

## **NASA Response to the 2015 Senior Review for Heliophysics Operating Missions**

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### **Background**

The Senior Review for Heliophysics Operating Missions has been conducted 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, held every two 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. NASA uses the findings from the Senior Review 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 2016 and 2017; and
- Issue initial funding guidelines for 2018, 2019, and 2020 (to be revisited in the 2017 Senior Review).

This established practice was codified in 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 life time.”

Missions in the 2015 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 2015 Senior Review included the following heliophysics missions (in alphabetical order):

- ACE
- AIM
- CINDI
- Hinode (JAXA mission)
- IBEX
- IRIS
- RHESSI
- SDO
- STEREO
- THEMIS
- TIMED

- TWINS
- Van Allen Probes
- Voyager
- Wind

The 2015 Senior Review was conducted April 21-24, 2015. All of the missions were reviewed in a single panel. Three missions currently operating in the portfolio were 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. Geotail was omitted because findings from previous Senior Review panels remarked that the low-cost data downlink that the US supports for this JAXA mission consists of no science analysis. Cluster-II was omitted from the current Senior Review because US participation will end at the end of Fiscal Year 2015 (October 1, 2015)

The charter for the comparative 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 (FY16 and FY17) and the extended period (FY18, FY19, and FY20)
- Provide findings to assist with an implementation strategy for Heliophysics Division MO&DA for FY16 through FY20
- 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 FY16 and FY17 along with forward looking findings through FY20.

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 <http://science.nasa.gov/heliophysics/senior-review/>

Based on the findings and recommendations in the report, NASA has made decisions for each of the 15 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 2015 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
- CINDI: extension approved until reentry in 2016
- Hinode (JAXA mission): extension approved
- IBEX: extension approved
- IRIS: extended mission approved
- RHESSI: extension approved
- SDO: extended mission approved
- STEREO: extension approved
- THEMIS: extension approved
- TIMED: extension approved
- TWINS: extension approved
- Van Allen Probes: extended mission approved
- 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 2017 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 2017 Heliophysics Senior Review.

## **CINDI**

The CINDI instrument onboard the C/NOFS satellite is approved to continue planning against the current budget guidelines through the duration of the mission, expected to end sometime in 2016 due to reentry, and through mission closeout. Any changes to the guidelines will be handled through the budget formulation process. Due to satellite reentry, the CINDI mission will *not* be invited to the 2017 Heliophysics Senior 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 2017 Heliophysics Senior 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 2017 Heliophysics Senior Review.

## **IRIS**

The IRIS mission is approved to continue its first extended mission and to plan 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 2017 Heliophysics Senior Review.

## **RHESSI**

The RHESSI 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 RHESSI mission will be invited to the 2017 Heliophysics Senior Review.

## **SDO**

The SDO mission is approved for its first extended mission. 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 SDO mission will be invited to the 2017 Heliophysics Senior Review.

## **STEREO**

The STEREO mission is approved to continue planning against the current budget guidelines. NASA will work with the mission as it attempts to regain contact with the STEREO-B satellite continue through the end of 2015. Any changes to the guidelines will be handled through the budget formulation process. The STEREO mission will be invited to the 2017 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 2017 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 2017 Heliophysics Senior Review.

**TWINS**

The TWINS 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 TWINS mission will be invited to the 2017 Heliophysics Senior Review.

**Van Allen Probes**

The Van Allen Probes 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 Van Allen Probes mission will be invited to the 2017 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 2017 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 2017 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 heliophysics operating missions and their proposed plans for the next two 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.