16 JANUARY 1985
WEDNESDAY MORNING
Session 43: Galactic Structure II
9:40–11:30 (Empire East, Holiday Inn)

43.01
Nell Observations of the Galactic Center
Serabyn, E. (UCB), and Lacy, J. H. (UT)

The velocity field within 2 pc of the galactic center has been investigated by observing the [NII] 12.8 \mu m fine-structure line emission from Sgr A West. The observations show regular variations in velocity along several of the most prominent radio continuum features, indicating the presence of at least two large-scale flows of ionized gas. One of the flows follows a circular orbit at a galactocentric radius of \approx 1.7 pc, and requires 4.7 \times 10^7 M\odot to lie within that radius. The other flow is well fit by an eccentric orbit about a point mass. This orbit approaches within 0.5 pc of the center of the galaxy and requires \geq 3.5 \times 10^8 M\odot to lie within that radius. The inferred mass distribution is too centrally peaked to be due to a spherical isothermal stellar cluster, implying that a substantial fraction of the mass located within 1.7 pc of the center is contained in a centrally condensed form, possibly a massive black hole, with mass \approx 3 to 4 \times 10^8 M\odot. The best fit orbits occur under the assumption that the point mass is near the 2 \mu m source IRS 16 NE.

This work was supported in part by NASA grant NGL 05-003-272.

43.02
The Galactic Ultraviolet Radiation Field
R. C. Henry and W. B. Landesman (JHU)

Integrations of the TD-1 ultraviolet star catalog are used in a quantitative evaluation of the strong anisotropy of the galactic radiation field. The integration was for 1563 A, and was over a band of width 40\cir centered on the Gould equator (which is tipped 19\cir to the galactic equator). We find that from Gould longitude (i.e., approximately, galactic longitude) 190\cir to 360\cir the brightness averages \approx 27,000 photons (cm^{-2} s^{-1} A^{-1}). In contrast, from 0\cir to 190\cir, the average brightness is only \approx 5000 if these units, and in even greater contrast, from 100\cir to 180\cir the brightness is only \approx 1000 of these units. We have also applied the TD-1 catalog to re-assess the stellar contribution to the moderate- and low-latitude Apollo-17 targets of Henry, Anderson, Feldman, and Pantie (Ap.J. 222, 902, 1978). While TD-1 integrations show that in general the star-catalog-integration method of evaluating the stellar contribution to a target overestimates by \approx 40\%, on the two Henry et al. targets the error is still dominated by spacecraft pointing uncertainty, and the conclusions are not affected: in particular, at the b=-13\cir target in Taurus, no more than 600 units of diffuse galactic light can be present. Finally, we discover a number of large regions at high galactic latitudes having extraordinarily low (-100 of the above units) surface brightness, as judged by TD-1 integrations.

This work was supported by NASA grant NAG5-619.

43.03
IUE Observations of Interstellar Hydrogen and Deuterium toward Alpha Centauri B
J. Murthy, R. C. Henry, H. W. Moon (JHU), W. Landesman* (GSFC), J. L. Linsky (JILA), and J. Russell (ST ScI)

Observations of interstellar HI and DI absorption, cutting into the chromospheric Ly alpha line of nearby late-type stars, may be used to study the interstellar medium in the immediate neighborhood of the sun. We have obtained the first high-dispersion profiles of the Ly alpha emission line of a Cen B (KIV, d=1.3 p.c.) using the short wavelength spectograph on the International Ultraviolet Explorer (IUE) satellite. Our determination from geocoronal and planetary spectra has been largely eliminated by the use of the small aperture (3\cir circle). The square-well like interstellar HI absorption feature shows good agreement with the absorption profile observed toward a Cen A by Landesman et al. (Ap. J. 1984, in press). Interstellar deuterium has been detected and a lower limit of 10^{-3} has been placed on the deuterium to hydrogen ratio (D/H).

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43.04
Further Observations of H and He in the Very Center of the Galaxy
K. Krisciunas, T. R. Geballe (UKIRT), and R. Wade (R. Obs. Edinburgh)

We present observations of the 4.05 \mu m Brackett-\alpha line of H I in the Galactic Center. We measured 19 positions centered on IRS 16, with a beam size of 275 and a step size of 270. These observations follow up our previous 1.1 mm map of Br-\alpha taken with a 472 beam (Geballe et al. 1984, Ap. J. 284, 118). We confirmed the presence of the high velocity Br-\alpha emission (+700 km/sec) at IRS 16, presumably the result of mass outflow, and detected high velocity emission in a number of pixels in its vicinity. Spatial resolution of the high velocity line emitting region allows us to conclude that the mass loss rate is closer to the upper limit of our previous range of values: M > 10^{-3} M\odot/yr.

Our previous work implied that a sizeable fraction of the ionizing radiation in the Galactic Center is attributable to IRS 16. To test this we measured the 2.06 \mu m He I to 2.17 \mu m Br-\gamma line ratio at a number of non-adjacent positions in a 570 beam. The data show that the largest He I/Br-\gamma ratios are found at IRS 6 and IRS 16. Thus IRS 16 may be an important source of ionizing radiation, but other ionizing sources are probably also present.

43.05
Mapping Molecular Hydrogen Emission from the Galactic Center
I. Gatley, R. Wade (UKIRT), T. J. Jones (U. Minn.), A.R. Hyland (MSSSO)

Maps of the 2.12 \mu m v = 1-0 S(1) line of molecular hydrogen have been made on UKIRT with a velocity resolution of \approx 130 km s^{-1}. A 1.5\arcmin x 2.5\arcmin area was fully sampled using an 18\arcsec beam. The two lobes of emission found earlier (Gatley et al., 1984, MNRAS, Vol. 210) about 80\arcsec apart on opposite sides of IRS16 are confirmed. In addition, there is a third peak of emission NW of IRS16. The velocity structure and overall morphology of the H2 emission is consistent with a uniformly rotating, lumpy ring of shocked gas, tilted -30\arcsec out of the line of sight to the galactic center. This is in excellent agreement with the model proposed by Gatley et al. where mass loss from an energetic object near or at IRS16 impacts the inner edge of the toroid of cold molecular gas seen in far IR and CO maps.

43.06
Molecular Clouds in The Carina Arm
D.A. Grabelsky, R.S. Cohen (Columbia U.), L. Bronfman (Columbia U. and Chile), H. Alvarez, J. May (U. Chile), F. Thaddeus (Goddard Inst. and Columbia U.)

With the Columbia University 1.2 m telescope on Cerro