

A Decadal Strategy for Solar and Space Physics (Heliophysics) - Panel on Atmosphere-Ionosphere- Magnetosphere Interactions

Committee

Jeffrey M. Forbes

Chair

JEFFREY M. FORBES is a professor and the Glenn Murphy Endowed Chair of the Department of Aerospace Engineering Sciences at the University of Colorado at Boulder. Dr. Forbes' research interests include the upper atmosphere environments of Earth, Mars, and other planets and the coupling of these environments to lower altitudes and to solar variability; geomagnetic storm effects on satellite drag variability; the vertical propagation of tides and planetary waves in planetary atmospheres and their electrodynamic and chemical effects; utilization of accelerometer, satellite drag, and satellite remote sensing data to elucidate atmospheric variability; and testing, validating and developing upper-atmosphere models. He also conducts numerical simulations of the above phenomena. Dr. Forbes also is the principal investigator of the Multidisciplinary University Research Initiative on Atmospheric Density Prediction of the Air Force Office of Scientific Research and the chair of the Academic Affairs Committee for the American Institute of Aeronautics and Astronautics (AIAA). He is a fellow of the American Geophysical Union and an associate fellow of the AIAA and received the 2010 AIAA Robert M. Losey Atmospheric Sciences Award. He received his Ph.D. in applied physics from Harvard University. Dr. Forbes has previously served on the following NRC committees: the Review of the Next Decadal Mars Architecture, the Committee on Solar-Terrestrial Research, and the Committee on Solar and Space Physics.

James H. Clemmons

Vice Chair

JAMES H. CLEMMONS is the principal director of the Space Science Applications Laboratory at the Aerospace Corporation. In his 13 years at Aerospace, Dr. Clemmons has led development of approximately 20 scientific instruments, flown on sounding rockets and satellites, to investigate a variety of phenomena in Earth's magnetosphere as well as its ionosphere-thermosphere-mesosphere system. He is the author of numerous publications, including studies of observations conducted with the Freja satellite and other missions characterizing electric, magnetic, and plasma phenomena in the space environment. Before joining Aerospace, he worked at NASA Goddard Space Flight Center, the Swedish Institute for Space Physics, and the Max-Planck-Institute for Extraterrestrial Physics on related research. He has participated in several NASA advisory groups and is the recipient of several awards by NASA and the Aerospace Corporation. Dr. Clemmons is a member of the American Geophysical Union, the American Physical Society, and the American Chemical Society. He was a Fulbright Scholar and a resident associate of the National Research Council. Dr. Clemmons received B.S. degrees in physics and chemistry from the University of Illinois, Urbana-Champaign, and an M.S. and Ph.D. in physics from the University of California, Berkeley. He has no prior NRC experience.

Odile de la Beaujardiere

Member

ODILE DE LA BEAUJARDIERE is the principal investigator of the Communication/Navigation Outage Forecasting System at the Air Force Research Laboratory's Space Vehicles Directorate. Previously, she was a member of the NSF Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) Science Steering Committee, and worked at SRI International.

John V. Evans

Member

JOHN V. EVANS (NAE) is a retired chief technical officer of COMSAT Corporation, a position he took after serving as president and director of COMSAT Laboratories, the largest research center devoted entirely to satellite communications research. Prior to joining COMSAT, Dr. Evans was assistant director of the Massachusetts Institute of Technology Lincoln Laboratory. His current technical interest lies in satellite communications technology, including both space and ground segments. Dr. Evans is the co-editor of Radar Astronomy and has published more than 100 papers on the topics of radar reflection and high-power radar studies of the upper atmosphere and ionosphere. He is a member of the International Astronomical Union, AGU, and the American Institute for Aeronautics and Astronautics. He is a fellow of the Institute of Electrical and Electronics Engineers, and a member of the National Academy of Engineering. In 1975 he was awarded the Appleton Prize by the Council of the Royal Society of London for his contributions to ionospheric physics. He earned his Ph.D. in physics from Manchester University.

Roderick A. Heelis

Member

RODERICK A. HEELIS is the Cecil and Ida Green Honors Professor of Physics and director of the William B. Hanson Center for Space Sciences at the University of Texas at Dallas. His research specialization covers planetary atmospheres, ionospheres, and magnetospheres, and the physical phenomena coupling these regions. Dr. Heelis has published more than 130 papers in the refereed literature and presented numerous invited papers at national and international meetings. He serves as principal investigator for grant and contract research sponsored by the Department of Defense and NSF. In addition to his research activities, Dr. Heelis also serves on a number of advisory committees and working groups, including being a member of the NASA Sun-Earth Connections Advisory subcommittee. Dr. Heelis graduated from the University of Sheffield with a Ph.D. in applied and computational mathematics.

Thomas J. Immel

Member

THOMAS J. IMMEL is an associate research physicist and senior fellow at the Space Sciences Laboratory at the University of California, Berkeley. His expertise lies in interpretation of remote-sensing data and modeling of physical processes in the upper atmosphere and ionosphere. Dr. Immel's work has included ultraviolet imaging observations from four NASA missions: Dynamics Explorer, Polar, Imager for Magnetopause-to-Aurora Global Exploration (IMAGE), and Thermosphere, Ionosphere Mesosphere Energetics and Dynamics (TIMED). He served on the NASA Heliophysics 2009 Roadmap Team, and is currently serving on the NSF-CEDAR Science Steering Committee and the NASA Geospace Mission Operations Working Group. Dr. Immel received his Ph.D. in Physics from the University of Alaska Fairbanks.

Janet U. Kozyra

Member

JANET U. KOZYRA is the George R. Carignan Collegiate Research Professor at the Space Physics Research Laboratory at the University of Michigan. She has also served as a summer faculty member at the Air Force Geophysics Laboratory at the Hanscom Air Force Base in Massachusetts. Dr. She is active in space plasma physics and aeronomy, concentrating on processes that couple the atmosphere and ionosphere with near-Earth space. Her research emphasis has been on development of theoretical models of geophysical regions and the comparison of model results with satellite observations. Dr. Kozyra was the first demonstrator of the importance of high-energy oxygen ions in producing stable auroral red arcs through collisions with thermal electrons at high altitudes. She is currently a co-investigator on the TIDE instrument onboard the POLAR spacecraft, and has also been selected as an interdisciplinary scientist on the proposed Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics (TIMED) mission. Dr. Kozyra is an elected fellow of the American Geophysical Union, (AGU), and is a former associate editor for the Journal of Geophysical Research and Geophysical Research Letters. She received her Ph.D. in space physics and aeronomy from the University of Michigan.

William Lotko

Member

WILLIAM LOTKO is a professor of engineering at the Thayer School of Engineering at Dartmouth College. He has also held the positions of interim dean and senior associate dean of the Thayer School. Before coming to Dartmouth, he was a research physicist at the Space Sciences Laboratory at University of California, Berkeley. Dr. Lotko is currently investigating and developing simulation models for ionospheric outflows into the magnetosphere, electron precipitation into the high-latitude ionosphere and thermosphere, plasma kinetics that enable superfluent ion outflows and electron precipitation, and the effects of all of these processes on global geospace dynamics. He is the principal investigator for Dartmouth's Heliophysics Theory Project sponsored by NASA, co-investigator for the NSF-sponsored Center for Integrated Space Weather Modeling, and team leader for one of NASA's Living With a Star projects that focuses on geospace dynamics during storms. He is the editor-in-chief of the Journal of Atmospheric and Solar-Terrestrial Physics and is an elected fellow of the AGU. He holds a Ph.D. in physics from the University of California, Los Angeles.

Gang Lu

Member

GANG LU is a senior scientist in the Terrestrial Impacts of Solar Output section of the High Altitude Observatory at the National Center for Atmospheric Research. Her primary research covers high-latitude ionospheric electrodynamics, solar wind-magnetosphere-ionosphere thermosphere coupling, and space weather. Dr. Lu serves as the scientific discipline representative to the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP). She is a member of NSF's Geospace Environment Modeling (GEM) Steering Committee and a member of the Auroral Plasma Physics Working Group at the International Space Science Institute. She is the associate editor for the Journal of Geophysical Research, was elected as the secretary for the aeronomy section of the AGU Space Physics and Aeronomy (SPA) section, and was awarded editor citation for excellence in refereeing for the Journal of Geophysics Research-Space Physics. Dr. Lu received her Ph.D. in space physics from Rice University.

Kristina A. Lynch

Member

KRISTINA A. LYNCH is an associate professor of Physics and Astronomy at Dartmouth College. Prior to arriving at Dartmouth, Dr. Lynch was a research assistant professor at the University of New Hampshire. Her research revolves around auroral space plasma physics, ionospheric and mesospheric sounding rocket experiments, instrumentation, and data analysis, and wave-particle interactions in the auroral ionosphere. She has a Ph.D. from the University of New Hampshire.

Jens Oberheide

Member

JENS OBERHEIDE is an associate professor of physics in the Department of Physics and Astronomy at Clemson University. Previously, he was an associate professor in atmospheric physics at the University of Wuppertal. Dr. Oberheide is a specialist in satellite data analysis and conducts empirical modeling of global-scale wave dynamics in Earth's upper atmosphere. His research interests include the dynamics of Earth's mesosphere-thermosphere-ionosphere system; the forcing and vertical propagation of tides, planetary waves, and gravity waves including their effects on chemistry and electrodynamics; geospace environment coupling to the atmosphere below and to solar activity; and utilization of satellite and ground-based remote sensing data to resolve variability and vertical coupling processes in the atmosphere. Dr. Oberheide is a recipient of the NASA Group Achievement Award to the TIMED team. He is an associate editor for the Journal of Geophysical Research-Atmospheres. He served on the NASA Senior Review panel of the 2009-2012 Mission Operations and Data Analysis Program for the Heliophysics Operating Missions. Currently, Dr. Oberheide serves on the Steering Committee of SCOSTEP's "Climate and Weather of the Sun-Earth System" program and leads one of its working groups, investigating the geospace response to variable waves from the lower atmosphere. He received his Ph.D. in physics from the University of Wuppertal.

Larry J. Paxton

Member

LARRY J. PAXTON is a staff scientist and head of the Atmospheric and Ionospheric Remote Sensing Group at the Johns Hopkins University Applied Physics Laboratory (APL). He is the co-principal investigator for the global ultraviolet imager on the NASA Thermosphere Ionosphere Mesosphere Energetics and Dynamics Mission (TIMED) and the principal investigator on the Defense Meteorological Satellites Program's (DMSP) special sensor ultraviolet spectrographic imager (SSUSI). His research focuses on the atmospheres and the ionospheres of the terrestrial planets, in particular the aeronomy of the Earth's upper atmosphere and the role of solar cycle and anthropogenic change in creating variability in the dynamics, energetics and composition of the upper atmosphere. Dr. Paxton was APL's chief scientist for the Ultraviolet and Visible Imagers and Spectrograph Imagers (UVISI) on the Midcourse Space Experiment (MSX). He has been involved in over more than a dozen satellite, shuttle and sounding rocket experiments. He has served on several NASA and NSF committees, panels, and working groups and currently chairs the International Academy of Astronautics Commission 4 on Space Systems Utilization and Operations. Dr. Paxton has published nearly 200 papers on planetary and space science, instruments, remote sensing techniques, and space mission design. He earned his Ph.D. in astrophysical, planetary, and atmospheric sciences from the University of Colorado at Boulder.

Robert F. Pfaff

Member

ROBERT F. PFAFF is a space scientist in the Laboratory for Extraterrestrial Physics at the NASA Goddard Space Flight Center. Prior to arriving at Goddard, he was a research support specialist at Cornell University's School of Electrical Engineering. He is the principal investigator for the Communications/Navigation Outage Forecasting System (C/NOFS) Vector Electric Field Instrument and co-investigator for the San Marco Satellite Electric Field Experiment, the Polar Electric Field Investigation, and the Cluster Electric Field Investigation. In addition to these projects, Dr. Pfaff is also either principal or co-investigator of numerous sounding rockets. He received his Ph.D. in physics from Cornell University.

Joshua Semeter

Member

JOSHUA SEMETER is an associate professor in the Department of Electrical and Computer Engineering, as well as the director of the Center for Space Physics at Boston University. He was previously a senior research engineer at SRI and a scientist at the Max Planck Institute for Extraterrestrial Physics. His research interests revolve around ionospheric and space plasma physics, spectroscopy of atmospheric airglow and the aurora borealis, image processing, and radar systems and radar signal processing. Dr. Semeter was associate editor of the Journal of Geophysical Research from 2004-2006. He won the 2009 Boston University Electrical and Computer Engineering Faculty Teaching Award and the 2006 NSF CAREER Award. Dr. Semeter graduated from Boston University with a Ph.D. in electrical engineering.

Jeffrey P. Thayer

Member

JEFFREY P. THAYER is an associate professor of remote sensing in Earth and space science in the Aerospace Engineering Sciences Department at the University of Colorado (CU). At CU, Dr. Thayer has led the design, manufacturing, and testing of lidar systems for lower and upper atmosphere research with deployments in remote locations, such as Greenland. He was director of the National Science Foundation (NSF) Sondrestrom Upper Atmosphere Research Facility in Greenland and performed experiments using incoherent scatter radar. His research interests include remote sensing instrumentation for atmospheric and space science, optical engineering for lidar system design and deployment, geophysical fluid dynamics, ionospheric electrodynamics and thermosphere dynamics and composition. Dr. Thayer is a recipient of the Stanford Research Institute (SRI) Presidential Achievement Award and the University of Michigan Alumni Merit Award. Dr. Thayer served as chair of the NSF Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) program for the past 3 years. He has also served on the NASA Geospace Mission and Operations Working Group, the NASA Sun-Earth Connections Roadmap Team, the NASA Science and Technology Definition Team for Solar-Terrestrial Probe Geospace Electrodynamics Connections Mission, and the NSF CEDAR Science Steering Committee. He earned his Ph.D. in atmospheric and space physics from the University of Michigan.