ABSTRACTS

35.06
MOLECULAR LINE AND CONTINUUM STUDIES
OF THE SAGITTARIUS B2 MOLECULAR CLOUD

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We have observed the 1300 μ, 1100 μ, 800 μ, 450 μ, and 350 μ continuum emission from the Sgr B2 molecular cloud core using the 14 m Five College Radio Astronomy Observatory antenna at New Salem, Massachusetts, and the 15 m James Clerk Maxwell Telescope at Mauna Kea, Hawaii. We have modeled the dust emission from Sgr B2(M) and (N) sources using the radiation transfer code of Egan, Leung, and Spagna (1988). Our model is based on the assumption that the northern source is located behind the dust cloud associated with Sgr B2(M) and is, therefore, attenuated at short wavelengths by cold foreground dust. The model successfully predicts the observed flux in a 60° beam at wavelengths between 20 μ and 1300 μ, as well as the observed change in the middle-to-near peak flux ratio as a function of frequency. In a 50° beam, the middle-to-near flux ratio changes from 0.85 at 1100 μ to 1.3 at 350 μ. The observed increase of the flux ratio with frequency is mostly a result of extremely large opacity in the northern source (a 100 μ optical depth of ~16) and to some extent attenuation by cold foreground dust. The results of the model calculations confirm the high dust column density through the cloud suggested by Lis and Goddard (1989). Sgr B2, with a dynamical mass of about 10^5 M⊙, is very close to virial equilibrium. The mean density for the 45 pc diameter region is between 2500 and 4000 cm^-3, approximately a factor of 20 higher than in dark clouds of similar size. The high dust column density found in this study suggest that fractional abundances of many molecular species in the cloud may be significantly lower than the typical values in local interstellar clouds.


35.07
Interstellar Energies: Magnetic, Kinetic, and Gravitational Energy Density In Bound and Unbound Clouds

P.C. Myers and A.A. Goodman (CFA)

Observations indicate that energy densities in the interstellar gas range from about 10^-12 erg cm^-3 for "intercloud" gas to about 10^-6 erg cm^-3 for water masers. We present five pieces of evidence that much of the interstellar gas in this range has magnetic and nonthermal kinetic energy densities which are nearly equal. We discuss evidence that some interstellar clouds are not bound by gravity, while others contain dense, boundary regions surrounded by less dense, unbound regions. We discuss implications of these findings for cloud physics, cloud evolution, and star formation.

35.08
Measurement of Magnetic Field Strength in the Dark Cloud B1


By measuring the Zeeman effect in thermally excited OH emission lines, we have detected a 27 ± 4 μG magnetic field in the molecular cloud B1, part of the Perseus complex of molecular clouds. The measurements required approximately 30 hours of integration time at the Arecibo 1000 ft (305 m) telescope. Previous attempts to measure the Zeeman effect in OH (1665 and 1667 MHz) emission, all with smaller telescopes and similarly long integration times, have resulted only in upper limits and one '3-O' detection. Arecibo proved superior to the smaller telescopes because its small beamsize (~3 arcmin at 1665 MHz) is better matched to the angular size of the OH emission associated with nearby molecular cloud cores. The field measured in B1 agrees well with theoretical predictions made by substituting observations of spectral linewidth, volume density, and cloud size into a model of magnetic and virial equilibrium. OH emission observations, which can simultaneously measure linewidth, density, cloudsize—and now magnetic field strength, provide the best currently available observational tool for assessing the role of magnetic fields in the energetics and support of molecular clouds where n > 10^8 cm^-3.

We have also detected a magnetic field of ~10 ± 3 μG using the NRAO Green Bank 140-foot telescope, at the same position in B1 as the Arecibo measurement. This result is relevant to the gas within the Green Bank OH beam, which has a FWHM ~15'. B1 represents one of about ten OH condensations associated with molecular cloud core in the Perseus region, many of which contain protostellar or young stellar sources. In an effort to study the magnetic field in this star-forming region, extensive Zeeman measurements of OH condensations in Perseus are planned for the near future at Arecibo.

Session 36: Seyfert & Markarian Galaxies
3:40-5:10 pm, Salon F

36.01 (Dissertation)

A Study of the Structure and Dynamics of the Narrow Line Region of Active Galactic Nuclei

S. Veilleux (Lick Obs./UCSC)

The results of a high-resolution study of narrow emission line profiles in AGN are presented. The Hamilton echelle spectrograph installed at the coude focus of the Shane 3-m telescope was used to obtain high S/N spectra of 15 Seyfert galaxies covering the range 4600 Å ~ 7500 Å at an average resolution of about 10 km/sec. The galaxies in the sample were selected on the basis of their apparent magnitude and the quality of their optical spectrum (numerous strong emission lines, weak stellar absorption lines, ...). The usual line profile parameters (peak and centroid velocities, widths, asymmetries, and area parameters) were measured for all the stronger emission lines. The excellent resolution of the data allows the measurement of these parameters in the very core of the lines. Comparisons of the results of the present study with the results of Vrtilek and Carleton (1984) generally show very good agreement for both the widths and line center velocities of [O III] λ5007. On the other hand, line width measurements of lower resolution studies tend to be larger than the present measurements. The discrepancy appears to be a function of the resolution, being larger for narrower emission lines and lower resolution studies. An important result of the present study is that nearly all of the galaxies in the sample show clear evidence of profile substructures in their narrow emission lines. Secondary peaks are seen in the line profiles of a number of galaxies. Line profile ratios ("velocity mapping") indicate, in some cases, significant differences in the physical conditions of the individual subcomponents constituting the narrow line region. The standard picture of a spherically symmetric narrow line region composed of a large number of small radially-moving clouds mixed with dust is reconsidered in the context of these new results.

36.02
Near-Infrared Emission-Line Spectra of the Orion Nebula, NGC 4511, and Other Seyfert Galaxies

D.E. Osterbrock, R.A. Shaw, and S. Veilleux (Lick Obs./UCSC)

Well exposed CCD spectra have been obtained at moderate resolution (FWHM ±7 Å) of NGC 4511 and NGC 1976 in three overlapping regions covering the region 7,000-11,000 Å. The strongest three lines in both objects are, in order, [S II] λ6732, He I λ10830, and [S III] λ9069. The Orion Nebula spectrum is very helpful in identifying lines in the Seyfert galaxy spectra. Lines identified in NGC 4511, many of them previously known, include H I, He I, He II, O I λ8446, [C II], [Fe II], [Fe III], [Cl II], [M Х II], [Ar III], [Ar VII], [S III], and [S VII] λ3991.