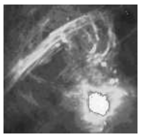
GCNEWS



The Newsletter of Galactic Center Research

Vol.4 **February 1997**

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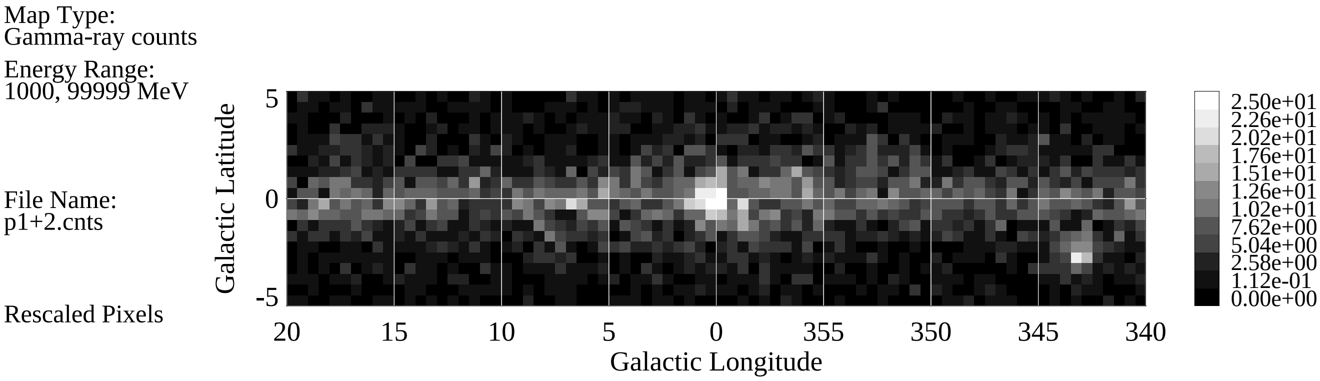
The Galactic Center as seen with EGRET



The distribution of γ-rays detected by EGRET during phase 1 and 2 with E>1GeV. The PSF-shaped Galactic center excess is immediately apparent. Pulsar PSR B1706−44 is also apparent at l=343°, b=−3°(Figure 1 of the article by John Mattox, page 3.

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Editorial: Where *is* the Galatic center?

Heino Falcke & Angela Cotera

Although important to understanding the relation of objects at different wavelenghts, rarely do astrometric papers knock you off your feet: but it has just happened in Galactic Center research! In the last issue we reported about the headline-making determination of the black hole mass of Sgr A* from stellar proper motions. This issue contains another equally important paper published by Menten *et al.* in the ApJ Letters (see p. 6), using stellar SiO masers in the central cluster to pinpoint the position of Sgr A* in the 2.2 μm difraction limited reference frame to an estimated accuracy of 30 milli-arcseconds. Therefore, we may now know where the exact position of the physical center of the Galaxy is, as it is generally thought that Sgr A* marks the location of the supermassive, central black hole. The observations also reveal that this black hole candidate is actually black in the NIR as the derived position points right at $\cdots$ *nothing*! There are no NIR sources coincident with the determined position of Sgr A*. Certainly this remarkable result will stimulate further work in this area in order to confirm and possibly improve the position of **the** Galactic Center.

Perhaps, within the next few years we as a community will seriously think about using the position of Sgr A* as the l=0.0, b=0.0 reference point for the Galaxy. This would not be the first time that the center of a galaxy was defined by the presence of a radio source. There is, however, a possible caveat occasionally raised mainly by Leo Blitz: is Sgr A* really in the dynamical center of the Galaxy? If so, how could a 2×10^6 $M_\odot$ black hole be responsible for such a wide spread gravitational effect? Sgr A* may mark the center but it probably does not *cause* it to be there. We know from other galaxies that sometimes the physical center seems to be dislocated from the center of the outer isophotes and the center of rotation of the outer parts of the galaxy. In this respect "Center" may always be a relative term and one may always need to distinguish between the physical and dynamical centers. How certain are we that they are identical in the Galaxy and to which precision? The position of Sgr A* will probably always be the best known quantity in this equation. No matter what, Sgr A* has certainly captured our full attention in the past few months, with additional information on this source and its surroundings to be presented at the upcoming IAU Symposium No. 184, 'The Central Regions of the Galaxy and Galaxies'(see p. 8 for the Preliminary Program).

Besides this interesting paper on one of the central questions in GC research, the current issue of GCNEWS brings you a number of other interesting abstracts, primarily on the nature of the interstellar matter in the Center of the Galaxy. Interestingly, two contributions in this ongoing discussion come from high-energy experiments which find extended pair annihilation radiation (Cheng et al., p. 7) and 26Al emission (Naya et al., p.6). Heretofore, high-energy observations (e.g. beyond x-rays) have been unable to make the vast contributions to Galactic Center research that radio and infrared studies have made because of the low resolution of high energy surveys and the consequent large positional errors. Indeed at both previous Galactic Center conferences and in papers published in the available literature, high-energy research has been, unfortunately, somewhat marginalized. We have therefore asked John Mattox, who first reported an EGRET detection of the Galactic Center a few years ago, to summarize in a very compact form the results of EGRET observations of the Galactic Center — and indeed this is an area of research that deserves more attention.

You will find his article and the new abstracts on the following pages and we hope you find this Newsletter a helpful and stimulating tool for your research.

The High-Energy Gamma-Ray Source at the Galactic Center

J. R. Mattox, *Astronomy Department, Boston University*

Abstract

In the course of a full-sky survey, the Energetic Gamma Ray Experiment Telescope (EGRET) aboard the Compton Gamma Ray Observatory detected a high-energy (30 MeV - 30 GeV) γ-ray excess, 2EG J1746-2852, which is consistent in position with the Galactic center (within 0.2 degrees of l= 0.05, b=−0.05, with 95% confidence). The proximity indicates that it is probably associated with the Galactic center. The excess is observed to be distributed as the EGRET point spread function. The flux is 1.1±0.1 $\times 10^{-6}$ photons $cm^{-2}s^{-1}$, corresponding to a high-energy γ-ray luminosity of $\approx 5 \times 10^{36}$ ergs/s if it is at the Galactic center. It is possible that the γ-ray emission is due to the $\approx 10^6$ $M_\odot$ black hole candidate Sgr A, but there is not significant evidence of variability to confirm this. A diffuse origin within a ≈100 pc distance of the Galactic center is also possible.*

1.0 Introduction

The Energetic Gamma Ray Experiment Telescope (EGRET) aboard the *Compton Gamma Ray Observatory* is sensitive in the energy range 30 MeV to 30 GeV (Thompson *et al.* 1993). A catalog of EGRET sources based on the first 30 months of exposure is given by Thompson *et al.* (1995). It includes 129 sources. Five are pulsars, and ∼50 are identified with radio sources which appear to be of the blazar class of AGN. A total of 71 are unidentified. Among the unidentified sources is 2EG J1746-2852.

2.0 The EGRET Detection

The EGRET data clearly show an excess spatially coincident with the center of the Galaxy (Figure 1, see cover page) which is consistent with the EGRET point spread function. A likelihood position estimate (Mattox *et al.* 1996) has been done for the event energy selection, E>1 GeV. Assuming a point source, the formal likelihood result is that it is located with 95% confidence within 0.13° of $l = 0.05°$, $b = -0.05°$. Allowing for a systematic error equal to the statistical error, the radius of uncertainty is 0.2°. Thus, the low-energy γ-ray source 1E1740.7-2942 is excluded with high confidence. The proximity indicates that this excess is probably associated with the Galactic center. With 9 EGRET sources in the region -20°$< l < 20°$ and -5°$< b < 5°$ (Thompson *et al.* 1995), the probability that any non-Galactic-center source would be found within 0.1° of the Galactic center may be estimated as $9[\pi\ 0.1^2/(40 \times 10)] = 0.001$. The position analysis implies that if the emission is extended, it also must be centered within ∼0.2° of $l = 0.0, b = 0.0$. This is narrower than the distribution of the wide-line molecular clouds at Galactic radius ≈400 pc.

While it is not known what the occurrence rate of such compact diffuse emission regions might be, it must be less than or equal to 9 in the region $-20 < l < 20°$ and $-5 < b < 5$. Therefore, with 99.9% confidence, the point source (or compact diffuse γ-ray excess) is associated with the Galactic center.

The spectrum is shown in Figure 2. This has been derived by making a likelihood estimate of flux for each of the narrow standard EGRET energy intervals using the diffuse model of Hunter *et al.* (1997). Because the PSF blossoms into an uncertain diffuse model at low energy, the photons with E< 150 MeV have not been used in the analysis. The best power law fit has a photon index of −1.7. The fit is not good (reduced $\chi^2 = 3.6$). The low energy departure from the power-law could be due to an error in the diffuse model. If the high energy point is not below the power-law extrapolation due to statistical fluctuation (5% chance), a spectral break occurs at ∼3 GeV.

3.0 Summary

EGRET detects an unresolved source of GeV emission which is coincident with the direction of the Galactic center. It is likely that this source is in fact at the Galactic center, but it is not clear whether this is a compact source, or whether it is extended over a ∼100 pc region. Pohl (1997) suggests that the emission is due the Galactic center arc. A more complete description of the EGRET result is in preparation by Mayer-Hasselwander *et al.* (1997).

The GeV observations of the proposed GLAST satellite (Michelson *et al.* 1997) will be very useful in understanding this γ-ray source. With ~10 times the effective area of EGRET and a point spread function which covers ~1/10 of the solid angle of EGRET's PSF as a function of energy, GLAST will determine the position of the source to better than an arc minute, and will allow for resolution of extended emission as small as a few pc. The expected stability of the response of GLAST will also provide for detecting small variation in flux. The GLAST mission is well defined (Michelson *et al.* 1997). It could fly within ~5 years of getting the required ~$200M funding.

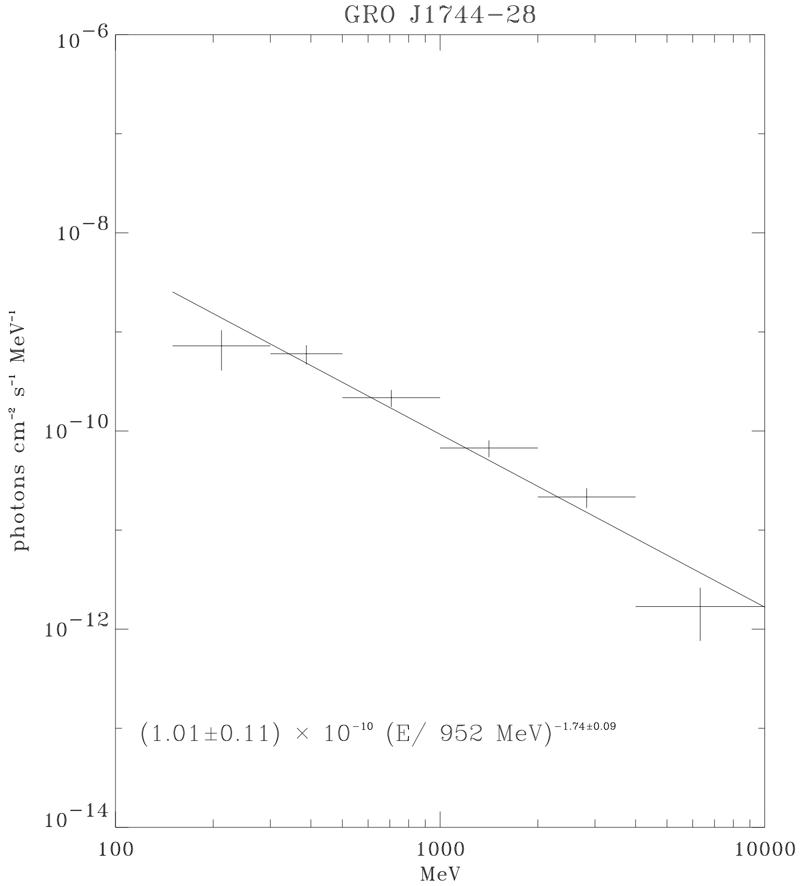

Figure 2. The spectrum of the Galactic center excess for the phase 1 and 2 data.

References

Hunter *et al.*, 1997, ApJ, in press
Mattox, J.R. *et al.*, 1996, Ap J, 461, 396
Mayer-Hasselwander *et al.*, 1997, in preparation
Michelson, P.F., *et al.*, 1997, in preparation; also see http://www-glast.stanford.edu/ Pohl, M., 1997, AA, 317, 441
Thompson, D.J., etal., 1995, ApJ S, 101, 259
Thompson, D.J., etal., 1993, ApJ S, 86, 629

Abstracts

A Hot Ring in the Sgr B2 molecular cloud

P. de Vicente[1], *J. Martín-Pintado*[1] and T. L. Wilson[2]

(1) Centro Astronómico de Yebes, Guadalajara, Spain, (2) Max-Planck Institut für Radioastronomie, Bonn

We present high angular resolution ($13-26''$) large scale mapping ($4' \times 7'$) of the J=5–4, J=8–7, and J=12–11 lines of CH_3CN and $CH_3^{13}CN$ and of the J=11–10 line of HC_3N towards the Sgr B2 molecular cloud. All the K components of all CH_3CN lines are observed in emission except towards Sgr B2M where we have detected the J=5–4, K=4 and J=6–5, K=5 lines in absorption. CH_3CN and HC_3N show a ridge of strong emission along a north-south direction which contains the star forming regions Sgr B2M, Sgr B2N and Sgr B2S. The kinematics of the molecular gas shows four major molecular clouds with radial velocities of 44-54, 55-66, 67-78 and 90-120 $km\,s^{-1}$ and sizes of a few parsecs. The main molecular cloud with a radial velocity of 55-66 $km\,s^{-1}$ is observed over the whole region. Maps of the kinetic temperature and density derived from an LVG analysis of the CH_3CN data are presented for the molecular clouds at 44-54, 55-66 and 67-78 $km\,s^{-1}$. The kinetic temperature for the three clouds ranges between 40-400 K, while the density is $\sim 10^5$ cm^{-3} for all clouds. The total mass in these clouds is $3 \cdot 10^6$ $M_\odot$, with 70% of the mass in the 55-66 $km\,s^{-1}$ molecular cloud. This cloud reveals the presence of four different components: the hot cores, the warm envelope, the very hot component and the hot ring. The largest kinetic temperatures (200-400 K) are found towards the hot cores associated to the star forming regions Sgr B2M and Sgr B2N, with sizes of 0.5 and 0.7 pc respectively. Two new cores close to Sgr B2N with sizes of 0.3 pc have been found. H_2 densities for the hot cores are $10^6 - 10^7$ cm^{-3}. The mass in the cores is typically $10^3 - 10^4$ $M_\odot$. The warm envelope extends over the whole region; this has a uniform kinetic temperature, between 40-80 K. The kinetic temperatures are higher than the dust temperatures at distances larger than 1 pc. The density in the warm envelope decreases with distance as $n(H_2) = 2.96 \cdot 10^5\,cm^{-3}\,(r/pc)^{-0.87}$. The analysis of the absorption lines in the J=K components of the J=5–4 and J=6–5 lines shows the presence of a hotter and more diffuse envelope probably surrounding the warm envelope. An analysis of our data gives a kinetic temperature of 300 K and a density of $\sim 10^3$ cm^{-3}. The kinetic temperature maps reveal, for the first time, the presence of a ring of hot gas (100-120 K) surrounding Sgr B2M and Sgr B2N with a radius of 2 pc and a thickness of 1.4 pc. Our data suggest that the density in the hot ring is similar to that in the warm envelope.

The high temperature of the hot cores and the kinetic temperature distribution for distances smaller than 1 pc can be accounted for by gas-dust collisional heating. This temperature is consistent with the total luminosity of the central sources Sgr B2M and Sgr B2N. In contrast, the dust temperatures in the warm envelope are too low (10-20 K) to heat the warm envelope molecular gas by this mechanism. Heating by dissipation of turbulent motions in the envelope of Sgr B2 can explain the high gas kinetic temperatures. The presence of the hot ring suggests the existence of another heating mechanism. The morphology of the hot ring which surrounds the 50 microns and the radio continuum emission of Sgr B2M and Sgr B2N suggests that this feature might be associated to the interface between the warm envelope and the ionized bubble created by the OB stars recently formed in the Sgr B2 core. In this interface, heating by UV photons and or shock fronts produced by the expansion of the ionized gas could explain the hot ring.

to appear in A&A

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SiO Maser Sources toward the Sgr B2 Molecular Cloud

Shigetomo Shiki[1], *Masatoshi Ohishi*[2] *and Shuji Deguchi*[2]

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We have detected six new SiO maser sources towards the Sgr B2 molecular cloud. One is identified with an OH 1612 MHz maser source which was previously found by the VLA, and another associated with an IRAS source. The other four sources are not associated with any known OH/IR or IRAS sources. The spatial density and the kinematic property for these sources are found to be similar to those of the OH/IR sources near the Galactic center. This fact suggests that they are mostly stellar SiO maser sources in front of (or behind) the Sgr B2 molecular cloud. A possibility of association with young stellar objects, however, cannot completely be ruled out for the one SiO source (17450-2808) which is associated with an IRAS source exhibiting infrared colors of young objects.

to appear in ApJ, March 20
email: deguchi@nro.nao.ac.jp

Detection of high velocity 26Al towards the Galactic centre

Juan E. Naya [1,2], *Scott D. Barthelmy*[1,2], *Lyle M. Bartlett* [3], *Neil Gehrels* [1], *Marvin Leventhal* [4], *Ann Parsons* [1], *Bonnard J. Teegarden* [1], *& Jack Tueller* [1]

(1) NASA/Goddard Space Flight Center, (2) Universities Space Research Association, Seabrook, MD, (3) NAS/NRC Resident Research Associate, NASA/GSFC, (4) Dept. of Astronomy, University of Maryland

Theory predicts that radioactive 26Al (which has a half-life of 0.72 Myr) is released into the interstellar medium by nova and supernova explosions, from winds of massive stars in the Wolf-Rayet phase, and from less-massive stars in very late stages of their evolution (in the Asymtotic Giant Branch phase). Observations of 1809 keV g-ray emission from 26Al can therefore be used as a tracer of Galactic Nucleosynthesis during the past million years. The irregularity of the emission in the plane of the Galaxy suggests that the dominant sources are likely to be massive stars and supernovae; the other predicted sources are older, and therefore expected to be distributed more uniformly. Here we report the detection of the 1809 keV emission line from the direction of the Galactic centre, and we show that the line width is approximately three times that expected from the effect of Doppler broadening due to Galactic rotation. The high velocities inferred from the line width favour an origin of 26Al in supernovae or Wolf-Rayet stars. Moreover, the fact that the 26Al has maintained such high velocities is difficult to reconcile with our current understanding of the propagation of material in the interstellar medium.

Letter to Nature, Vol. 384, p. 44, 1996
email: naya@tgrs2.gsfc.nasa.gov

The Position of Sagittarius A*: Accurate Alignment of the Radio and Infrared Reference Frames at the Galactic Center

Karl M. Menten[1], *Mark J. Reid*[1], *Andreas Eckart*[2] *& Reinhard Genzel*[2]

(1) Harvard-Smithsonian Center for Astrophysics, (2) Max-Planck-Institut für extraterrestrische Physik, Garching

We present a novel approach to the long-standing problem of locating the position of the compact nonthermal radio source Sgr A* on infrared images of the Galactic center region. Using the VLA, we have detected SiO and H_2O maser emission toward several sources within the central parsec of our Galaxy. These masers arise from the innermost parts of circumstellar envelopes of giant and supergiant stars that are members of the nuclear star cluster and appear as compact infrared sources in a diffraction-limited 2.2 μm infrared image. One of the SiO masers is associated with the M-type supergiant IRS 7, the most prominent 2.2 μm point source in the Galactic center region. The radio data allow measurements of the maser positions relative to the compact non-thermal radio continuum source Sgr A* with milliarcsecond accuracy. Because stellar SiO masers near the Galactic center trace their host stars to within a few milliarcseconds, these relative positions can be used to

calibrate the plate scale and rotation of the infrared image. Our method allows registration of the radio relative to the infrared reference frame with an estimated accuracy of 0."03. Using the improved position accuracy we put a stringent upper limit on Sgr A*'s 2.2 μm flux density that is significantly lower than values predicted by recent theoretical model calculations.

ApJ 475, L111 (1997)
ftp://alpkmm.harvard.edu/pub/paper_and_table.ps, fig1-color.ps, fig2-color.ps
email: menten@sunkmm.HARVARD.EDU

Accretion Disk Evolution With Wind Infall I. General Solution and Application to Sgr A*

Heino Falcke[1] *& Fulvio Melia*[2,3]

(1) Astronomy Department, University of Maryland, (2) Department of Physics & Steward Observatory, University of Arizona, (3) Presidential Young Investigator

The evolution of an accretion disk can be influenced significantly by the deposition of mass and angular momentum by an infalling Bondi-Hoyle wind. Such a mass influx impacts the long-term behavior of the disk by providing additional sources of viscosity and heating. In this paper, we derive and solve the disk equations when these effects are taken into account. We present a survey of models with various wind configurations and demonstrate that the disk spectrum may then differ substantially from that of a standard α-disk. In particular, it is likely that a wind-fed disk has a significant infrared bump due to the deposition of energy in its outer region. We apply some of the results of our calculations to the Galactic Center black hole candidate Sgr A* and show that if a fossil disk is present in this source, it must have a very low viscosity parameter ($\alpha \lesssim 10^{-4}$) and the Bondi-Hoyle wind must be accreting with a very high specific angular momentum to prevent it from circularizing in the inner disk region where its impact would be most noticeable.

ApJ 479, in press
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www.astro.umd.edu/ hfalcke/publications.html#wintercept
xxx.lanl.gov/abs/astro-ph/9611095

The Nature of the Faraday Screen Toward the Galactic Center Nonthermal Filament G359.54+0.18

F. Yusef-Zadeh[1] *, M. Wardle*[2] *and P. Parastaran* [3]

(1) Department of Physics and Astronomy, Northwestern University, (2) Research Centre for Theoretical Astrophysics, University of Sydney, (3) Panasonic Factory Automation, Frankslin Park, Illinois

We present multifrequency VLA observations of the intensity and polarized emission from G359.54+0.18, a system of nonthermal filaments near the Galactic Center. The intrinsic magnetic field lines run primarily along the filaments. The rotation measure (RM) varies between −4200 and −370 rad m^{-2} on scales of several arcseconds, implying that the ionized, magnetized medium responsible for the Faraday rotation is less than 0.1 pc thick. In turn, this implies that the magnetic field in the Faraday screen is large, suggesting that it is located close to the Galactic center. Further evidence is provided by the anisotropy of the RM fluctuations. The structure of the eastern portion of G359.54+0.18 suggests that the magnetic field in the filaments is highly distorted as a result of an interaction with an adjacent Galactic center molecular cloud.

ApJ 475, L119
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www.astro.nwu.edu/astro/farhad/papers.html

A Maximum Entropy Map of the 511 keV Positron Annihilation Line Emission Distribution Near the Galactic Center

L.X. Cheng[1]*, M. Leventhal*[1]*, D.M. Smith*[1] *W.R. Purcell*[2]*, J. Tueller*[3]*, A. Connors*[4] *D. Dixon*[5]*, R.L. Kinzer*[6]*, & J.G. Skibo*[6]

(1) Departmentof Astronomy, University of Maryland, (2) Department of Physics and Astronomy, Northwestern University, (3) Laboratory for High Energy Astrophysics, NASA/GSFC, (4) Space Science, Morse Hall, University of New Hampshire, (5) University of California, Institute for Geophysics and Planetary Physics, (6) Naval Research Laboratory, Washington, DC.

We have applied the Maximum Entropy

Method to a large data set which was constructed based on CGRO/OSSE, SMM, TGRS, GRIS, HEXAGONE and FIGARO observational results of the Galactic Center 511 keV annihilation radiation to produce a Maximum Entropy map of the 511 keV line emission distribution. This map suggests that the 511 keV emission from this region consists of at least two components: a central bulge with a flux of $5.7 \pm 0.29 \times 10^{-4} ph$ $cm^{-2} s^{-1}$ and a Galactic Plane component with a flux of $2.2 \pm 0.4 \times 10^{-4} ph\ cm^{-2} s^{-1}$. The central bulge has a centroid of $l = -0.47 \pm 0.24, b = 0.1 \pm 0.18$ and FWHM$\sim 5°$. We note that the Galactic Plane component agrees in position with a strong hot spot in the Comptel map of 1.8 MeV ^{26}Al line emission. The 511 keV line flux difference between CGRO/OSSE and other instruments with larger field-of-view suggests the existence of an extended diffuse 511 keV emission. An interesting hot spot at $l = -4°, b = 7°$ with a flux of $\sim 2 \times 10^{-4}$ ph $cm^{-2} s^{-1}$ is shown on our map. A bootstrap test indicates that the significance level of feature is 3.5σ.

submitted to ApJ Letters

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Preliminary Program

2nd Circular

IAU Symposium No. 184

THE CENTRAL REGIONS OF THE GALAXY AND GALAXIES

1997 Aug 18-22, Kyoto Japan

Dear Colleagues,

Please find attached the preliminary program of the symposium. Time allocation/poster will be anounced later. Please send us by

FEBRUARY 15, 1997, your
ABSTRACT with final title of paper

for the convenience of printing the abstracts together with those related to GA and other symposia. More additional papers will be also welcome.

Sincerely Yours,

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IAU Symposium 184
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Abstract :

Preliminary Program, IAU S184

1997 Monday, August 18, afternoon: Session 1:

- Introductory talk: *TBA*

(1) STELLAR CLUSTERS AND STAR FORMATION

(1.1) Galatic Bulges

- R: Chemical Evolution of Galactic Bulges (R:=Review): *M. Rich, USA*
- Are the galactic bulge and bar the same ?: *Y.K. Ng, ITALY*
- SiO Maser sources s in the Galactci Bulge: *Shuji Deguchi, JAPAN*
- Populational Synthesis of Spiral Bulges: *T.P. Idiart, J.A. de Freitas Pacheco, R.D.D. Costa, France*
- Secular Dynamical Evolution of Spiral Galaxies and the Formation of Galactic Bulges: *Xiaolei Zhang, CfA USA*
- Nuclear Rise of Rotation Curves and Massive Cor:

Y.Sofue, M.Honma, Y.Tutui, A.Tomita, Tokyo Japan

(1.2) Galatic Center Star Clusters

- 2μmNarrow-Band Survey for Emission-line Stars in the Inner Galaxy: *Robert Blum, USA*
- The Stellar Content in the Quintuplet Cluster: *Donald F. Figer, USA*
- NICMOS Observations of Galactic Nuclei: *Rodger I. Thompson, USA*
- Stellar sources in a field at l = -45 deg, b = 0 deg of the ISOGAL survey (ISOCAM 15 microns observations): *Devendra Ojha, France*
- Chemically decoupled nuclei in disk galaxies: *Sil'chenko O.K. Russia*
- Observational data implying the NGC 1275 nucleus complexity: *I.I.Pronik, Crimean astrophys obs*
- Determination of the 3D distribution function in nuclear star cluster: *Alexei Fridman*
- Galaxy evolution and population in relation with active nuclei (tbf): *B. Rocca-Volmerange*

Tuesday August 19, morning: Session 2:

(1.3) Star formation and Starbursts

- R: Star Formation at the Galactic Center and its Long-term Effect on the Stellar Population: *E. Serabyn, USA*
- Atomic ISM in the Nuclear Starburst Region: *Min S. Yun, NRAO*
- Theory of star formation in the Galactic Center: *Hans Zinnecker, Potsdam*
- A Surface Brightness Limit To Starbursts: *Gerhardt R. Meurer, USA*
- Star Formation and Stellar Dynamics in Seyfert Nuclei: *Roberto Maiolino, Germany*
- Starburst Properties of Barred Galaxies: *R. Kandalian, A. Kalloghlian, Armenia*
- Are the stellar populations in starbursts, LINERs and Seyfert similar?: *Monique Joly, France*
- IR variations in Seyfert galaxies - what they tell us: *I.S. Glass,South Africa*
- Where Dense star clusters form in the Magellanic Clouds? Connection with the mass of the parent galaxy: *M. Kontizas and E. Kontizas, Athens*
- Evidence for spiraling massive star formation in the nucleus of an active galaxy: NGC4303: *L. Colina, STScI*
- ISO spectroscopy of the Galactic Center and Starburst Nuclei: *Dieter Lutz*
- Observations of the Galactic Center Region with ISO: *Sabine Philipp and Robert Zylka*
- ISO SWS spectroscopy of Active Galactic Nuclei: *Eiichi Egami, Germany*
- WFPCII Imaging of Nearby Active Galactic Nuclei: *Matt Malkan, UCLA*
- The Nuclear Region of NGC 1068 the stellar cluster and hot dust emission: *Niranjan Thatte,Germany*
- The nature of the ionizing source in Mrk 231, an ISO result: *Dimitra Rigopoulou, MPIE/London*
- X-Ray Constraints on Starburst and Accretion Activity in Galactic Nuclei: *A. Ptak, NASA/UMD*
- Nuclear Fuelling by Radiative Avalanche Induced by Starbursts: *Masayuki Umemura, Jun Fukue, Shin Mineshige*

Tuesday, August 19, afternoon: Session 3:

(2) NUCLEAR INTERSTELLAR MEDIUM

(2.1) Neutral ISM in the Galactic Center

- R: Radio Continuum and Molecular Gas in the GC: *Yoshiaki Sofue, Japan*
- A Large-Scale CO Imaging of the Galactic Center with the Nobeyama 45-m Telescope - Shell Statistics and Star Formation History: *T. Hasegawa et al. JAPAN*
- Molecular gas in the Galactic Center (to be fixed): *M. Tsuboi, JAPAN*
- Statistical Properties of Dense Molecular Clouds in the Galactic Center Region: *Atsushi Miyazaki, M. Tsuboi, JAPAN*
- CS survey of a Galactic center cloud with the IRAM 30m telescope: the interaction between dense molecular gas and a nonthermal filament: *Carsten Kramer, Germany*
- Asymmetry of the nuclear interstellar medium derived from radio sources: *Didier Fraix-Burnet, Obs.Grenoble*
- Detailed optical and H-band population synthesis in AGN: *Catherine Boisson, Meudon France*

(2.2) Molecular Gas in Nuclei of Galaxies

- R: Molecular gas in the nuclei of luminous IR galaxies: *Nick Scoville, USA*
- The BIMA Survey of Seyfert Nuclei: *Leo Blitz, et al., USA*
- Nuclear molecular disk and outflow: *J. A. Irwin, Canada*
- The Kinematics and Distribution of the Molecular Gas in the Circumnuclear Regions of AGN: *Linda J. Tacconi, Germany*
- Kinematics of circumnuclear regions (preliminary): *Johan H. Knapen, UK*
- The nuclear interstellar medium in ultraluminous infrared galaxies: *Paul P. van der Werf, The Netherlands*
- NMA observations of CO in Galactic Centers: *Kazushi SAKAMOTO, JAPAN*
- New high-resolution observations of molecular gas towards the nuclei of spiral galaxies: *Santiago GARCIA-BURILLO., SPAIN*
- Gas dynamics in the central part of the Sy 1

galaxies: III Zw2 and Mrk 817: *Luka C. Popovic, Belgrade, Yugoslavia*

Wednesday, August 20, morning: Session 4:

(2.3) Gas dynamics in the Galactic center

- R: Nonaxisymmetric Gas Dynamics in the Galactic Center: *Combes, Francoise, France*
- Observations of Bars and Central Activity: *Aage Sandqvist, Stockholm*
- Dynamics of the Galactic bar: *HongSheng Zhao, The Netherlands*
- Orbital structure in scale-free triaxial cusps: *Daniel Pfenniger, Switzerland*
- Bars and central activity: *Masafumi Noguchi, Tohoku Uni., Japan*
- Bar and the Nuclei (TBA): *Isaac Shlosman, USA*
- Bars and Nuclear Feeding: *K. Wada, Hokkaido, Japan*
- Structure and dynamics of the inner Galaxy (COBE results): *Gerhard, Ortwin, Switzerland*
- Formation and Evolution of Nuclear Gaseous Bars: *Daniel Friedli, Switzerland*
- Physical Conditions of the Gas in the Centers of Nearby Galaxies: *Jean Turner, USA*
- The response of molecular cloud chemistry to a strongly variable environment: *Jacques le Bourlot, France*
- Direct evidence for gas streaming and shocks in the galactic bar of an AGN (NGC4151): *Carole G. Mundell UK*

(2.4) IR observations of the Center of MW

- R: The Nuclear Stellar Cluster and the Central Dark Mass in the Milky Way: *Reinhard Genzel, Germany*
- NIR and Mm/Submm Mosaicing of the Central 100 pc: *Robert Zylka, Germany*
- Sgr A* Wind, IRs7 Bow Shock and Tail, and IR/Radio Source Displacements in the Galactic Center: *Dan Gezari, NASA/Goddard*
- 12.5-micron Imaging of Sgr A West with the Keck Telescope: *Morris, M., Figer, D.F., Becklin, E.E., Puetter, R.C. and Jones, B, USA*

Thursday, August 21, morning: Session 5:

(2.5) Gas structures in the central pc's

- Inside the central cavity: *Peter G. Mezger, Germany*
- The Galactic Center - A Laboratory for AGN: *Wolfgang J. Duschl, Germany*
- 1720 MHz OH Masers observations of the Galactic Center Region: *Farhad Yusef-Zadeh, USA*
- Gaseous Accretion Flows in the Inner Parsec of the Galaxy: *Robert F. Coker and Fulvio Melia, USA*
- Hα Velocity diagnostics of Circumnuclear Zones in Spirals: *J.E.Beckman, (+M.Rozas, J.H. Knapen), Spain*
- The Fourier analysis of the observed velocity field of gas in the inner 1.5pc: *A. Fridman, Moscow*
- Does detected systematic radial velocity in ionized disk be a new type of accretion?: *A. Fridman, Moscow*

(2.6) Outflow and high-temperature gas

- X-ray observations of the Galactic Center: first results of the Italian SAX Satellite: *Sandro Mereghetti, Italy*
- Ionized nuclear winds and the X-ray spectra of AGN: *I. Appenzeller, S. Wagner, Heidelberg*
- Flows in the Nuclei of Active Galaxies: *R.J.R. Williams, UK*
- High velocity outflow from the Seyfert galaxy NGC 7319: *Kentaro Aoki, JAPAN*
- Interaction of Jets with the ISM in Compact Radio-Loud AGN /or The Central Dark Mass in the Milky Way: *Geoff Bicknell, AUSTRALIA*
- Relationship between kpc and pc-scale ISM gas structures (i.e. bars, nuclear outflow cones and radio jets): *Carole G. Mundell UK*

(2.7) Magnetic Phenomena

- R: Magnetic Phenomena in the Galactic Centers: *Mark Morris, USA*
- Polarized emission from the Galactic Center: *W. Reich, Germany*
- The interaction of the Sgr C Nonthermal Filaments with the ambient medium: *Johannes Staguhn, Germany*
- Magnetic phenomena around BH : to be fixed: *R.Blandford*

Thursday, August 21, afternoon: Session 6:

BLACK HOLES AND CENTRAL ACTIVITY

(3.1) Black Holes in Galaxies

- R: Black holes in galaxies HST results: *H. Ford, HST, USA*
- Black Holes or Central Bars in nearby galactic nuclei?: *Eric Emsellem, Germany*
- The nucleus of M31: *Roland Bacon, France*
- HST/FOS observations of the nuclei of M32, NGC 7052 and IC 1459 the case for massive black holes: *Roeland van der Marel, USA*
- VLBI observations of AGN (TBD): *Bob Preston, USA*
- Studies of AGN and Black holes with water vapor masers: *N. Nakai, JAPAN*
- Story of the discovery of a massive black hole in NGC4258: *Makoto Miyoshi et al., Japan*
- Stellar Dynamical Constraints On Alternatives To A Black Hole In Galaxies Which Contain A Central Massive Object (NGC 4258, the Galaxy, and

others): *Eyal Maoz, Berkeley USA*

(3.2) Case for a Black Hole in the Galactic Center

- R: The question of black holes and the centers of galaxies: *Douglas Richstone, USA*
- Stellar proper motions based on diffraction-limited imaging at 2-microns with the Keck Telescope of the inner 5″of the Galaxy: *Andrea Ghez, M. Morris, and E.E.Becklin, USA*
- Proper Motions towards the Galactic Center: *Eckart,A., and Genzel, R., Germany*
- Progress toward a Trigonometric Parallax of SgrA*: *Reid, M. J., USA, Readhead, A. C. S., Treuhaft, R. & Vermeulen, R.*
- Latest Results on the Radiative and Hydrodynamical Characteristics of Sgr A*: *Fulvio Melia, USA*
- High energy gamma-rays from the galactic center: *Martin Pohl, Germany*
- Short-Timescale Variability of Sgr A* at Short Millimeter Wavelengths: *Takahiro Tsutsumi, Nobeyama Japan*

Friday, August 22, morning: Session 7:

(3.3) Black-hole powering of AGN and jets

- R: The formation of massive holes / or Physical processes around massive holes displaying low-level activity: *Martin Rees, UK*
- The nature of compact radio nuclei in galaxies: *Heino Falcke, USA*
- The correlated variability in optical and radio bands for extragalactic objects: *J.H. Fan, CfA Gangzhou China*
- Relativistic beaming model for compact radio sources: *J. H. Fan, CfA Gangzhou China*
- A General Relativistic Simulation of Jet formation from Accretion Disk: *S. Koide, K. Shibata, and T. Kudoh, Japan*
- Binary Black Holes and Jets: *Y. Taniguchi, Tohoku Univ. Japan*
- Massive Black hole binaries in galactic nuclei: *Junichiro Makino, JAPAN*
- Circumnuclear gas studies including evidence for the obscuring torus invoked in Unified Schemes: *Carole G. Mundell UK*
- Demographics of Nuclear Activity in Nearby Galaxies: *Luis C. Ho, USA*
- Is it possible to distinguish between different accretion processes from the UV/X-ray spectrum of AGN?: *Suzy Collin, Anne-Marie Dumont, France*
- Nuclear activity due to globular cluster's mass accretion: *R. Capuzzo-Dolcetta, Rome*
- Conference Summary: *TBA*

SOC: J. Binney (UK), F. Combes (France), R. Genzel (Germany; co-chair), J. Kormendy (Canada), R.P. Kraft (IAU), M. Morris (USA; co-chair), N. Scoville (USA), Y. Sofue (Japan; chair), M. Tsuboi (Japan)

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Dates: 1997 August 18-22
Place: Kyoto International Conference Hall, Japan
http://www.ioa.s.u-tokyo.ac.jp/iau184

Other Announcements

- **GBI Monitoring of Sgr A*:** Thanks to NASA, the Green Bank Interferometer (GBI) is operating again. It is now fully dedicated to continually monitor radio sources which are of interest to X-ray astronomers. There is a good chance that your pet-source is already included in the program, but you can also propose new sources. The data is public and can be used by anyone almost immediately. Among the sources included in the program is the Galactic Center source Sgr A*. However, at present the calibration of this low-declination source with its extended emission is problematic and hence the data must be treated with great care. We will inform you as soon as the problems are solved and include a link on our web-page that will give you a daily update of the Sgr A* flux. Heino Falcke (hfalcke@astro.umd.edu) will serve as an informal contact person for any questions related to that particular source or see the GBI home page at (http://www.gb.nrao.edu/gbint/GBINT.html) for questions on the program.
- **MSX:** Images obtained with MSX (Midcourse Space Experiment) of the Galactic Center were released to the public late last July. To see these interesting midinfrared images, go to http://www.mrcnh.com/msx/CB/earlyres.htm.
- **Meeting:** There will be a pre-IAU meeting in Hong Kong, *1997 PACIFIC RIM CONFERENCE ON STELLAR ASTROPHYSICS*, August 13 - 16, at The Hong Kong University of Science and Technology. For more information contact K.L. Chan at maklchan@usthk.ust.hk. Abstract deadline is March 31st.
- **Deadline:** The next deadline to insure your abstract is included in GCNEWS Volume 5 is April 15, 1997 (but we must admit that this is a "Schroedinger" deadline: half dead and half alive — you can never know for sure).

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