National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

SMD/Heliophysics Division

April 4, 2018

SUBJECT: NASA Response to the 2017 Senior Review for Heliophysics Operating Missions

Background

The Senior Review for Heliophysics Operating Missions has been conducted typically biennially since the late 1990s.

The NASA Science Mission Directorate (SMD) conducts comparative reviews of operating missions within each division to maximize the scientific return from these missions within finite resources. The Senior Review, now held every three years, assists NASA in maximizing the scientific productivity from its Operating Missions within a constrained budget. NASA uses the findings from the Senior Review to define an implementation strategy and give programmatic direction to the missions and projects reviewed through the next five fiscal years. The specific findings are used to:

- Prioritize continued funding of the operating missions and projects;
- Define an implementation approach to achieve heliophysics strategic objectives;
- Provide programmatic and budgetary direction to missions and projects for 2018 and 2019; and
- Issue initial funding guidelines for 2020, 2021, and 2022 (to be revisited in the 2020 Senior Review).

This established practice was codified in the National Aeronautics and Space Administration Transition Authorization Act of 2017 (PL 115-10; Sec 513 (a) 1)):

"...The Administrator shall carry out triennial 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 exceed their planned missions' lifetime."

In early 2017 it was determined that the Senior Review should be conducted under the precepts of Federal Advisory Committee Act, requiring the members of the panel to be Special Government Employees, and have the final report as a deliverable to the Heliophysics Advisory Committee (HPAC). The HPAC then endorsed the methodology and report, delivering it to the Heliophysics Division.

Missions in the 2017 Senior Review for Heliophysics include strategic missions, Principal Investigator-led Explorer missions, and foreign-led missions in which the U.S. is a minor partner

(the NASA Senior Review assesses only U.S. funding for foreign-led missions). The 2017 Senior Review included the following heliophysics missions (in alphabetical order):

- ACE;
- AIM;
- Geotail (JAXA mission);
- Hinode (JAXA mission);
- IBEX;
- IRIS;
- MMS;
- RHESSI;
- SDO;
- STEREO;
- THEMIS;
- TIMED;
- TWINS;
- Van Allen Probes;
- Voyager;
- Wind.

The 2017 Senior Review was conducted October 30 - November 3, 2017. All of the missions were reviewed in a single panel. Only one mission currently operating in the portfolio was not reviewed. SOHO was omitted because findings from previous Senior Review panels remarked on the fact that the mission plays more of an infrastructure role with the coronagraph data it obtains, as opposed to science data.

The charter for the panel was to:

- Perform an assessment of the missions under review that includes:
  - scientific merit and expected science return (primary criterion),
  - cost efficiency, any ongoing technology development, data collection, archiving, distribution, mission and data usability, and the vitality of the mission's science team (secondary criterion), and
  - current costs (secondary criterion).

- Perform an assessment of the overall Mission Operations and Data Analysis (MO&DA) portfolio that includes:
  - scientific tradeoffs and opportunity costs of extending missions and
  - strength and ability of the portfolio.

- Rank the projects, reviewed during the period (FY18 and FY19) and the extended period (FY20, FY21, and FY22).

- Provide findings to assist with an implementation strategy for Heliophysics Division MO&DA for FY18 through FY22.

- Provide any relevant recommendations that would;
    - enhance the science return of ranked missions within available resources and/or
    - reduce the operation cost of ranked missions with acceptable impact on the science return.
- Make a recommendation on whether or not to extend each mission under review.

The review compared expected scientific returns and contributions to the system observatory relative to program costs under the pressure of reduced resources for operating missions. A set of findings consistent with the 2013 Heliophysics Decadal Survey was developed by the review panel, to help prioritize the resources for heliophysics operating missions for FY18 and FY19 along with forward looking findings through FY22.

The members of the Senior Review panels worked very hard to carry out their charge. NASA is very appreciative of the time and effort that they invested in the Senior Review.

This, and all previous Heliophysics Senior Review reports are available at https://science.nasa.gov/heliophys7cs/senior-review/

Based on the findings and recommendations in the report, NASA has made decisions for each of the 16 missions and projects as described below.

NASA Response

The report of the Senior Review panel makes clear that all of the projects proposing within the 2017 Senior Review are scientifically meritorious and deserving of continued funding and continued operations. The panel recommended that additional funding be found to preserve the portfolio of operating missions. Unfortunately, the current constrained budget conditions prevent NASA from being able to accommodate all the requested increases in funding for operating missions without unacceptable impacts on other parts of the heliophysics program.

NASA used the prioritized rankings and individual recommendations of the Senior Review to make the following decisions for each of the projects in the Senior Review. The missions are presented in alphabetical order.

Summary of NASA decisions:

ACE: extension approved;
AIM: extension approved;
Geotail (JAXA mission): extension approved;
Hinode (JAXA mission): extension approved;
IBEX: extension approved;
IRIS: extension approved;
MMS: first extended mission approved;
RHESSI: mission is to closeout by end of FY2020;
SDO: extension approved;
STEREO: extension approved;
THEMIS: extension approved;
TIMED: extension approved;
TWINS: mission is to closeout by end of FY2020;
Van Allen Probes: extension approved – not invited to SR 2020;
Voyager: extension approved;
Wind: extension approved.

Detailed NASA decisions for each mission:

ACE
The ACE mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The ACE mission will be invited to the 2020 Heliophysics Senior Review.

AIM
The AIM mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The AIM mission will be invited to the 2020 Heliophysics Senior Review.

Geotail (JAXA mission)
The Geotail mission is approved to continue, planning against the requested augmented budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The Geotail mission will be invited to the 2020 Heliophysics Senior Review, contingent on the outcome of any JAXA review.

Hinode (JAXA mission)
The Hinode mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The Hinode mission will be invited to the 2020 Heliophysics Senior Review, contingent on the outcome of any JAXA review.

IBEX
The IBEX mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The IBEX mission will be invited to the 2020 Heliophysics Senior Review.

IRIS
The IRIS mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The IRIS mission will be invited to the 2020 Heliophysics Senior Review.

MMS
The MMS mission is approved to continue operations as an extended mission. NASA HQ will work with the project to transition them to a budget profile that is consistent with missions in extended operations. The MMS mission will be invited to the 2020 Heliophysics Senior Review.

RHESSI
The RHESSI mission is to plan to a closeout of operations, with delivery of all final data products to the appropriate Heliophyiscs data archive by the end of FY2020. NASA HQ will work with the project to establish appropriate guidelines for such work. The RHESSI mission will not be invited to the 2020 Heliophysics Senior Review.

SDO
The SDO mission is approved to continue, planning against the current budget guidelines. NASA will work with the mission to address the findings that were raised by the Senior Review panel, to allow the mission to continue its successful operations. Any changes to the guidelines will be handled through the budget formulation process. The SDO mission will be invited to the 2020 Heliophysics Senior Review.

STEREO
The STEREO mission is approved to continue, planning against the current budget guidelines under the assumption that STEREO-B is not recoverable. Any changes to the guidelines will be handled through the budget formulation process. The STEREO mission (consisting of STEREO-A) will be invited to the 2020 Heliophysics Senior Review.

THEMIS
The THEMIS mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The THEMIS mission will be invited to the 2020 Heliophysics Senior Review.

TIMED
The TIMED mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The TIMED mission will be invited to the 2020 Heliophysics Senior Review.

TWINS
The TWINS mission is mission is to plan to a closeout of operations, with delivery of all final data products to the appropriate Heliophyiscs data archive by the end of FY2020. NASA HQ will work with the project to establish appropriate guidelines for such work. The TWINS mission will not be invited to the 2020 Heliophysics Senior Review.

Van Allen Probes
The Van Allen Probes mission is to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. Due to the reentry of the probes in 2019, the Van Allen mission will *not* be invited to the 2020 Heliophysics Senior Review.

Voyager
The Voyager mission is approved to continue, planning against the current budget guidelines. NASA will work with the mission to address the findings that were raised by the Senior Review panel, to allow the mission to continue its successful operations. The Voyager mission will be invited to the 2020 Heliophysics Senior Review.

Wind
The Wind mission is approved to continue, planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The Wind mission will be invited to the 2020 Heliophysics Senior Review.

Acknowledgement

NASA acknowledges the findings of the Senior Review Panel. NASA will implement a plan based on their findings, subject to budgetary and programmatic considerations. NASA is exceedingly grateful that these members of the community stepped forward to provide findings regarding the NASA Heliophysics operating missions and their proposed plans for the next three years.

NASA would like to formally thank the members of the Senior Review panel for their hard work, their dedication, and their willingness to commit to the full scope of the task before them. The process of reconciling the breadth of exemplary science made possible by the suite of current heliophysics operating missions, with the fiscal reality of the constrained budget conditions, made this an incredibly difficult task. Given the hard decisions that confronted them, the Senior Review panel rose to the task to recommend the best forward plan possible to ensure the health of the individual supported missions, the entire NASA Heliophysics portfolio, and the NASA heliophysics community.

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