Project Title:
Improvement in the Data Environment for Global and Local Helioseismic Studies of the Changing Solar Interior

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Project Information:
This is a proposal to improve the data environment for studies of the changing solar interior which are currently being carried out within the Living With a Star Program under NASA Grant NAG5-13510. Recently, several hints of possible temporal changes that have occurred during Solar Cycle 23 have been obtained through the application of helioseismic techniques to observations made with the Michelson Doppler Imager (MDI) Experiment onboard the SOHO spacecraft. These hints have included the discovery of the so-called Solar Subsurface Weather (SSW), and the confirmation of the existence of the so-called torsional oscillations in the sub-photospheric layers. The discovery of the SSW has included a reversal in the meridional circulation beneath the solar surface in the northern hemisphere during the years 1998 through 2001. NASA LWS Grant NAG5-13510 provides partial support for verifying that these same features can be seen in co-temporaneous ground-based observations taken at the Mt. Wilson Observatory 60-Foot Solar Tower since the SOHO mission began in 1996 and for searching for changes in both the meridional flow and in the torsional oscillations during Solar Cycle 22 using earlier MWO observations obtained on an annual basis since 1987. With the partial support of this grant, we have recently transferred 176 consecutive days (out of a 17-year total of 3270 days) of MWO Dopplergrams taken during mid-1996 to Stanford where we have employed two consecutive 72-day subsets of these images to confirm the existence of the torsional oscillations below the photosphere at that time. This data environment proposal will leverage the support provided by the above LWS grant since its approval will allow us to double the level of support of the three data analysts who have been processing the past MWO data and transferring the processed data to Stanford for analysis and permanent archival. Doubling their support will enable us to conduct our studies using a much larger amount of the past MWO archive than the current grant support will allow. We also propose to improve the radial resolution of the measurements of the shallow sub-surface layers by incorporating measurements of the frequency-splitting coefficients of the high-degree p-mode oscillations now that we have been able to remove the contamination introduced into those measurements by solar differential rotation. As soon as our MWO data have been archived at Stanford, they will also be available for use by the entire helioseismic community.

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