Frequencies of Solar Oscillations and the Seismic Structure of the Sun from SOHO/MDI

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The Michelson Doppler Imager (MDI) instrument on board the Solar and Heliospheric Observatory (SOHO) spacecraft is designed, fabricated, and operated by the Solar Oscillations Investigation (SOI) program. SOI is an international project to study the interior structure and dynamics of the Sun.

The striking stability of solar Dopplergrams measured by MDI, without an intervening atmosphere, substantially decreases the noise in the solar oscillations power spectrum compared with ground-based observations. This permits detection of lower amplitude oscillations, extending the range and precision of measured normal mode frequencies for inferring the internal structure of the Sun.

We present new measurements of the solar oscillation frequencies and results of frequency inversion. The sound-speed profile inferred from the mean frequencies of mode multiplets gives evidence for significant deviations from a standard solar model in the upper convective boundary layer, in a thin layer just beneath the convection zone and in the energy-generating core.
Multi-Dimensional Spectroscopy of Quiet Sun Structures
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One of the demands of today in solar physics and other fields of astrophysics is multi-dimensional spectroscopy. Typically dimensions include the wavelength, two spatial coordinates, but additional dimensions like the state of polarization and time are often of interest too.

In 1995 a new instrument for 3-dimensional spectro-polarimetry was brought into operation at the Gregory–Coudé–Telescope (GCT) at the Observatorio del Teide (Tenerife). The instrument is called MISC (Micro Image Scanner) and allows one to move the image of the sun perpendicularly across the entrance slit of the GCT’s spectrograph. To preserve the excellent polarimetric properties of the telescope, MISC is equipped with a Bowen compensator. In addition, a new Stokes V polarimeter has been designed and built to fit to MISC and its CCD camera. The MISC instrument itself has been presented at the AG-Tagung and the JENAM in 1995. Meanwhile, the development of the instrument has continued, the computer control has been improved, and the related software for data analysis has reached a state that we can present the first scientific results.

The observations presented here focus on structures on the quiet sun. With MISC we have simultaneously investigated fine structures seen in continuum images, images of the minimum intensity in spectral lines, Doppler maps from Stokes I images, magnetic maps from Stokes V signals, and other physical quantities.

References:

- F.Stolpe, M.Koschinsky, F.Kneer, 2D Spectroscopy with the Image Scanner of the Gregory–Coudé–Telescope on Tenerife, JENAM95 Proceedings, Experimental Astronomy, in press
- F.Stolpe, AG Abstract Series 11, 1995, p35