

# UNIVERSITY OF MARYLAND, BALTIMORE COUNTY

## ATMOSPHERIC PHYSICS GRADUATE PROGRAM

Baltimore, Maryland 21250

<http://physics.umbc.edu>

### General University Information

*President:* Freeman A. Hrabowski  
*Dean of Graduate School:* Janet C. Rutledge  
*University website:* <http://www.umbc.edu>  
*School Type:* Public  
*Setting:* Suburban  
*Total Faculty:* 838  
*Total Graduate Faculty:* 546  
*Total number of Students:* 13,767  
*Total number of Graduate Students:* 2,507

### Department Information

*Department Chair:* Prof. L. Michael Hayden, Chair  
*Department Contact:* Jennifer Salmi, Business Services Specialist  
*Total full-time faculty:* 22  
*Total number of full-time equivalent positions:* 22  
*Full-Time Graduate Students:* 16  
*Female Full-Time Graduate Students:* 6  
*First-Year Graduate Students:* 5  
*Female First-Year Students:* 2  
*Total Post Doctorates:* 5

### Department Address

1000 Hilltop Circle  
Physics Building, Room 220  
Baltimore, MD 21250  
*Phone:* (410) 455-2513  
*Fax:* (410) 455-1072  
*E-mail:* [jen.salmi@umbc.edu](mailto:jen.salmi@umbc.edu)  
*Website:* <http://physics.umbc.edu>

### ADMISSIONS

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#### Admission Contact Information

*Address admission inquiries to:* Dr. Matthew Pelton, Graduate Admissions Coordinator, Department of Physics  
*Phone:* (410) 455-2513  
*E-mail:* [mpelton@umbc.edu](mailto:mpelton@umbc.edu)  
*Admissions website:* <http://physics.umbc.edu>

#### Application deadlines

Fall admission:  
*U.S. students:* January 1      *Int'l. students:* January 1  
Spring admission:  
*U.S. students:* April 15      *Int'l. students:* April 15

#### Application fee

*U.S. students:* \$50      *Int'l. students:* \$50

#### Admissions information

For Fall of 2019:  
*Number of applicants:* 12  
*Number admitted:* 6  
*Number enrolled:* 5

#### Admission requirements

*Bachelor's degree requirements:* Bachelor's degree in Physics, Atmospheric Sciences, Chemistry, Math, Engineering, or related field is required.  
*Minimum undergraduate GPA:* 3.0

#### GRE requirements

The GRE is required.

#### GRE Physics requirements

The GRE Physics is not required.

#### TOEFL requirements

The TOEFL exam is required for students from non-English-speaking countries.  
Minimum accepted TOEFL scores:  
*PBT score:* 550  
*iBT score:* 80

#### Other admissions information

*Additional requirements:* Letters of recommendation, undergraduate transcripts, personal statement.  
*Undergraduate preparation assumed:* Young and Freedman, University Physics; Reif, Thermal Physics; Marion, Newtonian Dynamics; Tipler and Llewellyn, Introduction to Modern Physics; Griffiths, Introduction to Electrodynamics.

### TUITION AND ASSISTANTSHIPS

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#### Teaching Assistants, Research Assistants, and Fellowships

Number of first-year  
*Teaching Assistants:* 3  
*Research Assistants:* 1  
*Fellowship students:* 1  
Average stipend per academic year  
*Teaching Assistant:* \$26,000  
*Research Assistant:* \$29,000  
*Fellowship student:* \$31,000

#### Tuition year 2019–20:

Tuition for in-state residents  
*Full-time students:* \$659 per credit  
Tuition for out-of-state residents  
*Full-time students:* \$1,132 per credit  
*Credit hours per semester to be considered full-time:* 9  
*Deferred tuition plan:* No  
*Health insurance:* Available  
*Other academic fees:* \$140/credit.  
*Academic term:* Semester  
*Number of first-year students who received full tuition waivers:* 5

### FINANCIAL AID

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#### Application deadlines

Fall admission:  
*U.S. students:* April 15      *Int'l. students:* April 15

#### Loans

Loans are available for U.S. students.  
Loans are available for international students.  
*GAPSFAS application required:* No  
*FAFSA application required:* No

#### For further information

*Address financial aid inquiries to:* Dr. Matthew Pelton, Graduate Admissions Coordinator, Department, of Physics.  
*Phone:* (410)-455-2513  
*E-mail:* [mpelton@umbc.edu](mailto:mpelton@umbc.edu)  
*Financial aid website:* <http://www.umbc.edu/financialaid/>

**HOUSING**

**Availability of on-campus housing**

Single students: Yes  
 Married students: No

**For further information**

Address housing inquiries to: Office of Residential Life.  
 Housing aid website: <http://www.umbc.edu/reslife/>

**Table A—Faculty, Enrollments, and Degrees Granted**

Research Specialty	2017–18 Faculty	Enrollment Fall 2018		Number of Degrees Granted 2017–18 (2013–18)		
		Mas-ter's	Doc-torate	Mas-ter's	Terminal Master's	Doc-torate
<b>Atmospheric Physics</b>	5	–	16	2(10)	2(9)	2(8)
<b>Total</b>	5	–	16	2(10)	2(9)	2(8)
<b>Full-time Grad. Stud.</b>	–	–	16	–	–	–
<b>First-year Grad. Stud.</b>	–	–	5	–	–	–

**GRADUATE DEGREE REQUIREMENTS**

**Master's:** The M.S. degree is designed to prepare the graduate for immediate entry into the workforce as a practicing professional or as an entry into a doctoral program. This degree program is designed to offer students maximum flexibility, with many of the course requirements being electives. The minimum requirement for the master's degree is a total of 30 credit hours, of which 18 credit hours must be taken at the 600 level or higher. Students are encouraged to choose the thesis option, although a non-thesis option is available. All students must pass two ATPH core courses: PHYS 621: Atmospheric Physics I and PHYS 622: Atmospheric Physics II with a minimum grade of "B-". Additional 600-level or higher credits may be specialized ATPH courses or general physics courses. The specialized ATPH courses include PHYS 721: Radiative Transfer and PHYS 731 Atmospheric Dynamics, PHYS 722: Remote Sensing of the Earth's Atmosphere; PHYS 627 Atmospheric Measurement; PHYS 732: Computational Fluid Dynamics; and PHYS 741: Inverse Methods and Data Analysis. The general physics courses include courses in the areas of Electromagnetism; Statistical Mechanics; Classical Mechanics; Quantum Mechanics; Mathematical Physics; Computational Physics and Optics. In addition, all students also are required to take PHYS 698: Physics Seminar for two semesters. In addition to the master's core curriculum, students selecting the thesis option must complete a further six credit hours of course work approved by a faculty advisor and six credit hours of PHYS 799: Master's Thesis Research. Approval of the graduate program director is required if the thesis research is not performed under the direction of a faculty member within the UMBC physics department. Students selecting the non-thesis option must complete a further 12 credit hours of lecture course work approved by a faculty advisor, write a scholarly paper as part of an elective course and pass a written comprehensive examination. At least six of these additional 12 credits will be courses offered by the physics department, unless approved by the graduate program advisor in advance. The Qualifying Examination for ATPH students will be offered twice a year, one in late August and the other in January. The Qualifying Examination includes a written and an oral component and is designed to evaluate the student's level of knowledge in the areas taught in the first year of the ATPH physics program as well as the student's abilities to perform research.

**Doctorate:** The minimum requirement for the Ph.D. is 46 credit hours, with a minimum of 27 credit hours of lecture courses at the 600-level or higher and 12 credit hours of doctoral research (PHYS 899). The graduate program director must approve all coursework. All students must pass two ATPH core courses: PHYS 621: Atmospheric Physics I and PHYS 622: Atmospheric Physics II with a minimum grade of "B-". All students must also take the PHYS 640: Computational Physics. Additional 600-level or higher credits may be specialized ATPH courses or general physics courses. The specialized ATPH courses include PHYS 721: Radiative Transfer and PHYS 731 Atmospheric Dynamics, PHYS 722: Remote Sensing of the Earth's Atmosphere; PHYS 627 Atmospheric Measurement; PHYS 732: Computational Fluid Dynamics; and PHYS 741: Inverse Methods and Data Analysis. The general physics courses include courses in the areas of Electromagnetism; Statistical Mechanics; Classical Mechanics; Quantum Mechanics; Mathematical Physics and Optics. In addition, all students also are required to take PHYS 698: Physics Seminar for three semesters; PHYS 690: Professional Techniques in Physics; and a minimum of 18 credit hours of PHYS 899: Doctoral Thesis Research. To be admitted to candidacy for the doctoral degree, students first must complete the Ph.D. core curriculum (PHYS621 & PHYS622) with a minimum grade of "B-" and then pass the ATPH qualifying examination. The qualifying examination for ATPH students will be offered twice a year, one in late August and the other in January. The examination includes a written and an oral component and is designed to evaluate the student's level of knowledge in the areas taught in the first year of the ATPH physics program as well as the student's abilities to perform research. Students must pass the entire qualifying examination by the beginning of their 4th semester. Students who fail to do so will not be admitted to candidacy for the Ph.D. degree. A prospective doctoral student must select a faculty advisor to supervise the dissertation research. Usually dissertation research is performed under the direction of a tenure-track faculty member of the UMBC department of physics. After selecting an advisor, students should begin acquiring the necessary background knowledge and skills to conduct research and develop a research plan. By the beginning of the 3rd year, a prospective doctoral student, in consultation with their advisor, should form a preliminary committee consisting of the advisor and two other faculty members from the UMBC Department of Physics. At least two of the members of this committee must be tenure-track faculty. The preliminary committee is charged with determining whether the student should be admitted to candidacy for the doctoral degree. A recommendation to this effect must be made to the full physics faculty by the start of the 4th year. The full faculty then will vote whether to recommend to the Graduate School that the student be admitted to candidacy for the doctoral degree. Immediately after it has been formed, the preliminary committee will meet with the student to discuss the proposed research project and progress to date. The committee will inform the student of any actions he or she must perform satisfactorily for the committee to make a positive recommendation to the faculty. In formulating its recommendation, the committee may gather and consider any relevant information concerning the student's potential for performing research at the doctoral level. This information should include, but is not limited to, the student's overall graduate record, a written research proposal and an oral presentation of the proposed research project. After admission to candidacy and completion of the research, the student will be required to write and defend a dissertation before a committee constituted in accordance with Graduate School regulations. This research should be of a quality suitable for publication in a refereed physics journal.

The chair of this committee must be a regular member of the graduate faculty and a tenure-track faculty member in the Department of Physics.

**Thesis:** Thesis may be written in absentia.

**SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS**

There are close relationships between UMBC and several other research institutions in the Baltimore-Washington area. Formal cooperative agreements are in place between the UMBC and NASA Goddard Space Flight Center (GSFC) in the form of the Joint Center for Earth Systems and Technology (JCET) <http://jcet.umbc.edu>, the Center for Research and Exploration in Space Science and Technology (CRESST) <http://cresst.umd.edu/>, and the Goddard Planetary Heliophysics Institute (GPHI) <http://gphi.umbc.edu>. UMBC also hosts the Center for Advanced Studies in Photonics Research (CASPR) <http://www.umbc.edu/caspr/>.

**Table B—Separately Budgeted Research Expenditures by Source of Support**

Source of Support	Departmental Research	Physics-related Research Outside Department
<b>Federal government</b>	\$4,333,329	
<b>State/local government</b>		
<b>Non-profit organizations</b>		
<b>Business and industry</b>		
<b>Other</b>		
<b>Total</b>	\$4,333,329	

**Table C—Separately Budgeted Research Expenditures by Research Specialty**

Research Specialty	No. of Grants	Expenditures (\$)
<b>Atmospheric Physics</b>	17	\$4,333,329
<b>Total</b>	17	\$4,333,329

**FACULTY**

**Professor**

- Demoz**, Belay, Ph.D., University of Nevada-Reno, 1992. *Climate/Atmospheric Science*. Atmospheric Physics and Chemistry, Meteorological Observations.
- Franson**, James D., Ph.D., California Institute of Technology, 1977. Quantum optics and quantum computing.
- Gougousi**, Theodosia, Ph.D., University of Pittsburg, 1996. Nanoscience, interfaces.
- Hayden**, L. Michael, Ph.D., University of California, Davis, 1987. Department Chair. Nonlinear optical properties of polymers; electro-optic techniques; photonic devices.
- Johnson**, Anthony, Ph.D., City College of New York, 1981. *Optics*. Ultra-fast optical and optoelectronic phenomena.
- Martins**, Vanderlei J., Ph.D., University of Sao Paulo, 1999. Aerosol and Cloud Physics; radiative transfer; optics, satellite remote sensing; instrumentation development for laboratory, field, aircraft, and satellite measurements.
- Pittman**, Thomas, Ph.D., University of Maryland, Baltimore County, 1996. Graduate Program Director – Physics. Quantum optics and quantum computing.
- Rous**, Philip, Ph.D., Imperial College of Science and Technology, University of London, 1986. Provost and Senior Vice President for Academic Affairs. *Condensed Matter Physics*.
- Shih**, Yanhua, Ph.D., University of Maryland, 1987. Quantum optics; laser physics; nonlinear optics.

**Turner**, T. Jane, Ph.D., University of Leicester, 1988. Extragalactic astrophysics; x-ray astronomy.

**Associate Professor**

- Georganopoulos**, Markos, Ph.D., University of Thessaloniki, 1989. Broad-band synchrotron emission from relativistic flows in active galaxies, galactic microquasars and gamma-ray bursts.
- George**, Ian M., Ph.D., University of Leicester, 1988. Director of the Center for Space Science and Technology. Astrophysics; x-ray astronomy.
- Henriksen**, Mark J., Ph.D., University of Maryland, 1986. Astrophysics; X-ray astronomy.
- Hoban**, Susan, Ph.D., University of Maryland, College Park, 1989. Scientific information systems; digital library technologies and information technologies for science, technology, engineering and mathematics (STEM) education.
- Kramer**, Ivan, Ph.D., University of California, Berkeley, 1967. Mathematical modeling.
- Sparling**, Lynn C., University of Texas, Austin, 1987. Atmospheric physics; modeling.
- Takacs**, Laszlo, Ph.D., Eotvos University, 1978. Director of UMBC Nano-Imaging Center, Chair of Graduate Admissions Committee. Amorphous and metastable crystalline alloys; energy-dispersive X-ray diffraction; magnetic susceptibility.
- Worchesky**, Terrance L., Ph.D., Georgetown University, 1984. Associate Departmental Chair Undergraduate Program Director. Optical properties of semiconductors; photonics.
- Zhang**, Zhibo, Ph.D., Texas A&M University, 2008. Graduate Program Director—Atmospheric Physics. *Climate/Atmospheric Science*. Satellite-based remote sensing; cloud and aerosol micro-physical and optical properties; radiative transfer; aerosol-cloud-precipitation-radiation interactions; atmospheric physics.

**Assistant Professor**

- Ataca**, Can, Ph.D., Bilkent University, National Nanotechnology Research Center, 2011. *Computational Physics, Condensed Matter Physics*.
- Deffner**, Sebastian, Ph.D., University of Augsburg, 2011. *Quantum Foundations, Theoretical Physics*. My research concerns all topics of Quantum Thermodynamics. As a theoretical physicist, I employ tools from Statistical Physics, Open Quantum Dynamics, Quantum Information Theory, Quantum Optics, Condensed Matter Theory and Optimal Control Theory to investigate the nonequilibrium properties of nanosystems operating far from thermal equilibrium.
- Kestner**, Jason, Ph.D., University of Michigan, 2009. Condensed matter theory, quantum information theory.
- Meyer**, Eileen, Ph.D., Rice University, 2012. *Astrophysics*.
- Pelton**, Matthew, Ph.D., Stanford University, 2002.
- Zhai**, Pengwang, Ph.D., Texa A&M University, 2006. *Climate/Atmospheric Science*. Light scattering; radiative transfer; remote sensing; aerosols and clouds.

**Emeritus**

- Hoff**, Raymond M., Ph.D., Simon Fraser University, 1975. Atmospheric physics; lidar, air quality, satellite remote sensing.
- Melfi**, Harvey, Ph.D., College of William and Mary, 1970. Atmospheric lidar; remote sensing.
- Rasera**, Robert L., Ph.D., Purdue University, 1965. Perturbed gamma-ray angular correlation spectroscopy.
- Reno**, Robert C., Ph.D., Brandeis University, 1970. Hyperfine interactions in solids; electron microscopy; neutron diffraction measurement.
- Rubin**, Morton H., Ph.D., Princeton University, 1964. Theoretical physics; quantum optics.

**Research Professor**

- Remer**, Lorraine A., Ph.D., University of California, Davis, 1991. *Climate/Atmospheric Science*. Aerosol and cloud remote sensing. Cloud-aerosol-precipitation-climate interactions.
- Strow**, L. Larrabee, Ph.D., University of Maryland, 1981. High-resolution infrared molecular spectroscopy; atmospheric radiative transfer.

**Research Associate Professor**

- Davis**, David, Ph.D., University of Maryland, College Park, 1994. Galaxy clusters, X-ray astronomy.
- Kundu**, Prasun, Ph.D., University of Rochester, 1981. Satellite and ground-based remote sensing.
- McCann**, Kevin J., Ph.D., Georgia Institute of Technology, 1974. Lidar and atmospheric aerosols.
- Olson**, William, Ph.D., University of Wisconsin-Madison, 1987. Remote sensing of precipitation.
- Varnai**, Tamas, Ph.D., McGill University, 1996. Cloud physics and radiation transfer.

**Research Assistant Professor**

- De Souza-Machado**, Sergio, Ph.D., University of Maryland, College Park, 1996. Infrared remote sensing, radiation transfer, spectroscopy, plasma physics.
- Johnson**, Benjamin, Ph.D., University of Wisconsin-Madison, 2007. *Climate/Atmospheric Science*. Precipitation cloud modeling, radiative transfer, and remote sensing.
- Yuan**, Tianle, Ph.D., University of Maryland College Park, 2008. *Climate/Atmospheric Science*. Aerosol-cloud-precipitation interactions; remote sensing.

**Lecturer**

- Anderson**, Eric, Ph.D., Arizona State University, 1993. Physics education.

**DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF**

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**Theoretical**

- air quality. study the impact of atmospheric pollutions, such as ozone, aerosols and smoke on air quality and public health. Demoz, Remer, Sparling.
- Atmospheric Physics. Atmospheric dynamics; hurricane; radiative transfer; aerosol-cloud-precipitation interactions; cloud physics; remote sensing. De Souza-Machado, Demoz, Hoff, Benjamin Johnson, Kundu, Martins, Melfi, Olson, Remer, Sparling, Strow, Varnai, Yuan, Zhai, Zhang.
- Climate Change/Global Warming. Study the physics underlying climate change and global warming. De Souza-Machado, Demoz, Hoban, Hoff, Martins, Remer, Sparling, Strow, Yuan, Zhai, Zhang.
- Light scattering and radiative transfer. Theoretical and experimental studies of Light singly or multiply scattered in a turbid medium, including the atmosphere-land and atmosphere-ocean systems. Martins, Zhai, Zhang.
- Remote Sensing. Satellite-based remote sensing of aerosol and cloud properties, ocean color, temperature and water vapor and trace gases. De Souza-Machado, Demoz, Martins, Strow, Varnai, Yuan, Zhai, Zhang.

**Experimental**

- Atmospheric Physics. Aerosol and cloud properties; atmospheric dynamics; remote sensing measurements; LIDAR; aerosol-cloud-precipitation interactions; air pollution; atmospheric radiative transfer; optics instrumentation. De Souza-Machado, Demoz, Hoff, Benjamin Johnson, Kundu, Martins, Remer, Sparling, Strow, Varnai, Yuan, Zhang.
- Remote Sensing Instrumentation. Develop in situ, airborne, ground-based and satellite-based instruments for observing atmosphere. Demoz, Hoff, Strow, Zhai, Zhang.

**View additional information about this department at [www.gradschoolshopper.com](http://www.gradschoolshopper.com). Check out the “Why Choose Us?” section, find out more about the department’s culture and get links to social media networks.**