9.02

SUMER – Solar Ultraviolet Measurements of Emitted Radiation

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SUMER is a high-resolution normal-incidence UV-spectrometer in the wavelength range from 500 to 1600 Å on SOHO (Solar and Heliospheric Observatory), scheduled for launch in 1995. Its low noise detection system will resolve 700 km on the Sun and plasma velocities down to 1–3 km/s can be observed. These characteristics will allow us to perform high-accuracy spectral imaging in many EUV emission lines and to study many physical parameters of the solar atmosphere, especially in the transition region and the low corona. Coronal heating, solar wind acceleration, topology of the upper atmosphere will be among the physical processes that can be investigated. Specific targets will be coronal holes, bright points, magnetic loops, coronal mass ejections and explosive events. Correlative studies with other SOHO instruments and ground-based observers will enhance the scientific return of SUMER.

9.03

Status of the LASCO Instrument Development Program

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The Large Angle Spectrometric Coronagraph (LASCO) is a triple coronagraph being developed for the Solar and Heliospheric Observatory (SOHO) mission. The science objective addressed by SOHO, in general, and LASCO, specifically, is the heating of the solar corona and the acceleration of the solar wind. The observational approach to this science objective is to image the solar corona from 1.1 to 30 solar radii. This range of coronal imaging is achieved with three coronagraphs: the inner coronagraph (C1) covers the range 1.1 to 3 solar radii, the middle coronagraph (C2) covers the range 1.5 to 6 solar radii, and the outer coronagraph (C3) covers the range 3 to 30 solar radii.

The flight hardware for LASCO has been developed to the point that preliminary measurements have been made of the performance of each of the three individual coronagraphs. Final calibration of the CCD cameras for the LASCO coronagraphs has begun. In all of these aspects, the performance of the flight hardware is equal to or superior to the initial design specifications. For example, the stray light rejection of the C3 coronagraph at the edge of the field of view has been measured to be at the level of 10_{-12}. Details of the measurements of the instrument performance will be presented.

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9.04

The Solar Oscillations Investigation - Michelson Doppler Imager (SOI-MDI)

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The Solar Oscillations Investigation (SOI) seeks to study the Sun's interior structure and dynamics using data from the Michelson Doppler Imager (MDI) instrument. MDI is scheduled for launch on SOHO in July 1995. Each minute the instrument will compute maps of velocity and intensity from several 1024*1024 narrowband filtergrams centered about the Ni 6768 spectral line. Full disk (4" resolution) or high resolution (1.2") Dopplergrams and intensities will be transmitted continuously, though when high speed telemetry is not available the images will have to be spatially averaged. The averaging will maximize the sensitivity to specific sets of helioseismology modes. The longitudinal magnetic field and other quantities will be available less frequently.

The present schedule calls for delivery of the flight instrument to ESA for integration with the SOHO spacecraft in November 1993. Structural and engineering models of the instrument have already been integrated and tested with SOHO spacecraft models. The complete set of MDI flight optical elements has recently been assembled into the flight package and the instrument has produced filtergrams and Dopplergrams in vacuum. All of the flight mechanisms and all of the flight electronics boards have been used to record images. The onboard software and firmware and the ground-based data analysis capability are still being developed.

9.05

Michelson Doppler Imager Calibration and Performance Tests

I. Zayer (LPARL), R. Bogart, J.T. Hoeksema (Stanford), and T. Tarbell (LPARL)

The Solar Oscillations Investigation (SOI) Michelson Doppler Imager (MDI) instrument will be delivered to the ESA in late 1993. To meet the principal SOI goal, to successfully measure the solar interior structure, MDI must be able to make observations of high accuracy and precision. Thus it is critical that the characterization and calibration of the instrument be complete prior to delivery in November. The first stage of this effort sought to verify MDI's optical functions and was completed in Fall 1992. The fracture of the Lyot filter early in these tests led to its redesign and refabrication. Nevertheless, most of the optics were debugged and many analysis methods were perfected despite the defective filter. The goals of the current work are to more accurately verify MDI's scientific performance and characterize its systematic errors, to increase confidence in the electronic control hardware and software, and to develop calibration test procedures for use on the ground and in space.

A final pre-delivery effort will occur late this summer. It aims to fully characterize MDI's performance in its flight configuration, to cross-calibrate with other ground-based observations, to verify the onboard analysis system, and to obtain a performance baseline for later tests.

We present results from the above tests as well as comparisons with simulations.

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10.01

Turbulent Compressible Convection with Rotation

N.H. Brummell, J. Toomre (U. of Colorado) and N.E. Hurlburt (LPARL)

Simulations of laminar convection in rotating spherical shells of fluid have been unable to reproduce the differential rotation profile of the solar interior deduced from the observed frequency splitting of p-modes. This prompts us to examine rotationally-