IRAM Newsletter

Number 12 November 8, 1993

Contents

Electronic mail 1
Invitation: IRAM User Meeting at Grenoble 1
Workshop Announcement 2
Interferometer 3
Software 4
Scientific Results 5
New Preprints 7
Programs Scheduled on the 30-m Telescope in April–July 1993 9
Position open 11

Calendar of IRAM Meetings

- **IRAM User Meeting**
  December 6/7th, 1993
  See announcement on this page
  Location: Grenoble Contact: M.Grewing

- **Dust and gas continuum emission at sub/mm wavelengths**
  December 8-9th, 1993
  See announcement page 2
  Location: Grenoble Contact: M. Guélin C. Bertout

- **IRAM S.A.C. Meeting**
  December 7-8th, 1993
  Location: Grenoble

Electronic mail

Please note the new Internet address for IRAM Grenoble: `iram.fr`. Mail should be sent to e.g. `lucas@iram.fr`. The address for anonymous ftp is now `iraux2.iram.fr`. You should use the new address rather than the old one (`iram.grenet.fr`), which will sooner or later become unavailable.

Robert LUCAS

Invitation: IRAM User Meeting at Grenoble

This meeting is intended to discuss the current telescope status (30m and PdBI) and the plans for future developments. There will also be an opportunity to highlight recent scientific results, either in the form of short oral presentations or in a limited number of posters.

PRELIMINARY AGENDA

December 6th

14:00	Opening of the meeting
14:15–14:45	Status report on the 30m Telescope and discussion
15:45–16:15	Coffee break
16:15–18:00	Status report on the PdB Interferometer and discussion
18:00– ?	Reception at IRAM

December 7th

9:00–10:45	Presentation and discussion of future development plans
10:45–11:15	Coffee break
11:15–12:45	Status report and discussion of the Key Project
12:45–14:00	Lunch break
14:00–15:45	Short contributions
15:45–16:15	Coffee break
16:15–18:00	Poster session (or continuation of short contributions)

If you are interested in attending the next IRAM User Meeting, please fill in the questionnaire on page 13 before November 26th and return it to:
Mrs G. Matoso, IRAM
300 rue de la Piscine, 36406 Saint-Martin d'Hères, France
Fax (++33) 76 51 59 38.

Workshop Announcement

Grenoble Workshop on
Dust & gas continuum emission at sub/mm wavelengths

December 8–9, 1993
organised by IRAM & Observatoire de Grenoble
with the support of CNRS (*GdR–PCMGI*)

Location: Observatoire de Grenoble, Domaine Universitaire de Grenoble, 414 rue de la Piscine, St. Martin d'Hères, France

Nature: workshop with limited number of participants (50), astronomers and physicists (specialized in dust)

Rationale

Observations of dust radiation at FIR and sub/mm wavelengths are a powerful tool for investigating dust/gas properties in the interstellar medium. They are the only way to probe the very dense and cold star forming regions where molecules are depleted onto grains.

In the FIR domain, IRAS has produced high quality emission maps of nearby clouds, of the Milky Way and of external galaxies. These have triggered the modeling of the extinction/emissivity of dust grains, and have been used to derive dust temperatures as well as dust/gas masses in a number of galactic and extragalactic objects. The FIR emission, however, has a high power dependance on grain temperature and is rather insensitive to cold dust. Estimates based only on IRAS data thus tend to badly underestimate dust and gas masses (by typically a factor of 10 in cold molecular clouds). Another problem with IRAS data, especially for extragalactic studies, is their low angular resolution ($70''$ at best at 100 microns).

The situation is much more favorable at longer wavelengths, since, for $\lambda(mm) > 14/T_d$, dust emission scales about linearly with the dust temperature T_d, and since the terrestrial atmosphere becomes transparent. At $\lambda > 1$ mm, the cold dust (T_d = 15–20 K), which prevails in the dark clouds as well as in the star forming regions, becomes observable with ground-based telescopes. Resolutions of up to 10" can be reached with large single dishes (the IRAM 30-m telescope and the JCMT) and up to 1–$2''$ with interferometers (OVRO and in the near future the IRAM Plateau de Bure interferometer).

There is a price to pay for this access to cold dust and increase in angular resolution: the emission is very weak (in the Rayleigh-Jeans regime it scales as ν^4) and dust emissivity parameters, mostly extrapolated from IR and FIR data, are more uncertain.

Recent progress in the construction of sensitive bolometers, mostly bolometer arrays (such as the MPIfR 7-channel array operated at 1.3 mm, last winter, on the IRAM 30-m telescope) and the opening of the 1 mm window to large interferometers, have greatly reduced the sensitivity handicap. Sensitivity remains nevertheless the first critical factor in extragalactic and cosmological studies. Observations of Galactic clouds have allowed to empirically estimate the mean 1 mm dust emissivity parameters. The estimations, however, often differ from author to author, even for the nearby Galactic clouds; extrapolation to remote Galactic or extragalactic regions is thus problematic.

Because of their high scientific interest and of these recent technical breakthroughs, observations of λ 1 mm dust emission are developing quickly and are likely to explode in the coming years. It is the aim of the Grenoble Workshop to explore the scientific potential offered by current telescope performances, and to discuss present uncertainties on the dust emissivity. Attempts will be made to predict the benefits from future sensitivity improvements and to investigate how dust emissivity parameters could be refined.

Tentative planning

Wednesday, Dec. 8$^{\mathrm{th}}$, 9$^{\mathrm{h}}$ – 18$^{\mathrm{h}}$:
- Introduction: Present/near future submm/mm instrumentation
- Reviews: *i)* dust emissivity parameters at sub/mm wavelengths; *ii)* dust in the solar system/circumstellar envelopes; *iii)* dust in protostars/Young stellar objects; *iv)* continuum mm emission from the Milky Way/ nearby galaxies /High redshift galaxies
- Short presentations & open discussion on 2 controversial issues: *i)* molecule depletion in dense cloud cores (e.g. NGC 2024); *ii)* which is the best tracer of the gas in galaxies (e.g. NGC 891): CO+HI or the mm/submm continuum emission?
- Round table discussion with solid-state physicists about possible contributions from the laboratory measurements and theory to dust properties

Thursday Dec. 9$^{\mathrm{th}}$, 9$^{\mathrm{h}}$ – 17$^{\mathrm{h}}$:
- Oral contributions and poster session highlighting recent astrophysical results (including cosmology) with sub/mm bolometers
- Final discussion and Conclusions

Contact persons:

M. Guélin (IRAM), S. Cabrit, C. Bertout (Observ. Grenoble), P. André (SAp, CEA)

Local Organization:

E. Palleau (Secretary Observ. Grenoble), C. Berjaud (Secretary IRAM) Fax: (33) 76 51 59 38, Tel: (33) 76 82 49 00, email: berjaud@iram.grenet.fr

If you are interested in coming and participating to this workshop please fill in the questionnaire page 14 and send it to:
Mrs. C. Berjaud,
IRAM, 300 rue de la Piscine, 38406 St Martin d'Heres, France
Fax: (33) 76 51 59 38.

Interferometer

The bad weather in September and October has caused a very serious delay in the observations.

In addition, despite the major maintenance work which was done on all antennas during the summer months, it is now evident that some more work is needed, e.g. to seal the back cladding of antennas 2 and 4. The scotch tape which has been used for this does not seem to be able to withstand the climatic conditions, contrary to the outcome of an earlier long-duration test which gave a positive result. More work will also be needed to further improve the heating system on the antennas, including the ultimate exchange of the remaining first-generation heating matresses.

We engaged in a complete checkup of the subreflectors of antenna 1 and 4, since both antennas showed pointing errors in elevation. Some actuators have been replaced, and the antennas are now under final tests to check if the pointing jumps have disappeared.

Three–Antenna Projects and Summer Time

Our experience with the interferometer operation shows that a strict minimum of 2 weeks of maintenance per antenna is absolutely required every year. This leaves the array in a 3 antenna mode for at least 2 months, usually around July. Moreover, the weather conditions for summer time are often not good enough for high quality mapping (and specially at high resolution).

Accordingly, we would like to emphasize the need for "non critical" proposals, such as detection on short baselines, snapshot series for simple size measurements, self-calibrated projects, or in general all kinds of projects which can be carried out either under poor phase stability conditions or with an arbitrary (or limited) *uv* coverage. The available time for such projects is potentially large.

Data Reduction

It is now almost 3 years since the first interferometer data reduction workshop has been carried out at IRAM. Many things have changed in the mean time: new computers, new correlator, fourth antenna, improved reduction software, and first experience with the interferometer for some (unfortunately not so many) of you. It may be time for another round. This is a call for ideas: is it useful ? What should be discussed ? When and where ?

Please send your point of view and propositions to S.Guilloteau (guillote@iram.fr).

Stéphane GUILLOTEAU

Software

The GILDAS software, which includes GreG and CLASS, is available by anonymous ftp from iraux2.iram.fr on directory dist/soft, for the following UNIX-like operating systems and computers: AIX (IBM RS/6000 series), HPUX (HP 9000/700), Ultrix (DECStation 3100), Convex (C220), SUN-OS.

The code is distributed as compressed archives of the sources, with a Makefile for installation and a simple installation guide. The installation has been checked on AIX, HPUX and SUN-OS, and experience on Ultrix and Convex shows that installing on any Unix-like system is normally not a major problem. However, we have no experience of installation under SOLARIS on SUNs, neither under OSF-1 on Dec Alpha computers. In the latter case, the 64-bit architecture is a potentially serious problem. Some users have reported difficulties in installing under SUN-OS; these cases are still unexplained, and by lack of available SUN machines at IRAM, we are unfortunately not in a position to provide efficient help when such problems occur.

The software collection also includes CLIC, the calibration package for the interferometer, but usage of CLIC requires a licence of the NAG library. Moreover, because of the evolution of the interferometer which requires frequent updates, CLIC cannot yet be supported to the same level as other parts of the package.

A completely new software version has just been released. This version has been in use for quite some time in Grenoble, under AIX and HPUX operating systems. It features a completely redesigned graphic library allowing bitmap color display, a new version of CLIC allowing antenna based calibration, and an interactive deconvolution program which also handles mosaics. The installation procedure has been revised to allow independant updates of any part of the software; this should facilitate maintenance of critical programs like CLIC.

System contact persons:

- HP systems: Stéphane Guilloteau
- SUN systems: Stéphane Guilloteau
- IBM systems: Thierry Forveille

Application contact persons:

- CLIC program: Robert Lucas
- CLASS program: Gilles Duvert
- FITS interfaces: Thierry Forveille
- Postscript interfaces: Gilles Duvert
- GREG and GRAPHIC: Stéphane Guilloteau
- GILDAS tasks: the author, if mentionned, or the system contact.

The corresponding email addresses are :
`duvert@gag.observ-gr.fr`,
`forveill@gag.observ-gr.fr`,
`guillote@iram.fr`,
`lucas@iram.fr`.

IRAM-Grenoble no longer has the resources to support GILDAS under VMS. However, a with some delay on updating, an executable version, for VAX/VMS 5.5-1 and later releases, is available on Exabyte cassettes in VMS-BACKUP format if directly requested from IRAM, without any installation guide and without any support. This version is in use at IRAM-Granada and Pico Veleta.

Stéphane GUILLOTEAU

Scientific Results

MgNC and the carbon-chain radicals in IRC+10216

M. Guélin[1], R. Lucas[1], J. Cernicharo[2]
[1]IRAM, 300 rue de la Piscine, 38406 Saint Martin d'Hères, France
[2] C. A. Yebes, IGN, 19080 Guadalajara, Spain

Abstract: The emission from the 95 GHz and 98 GHz lines of the MgNC, C_4H and C_3H radicals has been mapped in IRC+10216 with the IRAM Plateau de Bure interferometer; the angular resolution was 4″x 3″. This emission is very similar for the three species and arises from an expanding hollow shell of radius $\simeq 15''$ (4.5 10^{16} cm). It differs markedly from the centrally peaked emissions of NaCl, SiO, SiS, CS and CO.

The shell-like distribution of the MgNC, C_4H and C_3H emissions results from a time dependant chemistry. Their patchy appearance reflects a clumpy gas distribution. The close correspondence between the emission peaks of the three species suggests a fast common formation mechanism, such as desorption from dust grains.

The shell where MgNC and the carbon-chains are detected is displaced by 2″ from the compact mm/IR source. This offset could be the signature of a binary star.

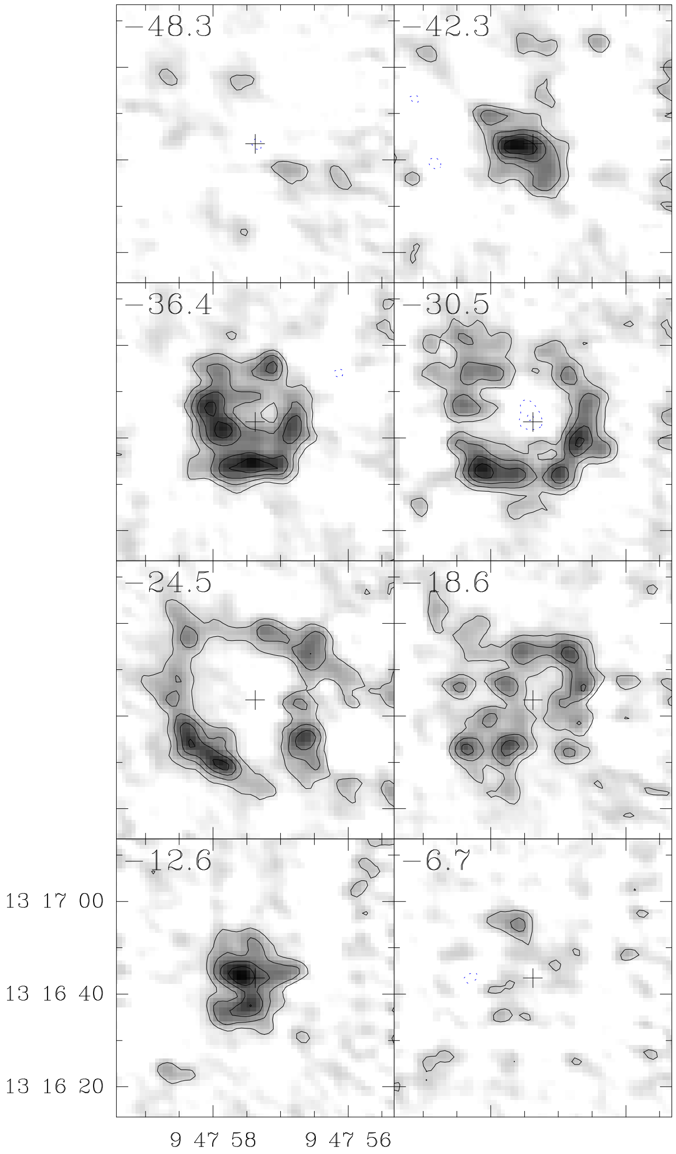

Figure 1: Velocity-channel maps of the MgNC $N = 8$–7 line emission, derived by combining the IRAM interferometer and single-dish data. The two fine-structure components have been averaged and the data smoothed to a resolution of 6.1 km s^{-1}. The synthesized beam is circular with a FWHP of 5″. A point-like continuum source coinciding with the IR source (cross) has been removed from the maps. Coordinate epoch is J 2000.

Images of the GG Tau Rotating Ring

A.Dutrey [1], S.Guilloteau [1], M.Simon [2]
[1] Institut de Radio Astronomie Millimétrique, 300 Rue de la Piscine, F-38406 Saint Martin d'Hères
[2] Astronomy Program, State Univ. of New-York, Stony Brook, NY 11794 U.S.A.

Abstract: Interferometric ^{13}CO $J = 1 \rightarrow 0$ observations performed with the IRAM interferometer reveal unambiguously a fully resolved rotating thin disk around the young close binary system GG Tau. The rotation curve and geometrical aspect are in perfect agreement with a Keplerian disk orbiting a binary system with total mass $\simeq 1.2 M_\odot$, consistent with the luminosities of the central stars, and inclined $\sim 43°$ to the line of sight. Images of the dust continuum emission show that the disk has a large inner cavity, of radius $\sim$ 180 AU. The disk extends at least to an outer radius $\sim$ 800 AU. The continuum dust emission and ^{13}CO and C^{18}O line fluxes taken together imply that the CO abundance in the disk is lower than that typical of the ISM by at least a factor of $\sim$ 20. Tidal forces induced by the binary are probably responsible for the inner hole in the dust and gas distribution. The size of the inner cavity is most simply explained if the orbit of the binary is eccentric. In such a case, the dust ring is located near an orbital resonance of the disk with the binary period. Effective angular momentum transfer from the binary to the disk is expected to increase the orbital eccentricity, and to stop further accretion onto the stars,

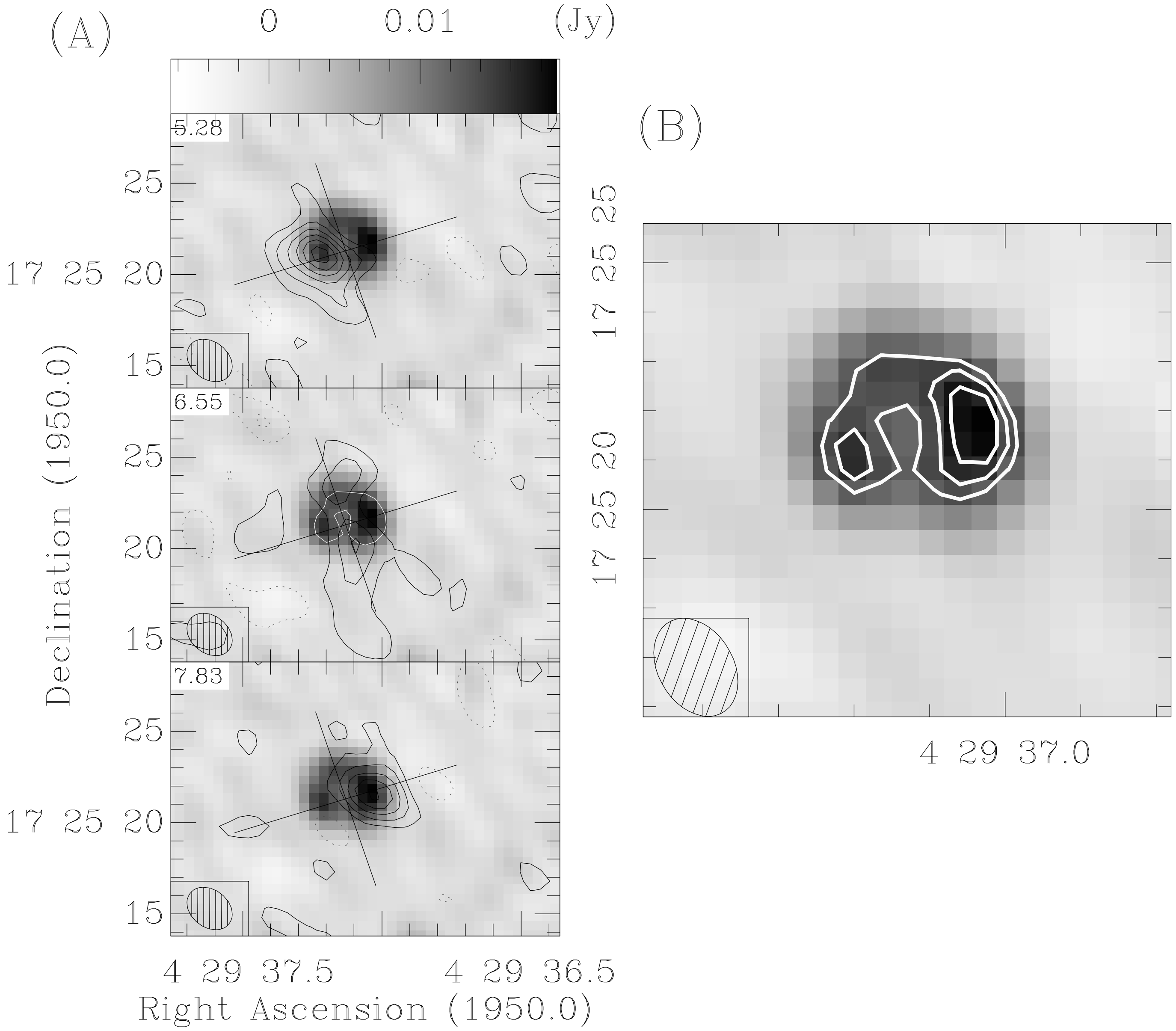

Figure 2: (A) Superposition of the high resolution continuum map of GG Tau at 2.7mm (grey scale) to three velocity channels at LSR velocities: 7.83, 6.55 and 5.28 $\mathrm{km\,s^{-1}}$ (contour maps; contour step is 1 K). For spectral lines images, the restoring CLEAN beam is $2.6'' \times 2.0''$ oriented at PA = 45°. The cross, tilted by $\sim 18°$ from the R.A. axis, indicates the apparent disk plane and axis. (B) Continuum map at 2.7mm: the central hole is clearly resolved . Levels are 13, 15 and 17 mJy/Beam. For continuum data, the restoring CLEAN beam is $2.1'' \times 1.4''$ oriented at PA = 26°.

thereby increasing the lifetime of the circumbinary disk. *To be published in A&A main journal.*

The Nature of the Dense Obscuring Material in the Nucleus of NGC 1068

L.J. Tacconi, R. Genzel, S. Madden, M. Cameron, and A. Harris
Max-Planck-Institut für extraterrestrische Physik

Abstract: We have made $3.4'' \times 2.3''$ resolution observations of the nuclear region of NGC 1068 in the J=1-0 line of HCN with the IRAM Interferometer on the Plateau de Bure. Our HCN map (Fig. 3) reveals the presence of a very strong, resolved nuclear source with an apparent size of about $4''$ (280 pc at D=14 Mpc) in diameter, as well as clumps of gas associated with a star forming ring located at a radius of $15''$ from the nucleus. We interpret the nuclear HCN source as a concentration of very dense ($n(H_2) \geq 10^4$ cm^{-3}) molecular clouds (mass $\sim$5–10×10^7 $M_\odot$) surrounding the active nucleus. An unusually high J=1$\rightarrow$0 HCN/CO intensity ratio for the nucleus of NGC 1068 and single component radiative transfer calculations for CO and HCN indicate that the bulk of the molecular gas is contained in dense, low filling factor cores in this region.

The HCN velocity field shows a north-west to south-east velocity gradient across the nucleus, a clear signature for rotation. Rotation alone cannot account for all kinematic structure of the nuclear region, however. We infer that turbulent velocities in excess of 100 km s^{-1} are also present, indicating that the molecular layer is very thick. Finally, from tilted-ring model fits to the central $6''$ we conclude that the molecular disk-like structure has an inclination angle of 30deg–40deg. Given this geometry, the HCN source cannot be associated with a pc-scale torus which has often been proposed to be obscuring the broad line region of NGC 1068. Rather, it is possible that one or more dense cloud cores in the thick molecular disk obscures the very nucleus of this Seyfert galaxy from our view.

CO absorption in the outer Galaxy: Abundant cold molecular gas

J. Lequeux[1], R.J. Allen[2], S. Guilloteau[3]
[1]Observatoire de Meudon, F-92195 Meudon, France
[2]Space Telescope Science Institute, 3700 San Martin Drive, Baltimore MD 21218, USA
[3]IRAM, 300 rue de la Piscine, 38406 Saint Martin d'Hères, France

Abstract: We have detected absorption in the CO(1-0) and CO(2-1) spectra of two very low-latitude radio continuum sources. Little CO emission is found in the immediate regions of these sources. The results, obtained with the 30m IRAM radiotelescope, have been confirmed with the IRAM interferometer for one of the sources in CO(1-0) absorption. There is only one absorption feature from the local gas, but at least 3 features are detected from gas at about 12 kpc from the Galactic center. This is an unbiased survey, whereas present CO emission surveys preferentially detect warm ($\gtrsim$ 10 K) molecular gas associated with recent massive star formation. We conclude that we have found evidence for the existence of significant amounts of cold molecular gas in the outer Galaxy; there may be 4 times more molecular gas than atomic gas at 12 kpc radius. The fraction of molecular gas can only increase at larger Galactocentric distances, and we suggest that cold molecular gas may make a significant contribution to the dark matter required by dynamical studies of spiral and irregular galaxies. Another consequence of our observations is that both the electron and proton components of cosmic rays decrease strongly at large radii, pointing to a Galactic origin of GeV cosmic rays.

New Preprints

The following preprints are available from IRAM:

300. 1.3mm emission in the disk of NGC 891 : Evidence of cold dust
M. Guélin, R. Zylka, P.G. Mezger, C.G.T. Haslam, E. Kreysa, R. Lemke, A.W. Sievers
1993 *Astron. and Astrophys.*

301. MgNC and the carbon-chain radicals in IRC+10216
M. Guélin, R. Lucas, J. Cernicharo
1993 *Astron. and Astrophys.*

302. CO in the "black eye" galaxy NGC 4826
F. Casoli, M. Gerin
1993 *Astron. and Astrophys.*

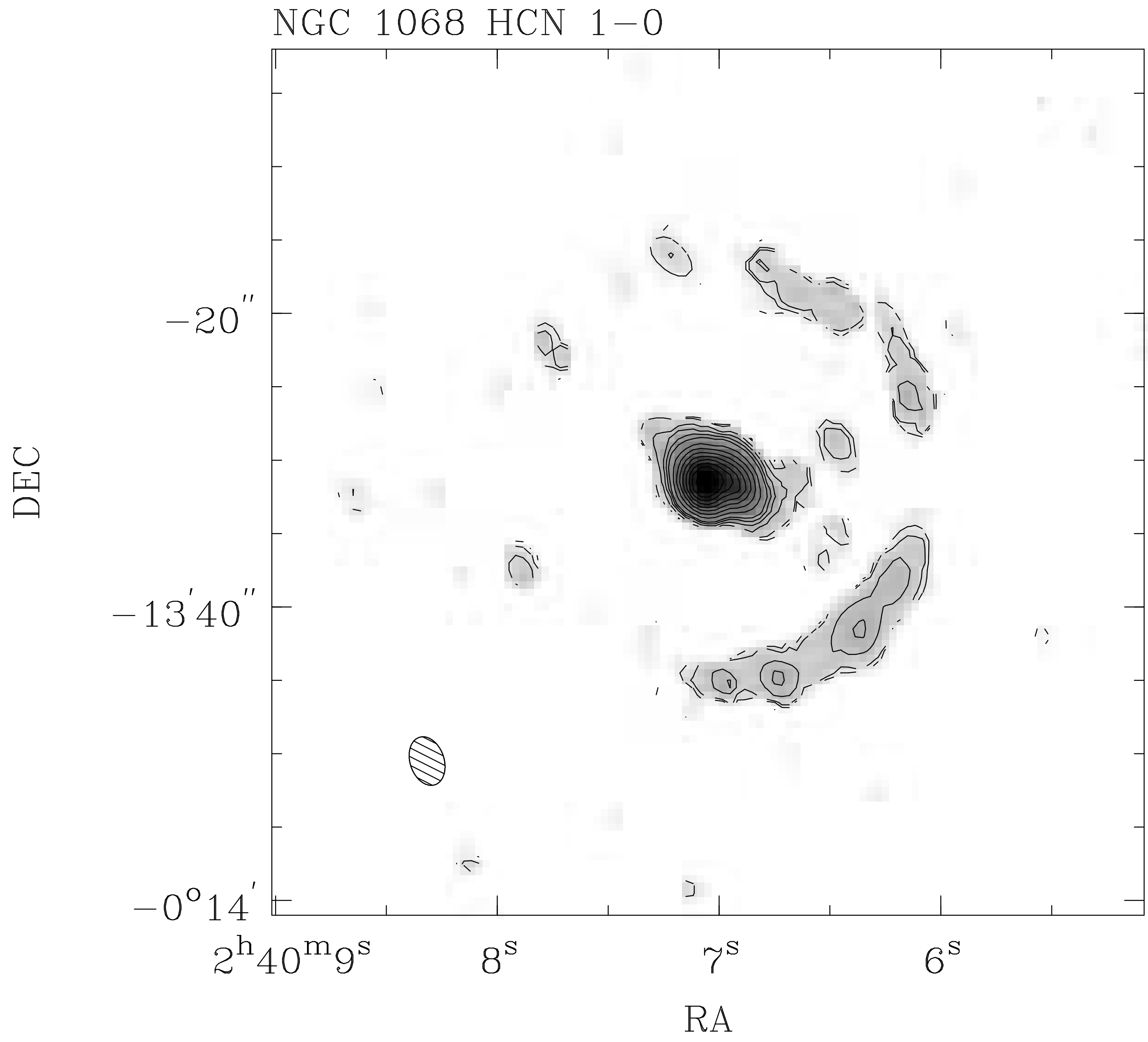

Figure 3: The integrated HCN emission map for NGC 1068 in grayscale. The weakest features shown are at the 3σ level (0.15 Jy/beam km/sec), and the strongest emission has an integrated flux of 1.1 Jy/beam km/sec. The $3.4'' \times 2.4''$ synthesized beam is shown in the bottom left corner of the image.

Programs Scheduled on the 30-m Telescope in April–July 1993

Date	Ident.	Title	Freq. (GHz)	Authors
Mar 30-Apr 13	235.92	Dense gas in absorption line systems towards quasars	151, 226, 113	Wiklind, Combes
	256.92	HNCO as a tracer of gas shocked by the explosion of SgrA-East	87, 88, 153, 219	Zylka, Schilke, Roueff
	247.92	A search for CO in X-ray absorbed elliptical galaxies	113, 114, 226, 229	Helfer, Blitz
	228.92	The "cloverleaf" : An excellent candidate for CO and Cl emission from a quasar at z 2.5	96, 98, 227, 229	Barvainis, Antonucci, Coleman
	288.92	^{13}CO J=1-0 emission toward 3 compact extragalactic continuum sources	110, 220	Liszt, Lucas
Apr 13 - 27	12.93	Molecular gas in NGC 3561	112, 224	Mirabel, Duc
	196.92	Chemical stratification in the helix nebula	115, 230, 90, 113	Forveille, Bachiller, Cox, Huggins
	194.92	The atmosphere of IO	221, 146, 143, 224	Lellouch, Belton, de Pater, Gulkis, Paubert, Encrenaz
	230.92	Search for circumstellar molecules around the red rectangle	86, 90, 174, 244	Jura, Kahane, Balm
	231.92	Circumstellar CO around bright oxygen-rich semi-regulars	230	Jura, Kahane
	232.92	CO mapping of the two component wind from the nearby semi-regular X Her	115, 230	Kahane, Jura
	60.93	High angular resolution molecular line observations of the clump-interclump structure in the Rosette molecular cloud	110, 147, 220, 244	Schneider, Stutzki
	259.92	A search for dense clumps in molecular outflows	97, 146, 220	Tafalla, Bachiller, Welch
	293.92	HNC and dense gas in a primeval starburst	105, 110, 140, 245	Solomon, Radford, Downes
	67.93	Multiline study of dense molecular gas in Arp 220	86, 89, 111, 134	Radford, Solomon, Downes
	68.93	The HNC and DCN luminosities of ultraluminous galaxies	89, 87, 142, 267	Radford, Solomon
Apr 27-May 11	103.93	Search for continuum mm dust emission from QSO's with $z > 4$	Bolometer	Omont, McMahon, Bergeron, Kreysa, Greve, Cox
	253.92	CO abundances in the outer galaxy	104, 110, 220, 330	Wouterloot, Brand
	197.92	Molecular gas content in IRAS blue compact dwarf galaxies	113, 114, 227, 229	Petrosian, Comte, Turatto
	198.92	H_2S in absorption towards W 49	168, 208, 99	Tieftrunk, Walmsley, Schilke
	214.92	A detailed study of an extremely quiescent core : L 1498	244, 147, 98	Lemme, Walmsley, Wilson, Muders
	20.93	Search for SO^+ in the IO torus	116, 162, 208, 255	Rosenqvist, Crovisier, Lellouch, Paubert
	219.92	Distribution of HCO^+ and CS in W49	267, 260, 241, 244	Dickel, Wilson, Mauersberger
	9.93	Search for CO 3-2 emission from luminous high redshift QSOs	92, 88, 110, 113	Van der Werf
	6.93	Venus' mesosphere global circulation and CO distribution	230, 115, 220	Lellouch, Rosenqvist, Billebaud, Paubert

Date	Ident.	Title	Freq. (GHz)	Authors
May 11 - 25	21.93	Is the bar in NGC 5383 already depleted from gas ?	114, 228	Wielebinski, Von Linden, Reuter, Braine, Brouillet
	22.93	Kinematics and dynamics of the ringed spiral NGC 7331	114, 229	Wielebinski, Von Linden, Reuter, Braine
	108.92	Molecular condensations in the Dumbbell and the Helix	115, 230	Huggins, Bachiller, Cox, Forveille
	13.93	Hollow shell structure in the L1551 outflow ?	110, 220, 115, 230	Bachiller, Cernicharo, Tafalla
	56.93	Counter-rotating molecular disks in the spiral NGC 4826 ?	115, 230	Casoli, Gerin
	48.93	Search for ortho-water fundamental transition in IRAS 10214+47	116, 169, 229	Encrenaz, Combes, Casoli, Gerin
	54.93	A detailed study of MON R2	96, 144, 241, 88	Evans, Wang, Walmsley, Zhou, Rawlings
	79.93	New features in the recombination line maser in MWC349	120, 147, 231	Thum, Bachiller, Martin-Pintado
	278.92	CO maps of the detached envelope around the carbon star TT Cyg	115, 230	Olofsson, Bergman, Eriksson, Gustafsson, Rieu
	277.92	A search for circumstellar NO, NS and H_2CO	86, 150, 253	Olofsson, Lindqvist, Nyman, Winnberg, Rieu, Jura
May 25-Jun 8	3.93	CO observations of the galaxy NGC 4501	114, 228	Bosma, Van Gorkom, Athanassoula
	89.93	CO observations of detached envelopes around M stars	115, 230	Loup, Waters, Zijlstra, de Jong, Nyman
	5.93	The chemistry of S-type stars	86, 90, 130, 244	Bujarrabal, Omont, Fuente, Alcolea
	71.93	Millimeter hydrogen recombination line emission from AGNs and stars	92, 91, 146, 231	Strelnitski, Smith, Martin-Pintado, Matthews, Thum
	19.93	Search for HCP on Saturn	239	Encrenaz, Lellouch, Paubert, Gulkis
	7.93	The carbon isotope ratio in extragalactic starburst nuclei	90, 108, 146, 226	Henkel, Mauersberger, Wilson
	44.93	Observations of CH_3CN and search for HC_5N on Titan	147, 220, 143, 218	Bezard, Marten, Paubert
Jun 8 - 22	223.92	Molecular gas in the central regions of M31	98, 109, 115, 230	Lequeux, Allen
	228.92	The "cloverleaf": An excellent candidate for CO and Cl emission from a quasar at $z\simeq2.5$	96, 98, 228, 229	Barvainis, Antonucci, Coleman
	45.93	CO observations of cooling flow galaxies with HI absorption	105, 211, 220, 222	Braine, Dupraz
	85.93	Weighting the molecular content in the Seyfert 2 NGC 5252	112, 225	Prieto, Freudling
	23.93	Dense cores and star formation in Bok globules	219, 147, 98, 244	Launhardt, Evans, Henning
	49.93	Mapping of IC342 in the HCO^+ and HCN lines. Complementary data to the interferometer data to measure the emission at low spatial frequencies	88	Truong-Bach, Viallefond, Rieu, Combes, Lequeux, Radford
	50.93	Molecular gas and star formation within galaxies in the Bootes Void	110, 220, 109, 218	Sage, Weistrop
	88.93	The evolution of molecular outflows from low-mass YSOs	115, 147, 230	Andre, Bontemps, Cabrit, Despois, Terebey
	62.93	The evolution of the Rosette's tear drops	220, 110, 115, 230	Gonzalez-Alfonso, Cernicharo
Jun 22-Jul 6	62.93	The evolution of the Rosette's tear drops	220, 110, 115, 230	Gonzalez-Alfonso, Cernicharo
	67.93	Multiline study of dense molecular gas in Arp 220	86, 95, 111, 134	Radford, Solomon, Downes
	68.93	The HNC and DCN luminosities of ultraluminous galaxies	89, 138, 143, 267	Radford, Solomon
	37.93	Search for new silicon-containing molecules, H_2Si and C_2H_2Si	94, 148, 158, 221	Yamamoto, Saito, Izuha, Cernicharo
	38.93	Astronomical search for a new calcium-containing radical : CaNC	97	Saito, Steimle, Takano, Guélin
	64.93	Mm continuum flux measurements of the 16 detected CGRO sources	90, 150	Steppe, Reuter

Position open

IRAM — Institut de Radioastronomie Millimétrique

Applications are invited for the post of

RESIDENT ASTRONOMER

at IRAM Granada/Spain, starting as soon as possible, and not later than March 1994.

IRAM Granada operates the 30m millimeter telescope, located 50 km from Granada in the Sierra Nevada at an altitude of 3000 m, and offices (laboratories/library/administration) in the town of Granada. The total size of the group is 30 persons.

The tasks of the resident astronomer include:

- to play an active role in the planning and execution of test observations (pointing, calibration, etc.) and their analysis, as well as general care and improvements of the telescope in such areas as software, receivers, backends and optics
- stimulation of astronomical activities and scientific support of the group of local astronomers
- regular participation in the astronomer-on-duty service at the 30 m telescope to support guest observers.

These activities will occupy at least 50% of the resident astronomer's time. In addition he/she has the possibility to pursue his/her own scientific projects, also in collaboration with IRAM astronomers and/or outside groups.

The applicant should have a Ph.D. in astronomy or physics and preferably several years of experience in observational astronomy. Knowledge in some areas related to the hardware or software of a millimeter telescope is of advantage. The ability to work at high altitude (3000 m) is essential. Good knowledge of English is required.

The initial appointment will be for a period of at least two years with the possibility of renewal. Applications should be submitted before November 30th, 1993, to:

Director
IRAM
300 rue de la Piscine
Domaine Universitaire
F-38406 St. Martin d'Hères Cedex, France

The IRAM Newsletter is edited by Robert LUCAS at IRAM-Grenoble (e-mail address: `lucas@iram.fr`).
The IRAM Newsletter is available in electronic form:

- by means of an anonymous `ftp` account, opened at IRAM for Internet users, containing in a read-only public area the most recent issues of the IRAM Newsletter, as well as documentation on the IRAM telescopes and on reduction software, distribution files for reduction software, files for proposal preparation. ... etc.
  To access those files, please connect through `ftp` to `iraux2.iram.fr` (or `193.48.252.22`) and read the `README` file.
- by means of an electronic mail file server installed at IRAM (on the VAX machine IRAM04). This file server is a file distribution service that uses electronic mail facilities to deliver files. To communicate with it you should send a message to the electronic address:
  `newsserv@iram.grenet.fr`
  For instance, to obtain a copy of the May 1992 issue, just send the one line message:
  `SENDME MAY92.PS`
  to the above electronic address. You will receive later a mail message containing the IRAM Newsletter in Postscript code. Please discard all the e-mail header information with a text editor, and send the file to a Postscript laser printer.
  More information may be obtained by sending the one line message:
  `HELP`
  Note that this file server also contains Postcript files of the proposal forms and of Plateau de Bure documentation.

We also compile a list of e-mail addresses of IRAM users (e.g., in order to send warning messages when the Newsletter is available, but also to provide fast information, if needed). If you feel your address should be on this list, please send the one line message:
`SUBSCRIBE`
to the following e-mail address:
`iramusers-request@iram.grenet.fr`
Both addresses are valid on Internet, EARN-Bitnet and EAN .... Please keep R. Lucas informed of any problem you may encounter.

IRAM Addresses:

	Address:	Telephone:	Fax:
Grenoble	Institut de Radioastronomie Millimétrique 300 rue de la Piscine, Domaine Universitaire 38406 St Martin d'Hères Cedex, France	(33) 76 82 49 00	(33) 76 51 59 38
Plateau de Bure	Institut de Radioastronomie Millimétrique Observatoire du Plateau de Bure 05250 St Etienne en Dévoluy, France	(33) 92 53 85 20	(33) 92 53 85 23
Granada	Instituto de Radioastronomía Milimétrica Avenida Divina Pastora 7, Núcleo Central 18012 Granada, España	(34) 58 27 95 08	(34) 58 20 76 62
Pico Veleta	Instituto de Radioastronomía Milimétrica Estación Radioastronómica IRAM-IGN del Pico Veleta Sierra Nevada, Granada, España	(34) 58 48 02 11	(34) 58 48 08 60

E-Mail Addresses:

- IRAM-Grenoble: `username@iram.fr`, or through BITNET: `username@iramfr51.bitnet`, or through PSI: `PSI%0208038080590::username`
- IRAM-Granada: `username@iram.es`, or through SPAN: `IRAMEG::username` or `16494::username` or through PSI: `PSI%02145258020628::username`

The `username` is generally the last name of the person to be contacted.

If you are interested in attending the next IRAM User Meeting, please cut off this page, fill in the following questionnaire and return it before November 26th to:
Mrs G. Matoso, IRAM (300 rue de la Piscine, 36406 Saint-Martin d'Hères, France - Fax (++33) 76 51 59 38).

....

USER MEETING
IRAM–Grenoble
December 6/7, 1993

Registration Form

Name: ....
Surname: ....
Address: ....
....
....
....
Tel: ....
Fax: ....
E-mail: ....

Do you need hotel reservation ?
From ....Dec 1993 to ....Dec 1993
(Number of nights: ....)
Single Room ☐
Double Room ☐

I will attend:
Yes ☐
No ☐
Perhaps ☐
I will present a contribution:
Yes ☐
No ☐
I prefer:
an oral contribution ☐
a poster ☐
The titles(s) of my papers(s) is (are): ....
....
....
....
....
....

If you are interested in coming and participating to this workshop please cut off this page, fill-in the following questionnaire and send it to:
Mrs. Berjaud, IRAM (300 rue de la Piscine, 38406 St Martin d'Hères, France, Fax (33) 76 51 59 38).

. . . .

WORKSHOP: DUST & GAS CONTINUUM EMISSION AT SUB/MM WAVELENGTHS

GRENOBLE, December 8–9, 1993

NAME:

INSTITUTE ADDRESS:
FAX:
E-MAIL:
Please mention main field of research:
Astronomical observations; dust grains physics/ chemistry

I will come (*delete what does not apply*):

and present a contribution

TITLE:
ABSTRACT (<8 lines):

Preferred option (*delete what does not apply*):

Oral presentation
Poster presentation
I am interested in participating in the round table discussion YES NO
Planned dates of arrival/departure:

(*Limited financial help will be available for a few young researchers; if you apply for this help, please, specify the amount requested*)