AIPSLETTER

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A newsletter for users of the NRAO
Astronomical Image Processing System

Written by a cast of *AIPS*

Edited by
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IMPORTANT

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General Developments in *AIPS*

Current Release

The `15OCT97` release of Classic *AIPS* is now available. It may be obtained via *anonymous* ftp or by contacting Ernie Allen at the address given in the masthead. *AIPS* is now copyright ©1995, 1996, 1997 by Associated Universities, Inc., NRAO's parent corporation, but may be made freely available under the terms of the Free Software Foundation's General Public License (GPL). This means that User Agreements are no longer required, that *AIPS* may be obtained via anonymous ftp without contacting NRAO, and that the software may be redistributed (and/or modified), under certain conditions. The full text of the GPL can be found in the `15JUL95` *AIPSLetter*. Details on how to obtain *AIPS* under the new licensing system appear later in this *AIPSLetter*.

The next release of *AIPS* will be `15APR98`. It is possible to get early access to this release by running a "midnight job"; see the *AIPS* home page for further details.

Space VLBI Support

The `15OCT97` release of *AIPS* incorporates a number of revisions and enhancements arising from our experiences in processing observations made during the in-orbit checkout (IOC) of the HALCA spacecraft. Several Space VLBI enhancements are summarized in the next section of this newsletter. We recommend that `15OCT97` be installed at all *AIPS* sites that will be used to reduce HALCA observations.

Staff Changes

In September Gustaaf van Moorsel left the *AIPS* group to concentrate on AOC computing issues, and Tony Beasley took over as head of the *AIPS* group. Eric Greisen returned to the *AIPS* group after 18 months of work on his experimental version, CVX. Eric's CVX version of *AIPS* has been successfully merged with `15OCT97` *AIPS* and the combined version will form the basis of `15APR98`.

AIPS Distribution

A total of 148 copies of the `15APR97` release were distributed, of which 79 were in source code form and 69 were distributed as binary executables. The table below shows the breakdown of how these copies were distributed. This includes both source code distributions and binary distributions.

ftp	8mm	4mm	ZIP	Floppy
137	6	3	2	0

User feedback suggests that the distribution over operating systems for installed versions of `15APR97` was as follows.

Operating System	No.	`15APR97` %	`15OCT96` %
Solaris/SunOS 5	255	66	46
PC Linux	61	16	19
HP-UX	23	6	4
Dec Alpha	23	6	10
SunOS 4	19	5	13
SGI	2	1	5
IBM /AIX	1	0	4
Total	384		

The distribution of `15APR97` has been rather lower than that for `15OCT96`, perhaps reflecting the fact that `15OCT96` had a longer lifetime than normal as `15APR97` was delayed by several months. These figures are affected by the percentage of *AIPS* users that register with NRAO. We remind serious *AIPS* users that registration is required in order to receive user support.

Improvements for Users in `15OCT97`

This release includes several improvements over `15APR97`. The most significant of these are described below. See the `CHANGE.DOC` file for more details.

General Improvements

Support for Large Files

Unix file systems have traditionally limited file sizes to a maximum of 2 Gbytes (2 097 152 bytes). Several of the more modern varieties of Unix have removed this restriction but *AIPS* has continued to assume that addresses in files can be stored in a standard 32-bit signed integer and has, therefore, been unable to take advantage of this change. This size restriction has proved awkward for some types of data reduction that require large volumes of data (eg. spectral-line mapping and space VLBI).

Starting with the `15OCT97` release of *AIPS* we have removed this limit so that *AIPS* can take advantage of large file facilities if they are made available by the host operating system. We have been able to use files larger than 2 Gbytes under IRIX 6 (SGI) and Digital UNIX 4 (DEC); this should also be possible under other operating systems. You should note, however, that filesystems may need to be set up in a particular manner before they can be used to store these large files: consult your system documentation to see what needs to be done.

Model Fitting

The `JMFIT` task, which fits model components to *AIPS* images now has a stricter convergence criteria so that it is less likely to position components at integer cell coordinates. It has also been modified to give better error estimates (see *AIPS* Memo 97 for more details).

Van Vleck correction in `FILLM`

The correlation coefficient produced by a digital correlator such as used by the VLA differs in a non-linear way from that produced by a perfect analog correlator. The VLA online system does not correct the visibilities for this difference. In most cases, measured correlation coefficients are too small for the effect to produce noticeable artifacts, but in cases of uncommonly high flux densities a correction — the so-called *Van Vleck correction* — may be needed. Fig. 1 shows the correction factor as a function of the correlation coefficient. In order to apply this correction, several quantities are required which are recorded on the archive tape but are not copied to the AIPS headers. Therefore, the latest stage at which this correction still can be applied is when the data are being read from tape to *AIPS* using the *AIPS* task `FILLM`.

This has now been implemented in `FILLM`; the Van Vleck correction will be applied when the third bit in parameter `CPARM(6)` is *on*. This is done by adding 8 to whatever value of `CPARM(6)` the user wants. Fig. 2 shows an example of a strong continuum source (Cygnus A) without (top panel) and with (bottom panel) the Van Vleck correction applied.

The Van Vleck correction in `FILLM` currently only works on continuum data. Results should always be inspected carefully. There are cases (strong masers) where spectral line observations could benefit from a Van Vleck correction as well, and we may implement this at some future stage.

Improvements for VLBI (Including Space VLBI)

VLBA Correlator

`FITLD` and `INDXR` will now transfer clock offsets and atmospheric delay from VLBA `MC` tables to the initial calibration table of a uv data set. This improves the tracking of the data reduction process for astrometry.

Mk 3 Correlators

New tasks, `M3TAR` and `TFILE` have been added to the system that will load data from Mk 3 VLBI correlators which has been encoded in tar archive files. Thanks go to M. Wunderlich for contributing this code.

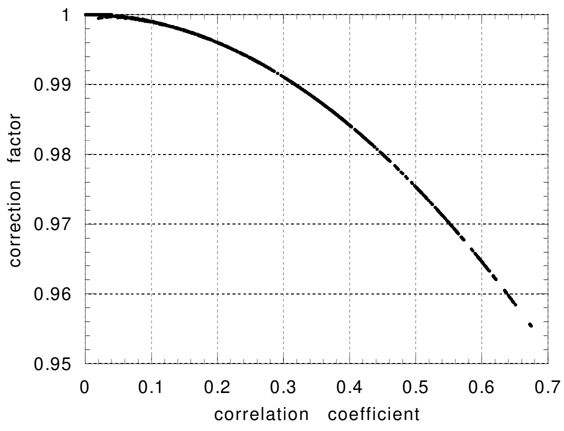

Figure 1: The Van Vleck correction factor applied to the visibilities as a function of the correlation coefficient. This graph refers to the actual Cygnus A data shown in Fig. 2. Note the unusually high correlation coefficients present in these data.

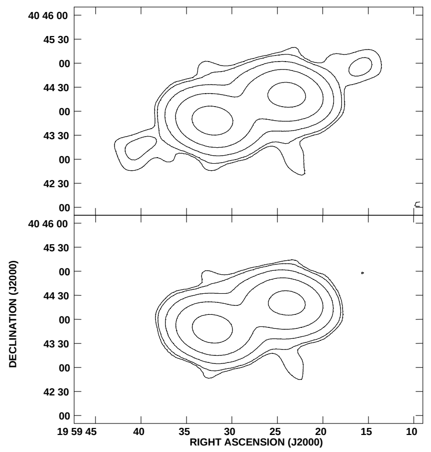

Figure 2: Cygnus A observations without (top) and with (bottom) the Van Vleck correction applied. Observations with other synthesis arrays confirm the spurious nature of the lobes at both ends in the top panel.

Forced Scan Breaks in `INDXR`

`INDXR` will now accept a list of times in a text file and will ensure that scans do not cross these times. This is primarily intended for Space VLBI, where scans should not span times at which clocks are reset at the ground stations since resetting the clock introduces discontinuous changes in residual delay.

Phase Calibration Data

VLBA antennas as well as some other VLBI antennas are equiped with pulse calibration system which provides the information necessary to align the phases of different IFs and polarizations as a function of time, removing the effects of any differences and fluctuations in the instrumentation. The instrumental delay can can be as large as 1 microsecond and can therefore cause several turns across typical VLBA band. With at least two tones in each band, it is possible to measure and remove the instrumental delay. The main problem is the existence of 2π ambiguities in the measured phase.

The *AIPS* task `PCCOR` uses pulse calibration data stored in an *AIPS* `PC` table to remove instrumental delays from UV data. Phase ambiguities are removed using the fact that phase of a calibrator's visibilities as a function of frequency should coincide with a straight line corresponding to a common delay for all IFs and polarizations.

`PCCOR` uses only the two tones with the lowest and highest freqquency within each IF. Tests of `PCCOR` have shown that it produces a good alignment of phases in IFs separated by as much as 500 MHz.

Pulse calibration (`PC`) tables may be loaded from text files extracted from VLBA log files using `PCLOD` or directly from FITS data files; the Calagary S2 correlator already incorporates pulse calibration data in its data sets and the VLBA correlator will begin adding them to data files in 1998.

Coherence Times

`COHER` will now produce estimates of the coherence time for data that has not yet been fringe-fitted. These estimates may be used to set an upper bound for `SOLINT` in `FRING` or `BLING`.

Astrometry

Most tasks that support astrometry have been updated in this release, as has the `ASTROMET.HLP` file which describes the recommended process for reducing astrometic data in *AIPS*.

A new POPS procedure `REFREQ` allows the reference frequency to be changed within a band and may be used to change the reference frequency for fringe-fitting to the centre of the band to improve the isolation of delay and rate errors.

Baseline-Oriented Fringe-Fitting

The size of the delay-rate region search by `BLING` is no longer limited by the size of the *AIPS* pseudo-AP. The full ambiguity range may be now be searched for arbitrarily long solution intervals and arbitrarily large numbers of channels — subject to machine limitations, of course.

`BLING` has also be tuned for greater speed and should now be significantly faster than `FRING` in most circumstances (much of this tuning was done prior to the release of `15APR97` but was not mentioned in the *AIPSLetter*).

`UVFIX` and Space VLBI

`UVFIX` has been revised to caluculate correct (u, v, w) coordinates for baselines to an orbiting antenna. This assumes that the orbital elements are encoded in the antenna (`AN`) table and are referenced to the J2000 equinox.

Corrections for differential aberration have also been added to `UVFIX`.

Recent *AIPS* Memoranda

The following memoranda are available from the *AIPS* home page.

95 AIPS/AIPS++ Interoperability
A.J. Kemball
August 29 1997
This note discusses the question of interoperability between AIPS and AIPS++ during the transition period between the two systems. The objectives of such an effort and the technical means by which it might be achieved are considered. A distributed object design, which has already been investigated as a prototype, is presented as a solution.

96 AIPS on an Alpha/AXP Clone
Robert L. Millner, Patrick P. Murphy and Jeffrey A. Uphoff
October 14 1997
There has been some interest, both within NRAO and in the general Radio Astronomy Community, in the possibility of running AIPS on one of the many "clone" systems based on the Digital ALPHA AXP 21164 processor. Recently, NRAO/Charlottesville acquired such a system and proceeded to install the Linux operating system thereon. We have also started the process of porting AIPS to this 64-bit system, though the results reported herein are based solely on the use of binaries generated on an OSF/1 (Digital Unix) ALPHA processor and copied to the Linux system. We have successfully run the "DDT" suite of programs on this Linux/Alpha system and have achieved an AIPSMark(93) of 9.0.

97 Test of Errors of the Fitting Parameters at Gaussian Fitting Task JMFIT
L. Kogan
October 14 1997
Two-dimensional elliptical Gaussian fits are used in astronomy for accurate measurements of source parameters such as central position, peak flux density and angular size. The revised error analysis based on *con* and *kog* is implemented at the AIPS task JMFIT. A test of the errors of six parameters of fitted Gaussian into an image provided by JMFIT has been carried out. The test demonstrates a good agreement with the error predicted by JMFIT.

98 AIPSTerminal for Linux PCs
Robert L. Millner and Patrick P. Murphy
November 19 1997
There has been some interest in accessing *AIPS* on a home Linux PC. Many home machines lack the resources to run *AIPS* well and people may not wish to move large amounts of data to and from home. A small install package was created for Red Hat Linux which contains a minimal subset of *AIPS* to run the TV, Message and Tek servers. With this package, a user may run the servers from home, dial into the network and access *AIPS* on their workstation in an efficient manner.

AIPS Order Form for `15OCT97` *(Unix, "tar" format)*

Now licensed under the GNU GPL; not the old user agreement

AIPS is available via anonymous ftp to aips.nrao.edu (192.33.115.103)

1. Name and address of Contact Person: ______________________________
   ☐ Check here if address on back is ok. ______________________________
   (Include street address for UPS delivery) ______________________________

I ☐ want ☐ do not want to receive paper copies of the Aipsletter

2. ☐ New order ☐ ReOrder Do you have an old User Agreement? ☐ Yes ☐ No

   Have you registered previously? ☐ Yes ☐ No

   (Registration is free to educational/research sites and is required *on every release* if you want support from NRAO)

3. Tape "media" desired: .... ☐ Exabyte (5GB) ☐ Exabyte (2.2G) ☐ 4mm DDS DAT

   ☐ QIC 150 (150MB) ☐ 9-track 6250 bpi

   ☐ 100 MB "Zip" disk (includes Linux binaries)

   We reserve the right to institute a media charge at any time

   ☐ Check here for BINARY TAPE (load and go), exabyte or DAT only, and indicate OS/hardware

   ☐ Sparc/Solaris 2.5 (SC4) ☐ Sparc Ultra (SUL) ☐ Sparc/SunOS 4.1.2 (SC2.0.1)

   ☐ Linux 2.0 (ELF format) ☐ Silicon Graphics IRIX 6.4 ☐ IBM RS6000/AIX 3.2

   ☐ Dec Alpha/OSF-1 4.0 ☐ HP 9000/7xx HP/UX (not yet available)

4. Computer(s) make, model and OS version: ______________________________
   Include hardware/software/quantity info, e.g. ______________________________
   Sparc Ultra 2/SunOS 5.5/21, etc. ______________________________

5. DDT test package (15JAN94 version): .... ☐ (includes small, medium, and large tests;
   (FITS tape) NOTE: Also available via ftp on aips.nrao.edu in **`/pub/aips/DDT/15JAN94/*`**

6. Printed Documents Requested: .... ☐ AIPS Cookbook (`http://www.cv.nrao.edu/aips/cook.html`)

   ☐ AIPS Memos: ____________________ Going AIPS (15APR90) ☐ Vol 1 ☐ Vol 2

   (See separate list at `ftp://aips.nrao.edu/pub/aips/TEXT/PUBL/AIPSMEMO.LIST`)

7. Custom 3-ring binders .... Cookbook ☐

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