Consulting Agreement

Data Processing Project for

"The Solar Dynamics Observatory (SDO) Helioseismic and Magnetic Imager Investigation- Second Extended Mission"

Prepared for Phil Scherrer, Principal Investigator

Solar Physics Projects

Hansen Experimental Physics Lab

Stanford University

Stanford, CA 94305-4085

Prepared by Tim Larson

January 1, 2020

Timothy Larson
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Purpose: The purpose of this contract is to fund my Stanford Solar Physics Project Consulting Agreement from January 1, 2020 till September 30, 2020.

Overview: Data Processing Project

Scope of Work:

1. Support the completion and referee response efforts for Johann Reiter et al. paper that is nearly complete. This includes updating the JSOC processing scripts to perform 2d RLS rotational inversions up to *l*=1000 and generate the corresponding averaging kernels. This includes tasks to produce high *l* modes sets regularly available.

2. Support the Solar Rotation Project by producing 2304d processing of time-series including peak fitting and inversions for rotation and structure. This can be done in several phases such as preparing scripts to generate the long time series, modify the peak fitting program to support large arrays, modify the rotation inversion code to support large arrays, modify the JSOC HMI pipeline processing scripts to include the long time series in normal production. Also prepare scripts to treat the SOHO/MDI data as a single time series which can be run on existing Dopplergrams and later in re-calibrated Dopplergrams accounting for the SOHO orientation changes that started in 2003. Explore merging low-*l* time series from SOHO/MDI and SDO/HMI for 2-sunspot cycle analysis.

   The certainty of conclusions based on HMI data can be enhanced by comparison with as similar as possible analyses of GONG provided data. This would require using merged GONG images instead of time series made from SHTs as is presently done for GONG. The merged GONG images series may be available from work done by others.

3. Consult with Johann Reiter to develop a plan to migrate his code into the HMI pipeline processing. This should include both the MPTS and WMLPT code presently in stand-alone FORTRAN code running at Stanford.

4. Complete the tasks to get the intensity data into the global HS processing pipeline for HMI.

5. Work with Charles Baldner in coordination with Sasha Kosovichev to add the solar structure inversion code to the HMI processing library.

6. Work with Rick Bogart and Ed Rhodes to migrate the sunspot cycle-22 MWO data into DRMS data series to preserve it for extending findings from SDO/HMI (cycle 24 and hopefully 25) and SOHO/MDI (cycle 23) into cycle 22.

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Consulting Invoice, Payment Terms and project budget:

Hourly Consulting Rate: $50.00
# of month: 9 months
Invoice Frequency: Monthly
Payment Terms: Net 30 days from Invoice Date

Consulting Year	# of months	HRs /month	Annual HRs	Hourly Rate	Reimbursement expense	Annual Fees
2020	9	87	783	50	850	40000
			Total			**40000**

The table above summarizes my proposed consulting fees and reimbursement expense for the time period of January 1, 2020 through September 30, 2020. The total estimated budget for this period is $40,000. This budget includes expectation of 20 hours per week at $50/hour $850 of unspecified estimated reimbursed expenses such as supplies and communications.

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