



# THE JCMT NEWSLETTER

September 1995 Issue Number 5

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## **Message from the Director**

The spring meetings of the Advisory panel and the JCMT Board were relatively low-key with no major decisions being required. However, excellent news was received from the Netherlands in that they have agreed to continue their full subscription to the JCMT for at least the next three years. On the other hand, the Canadian government has enforced severe cutbacks on the National Research Council and these have promulgated down to the astronomy area. Although the JCMT operation funding has been protected, nevertheless, downstream operational savings are being sought by Canada. In this light, the PPARC review of the JCMT, which was mentioned in the previous newsletter, now looks to take place in late 1997, reporting in the spring of 1998.



Following the Optical-Infrared-Millimetre review by PPARC, a decision has been taken to give the island sites more autonomy. The process of defining what this autonomy means and the implementation of the new regime are currently under discussion.

Recruitment and staffing planning has taken a major effort over the past few months and a number of interviews regarding new posts are in the pipeline or have taken place. JCMT operations suffered an upward blip in the time lost through faults, mainly because of tuning problems with RxA2 and some problems with micros, especially the carousel. Work on projects has made good progress and the power and grounding is now essentially completed. Much effort is currently being expended on preparations for the new receivers.

Users may not be aware of the fact that each week at the Operations Meetings which is attended by myself, the Telescope Manager, Scheduler, the support astronomers, telescope operators, members of the software group, Chief Engineer and Head of the Instrument Support Group, the work done on the telescope over the past week, the faults, reports from users are all discussed in detail. The user reports are very helpful in illuminating those areas where we are not quite up to user expectations (and these virtually always come as no surprise as they are areas we are either working on, or are effort limited in making further progress) and for providing a quick summary of the scientific results and potential for publications. Although users naturally tend to focus on the faults (because that is the way the questions are asked) it is very gratifying to read the very positive points made by many concerning the quality of the facility and support offered by the JCMT. Suggestions for improvements to the software are usually appended to the list and these are often incorporated to the 'software wish list'.

We continue to move towards greater reliance on the WWW for our information systems and documentation. As Graeme Watt will describe later, this Newsletter will appear on the WWW long before the hardcopy version arrives on users' desks. We expect to make even greater use of the WWW for information and documentation but I am aware of the problems of users having to login continually to catch new items. We will be addressing the ways by which users can be 'prompted' to read the relevant items over the next few months. The use of e-mail exploders is probably the easiest process that further information will be disseminated.

The workshop on New Modes of Observing for the Next Century was held in Hilo from July 6th to 8th and was extremely successful. There were about 80 attendees at the meeting (the conference photo is on the WWW on the JCMT home page) and stimulating discussion sessions were plentiful. It is very clear that all major international (and many national) facilities are rapidly moving towards some form of flexible scheduling, to match the requirements of the observational programme with the weather pertaining at the telescope. Queue scheduling and tools to implement queuing were very impressive, as were some of the user-interface input screens. Later in this Newsletter I discuss how we anticipate moving towards flexible scheduling, linked with commissioning RxW and SCUBA. A highlight of the last semester was the successful introduction of queue observing using UKT14 as a testbed in



preparation for SCUBA (which will *only* operate using a queue system). This was run during a number of Director's shifts and has proved to be very successful and the lessons learned now will be extremely valuable for SCUBA. This is discussed by Firmin Oliveira elsewhere in this Newsletter.

*Ian Robson,*

*Director, JCMT*

## International Proposals for time on the JCMT

Proposals for telescope time from users who are classed as 'international' (not employed by the UK, Canada, Netherlands or the University of Hawaii) are welcomed and encouraged. The JCMT Board has made it clear that there should not be artificial barriers to international users, either in the proposal or the allocation phases. In this context it is particularly important that these users are fully informed of events and forthcoming developments at the JCMT. Users who wish to be notified of upcoming changes, which may affect observing proposals for example, should send their e-mail address to Graeme Watt (gdw@jach.hawaii.edu) for inclusion on the international e-mail exploder list.

*Ian Robson,*

*Director, JCMT*

## Flexible Scheduling for Semester 96A

Ever since operations began at JCMT it has been clear that the completion rate, especially for high-frequency proposals has been much lower than desirable. The overwhelming obstacle to completion is the weather: spectral-line observations at frequencies above 345GHz, and *all* continuum observations, require weather at the 50-percentile or better. At the same time, it is frustrating to observe that many very average proposals, that *could* be done in perfectly average weather, do get done in superb weather, just through the luck of the draw. ITAC and the TAGs have tried several variants on the theme of flexible scheduling, with the goal of matching the weather better to the observational schedule, but it would be fair to say that none have been very successful, except perhaps for the CANFLEX and UKFLEX experiments. Here observations were made for the applicants by a small team of experienced observers, who juggled the observations against the weather so as to maximize the return.

The desiderata for any flexible scheduling scheme are relatively simple:

\* To maximize the scientific return of the telescope *globally* — that is, to maximize the number of programs which are actually completed, in particular the highest priority programme.



\* To continue to provide hands-on training for students and post-docs.

The difficulty of inventing a scheme satisfying even these modest requirements has delayed any serious attempt at flexible scheduling until now. With the imminent arrival of SCUBA and RxW — both high-frequency instruments — the need for an effective flexible scheduling system has become even more pressing. SCUBA and RxW will be highly competitive, and we envisage that many of the most highly-rated proposals will request time on one or both of these instruments.

With this in mind, the TAGs and ITAC have been working with the JCMT Director and his staff to try to define a workable system to begin in semester 96B.

At the present time, with 3 new instruments pending delivery either in semester 95B or in 96A it is difficult to implement significant changes to the scheduling technique and hence only minor attempts at both flexible and serviced mode observing will take place in these semesters. Certain flexible blocks have been created in the schedule for semester 95B and several allocations have been designated to be done in serviced mode by JCMT staff. The Netherlands community have taken the initiative and decided that **ALL** their allocated programmes will be attempted in a completely flexible fashion throughout the semester. The observations will be undertaken by Remo Tilanus and/or Fred Baas with occasional assistance from Netherlands observers who may visit the island for longer periods of time. The result of this experiment will be extremely useful in determining the direction of future JCMT allocations.

Further details on all aspects of JCMT scheduling should be referred to Graeme Watt at the JAC.

For semester 96A, it is unlikely that a significant fraction of the observing allocation will be setup in a serviced mode other than low-frequency backup programmes for SCUBA commissioning and for further commissioning of RxW. **The community are advised that the SCUBA and RxW teams will require large quantities of stable, high-frequency weather in order to fully commission their instruments and therefore there will be ample opportunity for low-frequency (A-band and some B- band) applications to be completed.**

In future semesters, the ITAC would like to allocate approximately half of the available JCMT time (after the E&C, UH and DDT shifts have been removed) to prioritized queue scheduling.

This gives each proposal a priority which is dependent on scientific merit, and then asks the PI to identify a minimum set of observing conditions (ie: tau(225 GHz), seeing, elevation, system temperature, etc). The highest priority proposal for which all these constraints are satisfied is executed. This scheme has the advantage that the highest-rated science *always* gets done with the highest priority.

The main responsibility for the conditions under which a programme is done lies with the Principal Investigator. The PI decides on the go/nogo criteria. This may extend as far as the preparation of ICL control files if the PI so desires.



The removal of the 'backup' part of a regular application persuades applicants to seek a real allocation for low-frequency time if desired.

Sufficiently highly-rated proposals would be permitted to opt-out from queue scheduling, provided high- frequency proposals had a PATT-approved low-frequency backup. The backup could be either another accepted proposal, or a proposal which was not allocated time, but was nevertheless approved for this purpose by the appropriate national TAG. Opted-out proposals would be encouraged to form consortia and seek block scheduling to maximize their productivity. It is expected that most of these opt-out proposals will be primarily highly-rated low-frequency applications used for training students, research staff, etc.

In the first instance, we would anticipate queues could be created on a national basis, with support predominantly from national staff. We would hope however, that the system would evolve towards a single integrated queue in due course. The percentage of time allocated to queue scheduling will also be expected to evolve with experience.

There is no axe to grind here. We are definitely not prejudging the relative merits of high- vs low-frequency observing — proposals will continue to be ranked according to scientific merit by the TAGs as before. After that, the single task of the telescope staff and the TAGs is to maximize the scientific return from the telescope. Doubtless there will be teething problems with queued-mode observing, and we certainly expect that its operation will evolve with time. (Constructive) feedback from the users will be very important in striking the necessary balances. Your input is very welcome now — you can make your views known to any TAG member, Ian Robson or Graeme Watt. But do remember that we are trying to juggle many different interests and that it will not be possible to satisfy everyone. Please give the experiment a fair try!

*Rachael Padman, MRAO (UK Rep for the ITAC) &*

*Graeme Watt, JAC (ITAC Tech Sec)*

## People & Events

**Dayna Oda Kell** resigned her position as Admin. Clerk in February 1995 after a period of 3 years. Amongst her many duties, one task that Dayna excelled at was keeping track of the fleet of JAC vehicles. We all wish her well for the future and hope she had many enjoyable experiences (apart from the vehicle scheduling!) at the JAC.

**Roxana Myers** joined the JAC in February 1995 as a temporary Admin. Clerk. Her position was made permanent in late July. Visitors to the JAC will meet a smiling and cheerful Roxana in the front office on their arrival.

**Carol Jennings** started on August 1st 1995 as a receptionist for the JAC. Once Carol has mastered the



strange collection of staff names she will field the incoming telephone calls.

**Chris Purton** retired as Scheduler after a three year period of trying to put JCMT applications into order and maintaining an observing schedule. He has now been relocated at DRAO where he continues in a scheduling kind of position but with much less stress than previously suffered at the JAC.

**Joseph Fletcher** has completed a tour of duty from the HIA. His achievements at the JAC are highlighted by his work with diagnosing and improving the power and grounding systems at the JCMT. Joseph has now decided to take retirement and returned to Canada.

**Bill McCutcheon** will complete his sabbatical year at the JAC and returned to Canada armed with boxes full of new JCMT data.

**David Belton** has returned to Canada after a 4-month study period at the JAC.

**Jason Stevens** has been assigned to the JAC for approximately six month, replacing Wayne Holland who is back at ROE working on SCUBA. Jason has already spent some time working on the blazar monitoring programmes at the JCMT and will now find himself landed with a few more staff support duties.

**Michael Heyd** has spent a four month period at the JAC working on a variety of software projects. Michael is a Canadian co-op student out to gain work experience.

**Graeme Watt** has transferred from ROE out to the JAC to begin a third (!) tour of duty in Hawaii. He restarted his duties as JCMT Scheduler on 17th July 1995. With Graeme's transfer there is now in effect no JCMT home end at ROE. Editing and production of the JCMT Newsletter and Annual Report will now be done from the JAC.

Congratulations to **Jane Greaves** and **Wayne Holland** on their marriage on 9th April 1995.

Congratulations also to **Joanne Davidson** and **Jamie Scobbie** on the birth of **Kieran Kimo Davidson** who arrived on 24th May 1995.

Congratulations to several RCUH staff who have been in service for a considerable (some might say enormous!) number of years: **Sidney Arakaki**, **Manuel Martinez** & **Kent Tsutsui** have attained more than 15 years each; **Tom Geballe** and **Mark Horita** have attained 10 years each.

## Editor's Bit

I must apologise (again!) for the extremely late delivery of this issue of your favourite Newsletter. The problem is entirely mine caused predominantly by the relocation of my office from the damp, cold, misty climate of Blackford Hill, Edinburgh to the equally damp and misty, but not cold climate of Hilo, Hawaii. All things said, I believe the move to the other side of the planet has proceeded quite smoothly!

The JCMT Newsletter has changed page size, changed printer, changed distribution centre, and



changed contents. Basically anything that can be, or has to be, updated at frequent intervals (such as instrumentation, scheduling, etc) will no longer go into the Newsletter but will be accessible *as soon as possible* on the JCMT homepage of the World-Wide Web.

In addition, urgent messages and other information will also be distributed through the e-mail. The Canadians already have an 'exploder' system which redistributes single messages to interested parties at a great many sites. A similar system will be setup to keep UK, Netherlands & International users informed. In order to make the distribution list, your e-mail address will be required and a facility will shortly be available on the WWW homepage to allow you to insert the details.

This issue of your Newsletter is a little lacking in the science section. I shall be chasing up observers yet again in an attempt to prise out some highlights of their observations for the next issue. The technical section continues to blossom but that is primarily because I can keep appearing in the doorways of JAC offices until the occupant finally gives in and sends some text.

In these troubled days of financial cutbacks and insecurity in many scientific fields, support your telescope -- submit articles for the Newsletter!!

*Ed*

## ***INSTRUMENTATION***

### ***Summary of JCMT Instrumentation for Semester 96A***

Semester 96A (1 February 1996 - 31 July 1996) JCMT instrument availability and sensitivities can now be located on the JCMT home page of the World-Wide Web at URL:

***/JCMT/home.html***

Additional details can be found on an e-mail fileserver. This fileserver system exists to provide instrumental data, both archival and current, and other information.

*Henry Matthews, JAC*

### ***Instructions for proposals for RxB3, RxW and SCUBA for Semester 96A***

Unfortunately, the delivery date of RxB3 has slipped and it will not arrive in Hilo until February 1996 at the earliest. Until the receiver has been successfully commissioned it will not be available for astronomy. Users should continue to propose B-band observations with RxB3i.

Progress on RxW is going well and I am informed by MRAO that the delivery date of RxW to the telescope is expected to be in the late autumn of 1995 (following a successful laboratory acceptance test at Cambridge). However, as RxW will require extensive commissioning (that will need dry weather which will be flexibly scheduled against PATT programs - see article on flexible scheduling for



semester 96A) **no proposals will be accepted for RxW for semester 96A.** Following commissioning, C-band proposals which have already been allocated time will be undertaken using RxW. **No D-band proposals will be accepted by PATT for 96A.** Notification of D-band observations to be undertaken in SERVICE mode will be made at a later date and users notified through email exploders and the WWW.

The situation regarding SCUBA is described elsewhere in this Newsletter and delivery to Hawaii is now expected by the end of the year. Although we expect to begin commissioning during semester 96A, the precise dates are still uncertain and therefore **no proposals for SCUBA will be accepted for 96A. Proposals to use UKT14 should continue.** As I have previously indicated, the first observations with SCUBA will be undertaken in a serviced mode by members of the commissioning team and users will be notified by e-mail exploder and the WWW of what type of proposals to submit for these 'shared risk' observations. Ensure you are on the e-mail exploder -- see the WWW JCMT homepage.

*Ian Robson,*

*Director JCMT*

### ***SCUBA Update***



As reported in the last JCMT newsletter SCUBA has had a long-standing problem with vibrationally- induced microphonics from the closed-cycle cooler (CCC). These levels have been reduced significantly over the last year or so, but residual features still remain in the signal band of the instrument (these features would significantly degrade the achievable signal-to-noise, particularly for the "raster-scan" observing mode). As a result of this it was decided to remove the CCC, and replace it with a liquid nitrogen can. This modification means that the internal optics will be at a higher temperature, but the main radiation shield will be significantly colder than previously. The net effect is that the background photon noise on the bolometer arrays is increased by only 1% — thereby having minimal effect on the receiver performance. The new nitrogen can will be tested in mid-August, when for the first time the instrument will be complete (both arrays and the photometric pixels will be installed).

In recent months the performance of the instrument in the laboratory has been most encouraging (with the CCC switched off!). We are now routinely recording data through the data acquisition system, using



the dedicated SCUBA user-interface and observing queue. The observing modes are gradually being commissioned in the lab; "jiggle-map" and "flat-field" have recently been successfully demonstrated. Optical tests using a telescope simulator have shown that the beam profiles at 850 microns are very close to theoretical, and not significantly distorted at the edges of the array. Jiggle-maps of a point source (essentially equivalent to beam map on the telescope) are nice and circular, again, even at the edges of the array. We've even managed to image an extended source — a cut-out, asymmetric "K" shape! This was important to demonstrate jiggle-map of an extended source (about 1 arc minute), and also to check that field distortion corrections had been applied correctly. Another highlight has been the successful demonstration of the internal calibrator. This corrects for variations in bolometer sensitivity, due to their construction, and also due to their non-uniform response to background power (caused by changes in sky emissivity) and source brightness.

SCUBA is now scheduled for delivery to the JAC just before Christmas of this year. There will be a period of 4-5 weeks in Hilo when the instrument will be assembled and checked-out before going up the mountain. This period will also be used for JAC staff training. We estimate that it will require up to a further 4 weeks to fully install SCUBA on the telescope and complete the necessary pre-commissioning system checks. Astronomical commissioning is expected to begin in early March of next year.

*Wayne Holland, JAC*

*SCUBA Project Team*

## ***PATT INFORMATION***

### ***PATT Application Deadline***

**Deadlines for receipt of JCMT applications for semester 96A are:**

for Netherlands applications:

**15th September**

for UK, Canadian and International applications:

**30th September**

Note the change of the UK deadline from the previous few semesters. To ensure prompt processing, please ensure that your applications are sent to the correct establishment. Applications for JCMT time should be submitted to the national TAG of the Principal Investigator (PI) or, if the PI is not from one of the 3 partners, to the national TAG of the first named co-investigator on the application who is from one of the partners. International applications (those with no applicants from one of the partners) should be submitted to the PATT Secretariat at PPARC, Swindon. Members of the JAC staff in Hawaii



(apart from those funded directly by the partners) count as International unless they are the PI on an application, when it should be forwarded to the appropriate national TAG.

Please help us to manipulate a consistent set of applications by only using the new revised PATT3. Older versions will still be accepted.

#### Country paying salary of Principal Investigator

Canada Other	Netherlands	UK or
JCMT Time Allocation Group, Secretariat,	JCMT Program Committee,	PATT
Herzberg Institute of Astrophysics,	Leiden Observatory,	PPARC,
100 Sussex Drive, Ottawa, House,	P O Box 9513,	Polaris
Ontario K1A 0R6 SN2 1ET,	2300 R A Leiden,	Swindon,
CANADA KINGDOM	NETHERLANDS	UNITED

### ***PATT ITAC Report for Semester 95B***

#### **Allocations**

The individual partner TAGs hold meetings in their respective countries prior to the PATT session to assess applications from their own country. At these meetings informal numbers of shifts are nominated for each application in a priority order. The Chairpersons of each TAG bring their respective lists to the PATT where the ITAC combine the awards, include discussion of the engineering and commissioning requirements and assess the international applications. The final allocations of shifts are made by the ITAC.

#### **Applications to be considered**

UK status	45
Canadian status	37
Netherlands status	17
International status	10
University of Hawaii	7
TOTAL:	116

The PATT meeting for semester 95B was held at The Falcon Hotel in Stratford upon Avon, UK on 7th & 8th June 1995.



It should be noted that if the PI on an application is a JCMT staff member based in Hilo, then the application is assessed by the appropriate national TAG. However, by Board rule, International status is given to any application where the only named collaborator from any partner country is such a JCMT staff member. International applications are assessed by the Chairpersons of the national TAGs at the ITAC meeting.

#### **Time Available (in 16-hour nights)**

No. of nights in semester 95A	183.0
Engineering and Commissioning	42.5
University of Hawaii (10%)	14
Director's discretionary use	4
<b>Available for PATT science:</b>	<b>122.5</b>

The above table indicates the order in which nights are removed from the total available for the semester. Semester 95B covers a winter period from 1st August 1995 through 31st January 1996 inclusive. The JCMT is closed for the night of 24th December.

#### **Awards (in 16-hour nights)**

UK status	62.5
Canadian status	28.5
Netherlands status	23.0
International status	8.5
University of Hawaii	14.0
<b>TOTAL allocation:</b>	<b>136.5</b>

For those not familiar with the JCMT Board formula, the total time requested is divided amongst the PI and collaborators. 50% of the time is awarded to the country paying the salary of the PI. The remaining 50% is divided equally over **ALL** investigators (including the PI).

#### **Attribute by JCMT Board formula (in nights)**

UK	50.9
Canada	29.3
Netherlands	20.5
International	22.2



## **Instrumentation**

The reduction in allocation of time for UKT14 is again due to reduced request as applicants await the arrival of SCUBA to continue their programmes. The Lethbridge Group have requested to bring their own Fourier Transform Spectrometer (FTS) system this time. Previously their FTS interfaced with the UKT14 bolometer but they now have a stand-alone instrument with its own bolometer and cryostat. No RxG time was requested for this semester.

### **Instrument distribution**

UKT14	14%
FTS	2%
SBI	7%
RxA	37%
RxB	33%
RxC	7%

## **Long-Term Status**

L/M/95A/U22, approved for long-term status for two semesters, was given 6 shifts. This is the final award of time for this project.

L/M/Y/C05 was awarded 'thesis status' by the Canadian TAG several semesters ago and has not yet been completed. For 95B it has an award of 3.5 shifts. The programme will continue through future semesters until completed.

L/M/95B/U14 and L/M/95B/U15 were awarded long-term status for 2 semesters with awards of 8 shifts and 4 shifts respectively in 95B. Further shifts may be given in 96A subject to submission of a report.

## **Engineering & Commissioning**

The engineering & commissioning time for 95B includes major engineering periods to replace the telescope encoders for 24-bit models, to upgrade the antenna azimuth track.

Commissioning of the antenna and instrumentation continues with periods required to characterise and improve the surface via metrology and beam map measures, monitor the antenna performance and tracking through pointing and inclinometry runs, measure receiver performances and efficiencies, and increase the catalogue of standard spectra available at the telescope. In addition time is required to complete the set of observing tests remaining from 95A which include pre-SCUBA chopping/noise tests, 'continuous spinning' polarimeter tests, DAS non-standard configuration tests and software upgrade tests.



Time has been allocated for commissioning of RxB3 and RxW but no time for SCUBA. There are non-standard instrument configurations schedule for 95B (SBI & FTS) which require set-up and calibration time.

### **Observatory Backup Programme**

The Observatory Backup (M/94B/I09) was discussed in view of the submission for further time. The ITAC decided that this programme may continue **BUT** only for CO (2-1) and 13CO (2-1) mapping of the nominated sources. More explicit requests must be made through the ITAC before proceeding to observe any other lines and/or sources. The ITAC also recommended that the current data be made available to the community.

### **Fallback Programmes**

A number of applications have been approved by the ITAC to be included in the schedule should either RxB3 and/or RxW fail to meet the delivery date. The commissioning time set aside for these instruments will be apportioned according to the partner funding ratio of 55:25:20 = UK:Canada:Netherlands after 10% has been given to the University of Hawaii. Applicants on these fallback programmes will be informed by the JCMT Scheduler when/if their time is to be scheduled.

Since the fallback applications do not necessarily fit directly into the scheduled slots for the instruments some changes may be required to the schedule for the second half of the semester. All applicants affected will be informed in advance by the JCMT Scheduler.

### **Service time**

Allocations for this semester are:

CDN = 6 shifts allocated;

NL = 0 shifts allocated;

UK = 8 shifts allocated

### **Redesign of the JCMT Application form**

The revised version of the PATT3 form met with a great deal of approval at the last round of applications. It is likely that some minor revisions to this form will occur as further flexible scheduling and serviced observing is implemented. The current version of the form should now be used wherever possible. Older versions will be phased out. The new form is available on the JCMT homepage of the World Wide Web. There is also a template form available which enables a suitable Latex output to be generated from a simple editing of the file.

The first 2 pages of the form are to be completed by all observers. The third page need only be completed and submitted with UK applications.



***Successful JCMT Applications for Semester 95B***

<b>PATT</b>	<b>P.I.</b>	<b>Shifts</b>	<b>Title of Investigation</b>
C01	Moffat A F J	1	Search for CO emission in strong dust-making Wolf-Rayet stars
C03	Redman R O	4	Thermal continuum spectra and rotational lightcurves of three bright s-type asteroids
C04	Mitchell G F	3	The gas kinetic temperature in molecular outflows
C05	Moriarty-Sch. G	3	Mapping dense gas in circumstellar environments: modelling density distributions
C06	Vallée J P	1	Extreme infrared (EIR) polarimetry of elongated molecular clouds
C08	McCutcheon W	2	Sequential star-formation and CO isotopomer fractionation in NGC 6334
C09	Matthews H E	1	The relationship between molecular outflows and optical jets
C10	Seaquist E R	2	Study of hydrogen recombination line maser at H26( in M82
C15	Wilson C D	1	Atomic carbon emission from giant molecular clouds in M33
C18	Kahane C	2	The 12C/13C ratio in the envelopes of extreme 13C-rich carbon stars
C19	Avery L W	3	A study of the shock-induced chemical anomalies in L1157
C20	Duley W W	2	Search for TiO in high-temperature star-forming regions
C23	Hasegawa T I	3	Observations of non-dissociative shocks in molecular clouds
C24	Thornley M D	1.5	Physical properties of molecular gas in the flocculent spiral NGC 3521
C28	Joncas G	1	G104.7+2.8, a supernova remnant-molecular cloud interaction site?
C31	MacLeod J M	4	The chemical properties of bipolar outflows
C32	Bastien P	2	Submillimetre polarimetry of circumstellar disks
C33	Naylor D A	4	Search for tropospheric CO absorption in Neptune
C35	Clark T A	1	Limb distribution and mapping of H I n=19-20 emission from the Sun
C36	Leahy D A	3	Sharpless 219: modelling the H II/H I/CO interface region



C37	Butner H M	3	Evolution of dense gas from pre-protostellar molecular cores to protostellar cores
C/Y05	Papadopoulos P	3.5	Temperature, density gradients of the molecular gas in Seyferts
H01	Jewitt D	2	Submillimetre continuum from near-Earth comets
H02	Greene T	4	Mapping the CO outflow of a spectacular YSO in Taurus
H03	Hodapp K -W	3	Class 0 outflow sources
H04	Carpenter J	8	Molecular line survey of massive dense cores
H06	Evans A S	5	Submillimetre spectroscopy of $0.02 < z < 0.1$ powerful radio galaxies
H07	Sanders D B	6	CO(3-2) and CO(2-1) survey of the Galactic plane
I01	Myers P C	1	Correlating submillimetre fluxes with outflow properties
I04	Paglionie T A D	3	Mapping the density structure of starburst galaxies
I05	Bolatto A D	1	Dust in low metallicity environments: IC 10
I07	Fuller G A	2	The structure of the circumstellar environment of young stars
I09	Coulson I M	2	Galactic rotation curve from CO velocities of distant molecular cloud complexes
I10	Coulson I M	2	Dust and gas around Vega-excess candidates
N02	Röttgering H J	6	CO observations of high redshift IRAS quasars
N03	Israel F P	6	[C I], CO J=4-3 and J=3-2 observations of centres of galaxies
N04	Boogert A C A	6	Physical conditions and carbon budget around YSOs with ice bands
N05	Hogerheijde M R	6	$^{12}\text{CO}$ J=3-2 and $\text{HCO}^+$ J=3-2 mapping of YSOs in Taurus
N06	van Dishoeck E	6	Physical and chemical evolution of star-forming regions
N07	Spaans M	5	CO, C I and other molecules in PDRs around cool stars
N09	Groenewegen M	3	Do short period Miras lose mass, or how effective is radiation pressure on dust?
N10	Hurley K	3	Submillimetre observations of soft gamma-ray repeaters
N13	Magnier E A	3	A peculiar bipolar outflow object in M36
N15	Israel F P	2	Excitation of cold CO in big bulge galaxies



N19	Jaffe W J	2	CI emission from cool gas in cooling flow clusters
95A/U22	Rawlings S	6	CO survey of the only complete sample of high-redshift galaxies
U03	Macdonald G H	5	Chemical evolution of hot molecular cores - confrontation of theory and observation
U04	Dent W R F	4	HH2: the chemical effects of an outflow shock
U09	Minchin N R	8	A comprehensive fractionation study of a selection of extended PDRs
U11	Russell A P G	6	Isotopic CO in NGC 253
U14	Dent W R F	8	Statistics of YSO outflows
U15	Davies J K	4	Molecular content of comet P/Honda-Mrkos-Pajdusakova
U16	Dent W R F	4	Searching for molecular gas in stellar jets
U17	Guilloteau S	4	Spectroscopy and photometry of T Tauri disk candidates- measuring properties of the protoplanetary disks
U18	Padman R	2	Interferometric studies of multiple T Tauri star systems
U20	Wang Y	5	Spectral signatures of infall in three Bok globules
U26	Little L T	4	Submillimetre polarimetry of G34.3+0.2 and G35.2-0.74
U27	Little L T	4	C I/CO in cold clouds: core chemistry and dark matter probe
U29	Ivison R J	3	Dust in galaxies at $z = 4$
U30	Mannings V G	4	Photometry and scans of Herbig Ae/Be systems
U31	Richer J S	2	Submillimetre interferometry of the protostellar condensations in the NGC 2024 cloud core
U33	Richer J S	6	Excitation and acceleration in the bow shocks of protostellar outflows: CO 4-3 and SiO studies
U35	Bridges T J	7	CO mapping in NGC 1275
U36	Bridges T J	4	Physical conditions of CO in young starburst galaxies
U38	White G J	5	Sequential star formation and CO isotopomer fractionation in NGC 6334
U40	Toth L V	4	A complete study of low-mass star formation in L1251
U41	Greaves J S	4	Observational tests of polarisation mechanisms
U43	White G J	6	Tracing molecular gas in the Lynds 1551 outflow



source

Due to the non-delivery of RxB3 during semester 95B, several fallback applications have been inserted into the schedule. In addition to 2 extra shifts allocated to the Canadian service programme the following are added:

C22	Hajjar R	1	Mapping group II Ae/Be Herbig stars, a search for possible deeply embedded companions
H04	Carpenter J	2*	Molecular line survey of massive dense cores
N01	Israel F P	3	Radial distribution of CO emission in M33
U01	Doyle J G	3	The nature of dust grains around evolved C- and O-rich stars
U21	Gear W K	1	Studying the polarization variability of Blazars; understanding the magnetic field orientation
U22	Gray M D	1	Silicon monoxide submillimetre masers in late-type stars
U44	White G J	2	A CO study of cometary globules

\* = these shifts in addition to the 8 already allocated.

## STATISTICS

### *Weather and Fault Statistics for Semester 95A*

The following tables present the weather loss and fault loss for semester 95A. Full details are stored on database at the JAC and interested readers are referred there for further information. *The total clear time lost from primary programmes for semester 95A is 6.1%.*

Month	Avail	Extend	Primary	%	Backup	%
	Hrs	Hrs	Loss		Loss	
February	444.0	30.2	89.8	20.2	54.5	12.3
March	480.0	25.3	70.8	14.8	60.0	12.5
April	480.0	22.3	115.7	24.1	42.0	8.8
May	473.5	23.3	67.0	14.1	25.5	5.4
June	456.0	25.3	16.0	3.5	0.0	0.0
July	497.0	51.8	47.80	9.5	18.5	3.7
<b>Total</b>	<b>2830.5</b>	<b>178.2</b>	<b>406.3</b>	<b>14.4</b>	<b>200.5</b>	<b>7.1</b>



**Table 1:** *JCMT weather statistics.*

Month	Avail	Total	ANT	INS	COMP	SOFT	CAR	OTH
February	444.0	18.9	1.6	12.2	0.3	1.8	0.8	2.3
March	480.0	33.1	1.4	9.6	5.1	2.0	14.4	0.6
April	480.0	17.9	0.8	5.5	2.5	2.0	1.1	6.1
May	473.5	25.6	3.0	12.9	4.5	1.6	1.7	2.0
June	456.0	28.8	8.4	8.8	2.5	0.6	1.4	7.2
July	497.0	23.2	2.8	9.9	0.8	1.4	0.6	7.8
<b>P (hrs)</b>	<b>2830.5</b>	<b>147.5</b>	18.0	58.9	15.7	9.4	20.0	26.0
<b>B (hrs)</b>		4.4	0.3	1.9	0.0	0.0	0.3	2.0

**Table 2:** *JCMT fault statistics. Wherever possible the faults are categorised into ANT = antenna; INS = instrument; COMP = computer hardware; SOFT = software; CAR = carousel; with the remainder going to OTH = other. The figures in the table may not appear to add up correctly due to rounding in the original program. P defines the time lost from Primary projects. The category B(hrs) is the time lost to Backup projects.*

## ***TECHNICAL NEWS***

### ***The JCMT Control Room Refurbishment***

Those readers who have visited the JCMT in the past six months or so will have found the control room in a state of upheaval as it undergoes improvements. The refurbishment had long been discussed and planned, and is now becoming a reality. I think we can say that those who have recently had to work in the control room at night have been pleased on the whole with the changes, and with the evidence that the project will continue to completion. Nothing has been said in the Newsletter previously about this project, so I owe our readers a little more than just a simple update on progress.

Over the years since the JCMT was brought into service in 1987 most of the equipment and facilities in the room simply came in as needed and stayed more or less where they first sat. In the end this led to a rather untidy situation, and one unbefitting a world-class facility. The Director, JCMT determined that the control room would be upgraded and I was given responsibility for achieving this task. In my first comments on the situation (10th January 1994) the stated goal of the control room refurbishing was 'to provide a professional working environment for visitors and staff', and in the same memo I noted that '...the control room is the TO's office; the rest of us are visitors.' I have tried to keep these ideas in



mind throughout.

Familiarity with other control rooms around the world, and thinking the problem through led to a number of guiding principles, including that:

- 1) the number of work areas in the control room needs to be limited to not more than four, including the TO's area. Basically a work area centers on a workstation, and needs to include sufficient flat space (yes, we still use paper!). The latter needs to be large enough, and the total area of the control room is small enough that four is a reasonable maximum. Anything else constitutes severe overcrowding;
- 2) the TO area needs to be clearly demarcated and contain a control console of sorts. In this area all relevant information, such as the progress of the observations and the electromechanical status of the telescope and carousel, should be readily to hand;
- 3) potentially RFI-sensitive equipment should not be present in the control room, but should be in a shielded environment. The major issue which has surfaced in this regard is the location of the DAS IVC rack. From the point of view of the premium on control room floor space it would be advantageous to move it to an alternative location, and
- 4) directed lighting is required to reduce glare from terminal screens and provide light where wanted. In addition the known physiological effects of fluorescents indicate a requirement for incandescent track lighting.

To test out some 'proofs of concept' early on we first (i) rearranged the TO area to provide an L-shaped working area, and (ii) provided a video link from the observing status screen into the so-called 'crew room' downstairs. Without a doubt the first has improved the TO sense of function, and the second the level of contact with the observing while being able to eat in peace. It is ironic that more positive comments have been received from observers on this second issue alone than anything else.

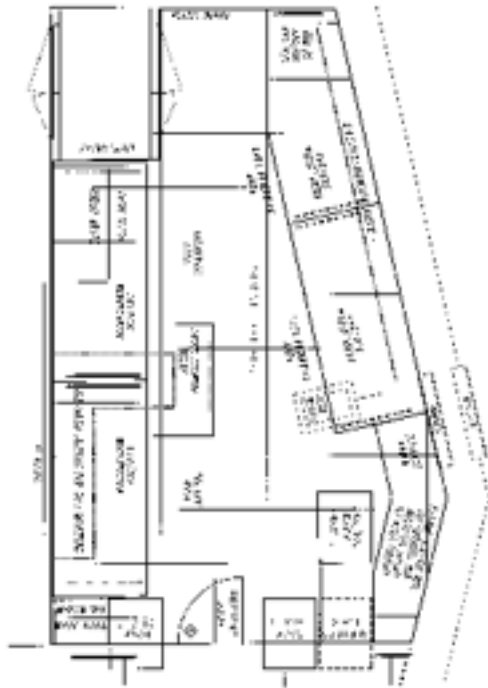
Although progress has been slow at times, we are quite pleased with the results to date. Most of the actual work has been done as part of the power and grounding project by Joseph Fletcher and Doug (Chase) Reed. Joseph has just left us to return to Canada (and an uncertain future), and this is a good place to record for posterity our appreciation of his contribution to the control room upgrade project. His efforts have helped greatly to maintain momentum in the project, and his straightforward and commonsense practical approach to the details has undeniably been extremely effective. He has been responsible also for the many drawings and floor plans we have put forth.

The floor plan to which we are working (see Figure 1) was arrived at through a long process of consensus- taking, after which we arrived at essentially the plans we started with a year before, which was rather gratifying. For some time the alternative plans were available on the Web as part of the consensus review.

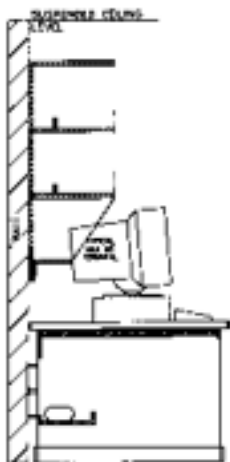
This plan required the removal of the supporting wall to the right of the main sloping window, which



resulted in a significant improvement in the spaciousness of the room. Above the work surfaces, as indicated in Figure 2 in section, there are to be wall-mounted cupboards and shelving, which will provide storage and room for reference materials.



**Figure 1.** This image is available in more detail as a Postscript file elsewhere. The floor plan to which we are working. The plan divides the room conceptually into an operations area, facing the telescope, and a data analysis area facing the outside wall. The basic aspects of the plan provide for a significant increase in workspace via four large surfaces. Additional working surface is provided by the T-shaped extension into the room on the operations side, which also serves to give clean definition to the TO area.



**Figure 2.** This image is available in more detail as a Postscript file elsewhere. A sideview of the working surface and wall-mounted shelving, showing the proportions in relation to a typical workstation



We will also have a couple of roll-out extensions under the working surfaces.

A summary of recent progress would include:

- 1) The electrical work is now essentially complete. All electrical cableways have been installed, and computer connections and electrical circuitry are complete. Dimmable incandescent track lights and better fluorescent fittings are in place. All switches and controls have been moved to the wall by the exit.
- 2) Most of the plasterboard finish is completed, including the area around where the old roof support used to be.
- 3) The electronics racks have been ordered. These will be embedded in the computer room wall. Two of these are unshielded, and one is shielded. The former will contain monitoring equipment, cable patch panels and non-RFI-sensitive electronics. The shielded rack will eventually contain the DAS IVC rack if it proves possible to move it. In the meantime, there are a number of items which could go in this rack, and it will be possible to test its RFI shielding ability. Delivery of the racks has just taken place; however, installation has been pushed back to October in view of the low priority of the control room upgrade project in relation to other projects.
- 4) Many observers (not to mention local staff) will be happy to know that the air conditioner which used to pour cold air on all present has been moved into the ceiling space. This is one of the evidences of Joseph Fletcher's practical approach to apparent difficulties; we have all complained about this problem for a long time, and he did something about it.

Most of the cellulose ceiling tiles have been installed, replacing the fiberglass ones originally in use. The humidifier, originally mounted on the wall by the exit has been replaced by a new one flush with the wall, and moved to the left to make room for cupboards and shelving along the back wall.

- 5) We have ordered the larger part of the furniture (that is, the five main desk areas, under-desk cabinets, and wall-mounted cupboards) which appears in the approved plan from a local cabinetmaker, and this should be delivered by the end of August. The furniture will be in a knock-down, ready-to-assemble form, and can be installed as manpower permits.

The next few months should therefore see the larger part of the refurbishment completed, in time for the new receivers. There are still a number of aspects which need work, however. For instance, the final pieces of furniture, mostly in the corner behind the DAS IVC rack, need to be ordered. A second, and rather major project is to define and build the monitoring and electronics racks either side of the computer room door. It is clear to me that part of the monitoring equipment will need to include hardwired telescope, carousel and other status information which can operate independently of the control computers. The precise specification of these pieces of equipment is a subject of continuing discussion.



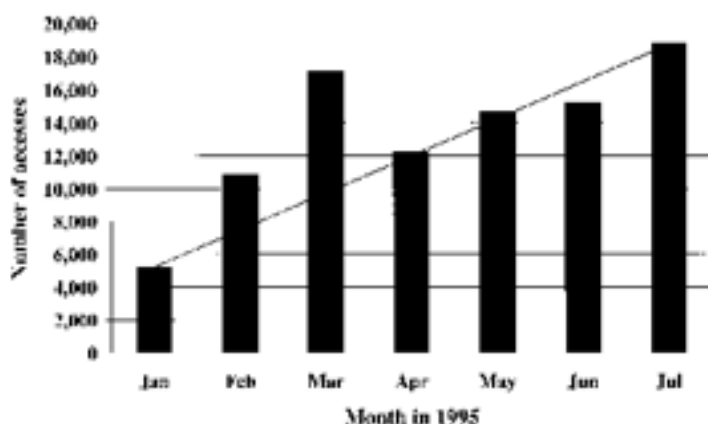
## ***JCMT User Documentation - an Update***

In the August 1994 edition of the JCMT Newsletter, pp 27-28, I summarised the various sources of information for those interested in using, or actually observing with, the JCMT. Possibly now is a good time to update that summary.

Since this time last year there has been a gradual shift in emphasis as far as the sources of documentation go, away from the e-mail-based fileserver system (JCMT\_INFO) in favour of the World-Wide Web on Internet. Most of the important information an intending or actual observer needs to know can be retrieved from the Web. The URL for the JCMT home page is:

**/JCMT/home.html**

The histogram shows the number of WWW accesses per month from the beginning of 1995 for JCMT and UKIRT combined. Overlaying the evident trend towards increasing usage of the Web pages, there is a burst of activity in February and, particularly, March, due presumably to the impending application deadlines. Taken separately, access to the JCMT pages considerably exceeds that for the UKIRT page, probably a result of the wider user community. The two items attracting most attention are the User's Guide and SCUBA information.



The interest in our Web pages is

encouraging, and I expect this will further erode the effort spent by myself on the fileserver, at the very least for the reason that maintaining two systems takes more time than just one. However, I am mindful that not all of our customers may find the Web convenient for all purposes, and that certain information is more valuable to you than others, so I am interested in your views. If you want to write to me, send me an e-mail at my address below.

One of the major pieces of information accessible from the JCMT home page is to be the Astronomer's Reference Manual (ARM). Generally this is useful if you are actually going to observe with the JCMT. It consists of eight major sections, and at the moment of writing two of these are available on the Web (Parts 5 and 6, on making spectral line observations, and reducing the data, respectively). As I continue



to update the ARM, the other sections will appear in this form. Only material available to me electronically is to be included in the Web version.

The complete ARM is available in hardcopy in Hilo, at HP, and at the JCMT. In addition 'roving' (and boldly numbered) copies will be made available on loan to visiting observers at the JCMT, one per observing team, starting August 1 (*i.e.* with the beginning of semester 95B). The fact that I promised this would happen a year ago shows that this is a bigger undertaking than I estimated.

Your 'roving' copy can be picked up on check-in at the JAC before going to the summit. Roxana Myers in the front office will ask you to sign for it, and you will be responsible for returning it at the conclusion of your run. If you don't want one to take up with you, then just tell Roxana. In view of the amount of work involved in creating and maintaining these copies I am not keen on losing any of them.

However, while your copy is in your possession, I would like to encourage you to write comments in it. In this way I will be able to upgrade the information contained in the ARM as I review your comments during the continuing process of revision.

*Henry Matthews, JAC*

*Information Coordinator*

### ***Medical Disclaimer Forms***

PPARC have initiated a procedure whereby visitors to the JAC facilities on Hawaii will no longer be required to provide a medical certificate, but will be warned of the potential dangers of working at altitude and be required to sign a disclaimer. Disclaimers will be issued to groups by the PATT Secretariat following PATT allocations. Signed disclaimers need to be returned to the PATT Secretariat for every person visiting the telescopes, not just principal applicants.

Only one disclaimer per person will be required and it will remain valid for all approved programmes. It is intended to renew these disclaimers every four years. Failure to provide a signed disclaimer will mean that individuals will be denied access to the telescope(s). The form is also available on the JCMT homepage of the World Wide Web.

*Graeme Watt, JAC*

### ***The UKSERVICE Program at JCMT***

#### **Abstract**

An analysis is made of the UKSERVICE observing program at JCMT. Most users are satisfied with the quality of their data, although improvements are suggested and need to be addressed. A rough estimate shows service observing could save up to 10% of JCMT telescope time.

#### **Introduction**



Service observing programs have been operating at JCMT for 3-4 years. Applications for UKSERV time are similar to those to PATT. They are evaluated for scientific value and technical feasibility, and for conformity to the approved use of the service program (see the JCMT Newsletter of July 1993, p12). The observations are performed by JCMT support staff, in a flexible way depending upon weather conditions, and the data are made available to the PIs for electronic collection and reduction at their home institutes.

With the conference 'New Modes of Observing for the Next Century' scheduled for June 1995 in Hilo, it seemed timely to determine whether the community was getting the most from this service. The results were presented as a poster paper at that conference, the proceedings of which, including this contribution, are published in the Conference Proceedings series of the Astronomical Society of the Pacific.

The investigation was in three parts :

POLL 1 - of PIs who had obtained UKSERV data,

POLL 2 - of UK astronomers who had obtained regular PATT time at JCMT, but who had not used the UKSERV program as PI,

an analysis of observing reports for both service programs and regular PATT programs to derive efficiency of time usage.

### Poll 1

PIs of JCMT UKSERV programs were surveyed by e-mail during March and April of 1995. The questions, responses and other comments are presented here as Appendices 1 and 2.

The distribution of programs by semester and instrument ( U= the common user bolometer UKT14, A/B/C= the A-/B-/C-band spectroscopic receivers), and the distribution of responses by the same criteria are shown in Table 1.

<----- programs ----->						<----- responses ----->				
Sem Total	U %	A	B	C	Total	U	A	B	C	
V 57	4	6	4	—	14	4	1	3	—	8
W 24	10	3	4	—	17	3	0	1	—	4
X 31	10	1	1	1	13	3	1	0	0	4
Y 23	5	2	4	2	13	0	1	2	0	3



94a 56	12	9	3	1	25	7	3	2	1	13
94b 58	6	9	5	4	24	5	5	2	2	14
Total	47	30	21	8	106	22	11	10	3	46
%						47	37	48	38	43

**Table 1.** Distribution of programs by semester and instrument

*Were the observations performed as requested ?*

<b>Maps</b>	<b>All programs</b>		<b>U</b>		<b>A+B+C</b>		<b>Point-sources</b>		
Yes 90%	31	84%	12	67%	19	100%	22	81%	9
Sort of 0%	4	11%	4	22%	0	0%	4	15%	0
No 10%	2	5%	2	11%	0	0%	1	4%	1

*Were the calibrations performed satisfactorily ?*

<b>Maps</b>	<b>All programs</b>		<b>U</b>		<b>A+B+C</b>		<b>Point-sources</b>		
satisfactory 70%	26	70%	9	50%	16	84%	19	70%	7
useful 20%	9	25%	7	39%	3	16%	7	26%	2
unsatisfactory 10%	2	5%	2	11%	0	0%	1	4%	1

*Was the Data Quality (eg S/N) satisfactory ?*

<b>Maps</b>	<b>All programs</b>		<b>U</b>		<b>A+B+C</b>		<b>Point-sources</b>		
excellent 50%	15	40%	5	28%	10.5	55%	9.5	36%	5
satisfactory 40%	18	49%	9	50%	8.5	45%	13.5	52%	4
unsatisfactory 10%	4	11%	4	22%	0	0%	3	12%	1



**Table 2.** Observations, Calibrations and Data Quality

<b>Client type</b>	<b>UK</b>		<b>International</b>	
Access Easy	20	91%	3	60%
Not easy	2	9%	2	0%
Reduction Easy	19	90%	3	60%
Not easy	1	5%	2	40%
not attempted	1	5%	0	0%

**Table 3.** Access to data and reduction at home base

<b>Publications</b>			<b>Impression</b>			<b>Use again</b>		
Already	10	27%	favourable	28	90%	Yes	28	90%
likely	24	65%	non-committal	2	7%	Maybe	0	0%
unlikely	3	8%	otherwise	1	3%	No	3	10%

**Table 4.** Programs yielding Publications, and General Impressions

Of 52 PIs polled on their 106 programs (average = 2.0 programs per PI), we received responses from 32 PIs regarding 46 programs. Tables 2-4 show the breakdown of responses to some of the questions regarding satisfaction with the observing and data, ease of access to the data, resulting publications, and general impressions.

Of 25 discharged UKSERV programs, 21 (84%) were also described by respondents as being 100% completed, and 4 were described as 0%, 33%, 50% and 95% completed. The latter was considered successfully concluded by the PI, and the third was deemed to be unviable as a service proposal and was terminated. Only in two cases did respondents feel that they had been let down :

1. only 1 hour of integration was done cf. 5 hours requested. The target, an asteroid, moved away from Earth and so the loss was irrecoverable (we note that the conditions were not favourable for photometry during the only two UKSERV shifts available).
2. because 'observing instructions were not followed fully' integration times were shorter than requested : 0.5 hours cf 2 hours for 2 of 3 targets (we note that 450 mm photometry was good on only one of the 6 nights that it was attempted. The program was not resubmitted for completion).

## Poll 2

Seven replies were received from 22 questionnaires. Respondents typically perceived that restrictions on time and complexity would prevent acceptance of their likely proposals. A need was expressed for more regular scheduling and a faster response time. One respondent was adamant that he wouldn't



want, wouldn't trust, anyone else to do his observing for him.

## **Analysis of Observing Reports**

Records for 1993 & 1994 show that 20% of time allocated to primary observing programs was lost to equal proportions of weather that was 'poor' (photometrically unstable or high opacity) or 'bad' (leading to closure). The poor weather was then used for a backup program. In the same period such weather claimed only 11% of service time.

## **Results**

The responses to the questions in the polls, the other comments of the respondents, and the analysis of the observing records may be summarized as follows:

1. At about the 90% level, UK astronomers are satisfied with UKSERV,
2. Service observing makes good use of the telescope. It has an implicit flexibility that allows good use to be made of almost any weather.
3. For about 5% of the proposals the observations and calibrations were not performed satisfactorily. This crack is large enough for those PIs who fell into it, and UKSERV must attempt to close it. This may be done by
  - better communication between client and observer, and/or more detailed specifications of the observations and desired noise levels;
  - having observers who understand the needs of astronomers. (We think our current observers meet this criterion already.)
4. There is no obvious difference in perceived performance between proposals requiring maps and those requiring single point observations, although our sub-mm photometry was less well received than our spectroscopy. In this context sub-mm photometry should perhaps be considered as more difficult than spectroscopy. How these perceived performance levels compare with those of 'classical' observers needs to be assessed. We mention here that multi-shift PATT proposals have also been performed at JCMT in serviced mode with reasonable success.
5. Our data transport mechanism uses VMS backup, a STARLINK compression and FTP. Our international clients had some trouble accessing STARLINK software, and increasing numbers of UK-based scientists in Unix environments are requesting their data in appropriate format.
6. PIs need more feedback concerning the status of their programs. These problems may best be solved by a noticeboard system such as the World Wide Web.
7. A facility is needed for service clients to access JCMT utilities in order to better analyse their data.

## **Conclusion**



1. UKSERV provides UK astronomers with high-quality data that might be difficult to obtain through normal channels.
2. Service observing is an acceptable means of obtaining data. While the characterization of program by complexity is unclear, there seems no limit yet to the possible scope of service observing.
3. Service observing is an efficient way to use telescope time, saving perhaps 10% of the available time currently lost to 'poor' weather.

UKSERV may be improved by :

better communications with the clientele, perhaps using WWW, particularly in order to reassure them that their proposals are still in the queue

easier access for clients to their data and to JCMT utilities

convincing that part of the community still unsure of the feasibility of having their data obtained for them.

*Iain M. Coulson, JAC*

### ***UKSERV in Semester 95B***

The UK Service Programme is open to applications from UK and International applicants alike. Canada and the Netherlands run their own service programmes on the JCMT.

Applications are accepted for observations that take no more than 4 hours to complete (half of a standard JCMT shift). Typical applications include those requiring completion of PATT projects that have been partially weathered out or nearly-but-not-quite finished; pilot projects which may lead to full-blown PATT applications; short investigations that would not justify a full PATT application; monitoring programmes; and targets of opportunity.

Currently the UK-TAG allocates about 8 shifts to UKServ per semester which the JCMT Scheduler then attempts to distribute throughout the semester so as to maximise the RA range covered. This is not always as simple a task as it may sound.

All applications are awarded a scientific grading by 2 independent assessors, one of whom is a member of the UK-TAG. In addition the applications are technically assessed by staff at the JAC. The assessment process should take no longer than two weeks after which the applicant is notified whether his project has been added to the service list or whether a rewrite is necessary. The UK Service Programme can be an extremely rapid method of obtaining your data.

Prospective applicants can obtain information about the UK Service Programme from the JCMT home page on the World Wide Web. If you wish to obtain further information then send an e-mail request to:

**jcmt@roe.ac.uk**



## UKServ in semester 95B

There are 8 shifts of UKServ scheduled this semester. They are provisionally located on the following dates (but are subject to change due to the instrument delivery modifications).

Date	Shift	Instruments	Times
Oct. 23	M	UCBA	0130-0930
Nov. 30	M	UCBA	0130-0930
Dec. 1	M	UCBA	0130-0930
Dec. 7	M	UCBA	0130-0530
Dec. 8	M	UCBA	0130-0530
Dec. 9	M	UCBA	0130-0530
Dec. 15	M	UCBA	0130-0530
Dec. 16	M	UCB	0130-0530
Dec. 17	M	UCB	0130-0530
Dec. 22	M	UCBA	0130-0930
Jan. 9	M	UCBA	0130-0930

In the second column E indicates evening shift and M indicates morning shift. The third column indicates the instruments expected to be available for each period: U=UKT14; C=RxC2; B=RxB3i; A=RxA2. The times in the fourth column are local Hawaiian time on the date given.

*Graeme Watt, ROE*

## ***UNIX SPECX distribution via WWW***

The JACH has started distributing a compiled standalone version of UNIX Specx via its WWW pages. This version can be installed at non-Starlink sites without the need to import vast sections of the Starlink distribution (or an installed F77 compiler and libraries). After copying the necessary files from the JACH, further installation can be completed in about 5 minutes. Executables are available for SUN Sparcs running Solaris or SunOS and Dec Alpha's running OSF/1.

UNIX Specx is still under development and a number of enhancements and bug fixes have been incorporated in the JACH distributon. In fact, all attempts are being made to keep the distribution up-to- date continuously. For this reason the distribution may also be of interest to Starlink sites which can not wait for an update via the regular mechanism.

Standalone Specx can be obtained using Mosaic to the 'James Clerk Maxwell"section of the JAC WWW pages (<http://www.jach.hawaii.edu>), topic 'Unix Specx':



URL : `ftp://ftp.jach.hawaii.edu/pub/jcmt/specx`

Alternatively, the relevant files can be obtained via anonymous ftp from `ftp.jach.hawaii.edu` (log in as 'anonymous', password your e-mail address) in directory `pub/jcmt/specx`:

Once connected, type (or use the above entry via Mosaic etc)

```
ftp> cd pub/jcmt/specx
```

```
ftp> get AAAREADME
```

```
ftp> get INSTALL_SPECX
```

and follow instruction therein.

Users are encouraged to 'register' with me (`rpt@jach.hawaii.edu`) once they have installed Specx (see WWW page). Registered users will be notified of major bug fixes.

### **Enhancements**

A list of some of the more major enhancements of the standalone version with respect to the current Starlink distribution:

incorporated in standalone Specx is a sophisticated command-line user interface developed by the GNU consortium (the Readline library distributed with the Bash shell). This interface supports the regular arrow-keys editing of the history, a large number of Emacs-like control-key commands (can be changed to Vi-like appearance), plus features like a TAB-key expansion of filenames and support of keyboard macros.

a signal-handler has been added to the standalone version which traps ctrl-C's and arithmetical errors. A ctrl-C will abort the current Specx function and put you back at the Specx prompt, similar to the VMS version. This feature is not completely full-proof, but appears to work under most conditions.

standalone Specx uses the newest version of Caltech's plain-vanilla PGPLOT distribution. It supports many new devices such as GIF files.

the standalone version correctly writes 4-Byte FITS files, instead of 2-Byte FITS which can lead to digitization errors. The FITS keyword list has been enlarged for better support of Specx FITS files under AIPS.

plus a number of minor Bug fixes (e.g. FIT-GAUSS).

My impression is that the standalone version of Specx is much more robust than the current Starlink version, although more work is needed. One particular major bug in all Unix distributions which needs to be fixed before making a new release to Starlink is associated with use of the HDS files.

### **WARNING: ANNOYING BUG IN UNIX SPECX**



The UNIX version of Specx has adopted the HDS format for its native file format (hence the .sdf files). Unfortunately the way Specx uses its files, namely as continuously open buckets to which spectra are added or from which spectra are read, causes the files to be corrupted in the event Specx exits abnormally (e.g. crashes). This problem is under investigation by Rachael Padman and the best advice for now is to keep backup copies of the most important files otherwise you will probably find yourself in the tedious situation of having to redo yesterday's work.

One change which helps, but not fully fixes the problem is to add the following lines to the \$SYS\_SPECX/specxstart script:

```
#  
# TEST: Disable HDS mapping in favor of R/W mode  
#  
setenv HDS_MAP 0  
Remo Tilanus, JAC  
(rpt@jach.hawaii.edu)
```

## ***The UKT14 Queuing System***

### **Introduction**

The UKT14 queueing system software is an adaptation of the SCUBA queueing and sequencing system. It provides the basic tools needed to manipulate entries in a queue throughout the observing session. It does not have the ability to order the queues as do the more complex queueing systems. It is an interface to the JCMT antenna control system and uses the Adam message system for intertask communication.

The parameters for an observation are specified in an observation definition (obsdef) file. In all, about thirty parameters are required for UKT14 photometry. The parameters are read by the sequencing software (SCUCD) as input to a program script for the observation. There are scripts to acquire a source, to setup for a sequence of observations, to point, to focus, to take a sample and to do an auto-sequence. The program scripts are supplied with the queueing system and the observer need not be concerned with its details. However, changes to a script can readily be made by the software group.

### **Windowing Environment**

The queueing system is started up from a Vax or Sun workstation by opening up a window and logging in to the control computer (MWTTEL). A command is entered to automatically create three more windows: one for displaying the queues, another for the UKT14 summary data, and a third window for system messages. Commands to control the queues are entered from the original window.



The queue window shows the leading entries in the queues. Also shown are the last entry sent, the total number of queued entries and the state of the queue (either running, stopped or paused). A total of a hundred entries are allowed in each queue.

The summary window is for the logging of UKT14 observations. There is a one line display for each observation, giving the source name, observation number, airmass, filter, aperture, signal and signal-to-noise.

## **Queue Management**

The queue management system provides for the creation and manipulation of entries in the queues. A queue entry refers to an obsdef file containing the parameters for the observation. The observer is responsible to create and order the queues. In the running state the top queue entry is automatically sent to SCUCD which gets the parameters and sends commands to the antenna control system. The queueing is stopped when an error occurs or paused when a response is required from the observer. Commonly used obsdef files are stored in a system directory.

There are two queues, primary and secondary. The primary queue is where obsdef entries are first made. A macro obsdef specifies multiple observations and it is expanded onto the secondary queue in order to maintain its group quality. There are commands to manipulate either queue. A standard repertoire of commands is available to add, delete, cut and paste to a queue. The observer can select which queue to run with and can start or stop the queues.

## **Conclusion**

In general, the queueing system can improve efficiency because it enables advanced preparation of observations. It also automates much of the commands used in the setup and taking of samples. Thus far the queueing system has been used successfully for the photometry of blazars. The basic development of the system is complete, although enhancements are possible as the requirements for this observing mode become more apparent. It can be used for any beamswitched UKT14 observations (except polarimetry.) It is planned to be used for pointing runs. A likely upgrade will be to run it in a distributed mode using the Adam network for inter-nodal communication, as it will be in the SCUBA system.

The queueing software was originally created by B.D. Kelly, A.C. Davenhall and J. Lightfoot. The sequencing software was created by J. Lightfoot. This author has made modifications to each of these softwares to adapt it for UKT14 (single bolometer) photometry.

If you would like to use the queueing system for your photometry at JCMT, email the author at [firmin@jach.hawaii.edu](mailto:firmin@jach.hawaii.edu).

## **Reference:**

Oliveira, F.J., *The UKT14 Queueing System*, in



"New Observing Modes for the Next Century", PASP Conference Series.

*Firmin J. Oliveira, JAC*

*(JCMT Software Engineer)*

### ***A Note on Observing Overheads***

In the widely-circulated report of the most recent meeting of the JCMT Advisory Panel (on June 12) it is stated that "...overheads on typical heterodyne observations have decreased from 40% to 20%". These numbers were provided by a JCMT Staff Scientist very soon after the new control computer was installed; in fact they refer to 'wasted' time as defined here. Since prospective observers may be tempted to base their time requirements on this statement some clarification is in order. In the general sense implied, for most line observations, such a major decrease is **NOT** the case, although there has been some improvement over the past year due to upgrades in hardware and a considerable software effort. The principal improvement has in fact come from the introduction of raster ('on-the-fly') spectral line mapping, and users should seriously consider using this mode where appropriate. Below I consider some specific common examples of observing overheads, and comment on the overall efficiency of observing.

What I have done is look through some recent observing sessions, mostly those with which I have been closely involved. Generally, I have used sequences of scans which have been more or less continuous, that is, there has been essentially no dead time due to uncertainty on the part of the observer or some other delay. Usually in such cases, an ICL procedure has been active, or the Telescope Operator has typed ahead to allow several observations to proceed without additional intervention. In such cases the dead time does not exceed a few seconds. I calculate the elapsed time ( $T_e$ ) for an average scan to complete in such a sequence, and any software/hardware overhead in starting a scan is naturally included. The total integration time ( $T_i$ ) requested is known from the observing log (e.g. the JOURNAL program) and the on-source (signal phase) time ( $T_s$ ) can be derived knowing the observing mode. Then I derive the overhead (Over), defined as  $(T_e - T_i)/T_i$ , the on-source efficiency (OSE), given by  $T_s/T_e$ , and the 'wasted' time, defined as  $(T_e - T_i)/T_e$ . 'Wasted' time is the time when the system is not recording data of any kind.

Case Notes	Rx	Mode	sec/cyc	$T_e$	$T_i$	$T_s$	Over	OSE	wasted
1 switch 20'	A2	PSSW	60x10	14:25	10:00	5:00	44	35	31
2 (a) with cal.	B3i	BMSW	60x10	13:35	10:00	5:00	36	37	26
(b) cal.				12:40	10:00	5:00	27	39	21
3	B3i	FRSW	60x10	11:20	10:00	10:00	13	88	12



hardw.fr.sw.

4 (a)	C2	BMSW	60x10	14:46	10:00	5:00	48	34	32	
with cal.										
(b)				13:23	10:00	5:00	34	37	25	w/o
cal.										
5 (a)	A2	Raster	3x59x15	61:00	50:00	44:15	22	73	18	May
20										
(b)				58:00	50:00	44:15	16	76	14	
June 25										
(c)				58:30	50:00	44:15	17	76	15	
July 29										
6	UKT14	Raster	1x61x77	86:00	78:17	78:17	10	91	9	
dual-beam										

Most of the entries in this table are self-explanatory, particularly for those with some experience of observing with the JCMT. PSSW, BMSW, FRSW are position-, beam- and frequency-switching respectively. 'Raster' refers to the 'on-the-fly' continuous scanning mode. Particulars relating to the various examples are given in the last column. 'With' and without ('w/o') cal(ibration) refers to whether an off- source calibration is done prior to the scan or not. Generally the latter is the norm, now that continuous calibration has been enabled with the DAS.

In preparing proposals the prospective user will be most interested in the 'overhead' column. If you have calculated the total integration time ( $T_i$ ; sig. + ref.) then a typical observation will take that much percentage longer to actually perform. The OSE column tells you how much of the elapsed time is actually spent on source. Most of the common modes split the integration time 50-50; the rastering and frequency-switching modes spend most, or all, of the time on-source, respectively. For UKT14 dual-beam raster maps, included for comparison, both beams are included in the map, and so almost no time is lost.

The most inefficient modes are position-switching (the actual overhead depends somewhat on the distance to the reference), and C2 observations with intervening calibration (the calibration action is very slow in the hardware). The on-source efficiency is also low for these modes. The modes with the lowest overhead, and the highest on-source fractional times are frequency-switching and rastering. With the latter note that for a spectral line raster each row of  $n$  points,  $t$  secs per point, is accompanied by a reference spectrum of length  $t\ddot{O}(n)$  secs. Three instances of case 5 are given for different dates; similar obs. were done on the same source. Case 5(a) appears to have significantly higher overhead than either of the other two. Probably this is due to software development of the procedure in the interim. However, there is no difference between cases 5(b) and 5(c). This may be interesting, in that the later data were taken with a faster telescope control computer (VAX 4000/90 vs 4000/60).



This table illustrates the point that the spectral line overhead is anywhere in the region between about 13% and almost 50%. 20% is not a representative number. My experiments, incomplete as they are, do however suggest that for these standard modes, one should be able to scale the results to arrive at sensible estimates of elapsed time. The position- and beam-switching and raster modes are independent of the receiver being used. They also say that there has been a significant improvement in overhead since the last version of the Guide for the Prospective User was made available (25th January).

Finally, it is of interest not just to calculate the efficiency of individual scans, but also of a complete observing shift. I have modified the JOURNAL routine to do this (new version available soon). What it reports is that, for the few shifts I have examined in developing the program, the telescope is gathering photons for typically 55-65% of the time elapsed between the beginning of the first scan and the end of the last. This includes pointing and focus measurements. However, the program has no knowledge of what happened before the first scan started, although it does make a guess as to when the last scan ended. If one adds on the 15-30 minutes taken to set up the system, open doors and roof, tune receivers and so on, then one arrives at the estimate of the total time needed for a given program is approaching twice that of the total integration time needed. Experienced observers have felt this in their bones for a long time, but now I can prove it.

*Henry Matthews, JAC*

*Information Coordinator*

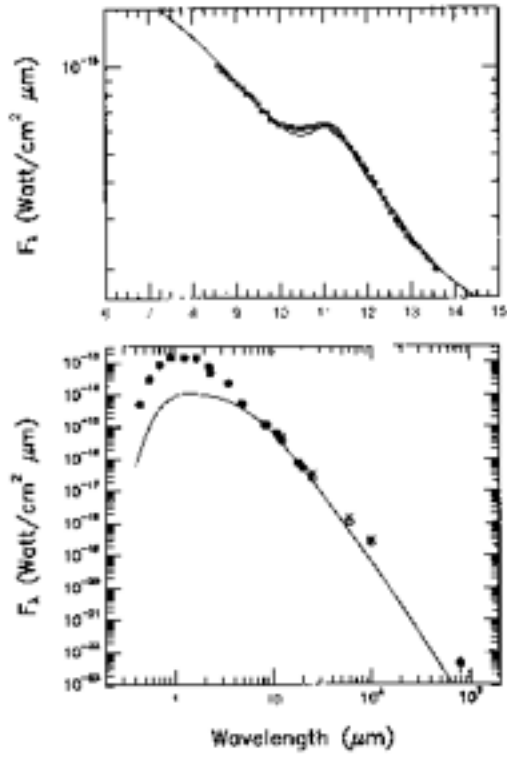
## ***SCIENCE HIGHLIGHTS***

### ***Problems in the interpretation of the observed flux distribution of dust-obscured stars***

#### **Studying dust — obscured objects**

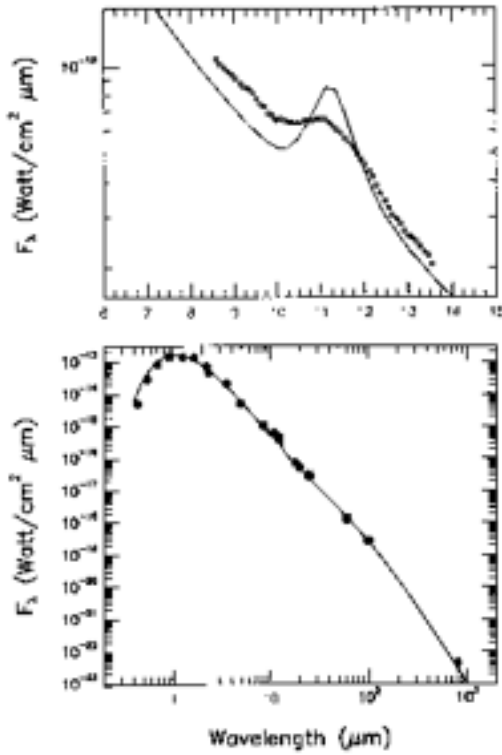
Absorption and/or emission features observed at 11mm in low resolution infrared spectra of late-type stars are the signatures of dust-obscured evolved objects. In particular, Amorphous Carbon (AC) and Silicon Carbide (SiC) are believed to be the main components of the circumstellar matter around C-rich stars, while dust shells composed of Silicate surround O-rich stars. A modelling technique focussed on the analysis of the whole spectral flux distribution, including broadband photometry from the optical to the sub-mm and infrared spectra (7—23 mm), represents a natural tool to tackle this problem. Several authors have developed numerical codes to





**Figure 1.** Top: a model showing an excellent fit to the mid-infrared spectra of UU Aur. Bottom: an enlarged view of the above model which shows a poor fit to the overall photometric distribution





**Figure 2.** A contrary example to Fig.1 where a model shows a poor fit to the mid-infrared spectra of UU Aur (top), but a good fit to the overall photometric distribution (bottom)

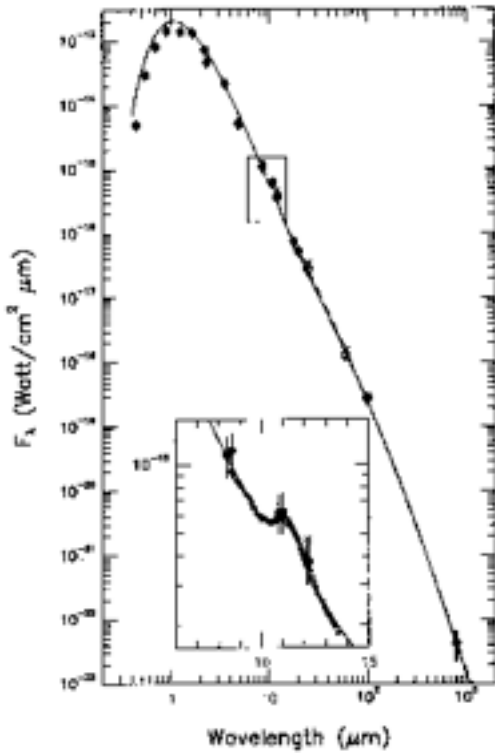
solve the transfer of radiation through a medium composed of dust grains of different sizes and different chemical compositions: then by comparing theoretical models with observational data, one obtains information on the nature of the envelopes around the objects. However, as in the modelling of any astronomical object, there are limitations in the technique; below we outline a few of these.

### Broadband spectral modelling

The importance of reproducing the whole spectral distribution, including broadband photometry *and* infrared spectra is emphasized by the examples given in Fig. 1 and Fig. 2. In Fig. 1 (top) we show the low resolution spectra from IRAS of the C-rich star UU Aurigae (empty squares), which has been well reproduced by a model which pictures the dust shell as composed of a mixture of SiC and AC (continuous line). Although, this model produces an excellent fit to the mid-infrared spectra, it can not account for the observed broadband photometric distribution without imposing additional constraints (Fig. 1, bottom).

A contrary example is given on Fig. 2: with a model which fits the gross properties of the whole flux distribution but is unable to reproduce the feature around 11.3 μm.





**Figure 3.** Models for UU Aur with two dust components. Continuous line: AC and SiC. Dashed line: silicate and SiC.

Actually, even a multi-spectral analysis does not lead to a unique model fitting the observational data. For example, using a modelling technique which describes a multi-component dust shell without assuming a drastic number of approximations, one typically deals with about 10 parameters: e.g. stellar parameters such temperature and radius; geometrical extension of the dust shells; sizes, chemical composition and numerical density of dust grains.

Moreover, extinction and scattering coefficients of a given dust component are not always very well known, and sometime remarkable discrepancies are found in the numerical values suggested by different authors. With such a large number of free parameters, there is a suspicion in some circles that the above modelling technique is able to reproduce any kind of observed flux distribution. In true second-hand car salesman speak, this of course is not the case. Below, we discuss the modelling of UU Aur, outlining some of the problems.

### **The irritating case of UU Aur**

UU Aur is a star which clearly shows a far infrared excess. A 'traditional' modelling technique picturing the star as surrounded by a shell composed of a mixture of AC and SiC, with a density distribution as  $r^{-2}$  ( $r$  being the distance from the star) does not account for the observed infrared excess. The density



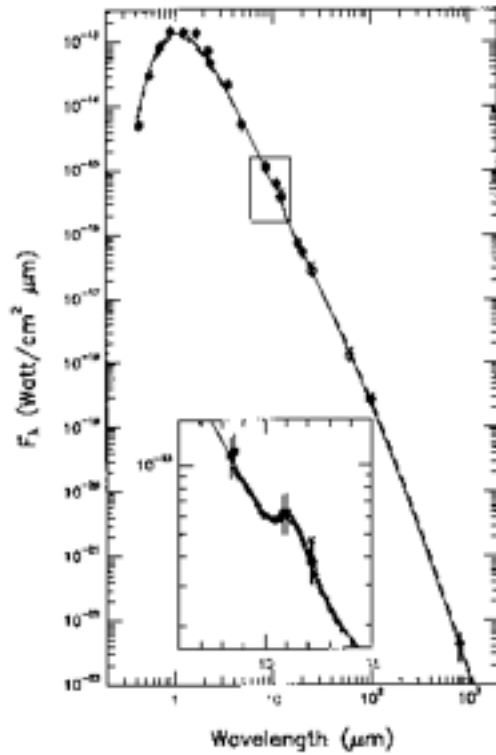
law in  $r^{-2}$  implies a mass loss rate constant with the time, while the observed infrared excess at the long wavelengths needs a different slope to the density distribution. In order to modify the density distribution, a simple approach is to assume that the condensation of one of the dust components arises at a very large distance from the star.

Figure 3 shows the best-fit obtained assuming that SiC condense at a distance of few stellar radii, and AC condense at the distance of a few hundred stellar radii. By contrast, assuming that SiC also condenses farther away from the star, the gross properties of the flux distribution are still well reproduced, but it is not possible to fit the feature seen in the mid-infrared spectra.

Actually, in order to fit the data of UU Aur, AC is not strictly required, provided that an efficiency law in  $l^{-1}$  at long wavelengths is assumed. The dashed line in Fig. 3 shows the best fit obtained by substituting the amorphous carbon with silicate, and assuming silicate condenses at a few hundred stellar radii.

All the above models fit poorly the near infrared photometry. A possible explanation would be to invoke variability: in the AGB stars, variations of 2 magnitudes during a period of a few months are easily found in the optical and in the near infrared photometric measurements, furthermore there is evidence of noticeable variations of flux in the sub-mm. Thus a multi-spectral coverage of measurements taken *at the same time* appears to be the only option in order to analyse the flux distribution of AGB stars. Therefore, the lack of co-eval data for UU Aur could explain the poor fit. Another explanation is that we have modelled the flux emerging from the star as a blackbody, whereas C-star photospheric spectra are heavily line blanketed.





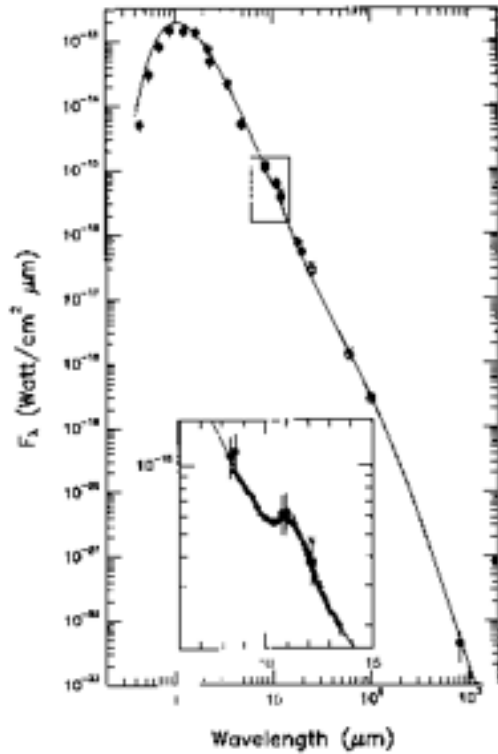
**Figure 4.** Models for UU Aur with three dust components: AC, SiC and silicate. Continuous line: both silicate and AC are present in the outer parts of the shell. Dashed line: a 'detached' shell composed of silicate only is considered.

However, if one strongly wishes to see a good fit from the optical to the sub-mm, we may consider a three- component model, including AC, SiC and silicate (the silicate condensing farther away from the star): see Fig. 4, continuous line.

The idea that detached shells composed by silicate surround an inner shell of AC and SiC is an attractive one as it leads one to speculate that O-rich stars may represent an earlier stage in the evolution of AGB stars, which then evolve as C-rich stars. The dashed line in Fig. 4 shows the results in testing this hypothesis: the circumstellar envelope is composed of an inner shell of AC and SiC, then the density of the shell is dropped, and a new shell composed of silicate is considered. This situation is different from the previous one, where silicate, AC and SiC coexist in the outer part of the shell.

We can even employ a more sophisticated model via taking into account a time-dependent mass loss rate. For example, the continuous line in Fig. 5 shows such a beast where the best-fit is obtained assuming a dust- shell composed of amorphous carbon and SiC as originated by a mass loss process which has been interrupted for a few hundred years in the recent past.





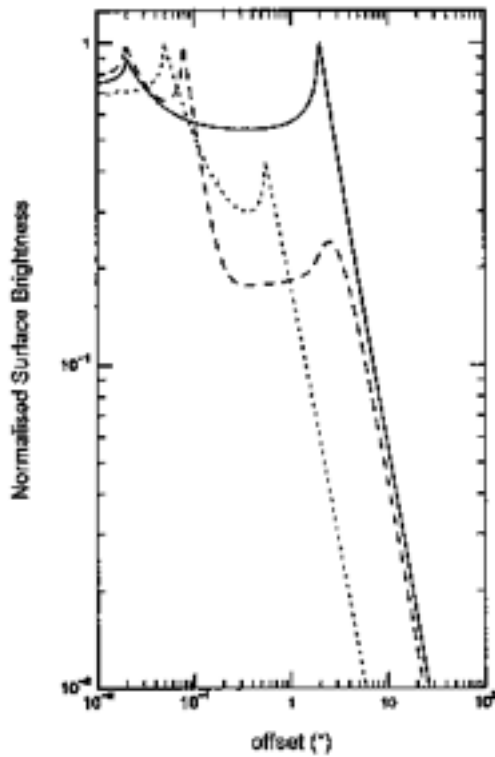
**Figure 5.** A time-dependent mass loss rate model for UU Aur, including AC and SiC.

### Conclusions and what of the future?

As shown in the different plots it is rather difficult to discriminate between the various proposed models. From this analysis - which has been intentionally made *only* on the observed spectral distribution - what conclusions can be derived?

First of all, the results from the analysis of the flux distribution of C-rich (and O-rich) stars, should be regarded with some caution. It is worth to point out this concept with a numerical example, e.g. the model shown in Fig. 2 (continuous line) has been obtained assuming a two component model with AC and SiC and a constant mass loss rate, has a ratio  $\text{SiC}/\text{AC} = 0.01$ . On-the-other-hand, the model shown in Fig. 5, obtained assuming a time-dependent mass loss rate, has a ratio  $\text{SiC}/\text{AC} = 1$ .





**Figure 6.** The normalized surface brightness in the millimeter regions for the UU Aur models involving a two dust component model with AC and SiC (continuous line), a three dust component model with AC, SiC and silicate (dotted line), and a time-dependent mass loss rate model including only AC and SiC (dashed line).

Indeed, rather than provide parameters of the best-fits, it seems more convenient to try an answer the following questions: which features of the models must be excluded and which features cannot be ruled out?

In the case of UU Aur, the spectral analysis shows that:

- i) SiC is required as a dust-shell component, and it must condense near the star (within a few stellar radii), otherwise the feature around 11.3 mm cannot be explained.
- ii) A density law in  $r^{-2}$  is not sufficient to account for the observed flux distribution at the long wavelengths.
- iii) Provided that the flux observed at the long wavelengths can be explained as due to an episode of change in the mass loss rate, such episode could have occurred in a time-scale of a few hundred years.

This is not much... however, all is not lost. One possible way of distinguishing between the various models outlined in Figs. 3, 4 & 5 maybe via imaging in the millimeter region. In Fig. 6, we reproduce the normalized surface brightness plots as a function of angular resolution for three models. As is quite



noticeable, these models have different surface brightness and provided one can use instruments with sufficient angular resolution, the millimeter region offers a potentially valuable diagnostic tool. But what of current instrumentation. With SCUBA on the JCMT, the best angular resolution is 6 arc sec at 450 mm. Using the JCMT and the CSO in an interferometer mode will achieve 1.4 arc sec at 1 mm or 0.6 arc sec at 450 mm, allowing at least to discriminate if the outer part of the dust shell is composed of silicate or AC grains.

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### ***Ethyl Alcohol in Space***

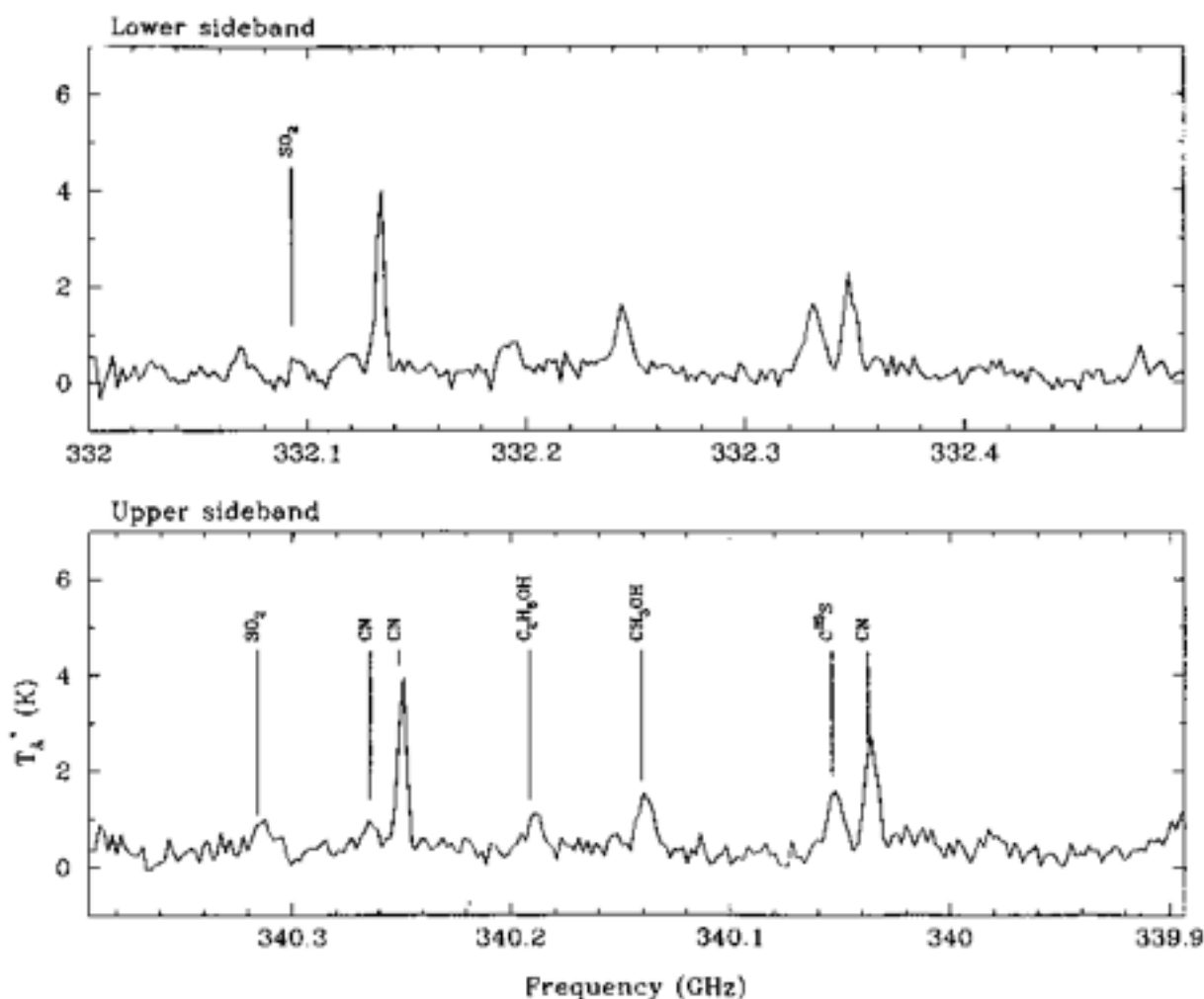
During 1991 and 1992 a 330-360 GHz spectral survey of the hot molecular core associated with the ultracompact HII region G34.3+0.15 was carried out at the JCMT. This HII region is a prototypical example of the cometary morphology and has been interpreted in terms of the bow-shock interaction between the ambient molecular cloud and the wind from an energetic young star moving through the cloud. NH<sub>3</sub>(3,3) observations with the VLA by Heaton et al. (1989), showed that the highly compact molecular cloud appears to be wrapped around the head of the cometary structure.

The survey (Macdonald et al. 1995) resulted in the detection of around 350 lines down to a one sigma noise level of around 0.16 K, roughly 11 lines per GHz to a detection limit of about 0.5 K in Ta\*. The identification of these lines proved very time-consuming due to the relative lack of measured laboratory lines at such high frequencies. This is particularly the case for large molecules such as methyl formate, HCOOCH<sub>3</sub>, ethyl alcohol, C<sub>2</sub>H<sub>5</sub>OH, dimethyl ether, CH<sub>3</sub>OCH<sub>3</sub>, and ethyl cyanide, C<sub>2</sub>H<sub>5</sub>CN.

Currently, we have identified 32 distinct chemical species (some 40 per cent of all presently identified interstellar molecules) plus 18 isotopomers, with possible detections of 8 further species. Around 70 lines, many detected in the spectral surveys of Orion, remain unidentified.

Based on new laboratory measurements at Ohio State University, we were able to identify 14 lines with ethyl alcohol (Millar et al. 1995). A rotation diagram analysis showed two surprises: first, that the ethanol was hot, with a rotation temperature of 125 K; second, that it was abundant — with a column density of  $2.0 \times 10^{15}$  cm<sup>-2</sup> averaged over the 14 arcsec beam. This corresponds to a fractional abundance of about  $5 \times 10^{-9}$  with respect to H<sub>2</sub>, about one million times larger than predicted by pure gas-phase ion-molecule chemistry and perhaps indicates that ethyl alcohol is formed on dust grain mantles and subsequently evaporated into the gas-phase due to the interaction of the star and the molecular cloud.





**Figure 1.** Double-sideband spectra including the 55,2 - 54,1 and 65,1 - 54,2 lines of ethanol at 340.189 GHz. Frequency scales shown correspond to lower sideband (top) and upper sideband (bottom) components. The local oscillator frequency for the lower spectrum was increased by 10 MHz for sideband identification. A velocity of 58 kms-1 relative to the local standard of rest has been assumed.

Ethyl alcohol was first detected in the interstellar medium in 1975 by a team led by Ben Zuckerman, but proved elusive in subsequent searches. Before this detection, only Sgr B2 and W51M showed conclusive proof (!) of the presence of ethyl alcohol. Subsequently, Ohishi and collaborators at Nobeyama have detected it toward a number of hot core sources in regions of massive star formation. In a recent article, they show that in Orion the spatial distribution of ethyl alcohol is similar to that of other, large oxygen-bearing molecules such as methanol, methyl formate and dimethyl ether and is associated with a hot core called the Compact Ridge cloud.

The detection of such large amounts of ethyl alcohol, and previous detections of even larger amounts of methanol, in hot cores suggests that grain surface chemistry may be very efficient in producing alcohols. Recently, Charnley et al. (1995) have discussed the chemistry following the evaporation of various alcohols, including methanol, ethanol, propanol and butanol from grains in hot cores. Using the



limited laboratory data available, they have shown that even larger molecules can be formed in the gas-phase from these evaporated molecules. The most abundant are predicted to be methyl ethyl ether ( $\text{CH}_3\text{OC}_2\text{H}_5$ ) and diethyl ether ( $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$ ) and could be detectable in hot cores. Unfortunately, the submillimetre spectra of these are as yet unknown. Searches at low frequencies ( $< 20$  GHz) have been made but do not constrain the models. Charnley et al. discuss various mechanisms by which alcohols might be formed in dust mantles including H and O atom attack on species containing carbon double and triple bonds, radical-radical surface

reactions and diffusion-controlled reactions. There are problems associated with all of these mechanisms; work is currently underway to examine these quantitatively.

Finally, it is worth pointing out how much ethyl alcohol is present in G34.3. Geoff Macdonald, who has a keen interest in such matters, calculated that there is enough for 300,000 pints of beer for every person on Earth every day for the next billion years, and created quite a media stir as a result. Of course, he didn't say that the proof is low, less than one per cent (alcohol-free beer !), nor that condensing the gas directly would give a brew guaranteed to leave a headache next morning — the cloud contains a lot of HCN. Of course, those of us Mancunions (and others) addicted to Boddingtons beer know that a headache is part of the pleasure and not something which necessarily implies a bad pint.

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### **Distribution:**

The **JCMT Newsletter** is primarily distributed according to a mailing file held by Dr. Graeme Watt at the JAC. Anybody wishing to be placed on this mailing list should contact Graeme. The current distribution of the JCMT Newsletter runs to 1600 copies.

The HIA, Ottawa, maintain a distribution list for interested Canadian persons and/or institutes. Canadians wishing to be included on the mailing list should contact the JCMT Section at the HIA.

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E-mail: **gdw@jach.hawaii.edu** (InterNet)

### **On-line Documentation:**

All up-to-date information on the JCMT and instrumentation is held on the homepage on the World Wide Web. The current information held on the WWW may supplement or provide more recent developments from those contained in this Newsletter. Users are requested not to solely use the details in the Newsletter for composing their applications.

The JCMT homepage has URL:

**/JCMT/home.html**

A FILESERV system is also accessible at the JAC via e-mail messages:

**jcmt\_info@jach.hawaii.edu**



## JCMT Data Archive:

The archive data is no longer available on-line at ROE. Users requiring information and/or data from the existing archive should contact Peredur Williams at [pmw@roe.ac.uk](mailto:pmw@roe.ac.uk).

## Service Observing:

Applications should be sent by e-mail to the following:

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### ***NEXT ISSUE DEADLINE***

The absolute deadline for submission of science and/or technical articles for the next issue of this Newsletter is **31st December 1995**. All communications regarding this Newsletter should be sent via email to [gdw@jach.hawaii.edu](mailto:gdw@jach.hawaii.edu).

### ***Acknowledgements***

*The JCMT Newsletter* is an official publication of the James Clerk Maxwell Telescope and has ISSN 1351-5497. The manuscript is formatted with Word for Windows 6.0 and printed via a commercial printing establishment. Distribution of the printed Newsletter is to all those on a mailing list held at the Joint Astronomy Centre (distribution within Canada is to all those on a mailing list held at the Herzberg Institute for Astrophysics).

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