

Helioseismic and Magnetic Imager

Stanford University

Contract NAS5-02139

Progress Report for March 2008

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 this date the contract has been modified 43 times. The contractual launch date is 31 August 2008 however the official “launch readiness date” is now 1 December 2008.

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 section of the monthly report is written on 16 April 2008 and describes activities at Stanford University in support of HMI and JSOC-SDP development.

Status and Activities during March.

Administrative Issues:

We have received the RFP for the launch delay III and inclusion of a science component for all of Phase-E. We expect to deliver a proposal in April. We have issued an RFP to Lockheed for the first two years of Phase-E Co-I effort. We are beginning to update the other Co-I Phase-E subcontracts.

Instrument Development:

Overview:

We are continuing to work with LMSAL and the SDO team to close out the few remaining open items on the instrument. Details are in the LM monthly report. We supported the SDO PER in March and upcoming environmental testing of SDO.

Instrument Calibration:

The HMI calibration team is working on completing the detailed analysis of the calibration data obtained during testing and producing a detailed calibration report. This report will serve as the basis of a detailed instrument performance paper. Analysis of CPT data has been performed. The variation in retardance of the front window with temperature is a concern and lab tests are being performed to hopefully verify the problem is from radial temperature gradients present in air and not bulk temperature variations. The latter case would lead to a reduction in magnetic field sensitivity during the mission. In any case we should be investigating establishing a regular ground cross calibration.

HMI SDP:

HMI Level 1

Work on Level-1 has started. A prototype Dopplergram code has been completed. An outline of the multiple steps in the level-1 code has been prepared.

HMI Level 2

Work is continuing on tasks for several standard product pipelines. Existing programs for all parts of the time-distance pipeline have been identified and tested. Work is continuing on tuning the inversion process for HMI parameters. We are developing proxy data based on MDI observations so we can test the new code modules with HMI-sized files. Work is continuing to convert the code sections to run in the DRMS environment. A Vector Field splinter meeting was held just before the SDO Teams meeting in March. The vector field team has agreed on algorithms to include in the initial pipeline and these have been tested on proxy data from ground-based and Hinode vector field observations. A key team member, Juan Borrero, is leaving HAO for MPS (Germany) soon and is actively porting his code to JSOC.

JSOC SDP:

Weekly JSOC development status is now available on the jsocwiki at <http://jsoc.stanford.edu/jsocwiki/DeveloperProgressReports>

JSOC Capture System

The Data Capture System (DCS) is complete. Data flow tests with the DDS are continuing with only minor issues at this date. The offsite systems have arrived and are being configured for use. The offsite data repository machine will remain at Stanford for the 72-day tests so that we can verify the end-to-end function omitting only the bi-weekly trip to LMSAL. The offsite emergency DCS system will be moved to the space in the MOC when the system is complete and tested. It will be maintained in current software configuration by remote access after that. It will be available to support SDO testing at GSFC if needed and if connections are available.

JSOC Storage Unit Management System (SUMS)

The SUMS system code development is complete. Several minor issues remain that are being worked as part of the overall database efficiency and maintenance topic. The T-950 work is complete and we are in the process of migrating the data in the prototype SUMS system (both disks and tapes) over to the final system. This migration is expected to be complete during April. At that time we will be running SUMS in the basic configuration to be used in at least the first part of Phase-E.

JSOC Data Record Management System (DRMS)

The base DRMS system is stable. "Loose" ends are being closed. We are moving ahead with plans to support a more general IDL implementation within the SolarSoft framework. This work will be implemented by LMSAL personnel. We have done a full release of code version 4.2 and have a stable "NetDRMS" version that does not need local non-DRMS code. This version is for remote DRMS sites. Several remote DRMS sites are now functioning "stand-alone" waiting for the database "Slony" scripts (see below).

JSOC Database Development

This topic is added this month to reflect the increased level of work on database maintenance issues. We have installed copies of the database on two test machines and have verified the functioning of the Slony-I software that we will use to distribute key tables to remote DRMS systems. We have demonstrated the full functionality needed on the local systems and will extend it to remote systems as soon as some simple timing performance verification is complete. We expect

to support remote DRMS/SUMS systems for at least LMSAL, NSO, and SAO in the US and at MSSL in the UK, Max Planck for Solar System Research (MPS) in Germany, and one in Bangalore India. The replication and remote DRMS support is moving ahead and should be operational by the end of April.

JSOC Level-0 Processing

The flight supporting version of the level-0.1 code HMI is complete. Work is beginning on the minor modifications for AIA. The full level-0 code as we define it includes import of S/C ancillary science packets and FDS data. Work is advancing on this area and will support lev0.3 and lev0.5 data products. We need to finalize plans with LMSAL for the access to HK data flowing through the socket connection from the MOC via White-Sands router via the OC3 lines via Stanford-LM direct link to the LM JSOC-OPS room “open” workstation, then back to Stanford. LM has ordered the workstations and they will be first installed at Stanford to verify interfaces. They will be moved to LM after the dedicated high-speed Ethernet link is installed.

JSOC Data Export

We have implemented a prototype of the basic web access code. We are tuning the specifications for exports that require data staging in SUMS, simply processing tasks such as converting to the FITS protocol with headers, and the cases requiring significant processing (e.g. process on demand). We are initially using simple cgi-bin tools to allow traditional web interface, AJAX style interfaces, and command line (wget) access to the data. This will be used to support the browseable catalog, direct data access, access from SolarSoft, and remote DRMS/SUMS support. Other API calls (e.g. the Google WTK protocol or XML) will likely be added as simple extensions to the initial system as the need is confirmed.

JSOC Hardware

The base JSOC-SDP hardware is in place and nearly ready for full use. We are only waiting until the SUMS data is migrated from the prototype system to open access to the full development team. There is still some software changes that will be made by the vendor (SGI) to fully support RDMA access over the infiniband interface between the processor cluster and the disk arrays. The first DRMS database machine is installed with installation of PostgreSQL beginning. The final ¾ of the processor cluster quote is in hand and we are proceeding with pre-order approval from GSFC. We did achieve the assumed cost savings by waiting the additional 6-months to order the final segment of processors. The data viewing workstations to be installed at GSFC have arrived and are being configured.

Science Team:

The science team funding issues mentioned in prior reports continue to be a concern. We are exploring several methods to solve the most critical of these issues.

We held the joint HMI – AIA – EVE science team workshop on 25-28 March in Napa. The meeting was quite successful at identifying the processing and science development needs for the early science phase of the mission. The prime conclusion from the meeting that that “there is a lot of work remaining!!!” Due in part to the still slow start of the Co-I teams due to low SDO specific funding, it is very likely that the initial science data products will be less complete than we had hoped. The web page for the meeting is being updated with actual presentations as they are collected and delivered (http://hmi.stanford.edu/TeamMeetings/Mar_2008/). More than 170 people participated in the meeting. Interest in SDO data and science is high and growing.

Stanford office space issues

We are making final plans for the move from Poplar to Cedar-South for about 1/3 of the team. Three people will move from P&A to Cedar as part of the move. This will get the entire team into the offices they will have for the initial phases of Phase-E. This move will take place early in the week of 28 April. Hopefully the disruptions of office moves will be behind us for a while. We still need to find more space in the Cypress/Cedar area for the rest of the team to have an efficient program. This may take a couple of years.

Planned Activities for April

Continue testing data flow through connection between DDS and Capture system.

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

The Level-0 code for AIA will be integrated into the DRMS system, the HMI code is finished.

The Level-1 code work will continue to ramp up.

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

Near-term Milestones

30 April	Basic time-of-export processing capability functional
31 May	New goal for level-2 global seismology pipeline. This goal is probably achievable.
15 May	Data workstations and offsite DCS systems ready for GSFC/MOC
1 June	Ready to support 72-day DDS-JSOC endurance test.

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.