Helioseismic and Magnetic Imager

Stanford University

Contract NAS5-02139

Progress Report for May 2006

Introduction

The Helioseismic and Magnetic Imager (HMI) investigation proposal was submitted to NASA on 24 April 2002 in response to the Solar Dynamics Observatory Announcement of Opportunity AO 02-OSS-01, and this investigation was selected by NASA on 15 August 2002. The contract (NAS5-02139) between NASA and Stanford University was in place as of 27 September 2002. That contract has been modified (via Modification #13) to extend through Phase-E at launch plus 30 days plus six years with the launch expected in 31 August 2007. As of 15 June 2006 the contract has been modified 29 times.

In late November we submitted a complex proposal in response to an RFP for the merged program changes which include changing the original launch date to April 2008, the addition of 2-months to Phase-D after launch, the merging of HMI and AIA SOC and EPO activities to form the JSOC and merged EPO, and the funding driven launch delay to August 2008. We are proceeding with development of the JSOC and support of AIA development under the verbal assurance that NASA approves of the plan.

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 15 June.

Status and Activities during May.

Administrative Issues:

The Co-I subcontracts are in place. A few modifications are pending but work is not being delayed.

We have paused work on the development plan to be consistent with the new definitions of WBS elements used in the new JSOC schedule. This should be done by the time the JSOC proposal takes effect but effort has been shifted to level-0 code development for now. We continue to anticipate negotiations for the JSOC et al. proposal in the coming month.

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 mechanical, 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.

Instrument Calibration:

Following the initial "Sun Tests" which were completed in the first week of March we have continued development of analysis programs and are preparing for the resumption of calibration activities. A number of important issues/anomalies were found and most have been resolved. There is remaining uncertainty about the source of some of the optical "distortions" and the discrepancy in focus between tests with the Sun and stimulus telescope. Notes and descriptions of the results can be found at http://sun.stanford.edu/~schou/hmi/suntest. The regular weekly calibration planning meetings continue as a forum to discuss continuing analysis of the first sun tests and to prepare for "calibration in air". Prior to the in air calibrations we will do a revisit to the Sun Test objectives to verify that the needed corrective and completion actions were successful. Due to delays described in the LMSAL reports these tests are now expected to resume any day now. These tests and analysis will take a bit more than a week. . The "In Air" calibration is likely to begin about the first of July. We are evaluating which of the calibration activities can proceed without the benefit of the flight camera and data handling systems which will not be available until early July at best. For some aspects of the instrument, polarization measurements in particular, these will be the definitive calibrations while for most aspects the definitive tests will await in vacuum calibration with flight cameras in July/August.

Data EGSE:

We are working on including more complete image crop and image modes into the EGSE as well as handling the instrument image status housekeeping packets in the EGSE as well as in the Capture System level-0 processing. Except for possible modifications to and addition of more camera readout modes the EGSE effort is complete and the equipment is ready for both HMI and AIA I&T activities. It has not been tested with the flight electronics so problems are possible…

HMI SDP

HMI Level 1

The semiweekly development meetings continue to discuss refinements to the plans for HMI level-1 observable computation algorithms. This topic will be addressed in the coming months with initial implementations to be used for test data obtained in the in-air calibrations. Jesper Schou is leading this effort. Rick Bogart is coordinating the effort to gather keyword lists used by the various commonly used analysis packages.

JSOC SDP:

JSOC Capture System

Work on the capture system has begun with several meetings to clarify detailed requirements and design decisions. The goal is to have the capture system software essentially complete by November when we can finally order the hardware. The draft Data Capture System Specification has been reviewed and is being expanded to include more details. The "infrastructure" for the capture system development has been installed on a temporary system.

JSOC Storage Unit Management System (SUMS)

The SUMS system development is complete. This entry in the monthly reports will be maintained for a few months to report any issues that arise as the use of SUMS increases.

JSOC Data Record Management System (DRMS)

The DRMS development to handle multi-record data blocks is complete.

Karen Tian has completed testing the replication feature of the database system. This will used for the outside user access.

Rasmus Larsen, the lead developer of the DRMS left Stanford at the end of May as planned. His move from Stanford will significantly slow the development of the DRMS and the development of the JSOC processing pipeline.

Work in early June has focused on getting more personnel familiar with the DRMS implementation and improving the documentation. There is now a documentation "wiki" on the new http://jsoc.stanford.edu web site.

JSOC Science Module Development

No work planned for May. No work expected in June.

Science Team:

The joint HMI and AIA science team meeting was held in the week of 13 February 2006. The web site at http://hmi.stanford.edu/TeamMeetings/Feb_2006 contains detailed information. The presentations from the meeting are now present on the web site.

The absence of sufficient apparent support for the science team is the primary risk to the success of the HMI investigation and the SDO mission goals. The new NASA ROSS LWS TR&T NRA provides funding opportunities for the development of coronal and local-helioseismology science techniques to support SDO and we will be responding to this opportunity. Some work on DRMS development will be postponed to allow personnel to work on development of these plans.

HMI Home and JSOC-SDP Site:

The construction of the new Varian-II Physics building (now called the Physics and Astrophysics Building) is progressing with a schedule for occupancy on 2 August 2006. We have now confirmed that the JSOC data center will be built in the basement room in the NE corner of this building. Plans are progressing for the move into this space in the fall. In terms of office space, there has been little positive progress in the past month. We are still working the problem. We have a deadline of about May 2007 for a move date to new quarters somewhere.

Planned Activities for June

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

We will continue analysis of the Sun Test data begin in-air calibration activities. We have planned a review of the calibration plan for 23 June but may need to postpone it due to the delayed second "SunTest".

We have completed and posted the announcement of open positions for two scientific programmers to support DRMS completion and science module development.

Near-term Milestones

1 January 2005	Decision on space location within Stanford for the JSOC and Stanford HMI team facilities. ***This may have some progress this summer.***
23 June 2006	Calibration plan "review"
1 July 2006	First interviews for scientific programmer staff additions.

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.