September 22, 2014

To: CIT/ E. Stone, Voyager and ACE PI
NASA GSFC / 671 B. Dennis, RHESSI Mission Scientist
NASA GSFC / 674 D. Janchez, GSFC TIMED Project Scientist
NASA GSFC / 671 J. Gurman, STEREO Project Scientist
NASA GSFC / 614 C. Jackman, AIM Mission Scientist
NASA GSFC / 674 R. Pfaff, CINDI Mission Scientist
NASA GSFC / 674 D. Sibeck, THEMIS and Van Allen Mission Scientist
NASA GSFC / 671 A Szabo, Wind Project Scientist
NASA GSFC / 661 T. von Rosenvinge, ACE Mission Scientist
NASA GSFC / 673 M-C Fok TWINS Mission Scientist
NASA GSFC / 672 E. Christian, IBEX Mission Scientist
NASA GSFC / 671 A. Daw, IRIS Mission Scientist
NASA GSFC / 671 D. Pesnell, SDO Mission Scientist
NASA MSFC / S. Savage, Hinode Mission Scientist
Hampton Univ. / J. Russell, AIM PI
UC Berkeley / S. Krucker, RHESSI PI
Lockheed Martin ATC/ A. Title, IRIS PI
JHU / APL / J-H. Yee, APL TIMED Project Scientist
JHU / APL / B. Mauk, APL Van Allen Mission Scientist
UCLA / V. Angelopoulos, THEMIS PI
SWRI / D. McComas, TWINS and IBEX PI
UT Dallas / R. Heelis, CINDI PI
JPL / S. Dodd, Voyager Mission Manager
NASA GSFC / 444 R. Burns
NASA GSFC / 671 A. Roberts
NASA GSFC / 670 P. Smith

From: NASA HQ / J. Newmark / Interim Director, Heliophysics Division
NASA HQ/ J. Hayes / Program Executive Mission Operations

Subject: Call for Proposals — Senior Review 2015 of the Mission Operations and Data Analysis Program for the Heliophysics operating missions.

NASA's Science Mission Directorate (SMD) periodically conducts *comparative* reviews of Mission Operations and Data Analysis (MO&DA) programs to maximize the scientific return from these programs within finite resources. The acronym

MO&DA encompasses operating missions, data analysis from current and past missions, and supporting science data processing and archive centers. NASA uses the findings from these *comparative* reviews to define an implementation strategy and give programmatic direction and budgetary guidelines to the missions and projects concerned for the next 5 fiscal years (matching the Federal government's budget planning cycle). Additionally, from the **NASA Authorization Act of 2005 (Public Law 109-155), Section 304(a):**

> *"The Administrator shall carry out biennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that have exceeded their planned mission lifetime".*

The NASA Heliophysics Division (HPD) will host the next MO&DA Senior Review—a *comparative* review of missions within the MO&DA portfolio—during the week of April 22, 2015. This will be the third decade for reviews of this type for SMD, and the eighth for the HPD missions.

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This call outlines the objective and process for the review, and contains instructions for the preparation and submission of proposals and in-person presentations to the review panel.

The objectives of the 2015 HPD Senior Review for MO&DA is to assess the science merits and performance of these 15 missions (in alphabetical order): ACE, AIM, CINDI, Hinode, IBEX, IRIS, RHESSI, SDO, STEREO, THEMIS, TIMED, TWINS, Van Allen Probes, Voyager, and Wind. Performance factors to be evaluated will include mission scientific productivity, technical status, budget efficiency, data quality and accessibility, and contribution to the "Heliophysics System Observatory (HSO)."

The period for this Senior Review will cover FY16 to FY20. Each mission that is invited to this Senior Review will submit a proposal outlining how its science investigations will benefit the Heliophysics research objectives. These objectives and focus areas are described in the Science Plan for NASA's Science Mission Directorate 2014 (the *SMD Science Plan*).

Proposals should outline descriptions of the project's proposed science investigations, in a prioritized manner, the project's most recent accomplishments, the technical status relating to the ability of the project to conduct the proposed science investigations, Mission Archive Plans, and a high-level budget for the proposed investigations.

Projects are requested to submit plans that have a set of Prioritized Science Goals (PSGs) for the next 5 years: this will allow NASA flexibility in planning within a dynamic budgetary environment (e.g., reaction to a 5% budget reduction; planning for a flat budget without inflation, or if there should be an increase). These PSGs will also allow subsequent senior reviews to assess and measure the success of each

mission in achieving its stated goals. In addition, projects are expected to show progress against the PSGs that they proposed in the 2013 Heliophysics Senior Review.

The Senior Review panel, to be formed by NASA HQ, will evaluate these proposals at a special meeting in Washington, D.C., during the week of April 22, 2015.

The evaluation results will be contained in a report submitted to NASA HQ. NASA will use the panel's findings, rankings, and conclusions as input to rebalance mission allocations within the MO&DA portfolio. Actions could include authorizing the mission to pass from its prime phase to extended; maintaining the status quo, significantly restructuring the project; or deciding to terminate an ongoing science mission. The actions will have the most immediate impact on the budget allocations for the portfolio in the near-term (FY16, FY17, and FY18) and will act as approximate guidelines for the level of support in the out-years; FY19 and FY20).

Instructions to the Senior Review panel:

NASA HQ will instruct the Senior Review panel to:

(1) In the context of the research objectives and focus areas described in the SMD Science Plan, rank the scientific merits on the expected returns from the projects reviewed during the period FY16 through FY20. The scientific merits include relevance to the research objectives and focus areas, scientific impact, and promise of future scientific impact, as well as contributing to the system science of heliophysics. It is understood that predicting the science productivity of a mission over such a long period is speculative, but missions are asked to assume the *status quo* operationally; hence, the need for *Prioritized Science Goals* (PSGs) in the proposal. The panel is requested to assess the progress that each mission has made in achieving their PSGs from the last Senior Review. The panel will provide separate assessments on both the individual project's scientific merit and as a contributor to the Heliophysics system Observatory.

(2) Assess the cost efficiency, data availability and usability, and the vitality of the mission's science team as secondary evaluation criteria.

(3) From the assessments above, provide findings on an implementation strategy for the MO&DA portfolio for FY16 through FY20, based on the Extension Paradigm (described below), which could be one of the following:

   i. Continuation of projects as currently baselined;

   ii. Continuation of projects with either enhancements or reductions to the current baseline;

iii. Project termination.

(4) Provide on overall assessment of the strength and ability of the MO&DA portfolio to meet the expectations of the HSO from FY16 through FY20, as represented in the 2014 SMD Science Plan and in the context of the recent Heliophysics decadal survey.

The panel will *not* be asked to evaluate or assess the current utility of real-time data for operational or commercial users. However, the relevance of ongoing or new science investigations that may transition from research to operation in the future is within the purview of the Senior Review.

Mission Extension Paradigm:

Under this call, the budgets for mission extensions beyond the prime mission lifetime (in NPR 7120.5 parlance, Prime Phase E) will support, at a lower level, the activities required to maintain operations and continue to produce meaningful and significant science data, which is adequately described and accessible to the non-specialist researcher. When a mission has completed its Prime Phase E, NASA will accept higher operational risk, lower data collection efficiency, and instrument/mission degradation due to aging. It is anticipated that, along with this greater risk, the cost to implement will be at the level of approximately two-thirds that of Prime Phase E.

As a corollary to the above direction, priority will be given to maintaining an understanding of the instrument performance, monitoring progress toward accomplishing the objectives of science observations, and to involving the science community in formulating the mission observing program to make the best scientific use of NASA's missions.

Funding Environment:

Missions proposing to the Senior Review will compete for funding allocated *via* the Planning, Programming, Budgeting and Execution (PPBE) process for the period under review. Given the dynamic and constrained budget solution space that the Agency is working within, missions are urged to be cognizant of the fact that all discussions are zero-sum in nature vis-à-vis the overall Heliophysics Division's budget.

Budget guidance, as developed by the Heliophysics Division via the PPBE in the summer of 2014 serves as the basis of the budget guideline for the proposals. The HQ Program Officer will provide each project its budget guideline.

The Schedule for the 2015 Senior Review:

The following is the schedule for the 2015 Senior Review for the Heliophysics operating missions:

Call for Proposals issued: November 21, 2014
SR Proposals due: March 6, 2015
Senior Review panel meets: week of April 22, 2015
Publication of the panel's report; June 2015

Instructions to Proposers:

The SMD Science Plan incorporates the HSO as an integral element of the strategic implementation in the Heliophysics science discipline. This has been given renewed emphasis by the 2012 National Academy of Science's Heliophysics decadal report, "Solar and Space Physics: A Science for a Technological Society," and will be incorporated into the 2014 Heliophysics Roadmap as it is developed in the coming months.

Proposals need to discuss a mission's potential for advancing the state of the art of the science during the FY16 to FY20 timeframe, in each of these areas:

1. Development of research objectives (PSGs) and progress made in the PSGs identified in the last Senior Review. Relevance of the PSGs to Heliophysics research objectives, both as individual missions with unique capabilities, and contributions to system science as a part of the ensemble which constitutes the HSO;

2. Spacecraft and instrument health and safety;

3. Productivity and vitality of the science team (e.g., published research, training younger scientists, etc.), as well as maintaining the continuity of the expertise in the calibration, validation, and archiving of individual instrument data sets and appropriate metadata;

4. Promise of future impact and productivity (due to uniqueness of orbit and location, solar cycle phase, etc.);

5. Impact of scientific results as evidenced by citations, press releases, etc.; and

6. Broad accessibility and usability of the data, with a self-assessment of the utility of the data produced both as a unique mission, and contribution to system science as a member of the HSO.

The proposal shall contain the following sections:

- Science and Science Implementation

- Technical and Budget
- Appendix - Mission Archive Plan
- Acronym List
- Standard Budget Spreadsheet

The scientific and the technical/budget sections combined should not exceed more than 30 pages of writing and graphics. *Not included* in the page limit are the appendix, the acronym list, or the budget spreadsheet. *Included* in the page limit are bibliographies, references, and letters of endorsement: include only the most important references, as appropriate. Letters of endorsement are *not* needed for the Senior Review.

All pages are to be formatted on 8.5- x 11-inch paper, single-spaced, with character (font) size not less than 10 points. The proposal shall be submitted in PDF format.

Should the home institution require signatures, please prepend these as a cover letter to the proposal. Copies of this submittal letter will not be used in the review but will be retained within the Heliophysics Division. Sufficient proposal identifiers include the project name and names of key writers or presenters placed at the top of the first page.

Instructions for the Science and Science Implementation Section:

The science and science implementation section of the proposal should describe the science merits of the proposed continued program and the specific contributions of the instruments to the mission and to the system science of heliophysics. The emphasis of this section should focus on how the proposed science objectives will contribute to the state of knowledge of the discipline, and their relevance to the research objectives and focus areas as stated in the SMD Science Plan. The science proposal should have a set of PSGs for the mission in the next 5 years, as well as a summary of progress made in the PSGs identified in the last Senior Review. For missions currently in extended phase, it is not necessary to cite the mission's original science objectives. Each team is expected to conduct extended phase scientific investigations of the highest scientific merit with a clear implementation plan. These investigations should be distinct from the task of archiving data. The scientific merit of the program is a major criterion used to determine ranking.

Missions should describe how they will achieve their PSGs. This can be solely within the funded Mission Team, or include other components of the HSO, or can be broadened out to include the science that will be achieved through the larger community. For the latter this can be both through funded NASA research programs (Guest Investigator, Supporting Research,, LWS Targeted Research &Technology, Grand Challenge Research (Theory), etc.) and it can be through international efforts. Previous work that was performed sets the foundation and establishes the feasibility for the future work.

The Senior Review panel will be asked to evaluate the scientific merit and implementation of each mission's proposal. Given the emphasis on the systemic nature of the discipline, a discussion of the impact the mission's unique science, as a contribution to the overall system science performed by the HSO, is necessary for the panel to understand the evolving nature of the HSO.

Instructions for the Technical and Budget Section:

This section should address the overall technical status of the components of the mission. These components include the spacecraft bus, instruments, and ground system, including spacecraft control center and science center(s). The discussion should summarize the health of the components and point out limitations to future science investigations as a result of degradation, aging, use of consumables, obsolescence, etc.

A second part of this section should discuss the proposed budgets. Labor, major equipment, and other expenses for the in-guideline budget must be explained in sufficient detail to determine the incremental cost of each proposed task. The budget must include any project-specific costs including government-furnished mission services performed by the Space Science Mission Operations Office at Goddard Space Flight Center (GSFC), Marshall Space Flight Center (MSFC), the Jet Propulsion Laboratory (JPL), or by NASA's communication networks such as the Deep Space Network (DSN), the Ground Network (GN), the Space Network (SN) or the NASA Integrated Network Services (NINS) as administered by the SCAN organization. Missions in extended phase are asked to separate the costs of obtaining, validating, calibrating, and archiving data from costs of completing scientific investigations with the data obtained.

A summary discussion of any anticipated 'in kind' support from NASA-funded sources other than the project's MO&DA budget is required. These 'in kind' sources include tracking support from the NASA tracking networks and support from the multimission infrastructure projects at GSFC, MSFC, JPL, and elsewhere. Representations of direct or 'in-kind' funding from non-NASA sources—such as international partners, other U.S. Government agencies, etc.—should not be provided because their contributions are not part of this particular review.

The attached spreadsheet contains instructions and the mandatory form for the budget portion of each proposal. This form will serve as a standard budget spreadsheet for all proposals, and allows the panel to make the appropriate comparisons. For the period under consideration in this Senior Review, the budget should be itemized, as required in the spreadsheet, and described in sufficient detail for the panel in the technical and budget section.

If the current budget guideline for the project (as part of the current NASA operating

plan) for any of the fiscal years is greater than zero, provide a plan that meets that guideline.

If the project believes that the current budget guideline is insufficient, the project should identify the impact of the current budget on the mission, with emphasis on the science content. If the current budget guideline for the project for any of the years is zero, and it is proposed to carry on the investigations during that year, then the project should propose a minimum scenario to keep the mission viable. By identifying such a minimum acceptable funding level, the project is indicating that any lower funding level is untenable, and that the project should be terminated rather than be funded at a sub-minimal level.

The budget spreadsheet provides tables for NASA-provided 'in kind' support and instrument team budgets. There is a five-way breakdown, which is described in the attached spreadsheet. The format for instrument teams does not follow the five-way breakdown.

Spreadsheet says four-way.

The Mission Archive Plan (MAP) Appendix:

The Heliophysics Science Data Management Policy incorporates the concept of the MAP and establishes the link between the creation and updates of MAPs and the Senior Review process. It also provides an outline of the information sought in a MAP.

For this Senior Review, each mission should submit a MAP with an emphasis on describing what final, useful, calibrated, documented products the mission will produce that will form the mission's active legacy.

Ideally, all products will be available in self-describing formats; i.e., Flexible Image Transport System (FITS), Common Data Format (CDF), Network Common Data Format (NetCDF), or Hierarchical Data Format (HDF). American Standard Code for Information Exchange (ASCII) products are acceptable, when they are accompanied with adequate documentation. Any other format would require very strong justification.

A long-term archiving plan should be clearly spelled out. Products that are already in and served by Final Archives are assumed to be taken care of, and need not be discussed in detail. If the data are to be held in and served by other than a standard Final Archive, the long-term plan should indicate the cost, how it will be defrayed, and how the guidelines for reliable archives specified in the Data Policy will be achieved. The proposal should include a plan for archiving the highest level of untransformed data and the software to process it, as well as, more importantly, calibrated data products and higher-level products such as summary graphs of more processed products such as pitch-angle distributions in selected energy bins, or lower and high-

resolution jpeg displays of FITS (or other) images. Calibrated and higher-level products should remain actively available to users. Plans should be formulated for the provision of data files for products now provided only through a service with on-the-fly processing.

Missions should identify, in addition to existing products, any new products and a route to providing them. If more funding would be needed, the required resources for a data upgrade route should be determined.

Specific notes on providing a data product list:

NASA Heliophysics maintains an Inventory of registered products that is easily accessible through the Heliophysics Data Portal. The goal is for all HP products to be discoverable and accessible through this online service, in addition to more specific means. In some cases, the service provides direct access, and where this is not possible, the service provides the most direct route(s) to the data via file transfer protocol (ftp) or some other service. The HP Data Registry consists of descriptions of data and display products in a standard language (SPASE), thus allowing searches based on using standard terms. In addition, the Registry allows missions to advertise to the science community the current set of products.

Given the maturity of the HP Inventory/Registry, missions shall have all their data products registered in SPASE; products already registered (the list is fairly complete) can be found at the Data Portal. The Space Physics Data Facility (SPDF) or an appropriate Virtual Observatory can supply the actual SPASE descriptions, if needed, based on mission input. The listing in the Data Portal will then constitute the required list of mission products. The Registry is at the level of a “logical scientific entity.” Thus, a “data product” is defined by a given type of information that is derived from an instrument or instruments. For example, the same information in different formats (e.g., ASCII or CDF) or from the instrument in different modes (e.g., the same differential fluxes, but with different binning) may often be regarded as one product. This avoids a proliferation of products and more readily guides non-expert users to the data.

The product accessibility and use should be clear to non-expert scientists, and there should be clear instructions via the Registry descriptions. Cases of products requiring significant changes may be appropriate for data upgrade projects, and suggestions for such efforts should be included in the MAP.

Data quality should be discussed in the documentation of the data: caveats should be clear, and referred to in the SPASE descriptions either directly or via a URL.

Required Appendices and Attachments:

There are two required Appendices for all Senior Review proposals:

- Appendix A: The Mission Archive Plan, not to exceed 10 pages (does not count against the page limit).

Additionally, at the end of the proposal, include a full list of all acronyms with their designations spelled out. The acronym list does not count against the page limit.

Each mission will submit the *standard budget spreadsheet* both with the proposal, and *via* email as a separate Excel spreadsheet to the Program Executive for MO&DA. The attachment to this memo describes the mandatory format for the budget submission and supplies the spreadsheet template.

Proposal Submission:

The proposals will be uploaded electronically in PDF format to the NASA NSPIRES website and must be received by 6:00 PM EST on the due date, March 6, 2015. *Please note the following changes from previous practice: 1) the submissions will be made through the NASA NSPIRES website; 2) the standard budget template must be appended to the proposals; 3) the entire submission must be made as a single file in PDF format.*

Further Information Required for the Senior Review Deliberations:

After submission of proposals, members of the Senior Review panel may have further questions or requests for clarification. If that is the case, identical requests for further information will be sent to all missions/projects prior to the in-person panel review.

As part of a proposal submission, a project should consider providing an online bibliography of recent publications. The proposal should contain the URL to this bibliography. It is recommended that the bibliography should be listed in sequence with the most recent refereed publications first. The bibliography should contain, as a minimum, the most recent papers over the past 2 or 3 years. It is appropriate to list papers to American Geophysical Union (AGU) meetings, conferences, workshops, PhD theses, etc., but these should be listed separately from the listing of the refereed papers.

The Meeting of the Senior Review Panel:

The Senior Review panel will meet for 4 days and follow this agenda:

Day 1: Morning: Instructions, MO&DA program background, logistics (writing assignments, etc.), comparisons, and a discussion of conflicts of interest and the procedures to minimize their impacts. Rest of the day:

Project presentations, plus questions and answers (project assignments TBD);

Day 2: Complete/continue project presentations;

Day 3: Complete the project presentations, and begin assessments;

Day 4: The Senior Review panel completes draft assessment and presents its initial findings to NASA HQ.

Presentations to the Senior Review Panel:

Each proposing project will be allotted ~20 minutes for an oral presentation to the Senior Review panel. To minimize the burden on projects, no more than three people may represent any one of the projects.

During each project presentation, the project representatives should plan on using one-half of the allocated time for their prepared presentation, and reserving one-half for questions and answers.

- The primary purpose of the oral presentations is to provide a forum for questions from panelists and answers from the projects.
- Secondarily, this is an opportunity for projects to provide any significant updates; e.g., science results obtained since proposal submission.
- Lastly, and with the lowest priority, it is an opportunity to repeat the highlights of the proposals, which have been read by all panelists.

After the Meeting of the Senior Review panel:

At the end of the meeting of the Senior Review panel, there should be a good first draft of the panel's report. The key findings and conclusions of the panel should be drafted and reviewed prior to their dispersal. The panel will outbrief their report to the Heliophysics Director and staff, as well as the SMD Associate Administrator. The panel will then take about 4 weeks to finalize and submit its report.

In June 2015, NASA HQ will contact each of the proposing missions/projects and relay direction resulting from the Senior Review. This direction may include new budget guidelines and other specific instructions resulting from the Senior Review process, possibly including notices of intent to terminate. At this time, NASA HQ will post the report of the Senior Review panel to a public NASA HQ website. Each of the projects will then submit back to NASA HQ their plan for complying with the new guidance and instructions. The NASA HQ program scientists will ensure that key

officials in participating international space agencies or other U.S. government agencies that are partners in a proposing mission are contacted and apprised of NASA's decisions resulting from the Senior Review.

The next Senior Review will be held 2 years hence, allowing NASA the ability to rebalance the portfolio as needed.

Further Information:

For further information, please contact:

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One attachment:
MS Excel spreadsheet: Helio_SR_2015_Std_Budget_Spreadsheet

Useful Links:

4/Policy Documents and other inputs:

NASA Strategic Plan (2014):

http://science.nasa.gov/media/medialibrary/2014/05/02/2014_Science_Plan-0501_tagged.pdf

SMD Science Plans (2014):

http://science.nasa.gov/media/medialibrary/2014/05/02/2014_Science_Plan-0501_tagged.pdf

NAS Heliophysics Decadal Survey:

http://science.nasa.gov/media/medialibrary/2012/08/29/Helio_DS.pdf

Mission Archive Plans:

Heliophysics Data Policy:
http://science.nasa.gov/media/medialibrary/2011/02/10/Heliophysics_Data_Policy_2009Apr12.pdf

SPASE Standard:
http://spase-group.org

Heliophysics Data Portal:
http://heliophysicsdata.gsfc.nasa.gov