Venus, 4th International Planetary Probe Workshop, June 27 - 30, Pasadena, CA
- **Withers** (2005) Atmospheric profiles from Spirit and Opportunity, Spring AGU meeting, Abstract P24A-02
- Montabone, Lewis, Read, and **Withers** (2005) The weather on Mars at the time of MERs and Beagle 2 landing, European Geosciences Union Meeting, Abstract EGU05-A-09628
- **Withers** (2004) Should we believe atmospheric temperatures measured by entry accelerometers travelling at “slow” near-sonic speeds?, 2nd International Planetary Probe Workshop, August 23 - 27, NASA Ames
- **Withers**, Towner, Hathi, and Zarnecki (2003) Review of the trajectory and atmospheric structure reconstruction for Mars Pathfinder, International Workshop on Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science, Lisbon, Portugal, October 6 - 9, 2003
- **Withers** (2003) Scientific uses of crude telemetry during Mars atmospheric entry, DPS meeting, Abstract #14.24
- **Withers**, Zarnecki, Towner, and Hathi (2002) Trajectory reconstruction for Beagle 2, 6th Huygens Descent Trajectory Working Group Meeting, Pasadena, CA
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