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, 10 years into the program, the contract has been modified 60 times.

The development of the HMI flight instrument was subcontracted to the Lockheed Martin Space System Company at its Lockheed-Martin Solar and Astrophysics Laboratory (LMSAL) in Palo Alto California. This subcontract is nearly closed with final billing remaining. All periodic reports are available at [http://hmi.stanford.edu/Status_Reports/](http://hmi.stanford.edu/Status_Reports/). The quarterly reports from science Co-Investigators have stopped since except for a few who are completing their supported work, there is no further Co-Investigator support in the program. 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 15 October 2012 to cover the activities at Stanford University in support of HMI and JSOC-SDP since July 2012. There was sufficient communication with the SDO project office at the SDO weekly telecons and at the various conferences so this report is primarily for documentation purposes. This report will continue in the style used during development until the LM subcontract for phase A-D is closed.
Status and Activities.

Administrative Issues:

We apparently can not convince LM to do as was contracted and give us the final bill shortly after the end of Phase-D, which occurred on 30 April 2010. It is our understanding that if LM rates change for the time of the contract that we will pass any increased costs on to NASA. (unchanged). LM has a no-cost extension on its Phase-E contract – and that will end soon. So shortly we will have only the not-finalized Phase B-D contract with LM to finish.

We also have not yet received all the documents needed to calibrate HMI in a form that are not marked ITAR. The information we need for calibration is not ITAR sensitive but LM has labeled the documents ITAR and while agreeing that the information we need is not ITAR sensitive, will not remove the labels. (unchanged, no progress)

HMI Instrument:

Overview:

HMI continues to operate very well. No changes to the operating sequence are planned.

Instrument Operations:

No issues to report.

Instrument Calibration:

The HMI Calibration team has plans for an in-orbit calibration and performance paper for the topics not yet in published form. These include the actual final observing sequence and a rundown of the known issues. These continue to be described on the jsocwiki and JSOC HMI Release Notes pages. Real work on this paper is continuing.

HMI SDP:

HMI Level 1

Complete and no changes anticipated. The addition of a new metadata keyword went without incident so far as the data was concerned. The JSOC propagation of the new keyword to the remote DRMS sites however was not smooth. See below.

HMI Level 2

Nearly complete.

Work is continuing on tasks for several standard product pipelines.

Work is proceeding on implementing the time-distance pipeline. All elements of the planned pipeline are functioning with the travel-time products published in
The standard inversion code is not yet automatic but results are available to all interested parties at hmi.tdVinvrt_synopHC.

The “Rings” analysis pipeline is operating with tracked data cubes being generated and spectra computed, and analysis of flows generated. The Co-I provided 3-D inversions of this data are nearly operational. The inversions are available as described at http://jsoc.stanford.edu/doc/data/hmi/hmi.rdV*%20%28Ring%20Diagrams%29/

We now have 12 72-day intervals for global helioseismology analysis. The 13th will be available at the end of November. Each completed interval is processed as soon as the level-1.5 data is available. The first 72-day interval began on 30 April 2010 (GONG month 153). The processing pipeline is complete. The global mode frequencies are now complete and available in the data series hmi.V_sht_modes.

JSOC SDP:

In mid August the Stanford Cogen plant shutdown after a construction error breaking a 60kV line. For two days Stanford had no chilled water and was at the limit of backup power from PG&E. We were required to shutdown the JSOC computers during this time. Some hardware was damaged and some RAID disk drives needed rebuilding. The full operation of the JSOC system was restored after a few days with no loss in data.

JSOC Data Record Management System (DRMS)

DRMS and its ties to SUMS are stable. An update to SUMS that will prevent out of date versions of user software from requesting access to data on tapes has been installed and will be enabled soon. We will try to identify all users of old code and insist on updates prior to enabling this feature.

SUMS data Storage Unit Management System

Disk volume growth and maintenance continues to be a challenge.

SUMS is managing the c. 8TB/day flow and archive functions with much less disruption than near the start of the mission. A recent reboot of the old primary fileserver reinforced the recent decision that we need to move forward with replacement capacity for the “d02” server and its 600TB of disk space. The plan will be to add new disks and new file servers to hold all new data, then to migrate online data that has tape backups to d02 such that a failure will not cause any more disruption than restoring from tape.
The current status of SUMS online data can be found at http://jsoc.stanford.edu/~jsoc/SUM/sumlookgroup with a link from this page at the bottom of the first page of the jsocwiki.

**JSOC Database Development**

No new capability. System is stable. We are investigating methods to improve the speed of some heavily used queries

**JSOC Data Export**

Work is continuing on providing an easier to use user interface. The main improvement planned is an interface for new or casual users that we refer to as a “visual catalog” which will provide sample images of the main data products and have a hierarchal graphical index to the datasets. Draft versions of these pages are nearing release and can be found at http://jsoc.stanford.edu/new/ until they are ready to replace the present pages. Some text on the top level page still needs corrections, such as to highlight SDO among other things.

**JSOC Hardware**

The JSOC-SDP hardware is in place and in regular use. We have now installed the “science analysis” machine along with some new faster cluster nodes. This ends the planned development so now changes will be for replacements and same-function upgrades as older equipment ages.

The first replacements are the Data Capture systems. These have been in place for six years and have had increasing failures with the most recent causing several hours of retransmission required after a RAID failure. The replacement machines will have integrated disks rather than an attached RAID box. The reduced footprint will free some rack space as a bonus.

**HMI Science Team**

The Stanford SDO supported science team’s efforts to date are fully used to complete the initial characterization and calibration activities and making the data available to the broader community.

That HMI broader science teams, as well as the local one, are supported by other grants/contracts and reports their progress via papers and conferences. Incremental support for porting available code into the JSOC is finished, the HMI Co-Is are now relying completely on grants to support their efforts.

**Planned Activities for Fall**
Get the as-built, as-operated characteristics published.

Provide this report monthly.

Support preparation of the SDO Senior Review proposal.

Support SDO workshops in Cairn Australia and Petaluma CA in November.

Support plans for the LWS Helioseismology workshop in February 2013 and the SDO workshop in March 2013.

**Attachments**

This report, the final Co-I reports, and EPO reports which are considered attachments and available at [http://hmi.stanford.edu/Status_Reports](http://hmi.stanford.edu/Status_Reports) for convenience.