AIPSLETTER

Volume XXI, Number 2: December 31, 2001

A newsletter for users of the NRAO
*A*stronomical *I*mage *P*rocessing *S*ystem

Written by a cast of *AIPS*

Edited by
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General developments in *AIPS*

Move of the *AIPS* home

Since what remains of the *AIPS* programming group is now all in Socorro, we have decided to move all software functions to the Array Operations center. The primary address for reaching the *AIPS* group remains `daip@nrao.edu`. The web address will change to `http://www.aoc.nrao.edu/aips` and the ftp address will become `ftp://ftp.aoc.nrao.edu/computing/aips`. Ernie Allen in Charlottesville will continue to assist the group by handling registrations, usage statistics, and requests for tapes, CDroms, and paper documents. Ernie may be reached at `aipsmail@nrao.edu` for which he performs triage and at `eallen@nrao.edu`.

The "Midnight Job" has been changed. The secure shell, with all its fragile complexities, will no longer be required. Instead `mnj.aoc.nrao.edu` will serve up *AIPS* incrementally — or as a whole — using the Unix tool `cvs` running with anonymous ftp. Linux sites will almost certainly have `cvs` installed; other sites may have installed it along with other GNU tools. Secondary MNJs will still be possible using `ssh` or `rcp` or NFS as at present. Further changes to the MNJ will be discussed later in the *AIPSLetter*.

Linux news

RedHat has released versions 7.0, 7.1, and 7.2 of their Linux system. The good news is that version 7.1 and beyond contain numerous system improvements including the 2.4.2 kernel. This kernel allows *AIPS* to read and write files larger than 2 Gbytes. The bad news is that these releases include and depend on the "GNU compilers version 2.96." The quote marks are added because the GNU compiler group never released a version 2.96 and they do not support this "version." We have found that this `g77` produces optimized code that is unreliable. There are problems with `IMAGR`, TV window setting, `TVFLG`, and who knows what else. We do recommend RedHat release 7.2, but you must also install the GNU compiler suite version 2.95 (now 2.95.3) or 3.0+ (now 3.0.3) — both of which work well — and change your local copies of `FDEFAULT.SH`, `CCOPTS.SH`, and `FDOPTS.SH` to point at it. Some other Linux distributions also include the 2.96 compiler with the same unfortunate results. Instructions for fetching and installing the real GNU compilers are given on the *AIPS* web page.

Current and future releases

We have reinstated the old practice of having formal *AIPS* releases, but on an annual basis with binary releases only for Solaris and Linux. All architectures can do a full installation from the source files. The current release is called `31DEC01` and is now frozen. You may fetch a copy of this version from either our Charlottesville (`www.cv.nrao.edu/aips`) or Socorro (`www.aoc.nrao.edu/aips`) web sites. Copies of `31DEC01` on CDrom or magnetic tape may be ordered from Ernie Allen at `aipsmail@nrao.edu`. This issue of the *AIPSLetter* is intended to advise you of developments in the last six months in this new release; the June 30 issue of the *AIPSLetter* covered the first six months.

A new version of *AIPS*, called `31DEC02`, is now under development by the *AIPS* Group. You may fetch (from the aoc web site only) and install a complete copy of this version at any time. Having fetched `31DEC02`, you may update your installation whenever you want either as a whole or by running the so-called "midnight job" which uses transaction files to copy and compile the code selectively based on the code changes and compilations we have done. We expect users to take the source-only version of *AIPS* over the Internet (via *anonymous* ftp).

AIPS is now copyright © 1995 through 2002 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* and in the file called `COPYING` distributed with each release of *AIPS*.

Improvements of interest to users in 31DEC01

We expect to continue publishing the *AIPSLetter* approximately every six months with the December *AIPSLetter*s tied to the annual releases. The June 30, 2001 *AIPSLetter* described a surprising number of changes in `31DEC01` over its first six months. That *AIPSLetter* described five new tasks: `CHKFC` to check the contents of an `IMAGR BOXFILE`, `DEFLG` to flag data based on the level of decorrelation, `SNFLG` to flag data on a baseline basis based on phase jumps in the `SN` or `CL` table, `VPFLG` to make sure that all polarizations are flagged in a sample if any are, and `DRCHK` to test the installation control files for correctness. A new verb was written called `EPOCONV` to convert epochs in the `COORDINA` adverb. New VLBA Utility procedures also became available. Significant improvements in `IMAGR`, `SETFC`, `FILLM`, `FITLD`, `BPASS`, `PCAL`, `CLCOR`, `SAD`, `TVFLG`, `ZAP`, and others were described. That *AIPSLetter* is available from either of the two web sites above.

In the last six months, the level of activity has been less surprising. There is a new procedure `FITDISK` to write data using `FITTP` to disk files with names based on the internal file names. A new pseudoverb `USAVE` allows the POPS environment to be saved to another user number. The new task `RMSD` computes the local rms in a moving 2-dimensional window. Wendy Lane and Joe Lazio of NRL contributed a new task `UVWAX` to delete data based on the (u, v, w) location. Bryan Butler has contributed some significant improvements to `FILLM`. `TECOR` was made more convenient to use and was discovered to be very helpful even at relatively high frequencies.

Other than relatively minor differences, `31DEC01` is compatible in all major ways with the 2000, 1999, and `15OCT98` releases. There are significant incompatibilities with older versions.

Data reading and writing

FILLM

`FILLM`, the task that translates VLA on-line data into *AIPS* was enhanced significantly by Bryan Butler. For moving sources, `FILLM` now creates and fills a source position (`PO`) table. For the present there are no tasks that use these data other than the various generic table-handling tasks such as `PRTAB`, `TAPLT`, `TASRT`, etc. In all cases, `FILLM` now also creates a weather data (`WX`) table and fills it with the weather data recorded at the VLA. The task now puts real information into the initial `CL` calibration table using the weather data to calculate opacity and a text file (called `$AIPSIONS/VLA.GAINS`) to provide the gain curve correction. These operations are controlled by a variety of user adverbs. Note that this change means that, in later calibration steps, users will need to set `DOCALIB = 2` even when `GAINUSE` is one. The shadowing checks, by default, now use internal information covering all antennas rather than simply checking those antennas in the current subarray. A new option was added to `CPARM(2)` to have the task ignore all source qualifier numbers.

Other changes included a correction to the center coordinate used for the VLA. The default behavior of `CPARM(7)` was changed for spectral-line data: $= 0$ gets a new `FQ` number on a 30 km/sec change in velocity, < 0 gets only 1 `FQ` number in all cases, and > 0 is the frequency tolerance in kHz for a new `FQ` number. `FILLM` now renames a source if its RA and/or Dec differ from those of an identically named and qualified source. Added a bit to `CPARM(2)` for planetary observations where position changes are to be ignored.

Others

A new standard procedure called `FITDISK` was written. After a `RUN FITDISK` you may use the procedure to construct an output disk file name from the *AIPS* internal file name and sequence number and then to run `FITTP`. In the output name, trailing blanks are discarded and embedded blanks are replaced with underscores. The name, class, and sequence number are connected by periods.

A non-trivial error was found in the precession routines used for J2000 coordinates. When a coordinate was precessed from apparent to mean and back again it did not return to its initial value. Some of this was due to a scheme for interpolation in the routines that attempted to avoid excess computation, primarily by `UVFIX`. `FITLD` misinterpreted this parameter and a bug within the routines caused coordinate errors of 0.2 arc seconds or more. This bug and the usage of the routines by `FITLD` and `CLCOR` was corrected. A more subtle set of errors was also present. The routines assumed that the conversion could be done simply by changing the sign of the time interval. If all terms used only odd powers of time, that would be okay. But they don't. Proper inverse matrices were found to implement the precession properly.

`FITLD` was corrected to rebuild `CQ` tables after reading each file. The previous code simply made a mess of things. The `DELCORR` adverb was removed since the correction should always be done for VLBA Correlator data and never done for other correlators. The attempt to guarantee that there is always data for `FQ` number 1 caused incorrect frequencies to be written to the `FQ` table when the first data encountered were from a correlator `FQ` number other than 1. The parameters controlling the maximum number of channels and the like were changed to those used in the rest of *AIPS*; a data set with 8192 spectral channels and 2 polarizations needed to be read! This data set also uncovered a bug comparing the buffer sizes to those needed. Data sets with different `FQ` numbers but identical frequencies caused some errors in logic which have been repaired.

`UVLOD` and its copy in `FITLD` attempted to convert abnormal Stokes and Complex axes to normal ones. The conversion was suppressed for another case that would not be handled properly.

UV data calibration

VLBA ionospheric calibration

Application of global ionospheric models has been found, in many cases, to improve greatly the calibration of the phases of VLBA visibility data, particularly near solar maximum. This can be especially important in phase-referencing observations, where determination of the relative phase ambiguity between two adjacent calibrator scans is necessary to calibrate the program source properly. The calibration can be performed by correcting the ionospheric dispersive delay using global GPS models for the ionosphere and the *AIPS* task `TECOR`; for details see the `TECOR` explain file as well as VLBA Scientific Memos 22 and 23. `TECOR` has been upgraded to permit the use of global ionospheric models that cover multiple UT days, necessary for any observations that approach or cross UT midnight.

We have determined recently that, in at least some circumstances, the ionospheric effects are large enough to have a significant impact at observing frequencies as high as 5 GHz or 8 GHz. This result has been written up as VLBA Test Memo No. 68; the Test Memo and the aforementioned Scientific Memos are available on the VLBA web site. We strongly recommend that VLBA observers using phase-referencing at frequencies up to 8 GHz run TECOR before final fringe-fitting on the calibrator. The most careful observers may wish to compare fringe-fit solutions with and without TECOR to insure that the correction has helped their data, since at times, it may not be necessary at the higher frequencies. However, using TECOR when it is not necessary is unlikely to harm the data.

Editing

A new task, UVWAX, was submitted by Wendy Lane and Joe Lazio of the Naval Research Laboratory. It flags data when the values of $|u|$ and $|v|$ are in a specified rectangular box and/or when $|w|$ is in a specified range of values. Primarily this is used to get rid of data with near-zero fringe rates and data with large $|w|$ which may require large numbers of small facets in imaging.

TVFLG and SPFLG were given a new option to expand the time ranges flagged by DPARM(5) seconds. The times assigned to data in these tasks result from a gridding process and therefore may not exactly match those in the data, making this option essential. UVCOP was changed to apply all flag table entries regardless of source number to single-source data sets. Previously, flags with non-zero source number were not applied.

Other changes

ELINT now displays the uncertainties in the polynomial coefficients it has fit.

ACCOR no longer writes SN entries for integration periods which are significantly less than SOLINT since they are excessively noisy. The source number is no longer written when SOLINT is > 0, since multiple sources may be involved. The default SOLINT has been reduced to 2 minutes since the automatic gain control can change sampler voltages on fairly short time scales.

FRING was corrected to use the adverb CMETHOD which it had ignored. All model computations using Gaussian components were made more likely to work with gridded methods by loosening the requirement for exact match in all width parameters.

SPLIT was corrected to leave the velocity system parameters alone when calibrating single-source data.

Various calibration procedures were also revised:

VLACALIB (in VLAPROCS) was given the DOBAND and BLVER adverbs so that it can be used with spectral-line data.

VLACLCAL (in VLAPROCS) was changed to remove numerous "hidden" adverbs and to give the user control over the LISTR output.

VLBACALA (in VLBAUTIL) was corrected to have a reasonable, rather than way too small, clip level to apply to the SN table generated by APCAL. This replaces an absence of amplitude clipping and, for November 23 – December 19, an excess of such clipping.

VLBACPOL (in VLBAUTIL) was changed to apply the SN table to all antennas. Clarifications were made in the help file.

Imaging

IMAGR received less than its usual share of attention. The handling of BOXFILEs was clarified so that leading blanks are always ignored by IMAGR and FILEBOX. Errors giving a field number to IMAGR no longer cause it to quit. The use of negative FLUX caused confusion in the default values for FGAUSS. The changing of FLUX with TELL also caused a problem with the actual cutoffs used for each field, which are set by FGAUSS. If the field cutoff value matches the FLUX before the TELL the the new field cutoff will match the new FLUX. Note that the actual field cutoff is controlled by FGAUSS in a way that does not allow that adverb to be changed by TELL.

Modeling, analysis, and related plotting

Model fitting

The subject of Gaussian fitting in the presence of correlated noise is still being studied. So far the results of these studies have not been incorporated into code, but they will be. The good news is that the error estimates from `JMFIT`, `IMFIT`, and `SAD` are reasonable even if they are not completely right. This study has led to some changes to the code in the last six months. These three tasks now have the option to scale the printed peaks and fluxes by the primary beam and the printed peak values are increased by the beam smearing factor (when invoked). The attempts at deconvolution have been made more useful, allowing partial solutions with more sensible position angles. The deconvolutions were extended by adding the deconvolution of the Clean beam plus one sigma to the others; this may be the best estimate of the upper limit to the source size.

`SAD` was given the option to loop over clip levels in selecting islands. It was found that an initial low clip level caused the automatic fit of strong sources to become confused by low-level "signals." By looping from higher to lower clip levels, strong sources are removed before the lower level signals are considered. Another reason to discard a fit source — total flux — was added. This gets rid of weak and small sources which are less reliable than weak but extended objects. A bug in the position angle of the deconvolved results and the bandwidth smearing, affecting only `SAD`, was corrected.

Miscellaneous matters

RMSD is a new task that computes the rms at each pixel by self-consistent methods using a two-dimensional window centered on the pixel. The output may be either the computed rms or the input image clipped using the computed rms. The latter, after transposition, will be an interesting input to `XMOM`.

COMB was given a new `OPCODE = 'SUMM'` which is identical to `SUM` except that, when one image is blanked, the result is taken from the other image as in `MEAN`.

SLCOL was changed substantially in the format and type of data displayed. It now does X, Y with respect to the true reference pixel plus the distance from a user-specified pixel (default is the reference pixel) with a sign set by the X difference from that point. All components of all models are now displayed. A pre-existing output file may be replaced or have the new information appended.

DFTPL had errors in the computation of the I polarization from RR and LL. These errors would produce both wrong answers and zero-divide aborts under normal conditions.

UVPLT has a new option (number 17!) to plot against uv distance in a user-specified position angle (given by `ROTATE`).

CLPLT was found to make a complete mess when asked to average over spectral channels and IFs. It now works as advertised.

System management

USAVE allows a user to `SAVE` his POPS environment to another user number on the same computer. Users frequently use more than one number in order to separate projects and this should help facilitate that process.

XAS was corrected. For some internal computations, the byte order in the computer running `XAS` matters. But for the display of TrueColor images, it is the byte order in the computer running XWindows that matters. Added code to determine the latter and then use it in the relevant place.

Midnight Job procedures were changed to use the UT time precise to 1 second rather than the Charlottesville and site local times in integer days. The putbck system in Charlottesville was changed to record the time in UT. Now there should be no way for a change to slip though a "time warp."

AIPS Distribution

The first table below shows the breakdown of how the (preliminary and frozen) copies of recent *AIPS* releases have been distributed. Magnetic tapes seem to have gone out of favor. Also, with annual releases, many sites are opting to download preliminary (still changing) versions of the current release. The second table below is based on the always disappointing number of registered installations of the various releases. It indicates that the distribution over operating systems was heavily weighted toward Solaris, but that Linux is now slightly preferred. However, when asked about "primary" architecture, 72% of the 98 sites answered Linux for `31DEC00` and 18% answered some flavor of Sun OS. For `31DEC01`, 73% of the 110 sites answered that Linux is their primary architecture and 26% Solaris.

By December 30, 2001, 556 copies of the `31DEC01` release had been distributed, all by ftp. That version remained under active development throughout 2001. A few of the sites have begun taking updates regularly via the "midnight job." We recommend the midnight job to all serious *AIPS* users. It is hard to convert the 556 downloads recorded by the ftp monitoring system to a number of sites. A good estimate would be 448 "sites" with 48 of them taking multiple full copies through the year. This may be an overestimate since multiple computers at the same university are counted as multiple "sites" if the user identification is different or generic (*e.g.*, mozilla).

Also by December 30, 2001, 230 copies of the frozen `31DEC00` release had been distributed, 209 by ftp. (This is added to the 407 sites that took copies of `31DEC00` when it was called `31DEC99`, via ftp before it was frozen.) We believe that some sites have taken the full release more than once at different dates, but we do not have an accurate count of these. The distribution of `31DEC00` has now been terminated. Almost all of the distribution has been of source-code only. Binaries are distributed on CDs and 24 sites downloaded binaries via ftp. Of 637 non-NRAO sites receiving `31DEC00` only 98 (15%!!) have registered. The rate of registration has been rather better for the `31DEC01` release. We remind serious *AIPS* users that registration is expected in order to receive user support.

	ftp	CDrom	8mm	4mm	ZIP	Floppy
15OCT98	242	71	8	1	0	0
15APR99	290	69	0	2	0	0
15OCT99	277	102	1	2	0	0
31DEC00	637	21	-	-	-	-
31DEC01	448	-	-	-	-	-

OS	DEC01 %	DEC00 %	OCT99 %	APR99 %	OCT98 %	APR98 %	OCT97 %	APR97 %	OCT96 %
Linux	50	47	33	27	27	19	23	16	19
Solaris	41	43	54	53	61	66	50	66	46
SGI	6	2	4	13	1	3	1	1	5
SunOS 4	2	0.3	1	1	1	4	14	5	13
HP-UX	0.5	2	5	2	5	2	3	6	4
FreeBSD	0.2								
Dec Alpha	0	5	1	4	3	7	9	6	10
Alpha Linux	0	0.3	1	0	0				
IBM /AIX	0	0	0	0	2	1	0	0	4

Patch Distribution for `31DEC00`

As before, important bug fixes and selected improvements in `31DEC01` can be downloaded via the Web beginning at `http://www.aoc.nrao.edu/aips/patch.html`. Alternatively one can use *anonymous* `ftp` on the NRAO cpu `ftp.aoc.nrao.edu`. Documentation about patches to a release is placed in the anonymous-ftp area `pub/software/aips/`*release-name* and the code is placed in suitable subdirectories below this. The `31DEC00` release had a few important patches all of which were listed in the previous *AIPSLetter*. They applied to `SCMAP`, `SCIMG`, `FILLM`, `UVCON`, `PBCOR`, and `FRING`.

AIPS Order Form for **`31DEC01`** **(Unix, "tar" format)**

Available under the Free Software Foundation's General Public License

Order online: `http://www.aoc.nrao.edu/aips/forms/aipsorder.html`

AIPS is available via anonymous ftp at ftp.aoc.nrao.edu/pub/software/aips

1. Name and address of Contact Person: ____________________

☐ Check here if address on back is ok. ____________________

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☐ Exabyte (5GB) ☐ Exabyte (2.2G)

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

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Include hardware/software/quantity info, e.g. ____________________

Pentium III/Linux 2.2, etc. ____________________

5. Y2K test package: ☐ (includes small, medium, large data sets; FITS tape)

NOTE: Also available via ftp on ftp.aoc.nrao.edu in `/pub/software/aips/FITS/*` and on the CDROM

6. Printed Documents Requested:

☐ AIPS Cookbook (always available at `http://www.aoc.nrao.edu/aips/cook.html`)

☐ Vol 2 ☐ Vol 1 of Going AIPS (15APR90)

☐ paper copy of the Aipsletter (always available at `http://www.aoc.nrao.edu/aips/`)

☐ AIPS Memos: ________________

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

Send this order form (or an electronic equivalent) to:

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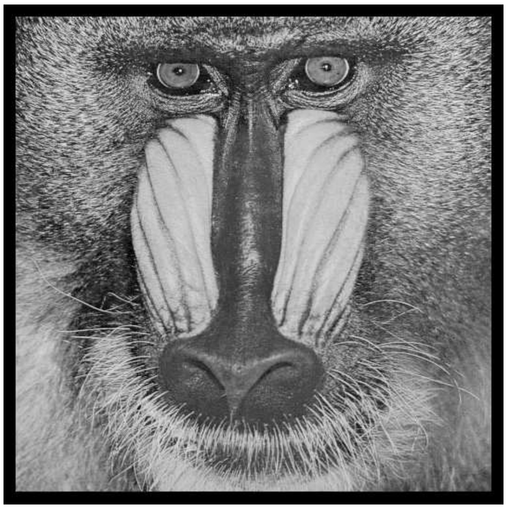

December 31, 2001

AIPSLETTER
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FIRST CLASS

To:

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