

Helioseismic and Magnetic Imager

Stanford University

Contract NAS5-02139

Progress Report for December 2006

Introduction

The Helioseismic and Magnetic Imager (HMI) investigation contract (NAS5-02139) between NASA and Stanford University has been in place since 27 September 2002. As of 16 January 2007 the contract has been modified 33 times to extend through Phase-E at launch plus 90 days with launch expected by 31 August 2008. Mod 33 included launch delays and the formation of the HMI/AIA Joint Science Operations Center (JSOC).

The development of the HMI flight instrument is subcontracted to the Lockheed Martin Space System Company at its Lockheed-Martin Solar and Astrophysics Laboratory (LMSAL) in Palo Alto California. The monthly progress of the LMSAL subcontract is reported in parallel with this report and is considered to be an attachment to this report. The monthly report for E/PO activities is also attached to this report. All monthly reports are available at http://hmi.stanford.edu/Status_Reports/. The quarterly reports from science Co-Investigators are also available online and are considered to be attachments to this report. These monthly reports are written a week or two into the following month and include some status as of the date written. This report is written on 19 January 2007.

Status and Activities during December.

Administrative Issues:

Stanford University closed for the final 2 weeks of December. Work on HMI and JSOC development continued during the break at a low level. The HMI-PER and AGU meeting were both in the second week of the month. The combined effect of the holiday shutdown and meetings resulted in a reduced rate of progress for the month, as expected.

The LMSAL cost proposal for costs to complete Phase-D work was received just before the Stanford holiday closure and was forwarded to NASA in mid December.

Our search will resume after the first of the year for the remaining scientific programmer position. We are beginning work on final job description for a computer system administrator to assist with the development and support of the JSOC production system. Our Administrative Assistant, Millie Chethik has announced her plans to retire in February. That position has been advertised and applications are being reviewed.

Instrument Development:

Overview:

The SU team supported regular Weekly HMI meetings at the LMSAL facilities including the regular weekly status meeting and topical development and I&T meetings in areas including optics, thermal, electrical, software, CCD cameras, and others as needed.

The Stanford personnel responsible for the HMI instrument performance (R. Bush and J. Schou) are working intensively supporting the calibration activities. Sebastien Couvidat, Cristina Soares, Richard Wachter, and Tom Duvall are participating in analysis of calibration data.

Instrument Calibration:

The vignetting that was detected at the mounting of the beam control lens continues to be studied. We are following dual paths of preparing to replace the inner sleeve of the Lyot housing with a properly made aperture and assessing to see if we can demonstrate that we can mitigate the impact of not correcting the problem. If necessary we will change the part during EMI/EMC testing when the schedule impact could be minimized. The blocking filter fringes will be further evaluated during vacuum calibration.

Due to continued delays in the joint operation of the flight software and the FPGAs in the CIF and DCHRI boards, the "In Air" calibration did not begin until the second week of January. One of the remaining optical concerns, poor imaging quality, has been determined to be due to the front window filter. With the window removed optical performance is acceptable. There are unmounted spare windows and a recovery plan is being developed. By mid January the practical in-air calibration was complete with the instrument ready to begin in-vacuum calibration. Due to the front window problem the goals for the initial in-vacuum calibration will be to make sure all the calibration procedures are tested along with their analysis routines, and to perform in detail only those calibration

activities that will not need to be done only after the final flight window is installed. Some schedule days will be transferred from the planned in-vacuum calibration interval to the thermal-vacuum testing time to allow the final calibrations to be accomplished during that time.

Pre-Environmental Review:

The PER was held on 13 December as scheduled.

Data EGSE:

The development of the data EGSE is complete.

HMI SDP:

HMI Level 1

Work on Level-1 will start in earnest after calibration activities are complete. Work is however progressing on definition of the keywords that will be used to describe the images in level-0.5 which is input to level-1.

HMI Level 2

We have completed a thorough review of the HMI processing pipeline module requirements. An update to the appendices in the HMI Science Plan is being prepared and will be the basis of an update of the data product document. The effort needed to complete the pipeline processing has been assessed and the presently un- and under-funded efforts have been identified so we can judge which data products are at risk at the present funding levels and what additional funding would correct the issues. The results of this assessment have been provided to Dean Pesnell. After discussions with the SDO project we are prioritizing these tasks but do not see the needed funding arriving in time to fully support these activities. We will set priorities for use of the available funding during late January.

We are beginning to port some of the MDI pipeline modules into the DRMS system. We are beginning work on the port of the MDI v2helio program which is the first step in the global helioseismology processing pipeline.

JSOC SDP:

JSOC Capture System

Work on the capture system has continued. The capture system hardware orders and have been placed and some components have arrived. The processors are expected in late January. We will delay purchasing two of the three tape systems until spring when the higher density versions are expected to be available. We expect to have the capture system components integrated by early February with the software installed by the end of that month.

JSOC Storage Unit Management System (SUMS)

The SUMS system development is complete. Residual testing and minor bug corrections continue as increased usage exposes problems.

JSOC Data Record Management System (DRMS)

Work in December continued to focus on getting more personnel familiar with the DRMS implementation building simple utility modules, finding bugs, and improving the documentation. The documentation “wiki” on the <http://jsoc.stanford.edu> web site continues to be improved. This group is quickly improving documentation, identifying and correcting bugs, etc. Modules that will be used for ingesting housekeeping data have been developed. Programs to ingest the ground test ancillary data are complete.

JSOC Level-0 Processing

Work is continuing on moving the level-0 code developed for the EGSE into the DRMS/SUMS environment. A fully documented level-0 processing specification is being reviewed. The ingest program for the ground test data has highlighted several issues that will simplify some of the level-0 code.

Science Team:

As mentioned above, we have completed a detailed review of the Phase-D plans for the Co-I team provided data product computation code, status and risks of insufficient funding. The results of this survey have been forwarded to the SDO Project Scientist, Dean Pesnell.

HMI Home and JSOC-SDP Site:

There is some movement on the part of Stanford administration to identify space for the solar group. We may know in a few weeks. We have however been advised that we should also resume exploration of the off-campus alternative. Unfortunately the above words continue to be unchanged from last month(s). A decision of on or off campus must be made by end of January.

Planned Activities for January

Capture system hardware delivery to Annex-B for integration.

We expect to continue documentation updates and code development of the DRMS system.

We will begin in-air calibration activities.

We will begin level-2 pipeline module porting from the MDI system.

We will continue the search for another scientific programmer to support science module development.

We will begin implementation of the detailed plan to move our existing computer systems into the new Physics and Astrophysics building.

Near-term Milestones

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| 1 January 2005 | Decision on space location within Stanford for the JSOC and Stanford HMI team facilities. |
| 15 February 2007 | Capture system components in house and integrated. |
| 15 March 2007 | Move computer systems into new data center room. |

Attachments

Lockheed Martin Solar and Astrophysics Laboratory HMI progress report and the HMI/AIA EPO progress report for the month are attached. This report, the LMSAL report, and EPO reports are also available at http://hmi.stanford.edu/Status_Reports for convenience.