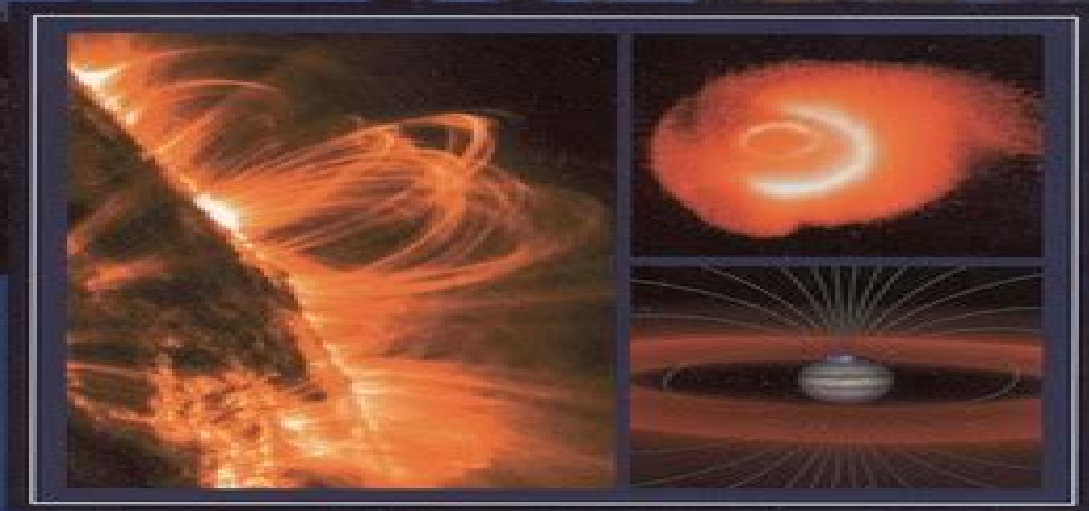


EXECUTIVE SUMMARY

The Sun to the Earth —and Beyond

*A Decadal Research Strategy in
Solar and Space Physics*



NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Sun To The Earth And Beyond A Decadal Research Strategy In Solar And Space Physics

M Lipman



Sun To The Earth And Beyond A Decadal Research Strategy In Solar And Space Physics:

The Sun to the Earth and Beyond National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Solar and Space Physics, Solar and Space Physics Survey Committee, 2003-12-17 This volume The Sun to the Earth and Beyond Panel Reports is a compilation of the reports from five National Research Council NRC panels convened as part of a survey in solar and space physics for the period 2003-2013 The NRC's Space Studies Board and its Committee on Solar and Space Physics organized the study Overall direction for the survey was provided by the Solar and Space Physics Survey Committee whose report The Sun to the Earth and Beyond A Decadal Research Strategy in Solar and Space Physics was delivered to the study sponsors in prepublication format in August 2002 The final version of that report was published in June 2003 The panel reports provide both a detailed rationale for the survey committee's recommendations and an expansive view of the numerous opportunities that exist for a robust program of exploration in solar and space physics

The Sun to the Earth--and Beyond National Research Council (U.S.), Solar and Space Physics Survey Committee Staff, 2002 The Sun to the Earth -- And Beyond National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Solar and Space Physics Survey Committee, 2003-07 The sun is the source of energy for life on earth and is the strongest modulator of the human physical environment In fact the Sun's influence extends throughout the solar system both through photons which provide heat light and ionization and through the continuous outflow of a magnetized supersonic ionized gas known as the solar wind While the accomplishments of the past decade have answered important questions about the physics of the Sun the interplanetary medium and the space environments of Earth and other solar system bodies they have also highlighted other questions some of which are long standing and fundamental The Sun to the Earth and Beyond organizes these questions in terms of five challenges that are expected to be the focus of scientific investigations in solar and space physics during the coming decade and beyond

Solar and Space Physics and Its Role in Space Exploration National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on the Assessment of the Role of Solar and Space Physics in NASA's Space Exploration Initiative, 2004-11-11 In February 2004 the President announced a new goal for NASA to use humans and robots together to explore the Moon Mars and beyond In response to this initiative NASA has adopted new exploration goals that depend in part on solar physics research These actions raised questions about how the research agenda recommended by the NRC in its 2002 report The Sun to the Earth and Beyond which did not reflect the new exploration goals would be affected As a result NASA requested the NRC to review the role solar and space physics should play in support of the new goals This report presents the results of that review It considers solar and space physics both as aspects of scientific exploration and in support of enabling future exploration of the solar system The report provides a series of recommendations about NASA's Sun Earth Connections program to enable it to meet both of those goals

The Sun to the Earth and Beyond

National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Solar and Space Physics, Solar and Space Physics Survey Committee, 2003-11-17 This volume The Sun to the Earth and Beyond Panel Reports is a compilation of the reports from five National Research Council NRC panels convened as part of a survey in solar and space physics for the period 2003-2013 The NRC's Space Studies Board and its Committee on Solar and Space Physics organized the study Overall direction for the survey was provided by the Solar and Space Physics Survey Committee whose report The Sun to the Earth and Beyond A Decadal Research Strategy in Solar and Space Physics was delivered to the study sponsors in prepublication format in August 2002 The final version of that report was published in June 2003 The panel reports provide both a detailed rationale for the survey committee's recommendations and an expansive view of the numerous opportunities that exist for a robust program of exploration in solar and space physics

A Performance Assessment of NASA's Heliophysics Program National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Heliophysics Performance Assessment, 2009-04-24 Since the 1990s the pace of discovery in the field of solar and space physics has accelerated largely owing to NASA investments in its Heliophysics Great Observatory fleet of spacecraft These enable researchers to investigate connections between events on the Sun and in the space environment by combining multiple points of view Recognizing the importance of observations of the Sun to Earth system the National Research Council produced a solar and space physics decadal survey in 2003 laying out the Integrated Research Strategy This strategy provided a prioritized list of flight missions plus theory and modeling programs that would advance the relevant physical theories incorporate those theories in models that describe a system of interactions between the Sun and the space environment obtain data on the system and analyze and test the adequacy of the theories and models Five years later this book measures NASA's progress toward the goals and priorities laid out in the 2003 study Unfortunately very little of the recommended priorities will be realized before 2013 Mission cost growth reordering of survey mission priorities and unrealized budget assumptions have delayed nearly all of the recommended NASA spacecraft missions The resulting loss of synergistic capabilities in space will constitute a serious impediment to future progress

Priorities in Space Science Enabled by Nuclear Power and Propulsion National Research Council, Division on Engineering and Physical Sciences, Aeronautics and Space Engineering Board, Space Studies Board, Committee on Priorities for Space Science Enabled by Nuclear Power and Propulsion, 2006-04-20 In 2003 NASA began an R D effort to develop nuclear power and propulsion systems for solar system exploration This activity renamed Project Prometheus in 2004 was initiated because of the inherent limitations in photovoltaic and chemical propulsion systems in reaching many solar system objectives To help determine appropriate missions for a nuclear power and propulsion capability NASA asked the NRC for an independent assessment of potentially highly meritorious missions that may be enabled if space nuclear systems became operational This report provides a series of space science objectives and missions that could be so enabled in the period beyond 2015 in the

areas of astronomy and astrophysics solar system exploration and solar and space physics It is based on but does not reprioritize the findings of previous NRC decadal surveys in those three areas Space Studies Board Annual Report 2009 National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, 2010-01-01 The Space Studies Board SSB was established in 1958 to serve as the focus of the interests and responsibilities in space research for the National Academies The SSB provides an independent authoritative forum for information and advice on all aspects of space science and applications and it serves as the focal point within the National Academies for activities on space research It oversees advisory studies and program assessments facilitates international research coordination and promotes communications on space science and science policy between the research community the federal government and the interested public The SSB also serves as the U S National Committee for the International Council for Science Committee on Space Research COSPAR The present volume reviews the organization activities and reports of the SSB for the year 2009

Review of the Draft 2014 Science Mission Directorate Science Plan Committee on the Assessment of the NASA Science Mission Directorate 2014 Science Plan, Space Studies Board, Division on Engineering and Physical Sciences, National Research Council, 2013-12-16 NASA's Science Mission Directorate SMD is engaged in the final stages of a comprehensive agency wide effort to develop a new strategic plan at a time when its budget is under considerable stress SMD's Science Plan serves to provide more detail on its four traditional science disciplines astronomy and astrophysics solar and space physics also called heliophysics planetary science and Earth remote sensing and related activities than is possible in the agency wide Strategic Plan Review of the Draft 2014 Science Mission Directorate Science Plan comments on the responsiveness of SMD's Science Plan to the National Research Council's guidance on key science issues and opportunities in recent NRC decadal reports This study focuses on attention to interdisciplinary aspects and overall scientific balance identification and exposition of important opportunities for partnerships as well as education and public outreach and integration of technology development with the science program The report provides detailed findings and recommendations relating to the draft Science Plan Issues and Opportunities Regarding the U.S. Space Program National Research Council, Division on Engineering and Physical Sciences, Aeronautics and Space Engineering Board, Space Studies Board, Pamela L. Whitney, Richard B. Leshner, Radford Byerly, Jr., 2004-03-02 Ever since the completion of the Apollo program there has been a lack of consensus about the future of human spaceflight The Columbia tragedy in February 2003 rekindled public debate about this question In November 2003 the Space Studies Board and the Aeronautics and Space Engineering Board organized a workshop to explore aspects of the question what should be the principal purpose goals and priorities of the U S civil space program This report presents a factual summary of that workshop which identified past lessons learned and guiding principles for the future of the civil space program Seven broad themes emerged from the workshop and these themes are highlighted in the report The report also presents discussions of strategies for the human spaceflight program and guiding

principles of and boundary conditions for a 21st century space policy

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