VITA

Robert M. Winglee

Personal Biographical Data:

Birthplace and date:	Sydney, Australia (Permanent Resident of USA); 10 May 1958
Education:	Ph. D., University of Sydney, 1984
	B. Sc. (Hons.), University of Sydney, 1980

Present Positions:

7/05—present:	Chair, Department of Earth and Space Sciences, University of Washington
1/04—present:	Director, Research Institute for Space Exploration, University of Washington
9/00—present:	Professor, Dept. of Earth and Space Sciences (formerly Geophysics Program), University of Washington
7/00—present:	Adjunct Professor, Department of Aeronautics and Astronautics, University of Washington
12/99—present:	Adjunct Professor, Department of Astronomy, University of Washington
5/93—present:	Adjunct Professor, Department of Physics, University of Washington

Past Positions:

9/96-9/00:	Associate Professor, Geophysics Program, University of Washington
12/91-9/96:	Assistant Professor, Geophysics Program, University of Washington
5/91-12/91:	Professional Scientist, Department of Space Sciences, Southwest Research Institute
12/89-4/91:	Senior Research Associate, Department of Astrophysical, Planetary and Atmospheric Sciences, University of Colorado at Boulder
3/88-4/91:	Lecturer, Department of Astrophysical, Planetary and Atmospheric Sciences, University of Colorado at Boulder
10/86-12/89:	Research Associate, Department of Astrophysical, Planetary and Atmospheric Sciences, University of Colorado at Boulder
8/85-10/86:	Assistant Research Geophysicist, Institute of Geophysics and Planetary Physics University of California, Los Angeles
2/84-8/85:	Post-doctoral Fellow, Department of Astrophysical, Planetary and Atmospheric Sciences, University of Colorado at Boulder

Professional Societies:

American Geophysical Union
American Institute of Aeronautics and Astronautics

Other Professional Activities

Associate Director for the Washington NASA Space Grant Consortium, 1999 to present
Associate Chair, Department of Earth and Space Sciences, Univ. of Washington, 2001-2005
Editor for Geophysical Research Letters, 1997 to 2000
Associate Editor for Geophysical Research Letters, 1995 to 1997
Science Leader for UW undergraduate team for the 2001 Human Exploration and Development of Space: University Partners (HEDS-UP) Design Competition

Awards

DISCOVER Magazine Awards for Technological Innovation, sponsored by the Christopher Columbus Fellowship Foundation, Aerospace category, 2001.

Invited Outreach Presentations

Discovery Channel, "Science of Star Wars," 2005.
Cascadia Con, North American Science Fiction Convention, 2005
Science Fiction Museum and Hall of Fame, "Space Exploration: Envisioning the Future," Seattle, 2005.

Fields of Interest:

Prof. Winglee has extensive experience in space plasma physics and engineering, particularly in relation to the space environments around the planets and advanced space propulsion systems. Significant areas of research include the generation of auroral kilometric radiation, heating of ionospheric ions in the auroral zone, the active injection of beams from spacecraft, reconnection in the magnetotail and magnetopause, ionospheric ion outflows, and planetary magnetospheres. Particle and fluid simulations have been used extensively to quantitatively determine mechanisms for ion and electron heating and acceleration and the characteristics of the induced currents and wave emissions. The research also utilizes comparative studies with satellite data, including Dynamics Explorer I, Solar Maximum Mission. Recent research has utilized data from Wind, Polar and IMAGE spacecraft in conjunction with global multi-fluid modeling to investigate the specific roles the solar wind and ionospheric sources in the mass loading of the magnetosphere. More recently, applications to Mars and the icy Moons of Jupiter using Mars Global Surveyor and Galileo data have provide new insight into the space environments of these weakly magnetized systems. Dr. Winglee has also been the editor of three conference proceedings and has published or submitted for publication more than 100 papers. He was the Space Physics and Aeronomy Editor for *Geophysical Research Letters* between 1997 and 2000. He is lead investigator on the development of new plasma propulsion systems for spacecraft that has received international attention including M2P2 and Magbeam.

Ph. D.'s Supervised

M. E. McKean, (APAS)*Influence of Wave-Particle Interactions on Solar Flare Dynamics*, Univ. of Colorado, 1990.
Z. Zhu (Geophysics), Particle Kinetic Effects on the Dynamics of the Earth's Magnetotail, Univ. of Washington, 1994.
R. K. Elsen (Geophysics), Global Modeling of the Average Response of the Magnetosphere to Varying Solar Wind Conditions, Univ. of Washington, 1996.

A. Goodson (Physics), Jet Launching Mechanisms from Young Stellar Objects, Univ. of Washington, 1998

M. Wilber (Physics), Plasma Transport Across the Earth's Magnetopause, Univ. of Washington, 1998.

S. Matt (Astronomy), The influence of poloidal magnetic field on astrophysical outflows, Univ. of Washington, 2002.

E. Harnett (Geophysics), Mini-magnetospheres at the Moon and on Mars, Univ. of Washington, 2003.

T. Ziemba (Aeronautics and Astronautics), Mini-Magnetospheric Plasma Propulsion, Univ. of Washington, 2003.

L. Giersch (Aeronautics and Astronautics), Experimental investigation of plasma sail propulsion concepts using cascaded arcs and rotating magnetic field current drive, Univ. of Washington, 2005.

C. Paty (Earth and Space Sciences), Ganymede's magnetosphere: Unraveling the Ganymede-Jupiter interaction through combining multi-fluid simulations and observations, Univ. of Washington, 2006.

Masters Supervised

Q. Li (Geophysics), Anomalous plasma observed near the plasma sheet during substorm growth phase, Univ. of Washington, 1999

D. Collins (Physics), Generating energetic particle populations in the Earth's magnetosphere, Univ. of Washington, 2001.

Current Graduate Students

D. Snowden (Earth and Space Sciences)

J. Prager (Physics)

B. Race Roberson (Earth and Space Sciences)

A. Kidder (Earth and Space Sciences)

Undergraduate Students Mentored in Research

J. Hughes, K. Princehouse. L. Winstrom, B. Warrick, M. Bentz, E. Suthers, H. Cummings, J. Cascarden, L. Rachmeler, M. Nivala, T. Schnackenberg, S. Isley, A. Stickle, E. Bell, J. Trescott, G. Quetin, D. Peters, J. Duncan, J. Porter

National and International Committees:

NASA Small-Class Explorer Mission Peer Review, January, 1989

NASA Solar Physics Peer Review, September, 1991

Allocation Committee, San Diego Supercomputing Center, 1992-4

Program Committee, Yosemite Conference on Solar System Plasma Physics: Resolution of Processes in Space and Time, 1993.

NASA Compton Gamma Ray Observatory Guest Investigator Peer Review, May, 1993.

Meta-Allocation Committee, NSF Supercomputing Centers, 1994.

International Space Physics Educational Consortium, 1994-to present.

NASA Space Physics Theory Program Peer Review, November, 1995.

NASA Ionospheric Program Peer Review, November, 1996.

Chair, Organizing Committee for the *6th International Conference on Substorms*, March 24-29, 2002.
Technical Committee for the *Space Technology and Applications International Forum 2002* on magnetic and plasma sails, Feb. 2002.
NASA Technology Working Group for the development of mini-magnetospheric plasma propulsion, 2001.
NASA Technology Assessment Group for the development of plasma sails, 2002.
American Institute of Physics Publication Committee, 2003-2007.
NSF Global Environment Modeling, Program Committee, 2004-6.
AGU James B. Macelwane Medal Committee, 2004-2006.
NSF Space Weather Panel Review, 2006.
NSF GEM Post-Doc Panel Review 2006.

Departmental Committees:

Admissions Committee, 1992, 1993
Building Committee, Chair 2003
Computing Administrator, 2002
Computing Committee, 1993, 1999, 2002-04
Curriculum Committee, 1996, 1997; Chair 1998, 2000, 2001, 2002
Executive Committee, 2001-05.
Geophysics/Geology Interim Report Committee, Chair 2000
Johnston Scholarship Award Committee, Chair, 1994
Promotions Committee, 2001
Qualifying Committee, 1994, Chair, 1995
Recruitment Committee, 1993
Search Committee, 2001, 2002
Ad Hoc Committee on Research Faculty 2002

Courses Taught (Last 5 yrs):

Access to Space (ESS205) Spring 2003
Current Topics in Space Physics, (ESS595) Fall 2002, Spring 2003
Computational Plasma Physics (ESS579) Spring 2003
Kinetic Plasma Theory, (ESS578) Spring 2002, Spring 2004
Space and Plasmas, (ESS 415/515) Winter 2002, 2003
Space and Space Travel (ESS102) Fall 2002; Fall 2003;Winter 2004; Fall 2004; Winter 2005;

Proceedings Published

MAX '91 Workshop 2: Developments in Observations and Theory for Solar Cycle 22, edited by R. M. Winglee and B. R. Dennis, Laurel, Maryland, 8-9 June, 1989.

MAX '91 Workshop 3: Max '91/SMM Solar Flares : Observations and Theory, edited by R. M. Winglee and A. L. Kiplinger, Estes Park, Colorado, June 3-7, 1990.

Sixth International Conference on Substorms, edited by R. M. Winglee, University of Washington Press, ISBN: 0-9711740-3-2, 2002.

LIST OF PUBLISHED PAPERS: LAST 5 Yrs

Li, Q., R. M. Winglee, M. Wilber, L. Chen, and G. Parks, The Geopause in Relation to the Plasma Sheet and Low Latitude Boundary Layer: Comparison Between Wind Observations and Multi-Fluid Simulations, *J. Geophys. Res.,* **105**, 2563, 2000.

Winglee, R. M., Mapping of ionospheric outflows into the magnetosphere for varying IMF conditions, *J. Atmos., Solar Terrestrial Physics,* **62,** 527, 2000.

Winglee, R. M., J. Slough, T. Ziemba, and A. Goodson, Mini-magnetospheric plasma propulsion: High speed propulsion sailing the solar wind, *Space Techonology and Applications International Forum-2000,* edited by M. S. El-Genk, American Institute of Physics **CP504**, l-56396-9, p. 962, 2000.

Winglee, R. M., J. Slough, T. Ziemba, and A. Goodson, Mini-magnetospheric plasma propulsion: Tapping the energy of the solar wind for spacecraft propulsion, *J. Geophys. Res.,* **105**, 21,067, 2000.

Morgan, D., J. D. Menietti, R. M. Winglee, and H. Wong, Perpendicular electron heating by absorption or auroral kilometric radiation, *Planetary Space Sci.,* **48**, 41, 2000.

Harnett, E., and R. Winglee, Two-dimensional simulation of the solar wind interaction with magnetic field anomalies on the surface of the Moon, *J. Geophys. Res.,* 105 24,997, 2000.

Matt, S., B. Balick, R. Winglee and A. Goodson, Equatorially concentrated outflows from non-rotating magnetic stars, *Astrophys. J.,* **545,** 965, 2000.

Winglee, R. M., D. Chua, M. Brittnacher, and G. K. Parks, Ionospheric response to solar wind forcing during the September 24-25, 1998 magnetic cloud event, Space Weather, edited by P. Song, H. J. Singer, G. L. Siscoe, *Geophysical Monograph 125*, AGU p. 403, 2001.

Wilber, M., Q. Li, R. M. Winglee, G. K. Parks, M. McCarthy, and R. P. Lin, A new particle population near the high-latitude plasma sheet, *J. Geophys. Res.,* **106**, 29,669, 2001.

Winglee, R. M., T. Ziemba, J. Slough, P. Euripides, and D. Gallagher, Laboratory testing of the mini-magnetospheric plasma propulsion (M2P2) prototype, *Space Technology and Applications International Forum-2001*, edited by M. S. El-Genk, American Institute of Physics **CP552**, l-56396-980, p. 407, 2001.

Ziemba, T., R. M. Winglee, R. M. Winglee, and P. Euripides, Parameterization of the Laboratory Performance of the Mini-Magnetospheric Plasma Propulsion (M2P2) Prototype, *Proc. of 27th International Electric Propulsion Conference,* **IEPC-01-201**, 2001.

Winglee, R. M., T. Ziemba, P. Euripides and J. Slough, Computer Modeling of the Laboratory Testing of Mini-Magnetospheric Plasma Propulsion (M2P2), *Proc. of 27th International Electric Propulsion Conference Proceedings,* **IEPC-01-200,** 2001.

Winglee, R. M., T. Ziemba, P. Euripides, and J. Slough, Magnetic Inflation Produced by the Mini-Magnetospheric Plasma Propulsion Prototype, *Space Technology and Applications International Forum-2002,* edited by M. S. El-Genk, American Institute of Physics **CP608,** 433, 2002.

Matt, S., A. P. Goodson, R. M. Winglee, K.-H. Bőhm, Simulation-Based Investigation of a Model for the Interaction Between Stellar Magnetospheres and Circumstellar Accretion Disks, *Ap. J.,* **574,** 232, 2002.

Winglee, R. M., D. Chua, M. Brittnacher, G. K. Parks and G. Lu, Global impact of ionospheric outflows on the dynamics of the magnetosphere and cross-polar cap potential, *J. Geophys. Res.,* **107***,* 10.1029/2001JA000214, 2002.

Harnett, E. ,and R. M. Winglee, 2.5-D particle and MHD simulations of mini-magnetospheres at the Moon, *J. Geophys. Res.,* **107**, 10.1029/2002JA009241, 2002.

Winglee, R. M., Influence of Ionospheric Processes on Substorm Activity, *Proceedings of the 6th International Conference on Substorms,* edited by R. M. Winglee, Univ. of Washington Press, p. 404, 2002.

Winglee, R. M., Circulation of ionospheric and solar wind particle populations during extended southward IMF, *J. Geophys. Res.,* **108**, 10.1029/2002JA009819, 2003.

Harnett, E. M., and R. M. Winglee. 2.5D fluid simulations of the solar wind interacting with multiple dipoles on the surface of the Moon, *J. Geophys. Res.,* **108**, 10.1029/2002JA009617, 2003.

Harnett, E. M., and R. M. Winglee, 3D fluid simulations of the Martian magnetosphere, *Geophys. Res. Lett.*, **30**, 10.1029/2003GL017852, 2003.

Matt, S., R. M. Winglee, and K.-H. Bőhm, Collimation of a Central Wind by a Disc-Associated Magnetic Field, MNRAS, **345**, 660, 2003.

Ziemba, T., R. Winglee, P. Euripides, L. Giersch, and J. Slough, "Efficient plasma production in low background neutral pressures with the M2P2 prototype," *AIAA* paper No. 2003-5222, July, 2003.

Giersch, L., R. Winglee, T. Ziemba, P. Euripides, and J. Slough, "Magnetic dipole inflation with cascaded arc and applications for mini-magnetospheric plasma propulsion," *AIAA* paper No. 2003-5223, July, 2003.

Winglee, R. M., P. Euripides, T. Ziemba, J. Slough, and L. Giersch, "Simulation of mini-magnetospheric plasma production (M2P2) interacting with an external plasma wind," *AIAA* paper No. 2003-5224, July, 2003.

Paty, C., and R. M. Winglee, Multi-fluid simulations of Ganymede's magnetosphere, *Geophys. Res. Lett.*, **31**, L24806, doi:10.1029/2004GL021220, 2004.

Winglee, R. M., Influence of heavy ion outflows on tail reconnection and the auroral current system, *J. Geophys. Res*., **109,** A09206, doi:10:1029/2004JA010385, 2004.

Winglee, R. M., W. Lewis, and G. Lu, Mapping of the heavy ion outflows as seen by IMAGE and multi-fluid global modeling for the April 17, 2002 storm, *J. Geophys. Res*., **110**, A12S24, doi:10.1029/2004JA010909, 2005.

Harnett, E. M., and R. M. Winglee, 3D multi-fluid simulations of Pluto's magnetosphere – a comparison to 3D hybrid simulations, *Geophys. Res. Lett., **32,*** L19104, 2005GL023178, 2005.

Paty, C., and R. Winglee, The role of ion cyclotron motion at Ganymede: Magnetic field morphology and magnetospheric dynamics, *Geophys. Res. Lett.,* **33**, L10106, doi:10.1029/2005GL025273, 2006.

Ziemba, T., P. Euripides, J. Slough, R. Winglee, L. Giersch, J. Cascarden, T. Schnackenberg, S. Isley, Plasma characteristics of a high power helicon discharge, *Plasma Source Sci. Tech.*, **15**, 517, 2006.

Harnett, E. M., R. M. Winglee, and C. Paty, Multi-scale/multi-fluid simulations of the post plasmoid current sheet in the terrestrial magnetosphere, *Geophys. Res. Lett.,* **33**, L21110, doi:10.1029/2006GL027376, 2006.

Winglee, R., T. Ziemba, L. Giersch, J. Prager, J. Carscadden, and B. R. Roberson, Simulation and Laboratory Validation of Magnetic Nozzle Effects for High Power Helicon (HPH) Thruster, *Physics of Plasmas*, submitted, 2006.

Winglee, R. M., and E. Harnett, Radiation mitigation at the Moon by the Terrestrial Magnetosphere, *J. Geophys. Res.,* in preparation, 2007.

INVITED TALKS : LAST 5 YRS

Winglee, R. M, Advanced Spacecraft Propulsion, Astronomy Open House, University of Washington, April 20, 2002.

Winglee, R. M., Influence of ionospheric heavy ions on substorm and storm activity, 2002 Western Pacific Geophysics Meeting, Wellington, New Zealand, 9-12 July, 2002.

Winglee, R. M., Effects of hot particle populations on the pressure and dynamics of the magnetosphere, COSPAR, World Space Conference, Houston, Texas, 10-19 October, 2002.

Winglee, R. M., Multi-fluid/particle treatment of magnetospheric/ionospheric coupling during substorms and storms, GEM, Snowmass Village, June 23-27, 2003.

Winglee, R. M., Multi-fluid simulations of planetary magnetospheres, International Union of Geodesy and Geophysics, Sapporo, Japan, June 30 - July 11, 2003.

Winglee, R. M., Developments in Mini-Magnetospheric Plasma Propulsion, International Union of Geodesy and Geophysics, Sapporo, Japan, June 30 - July 11, 2003.

Winglee, R. M., Hot Topics#2: Human Space Exploration – Should we continue?, Geological Society of America, Nov. 2-5, 2003.

Winglee, R. M., Plasma Propulsion for Future Exploration; Sailing the Solar Winds and Beyond, 23rd International Space Development Conference, National Space Society, Oklahoma City, Oklahoma, May 27-31, 2004.

Winglee, R. M., Heavy ionospheric ion effects on reconnection in the magnetotail, Fall AGU, San Francisco, Dec. 13-17, 2004.

Winglee, R. M., Developments in Advanced Electric Propulsion, Celebration of Distinction, Univ. of Washington, May 2005.

Winglee, R. M., Heavy ion and ion cyclotron effects on reconnection in the Magnetotail, International Association of Geomagnetism and Aeronomy, Toulouse France, July 18-29,2005.

Winglee, R. M., T. Ziemba, J. Prager, B. R. Roberson, N. Stobie and J. Carscadden, High power helicon plasma propulsion using nonlinear helicon waves, National Radio Science Meeting, Boulder, Colorado, Jan. 4-7, 2006.

Winglee, R. M., Ion cyclotron and heavy ion effects on tail reconnection and substorm dynamics, Earth-Sun System Exploration: Energy Transfer, Kona, Hawaii, Jan. 16-20, 2006.

Paty, C. and, R. M. Winglee, Understanding the interaction between Ganymede's and Jupiter's magnetospheres through multi-fluid simulations and observations, European Geosciences Union, Vienna Austria, April 15-20, 2006.

R. M. Winglee and E. Harnett, Multi-scale/multi-fluid simulations of magnetic reconnection and flux ropes in the terrestrial magnetosphere, 8th International School on Space Simulations (ISSS-8), Lihue, Kauai, Feb. 26 – Mar. 2, 2007.

LIST OF CURRENT AND PENDING RESEARCH SUPPORT:

R. M. Winglee

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A. Current Support

1. NASA – Mars Fundamental: "Atmospheric forcing and losses at Mars due to Solar Wind Interactions", February 1, 2005 to January 1, 2007, $160,000, 0.25 MM summer to be performed at the Univ. of Washington.
2. NASA-STTR – "Electrode-Less Plasma Propulsion using a High Power Helicon Phase II", co-I, Univ. of Washington Component, May 16, 2005 to May 15, 2007 $135K, 0.5 MM summer to be performed at the Univ. of Washington.
3. NASA – Geosciences: "Energization of ionospheric and solar wind ions and their role in global magnetospheric dynamics using comparative multi-fluid simulations, February 1, 2005 to January 31, 2008, $240,988, 0.25 MM summer, to be performed at the Univ. of Washington.
4. NASA: Outer Planets: "Investigation of the plasma environment and magnetosphere of Ganymede", PI W. Paterson, co-I subcontract for 45K, 0.125 MM summer to be performed at the Univ. of Washington.
5. NSF/National Space Weather: "The role of the ion cyclotron effects on the tail and the global auroral currents during substorms", co-PI, $315,000 for 0.5 MM summer, for 3 yrs, to be performed at Univ. of Washington.
6. NASA/Cassini: "High Resolution Multi-Fluid Simulations and Cassini Data Comparisons of the Induced Magnetosphere at Titan",$161,800 for 0.5 MM summer, for 2 yrs, to be performed at Univ. of Washington.

B. Proposals Pending as PI or co-I

1. NASA: MMS: "Multi-Scale/Multi-fluid simulations of the terrestrial magnetosphere," $3.5M over 10 yrs, 0.5 MM summer initially, to be performed at Univ. of Washington.
2. NASA/Messenger: "Multi-Scale/Multi-Fluid Simulations of Mercury's Magnetosphere", $586,000 for 0.5 MM summer, for 6 yrs, to be performed at Univ. of Washington.
3. NASA/LWS: "Global modeling of the transport and magnetospheric energization of ionospheric outflows during storms" $330,000 0.5 MM summer, for 3 yrs to be performed at Univ. of Washington.
4. NSF/DOE: "Nonlinear dynamics of high power helicons", $436,000 0.5 MM summer, for 3 yrs to be performed at Univ. of Washington.
5. NSF/DOE: "Single Particle Trajectory Studies of Particle Acceleration/Transport Associated with Thin Magnetospheric Current Sheets Using Advanced GPU Technologies", $106,000 0.25 MM summer, for 3 yrs to be performed at Univ. of Washington.