

Eric W. Grashorn, Ph.D.

CONTACT INFORMATION

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Ohio State University
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RESEARCH EXPERIENCE

Ohio State University, *Post Doctoral Researcher* 2008 - Present
Antarctic Impulsive Transient Array (ANITA)

NASA funded balloon borne radio interferometer designed to detect cosmic neutrinos.

- Used C++ to develop model of RF transmission through rough surfaces at greater than the critical angle.
- Lead team to make first wideband measurement of radio emission from cosmic rays.
- Designed high-efficiency triggering system for broadband RF system.

Air-shower Molecular Bremsstrahlung Radiometer (AMBER)

Experiment using satellite television equipment to detect microwave emission from cosmic rays.

- Developed C++ simulation of microwave emission from cosmic ray airshowers.
- Deployed microwave reflector-feedhorn-amplifier system in the field.

Radio Extensive Airshower Simulation (REAS)

Simulation of radio emission from electromagnetic showers induced by cosmic rays.

- Extended existing simulation to cover wider geometry and frequency range.

Pierre Auger Observatory

Largest cosmic ray observatory in the world at 3,000 km², located in Mendoza, Argentina.

- Used maximum likelihood method to determine the mass of incoming cosmic rays.
- Measured proton-air cross section at higher energies than laboratory capabilities.

Dissertation Supervision

- Provided guidance and advised PhD students on the direction of their research.
- Reviewed and edited manuscripts of PhD students.

Conference Organization

Highest Energy Hadronic Interactions Workshop, *Ohio State University, April 8, 2010.*

Center for Cosmology and Astroparticle Physics Symposium, *Ohio State University, October 12-14, 2009*

- Secured grant funding to pay for attendee travel and accommodations.
- Facilitated presentations and conference discussions.

University of Minnesota, *Research Assistant* 2004 - 2008

Main Injector Neutrino Oscillation Search (MINOS)

Neutrino experiment with beam and near detector at Fermilab, far detector at Soudan, MN.

- Resolved problem of kaon production in cosmic ray induced nuclear cascades using statistical correlation of particle data with atmospheric temperature variations.
- Used statistical analysis to measure cosmic ray deficit to investigate interplanetary magnetic field.
- Performed statistical analysis to discover extragalactic neutrino production.

Ball State University, *Research Assistant* 2001 - 2003

- Developed method using calcium filters to perform wide-field red dwarf star surveys.
- Performed observations of red dwarf stars at Lowell Observatory, Flagstaff, AZ.

TEACHING EXPERIENCE	University of Minnesota, <i>Teaching Assistant</i> 2003 - 2007
	<ul style="list-style-type: none"> • Lead introductory algebra & calculus based Physics Labs. • Instructed recitation sessions and individualized tutoring.
	The Arts Place, <i>Guitar Instructor</i> 2002 - 2003
	<ul style="list-style-type: none"> • Instructed beginning through advanced students, from ages 5 - 50.
EDUCATION	University of Minnesota, Ph.D., Physics June 2008
	Dissertation Title: "Particle Astrophysics with the MINOS Far Detector" Advisers: Prof. Marvin L. Marshak, Prof. Alec T. Habig
	University of Minnesota, M.S., Physics August 2005
	Thesis Title: "Search for a Cosmic Ray Point Source with the MINOS Far Detector" Adviser: Prof. Alec T. Habig
	Ball State University, B.S., Physics June 2003
	Research Project: "Luminosity Classifications of Low-Mass Red Stars"
LEADERSHIP EXPERIENCE	University of Minnesota Council of Graduate Students 2007 - 2008
	<i>Vice President for Internal Relations</i>
	<ul style="list-style-type: none"> • Wrote official publications. • Organized Graduate School orientation.
	University of Minnesota Physics Grad Student Organization 2006 - 2008
	<i>Officer</i>
	<ul style="list-style-type: none"> • Organized mentoring program, social events.
AWARDS, AFFILIATIONS	R.D. and H.T. Miller Scholarship Ball State University 2002 American Physical Society; Divisions of Particles and Fields, Astrophysics
TECHNICAL EXPERTISE	<p>Computing: C/C++, ROOT, Matlab, Mathematica, Perl, Fortran, Make, Unix Scripts</p> <p>Analysis: Statistical analysis of large data sets, multivariate analysis</p> <p>Hardware: Microwave RF systems</p> <p>Simulations: Geant4, Corsika, REAS, NECREF</p> <p>Other: Unix/Linux, Windows, L^AT_EX, MS Excel, Word, Powerpoint</p> <p>Batch: PBS, condor</p>

Published 29 articles in leading peer-reviewed journals, demonstrated ability to choose problems of wide interest and ability to carry those projects to completion, contributing to a variety of fields.

Primary Authorship

“Observation in the MINOS far detector of the shadowing of cosmic rays by the sun and moon,” Adamson, P. *et al.*, The MINOS Collaboration, *Astropart. Phys.* **34**, 457-466. (2011)

“Observation of ultra-high-energy cosmic rays with the ANITA balloon-borne radio interferometer,” Hoover, S. *et al.*, The ANITA Collaboration, *Phys. Rev. Lett.* **105**, 151101. (2010)

“Observation of muon intensity variations by season with the MINOS Far Detector,” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **81** 012001. (2010)

“The atmospheric charged kaon/pion ratio using seasonal variation methods,” Grashorn, E. W. *et al.*, *Astropart. Phys.* **33** 140-145. (2010)

“Sudden stratospheric warmings seen in MINOS deep underground muon data,” Osprey, S. *et al.*, The MINOS Collaboration, *Geophys. Res. Lett.* **36** L05809. (2009)

Secondary Authorship

“The First Limits on the Ultra-high Energy Neutrino Fluence from Gamma-ray Bursts,” A. G. Vieregg *et al.*, The ANITA Collaboration, arXiv:1102.3206 [astro-ph.HE]. (2011)

“Observational constraints on the ultra-high energy cosmic neutrino flux from the second flight of the ANITA experiment,” Gorham, P. W. *et al.*, The ANITA Collaboration, *Phys. Rev. D* **82** 022004. (2010)

Collaboration Authorship

“The Pierre Auger Observatory scaler mode for the study of solar activity modulation of galactic cosmic rays.” Abreu, P. *et al.*, The Pierre Auger Observatory *Journal of Instrumentation*, **6** P01003. (2011)

“Search for First Harmonic Modulation in the Right Ascension Distribution of Cosmic Rays Detected at the Pierre Auger Observatory,” Abreu, P. *et al.*, The Pierre Auger Observatory, *Astropart. Phys.* **34** 627. (2011) [arXiv:1103.2721 [astro-ph.HE]].

“Ultra-relativistic magnetic monopole search with the ANITA-II balloon-borne radio interferometer,” Detrixhe, M. *et al.*, The ANITA Collaboration, arXiv:1008.1282 submitted to *Phys. Rev. D*. (2010)

“New constraints on muon-neutrino to electron-neutrino transitions in MINOS,” Adamson, P. *et al.*, The MINOS Collaboration, arXiv:1006.0996 Submitted to *Phys. Rev. D*. (2010)

“A Study of the effect of molecular and aerosol conditions in the atmosphere on air fluorescence measurements at the Pierre Auger Observatory,” Abraham, J. *et al.*, The Pierre Auger Observatory, *Astropart. Phys.* **33** 108-129. (2010)

“Measurement of the depth of maximum of extensive air showers above 10^{18} eV,”

Abraham, J. *et al.*, The Pierre Auger Observatory, *Phys. Rev. Lett.* **104** 091101. (2010)

“Measurement of the energy spectrum of cosmic rays above 10^{18} eV using the Pierre Auger Observatory,” Abraham, J. *et al.*, The Pierre Auger Observatory *Phys. Lett. B* **685** 239-246. (2010)

“Search for sterile neutrino mixing in the MINOS long baseline experiment,” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **81** 052004. (2010)

“Trigger and aperture of the surface detector array of the Pierre Auger Observatory,” Abraham, J. *et al.*, The Pierre Auger Observatory *Nucl. Instrum. Meth.* **A613** 29-39. (2010)

“Neutrino and antineutrino inclusive charged-current cross section Measurements with the MINOS Near Detector,” Adamson, P. *et al.*, The MINOS Collaboration, arXiv:0910.2201 [hep-ex]. (2010)

“Search for muon-neutrino to electron-neutrino transitions in MINOS,” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. Lett.* **103** 261802. (2009)

“The fluorescence detector of the Pierre Auger Observatory,” Abraham, J. A. *et al.*, The Pierre Auger Observatory *Nucl. Instrum. Meth.* **A620** 227-251. (2010)

“Search for active neutrino disappearance using neutral-current interactions in the MINOS long-baseline experiment” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. Lett.* **101** 221804. (2008)

“Testing lorentz invariance and CPT conservation with NuMI neutrinos in the MINOS near detector” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. Lett.* **101** 151601. (2008)

“The magnetized steel and scintillator calorimeters of the MINOS experiment” Michael, D.G. *et al.*, The MINOS Collaboration, *Nucl. Instr. & Meth.* **A596** 190-228. (2008)

“Measurement of neutrino oscillations with the MINOS detectors in the NuMI beam” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. Lett.* **101** 131802. (2008)

“Study of muon neutrino disappearance using the Fermilab Main Injector neutrino beam” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **77** 072002. (2008)

“Measurement of neutrino velocity with the MINOS detectors and NuMI neutrino beam” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev D* **76** 072005. (2007)

“Measurement of the atmospheric muon charge ratio at TeV energies with MINOS” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **76** 052003. (2007)

“Charge-separated atmospheric neutrino-induced muons in the MINOS far detector” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **75** 092003. (2007)

“Observation of muon neutrino disappearance with the MINOS detectors in the NuMI neutrino beam” Michael, D.G. *et al.*, The MINOS Collaboration, *Phys. Rev. Lett* **97** 191801. (2006)

“First observations of separated atmospheric muon neutrino and muon anti-neutrino events in the MINOS detector” Adamson, P. *et al.*, The MINOS Collaboration, *Phys. Rev. D* **73** 072002. (2006)

- CONFERENCE PUBLICATIONS
- “ANITA and the Highest Energy Cosmic Rays,” Grashorn, E.W., (For the ANITA Collaboration), Contributed to the XXIV International Conference on Neutrino Physics and Astrophysics (Neutrino 2010), Athens, Greece, June 14-19, 2010
 - “Astroparticle physics with the MINOS far detector” Grashorn, E.W., (For the MINOS Collaboration), Contributed to the 31st International Cosmic Ray Conference (ICRC 2009), Lodz, Poland, July 7-15, 2009
 - “MINOS observations of shadowing in the muon flux underground” Grashorn, E.W., (For the MINOS Collaboration), Contributed to the 31st International Cosmic Ray Conference (ICRC 2009), Lodz, Poland, July 7-15, 2009
 - “An overview of the ANITA experiment”, Grashorn, E.W., (For the ANITA Collaboration), Contributed to the 44th Recontres de Moriond, La Thuile, Italy, Feb 1-8, 2009
 - “An introduction to the AMBER experiment”, Grashorn, E.W., (For the AMBER Collaboration), Contributed to the 44th Recontres de Moriond, La Thuile, Italy, Feb 1-8, 2009
 - “MINOS observations of shadowing in the muon flux underground”, Grashorn, E.W., (For the MINOS Collaboration), Contributed to 30th International Cosmic Ray Conference (ICRC 2007), Merida, Yucatan, Mexico, July 3-11, 2007, hep-ex/07101616
 - “Observation of seasonal variations with the MINOS far detector”, Grashorn, E.W., (For the MINOS Collaboration), Contributed to 30th International Cosmic Ray Conference (ICRC 2007), Merida, Yucatan, Mexico, July 3-11, 2007, hep-ex/07101617
 - ”The MINOS Detectors”, Grashorn, E.W., (For the MINOS Collaboration) Contributed to the 29th International Cosmic Ray Conference (ICRC 2005), Pune, India, August 3-10, 2005, hep-ex/0507018
- RECENT PUBLIC PRESENTATIONS
- Represented collaborators at numerous international conferences, invited to discuss work at leading research institutions around the world.
- “Atmospheric Physics Underground: MINOS and Beyond,” Invited Seminar, Laboratori Nazionali del Gran Sasso, Italy, October 12, 2010
 - “The AMBER Cosmic Ray Detector: Update and Outlook”, The Seventh Air Fluorescence Workshop, Coimbra, Portugal, September 22-24, 2010
 - “ANITA and the Highest Energy Cosmic Rays,” XXIV International Conference on Neutrino Physics and Astrophysics (Neutrino 2010), Athens, Greece, June 14-19, 2010
 - “An Overview of the ANITA Experiment,” AAS High Energy Astrophysics Division, Kona, HI, USA, USA, March 1-4, 2010
 - “The Nature of Horizontally Polarized Events in ANITA 1: MC Simulations,” APS April Meeting, Washington, DC, USA, February 13-16, 2010
 - “An Overview of the ANITA Experiment” CCAPP Symposium, Columbus, OH, USA, October 12-14, 2009
 - “Astroparticle Physics with the MINOS Far Detector,” 31st International Cosmic Ray Conference (ICRC 2009), Lodz, Poland, July 7-15, 2009
 - “An Introduction to the AMBER Experiment”, Grashorn, E.W., (For the AMBER

Collaboration), poster at the 31st International Cosmic Ray Conference (ICRC 2009), Lodz, Poland, July 7-15, 2009

“MINOS Observations of Shadowing in the Muon Flux Underground” poster at the 31st International Cosmic Ray Conference (ICRC 2009), Lodz, Poland, July 7-15, 2009

“An Overview of the ANITA Experiment,” 44th Recontres de Moriond, La Thuile, Italy, February 1-8, 2009

“An Introduction to the AMBER Experiment”, poster at the 44th Recontres de Moriond, La Thuile, Italy, February 1-8, 2009

“Astroparticle Physics with the MINOS Far Detector” Final Oral Examination, University of Minnesota, Minneapolis, MN, USA June 16, 2008

“Cosmic Rays at MINOS: Physics in the Background” Cosmology Lunchtime Seminar, University of Minnesota, Minneapolis, MN, USA, April 14, 2008

“Cosmic Rays at MINOS: Physics in the Background” CCAPP Seminar, Ohio State University, Columbus OH, USA, March 3, 2008

“Cosmic Rays at MINOS: Physics in the Background” High Energy Seminar, University of Notre Dame, Notre Dame, IN, USA, February 26, 2008

“Observation of Seasonal Variations with the MINOS Far Detector”, 30th International Cosmic Ray Conference (ICRC 2007), Merida, Yucatan, Mexico, July 3-11, 2007

“MINOS Observations of Shadowing in the Muon Flux Underground”, poster at the 30th International Cosmic Ray Conference (ICRC 2007), Merida, Yucatan, Mexico, July 3-11, 2007

“Particle Astrophysics Potential with the MINOS Far Detector” Preliminary Oral Examination, University of Minnesota, Minneapolis, MN, USA, December 1, 2006

“A Cosmic Ray Source?” Thesis Presentation, University of Minnesota, Duluth, MN, USA August 16 2005.

“First Experiences with Beam Data in MINOS”, Grashorn, E.W., (For the MINOS Collaboration) poster the 29th International Cosmic Ray Conference (ICRC 2005), Pune, India, August 3-10, 2005

“The MINOS Detectors”, Grashorn, E.W., (For the MINOS Collaboration) poster the 29th International Cosmic Ray Conference (ICRC 2005), Pune, India, August 3-10, 2005

“Brief History of MINOS, Pt II” PHYS 1021, University of Minnesota, Duluth, December 2, 2004

“Brief History of MINOS, Pt I” PHYS 1021, University of Minnesota, Duluth, November 13, 2003

“Luminosity Classification of Low Mass Red Stars” Indiana Academy of Sciences Fall 2002 meeting, October 11, 2002