Name	Affiliation	Title	Description	AIM	SWM	SH	None	original filename (mostly)	new filename	
Ali, Nancy A.	University of California Berkeley, Space Sciences Laboratory	Recommendations for Education/Public Outreach (E/PO) Programs: A White Paper Submitted for Consideration to the NRC Decadal Survey in Solar and Space Physics	This white paper addresses the importance of Education/Public Outreach (E/PO) as a major contributing factor to workforce development in solar and space physics as well as in creating a scientifically literate American public.				x	AliNancyA.pdf	01AliNancyA.pdf	
Ayres, Thomas R.	University of Colorado	Ground-Based Solar Physics in the Era of Space Astronomy	This is a synopsis of a 2009 report commissioned by AURA in advance of the Astro2010 Decadal Survey. The report concerned the future of ground-based solar physics and many of its conclusions are pertinent to the new Heliophysics Decadal Survey.			x		AyresThomasR-SH.pdf	02AyresThomasR-SH.pdf	
Bach, Bernhard	University of Nevada, Reno	The use of a Z-pinch facility as a platform for laboratory solar physics	There are a number of Z-pinch facilities in operation around the world. These facilities create and investigate the physics of high-energy-density (HED) plasmas. The plasmas produced in these laboratories are in an energy density regime, which is relevant to a number of astrophysical environmen			x		BachBernhardW-SH.pdf	03BachBernhardW-SH.pdf	
Bailey, Scott, M	Virginia Tech	A MISSION TO STUDY THE COUPLING OF ATMOSPHERIC REGIONS BY PRECIPITATING ENERGETIC PARTICLES	A NASA mission to explore and understand the atmospheric response to energetic particles, specifically the coupling of atmospheric regions, as the particle energy is redistributed via dynamical, chemical, and radiative processes.	x				BaileyScottM-AIM.pdf	04BaileyScottM-AIM.pdf	
Baker, Joseph B. H.	Virginia Tech	The Importance of Distributed Measurements of the Ionospheric Electric Field for Advancement of Geospace System Science and Improved Space Weather Situational Awareness	The electric field is an important magnetosphere-ionosphere parameter because it drives currents and plasma motion. Networks of ionospheric radars are valuable to the space physics community for providing spatially distributed electric field measurements and should be further developed.	x	x			BakerJosephBH-AIM.pdf	05BakerJosephBH-AIM.pdf	
Bala, Ramkumar	Rice University	Space weather forecasting through participation	This white paper advocates for stronger community participation.				x	Ramkumar_Bala_decadalsurvey_whitepaper.pdf	06BalaRamkumar.pdf	
Balch, Christoper C.	NOAA/SWPC	The Next Step in Heliospheric Modeling - Increasing the Interplanetary Observing Network	Deployment of an enhanced interplanetary observing network, consisting of up to 1000 CubeSats, represents an opportunity to use known technologies and modeling techniques to make order 0f magnitude improvements in the accuracy of physics based models for the solar wind and interplanetary CMEs.			x		BalchChristopherC-SH.doc	07BalchChristopherC-SH.doc	
Bandler, Simon R.	NASA Goddard Space Flight Center	High Spectral Resolution, High Cadence, Imaging X-ray Microcalorimeters for Solar Physics	We describe a solar-optimized X-ray microcalorimeter, which provides high-resolution spectra at arcsecond scales to enable a wide range of studies such as the detection of microheating in active regions, ion-resolved velocity flows, and the presence of non-thermal electrons in hot plasmas.			x		BandlerSimonR-SH.pdf	08BandlerSimonR-SH.pdf	
Bellan, Paul M.	Caltech	Using Laboratory Experiments to Study Solar Corona Physics	Because of demonstrations that lab plasma experiments can simulate many essential properties of solar coronal loops, it is recommended that the next decade of heliospheric research include advanced laboratory plasma experiments designed to tackle specific, outstanding coronal issues.			x		BellanPaulM-SH.pdf	09BellanPaulM-SH.pdf	
Bernasconi, Pietro N.	Johns Hopkins University / Applied Physics Laboratory	Solar MAgnetized Regions Tomograph (SMART) Mission	We present a mission to to map the solar vector magnetic fields at high spatial resolution at several heights in the solar atmosphere from the photosphere to the chromosphere across the magnetic transition region.			x		BernasconiPietroN-SH.pdf	10BernasconiPietroN-SH.pdf	
Bhattacharjee, Amitava	University of New Hampshire	Advanced Computational Capabilities for Exploration in Heliophysical Science (ACCEHS) – a Virtual Space Mission	We recommend that NASA, perhaps in partnership with NSF and other agencies, should lead by establishing a new peer-reviewed program in which critical-mass groups of heliophysicists, computational scientists, and applied mathematicians can be brought together to address transformational science quest	x	x	x		ACCEHS-Decadal Survey.pdf	11BhattacharjeeAmitavaAIMSWMSH.pdf	
Bishop, Rebecca L.	The Aerospace Corporation	Understanding Tropospheric Influences on the Mesosphere/Thermosphere/Ionosphere Region	Observational evidence implies that the troposphere can couple electrically, dynamically, and chemically to the upper atmospheric regions. We present specific science goals and observational platforms required to perform investigations into tropospheric and thermospheric/ionospheric coupling.	x				BishopRebeccaL-AIM.pdf	12BishopRebeccaL-AIM.pdf	
Bishop, Rebecca L.	The Aerospace Corporation	The International Space Station: Platform for Future Upper Atmospheric Investigations	With the addition of the Japanese Experiment Module Exposed Facility on the Kibo module, the International Space Station can now be considered a viable experiment platform for upper atmospheric investigations. Potential investigations, sensors, and customers utilizing ISS facilities is presented.	x				BishopRebeccaL-AIM2.docx	13BishopRebeccaL-AIM2.doc	
Bookbinder, Jay	Smithsonian Astrophysical Observatory	The Solar Spectroscopy Explorer Mission	The Solar Spectroscopy Explorer (SSE) is a scalable concept, with two to four instruments, balanced between coronal spectroscopy and imaging. Its core configuration is a small strategic mission built around an X-ray microcalorimeter and a high spatial resolution EUV imager.			x		BookbinderJ-SH.pdf	14BookbinderJ-SH.pdf	
Bortnik, Jacob	UCLA	MMAP: A Magnetic-field mapping mission concept	We outline a novel mission whose aim is to observationally map the geomagnetic field from GEO to the ionosphere in near-real time, using the recently described link between pulsating aurora and chorus waves. The mission design is flexible, scalable, and readily achieved with existing technology.	x	x			BortnikJacob-SWM-AIM.pdf	15BortnikJacob-SWM-AIM.pdf	
Bortnik, Jacob	UCLA	The critical role of theory and modeling in the dynamic variability of the radiation belts and ring current	This white paper highlights the critical role that was played by theoretical and modeling projects in the preceding decade, and urges the decadal committee to support further modeling efforts dealing with wave-particle interactions in controlling the structure and dynamics of the radiation belts.		x			BortnikJacob-SWM.pdf	16BortnikJacob-SWM.pdf	
Brown, Benjamin P	University of Wisconsin	An Experimental Plasma Dynamo Program for Investigations of Fundamental Processes in Heliophysics	Laboratory plasma experiments offer unique opportunities to probe heliophysically relevant phenomena. We here advocate for such community-scale plasma experiments.		x	x		BrownBenjaminP-SH.pdf	17BrownBenjaminP-SH.pdf	
Brown, Michael R.	Swarthmore College	Intermediate-scale MHD wind tunnel	We propose an intermediate scale MHD wind tunnel for turbulence studies. The device would be 1 m diameter and 10 m long. The separation of scales would be at least 2 orders of magnitude. Experiments on such a device would illuminate MHD turbulence processes such as observed in the solar wind.			x		BrownMichaelR-SH.pdf	18BrownMichaelR-SH.pdf	
Budzien, Scott A.	Naval Research Laboratory	Evolved Tiny Ionospheric Photometer (ETIP): A Sensor for Ionospheric Specification	ETIP is part of a new generation of space weather sensors with low size, weight, and power. The ETIP design addresses the requirements for space weather sensors, and includes adequate flexibility for accommodation on a range of future flight opportunities, including microsatellite constellations.	x				BudzienScottA-AIM.pdf	19BudzienScottA-AIM.pdf	
Budzien, Scott A.	Naval Research Laboratory	The Volumetric Imaging System for the Ionosphere (VISION)	Describes a mission for volumetric characterization of the ionosphere using optical tomography. The primary goal is to map and monitor global and mesoscale (> 10 km) electron density structures, such as the Appleton anomalies and field-aligned irregularity structures.	x				BudzienScottA-AIM.pdf	20BudzienScottA-AIM2.pdf	
Budzien, Scott A.	Naval Research Laboratory	Heterogeneous Measurements for Advances in Space Science and Space Weather Forecasting	To realize the promise of global assimilative ionospheric models for accurate ionospheric specification and, eventually, space weather forecasting with new, full-physics models requires heterogeneous datasets with complementary characteristics--not merely a higher volume of any single data type.	x				BudzienScottA-AIM.pdf	21BudzienScottA-AIM3.pdf	
Burch, James L.	Southwest Research Institute	Magnetospheric Causes of Saturn's Pulsar-Like Behavior	We propose a three-spacecraft mission to identify the cause of Saturn's periodicity. It will be designed to be accommodated with solar arrays, direct transmission of data from each spacecraft to DSN, and direct injection of the three spacecraft into Saturn orbits with no subsequent maneuvers.		x			BurchJamesL-SWM.pdf	22BurchJamesL-SWM.pdf	
Burger, Matthew H.	NASA/GSFC and UMBC/GEST	Understanding Mercury's Space Environment-Magnetosphere-Exosphere System: A Uni?ed Strategy for Observational, Theoretical, and Laboratory Research	Mercury's magnetosphere and exosphere will be extensively studied by the MESSENGER and BepiColombo spacecraft. To maximize the scientific return from these missions, we require a strong program combining ground-based and spacecraft observations, laboratory measurements, and numerical modeling.	x	x			BurgerMatthewH-SWM.pdf	23BurgerMatthewH-SWM.pdf	

Burkepile, Joan R	High Altitude Observatory / National Center for Atmospheric Research (NCAR)	The importance of ground-based observations of the solar corona	White light observations of the low corona are essential for understanding the formation and propagation of CMEs. Ground-based white light observations are low cost and have provided critical data. A new K-coronagraph is being built that will provide dramatically better data of the very low corona.			x		K-Coronagraph white paper-1.pdf	24BurkepileJoanR_SH.pdf		
Carpenter, Kenneth G.	NASA-GSFC	Stellar Imager (SI): developing and testing a predictive dynamo model for the Sun by imaging other stars	Stellar Imager will resolve surface magnetic activity and subsurface structure and flows of a population of Sun-like stars, in order to accelerate the development and validation of a predictive dynamo model for the Sun and enable accurate long-term forecasting of solar/stellar magnetic activity.			x		CarpenterKennethG-SH.pdf	25CarpenterKennethG-SH.pdf		
Cassak, Paul	West Virginia University	The development of a quantitative, predictive understanding of solar wind-magnetospheric coupling	Recent developments have raised questions about traditional views of the solar wind-magnetospheric coupling process. We propose a multi-pronged and interdisciplinary effort to understand observationally and theoretically what controls the coupling and how to predict it.		x			CassakPaul-SWM.pdf	26CassakPaul-SWM.pdf		
Chakrabarti, Supriya	Booston University	Domestication of Scientific Satellites	To fill the wide gap between CUBESATs and Small Explorer missions, and make space accessible to the new generation of explorers, a flexible and scalable satellite system design is necessary. Such a system will be ideal for many heliophysics studies.	x				ChakrabartiSupriya-AIM.pdf	27ChakrabartiSupriya-AIM.pdf		
Chau, Jorge L	Jicamarca Radio Observatory	An Ionospheric Modification Facility for the Magnetic Equator	This is a conceptual proposal for the deployment of an ionospheric modification facility, also called ionospheric heater, near the geomagnetic equator. A heater is a powerful high-frequency, or shortwave, radio transmitter that can be used to induce a number of phenomena in the ionospheric plasma.	x				ChauJorgeL-AIM.pdf	28ChauJorgeL-AIM.pdf		
Chi, Peter J.	UCLA	A National Ground Magnetometer Program for Heliophysics Research	Ground magnetic observations have become a network science made possible by multiple magnetometer projects. We recommend the establishment of a national ground magnetometer program to help coordinate, maintain, and enhance the magnetometer networks in North America and to support RBSP, MMS, and ot	x	x			ChiPeterJ-SWM-Revised.pdf	29ChiPeterJ-SWM-Revised.pdf		
Chollet, Eileen E.	Caltech	Career Development for Postdoctoral and Early Career Scientists	This white paper discusses some career development issues early career scientists face and recommends some community changes that will help the field retain young talent.				x	CholletEileenE.pdf	30CholletEileenE.pdf		
Christe, Steven D	NASA GSFC	The Focusing Optics X--ray Solar Imager (FOXSI)	The Focusing Optics X-ray Solar Imager (FOXSI), a new instrument concept, will tell us how and where electrons are accelerated, along which field lines they travel away from the acceleration site, where they are stopped, and how some electrons escape into interplanetary space.			x		ChristeStevenD-SH.pdf	31ChristeStevenD-SH.pdf		
Christensen, Andrew B	Aerospace Corp	The International Space Station as a Space Physics Observation Platform	A remote sensing space experiment, the RAIDS payload, has been successfully operated on the International Space Station since Oct 2009. Our experience has demonstrated that the Exposed Facility on the JEM module is suitable for siting optical instrumentation and conducting scientific experiments.				x	ChristensenAndrewBV1.doc	32ChristensenAndrewBV1.doc		
Christian, Eric R.	NASA/GSFC	Heliophysics Instrument and Technology Development Program (HITDP)	This paper describes a Heliophysics Instrument and Technology Development Program (HITDP), to re-invigorate hardware development, provide a pathway for new technology to be infused into missions, develop the next generation of instrument scientists, and ensure a healthy science mission program.	x	x	x		ChristianEricR-AIM-SH-SWM.doc	33ChristianEricR-AIM-SH-SWM.doc		
Chu, Xinzhao	University of Colorado at Boulder	Space Lidar Mission to Study Middle and Upper Atmosphere Dynamics and Chemistry	We discuss the scientific merits and technological feasibility of a space Na Doppler lidar mission to make high-resolution temperature, wind, and Na density measurements in the MLT region to study the upper atmosphere chemistry, structure and dynamics, especially the impact of gravity waves.	x				ChuXinzhao-AIM.pdf	34ChuXinzhao-AIM.pdf		
Chu, Xinzhao	University of Colorado	Whole Atmosphere LIDAR for Whole Atmosphere Study	we propose a new concept – the whole atmosphere lidar that can profile wind and temperature through the whole atmosphere from ground to 120 km with superlative accuracy and resolution for advancing the whole atmosphere science.	x				ChuXinzhao_AIM_WholeAtmLidar.pdf	35ChuXinzhao_AIM_WholeAtmLidar.pdf		
Chua, Damien H.	Naval Research Laboratory	Geospace Dynamics Imager: A Mission Concept for Heliospheric and Magnetospheric Imaging and Space Weather Forecasting	The Geospace Dynamics Imager is an innovative observational concept to provide the first direct, global images of the solar wind-magnetosphere system. The concept is based on the broad band detection of Thomson scattered sunlight by electrons in the solar wind and in geospace.		x			ChuaDamienH-SWM.pdf	36ChuaDamienH-SWM.pdf		
Chutjian, Ara	Jet Propulsion Laboratory, California Institute of Technology	Laboratory Solar Physics from Molecular to Highly-Charged Ions: Meeting Future Space Observations of the Solar Plasma and Solar Wind	New studies of the solar plasma, CMEs, and collision of the solar wind with comets and exospheres require a large database of cross sections in atomic and molecular ions. Described is an addition to the JPL facility to provide a compact storage ring with the new, required measurement capabilities.			x		ChutjianAra-SH.pdf	37ChutjianAra-SH.pdf		
Cirtain, Jonathan W.	MSFC/NASA	The High-Latitude Solar-C International Collaboration: Observing the Polar Regions of the Sun and Heliosphere	The Solar- C "Plan A" mission proposes to fly a focused suite of instruments designed to study the solar interior flows (by helioseismology), surface magnetic fields, transition region, and extended corona from an orbit inclined at least 40 degrees to the ecliptic plane.			x		Solar-C_Plan A.doc	38CirtainJonathanW_Solar-C_Plan A.doc		
Clarke, John T	Boston University	White Paper on Comparative Planetary Exospheres	We propose comprehensive observations of planetary and satellite exospheres by enhanced ground-based and new earth-orbiting telescopic instruments.	x				ClarkeJohnT-AIM.pdf	39ClarkeJohnT-AIM.pdf		
Claudepierre, Seth G.	The Aerospace Corporation	A CubeSat Constellation to Study Magnetospheric Ultra-Low Frequency Pulsations	This white paper addresses the need for a mission to constrain the azimuthal mode number spectrum of magnetospheric ultra-low frequency (ULF) pulsations.		x			ClaudepierreSethG-SWM.pdf	40ClaudepierreSethG-SWM.pdf		
CoBabe-Ammann, Emily	Emily A. CoBabe & Associates, Inc.	The Importance of Student Instrument Programs in the Workforce Development in Solar and Space Physics	Student instrument programs attract, retain and move students through the higher education pipeline into graduate studies and the scientific and engineering workforce. They are also critical training grounds for graduates students and post-docs aspiring to be the next generation PI.				x	CoBabe-Workforce.pdf	41CoBabe-Workforce.pdf		
Codrescu, Mihail	SWPC/NOAA	Data Assimilation for the Thermosphere and Ionosphere	The future of space weather services for the ionosphere/thermosphere is in the development of global data assimilation schemes using coupled thermosphere ionosphere models and large amounts of diverse data. Data assimilation is required because of the impossibility to measure the necessary inputs.	x				WhitePaperDataAssimilation.pdf	42CodrescuMihail.pdf		
Cohen, Christina M.S.	California Institute of Technology	Protecting Science Mission Investment: Balancing the Funding Profile for Data Analysis Programs	The advancement of Heliophysics requires scientific funding through both mission-related and non-mission-specific programs. Protecting data analysis funds from mission cost overruns is critical, as is adequate support for guest investigator programs. The Decadal Survey needs to address this balance.	x	x	x		CohenChristinaMS-SH.pdf	43CohenChristinaMS-SH.pdf		
Colgate, Stirling A.	Los AlamosNational Lab.	Experiments to Demonstrate Solar and Astrophysical Dynamos	Experiments have been based on the ansatz that turbulence alone would make a dynamo. Instead experiments have shown that turbulence leads primarily to enhanced resistive diffusion not a dynamo. It is only through experiments, not theory or modeling that this understanding has emerged.			x		White Paper dyn exp.pdf	27ßColgateStirlingA.pdf		
Conde, Mark G.	University of Alaska Fairbanks/Geophysical Institute	Constructively growing the sounding rocket program: A technology development line of sounding rocket launches	We propose that a competitive line of sounding rocket launches be added to the existing scientifically-competed program. This new line would be dedicated to technology development, enabling sounding rocket missions with long-term science goals but not necessarily immediate science closure.	x	x	x		CondeMarkG-AIM.pdf	44CondeMarkG-AIM.pdf		
Cooper, John F.	NASA Goddard Space Flight Center	Space Weathering Impact on Solar System Surfaces and Mission Science	Space weathering processes need interdisciplinary attention in heliophysics and planetary science to understand how surfaces and atmospheres directly exposed to space environments of planetary magnetospheres, the heliosphere, and the local interstellar environment are eroded and chemically modified.	x	x	x		CooperJohnF-SH.pdf	45CooperJohnF-SH.pdf		

Coster, Anthea J.	MIT Haystack Observatory	Investigations of Global Space Weather with GPS	Space weather can pose serious threats to space-based and land-based technological systems, and many of the serious space weather effects are produced by ionospheric storms. The global distribution of ionospheric sensors is severely lacking, especially over the oceans and in remote, difficult to ac	x				Space Weather.pdf	46CosterAntheaJ.pdf	
Cranmer, Steven R.	Harvard-Smithsonian Center for Astrophysics	Ultraviolet Coronagraph Spectroscopy: A Key Capability for Understanding the Physics of Solar Wind Acceleration	We describe how UV coronagraph spectroscopy enables measurements of the collisionless processes responsible for producing the solar wind. UVCS on SOHO made some key discoveries, but many questions remain unanswered because its capabilities were limited. Next-generation instrumentation is needed.			x		CranmerStevenR-SH.pdf	47CranmerStevenR-SH.pdf	
Davila, Joseph M	Goddard Space Flight Center	The International Space Weather Initiative (ISWI)	The ISWI has facilitated the deployment of 100 new instruments in Africa and around the world, Theses include GPS, magnetometers, particle detectors, H-alpha telescopes, and radio spectrographs. These instruments will provide a world-wide system of observations for the monitoring space weather.	x	x	x		ISWI White Paper Final.pdf	48DavilaJosephM.pdf	
Davila, Joseph M	Goddard Space Flight Center	Understanding Magnetic Storage, Reconnection, and CME Initiation	High resolution coronagraph images allow the tracing of magnetic fields in a fundamentally new way. EUV imagers typically have a filling factor of 0.1 or less, and see on 10% of the corona. Coronagraphs image all temperatures, and can finally allow us to understand the CME initiation process.			x		HICOR White Paper Final.pdf	49DavilaJosephM_HICOR.pdf	
De La Beaujardiere, Odile	AFRL	Global scintillation prediction	We propose a systems-approach mission to predict scintillations from UHF to L-band at all latitudes. A combination of space, ground observations, powerful neutral atmosphere/ionosphere/magnetosphere coupled models and careful analysis of the impact of scintillation on specific systems are required.	x				odiledelabeaujardiere-AIM.doc	50delaBeaujardiereOdile-AIM.doc	
DELABEAUJARDIERE, ODILE	AFRL	LONG-TERM CHANGES IN THE IONOSPHERE/MAGNETOSPHERE SYSTEM AND RELIABLE PLATFORM FOR INNOVATIONS IN SPACE SENSORS	DWSS, the DMSP follow on, ought to accommodate instruments that provide the observations required for long-term trends in the magnetosphere ionosphere system as well as provide a reliable "home" for flight opportunity to test new instruments.	x				odiledelabeaujardiereanddober-AIM.doc	51delaBeaujardiereOdileandDober-AIM.doc	
Denig, William F.	NOAA National Geophysical Data Center	On the Utility of Operational Satellite Data to Solar & Space Physics Research	Heliophysics research greatly benefits from the availability of National operational satellite datasets. Research needs do not drive operational requirements but should be considered in operational system design. Increased interaction between the operational and research communities is recommended.	x	x			DenigWilliamF-AIM.pdf	52DenigWilliamF-AIM.pdf	
Desai, Mihir I.	Southwest Research Institute	Particle Acceleration and Transport in the Heliosphere (PATH)	The Particle Acceleration and Transport in the Heliosphere (PATH) mission consists of a suite of high sensitivity and high resolution in-situ and remote sensing instruments designed to determine the mechanisms responsible for the acceleration and propagation of SEPs through the inner heliosphere.			x		DesaiMihirI_SH.doc	53DesaiMihirI_SH.doc	
Donovan, Eric	University of Calgary	The Great Geospace Observatory and Simultaneous Missions of Opportunity	Imaging from space provides us our best view of system-level geospace dynamics. This paper presents a novel concept of a cost effective multi-agency initiative to fly the "Great Geospace Observatory". GGO would provide a revolutionary three-dimensional view of Earth's plasma environment.	x				DonovanEricF-(revised)-AIM.doc	54DonovanEricF-(revised)-AIM.doc	
Dorelli, John C.	NASA-GSFC	Computational Heliophysics Innovation Program (CHIP)	We propose that NASA create a program to ensure that the heliophysics community keeps up with the rapidly advancing high performance computing (HPC) frontier over the next decade. The program should support agile HPC innovation driven by heliophysics problems of broad interest to the community.	x	x	x		DorelliJohnC-CHIP.pdf	55DorelliJohnC-CHIP.pdf	
Doschek, George A.	Naval Research Laboratory	A Concept White Paper for a New Solar Flare Instrument Designed to Determine the Plasma Parameters in the Reconnection Region of Solar Flares at Flare Onset	This white paper describes a possible Bragg crystal spectrometer experiment that could provide spectroscopic plasma diagnostics of the reconnection region of solar flares, such as electron temperature, turbulence, flows, and polarization.			x		DoschekGeorgeA-SH.doc	56DoschekGeorgeA-SH.doc	
Doschek, George A.	Naval Research Laboratory	The High Resolution Solar-C International Collaboration	Solving many of the important problems in solar physics requires observations that simultaneously cover the photosphere, chromosphere, transition region, and corona at high spatial, spectral, and temporal resolution. This white paper gives an overview of the proposed high resolution Solar-C mission.			x		DoschekGeorgeA-SH.pdf	57DoschekGeorgeA-SH.pdf	
Dyrud, Lars	JHU APL	A Crucial Space Weather Effect: Meteors and Meteoroids	Understanding the interplanetary meteoroid and dust environment is important for several fields of study from solar system evolution, solar wind, upper atmospheric physics, planetary atmospheres and ionospheres, planetary geology, and manned and unmanned space craft.	x		x		DyrudLarsP-AIM.pdf	58DyrudLarsP-AIM.pdf	
Dyrud, Lars	JHU APL	Commercial Access to Space for Scientific Discovery and Operations	The commercial use of space is anticipated to accelerate and will dramatically open new opportunities to address the frontiers of science. The observations required to achieve the greatest scientific advances will require arrays of scientific sensors distributed throughout the system gathering data.	x	x	x		DyrudLarsP-AIM-SWM.pdf	59DyrudLarsP-AIM-SWM.pdf	
Eastes, Richard W	University of Central Florida	Far Ultraviolet Imaging of the Earth's Thermosphere and Ionosphere	Far ultraviolet (FUV) spectral imaging from geostationary orbit can provide full disk images of atmospheric temperature and composition during the daytime and electron densities in the F2 region of the ionosphere at night.	x				EastesRichardW-AIM.pdf	60EastesRichardW-AIM.pdf	
Ebbets, Dennis, C.	Ball Aerospace & Technologies Corp.	Flight Opportunities for Hosted Payloads on the Iridium NEXT Satellites	There are opportunities for flying sensors as hosted payloads on the NEXT constellation of commercial communications satellites being developed by Iridium Satellite LLC. This white paper invites ideas for such instruments by the solar and heliophysics scientific communities, and by the space weather				x	EbbetsDennisC.pdf	61EbbetsDennisC.pdf	
Elkington, Scot R.	LASP, University of Colorado	MORE/ORBITALS: An international mission to advance radiation belt science	This whitepaper proposes support for the MORE/ORBITALS mission, an international collaboration to build a spacecraft to study the dynamical evolution of the radiation belts. The MORE/ORBITALS collaboration will significantly extend and augment the science return from the planned NASA RBSP mission.		x			ElkingtonScotR-SWM.pdf	62ElkingtonScotR-SWM.pdf	
Emmert, John T.	Naval Research Laboratory	Geospace Climate Present and Future	Understanding the systematic response of geospace to natural and anthropogenic forcing is vital to societal utilization of this environment, and requires continual monitoring of several key state parameters.	x				EmmertJohnT-AIM.pdf	63EmmertJohnT-AIM.pdf	
England, Scott, L	University of California Berkeley	Concept Paper: An Investigation of the Coupling of the Earth's Atmosphere to its Plasma Environment	Ion-neutral coupling is common to planetary atmospheres and stellar photospheres. The coupling of the atmosphere and ionosphere at Earth is a natural, within-reach laboratory. We propose a mission concept that addresses this topic in the simplest way possible, based on flight-proven instruments to	x				EnglandScottL-AIM.pdf	64EnglandScottL-AIM.pdf	
Englert, Christoph, R.	US Naval Research Laboratory	Spatial Heterodyne Spectroscopy: An Emerging Optical Technique for Heliophysics and Beyond	In the past two decades, Spatial Heterodyne Spectroscopy (SHS) has been used for laboratory spectroscopy, sounding rocket instruments, and space-borne experiments. The SHS concept has now reached a level of maturity that allows the serious consideration for NASA missions.	x		x		EnglertChristophR-AIM.pdf	65EnglertChristophR-AIM.pdf	
Eparvier, Francis G.	University of Colorado - LASP	The Need for Consistent Funding of Facilities Required for NASA Missions	Currently calibration and test facilities necessary for the success of NASA missions, such as NIST SURF Beamline-2, are funded haphazardly, precariously, and inconsistently. The risk is that these required facilities may go away and NASA science will be negatively impacted.				x	EparvierFrancisG.pdf	66EparvierFrancisG.pdf	
Erickson, Philip J.	MIT Haystack Observatory	Investigations of Plasmasphere Boundary Layer Processes in the Coupled Earth-Sun Geospace System	The paper proposes a focused attack on advancing knowledge of ionospheric structuring and space weather effects driven by M/I coupling in the critically important subauroral plasmasphere boundary layer (PBL), through use of multipoint measurement networks in both the American and Australian sectors.	x				EricksonPhilipJ-AIM.pdf	67EricksonPhilipJ-AIM.pdf	
Fennell, J. F.	The Aerospace Corp.	The Magnetospheric Constellation Mission	The proposal to consider, once again, the original Magnetospheric Constellation Mission concept for implementation in the next decade.		x			FennellJF-SWM.pdf	68FennellJF-SWM.pdf	

Fennell, J. F.	The Aerospace Corp.	Mission to Understand Electron Pitch Angle Diffusion and Characterize Precipitation Bands and Spikes	Observations of precipitation bands and spikes observed at low altitudes with little or no impact on equatorial fluxes are discussed and strong scattering near or above the loss cone is noted. A mission is outlined to obtain the data, understand the processes and answer the questions raised.	x	x			FennellJF-SWM.pdf	69FennellJF-SWM.pdf	
Fennell, J. F.	The Aerospace Corp.	Enhancement of POES Instruments to Provide Better Space Weather Electron Data	Paper encourages NOAA to seriously consider flying an electron sensor that measures the precipitating and trapped electron fluxes in the 40-2000 keV energy range on a continuous basis to fulfill operational and science needs discussed	x	x			FennellJF-SWM.pdf	70FennellJF-SWM2.pdf	
Fennell, J. F.	The Aerospace Corp.	Transition Region Exploration (TREx) Mission	Describes science need for a mission that spans the L* region from 4.5 - 8.5 in the equatorial plane. The mission would be to definitively determine whether relativistic electrons are accelerated, in situ, from a seed population by waves or from an external source by diffusion.		x			FennellJF-SWM.pdf	71FennellJF-SWM3.pdf	
Fleishman, Gregory D.	NJIT	UNCOVERING MECHANISMS OF CORONAL MAGNETISM VIA ADVANCED 3D MODELING OF FLARES AND ACTIVE REGIONS	The coming decade will see the routine use of solar data of unprecedented spatial and spectral resolution, time cadence, and completeness. To capitalize on the new (or soon to be available) facilities such as SDO, ATST and FASR, and the challenges they present in the visualization and synthesi			x		FleishmanGregoryD-SH.pdf	72FleishmanGregoryD-SH.pdf	
Florinski, Vladimir	University of Alabama in Huntsville	The outer heliosphere - solar system's final frontier	We discuss the needs for a dedicated theoretical program to study the physics of the outer heliosphere. We identify four main thrust areas: global structure, pickup ions and anomalous cosmic rays, galactic cosmic rays, and physics of the termination shock and heliopause.			x		FlorinskiVladimir-SH.pdf	73FlorinskiVladimir-SH.pdf	
Foster, John	MIT Haystack Observatory	DASI: Distributed Arrays of Scientific Instruments for Geospace and Space Weather Research	Geospace, acts as a coupled, complex system whose pieces and properties cannot be studied in isolation. Individual features and processes contribute to the composite picture, but a larger-perspective point of view is needed to begin to appreciate how these components work together to shape our space	x				FosterJohnC-AIM.pdf	74FosterJohnC-AIM.pdf	
Frahm, Rudy A.	Southwest Research Institute	Interaction of the Solar Wind with a Partially Magnetized Planet	This topic proposes a spacecraft experiment that deals with our nearest neighbor planet, Mars, and its interaction with the space environment.		x			FrahmRudyA-SWM.pdf	75FrahmRudyA-SWM.pdf	
Frazier, Jesse	Resonance Global	Alternate Magnetic Thermodynamics Study	An Alternate Spark could be the Mass Driver of Thermodynamics but not Permadynamics.Alternate Termodynamics is contingent to space and Tangent to Elcetromagnetic Development.NASA should prefigure its balance of energy and matter transfer of Heat to Force without the silent sparks brutalization.				x	Document-ooo.pdf	76FrazierJesse.pdf	
Fritts, Dave	NorthWest Research Associates	Solar Forcing of the Thermosphere and Ionosphere from below: Coupling via Neutral Wave Dynamics	We describe the motivations for a mission addressing neutral atmosphere - ionosphere coupling via neutral waves propagating into the thermosphere and ionosphere from the lower atmosphere and the auroral zone.	x				FrittsDave-AIM.pdf	77FrittsDave-AIM.pdf	
Fritz, Theodore, A	Boston University	Particle Acceleration and Entry of Solar Wind Energy into the Magnetosphere	The paper recommends the investigation of energetic particle acceleration in the cusp and the contributions of such a population to the plasma sheet and radiation belt.	x	x			FritzTheodoreA-SWM.pdf	78FritzTheodoreA-SWM.pdf	
Fry, Dan J.	NASA / Johnson Space Center	Solar Proton Event Risk Modeling for Variable Duration Human Spaceflight	We propose a strategy that will utilize agency science to feed the development of needed near-term probabilistic models that assess Solar Proton Event risk for long-duration human exploration. Past modeling efforts, new directions and the transition of research to operations is discussed.			x		FryDanJ-SH.pdf	79FryDanJ-SH.pdf	
Fuller-Rowell, Tim	University of Colorado	Forecasting Ionospheric Irregularities	There is a pressing need is to develop a capability to forecast the likely occurrence of ionospheric irregularities and their detrimental impact on communications and navigation. Forecasting the day-to-day variability of ionospheric irregularities is one of the challenges in space physics.	x				FullerRowell-AIM.pdf	80FullerRowell-AIM.pdf	
Fung, Shing F.	Geospace Physics Lab, NASA Goddard Space Flight Center	MAGnetosphere-Ionosphere Connector (MAGIC): Investigation of Magnetosphere-Ionosphere Coupling from High-to-Low Latitudes	We propose the MAGnetosphere-Ionosphere Connector (MAGIC) mission having a high-altitude satellite for auroral and plasmaspheric imaging and multiple lower-orbiting spacecraft for simultaneous in situ and radio sounding measurements. MAGIC will investigate M-I coupling from high-to-low altitudes.	x	x			FungShingF-AIM.pdf	81FungShingF-AIM.pdf	
Fuselier, Stephen A.	Lockheed Martin Advanced Technology Center	Stereo Magnetospheric Imaging (SMI) Mission	Energetic Neutral Atom (ENA) imaging misison using two spacecraft at the lunar L4 and L5 Lagrange points. Cross-cutting science includes plasma processes at the bow shock and magnetopause, in the cusps and magnetotail, lunar interactions, and heliospheric and interstellar phenomena		x	x		FuselierStephenA-SWM.doc	82FuselierStephenA-SWM.doc	
Gary, Dale E.	New Jersey Institute of Technology	The Frequency Agile Solar Radiotelescope (FASR)	FASR is a solar-dedicated radio telescope in a high state of readiness, with superior imaging capability and broad frequency coverage to address a wide range of science goals. The Solar and Space Physics Survey Committee (2003) selected FASR as its highest-priority "small project.			x		GaryDaleE-SH.pdf	83GaryDaleE-SH.pdf	
Gary, Dale E.	New Jersey Institute of Technology	Particle Acceleration and Transport on the Sun	Particle acceleration and particle transport are ubiquitous on the Sun. These complex coupled phenomena require comprehensive observations. Radio observations are emphasized because FASR in the coming decade will make unique and innovative contributions to these important problems.			x		GaryDale-SH.pdf	84GaryDale-SH.pdf	
Gentile, L. C., et al.	Air Force Research Laboratory	SCINTILLATION AND ENERGY INPUT FOR SPACE SITUATIONAL AWARENESS AND MONITORING THE ENVIRONMENT (SESSAME)	The SESSAME objective is to provide a new generation of space environmental monitoring instruments to measure high latitude energy input and scintillation at both high and equatorial latitudes.	x				GentileLC-SESSAME-AIM.doc	85GentileLC-SESSAME-AIM.doc	
Gentile, L. C., et al.	Air Force Research Laboratory	CONSTELLATION FOR HELIOSPHERIC AND IONOSPHERIC	A constellation of small dedicated satellites orbiting the equator combined with data from ground-based instruments would greatly advance our understanding of ionospheric effects on communication and navigation systems.	x				GentileLC-equator-AIM.pdf	86GentileLC-equator-AIM.pdf	
Gentile, L. C., et al.	Air Force Research Laboratory	POLAR AND EQUATORIAL COMMUNICATION OUTAGE SATELLITES (PECOS)	PECOS is a flagship mission that enhances current capabilities to meet future needs. These three paired constellations of small satellites flying in multiple orbits represent a low cost solution that meets many of our current space weather objectives with specialized arrays of sensors on each spac	x				GentileLC-PECOS-AIM.pdf	87GentileLC-PECOS-AIM.pdf	
Giampapa, Mark S.	National Solar Observatory	ASTEROSEISMOLOGY: THE NEXT FRONTIER IN SOLAR-STELLAR PHYSICS	Asteroseismology will allow us to identify and investigate true analogs of the Sun. This, in turn, will enable comparative studies of the influence of parameters such as rotation and convection zone structure on dynamo-related magnetic activity at all relevant time scales.			x		GiampapaMarkS-SH.pdf	88GiampapaMarkS-SH.pdf	
Giampapa, Mark, S.	National Solar Observatory	CAUSES OF SOLAR ACTIVITY	This white paper emphasizes critical importance of a sustained program of long-term, high-continuity observations of the solar magnetic field by a network of groundbased synoptic-type instruments.			x		GiampapaMarkS-SH_1.pdf	89GiampapaMarkS-SH_1.pdf	
Gilbert, Jason A.	University of Michigan	What Composition Measurements Could Have Done For Solar Probe Plus	The Solar Probe Plus mission will explore the source regions of the solar wind and of inner-source pickup ions, but the NASA-selected payload lacks a solar wind composition instrument. This paper examines the science benefits that composition data would have brought to the mission.			x		GilbertJasonA-SH.pdf	90GilbertJasonA-SH.pdf	
Gjerloev, Jesper W	JHU-APL	AURORAL FORMS AND THEIR ROLE IN THE DUNGEY CONVECTION CYCLE	We urge the committee to include the fundamental science objectives: What is the role of meso-scale auroral forms in the Dungey global convection cycle? We do so because of the universal importance of the science and argue that past missions have not been designed to provide the required observatio	x				GjerloevJesperW-AIM.pdf	91GjerloevJesperW-AIM.pdf	
Gjerloev, Jesper W	JHU-APL	SUPERMAG: THE GLOBAL GROUND BASED MAGNETOMETER INITIATIVE	For decades ground based magnetometers have proven to be the workhorse of the M-I physics community and their importance is indisputable. In this paper we urge the Decadal Report Committee to acknowledge the strength of this data set and the need for global collaborations such as SuperMAG.	x				GjerloevJesperW2-AIM.pdf	92GjerloevJesperW2-AIM.pdf	

Golub, Leon	Smithsonian Astrophysical Observatory	RAM: The Reconnection and Microscale Mission	This paper outlines a new approach to understanding the dynamic activity of hot, magnetized plasmas using the best example available, the solar corona. The goal is to determine the configurations leading to energy release and to locate sources of high energy particles.			x		GolubLeon-SH.pdf	93GolubLeon-SH.pdf	
Goncharenko, Larisa P.	MIT Haystack Observatory	Coupling through planetary waves: from the stratosphere to ionospheric irregularities	The presence of ionospheric irregularities adversely impacts communication and navigation systems. We propose observational strategy that would investigate potential effects of planetary waves on irregularities. If the concept is proven, it can serve as a path towards multi-day ionospheric forecast.	x				GoncharenkoLarisaP-AIM.pdf	94GoncharenkoLarisaP-AIM.pdf	
Goode, Philip	New Jersey Institute of Technology	The 1.6 m Clear Aperture Optical Solar Telescope in Big Bear – The NST	The first facility-class solar observatory in the US in more than a generation is in operation at BBSO. This largest aperture (1.6 m) solar telescope will provide an essential complement to SDO, Hinode and other satellite data, especially as a probe of the space weather.			x		GoodePhilipSH.pdf	95GoodePhilipSH.pdf	
Gopalswamy, Nat	NASA Goddard Space Flight Center	EarthAffecting Solar Causes Observatory (EASCO): A New View from SunEarth L5	This white paper outlines the concept of a mission that will make remote-sensing and in-situ measurements from the Sun – Earth Lagrange point L5 to understand the origin and evolution of large-scale solar disturbances such as coronal mass ejections (CMEs) and corotating interaction regions (CIRs).		x	x		GopalswamyNat-SH.pdf	96GopalswamyNat-SH.pdf	
Gross, Nicholas	Boston University	Value and Need of Helio and Space Physics Summer Schools	Using two current examples, the value of space physics summer schools are highlighted and continued funding of similar efforts is encouraged.			x		GrossNicholas-SH.pdf	97GrossNicholas-SH.pdf	
Gross, Nicholas	Boston University	Value of Enhanced Mentoring in ?Space and Helio Physics	Based on student interviews, this article briefly outlines the value of enhancing mentoring that a center provides through exposure of students to a broad range of mentors and activities.				x	GrossNicholas.pdf	98GrossNicholas.pdf	
Grotheer, Emmanuel B.	University of Texas at San Antonio	Determination of optical spectra and g-values for negative ions of low-mass atoms and molecules	Laboratory and theoretical work is needed to determine negative ions' emission spectra and g-values. With this data, spectrometers can be built to look for negative ions in Mercury's and other exospheres. Interactions of solar wind with Mercury's magnetosphere and surface are also discussed.	x	x	x		GrotheerEmmanuelB-AIM-SH-SWM.pdf	99GrotheerEmmanuelB-AIM-SH-SWM.pdf	
Habbal, Shadia R.	Institute for Astronomy	Exploring the Physics of the Corona with Total Solar Eclipse Observations	This white paper is a call to support total solar eclipse observations in the visible and near infrared wavelength range, to explore the physics of the corona, in particular on 21 August 2017. Support for the NASA-published total solar eclipse bulletins by Espenak and Andersen is also essential.			x		HabbalShadiaR-SH.pdf	100HabbalShadiaR-SH.pdf	
Heelis,Rod	University of Texas at Dallas	Magnetosphere Atmosphere Coupling Mission (MACM)	MACM has two well focused goals. 1) To discover the spatial and temporal scales over which the ionosphere and thermosphere respond to magnetospheric energy inputs. 2) To determine how magnetospheric sources and wind dynamos contribute to the electric field in the ionosphere and thermosphere.	x				HeelisRod-AIM.pdf	101HeelisRod-AIM.pdf	
Heelis,Rod	University of Texas at Dallas	Space-Atmosphere Boundary Layer Electrodynamics (SABLE)	The Space-Atmosphere Boundary Layer Electrodynamics (SABLE) mission is designed to uncover the pathways through which energy from the magnetosphere and solar wind is redistributed in Earth's atmosphere.	x				HeelisRod-AIM.pdf	102HeelisRod-AIM.pdf	
Hess, Sebastien L. G.	LASP - University of Colorado	Exploration Of The Uranus Magnetosphere	We propose a middle size mission to explore the Uranus magnetosphere. We propose a minimal set of instruments which are necessary to address the most compelling questions about the Uranus magnetosphere, and to improve our understanding of the solar wind-magnetosphere interactions in general.		x			HessSebastienLG-SWM.pdf	103HessSebastienLG-SWM.pdf	
Hill, Frank	National Solar Observatory	Helioseismology	Full understanding of solar physics requires knowledge of conditions below the photosphere, which can only be done with helioseismology. Progress towards current helioseismology science goals requires ground-based multi-wavelength observations, and space-based multi-viewpoint measurements.			x		HillFSeism-SH.pdf	104HillFSeism-SH.pdf	
Hill, Frank	National Solar Observatory	The need for synoptic optical solar observations from the ground	Synoptic observations are needed to understand the Sun and activity cycle. There are many advantages of ground-based observations, Agencies need to recognize the value of long-term observations and provide sufficient resources to obtain and improve the measurements.			x		HillFSyn-SH.pdf	105HillFSyn-SH.pdf	
Holzworth, Robert H	University of Washington	Lightning Influence on Ionosphere and Magnetosphere Plasma	Discusses the influence of lightning on ionoshere and magnetosphere processes, gives history behind ourcurrent knowledge, and suggests that lightning generated plasma waves may be much more important to magnetospheric and ionospheric physics than we realize. Proposes many more measurements.	x				Lightning Influence on Ionosphere and Magnetosphere Plasma.pdf	106HolzworthRobertH.pdf	
Horanyi, Mihaly	University of Colorado	iDUST: Interstellar and Interplanetary Dust Near Earth A mission concept for "dust tomography" of the heliosphere	Observations of the inward transport of interstellar dust and the outflow of near-solar dust provide a unique opportunity to explore dusty plasma processes throughout the heliosphere. The flux, direction and size distribution of interstellar dust can be used to test our models of the heliosphere.			x		HoranyiMihalySH.pdf	107HoranyiMihalySH.pdf	
Huang, Cheryl	Air Force Research Laboratory	A satellite mission concept to study thermosphere-ionosphere coupling	A satellite mission concept to study ion-neutral coupling is presented. A number of science questions which can be addressed is given. One of the main benefits will be improvement in satellite drag modelling.	x				HuangCherylY-AIM.pdf	108HuangCherylY-AIM.pdf	
Huba, Joseph D.	Naval Research Laboratory	A Comprehensive, First-principles Model of Equatorial Ionospheric Irregularities and Turbulence	To develop a new modeling capability that describes the onset and development of equatorial ionospheric irregularities covering a spatial range of 10s cm to 1000s km.	x				HubaJosephD-AIM.pdf	109HubaJosephD-AIM.pdf	
Hudson, Hugh S.	UC Berkeley	Solar Flares and the Chromosphere	We note a resurgence of interest in the chromosphere during a solar flare. New programs need to be put in place to follow up the Hinode and SDO successes here, and to take advantage of modern modeling prowess and ground-based data to understand this complicated but physically fundamental domain.			x		HudsonHughS-SH.pdf	110HudsonHughS-SH.pdf	
Hughes, W. Jeffrey	Boston University	The Future of Modeling the Space Environment	The capabilities and complexity of computational models have significantly increased over the past decade. A cohesive team of space and computational scientists and software engineers is needed to develop a modern space environment model. Funding agencies need to support such modeling teams.	x	x	x		HughesWJeffrey-SWM.pdf	111HughesWJeffrey-SWM.pdf	
Intrator, Thomas P.	Los Alamos National Laboratory	Fundamental heliophysics processes: Unsteady wandering magnetic field lines, turbulence, magnetic reconnection, and flux ropes	Magnetic flux tubes ropes are the building blocks of MHD. Earth based experimental collaborations with observation, simulation, and theory complement spacecraft data. Data about flux rope interactions are key to understanding unsteady, 3D, MHD-like energy conversion.		x	x		IntratorThomasP-SH-SWM.pdf	112IntratorThomasP-SH-SWM.pdf	
Israel, Martin H.	Washington University in St. Louis	The Effect of the Heliosphere on Galactic and Anomalous Cosmic Rays	The interplanetary magnetic field modulates both Galactic and anomalous cosmic rays in the inner solar system. GCR and ACR observed during the recent solar minimum show that the modulation is not well understood. Observations over at least the next 22 years are needed to resolve this puzzle.			x		IsraelMartinH-SH.pdf	113IsraelMartinH-SH.pdf	
Jackson, Bernard V.	Center for Astrophysics and Space Sciences, University of California, San Diego	SWIRES, a Solar Wind Instrument for REmote Sensing	SWIRES (Solar Wind Instrument for REmote Sensing) is a visible-light imager that provides solar wind bulk density measurements from an 840 km Sun-synchronous terminator polar orbit. The imager will provide a continuous view of sunlight scattered from heliospheric electrons. When the much larger background contribution of visible light from zodiacal dust and the sidereal sky is subtracted, the residue can be analyzed in terms of the heliosphere's fundamental plasma parameter, density.			x		JacksonBV-2.doc	114JacksonBV-2.doc	
Jackson, Bernard V.	Center for Astrophysics and Space Sciences, University of California, San Diego	"PERSEUS", a Pegasus Explorer for remote sensing and in-situ space science	PERSEUS instruments provide all sky coverage that enables mapping and 3D reconstruction of the heliosphere. A coronagraph observes rapidly-changing material flow and events near the solar surface while all-sky visible-light imagers observe the large scale structure of those solar wind flows.			x		JacksonBernardV-SH.doc	115JacksonBernardV-SH.doc	

Jensen, Elizabeth A.	Planetary Science Institute	Campaign Observations of the Heliosphere During the STEREO Superior Conjunction	Magnetic, velocity, and density fields of the heliosphere can be simultaneously measured using the radio signal from natural sources and spacecraft in superior conjunction. The months-long conjunction of the two STEREO spacecraft presents a unique opportunity to perform this investigation.			x		JensenElizabethA-SH.pdf	116JensenElizabethA-SH.pdf	
Ji, Hantao	Princeton Plasma Physics Laboratory, Princeton Univ.	Next Generation Experiments for Laboratory Investigations of Magnetic Reconnection Relevant to Heliophysics	This concept paper describes the scientific opportunity for next generation laboratory experiments to study magnetic reconnection in regimes directly relevant to space and solar plasmas.		x	x		JiHantao-SH-SWM.pdf	117JiHantao-SH-SWM.pdf	
Ji, Hantao	Princeton Plasma Physics Laboratory, Princeton Univ.	NStrengthening Heliophysics Through Coordinated Plasma Astrophysics Programs With Laboratory Plasma Physics and Astrophysics	This white paper introduces scientific opportunities articulated by Workshop on Opportunities in Plasma Astrophysics or WOPA (http://www.pppl.gov/conferences/2010/WOPA/). It recommends close coordinations with laboratory plasma physics and astrophysics to strengthen heliophysics programs.	x	x	x		JiHantao-AIM-SH-SWM.pdf	118JiHantao-AIM-SH-SWM.pdf	
Johnson, Les	NASA Marshall Space Flight Center	Solar Sail Propulsion: Enabling New Capabilities for Heliophysics	Solar sails can play a critical role in enabling solar and heliophysics missions. Solar sail technology within NASA is currently at 80% of TRL-6, suitable for an in-flight technology demonstration. It is conceivable that an initial demonstration could carry scientific payloads that, depending on the		x	x		JohnsonLes-SH.pdf	119JohnsonLes-SH.pdf	
Johnston, Janet C.	Space Weather Center for Excellence, Air Force Research Laboratory, Hanscom AFB, MA	Detecting and Tracking Solar Ejecta with Next-Generation Heliospheric Imaging Systems	The DoD has invested in the capability to specify conditions and phenomena in the heliosphere. An L5 imager, and/or an L1 or LEO Sun-Earth line imager can be accomplished with low risk, banking on knowledge gained from SMEI and STEREO.			x		JohnstonJanetC-SH.doc	120JohnstonJanetC-SH.doc	
Jones, Andrew R.	University of Colorado at Boulder	The Importance of Fundamental Laboratory Measurements to NASA Heliophysics	We stress the importance of fundamental laboratory measurements of quantities such as cross sections, atomic scattering factors and reaction rates that are vital to interpreting data from existing and future missions, as well as being essential for instrument design.				x	FundamentalMeasurements.pdf	121JonesAndrewR.pdf	
Judge, Philip G.	High Altitude Observatory, National Center for Atmospheric Research	Measuring magnetic free energy in the solar atmosphere	Infrared imaging spectroscopy offers a credible method for measuring free magnetic energy in the solar atmosphere. Relatively low risks outweigh a modest investment in instrumentation, to enhance missions such as SDO, and allow us to measure the origins of space weather events.			x		JudgePhilipG_SH.pdf	122JudgePhilipG_SH.pdf	
Kanekal,Shrikanth G.	NASA GSFC	Heliospheric Particle Explorer: Advancing our Understanding of Magnetospheric, Solar Energetic Particle, and Cosmic Ray physics	We propose a low earth orbiting satellite with an instrument payload that measure energetic particles over a wide range of energies and species. Charged particles (electrons, protons and heavy ions) in space provide a window into the physical universe encompassing a wide variety of phenomena cover		x	x		KanekalShrikanthG-SHSWM.pdf	123KanekalShrikanthG-SHSWM.pdf	
Kashyap, Vinay L.	Smithsonian Astrophysical Observatory	The Sun as a Star	We argue for an increased focus on studies that target solar-stellar connections. Theoretical work developed for the Sun has been beneficial to stellar studies. The converse is also true, via the larger parameter range and different types of data available for stars.			x		KashyapVinayL-SH.pdf	124KashyapVinayL-SH.pdf	
Keeley, Helena	Compsim	Using KEEL Technology for Vehicle Prognostics & Diagnostics, and for Other Space Applications	This whitepaper addresses how Compsim's KEEL Technology can be applied horizontally in the heliophysics realm (Theory & Modeling, Innovations: Technology, Instruments, and Data systems). It will describe how KEEL can satisfy NASA's future space needs which would otherwise cost billions of dollars.				x	KeeleyHelenaG.pdf	125KeeleyHelenaG.pdf	
Keesee, Amy M.	West Virginia University	A campaign to understand mechanisms responsible for ion heating in magnetic reconnection	We propose a multidisciplinary campaign to address the mechanisms of ion heating in magnetic reconnection.		x	x		KeeseeAmyM-SH.pdf	126KeeseeAmyM-SH.pdf	
Keil, Stephen L.	National Solar Observatory	Science and Operation of the Advanced Technology Solar Telescope	Science goals for ATST are outline. The ATST has received construction funds from the NSF MREFC program. Completion is scheduled for 2017. Strong operational and scientific support is needed from NSF to insure the $298M investment in ATST has the expected impact on our understanding of the sun.			x		KeilStephenL2-SH.doc	127KeilStephenL2-SH.doc	
Keil, Stephen L.	National Solar Observatory	GENERATION, EVOLUTION AND DESTRUCTION OF SOLAR MAGNETIC FIELDS	Magnetic fields control the inconstant Sun and play a major role throughout heliophysics. Measuring these fields on their natural physical scales requires a large aperture solar telescope. The ATST will provide this capability.			x		KeilStephenL-SH.doc	128KeilStephenL-SH.doc	
Keiling, Andreas	University of California, Berkeley	A Holistic Ionosphere-Auroral Zone-Magnetosphere Investigation	This concept paper outlines a holistic ground-spacecraft mission with four-point conjunctions along magnetic flux tubes connecting the ionosphere, the auroral acceleration region and the outer magnetosphere.	x		x		Keiling Mission Concept.pdf	129KeilingAndreas.pdf	
Kepko, Larry	NASA Goddard Space Flight Center	A NASA-funded CubeSat Program	We argue for a small augmentation to the SSOPD program to allow for CubeSats as an available science and technology platform	x	x	x		KepkoLarry-AIM-SWM-SH.pdf	130KepkoLarry-AIM-SWM-SH.pdf	
Kepko, Larry	NASA Goddard Space Flight Center	Magnetospheric Constellation	Magnetospheric Constellation is designed to trace the transport of mass and energy across the boundaries of and within Earth's magnetosphere using a constellation of up to 36 small satellites. MagCon is ready to be implemented today, with no further technology or instrument development.		x			KepkoLarry-MC-SWM.pdf	131KepkoLarry-MC-SWM.pdf	
Klimchuk, James A.	NASA Goddard Space Flight Center	Maximizing NASA's Science Productivity	This white paper argues that the science productivity of NASA's Heliophysics Science Division is not maximized by the current program balance, and recommends that research and analysis (R&A) funding be gradually increased by 10% of the HSD budget to an eventual target of 20-25% of the total budget.				x	KlimchukJamesA.pdf	132KlimchukJamesA.pdf	
Klumpar, David M.	Montana State University	The technological case for TinySats (CubeSats and Nanosatellites) in support of Heliophysics research	We establish that rapid developments in electronics miniaturization, new manufacturing techniques, and new materials and the development of a cadre of commercial suppliers of small satellite subsystems fortify the technical readiness of CubeSats for Heliophysics research.	x	x	x		KlumparDavidM-AIM.pdf	133KlumparDavidM-AIM.pdf	
Ko, Yuan-Kuen	Naval Research Laboratory	Breakthrough Toward Understanding The Solar Wind Origin	To make a breakthrough in the next decade toward understanding the origin of the solar wind, it is necessary to utilize solar spectroscopic observations and in situ solar wind ion composition measurements, and the synergy between the two is essential.			x		KoYuankuenSWOrigin-SH.pdf	134KoYuankuenSWOrigin-SH.pdf	
Ko, Yuan-Kuen	Naval Research Laboratory	Systematic Science for Future Missions	We should carefully examine ways and strategy for future fleets of space missions that can achieve systematic, optimal science. This not only includes identifying a set of key measurements that should not be sacrificed, but also the coordination of the locations and timing of data availability.			x		KoYuankuenSystemScience-SH.pdf	135KoYuankuenSystemScience-SH.pdf	
Komjathy, Attila	Jet Propulsion Laboratory	Detecting Tsunami Generated Ionospheric Perturbations Using GPS Measurements	Tsunamis have been a significant threat to humans living in coastal regions throughout recorded history. The Sumatra tsunami of 2004 took the largest toll of human life on record, with approximately 228,000 casualties attributed to the waves. More recent events have been sobering reminders of the h	x				KomjathyAttila-AIM.pdf	136KomjathyAttila-AIM.pdf	
Korendyke, Clarence M	NRL	Fine scale Advanced Coronal and Transition Region Spectrometer (FACTS) Mission: An Imaging Spectroscopy Mission to Observe Physical Processes of the Solar Chromosphere, Transition Region, and Corona	The FACTS mission is specifically designed to determine and characterize the dominant physical processes responsible for the structure, dynamics and evolution of the upper solar atmosphere. The mission is an STP class mission.			x		KorendykeClarenceM-SH.doc	137KorendykeClarenceM-SH.doc	
Kosovichev, Alexander	Stanford University	Solar Dynamo	The recent progress in helioseismic and spectro-polarimetric observations and realistic MHD simulations provides an opportunity of substantially advancing our understanding of the physical mechanisms of magnetic field generation and formation of magnetic structures on the Sun.		x	x		KosovichevAlexanderG-SH.pdf	138KosovichevAlexanderG-SH.pdf	
Krall, Jonathan	Naval Research Laboratory	Physica-based modeling of the plasmasphere	We argue case that a key priority of U.S. space physics enterprise should be to develop a physics-based numerical model of the coupled magnetosphere-ionosphere system that will describe the plasmasphere and its interactions with the ionosphere, magnetosphere and ring current.	x				KralljJonathan-AIM.pdf	139KralljJonathan-AIM.pdf	

Kucharek, Harald	University of New Hampshire	Multi-Scale Investigations of Fundamental Physical Processes	To understanding the role of coupling between different scales on particle acceleration, energy dissipation, and plasma transport in shocks, reconnection, and turbulence. This will be addressed by in situ measurements of particles and fields over a range of scales in regions of the magnetosphere.		x			KucharekHarald-SWM.pdf	140KucharekHarald-SWM.pdf	
Laming, J. Martin	Naval Research Laboratory	Science Objectives for an X-Ray Microcalorimeter Observing the Sun	We present the science case for a broadband X-ray imager with high-resolution spectroscopy, including simulations of X-ray spectral diagnostics of both active regions and solar flares.			x		LamingJMartin1-SH.pdf	141LamingJMartin1-SH.pdf	
Laming, J. Martin	Naval Research Laboratory	Understanding the Coronal Abundance Anomalies of the Sun	We emphasize the importance of the FIP abundance anomaly in regions of the solar corona and wind, for the insight it provides into wave-particle interactions in the solar atmosphere and how these might inform models of coronal heating, as well as relevance to several other issues.			x		LamingJMartin2-SH.pdf	142LamingJMartin2-SH.pdf	
Larsen, Miguel F.	Clemson University	Diffusion and transport near the turbopause	The paper addresses the poorly understood turbulent diffusion and transport processes in the lower thermosphere, and the need for more extensive in situ observations of the neutral dynamics in the region.	x				LarsenMiguelF-AIM.pdf	143LarsenMiguelF-AIM.pdf	
Lawrence, David J.	Johns Hopkins University Applied Physics Laboratory	Using Solar Neutrons to Understand Solar Acceleration Processes	Large gaps in our understanding of acceleration mechanisms involve energetic-ion acceleration in solar flares. Neutrons are uncharged and unaffected by solar magnetic fields; they can therefore provide direct information to improve our understanding of solar acceleration processes.			x		LawrenceDavidJ-SH.pdf	144LawrenceDavidJ-SH.pdf	
Lazio, Joseph	Jet Propulsion Laboratory	Magnetospheric Emission from Extrasolar Planets	The magnetospheric emissions from extrasolar planets represent a science frontier for the next decade. This paper describes the effort needed to detect and use the emissions to help us understand the nature of the planets/magnetospheres.		x	x		LazioJoseph-SH.pdf	145LazioJoseph-SH.pdf	
Lehmacher, Gerald	Clemson University	Small-scale neutral-ion coupling in the mesosphere	This white paper addresses the fundamental science questions "What governs the coupling of neutral and ionized species in the mesosphere?" and "What is responsible for the variability of the ionization layers in the mesosphere?"	x				LehmacherGeraldA_AIM.pdf	146LehmacherGeraldA_AIM.pdf	
Lemon, Colby L	The Aerospace Corporation	The Importance of Ion Composition and Charge State Measurements for Magnetospheric Physics	Only a small fraction of magnetospheric plasma instruments include ion composition measurements. We are advocating for more ion composition instruments in the magnetosphere on future missions in order to resolve outstanding questions in magnetospheric physics.	x	x			LemonColbyL-SWM.pdf	147LemonColbyL-SWM.pdf	
Lepri, Susan T	The University of Michigan	Solar Wind and Suprathermal Ion Composition Measurements: An Essential Element of Current and Future Space Missions	This white paper discusses the vital role of solar wind and suprathermal composition measurements in resolving major outstanding science questions regarding reconnection, particle acceleration and improving space weather predictions.			x		LepriSusanT-SH.doc	148LepriSusanT-SH.doc	
Lessard, Marc R.	University of New Hampshire	The importance of ground-observations and the role of distributed arrays in Polar regions	This paper describes the importance of high-latitude ground-based observations, emphasizing the importance of instrument development, distributed arrays of instruments and multi-instrument observations. The focus is small instruments or suites of instruments as opposed to facility-scale observatorie	x				dec_white_paper.pdf	149LessardMarcR.pdf	
Lewis, Laurel M.	self (company pending)	The Determination of the Effects of Major Impacts on Global Geophysical and Geological Parameters	An integrated study of global geologic and geophysical parameters in response to solar/galactic fields in order to better understand the past influence impact has had on Earth history as well as to better determine the probability of future events.	x	x	x		The Determination of the Effects of Major Impact on .doc	150LewisLaurelM.doc	
Li, Gang	CSPAR, Univ. of Alabama Huntsville	A "swarm" Mission to Study Particle Acceleration at Interplanetary Shocks	We propose a mission to study particle acceleration at interplanetary shocks via a swarm of spacecraft. Energetic particle measurement will be obtained at the mothership and simultaneous measurements of plasma and magnetic field with a spatial separation will be obtained at multiple sub-spacecraft.			x		LiGang-SH.pdf	151LiGang-SH.pdf	
Li, Xinlin	University of Colorado at Boulder	Energetic Particles from a highly Inclined Constellation (EPhIC)	This proposed mission addresses:(1) solar flares and solar energetic particles reaching at Earth, (2) the loss rate of Earth's radiation belt electrons, and (3) the effect of these energetic particles on the chemistry and dynamics of Earth's middle and upper atmosphere.	x	x	x		EPIC-white-submitted.pdf	152LiXinlin.pdf	
Liewer, Paulett C.	Jet Propulsion Laboratory, California Institute of Technology	Solar Polar Imager: Observing Solar Activity from a New Perspective	The Solar Polar Imager mission, in a 0.48-AU orbit with an inclination of 75º, targets the unexplored polar regions enabling crucial observations not possible from lower latitudes. The orbit is achieved using a solar sail, a technology now demonstrated in space by the Japanese IKAROS mission.			x		SolarPolarImager_Liewer.pdf	153LiewerPaulettC.pdf	
Lin, Chin S	Air Force Research Laboratory	PREDICT NEUTRAL DENSITY	Orbital aerodynamic drag continues to be the largest uncertainty in determining trajectories of satellites operating in Earth's upper atmosphere below about 600 km. Significant improvements in predicting satellite drag will come from the use of physics-based atmospheric density models in place of t	x				LinChinS2-AIM.pdf	154LinChinS2-AIM.pdf	
Lin, Chin S.	Air Force Research Laboratory	Research-to-Operation of Predicting Neutral Density	Significant improvements in research-to-operation of predicting satellite drag will come from the use of physics-based atmospheric density models. This will lead to a near-real-time, accurate operational capability to estimate future locations of satellites with high accuracy.				x	LinChinS2.pdf	155LinChinS2.pdf	
Lin, Chin S.	Air Force Research Laboratory	CubeSat Orbital Drag Experiment	A major thermospheric variability societal impact is the space debris threat to manned missions and satellites. Exploiting the CubeSat opportunity provides the unprecedented capability of long-term, routine high-accuracy measurements of thermospheric variability by accelerometers.	x				LinChinS1-AIM.pdf	156LinChinS1-AIM.pdf	
Lin, Robert P.	Univ. o California, Berkeley	Expansion of the Heliophysics Explorer Program	We point out that Heliophysics Explorer missions have the best success record in all respects of any space missions. We recommend that Heliophysics Explorers be axpanded to one per year: MIDEX expanded in scope to use Atlas/Delta ELVs: a Mini-Explorer be started; Missions of Opportunity continued.				x	LinRobertP.doc	157LinRobertP.doc	
Lin, Robert P.	Univ. of California, Berkeley	The Multi-spacecraft Inner Heliosphere Explorer (HELIX)	We propose a five spacecraft mission to study large scale solar transients in the inner heliosphere and their acceleration of particles to high energies.			x		LinRobertP-SH2.doc	158LinRobertP-SH2.doc	
Lin, Robert P.	Space Sciences Laboratory, University of California, Berkeley	Solar Eruptive Events (SEE) 2020 Mission Concept	We propose a complement of advanced new instruments focusing on the coronal energy release and particle acceleration sites of major solar eruptive events. The observations will provide detailed diagnostics of the magnetic fields, energetic particles, mass motions, and plasmas.			x		LinRobertP-SH.pdf	159LinRobertP-SH.pdf	
Lind, Frank D.	MIT Haystack Observatory	Next Generation Space Science with the Geospace Array	The Geospace Array is a next generation digital radio array capable of measurement of the Geospace environment. The system would be deployed globally to address science topics from the lower atmosphere, through the ionosphere and heliosphere, and to the surface of the Sun and beyond.	x	x	x		nas_decadal_strategy_geoarray_nov2010.pdf	160LindFrankD.pdf	
Livi,Stefano A.	Southwest Research Institute	Solar Wind Ion Composition Measurements	The chemical composition and charge state distribution of heavy ion elements in the solar wind will establish the physical links between the outward transport of solar energy and the solar wind, will provide direct measurements of solar eruption products in coronal mass ejections, and will discover			x		LiviStefanoA-SH.pdf	167LiviStefanoA-SH.pdf	
Love, Jeffrey J.	USGS Geomagnetism Program	Long--term coordinated ground and satellite monitoring of the ring current	We propose improved long-term, low-latitude ground and space-based magnetometer monitoring for at least an entire solar cycle. This will enable a separation of the combined effects of magnetospheric and ionospheric currents, leading to improved space-weather diagnositics.	x				Long-term-monitoring.pdf	161LoveJeffreyJ.pdf	

Luhmann, Janet G.	University of California, Berkeley	Guest Investigator and Participating Scientist Programs	Guest Investigator (GI) and Participating Scientist (PS) programs, and mission modeling and theory teams, provide major enhancements to the science potential of NASA's missions. The Decadal Survey needs to assess the funding missions should invest in such programs.				x	LuhmannJanet.pdf	162LuhmannJanet.pdf	
Luhmann, Janet G.	University of California, Berkeley	Extended Missions: Engines of Heliophysics System Science	This white paper summarizes arguments for supporting the Heliophysics System Observatory (HSO), the engine of heliospheric systems science. HSO incorporates a broad suite of missions in their prime and extended phases. The MO&DA for these missions must be considered as part of the Decadal Survey.				x	LuhmannJanetG.pdf	163LuhmannJanetG.pdf	
Lyons, Larry R.	UCLA	Conceptual Framework for Space Weather Dynamics: an Interplay of Large and Mesoscale Structure within the Nightside Magnetosphere-Ionosphere-Thermosphere System	New facilities and model development now allow for unprecedented comprehensive interdisciplinary study of the coupled magnetosphere-ionosphere-thermosphere system. Coordinated use of these capabilities has the potential for transformational understanding of structure, dynamics, and disturbances.	x				LyonsLarryR-AIM.pdf	164LyonsLarryR-AIM.pdf	
Lystrup, Makenzie	Laboratory for Atmospheric & Space Physics, University of Colorado at Boulder	A Multi-Spacecraft Jupiter Space Plasma Explorer	We propose a multi-spacecraft Jupiter explorer mission to measure the jovispace plasma environment in key locations simultaneously - within & without the magnetosphere, in the plasma disc & in boundary regions, in the dawn & dusk flanks - all while monitoring solar wind and auroral energy output.	x	x			LystrupMakenzie-SWM.pdf	165LystrupMakenzie-SWM.pdf	
Mabie, Justin J	U. of Colorado, CIRES at NOAA	A Comprehensive and Continuous Record of Ground Based Space Weather Observations	A comprehensive climatology of ground based space weather observations collected from magnetometers, ionosondes, and other methods must be modernized so that our robust suite of observations are available for data assimilation.	x		x		MabieJustinJ-AIM.pdf	166MabieJustinJ-AIM.pdf	
MacDonald, Elizabeth A.	Los Alamos National Laboratory	A science mission concept to actively probe magnetosphere-ionosphere coupling	This mission concept describes how directly mapping magnetic field lines from a magnetospheric satellite to their ionospheric footpoints using an on-board electron emitter and ground imaging techniques can answer long standing fundamental questions of magnetosphere-ionosphere coupling	x	x			MacDonaldElizabethA-AIM-SWM.pdf	168MacDonaldElizabethA-AIM-SWM.pdf	
Makela, Jonathan J.	University of Illinois at Urbana-Champaign	A North American Thermosphere Ionosphere Observation Network	Ground-based multi-instrument sites are needed to understand fundamental spatio-temporal processes in the Earth's ionosphere/thermosphere/mesosphere system. Scientific justification and potential instruments are described.	x				MakelaJonathanJ-AIM.pdf	169MakelaJonathanJ-AIM.pdf	
Mannucci, Anthony J,	Jet Propulsion Laboratory, California Institute Of Technology	Global Ionospheric Storms	We discuss Global Ionospheric Storms as an important sub-field of study within solar and space physics. Outstanding science questions are discussed as well as methods to address them.	x				MannucciAnthonyJ-AIM.pdf	170MannucciAnthonyJ-AIM1.pdf	
Mannucci, Anthony J.	Jet Propulsion Laboratory, California Institute Of Technology	Research To Operations: Continuous Improvement	Operational effectiveness benefits from research targeted towards improving capability. This white paper suggests a path forward that, over time, will lead to steadily improving operational capabilities in space weather.	x				MannucciAnthonyJ-AIM.pdf	171MannucciAnthonyJ-AIM.pdf	
Mannucci, Anthony J.	Jet Propulsion Laboratory, California Institute Of Technology	GNSS Geospace Constellation (GGC): A Cubesat Space Weather Mission Concept	We recommend technology investment in miniaturized GPS receivers that can be deployed on Cubesats for ionospheric remote sensing .	x				MannucciAnthonyJ-AIM.pdf	172MannucciAnthonyJ-AIM2.pdf	
Mannucci, Anthony J.	Jet Propulsion Laboratory, California Institute of Technology	Estimating The Forces That Drive Ionosphere And Thermosphere Variability: Continuous Data And Assimilative Modeling	We advocate developing a model-based approach to retrieving the driving forces from measurements of electron density structure and dynamics.	x				MannucciAnthonyJ-AIM.pdf	173MannucciAnthonyJ-AIM3.pdf	
Marshall, Robert A	Boston University	Ionospheric forcing from below: Effects of lightning	The ionosphere experiences forcing from above and from below, the latter in the form of gravity waves, tides, and lightning. The global effect of lightning on the ionosphere is not yet understood; extension of single-discharge studies to global effects are required to quantify the coupling.	x				MarshallRobertA-AIM-2.pdf	174MarshallRobertA-AIM-2.pdf	
Marshall, Robert A	Boston University	Ground-based Space Weather Instrument Suites	We propose that the geoscience community foster a class of instrumentation that involves multi-instrument ground-based suites, similar to satellite instrumentation. Each location on the ground should host an integrated suite of instruments, which are duplicated at different sites.	x	x			MarshallRobertA-AIM-1.pdf	175MarshallRobertA-AIM-1.pdf	
Martinis, Carlos	Boston University	Neutral winds in the upper atmosphere	Neutral winds in the upper atmosphere are very important for understanding many processes involving electro-dynamics and ion-neutral coupling. Neutral winds are very poorly represented in current models. The community needs to be able to measure these winds in a global spatial and temporal scale.	x				MartinisCarlos-AIM.pdf	176MartinisCarlos-AIM.pdf	
Matthaeus, William H.	University of Delaware	Turbulence and Nonlinear Dynamics and its many effects in Solar and Heliospheric Physics	This White Paper calls attention to the broad implications of nonlinearity and turbulence within the complex, coupled solar and heliospheric system. A major theme in the prior Survey, we suggest this emphasis be continued. Implications for basic science and for various programs are suggested.		x	x		MatthaeusWilliamH-SH.pdf	177MatthaeusWilliamH-SH.pdf	
Mauel, Michael E	Columbia University	Development and Validation of Space Weather Models using Laboratory Dipole Experiments	The capabilities of laboratory dipole plasma experiments have advanced dramatically during the past fifteen years, and today's dipole experiments present remarkable opportunities for the development and validation of Space Weather models of magnetospheric dynamics.	x	x			Lab_Dipole_WhitePaper.pdf	178MauelMikeE-SWM.pdf	
mazur, joseph E.	The Aerospace Corporation	Ultra-heavy nuclei in solar flare: the rarest elements in the Sun	UH abundances are important in understanding nucleosynthesis and further processing of matter in flare acceleration, interplanetary acceleration, and transport.			x		MazurJosephE2-SH.pdf	179MazurJosephE2-SH.pdf	
mazur, joseph E.	The Aerospace Corporation	Low-impact space environment sensors required on every NASA space vehicle	There exists a class of space environment sensors that are designed to monitor the effects of space hazards for engineering. This proposal includes the requirement to field such low-impact sensors on every vehicle and the requirement to collect and synthesize the data in a centralized repository.				x	MazurJosephE2-none.pdf	180MazurJosephE2-none.pdf	
mazur, joseph E.	The Aerospace Corporation	Need to measure solar energetic particle ionization states from ~1 to above 100 MeV/nucleon	The ionization state of solar energetic particles is a critical parameter for understanding their acceleration and propagation. We propose one or more charged particle sensors in low-Earth polar orbit to infer the ionization state using the geomagnetic cutoff technique.			x		MazurJosephE1-SH.pdf	181MazurJosephE1-SH.pdf	
mazur, joseph E.	The Aerospace Corporation	Unintended effects of increasing reliance on science requirements	NASA science missions are increasingly tracked with project management systems that establish and monitor requirements for science in the same way that engineering requirements and DOD mission requirements are tracked and managed. There are several unintended consequences of this approach.				x	MazurJosephE1-none.pdf	182MazurJosephE1-none.pdf	
Mazur, Joseph E.	The Aerospace Corporation	Unexploited heliophysics data sets	There are several near-Earth space science instruments that are currently returning particle and plasma data from highly-inclined and low-Earth orbit. These are valuable datasets for research into the sources and dynamics of the near-Earth trapped and precipitating particle environments.		x			MazurJosephE-SWM.pdf	183MazurJosephE-SWM.pdf	
McComas, David J.	Southwest Research Institute	Interstellar MApping Probe (IMAP) mission concept: Illuminating the dark boundaries at the edge of our solar system	Interstellar MApping Probe (IMAP) is a small-class mission that enables discovery of the detailed processes of the heliosphere/LISM interaction. Recent IBEX and other observations have exposed a broad range of fundamental open issues that call out for an advanced mission – IMAP – for resolution.			x		McComasDavidJ-SH.pdf	184McComasDavidJ-SH.pdf	
McConnell, Mark L.	University of New Hampshire	X-Ray and Gamma-Ray ?Polarimetry of Solar Flares	A determination of the extent to which flare accelerated electrons are beamed constitutes an essential step towards a greater understanding of particle acceleration in solar flares. Robust high energy polarization measurements offer the most effective means of measuring the electron beaming.			x		McConnellMarkL-SH.pdf	185McConnellMarkL-SH.pdf	
McCormack, John P.	Naval Research Laboratory	High Altitude Data Assimilation: Characterizing the Effects of Solar Variability from the Ground to the Thermosphere	To improve the observational characterization of the atmospheric response to solar variations, the Sun-Earth research community needs a high-altitude data assimilation system capable of exploiting a both satellite-based and ground-based observations using state-of-the-art assimilation techniques.	x				McCormackJohnP-AIM.pdf	186McCormackJohnP-AIM.pdf	

McDonald, Sarah E.	Naval Research Laboratory	The Importance of Thermospheric Winds for Ionospheric Modeling	Variations in the neutral wind drive a complex system of ionospheric currents and electric fields, which profoundly influence the structure and composition of the ionosphere. We present specific examples where neutral wind measurements are needed to enable reliable ionospheric modeling.	x				McDonaldSarahE-AIM.pdf	187McDonaldSarahE-AIM.pdf	
McHarg, Matthew G.	US Air Force Academy	Measuring Energy Inputs and ITM Response Using a Constellation of Small Satellites	Measuring Energy Inputs and ITM Response Using a Constellation of Small Satellites	x				McHargMatthewG-AIM.pdf	188McHargMatthewG-AIM.pdf	
McIntosh, Scott W.	High Altitude Observatory	The Solar Chromosphere: The Inner Frontier of the Heliospheric System	Understanding the solar chromosphere will open a new window onto mass and energy transport at the crucial innermost boundary of the heliospheric system. This white paper discusses the status of chromospheric physics and the frontiers that are opening up following recent observational discoveries.			x		McIntoshScottW-SH.pdf	189McIntoshScottW-SH.pdf	
McIntosh, Scott W.	High Altitude Observatory	ChroMag: The Community Synoptic Chromospheric Magnetograph	The Community Synoptic Chromospheric Magnetograph (ChroMag) is designed with the goal of capturing the relentlessly dynamic chromospheric environment through cutting-edge multi-wavelength imaging spectro-polarimetry of the full solar disk at a resolution approaching one arcsecond, in a few seconds.			x		McIntoshScott-SH-ChroMag.pdf	190McIntoshScott-SH-ChroMag.pdf	
McNutt, Ralph L., Jr.	Johns Hopkins University Applied Physics Laboratory	Interstellar Probe	We describe an Interstellar Probe that can be launched during the coming decade. We conclude that such a mission is feasible and discuss (1) the concept, (2) implications for solar and space physics, (3) estimated cost, and (4) how this concept meets Heliophysics Decadal Survey criteria.			x		McNuttRalphLJr-SH.pdf	191McNuttRalphLJr-SH.pdf	
Merkin, Viacheslav G.	Johns Hopkins University Applied Physics Laboratory	Synergy Between Large Data Sets, First-Principles and Empirical Models of the Magnetosphere	This white paper advocates for the need of support for programs that build on synergy between currently available and future large data sets of ionospheric and magnetospheric measurements and physics-based models of the ionosphere-thermosphere-magnetosphere system.	x				MerkinViacheslavG-AIM.pdf	192MerkinViacheslavG-AIM.pdf	
Mertens, Christopher J.	NASA Langley Research Center	Nowcast of Atmospheric Ionizing Radiation for Aviation Safety	The Nowcast of Atmospheric Ionizing Radiation for Aviation Safety (NAIRAS) is a prototype operational model for predicting commercial aircraft radiation exposure from galactic and solar cosmic rays [Mertens et al., 2008, 2010]. The NAIRAS model addresses an important national need with broad societa	x	x	x		NAIRASWhitePaper_Mertens_Final.pdf	193MertensChristopherJ.pdf	
Mertens, Christopher J.	NASA Langley Research Center	Ionospheric E-Region Chemistry and Energetics	We propose an Earth-observing, multi-satellite science mission to explore the last remaining frontier in upper atmospheric research – the ionospheric E-region. A quantitative understanding of the E-region is essential to understanding the state of the entire global ionosphere-thermosphere system, ye	x				EregionWhitePaper_Mertens_Final.pdf	**194MertensChristopherJ.pdf**	
Miesch, Mark, S	National Center for Atmospheric Research	The Importance of Polar Observations in Understanding the Solar Dynamo	The polar regions of the Sun play a critical role in the operation of the global solar dynamo but reliable observational data is currently lacking. An out-of-the-ecliptic space mission would remedy this, providing transformative insight into the dynamic origins of cyclic solar magnetic activity.			x		MieschMarkS-SH.pdf	195MieschMarkS-SH.pdf	
Millan, Robyn M.	Dartmouth College	NASA's Balloon Program: Providing World-Class Science, Technology Development, and Vital Training of the Next Generation of Space Physicists	This paper summarizes examples of balloon-based science accomplishments and future opportunities. We are advocating continued support of the ULDB program, increased support for small and mid-sized payloads and balloon flotillas, and appropriately scaled funding for development of new experiments.	x	x	x		MillanRobynM-SH.pdf	196MillanRobynM-SH.pdf	
Miller, Ethan S.	Johns Hopkins University Applied Physics Laboratory	Initiation of Irregularities in the Equatorial F-Region Ionosphere	Initiation of irregularities in the equatorial F region ionosphere remains an important problem. In this brief paper, we explore several theories and a variety of space- and ground-based measurements that will be useful to test these theories.	x				Miller_Decadal_Survey_2010_rev1.pdf	197MillerEthanS.pdf	
Mitchell, Donald G.	JHU/APL	GEospace Magnetosphere-Ionosphere-Neutral Interaction (GEMINI)	GEMINI uses two identical spacecraft in an 8 RE circular polar orbit for global, continuous imaging of the ring current, plasma sphere, atmospheric UV and auroral emissions. These, along with ground-based networks, other LEO existing assets, and global modeling address coupling of the AIM system.	x	x			MitchellDonaldG-AIM.pdf	198MitchellDonaldG-AIM.pdf	
Mitchell, Elizabeth J.	NASA/GSFC	Center for Magnetosphere and Ionosphere Decoupling Investigations	Current MHD models can simulate the asymmetric ionospheric conditions, but the ring current and radiation belt models assume polar cap symmetry, which is known to be erroneous. In order to address this lack, an initiative is outlined and a science and technology center is suggested.	x	x			MitchellElizabethJ-SWM.pdf	199MitchellElizabethJ-SWM.pdf	
Mlynczak, Martin G.	NASA Langley Research Center	Spectral Signatures of Geospace Climate Change	We propose continued measurement of infrared spectral signatures of the energy balance of the geospace environment. These measurements can be used to identify and attribute causes and consequences of geospace climate change.	x		x		MlynczakMartinG-AIM.doc	200MlynczakMartinG-AIM.doc	
Moebius, Eberhard	Space Science Center & Department of Physics, University of NH	NASA's Explorer Program as a Vital Element to Further Heliophysics Research	Explorers are vital to a mix of large and small mission opportunities for Heliophysics to maintain an innovative research, a diverse infrastructure, and to train the future workforce. An annual increase in Explorer funding by $50M is needed to return to an average launch rate of 1/year.	x	x	x		MoebiusEberhard-AIM-SH-SWM.doc	201MoebiusEberhard-AIM-SH-SWM.doc	
Moore, Thomas E.	NASA's Goddard Space Flight Center	Mechanisms of Energetic Mass Ejection	MEME will achieve the overarching objective: "Origins of Near Earth Plasmas; to understand the transport of terrestrial gas and plasma from its atmospheric source into the Magnetosphere and downstream Solar Wind" (2009 Heliophysics Roadmap).	x				MooreThomasE-AIM.pdf	202MooreThomasE-AIM.pdf	
Moore, Thomas E.	NASA's Goddard Space Flight Center	Laboratory for Active Space Experiment Research (LASER)	A case is presented for the resumption of active space experimentation in Heliophysics. A review of the history of such experiments indicates important successes, and a survey of known concepts for future experiments suggests outstanding opportunities.	x	x	x		MooreThomasE-SWM.pdf	203MooreThomasE-SWM.pdf	
Nossal, Susan M.	University of Wisconsin-Madison	Long Term Observations for Trend Studies	This white paper addresses the importance of long-term observations for understanding the chemical and physical processes affecting the whole atmosphere system, as well as recommendations for obtaining observations to enable long-term trend studies into the future.	x				NossalSusanM-AIM.pdf	204NossalSusanM-AIM.pdf	
Oberheide, Jens	Clemson University	Short-term variability of the IT system	We propose that the A-I-M panel recommends a comprehensive observation program to untangle the complex web of interacting processes and wave coupling that causes day-to-day variability in the IT system. The program should comprise a minimum of four identical spacecrafts supported by GB observations.	x				OberheideJens-AIM.pdf	205OberheideJens-AIM.pdf	
Oberoi, Divya	MIT Haystack Observatory	Heliospheric Science at Low Radio Frequencies	We describe how the new generation of low radio frequency telescopes provides effective means to exploit the electromagnetic propagation effects to probe the heliosphere and present the possibility of characterizing it in unprecedented detail.			x		OberoiDivya2-SH.pdf	206OberoiDivya2-SH.pdf	
Oberoi, Divya	MIT Haystack Observatory	High-Fidelity Coronal Imaging at Low Radio Frequencies	We describe how spectroscopic imaging of the Sun at low radio frequencies with next-generation radio interferometers can play a crucial role in addressing many long-standing puzzles related to magnetic fields and heating mechanisms in the solar corona.			x		OberoiDivya1-SH.pdf	**207OberoiDivya1-SH.pdf**	
O'Brien, Thomas P.	The Aerospace Corporation	Long-term monitoring of the global space environment	A specific proposal for a long-term inner magnetosphere monitor in a geosynchronous transfer orbit, and a general proposal for NASA-to-NOAA (research to operations) transfer of future NASA explorers after the end of their science mission.		x			OBrienThomasP-SWM.doc	208OBrienThomasP-SWM.doc	
Osten, Rachel A.	Space Telescope Science Institute	Deepening the Solar/Stellar Connection for a Better Understanding of Solar and Stellar Variability	The primary focus of this white paper is on solar and stellar variability. The purpose is to motivate a deepening of the solar/stellar connection, by recognizing it as a mutual relationship from which both solar physicists and stellar astronomers can benefit.			x		OstenRachelA-SH.pdf	**209OstenRachelA-SH.pdf**	

Papadopoulos, Dennis	University of Maryland	Active Experiments in Space - Ionospheric Heaters	A program that uses ionospheric heaters with ground and space diagnostics to study in a "cause and effect" space plasma processes of key importance to space plasma physics and geophysics is needed. We need to add an AMISR at HAARP, complete Arecibo and add a heater in Jicamarca.	x				PapadopoulosDennis-AIM.pdf	210PapadopoulosDennis-AIM.pdf	
Pevtsov, Alexei, A	National Solar Observatory	Long-term plan for groundbased solar physics	This letter to Heliophysics Decadal Survey draws attention to need for development a comprehensive long-term plan for groundbased solar physics.			x		letter2helio_decadal.doc	211PevtsovAlexeiA.doc	
Pfaff, Rob	NASA/Goddard Space Flight Center	Understanding Geospace on a Grand Scale: The Global Ionosphere/Thermosphere Constellation	A Frontier Mission consisting of a constellation of observing platforms that would sample the ionosphere and thermosphere at all local times and latitudes and hence provide a revolutionary advance towards understanding the processes that define this critical region of Geospace is described.REVISED	x				Pfaff_Robert-AIM_REVISED.pdf	212Pfaff_Robert-AIM_REVISED.pdf	
Pfaff, Robert	NASA/Goddard Space Flight Center	Sounding Rockets as Indispensable Research Platforms for Heliophysics Research and Development of a High Altitude Sounding Rocket	This white paper first provides an overview of the rocket program's capabilities that are critical for Heliophysics Research. It then describes the very exciting High Altitude Sounding Rocket (HASR) initiative.	x		x		HASR_White_Paepr_Pfaff_v2.doc	213PfaffRobertHASR.doc	
Pilewskie, Peter	Laboratory for Atmospheric and Space Physics, University of Colorado	The Total and Spectral Solar Irradiance Sensor: Response to the National Academy of Science Decadal Strategy for Solar and Space Physics	This paper recommends continuity of the measurements of total and spectral solar irradiance from space. The primary application is for climate studies. Solar irradiance is also highly relevant for solar modeling and space weather.			x		PilewskiePeter-SH.pdf	214PilewskiePeter-SH.pdf	
Podesta, John	Los Alamos National Lab	High-resolution, high-accuracy plasma, electric, and magnetic field measurements for discovery of kinetic plasma structures and processes in the evolving solar wind	Addresses the need for high cadence, high accuracy plasma and field measurements to diagnose kinetic scale processes in the solar wind and interplanetary medium		x	x		WhitePaper.pdf	215PodestaJohn.pdf	
Rast, Mark P.	University of Colorado, Boulder	Next Steps in Solar Spectral Irradiance Studies	Understanding the solar spectral output and its coupling to climate is a challenge to be met in the next decade. Essential: full-disk radiometric imaging of the Sun, high-res observation and modeling of globally unresolved dynamics, coupling to models of radiative and dynamical processes at Earth.			x		RastMarkP-SH.pdf	**216RastMarkP-SH.pdf**	
Reardon, Kevin P.	National Solar Observatory	Approaches to Optimize Scientific Productivity of Ground-based Solar Telescopes	There is clear value in the broader use of high-resolution, ground-based solar observations by the solar physics community and the need for university programs to train young scientists in the analysis of such data. Efforts to increase the accessibility of ground-based data should be supported.			x		ReardonKevinP-SH.pdf	217ReardonKevinP-SH.pdf	
Rempel, Matthias	High Altitude Observatory / NCAR	Modeling of magnetic flux emergence across scales	The paper summarizes recent progress in modeling flux emergence from the base of the convection zone into the solar corona. Future progress requires enhanced modeling capabilities and large coordinated teams of investigators that are currently not supported through available programs.			x		RempelMatthias-SH.pdf	218RempelMatthias-SH.pdf	
Retterer, John M.	Air Force Research Lab.	Next Gen IT Modeling Infrastructure for Space Weather Forecasting	Describes new infrastructure required for progress in Ionosphere/Thermosphere modeling, both for scientific progress and operational utility	x				RettererJohnM-AIM.pdf	219RettererJohnM-AIM.pdf	
Richardson, John D.	M.I.T.	THE HELIOSPHERIC INTERACTION WITH THE LISM: OBSERVATIONS AND MODELS	This white paper emphasizes the scientific progress to be made by continuation of the Voyager mission with appropriate theoretical and modeling support. The Voyagers are making the first measurements in the heliosheath and are likely to make the first in situ measurements of the LISM. The Voyagers are invaluable and irreplaceable scientific resources for developing our understanding of this most recently discovered and novel plasma regime--the heliosheath and its transition to the interstellar medium.			x		richardsonjohnd-SH.pdf	220richardsonjohnd-SH.pdf	
Rickard, Lee J	University of New Mexico	The Long Wavelength Array (LWA): A Large HF/VHF Array for Solar Physics, Ionospheric Science, and Solar Radar	The Long Wavelength Array (LWA), currently under construction in New Mexico, will be an imaging HF/VHF interferometer providing a new approach for studying the Sun-Earth environment from the surface of the sun through the Earth's ionosphere.	x	x	x		RickardLeeJ-SH.pdf	221RickardLeeJ-SH.pdf	
Ridley, Aaron J.	University of Michigan	A Constellation Mission to Understand the Thermospheric Reaction to Energy Input Across Scales	We propose a ionosphere/thermosphere constellation mission utilizing Micro-Satellites to study the dynamics of the upper atmosphere after energy input.	x				RidleyAaronJ-AIM.pdf	222RidleyAaronJ-AIM.pdf	
Roberts, D Aaron	NASA GSFC	The Heliophysics Data Environment as an Enabler of HP Science of the Next Decade	This paper argues for the continued support of a "Heliophysics Information System," as recommended in the previous HP Decadal Report, and as is being developed by many groups. General agreement on interoperability standards will be needed, and all groups should adopt clear open data policies.	x	x	x		RobertsDAaron-AIMSHSWM.doc	223RobertsDAaron-AIMSHSWM.doc	
Roddy, Patrick A.	AFRL	The Atmospheric Density Specification Experiment	Current models of the neutral thermosphere are inadequate because they are data starved. A neutral mass spectrometer mission is needed to feed these models and improve atmospheric drag forecasts.	x				RoddyPatrickA-AIM.pdf	224RoddyPatrickA-AIM.pdf	
Roelof, Edmond C.	Johns Hopkins U./Applied Physics Lab.	Telemachus Redux	Telemachus is a technologically-ready low-to-medium cost dual-mode mission that addresses basic science questions of the dynamics of (1) the sub-surface, surface, and coronal dynamics of the polar regions of the Sun, and (2) the non-ecliptic solar wind, fields and energetic particles.			x		RoelofEdmondC-SH.pdf	225RoelofEdmondC-SH.pdf	
Rowland, Douglas E.	NASA Goddard Space Flight Center	The Tropical Coupler mission	Tropical Coupler will, for the first time, provide a complete understanding of the forcing of the ionosphere and lower thermosphere by stratospheric and tropospheric effects at low latitudes, as well as determine the causes and consequences of internal ionospheric instabilities.	x				RowlandDouglasE-AIM.pdf	226RowlandDouglasE-AIM.pdf	
Russell, Christopher T.	University of California, Los Angeles	Determination of how charged interplanetary dust affects the flowing magnetized solar wind	The dust in orbit about the Sun has a mass density similar to that of the solar wind plasma. Since the dust is charged and the solar wind has an electric field in the frame of the dust, the solar wind and dust have mutual effects on each other. There is little understanding of this interaction.			x		RussellChristopherT-SH.doc	227RussellChristopherT-SH.doc	
Ryan, James M	University of New Hampshire	Ground Based Measurements of Galactic and Solar Cosmic Rays	A white paper discussing the merits of measuring and monitoring solar and galactic cosmic rays at ground level. Resending, because I am worried that I sent an incorrect format.			x		RyanJamesM-SH.pdf	228RyanJamesM-SH.pdf	
Rymer, Abigail M.	JHU/APL	The Case for Exploring Uranus' Magnetosphere.	We advocate support from the heliophysics community for a dedicated mission to Uranus, launched in the time-frame 2020-2023 and designed to make detailed in-situ observations of the unique Uranian magnetosphere.		x			RymerAbigailM-SWM.pdf	229RymerAbigailM-SWM.pdf	
Sanchez, Ennio R.	SRI International	Magnetic Meridian Ring of Incoherent Scatter Radars supporting science discovery and tracing AIM weather, climate, and global change	The Magnetic Meridian Ring is a concept to locate atmospheric observatories, built around incoherent scatter radars, at points all around a single geomagnetic meridian. It will provide global system scientists, modelers, and data consumers with the high quality data they require.	x	x			SanchezEnnioR-AIM.pdf	230SanchezEnnioR-AIM.pdf	
Scherb, Frank	University of Wisconsin-Madison	The Abundance of Deuterium and He3 in the Solar Wind	The abundance of deuterium in the solar wind is not known, and is probably associated with solar activity. This paper describes a novel instrument for detecting and measuring solar wind deuterium.			x		SherbFrank-SH.pdf.pdf	231SherbFrank-SH.pdf.pdf	
Schreiner, William S.	University Corporation for Atmospheric Research	Using space-based GNSS radio occultation data for ionospheric and space weather applications	Global Navigation Satellite System radio occultation data can provide global measurements of ionospheric TEC, density and scintillations. A follow-on COSMIC-2 mission consisting of a 12-satellite constellation would provide enormous benefit to ionospheric research and operational space weather.	x				SchreinerWilliamS-AIM.doc	232SchreinerWilliamS-AIM.doc	
Schrijver, Carolus J.	Lockheed Martin Advanced Technology Center	The solar magnetic dynamo and its role in the formation and evolution of the Sun, in the habitability of its planets, and in space weather around Earth.	The solar magnetic dynamo is the driver of all space weather, past, present, and future. Understanding thedynamo requires that we combine numerical studies and theory with observations of the evolving surface field of Sun and stars, and of solar and stellar internal flows.			x		SchrijverCarolusJ-SH.pdf	233SchrijverCarolusJ-SH.pdf	

Schwadron, N. A.	University of New Hampshire	Research to Operations (Res2Ops) -- Opportunities for Center Development	The required breadth of expertise needed for successful transitioning of research to operations lends itself to the formation of a number of research-to-operations Centers at Universities and Labs.To be sustainable, such centers need to be able to compete for a predictable funding resource.	x		x		ResearchtoOperationsCenters_v3.pdf	234SchwadronNARtOCenters.pdf	
Schwadron, Nathan A.	University of New Hampshire	NESSC Summer School for Undergraduates in Space Physics	The New England Space Science Consortium (NESSC) can provide both governance and lecturers in a new one or two week summer school for undergraduate students that provides students with an intellectual background to help in the pursuit of research projects (e.g., an REU gateway) and graduate programs	x	x	x		NESSC Summer School Whitepaper 2010-4.pdf	235SchwadronNA.pdf	
Semeter, Joshua	Boston University	Energy Transfer from the Solar Wind to the Solid Earth	The solar wind exerts a force on the magnetosphere of 100 million Newtons, which is transferred, magnetically, to the solid Earth. The global force balance governing this interaction is established using distributed measurements from ground and from space, coupled through first-principles modeling	x	x			Decadal_WhitePaper_0.pdf	236SemeterJoshua.pdf	
Shih, Albert Y.	NASA Goddard Space Flight Center	Solar Ion Acceleration and the Flaring Atmosphere	We discuss the open science questions, the remotely observable signatures (e.g., gamma rays, neutrons, and ENAs), and several instrument concepts that are associated with understanding solar ion acceleration, as well as the aspects of the flaring atmosphere that are probed by energetic ions.			x		ShihAlbertY-SH.pdf	237ShihAlbertY-SH.pdf	
Siskind, David E	Naval Research Laboratory	Dynamical Ground-to-Space (G2S) Coupler	Outlines the recent science linking the lower to the upper atmosphere and discusses measurement strategies to understand these couplings.	x				SiskindDavidE-AIM.pdf	238SiskindDavidE-AIM.pdf	
Smith, Charles W.	University of New Hampshire	The Case for Continued, Multi-Point Measurements in Space Science	The distributed assets of space science constitute the heliospheric "Great Observatory" and this unique creation with all the opportunities it represents must be preserved.	x	x	x		SmithCharlesW-ATM-SH-SWM.docx	239SmithCharlesW-ATM-SH-SWM.docx	
Smith, David M.	University of California, Santa Cruz	The High-Energy Sun at High Sensitivity: A NuSTAR Solar Guest Investigation Program	We describe the extraordinary solar science expected from NuSTAR, a NASA Small Explorer satellite to be launched in 2012 primarily for astrophysical observations, and outline the advantages of a dedicated Guest Investigator program specifically to support NuSTAR solar observations.			x		SmithDavidM-SH.pdf	240SmithDavidM-SH.pdf	
Smith, Steven M.	Boston University	Gravity Wave Coupling Processes Between the Lower Atmosphere and the Mesosphere and Lower Thermosphere.	In order to forecast space weather phenomena we need to understand fundamentally the dynamics (e.g., energy and momentum flux budgets, chemistry, etc) of the earth's lower atmosphere as a whole system. In this context, one important and poorly-understood aspect is the precise role that gravity waves, orig	x				SmithStevenM-AIM.pdf	241SmithStevenM-AIM.pdf	
Smith, Steven M.	Boston University	Neutral Temperature and Wind Measurements Earth's Thermosphere.	There is a dire need for accurate neutral temperature and wind climatologies of the earth's lower thermosphere in the altitude range 100 – 300 km. Current models such as the Mass Spectrometer Incoherent Scatter Model (MSIS), the Horizontal Wind Model (HWM) model only capture the basic features of th	x				SmithStevenMM-AIM.pdf	242SmithStevenMM-AIM.pdf	
Snow, Martin A.	University of Colorado/LASP	The Importance of Solar EUV and FUV Irradiance Measurements for Space Weather and Atmospheric Modeling	Extending the data record of solar EUV and FUV irradiances should continue to be a priority of the heliophysics community. Understanding both the long-term (climate) and short-term (space weather) influence of the Sun on the atmosphere is critical.	x				SnowMartinA-AIM.doc	243SnowMartinA-AIM.doc	
Sojka, Jan J.	Utah State University	Adoption of a Paradigm Shift for Space Exploration	We present a case for collaboration between all space science funding agencies to support synergistic activities that benefit all and provide the links between science and applications that will produce the societal benefits that we expect.	x				SojkaJanJ-AIM.pdf	244SojkaJanJ-AIM.pdf	
Solomon, Stanley C.	National Center for Atmospheric Research	Modeling and Measurement of Upper Atmosphere Climate Change	Increasing levels of CO2 and other anthropogenic greenhouse gases are decreasing the temperature of the upper atmosphere, opposite to the response of the lower atmosphere. In order to understand and quantify these changes, a program of model development and space-based measurements is required.	x		x		SolomonStanleyC-AIM.pdf	245SolomonStanleyC-AIM.pdf	
Spann, James F.	NASA MSFC	A cross-agency enabling effort focused on space weather observations and research-to-operation transition	In this white paper we present an approach to address the lack of a robust national coordinated research-to-application program for space weather and a lack of sufficient relevant space- and ground-based observations by proposing a joint federal agency program involving NASA, NOAA and NSF.	x	x	x		SpannJamesF1.pdf	246SpannJamesF1.pdf	
Spann, James F.	NASA MSFC	A NASA Applied Spaceflight Environments Office Concept	This white paper presents a solution to the NASA problem that there is no coordinated activity to harness the valuable knowledge and products across the field centers related to spaceflight environments, which includes space weather.				x	SpannJamesF2.pdf	247SpannJamesF2.pdf	
spann, James F.	NASA MSFC	Dynamic Geospace Coupling Mission	The Dynamic Geospace Coupling science mission addresses fundamental questions related to plasma processes that determine how energy and momentum from the solar wind propagate downward through geospace to Earth. It proposes a multi-spacecraft implementation with imaging and in situ instruments.	x	x			SpannJamesF-AIM-corrected.pdf	248SpannJamesF-AIM-corrected.pdf	
St. Cyr, O. C.	NASA-GSFC	Space Weather Diamond: A 10x improvement in real-time forecasting	This white paper promotes an applied heliophysics mission concept named "Space Weather Diamond" to facilitate the connection between science and societal needs (e.g., improvements in space weather prediction) by providing an order of magnitude improvement over present-day L1 monitors.	x	x	x		StCyr_SWxDiamond_DecadalSurvey_Nov2010.pdf	249StCyr_SWxDiamond_DecadalSurvey_Nov2010.pdf	
St. Cyr, O. C.	NASA-GSFC	Solar Orbiter: Exploring the Sun-Heliosphere Connection	A description of the ESA/NASA Solar Orbiter mission, including the science and mission design			x		StCyr_SolarOrbiter_DecadalSurvey_20101108.pdf	250StCyr_SolarOrbiter_DecadalSurvey_20101108.pdf	
Stephan, Andrew W.	Naval Research Laboratory	Global Ionosphere-Thermosphere-Mesosphere (ITM) Mapping Across Temporal and Spatial Scales	The combination of global imaging and low-altitude sensors measuring ultraviolet airglow provides a robust method for obtaining necessary routine space weather maps of the near-Earth space weather volume for both scientific inquiry and operational users.	x				StephanAndrewW-AIM.pdf	251StephanAndrewW-AIM.pdf	
Stevens, Michael H.	Naval Research Laboratory	Direct Observations of Global-Scale Transport in the Lower Thermosphere	Many ground-based and satellite-borne observations of water vapor exhaust from launch vehicles show that the effects can be global-scale. We will study global-scale dynamics by observing tracers injected by launch vehicles from a satellite in geosynchronous orbit.	x				StevensMichaelH-AIM.pdf	252StevensMichaelH-AIM.pdf	
Stoneback, Russell A	University of Texas at Dallas	Effective Aperture Behavior on the Earth and Sun	An investigation into the apparent equivalence between high latitude currents on both the Earth and Sun to currents used to calculate the diffracted field produced by an aperture is proposed.	x		x		StonebackRussellA-AIM.pdf	253StonebackRussellA-AIM.pdf	
Streltsov, Anatoly V.	Dartmouth College	Multi-scale Electrodynamics of Magnetosphere-Ionosphere Interactions	Observations from satellites, sounding rockets, and radars conducted in the high-latitude magnetosphere and the ionosphere frequently demonstrate intense electromagnetic fields and currents which properties cannot be explained by studying the magnetosphere or the ionosphere separately. Thus, for exa	x				WHITE PAPERS.pdf	254StreltsovAnatolyV.pdf	
Strong, Keith T.	SP Systems at NASA GSFC	4PI: A Global Understanding of the Solar Cycle	The 4PI observation-theory initiative provides the first continuous view of the solar magnetic field and plasma dynamics mapped from below the surface into the corona, over all solar longitudes with extended polar coverage, and tracks the evolution of the dynamo(s) throughout at least a solar cycle.			x		StrongKeithT-SH.doc	255StrongKeithT-SH.doc	
Swenson, Charles, M	Utah State University	CUBESATS IN HELIOPHYSICS RESEARCH	Heliophysics community needs multi-point measurements from within the space environment to make progress on important scientific questions. CubeSat technologies represent a significant opportunity for achieving multipoint observations from within the space environment.	x	x	x		SwensonCharlesM-AIM.doc	256SwensonCharlesM-AIM.doc	
Swenson, Gary R.	University of Illinois, Champaign, Urbana, IL	Remote Sensing the Upper Atmosphere with Lidar from Space	Lidar (Light Detection And Ranging) remote sensing of the atmosphere has now been realized for tropospheric remote sensing of clouds and aerosols on the NASA CALIPSO satellite as part of the A-Train constellation (ref: CALIPSO:Link). NASA also demonstrated cloud lidar on the Space Shuttle with the	x				SwensonGaryR_AIM.pdf	257SwensonGaryR_AIM.pdf	

Szabo, Adam	NASA GSFC	Solar Wind Kinetic Physics: High Time Resolution Solar Wind Measurements from the DSCOVR Mission	The NOAA/USAF refurbished DISCOVR (Deep Space Climate Observatory, formerly known as Triana) mission provides a unique opportunity to obtain unprecedented high time resolution solar wind measurements from the Sun-Earth L1 Lagrange point at minimal NASA cost.		x	x		SzaboA-SWM.pdf	258SzaboA-SWM.pdf	
Szabo, Adam	NASA GSFC	Energetic Particle Propagation and Coronal Mass Ejection Evolution in the Inner Heliosphere: Multi-point in-situ Solar Sentinels Observations	The Solar Sentinels mission, consisting of four, identically instrumented spinning spacecraft in 0.25 x 0.76 AU orbits, will provide in-situ particles and fields observations to answer questions of SEP transport and ICME evolution in the inner heliosphere.			x		SzaboAdam-SH.pdf	259SzaboAdam-SH.pdf	
Talaat, Elsayed R.	JHU/APL	Electrodynamics Observations with Numerous Satellites	A suite of small satellites distributed in local time at F-region altitudes with essential instrumentation would be able address ion-neutral coupling and the roles of the disturbance dynamo, tidal dynamos and magnetospheric penetration electric fields in determining the global electrodynamics.	x				TalaatElsayedR-AIM.pdf	260TalaatElsayedR-AIM.pdf	
Tomczyk, Steven	NCAR/HAO	COSMO - The COronal Solar Magnetism Observatory	We present the science justification and technical overview of the Coronal Solar Magnetism Observatory (COSMO). The COSMO is a facility dedicated to the measurement of magnetic fields and plasma properties in the solar corona to advance our understanding of the Sun's generation of Space Weather.			x		TomczykSteven-SH.pdf	261TomczykSteven-SH.pdf	
Tylka, Allan J.	Naval Research Laboratory	Heliophysics System Science and Funding for Extended Missions	Based on my experience serving on the last three Heliophysics Senior Review panels, I offer suggestions and recommendations regarding adequate funding for extended missions. These issues concern all areas of Heliophysics science.				x	TylkaAllanJ.pdf	262TylkaAllanJ.pdf	
Valladares, Cesar E	Boston College	On understanding the origin of plasma density variability within the polar caps	This document describes two ionospheric processes that contribute to the high variability of the plasma density within the polar cap: Polar cap patches and Sun aligned arcs	x				ValladaresCesarE_AIM.doc	263ValladaresCesarE_AIM.doc	
Velli, Marco	Jet Propulsion Laboratory, California Institute of Tecnology	SAFARI: Solar Activity Far Side Investigation	The Solar Activity Far Side Investigation, or SAFARI, is devoted to exploring the origins of solar magnetic activity by carrying out observations of the velocity and magnetic fields at the solar surface from a vantage point widely separated from the Earth in longitude.			x		VelliMarco-SH.docx	264VelliMarco-SH.docx	
Vourlidas, Angelos	Naval Research Laboratory	Mission to the Sun-Earth L5 Lagrangian Point: An Optimal Platform for Heliophysics & Space Weather Research	We argue that a research-to-operations approach is the best strategy to foster the vibrancy of our field in the next decade. A mission to the L5 Lagrangian point should spearhead this strategy because it enhances both fundamental research and space weather applications.			x		VourlidasAngelos-SH.pdf	265VourlidasAngelos-SH.pdf	
Vourlidas, Angelos	Naval Research Laboratory	A Proposal to Lighten The Burden of International Traffic in Arms Regulations on Heliophysics Research	Since 1999, all science missions are classified as 'defense systems' and are controlled by International Traffic in Arms Regulations. This overly restrictive regulatory regime impedes Heliophysics research. We describe the problem and provide a set of recommendations to improve this situation.	x	x	x		VourlidasAngelos-SH2.pdf	266VourlidasAngelos-SH2.pdf	
Walterscheid, Richard	The Aerospace Corportation	Gravity Wave Propagation in the in the Dissipative and Diffusively Separated Thermosphere	In order to further understanding of the upward coupling of waves from the lower atmosphere new observations combined with models of acoustic-gravity waves for thermospheric regions where rapid dissipation and diffusive separation diffusive separation prevail are required.	x				Walterscheid_Richard_L-AIM2.doc	267Walterscheid_Richard_L-AIM2.doc	
Walterscheid, Richard L.	The Aerospace Corporation	Effects of Large Amplitude Planetary Waves in the Ionosphere and Thermosphere	There is clear evidence that tides and planetary waves strongly affect each other. This is clearly seen in ionospheric data. A particularly interesting case is the rapid amplification of the southern hemisphere two-day wave (TDW) to very large amplitudes via interactions with tides.	x				Walterscheid_Richard_L-AIM.doc	268Walterscheid_Richard_L-AIM.doc	
Walterscheid, Richard L.	The Aerosapce Corporation	The Paired Ionosphere-Thermosphere Orbiters (PITO) Mission: Multipoint Geospace Science in 3D	The PITO concept utilizes two spacecraft in equal but opposite eccentric orbits so that when one is at apogee the other is at perigee and located within the field of view of the other. The measurements combine the best features of remote sensing (coverage) with in situ measurements (detail).	x				Walterscheid_Richard_L-AIM.doc	269Walterscheid_Richard_L-AIM3.doc	
White, Stephen M	AFRL Space Vehicles Directorate	Coronal Magnetic Fields	Coronal magnetic fields hold the key to understanding many of the important phenomena observed in the Sun's atmosphere. This paper outlines the difficulties we face in making advances in this field, and describes the developments needed to make progress over the next decade.			x		WhiteStephenM-SH.pdf	270WhiteStephenM-SH.pdf	
Wood, Kent S.	Naval Research Lab	Continuous FUV/EUV Imaging of the Ionosphere from Geosynchronous Orbit	Low-Earth orbit spectrometers and spectral imagers provide regional observations only at widely-spaced times. New imaging systems will generate measurements in 2-dimensional formats continuously for large regions with high spatial resolution. This paper describes an imager/monitor at geostationary	x				WoodKentS-AIM.pdf	271WoodKentS-AIM.pdf	
Wu,Qian	HAO/NCAR	Global Airglow Interferometer Limb-scanner (GAIL) A New Thermospheric Wind Instrument	In this white paper we describe a new concept of high altitude limb-scan instrument: Global Airglow Interferometer Limb scanner (GAIL), which will measure the thermospheric winds (200 to 300 km) by recording wind induced Doppler shift in the O 630 nm airglow emission day and night. Because GAIL	x				GAIL A globe view of the thermospheric dynamics.docx	272WuQian_GAIL.doc	
Yizengaw, Endawoke	Boston College	Understanding the unique equatorial electrodynamics in the African Sector	The white paper is proposing the ground-based scientific instrument arrays in the African sector, a region that has been devoid of ground-based instrumentation for space science, in order to address the physics behind the unique equatorial ionospheric irregularities and bubbles often observed in the	x				YizengawEndawoke-AIM.pdf	273YizengawEndawoke-AIM.pdf	
Zhang, Shunrong	MIT Haystack Observatory	Understanding upper atmospheric climate and change	Both theoretical models and observational evidence have revealed that Earth's upper atmosphere is cooling and thermospheric density and ionospheric electron density are experiencing corresponding long-term changes. These changes will have strong influence on human activities.	x				ShunrongZhangA-AIM.pdf	274ShunrongZhangA-AIM.pdf	
Zhang, Yongliang	The Johns Hopkins University Applied Physics Laboratory	Partition and variability of the magnetospheric energy input into the polar ionosphere	Multi-satellite and ground-chain measurements provide opportunity to address the questions on partition and variability of the magnetospheric energy input to the polar ionosphere, their dissipation, and their relation to the solar wind condition.	x				ZhangYongliang-AIM.pdf	275ZhangYongliang-AIM.pdf	
Zhou, Xiaoyan	Jet Propulsion Laboratory	Dayside Aurora and Auroral Conjugacy	We discuss the scientific significance of dayside and conjugate auroras that have less ambiguity in the connection to their causes. Measurements of such auroras can be achieved by balloon flights in the Antarctica and by coordinating the balloon with simultaneous Arctic ground-based auroal imaging	x	x			XiaoyanZhou-SWM-AIM.pdf	276XiaoyanZhou-SWM-AIM.pdf	
Zhu, Ping	University of Wisconsin-Madison	Meso Scale Transients in Magnetotail and Their Roles in Substorm Dynamics	We propose to systematically investigate meso scale transients in magnetotail, which may play key roles in mediating and regulating the transition process from the late substorm growth phase to the beginning of onset expansion.		x			ZhuPing-SWM.pdf	277ZhuPing-SWM.pdf	
Onsager, Terrance G.	NOAA Space Weather Prediction Center	Need for Explicit Basic and Applied Research Funding	The Decadal Survey Committee should advocate for distinct lines of funding by the U.S. civilian agencies for: 1. basic space physics research and 2. the development of space weather applications, maintaining distinct requirements for both.	x	x	x		OnsagerTerranceG-AIM-SH-SWM.pdf	279OnsagerTerranceG-AIM-SH-SWM.pdf	
Moses, J.D.	Naval Research Laboratory	Magnetic Properties of the Solar Atmosphere	The structure and dynamics of the solar atmosphere is dominated by the magnetic field. Our current lack of measurements of the coronal magnetic field is a major drawback to advance our understanding of the solar atmosphere. It is now technologically feasible to overcome this observational gap and ob			x		MosesJD-SH.pdf	280MosesJD-SH.pdf	
Vial, Jean-Claude	Institute d'Astrophysique	Fast UV Spectro-imagery for Solar Physics	We argue that imagining Fourier Transform Spectroscopy should be pursued to measure temperature, density, ionization, abundance, along with magnetic and velocity fields in the solar atmosphere in 3D and time, in the high chromosphere, corona and the transition region.			x		Vial.Jean.C-SH.pdf	281Vial.Jean.C-SH.pdf	
Zank, G.P.	University of Alabama in Huntsville	A White Paper advocating a Heliophysics Theory Mission	Recommendation for a major theory program that has the status of a Mission.	x	x	x		ZankGaryP-AIMSHSWM.pdf	282ZankGaryP-AIMSHSWM.pdf	

Zank, G.P.	University of Alabama in Huntsville	Role of the National Science Foundation ATM/GEO Directorate in promoting and supporting Space Physics	Recommendation that the NSF ATM/GEO Directorate not limit funding of heliospheric research to within 1 AU.			x		ZankGaryP-SH.pdf	283ZankGaryP-SH.pdf	
Araujo-Pradere, Eduardo A.	Univ. of Colorado and NOAA	Research To Operations (R2O) Activities, a Natural Conclusion of Research	The transitions of academic models to operations is an important element of the research process that would improve the inefficient knowledge transfer currently existing in Space Weather. These activities require an organizational structure and a clear financial commitment, barely existing today.				x	Araujo-PradereEduardo.pdf	284Araujo-PradereEduardo.pdf	
MacDowall, Robert J.	NASA/Goddard Space Flight Center	A Radio Observatory on the Lunar Surface for Solar studies (ROLSS)	A lunar-based radio telescope to image solar radio bursts at frequencies < 10 MHz is described. If such an observatory were in place by 2020, it would provide context for observations during Solar Probe Plus perihelion passes.			x		MacDowallRJ-SH.pdf	285MacDowallRJ-SH.pdf	
Wilson, Gordon R	AFRL	Local Response of the Ionosphere/Thermosphere to High-Latitude Energy Deposition	A mission design to monitor the atmospheric response in a local high-latitude region while simultaneously measuring the magnetospheric energy input to that region.	x				WilsonGordonR-AIM.docx	286WilsonGordonR-AIM.doc	
Oza, Nikunj C.	NASA Ames Research Center	Data Mining for Heliophysics	Analysis of heliophysics data is essential to increasing our knowledge of the sun. Unfortunately, the volume of data is much too large for manual examination and even for most advanced techniques. New data mining techniques are needed to support new breakthroughs in heliophysics.			x		OzaNikunjC-SH.doc	287OzaNikunjC-SH.doc	
Chandran, Benjamin D. G.	University of New Hampshire	THEORETICAL RESEARCH ON SOLAR WIND TURBULENCE	Significant advances in the theory of solar wind turbulence are needed as part of the community's efforts to understand the origin and thermodynamics of the solar wind. This White Paper describes several areas in which future research holds particular promise and offers brief policy recommendations.			x		Chandran_WP.pdf	288Chandran_WP.pdf	