JOINT INSTITUTE FOR VLBI IN EUROPE

Report for the first quarter, 2001

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Summary

Production correlation rates were under pressure during the quarter due to problems with the implementation of the DSPs on the correlator boards. Despite this, a total of 12 user projects and 4 network test projects were correlated in the three months. At the end of the period, final tests of the DSP system were underway, and it was expected that the operational mode of the correlator would be switched to DSP integration in the near future. Considerable effort has been expended in system software development and a new release of the operating system will be made early in the second quarter. Tests preparing the way for production correlation of pulsar gating and multiple field centre observations were carried out during the quarter.

Work on the definition of a pilot project for optical fibre connected EVN (eEVN) gathered pace in March with the focus on preparation of a proposal to the European Commission, Directorate General for Information Society, in their Cross-Program Action on Grid technologies. A first draft of the proposal was circulated to the EVN at the end of the quarter.

The EVN Support Group continued its work in supporting network monitoring, calibration, correlation, and help for individual PIs. An AIPS pipeline has been created to perform automatic calibration of Network Monitoring Experiments (NMEs), and this now gives a good overall view of the performance of the network. Work has begun on an investigation into what currently limits the EVN's performance in terms of rms image noise levels.

Six papers were published during the quarter, a further seven are in press, and one paper was submitted. Seventeen presentations were given outside Dwingeloo during the quarter.

An important step towards obtaining a stable financial basis for JIVE operations was taken at the end of the quarter with the approval of increased funding by the General Board of NWO. Efforts continued to secure similar commitments from the equivalent organisations in the other EVN countries.

1. Institute

Management
The JIVE Management Team met on 15 January, 12 February, and 16 March.

Follow-up of the ESF Review of the EVN and JIVE
In its meeting on 21 March, the General Board of NWO agreed to provide 454 keuro for 2001 towards JIVE operations costs from Central Programmes and Physical Sciences Council funds, in addition to 400 keuro/year in-kind contribution from host institute ASTRON. Continuation of this funding is contingent on the remaining 70% of the necessary funding being forthcoming from the other research organisations in Europe that support the EVN and JIVE.

European Commission
Garrett prepared and submitted a proposal to the EC seeking to extend the current FP5 IHP EVN Access proposal by 2 years. Part of the proposal preparation included the presentation of over 30 letters of support from (external) EVN users. Garrett also submitted the first IHP EVN Access annual report and JIVE’s contribution to the FINA Concerted Actions final report. Both reports were submitted in time for their respective deadlines (15 and 28 February 2001) and included full financial statements. The Access proposal is currently being evaluated by the commission; its fate is expected to be known in only a few months time. Together with Tibbe, Garrett updated the EC FP5 Large-Scale Facilities brochure.

Gurvits created a webpage for TMR-LSF RTD project "Enhancing the European VLBI Network of Radio Telescopes" and made it publicly accessible. He also revised the Second Annual report on the project (May 1999 – April 2000) in accordance with the EC's comments. Garrett (as TOG chair) and Gurvits initiated an RTD sub-contract with the NVI, Inc. (USA) on Field System development. The sub-contract was signed in March and commenced on 1 April.

Gurvits began preparation for the first annual report of the Infrastructure and Cooperation Network in Radio Astronomy (RADIONET). A RADIONET web page is under construction.

International collaboration
Gurvits prepared the second semi-annual report on joint activities under the NWO-OTKA grant for Dutch-Hungarian collaboration in radio astronomy (Aug 2000 - Feb 2001). He visited Hungary in Feb and gave a presentation on joint radio astronomy studies at the annual OTKA-NWO workshop.

Gurvits visited the Beijing and Shanghai Observatories in Jan-Feb with funding from the Dutch-Chinese collaboration in
radio astronomy supported by the Dutch and Chinese Academies of Science. He discussed various current and planned joint activities.

Gurvits continued discussions with various authorities in Ukraine and USA possible arrangements for upgrade of the MkIII terminal in Simeiz to MkIV.

**Personnel matters**
In February, Tui Bibby and Ellen Bishop ended their temporary appointments as secretaries at JIVE. Marjan Tibbe began work as Office Manager on 1 March.

**Publications**
Gurvits began editing the "EVN and JIVE Annual Reports 2000".

**Infrastructure**
Garrett assigned computing resources to visiting scientists and monitored e-mail from the generic JIVE account. Garrett managed the appointment of summer students to JIVE staff (via the joint ASTRON/JIVE Summer-student programme).

Schonewille updated several JIVE-web pages and also did OR commission work.

Van Langevelde and Garrett attended monthly meetings with the computer system management.

**Visitors**

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<td>W. Tschager</td>
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<td>N. Gizani</td>
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<td>Analysis and Scheduling of EVN observations</td>
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<td>A. Caccianiga</td>
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<tr>
<td>M. Marcha</td>
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<td>W. Vlemmings</td>
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<td>K. Berzins</td>
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2 Dataprocessor Operations
(Avruch, Campbell, Kramer, Van Langevelde, Leeuwinga, Phillips, Schonewille, Tenkink, Verkouter)

2.1 Introduction
In this quarter we struggled with the implementation of the so-called correlator board DSP project. In addition we lost some time during the renumbering of the ASTRON network. This put some pressure on the production rates, but more seriously, delayed implementation of new features. A number of visitors to JIVE used data from correlator. We received only positive feedback. Work was carried out on the JIVE specific features in the AIPS (spectral line) calibration, and progress was made on understanding the EVN telescope positions.

2.2 Production
The correlation of 12 user projects and 4 (network) tests was completed. A total of 14 projects were released to the PI. After prompting 13 PI’s to release their experiment, 5 experiments were actually released. Although during this quarter not all that much time was available for production, normal production figures were obtained. This demonstrates the maturity of the operational procedures.

Avruch clock searched EB016, and is reviewing the data and preparing it for release. He also clock searched EF008, and set up EM042 A & B for clock searching. These experiments have been correlated and are being reviewed.
Campbell oversaw the correlation and review of EH006, ES031, EM034, S01C1, and FP002 (un-gated). EV008B, which was begun in the previous quarter, was also completed. Recorrelation of part of EH007A using the position of the newly discovered reference source also occurred. FITS data for all these experiments were distributed to the PIs. New FITS files, suitable for incorporating the EVN station-position estimates derived from C00C1 were prepared for EC014 and all parts of EH007.

Phillips supported the correlation of EP037A, EAH001 and EK011A.

Van Langevelde supported the production correlation of UAH05. This project required a number of hand-crafted enhancements, for instance, in order to deal with many tape start and stops.

Van Langevelde contacted groups of users, once to prompt them to release their experiments, once to confirm correlator parameters for experiments from session 1, and finally to inform them of the possibility to obtain better station positions.

Van Langevelde continued to maintain the list of experiment statuses.

### 2.3 Correlator testing

FP002, the follow-up pulsar-gate test observation (to exercise incorporating an absolute synchronization of gate phase with ROT, replicating 16 channels, and checking more rigorously the quadratic phase-representation algorithm with ms-PSR data) was correlated in continuum mode in preparation for the necessary additional correlator-control features that would permit gated-correlation being soon available.

With Pogrebenko, Avruch is testing the simultaneous multi-center correlation feature using observation MT001 (PI Polatidis). A pair of radio sources separated by 30 arc-seconds was observed by a number of telescopes. After processing standard correlation, centered on each source (in progress), simultaneous correlation on both positions will be attempted eventually.

### 2.4 Logistics

The new version of SCHED required Kramer to make changes to log2vex in order to accommodate the new telescope database file structure. This change had unanticipated consequences for the log2vex program that prepares the VEX file used to control the correlation from station logs and the PI's skd file, resulting in an old geodetic position being used for the Shanghai telescope in a number of network tests.

Kramer continued to improve program log2vex and released version 1.8.0. The SCHED block in the VEX file is derived from the log-files. This means that we find real footages and times in the SCHED section, but also deleted stations in the case that there was no observation. The graphical window which shows a coloured matrix of all scans versus all stations, also gives the opportunity to delete scans with many fieldsystem errors (e.g. no tape movement). Many new comments, detected by the program, were made printable after compiling a vexfile. Further he worked on the test program for the tape units and made preparations for a final program layout.

Van Langevelde developed tools to display the delay between various stages in the experiment processing. It can be used to monitor how much time elapses between observation and correlation, and, for instance, between correlation and tape release.

Schonewille made schedules for the operator shifts. He also assisted to maintain the tape-library and support tape transport.

### 2.5 Astronomical Capabilities

A letter was sent to PIs explaining the situation of EVN station positions resulting from C00C1/FR005 analysis discussed in the previous quarterly report. New FITS files were made for those PIs who so requested.

At the EVN-PC van Langevelde presented a correlator report. One of the conclusions was that we have reached a level of maturity in the data product that allows us to start considering automatic tape release seriously.

Experiment EH006, with relatively short scans of many sources, provided useful data for the recurring problem of delay-rate-near-0 events on baselines including Wb: the resulting amplitude spikes seem to be mis-phased from the polynomial predictions by ~0.3ns/s. The cause of the DR=0 spikes has been attributed to correlation of phase-cal signals; Campbell is testing the hypothesis that the fringe-rotation of data from individual WSRT antennas into the tied array can explain these observed shifts.
Phillips visited Socorro to process the experiment EP037A as a beginning-to-end check that AIPS correctly deals with data from the EVN data processor, particularly for spectral line experiments. Working closely with Eric Greisen, a few small problems were fixed and a reasonably careful review of the AIPS code and the data reduction steps indicates that AIPS correctly handles EVN data correlated at JIVE. There was a minor problem with the AIPS task FITLD when loading "binary" fits (the standard format for the VLBA correlator and more flexible than the "uvfits" format currently used locally). FITLD gave spurious warnings that VLBA specific corrections would be made to the data (in fact they were not). More seriously an incorrect amplitude correction factor was applied. These have been fixed in the Dec01 version of AIPS. A minor problem in the output FITS format was also identified and fixed by Verkouter.

More seriously, it seems likely that the consequence of fringe rotation is not quite what has been assumed. For the VLBA correlator each station is fringe rotated to the earth center, so for spectral line experiments a correction must be made for the velocity of the center of the Earth (and the difference in velocity of the sun and the "local standard of rest"). Even though the MkIV correlator uses a station based correlator model, fringe rotation is still done on a baseline basis (using the difference of the station models). This means a correction must also be made for the velocity of the reference antenna wrt the earth center. This is the same as for MkIII correlators and is supported in AIPS. Unfortunately, the reference antenna is opposite to that used in MkIII. This results in a velocity error in the final data of up to 0.5 km/s (smaller for standard EVN experiments without Shanghai). Disturbingly, for spectral line experiments which require cross-polarisations, one of the 4 polarization products swap the reference antenna which AIPS cannot handle. A correction for this will need to be made locally. Confirmation of this problem is ongoing.

Otherwise, calibration and imaging of the data proceeded fairly smoothly. A significant amount of data was flagged due poor playback/recording. The final amplitudes of the data were quite different from previous observations of the same source, but this may be because of poor spectral resolution.

3. Further development of the Data Processor
   (Bos, Buiter, Campbell, Casse, Hazell, Kramer, van Langevelde, Leeuwinga, Millenaar, Noble, Olnon, Parsley, Phillips, Pogrebenko, Schonewille, Tenkink, Verkouter, Zwier)

3.1 Correlator Section
Together with Bos and Verkouter, Szomoru worked on completing the DSP project. For this project Digital Signal Processors were installed on the correlator boards, thereby greatly increasing the capacity of the correlator. Most time was spent debugging and testing the DSP software. At this time final tests are underway and it is expected that the operational mode of the correlator will be switched to DSP integration in the near future.

3.2 Station Units
It was noticed that negative autocorrelation peaks occur on one channel for the station occupying SU14; this was traced to a specific DMM board. Subsequently, similar but much more sporadic behavior has been detected on other units. Investigation of this is continuing, but made more time-consuming because of the sporadic nature of the events. Cross-correlations are not affected.

Phillips and Pogrebenko attempted to test a SU with a faulty DMM, which appears to yield negative auto-correlations. However the tests were unsuccessful as the unit behaved properly (after a number of unrelated problems running the tests).

3.3 Play Back Units
Overview of the problems with the DPUs this quarter:
- DPU 4: Capstan motor did not start. Action: Motor replaced and sent to Metrum.

A start was made this quarter to get a good picture of the DPU quality at both 160 and 80 ips. With a good test tape all the DPUs are examined and the results printed. New Recorder Test and Plot software developed by Kramer makes this possible. The quality plots are stored in a logbook.

3.4 High level control software
Releases
Last July’s release of the JCCS (JIVE Correlator Control Software) is still being used for operations. Olnon fixed a few minor bugs and applied a few patches. All of these had to do with better operational control and had no effect on the correlated data output: The head-peaking procedure was made slightly faster and more robust. It was made easier to do high-resolution spectral-line correlations on only a subset of the observed frequency channels (with Phillips). The use of scan start-time offsets was changed to prevent problems in starting correlation jobs.
Most of the upgrades mentioned in the last quarterly report are still waiting to become operational. They have all been
tested on the unit level, but they would not add much to the operational capabilities of the correlator until the new
correlator s/w (with the DSP’s) is included. So we will wait with the integration tests until then.

**Development**

Olnon participated in all the testing done by the other developers, especially that of the new correlator s/w.
Furthermore he concentrated on two bottlenecks in the operational work. First, the long-standing problems with subjob
selection and job start. That still is a source of frustration for the operators and support scientists. With the newest
improvements (only in test mode) we encounter fewer problems, but we still have not found the algorithm that handles
all the observation schedules we come across.

Another long-standing problem is the unstable peaking behaviour. The main problem here is its non-repeatability. Olnon
has done extensive case studies, but has not been able to really locate the source of the problem; probably there are
several of them. There appears to be a loose connection with playback quality and changing tapes and units
sometimes miraculously helps, which points to hardware problems. But then, the peaking procedure often reports
strange results which point to faulty control software; but we don’t know in which of the three completely different
subsystems: i.e. the high-level control, the Stations Unit, the Playback Unit, or a combination of all 3 of these.

Triggered by the peak problems and some new wishes on station units control, Olnon started to analyse and clarify the
relevant application module, which consists of 13000 lines of code. Some people wouldn’t call that development, but
maintenance and/or re-engineering.

Van Langevelde finished a first draft of a memo considering the requirements for supporting correlation of experiments
with more than 16 stations. It was discussed in two meetings and conclusions were reached that should lead to a final
version.

**System Configuration**

The year started with a reconfiguration of our internal computer network. It took Verkouter, Szomoru and Olnon a full
week to get the correlator working again. The correlator depends heavily on inter-process (and inter-hosts)
communications, and it took some time to figure out what was needed where.

Olnon and Verkouter have not yet resumed their effort to build the JCCS System with the newest GNU C++
compiler/linker. The new make system put in place to support such a transition, has now been working flawlessly for
several months for all the test systems running and will be part of the new release.

Verkouter spent some time on the issue of bringing the Data-to-Disk-Distributor machine (DDD, D-cubed for short)
online. Bos has provided Verkouter with a software library suited for DDD's architecture/OS. This enabled Verkouter to
compile, link and run the necessary software-elements on DDD. Compiling and linking take place successfully;
however, running the software requires some more investigation.

Szomoru continued work on the experiments database, debugging the existing code and adding functionality. Once
operational, the experiments database will be the front-end of the correlator control software, and will streamline the
preparation and archiving of projects. Some partial tests have already been completed. A complete test version will be
exercised soon.

**3.5 Post correlation software**

Verkouter spent approximately half of his time in order to finish implementation of the standard plots in C++ and
developing glish code to drive the C++ program and display the results. A working version was delivered end of March.
This version still needs some work but that is mostly of an aesthetic nature.

**3.6 Infrastructure**

The 600 blue tape cassettes that were delivered from NRAO last year, were completely assembled this quarter, mainly
by Hans Tenkink. In this process foam inserts are glued in the cassettes and new aluminium latches are installed. The
new re-reeled tapes were put into these new cassettes and added to the tape-pool.

On 20 March a fire alarm automatically switched off the correlator. The reason was a steam cylinder in the
airconditioning unit that had one electrode that became too hot. Intervention of the fire brigade from Dwingeloo was
called off at the last moment.

Szomoru spent the first week of January, with Verkouter and Olnon, on making the correlator system recover from the
effects of a general IP-renumbering by system management.

**3.7 Testing and preparing for operations**
The low amplitudes and extra lag-shift for correlations done with the new correlator software discussed in the previous quarterly report were resolved with new software from A. Bos.

3.8 Post Correlator Integrator
Verkouter, Szomoru and Bos tested the Correlator board DSPs. Existing problems were found and resolved. A successful high spectral resolution correlation (2048 frequency points/4092 lags) was performed using the DSPs. The correlation revealed a unique view of a 1.6GHz maser line with a velocity resolution of ~40km/s.

4. Network related development

Fibre optics connected EVN
Work on the definition of a pilot experiment for optical fibre connected EVN (eEVN) gathered pace during this quarter. Activity became focused on the preparation of a proposal to the European Commission requesting funds to finance the project. A number of potential collaborators and advisors were identified and met. Meetings were held at CERN in Geneva and NIKHEF in Amsterdam. The CERN meeting was attended by representatives of several EVN institutes, forming the basis of a contact group for the project. Various industrial companies were also contacted to explore and evaluate technical aspects and to quantify material costs. The deadline for submission of the proposal under the Fifth Framework IST Program is 25th April 2001. A first draft of the proposal was circulated to the EVN contact group and EVN directors for comment at the end of March.

EVN related R&D
Van Langevelde made a couple of changes to the VEX Sched code. It was realized that certain pointing modes, useful for mm VLBI could not be supported easily. Other fixes included warnings against 40ips recording and updating formatter related restrictions.

In preparation for a meeting of the aips++ user group, Van Langevelde reviewed the current status of the aips++ software. It was found that the stability and performance of the system had improved considerably, but the user interface was still quite obscure.

5. EVN Support Group Activities
(Avruch, Campbell, Gabuzda, Garrett, Gurvits, Van Langevelde, Reynolds, Sjouwerman)

5.1 Network Monitoring, Reliability and Performance
Gabuzda scheduled Network Monitoring Experiments (NMEs) N01C1 and N01L1. Reynolds, Avruch and Sjouwerman prepared and clock searched the NMEs and the Fringe test tape (F01C1). It was discovered that Jodrell Bank had swapped polarisations; this was corrected at C-band before the start of the session.

There were problems finding fringes to Shanghai for N01L1 at the EVN correlator at JIVE. After fringes were detected in Socorro by Sjouwerman, the problem at JIVE was eventually traced to an error in the station coordinates used. After correcting for this error, fringes were found to Shanghai for both the NME tests and the FTT. N01C1 and N01L1 were fully correlated and exported into FITS format for pipelining.

Reynolds wrote an AIPS pipeline to perform automatic calibration of all NMEs. Experiment N01C1 was processed by the pipeline and the results were made available via the pipeline web page. The pipeline gives a good overall view of the performance of the network - as it might be measured by an EVN PI. Garrett has considered the best way to numerically evaluate the network’s performance as a whole using the information available via the pipeline. Reynolds produced the Network Monitoring Report for experiment N01C1 and N01L1.

Campbell made a glish program that summarizes the fringes (residual delay location, amplitude, noise characteristics) for baselines to Wb for NME experiments at the request of P.Friedman.

Gabuzda continued the analysis of network monitoring experiment C00C1, in particular a comparison between the dynamic ranges obtained with those expected has been made.

5.2 Calibration
Reynolds produced the ANTAB calibration files for all experiments in the November 2001 EVN session.

5.3 Data Correlation
Global VLBI experiments GX007B, GO005B, GM040C, GX007A, GB038, GM038, GM043C and BV039 were correlated in Socorro by Sjouwerman and Socorro staff. These experiments were observed during session 1/2001. Sjouwerman also correlated BS086 in Socorro. In Dwingeloo, Sjouwerman verified that Effelsberg had crossed polarisations in the 25 cm session by correlating a small part of GM041A. This early detection was not enough to save some of the projects correlated in Socorro but 2 of the projects destined for correlation in JIVE were saved.

5.4 General Network Support
The EVN Support Group at JIVE met 3 times during this quarter to discuss support activities. Garrett monitored activity in the TOG during this quarter. In particular, he arranged and drew-up a contract between the EVN and Nancy Vandenberg Inc, which is expected to lead to significant enhancements to the FS to be made. The contract is expected to begin on 1 April 2001 and will run for 12 months. Other TOG developments included: formatter firmware installation (Freihold, Graham & Smythe), organization of a mini-workshop associated with the main TOG meeting (Tuccari, Alef et al.), a policy on obsolete DAR parts (Burgess et al.), and an investigation into what currently limits the EVN's performance in terms of image r.m.s. noise levels (Garrett). Currently the EVN under-performs by a factor of 3 or 4. Several possibilities were ruled out, including: AIPS telescope weights (their generation and implementation) and image artefacts due to the effective uv-coverage being skewed by naturally weighting the data. Work on this area continues and a test experiment targeting a (non-dynamic range limited) faint radio source will be proposed. Garrett began assembling a small group of TOG people to work on the development plans for 2-head recording. The idea is to make significant progress on 512 Mbits/sec (2-head) recording before the TOG meeting in Bonn (25 June 2001). Garrett authorized the continued support of EVN associated DAT tape shipments from NRAO. Garrett also attended monthly meetings of the local WSRT VLBI Target Team. The EVN web pages were updated as required, in particular several new images were added to the EVN image gallery.

5.5 EVN PI Support

5.5.1 Scheduling
Gabuzda provided scheduling support for global experiments GM038 (A. McDonald) and GM043 (L. Moscadelli) for Session 1/2001. Gabuzda and Garrett also assisted K. Exter (Armagh) with the submission of an EVN proposal for Feb 1 deadline. Reynolds and Garrett assisted in scheduling of experiments ED017A, ED017B and ED017C for the February 2001 EVN session. Reynolds updated the SCHED EVN station catalogues to include 5cm Methanol setups provided by Phillips. Sjouwerman helped with the scheduling of ED016 and EV009.

5.5.2 Support of Visitors to JIVE
Gabuzda provided data calibration and analysis support for EVN experiments ET007 (W. Tschager) and EC014 (A. Caccianiga).

5.5.3 Local and Visitor Computing Environment
Sjouwerman maintained the JIVE visitor friendly workstation environment with its standard settings and setups. Primary responsibility for maintaining and installing AIPS passed to Cormac Reynolds in this quarter.

6. Space VLBI
Gurvits participated in drafting the scientific justification part of the VSOP-2 proposal. He also initiated negotiations with various institutions in and outside Europe on possible tracking support for the VSOP-2 mission. At one face-to-face and two teleconference VSOP-2 coordination meetings, Gurvits made several presentations on possible involvement of European VLBI resources in the VSOP-2 mission.

7. Research

Avruch
Avruch continues to work on a study of Radio/IR survey counts with Dr. C. Pearson, ISAS, Japan. He also continues work on VSOP Survey data reduction.

Campbell
Continued work on pulsar-astrometry data analysis and provision of ionospheric simulations to D. Lebach (CfA) in support of VLBI astrometry related to the GP-B guide-star program.

Gabuzda
D. Gabuzda and V. Chernetskii worked on the analysis of multi-epoch dual-frequency (8 and 22 GHz) VLBA data for the BL Lac object 1803+784. These images show superluminal motion of a component between the core and a quasi-stationary feature about 1.5 mas from the core. Although the emission from the inner part of the jet is steep, as expected, the spectral index of this stationary feature is relatively flat, suggesting the presence of low-frequency
absorption, or possibly reacceleration of electrons at this location. One additional epoch for which four-frequency (5, 8, 15, and 22 GHz) data were available had earlier revealed the presence of a non-uniform distribution of thermal plasma in the vicinity of the VLBI structure. We plan to use the additional epochs with data at two frequencies to place limits on variability of the distribution of Faraday rotation near the core and inner VLBI jet.

Comparison of Gabuzda's 5 GHz VSOP space VLBI total intensity and polarisation images of the BL Lacertae object 0735+178 with 15 GHz VLBA images (with nearly the same resolution) obtained by J.-L. Gomez about a month later revealed appreciable absorption near the first of two nearly 90-degree bends in the VLBI jet, consistent with free—free absorption. This suggests that this bend is associated with a collision or interaction with a dense cloud. More recently, a comparison of the two polarisation images has suggested that there are regions of enhanced rotation measure (thermal plasma) near this bend, consistent with the presence of low-frequency absorption in this region. Further 5 GHz VSOP polarisation observations have been proposed for, in coordination with higher-frequency VLBA ground-array observations, in order to try to further investigate the nature of the absorption material and its relation to the twisted jet structure of this source, and also to confirm the enhanced Faraday rotation suggested by our initial analysis.

Garrett

Garrett prepared a press release associated with the successful EVN imaging of 3 faint sub-mJy radio sources in the HDF. The press release was extremely successful, appearing on APOD (Astronomical Picture of the Day - 8 February 2001) and various other web sites, radio programmes, newspapers and TV broadcasts. A proposal was submitted to NWO requesting support for a post-doctoral student to work on sub-mm and radio observations of the optically faint radio source population. Garrett also investigated the levels of distant Star-formation that could be detected by low-frequency radio arrays, such as LOFAR. Garrett (together with Morganti, Chapman and Helou) submitted a large proposal to commence deep WSRT imaging of the SIRTF "First Look" survey region. Garrett also contributed to a MERLIN proposal to observe a large sample of LINER galaxies (PI Mercedes and Barthel). Garrett (together with Morganti and Van der Werf) contributed to the "GOODS" Research Training proposal submitted by Fosbury (ESO). Garrett contributed extensively to the draft paper on multi-epoch 7mm VLBA observations of 1830-211 by Jin et al.

Gurvits

Gurvits continued post-correlation data processing of the 15 GHz VLBI survey of VSOP Survey sources (experiment BG077, together with K. Kellermann, E. Fomalont, H. Zhang). The survey consists of 95 sources from the VSOP Survey sample which otherwise have not been observed at 15 GHz with VLBA by Kellermann et al. (1998 AJ). All the BG077 sources have been imaged, the paper is in preparation. Gurvits continued to participate in the VSOP Survey data reduction. A major public release of the VSOP Survey database is in preparation and scheduled for the second half of 2001.

Gurvits, together with S. Frey, S. Garrington and M. Garrett, conducted MERLIN observations of two fields (one equatorial and one near the North Galactic Pole) containing AGNs identified in the Sloan Digital Survey in the frame of the Deep Extragalactic VLBI - Optical Survey (DEVOS). The observations are aimed at selecting targets for future VLBI observations. During a visit to the Jodrell Bank Observatory, Gurvits produced preliminary MERLIN images of all 89 targets in both fields observed.

Gurvits and K. Berzins, began imaging of a sample of extragalactic sources with flat or inverted spectra at frequencies above 10 GHz. The data were obtained in the global VLBI experiment GD014 at 22 GHz.

Gurvits and R. Nan (Beijing), finalized a paper on the results of a global VLBI experiment at 327 MHz on three high redshift radio galaxies. Gurvits, Garrett, X. Hong, and D. Jiang (Shanghai), continued to analyse multi-frequency multi-epoch data on the extragalactic source 1156+295. A paper is in preparation.

Van Langevelde

With Vlemmings (Leiden), Van Langevelde continued work on the proper motion of U Her, adding one more epoch to the data. Work was done on a draft of a paper on the Zeeman effect of water maser in the shell associated with S Per, which was produced by Vlemmings.

Phillips

Phillips completed processing ATCA observations of Northern methanol masers and did preliminary imaging of BIMA observations for presentation at IAU Symposium 206.

Reynolds

Reynolds submitted a paper 'Faraday Rotation in the VLBI core of BL Lac' to MNRAS for consideration for publication. Reynolds submitted two schedules to the VLBA for forthcoming observations of BL Lac objects. This project is in collaboration with Gabuzda and Tim Cawthorne (University of Central Lancashire).

Sjouwerman

Messineo (Leiden) and Sjouwerman worked on observations of 86 GHz masers of ISOGAL AGB sources in the
Galactic centre with the 30-m IRAM telescope. Another follow-up proposal was submitted and the first results were compiled and presented on the IAU 206 maser conference in Brazil. Furthermore, Sjouwerman continued reducing 1200 MHz WSRT data to search for OD in the Galaxy.

8. Education and training

<table>
<thead>
<tr>
<th>SUPERVISION</th>
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<tbody>
<tr>
<td>Staff member</td>
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<tr>
<td>D. Gabuzda</td>
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<td>D. Gabuzda</td>
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<td>L. Gurvits</td>
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<tr>
<td>Van Langevelde</td>
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<tr>
<td>Schilizzi</td>
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9. Meetings, work visits, symposia, conferences

<table>
<thead>
<tr>
<th>Meetings, work visits, symposia, conferences</th>
<th>Date</th>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>International SKA Steering Committee meeting, Boston, USA</td>
<td>4-7 Jan</td>
<td>Schilizzi</td>
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<tr>
<td>NIKHEF, Amsterdam</td>
<td>10 Jan</td>
<td>Parsley, Pogrebenko, Schilizzi</td>
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<tr>
<td>DG-IST, Brussels, Belgium</td>
<td>17 Jan</td>
<td>Schilizzi</td>
</tr>
<tr>
<td>Sterrewacht Leiden, NL</td>
<td>18 Jan</td>
<td>Sjouwerman</td>
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<tr>
<td>VSOP Operations and VSOP-2 coordination meetings, ISAS, Sagamihara, Japan</td>
<td>23-27 Jan</td>
<td>Gurvits</td>
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<tr>
<td>AIPS++ User Group, Champaign/Urbana II, USA</td>
<td>28-30 Jan</td>
<td>Van Langevelde</td>
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<tr>
<td>Work visit, Beijing Astronomical Observatory, Beijing, China</td>
<td>28 Jan – 2 Feb</td>
<td>Gurvits</td>
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<tr>
<td>NIKHEF, Amsterdam</td>
<td>1 Feb</td>
<td>Parsley, Pogrebenko</td>
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<tr>
<td>Work visit, Shanghai Astronomical Observatory, Shanghai, China</td>
<td>2-9 Feb</td>
<td>Gurvits</td>
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<tr>
<td>2nd ALMA BEE meeting, Dwingeloo</td>
<td>6 - 7 Feb</td>
<td>van Langevelde</td>
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<tr>
<td>CERN meeting, Geneva, Switzerland</td>
<td>7 Feb</td>
<td>Parsley, Pogrebenko, Schilizzi</td>
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<tr>
<td>Event</td>
<td>Dates</td>
<td>Presenters</td>
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<tr>
<td>2nd IVS Analysis Workshop, Goddard Space Flight Centre, MD, USA</td>
<td>12-14 Feb</td>
<td>Campbell</td>
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<tr>
<td>OTKA-NWO Workshop, Budapest, Hungary</td>
<td>21-24 Feb</td>
<td>Gurvits</td>
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<tr>
<td>IAU 206 Cosmic Masers, Mangaratiba, RJ Brazil</td>
<td>4 - 10 Mar</td>
<td>van Langevelde, Phillips</td>
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<tr>
<td>AOC, Socorro, USA</td>
<td>5-23 Mar</td>
<td>Sjouwerman</td>
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<tr>
<td>Global Grid Forum 1, Amsterdam</td>
<td>6-7 Mar</td>
<td>Schilizzi</td>
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<tr>
<td>IVS Technical Operations Workshop, Haystack, USA</td>
<td>10-15 Mar</td>
<td>Butler</td>
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<tr>
<td>NOVA instrumentation day, Utrecht</td>
<td>13 Mar</td>
<td>Garrett, Van Langevelde, Schilizzi</td>
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<tr>
<td>Fifth European Conference on Software Maintenance and Engineering, Lisbon, Portugal</td>
<td>14-16 Mar</td>
<td>Olnon, Szomoru</td>
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<tr>
<td>EVN-PC meeting, Bordeaux, France</td>
<td>23 Mar</td>
<td>van Langevelde</td>
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<tr>
<td>GRID workshop, Brussels</td>
<td>23 Mar</td>
<td>Schilizzi</td>
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<tr>
<td>Work visit, Jodrell Bank Observatory, UK</td>
<td>27 Mar – 1 Apr</td>
<td>Gurvits</td>
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10. Presentations

Campbell
"Radio Astronomy and VLBI", U.S. Naval Academy, Annapolis, MD, USA, 14 Feb.
"Pulsar Astrometry and the Ionosphere", U.S. Naval Academy, Annapolis, MD, USA, 15 Feb.

Gurvits
“A European segment of VSOP-2 under the ESA's flexi-mission proposal”, ISAS, Japan, 24 Jan
“Tracking options for the VSOP-2 mission”, ISAS, Japan, 25 Jan
“Milliarcsecond radio structures in AGN across the redshift space”, ShAO, China, 5 Feb
“Very Long Baseline Interferometry and how it sees the radio Universe”, OTKA-NWO, Hungary, 23 Feb
"Update on the VSOP-2 tracking options", VSOP-2 tracking meeting (telecon), 12 Mar

Van Langevelde
"Current Status of the JIVE processor", EVN-PC, Bordeaux, 23 Mar
"6 Years of Astrometric Monitoring of OH in U Her", Cosmic Masers, Brazil, 8 Mar
"The EVN MkIV system and the Correlator at JIVE", Cosmic Masers, Brazil, 9 Mar

Phillips
"The circumstellar environment of methanol masers", IAU Symposium 206. Cosmic Masers: From Protostars to Black Holes. Mangaratiba, Brazil, 6 Mar

Schilizzi
“eEVN”, NIKHEF, Amsterdam, 10 Jan
“eEVN”, DG-IST Brussels, 17 Jan
“VLBI: the sharpest view of the universe”, CERN, Geneva, 7 Feb
“eEVN”, Global Grid Forum 1, Amsterdam 7 Mar
“Future developments in VLBI”, NOVA Instrumentation day, Utrecht 13 Mar

Sjouwerman
"86 GHz SiO Masers in Late-type Galactic Bulge Stars", M. Messineo, H.J. Habeing, L.O. Sjouwerman, A. Omont, K. Menten, poster at the IAU 206, Cosmic Maser conference in Rio de Janeiro, Brazil.

11. Publications

Published:

J. M. Hutchison, T. V. Cawthorne, and D. C. Gabuzda, "Parsec-scale polarisation of the jet in quasar 4C71.07", MNRAS 321, 525


A.R. McDonald, T.W.B. Muxlow, A. Pedlar, M.A. Garrett et al. "Global very long-baseline interferometry observations of compact radio sources in M82", MNRAS 322, 100


Submitted


In Press:


