tral pulsar as an energy source is also considered. Initially, most species are neutral, but the innermost iron shell is largely singly ionized. As the expansion lowers the density, and hence the recombination rate, the ionization state of the iron increases. The presence of a pulsar is distinguished by powerful Fe III fine structure emission, which should be detectable from 500 – 1700 days after the explosion.

3.04

INFRARED SPECTROSCOPY OF SUPERNOVA 1987a FROM THE NASA KUIPER AIRBORNE OBSERVATORY

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We recorded a near-infrared spectrum of SN 1987a on UT 16.3 April 1987 using the University of Arizona Fourier transform spectrometer on the NASA Kuiper Airborne Observatory. Our objective was to survey the near-infrared spectrum of SN 1987a in wavelength regions between the H, K, and L photometric bands that are obscured by telluric H2O at ground-based telescopes. The achieved spectral resolution was 2 cm^-1, equivalent at 2.2 μm to a resolving power of 2300 and a velocity resolution of 130 km s^-1. All features intrinsic to SN 1987a were fully resolved. The spectrum is dominated by broad (3000 km s^-1 FWHM) atomic hydrogen emission lines. The strongest observed transition, Fe at 1.9 μm, is accompanied by resolved red- and blue-shifted companions that cannot be convincingly assigned to other species. The stronger, red-shifted component is also evident in other H lines. These velocity-shifted components to the HI lines could result from asymmetric expansion of the supernova atmosphere (e.g. shell structure), or they may indicate more specific phenomena in SN 1987a such as jets. We also observed an absorption feature at 2.7 μm and we are exploring the possibility that it is due to hydrated silicate grains in the circumstellar environment of SN 1987a. This feature could also be a photoionization edge, but we have not yet been able to assign it to a plausible species.

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3.05

Far Infrared Observations of SN 1987a

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We plan to observe SN 1987a in the 20 - 68 μm spectral range from the Kuiper Airborne Observatory (KAO) in Nov. 1987. The observations will have a spectral resolving power of ~30, and thus will allow us to see continuum dust emission from circumstellar dust or dust which may condense in the supernova ejecta as well as fine structure lines from elements synthesized in the supernova explosion. Some of the most interesting lines are those expected from Fe II. Measurements of the strength of the Fe II lines can give an accurate estimate of the total mass of synthesized Fe, which can be compared to the value derived from the energy flux from the radioactive decays in the ejecta. The November observations will be presented and compared to model predictions.

3.06

Observations of Far-Infrared Solar Continuum Variations Due to Compression Waves

C. Lindsey, E. E. Becklin, F. O. Orrall (University of Hawaii), M. W. Werner, T. R. Roellig (NASA-Ames Research Center), G. Kopp (Stanford University), J. T. Jeffries (NOAO)

We present recent observations of local solar continuum brightness variations at 50, 100, 200, 400, 600 μm radiation, made from the Kuiper Airborne Observatory in May, 1987. We monitored the Sun near disk center to detect brightness variations associated with 5-minute oscillations. We used the standard infrared technique of two-beam subtraction to compensate for varying sky and telescope emissivity, detector sensitivity variations, and transparency drift in the terrestrial atmosphere. We found brightness variations of order 3 K at all wavelengths in a 2 arcmin beam. We attribute the continuum brightness variations to temperature fluctuations in the chromospheric medium in response to compression experienced during vertical oscillations. The variations we detected showed strong correlations between different wavelengths. Interestingly, the longer wavelengths lag significantly behind the shorter wavelengths. This indicates that higher elevations lag lower elevations in their response to chromospheric oscillations. This continues the trend found at longer wavelengths (350 and 800 μm) in ground-based observations by Lindsey and Roellig.

3.07

Modeling the Solar Chromosphere by Airborne Solar Eclipse Observations

F. O. Orrall, E. E. Becklin, C. Lindsey (University of Hawaii), T. R. Roellig, M. W. Werner (NASA-Ames Research Center), G. Kopp (Stanford University), and J. T. Jeffries (NOAO)

Occultation measurements of the extreme limb of the Sun obtained at total solar eclipse provide an unambiguous height scale for the outer atmosphere that is independent of assumptions about how the atmosphere is supported against gravity. Such observations made in the far infrared and submillimeter continuum are especially valuable as a diagnostic for the chromosphere because the emission is radiated in LTE with a source function proportional to the local temperature. They thus place unique constraints on models of the atmosphere that strongly complement other observations.

The KAO is uniquely capable of making such observations. The continuum from 30 to 800 μm provides diagnostics for chromospheric structure through the temperature minimum region, the middle and upper chromosphere and the spicules. The 90 cm telescope on the KAO produces a narrow (~100") beam width that yields a major improvement in signal-to-noise by isolating a small section of the solar and lunar limbs at the line of contacts.

In this paper we summarize results of successful observations of the profiles of limb-intensity in the continuum at 30, 50, 100 and 200 μm made during the total eclipse of 1987 July 31. This was the first use of the KAO for solar observations and we discuss the technical requirements we had to achieve them. We describe new observations at 200, 400 and 800 μm to be made from the KAO during the forthcoming eclipse of 1988 March 17-18, and how they will be used to model the chromosphere and spicules.

3.08

5 – 13 μm Airborne Observations of Comet Wilson 1986: Preliminary Results


Comet Wilson was observed from the Kuiper Airborne Observatory approximately April 23.6 and 25.6 1987 UT (+3 and 5 days after perihelion) using the NASA-Ames Faint Object Grating Spectrometer. Spectrophotometric data were obtained with a 217° aperture (~10,000 km at the comet) between 5 and 13 μm with a spectral resolution of 50-100. Spectra of the inner coma and nucleus reveal a fairly smooth continuum with little evidence of silicate emission. The 5 – 8 μm color temperature of the comet was 500 ± 15 K, approximately 15% higher than the equilibrium blackbody temperature. All three spectra of the nucleus show a new emission feature at =12.25 μm = two channels (.22 μm) wide.