Session 69: Solar Atmosphere and Interior
Oral Session, 10:00-11:30 am
Salon I

69.01
What Have We Learned From High Frequency Solar Acoustic Oscillations?

P. Kumar (HAO/NCAR), E. Lu (JILA/HAO)

Peaks in the solar acoustic oscillation spectrum above the maximum trapped frequency (\( \sim 5.3 \text{ mHz} \)) have been shown to be due to the interference of traveling waves, in contrast with the discrete p-mode frequencies below 5.3 mHz. We will present the latest results from the analysis of high frequency oscillations, including the determination of the acoustic source profile.

69.02
Ground-based Photometry and Interpolated Nimbus-7 Total Solar Irradiance

G.A. Chapman, (SFO/CSUN), D.V. Hoyt (RDC)

Photometric images at 672nm and at the K-line (bandpass = 1nm) have been used to calculate irradiance fluctuations due to sunspots and faculae, respectively. These data have been compared to orbital Nimbus-7 total solar irradiance data interpolated to the approximate time of the images obtained at the San Fernando Observatory. For 15 data points we find a multiple regression coefficient, R, of 0.9801. The "non-magnetic" solar irradiance, \( S_w \), was 1371.87 \( \pm \) 0.21 W/m². For 21 data points from this time period the fit to interpolated ACRIM data gave an R = 0.9971 and an \( S_w = 1367.27 \) \( \pm \) 0.13. These results suggest that the irradiance scale of Nimbus-7 is about 4.6 W/m² above that of ACRIM. This work has been partially supported by NASA Grant no. NAG 5-1219 and NSF Grant no. ATM-8817634.

69.03
The Solar Spatio-Temporal Spectrum at High Frequency

R.S. Ronan, B.J. LaBonte, R. Kupke (UH/IFA)

We report on the results of full disk observations of the Sun taken at Mees Observatory, Haleakala Maui during 12 continuous days. Images in the Ca K line were recorded at a cadence of 30 seconds and at a spatial sampling rate of 5°. We construct a spatio-temporal spectrum from the time series of images with angular degree up to 300 and temporal frequency up to 16.6 mHz. We present the observed frequencies of the high frequency "modes" from rotationally corrected spectra. We observe ridges of power extending up to at least 10 mHz and up to a nominal radial order of 42. The frequencies to which the ridges are observed to extend are significantly above the photospheric acoustic cutoff frequency.

69.04
On the Generation of Magnetic Tube Waves in the Solar Convection Zone

Z. E. Musielak (U. Alabama, Huntsville), R. Rosner (U. Chicago), P. Ulmschneider and P. Gail (U. Heidelberg)

We discuss the correct status of computing longitudinal and transverse tube wave energy fluxes for the Sun. Recent work has focused on a better description of the turbulence and on incorporation of a physically meaningful description of the temporal spectrum (so-called "frequency factor") of the convective turbulence which drives magnetic tube waves. We shall present results showing the dependence of wave fluxes on the nature of this frequency factor and discuss possible role of these waves in the heating of the solar atmosphere.

69.05
On Reflection of Fast Mode Waves in the Solar Atmosphere

Beverly A. Stark and Z. E. Musielak (University of Alabama in Huntsville)

A new relationship for determining the critical frequency associated with fast mode wave propagation in an isothermal and magnetized atmosphere is introduced. The relationship is obtained by transforming the wave equation to the Klein-Gordon form where the critical frequency then appears explicitly as a coefficient in the equation. Previous findings that show the critical frequency for fast waves is influenced by both the gas and magnetic pressure are verified, although the relationship is different from that previously obtained. Numerical simulations are run to investigate the physics of wave reflection. Results are discussed in terms of their application to solar physics.

69.06
Heating Times and Heating Mechanisms in the Quiet Solar Atmosphere

R. Hamer (NRC/MSFC), R.L. Moore (NASA/MSFC)

We survey the characteristic heating times and the corresponding heating densities necessary to sustain the chromosphere, transition region, and corona in quiet regions. The transition region has a heating time that is much shorter and a heating density that is much greater than for either the chromosphere or the corona. This, together with the observed explosive character of the transition region on fine scales, suggests that the dominant heating mechanism in the transition region is basically different from that in the chromosphere and corona. We propose a new scenario for the heating of the quiet solar atmosphere in which all of the heating is primarily powered by microflares in the magnetic network. The microflares result in transient magnetic levitation of plasma in all levels of the chromosphere, transition region, and corona. The return inflow of this material can reasonably dominate the heating in both the chromosphere and the corona, but not in the transition region. We propose that the transition region is mainly heated by the current dissipation in the microflares.