General developments in *AIPS*

FILLM

31DEC06 contains a revision of FILLM which is essential to support the new data form that has been produced by the VLA since late June 2007. However, a bug affecting the scaling of cross-hand data in the new form was not corrected in 31DEC06. Therefore, VLA users will have to upgrade their copy of *AIPS* to 31DEC08 or 31DEC07 to read such data correctly. There are additional changes only in the 31DEC08 version of FILLM, which may be important to current observers.

Current and future releases

We have formal *AIPS* releases on an annual basis. While all architectures can do a full installation from the source files, Linux, Solaris, and MacIntosh OS/X (PPC and Intel) systems may install binary versions of recent releases. The last release is called 31DEC07; 31DEC08 remains under active development. You may fetch and install a copy of this version at any time using *anonymous* ftp for source-only copies and rsync for binary copies. This *AIPS Letter* is intended to advise you of improvements to date in 31DEC08. Having fetched 31DEC08, you may update your installation whenever you want by running the so-called "Midnight Job" (MNJ) which copies and compiles the code selectively based on the changes and compilations we have done. The MNJ will also update sites that have done a binary installation. There is a guide to the install script and an *AIPS* Manager FAQ page on the *AIPS* web site.

The MNJ serves up *AIPS* incrementally using the Unix tool cvs running with anonymous ftp. The binary MNJ also uses the tool rsync as does the binary installation. 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 with previous releases. We have found that cvs works very well, although it has one quirk. If a site modifies a file locally, but in an *AIPS*-standard directory, cvs will detect the modification and attempt to reconcile the local version with the NRAO-supplied version. This usually produces a file that will not compile or run as intended.

Patch Distribution for 31DEC07

Important bug fixes and selected improvements in 31DEC07 can be downloaded via the Web beginning at:

http://www.aoc.nrao.edu/aips/patch.html

Alternatively one can use *anonymous* ftp to the NRAO server ftp.aoc.nrao.edu. Documentation about patches to a release is placed on this site at pub/software/aips/*release-name* and the code is placed in suitable subdirectories below this. As bugs in 31DEC08 are found, they are simply corrected since 31DEC08 remains under development. Corrections and additions are made with a midnight job rather than with manual patches. Since we now have many binary installations, the patch system has changed. We now actually patch the master version of 31DEC07, which means that a MNJ run on 31DEC07 after the patch will fetch the corrected code and/or binaries rather than failing. Also, installations of 31DEC07 after the patch date will contain the corrected code.

The 31DEC07 release has had a number of important patches:

1. REBYTE did not handle tables with long rows (IM and possibly BP) correctly *2008-01-09*

2. FITLD did not translate WX (weather) tables correctly *2008-01-18*

3. DFT model division did not set weights correctly *2008-03-05*

4. FILLM did not scale and weight cross-hand data for some baselines correctly *2008-03-05*

5. VISDFT did not do multi-scale model division and subtraction correctly *2008-04-29*

6. FILLM did not set the CORRCOEF keyword correctly for recent data *2008-06-19*

AIPS Distribution

We are now able to log apparent MNJ accesses and downloads of the tar balls. We count these by unique IP address. Since some systems assign the same computer different IP addresses at different times, this will be a bit of an over-estimate of actual sites/computers. However, a single IP address is often used to provide *AIPS* to a number of computers, so these numbers are probably an under-estimate of the number of computers running current versions of *AIPS*. In 2008, there have been a total of 981 IP addresses so far that have accessed the NRAO cvs master. Each of these has at least installed *AIPS* and 214 appear to have run the MNJ on 31DEC08 at least occasionally. During 2008 more than 155 IP addresses have downloaded the frozen form of 31DEC07, while more than 611 IP addresses have downloaded 31DEC08. The binary version was accessed for installation or MNJs by 218 sites in 31DEC07 and 529 sites in 31DEC08. The attached figure shows the cumulative number of unique sites, cvs access sites, and binary and tar-ball download sites known to us as a function of week — so far — in 2008.

2008 systems shipped and CVS access by site
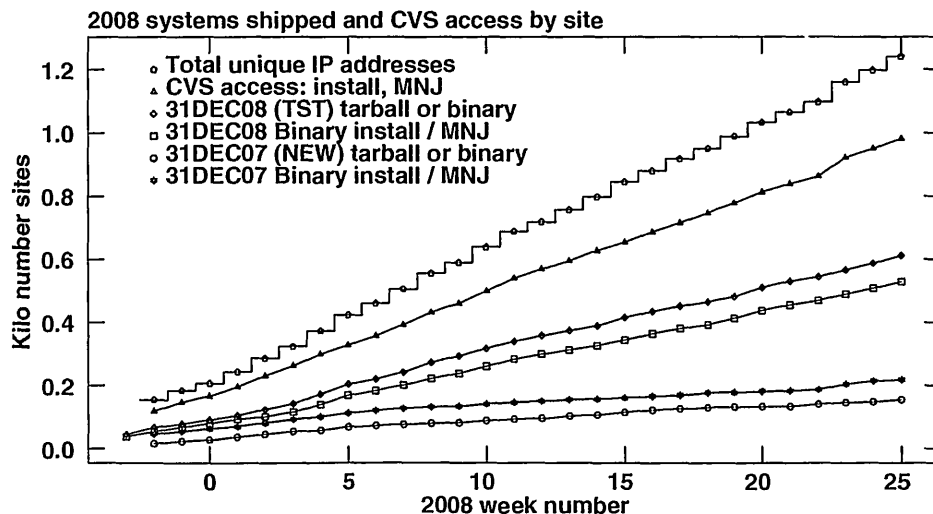
Improvements of interest in 31DEC08

We expect to continue publishing the *ATPSLetter* approximately every six months along with the annual releases. There have been quite a few changes in 31DEC08 in the last six months. A significant effort has been made to upgrade the capabilities of the "TV" display (XAS) and to make imaging and model computation more efficient through reduction in disk I/O. Although both of these should improve performance significantly for some users, neither causes any significant change in user inputs. A new verb SETMAXAP allows the user to guide *ATPS* in the matter of the amount of memory which it is safe to use within individual tasks. The model computation changes make this guidance significant. There are two new tasks to support on-line flagging tables which presently are written only for the VLA. These are PRTOF to print such tables and OFLAG to use these tables to generate entries in flag (FG) tables. A new task FIXAL and procedure FXALIAS have been written to deal with a temporary aliasing problem on EVLA-EVLA baselines. A new diagnosis task TIORD was written to check *uv* data sets to make sure that they are in strict time order, reporting any failures.

31DEC08 contains major changes to the display software. Older versions may use the 31DEC08 display (XAS), but 31DEC08 code may not use older versions of XAS. 31DEC04 through 31DEC08 use a new numbering scheme for magnetic tape logical unit numbers that is incompatible with previous versions. Thus all tape tasks and the server TPMON must be from one of these five releases. Other than these issues, 31DEC08 is compatible in all major ways with the with the 15OCT98 and later releases. There are significant incompatibilities with older versions.

TV display

The *ATPS* "television" display dæmon XAS was significantly modified to allow greater numbers of image memories and wider dynamic ranges. This upgrade was done by the addition of new operation codes so that older versions should be able to use the new display program without modification. The number of TV memories, each the size of the display screen, was changed from 4 to 16. This change will allow for much larger TVROAMs up to 4 x 4 planes or even 16 x 1 or 1 x 16 planes and for larger TVMOVIEs using a combination of more spectral channels and larger sub-images of each channel. The *ATPS* TV allows the user to do very complex combinations of images; the larger number of memories will allow "layering" up to 16 simultaneous images in the display.

The range of data values in each memory has been changed from 0–255 to 0–8191. The data go through look-up tables called LUTs which previously had 256 input values and output values in the range 0-255. The new range is 8192 inputs and output values in the range 0-2046. These outputs are summed over those image memories which are "on" and enter the output function memory look-up tables (OFMs) which now have 32752 possible input values (2047 × 16). The output data range is still 0-255, which is all the display screen can actually handle. This extended dynamic range should allow for greater display flexibility after the image has been loaded to the TV memory and should also allow mathematical combinations of images, such as TVHUEINT, of greater accuracy.

Other than the ability to ask for TVCHAN up to 16, there are few changes visible at the user level. Tasks and verbs that use two graphics or grey-scale channels now use new adverbs GR2CHAN and TV2CHAN, respectively, to specify the second display. The verbs GRON, GROFF, TVON and TVOFF that used to take a decimal-coded immediate argument, *e.g.*, TVON 12 meant turn on channels 1 and 2, now take a binary-coded immediate argument. Thus, in the new system, TVON 12 turns on channels 3 and 4 ($12 = 4 + 8 = 2^{3-1} + 2^{4-1}$). Other verbs and tasks which allowed TVCHAN and GRCHAN to have decimal-coded multiple values now no longer support that option. Task TVCPS now displays whatever graphics channels are visible rather than requiring the user to specify which of the visible and invisible ones it should use. *ATPS* INPUTS and GO now know the number of TV memories and the size of the TV screen locally and use those limits when checking adverb values.

Imaging and model computation

When $\mathcal{AIPS}$ computed the visibilities from a source model, it used to have to re-read the uv data for every facet and, for frequency-dependent models, every spectral channel. The latter occur in tasks IMAGR and OOSUB which allow the user to correct models for the primary beam pattern and for known images of spectral index. All tasks involved with model computation deal with multiple facets, including calibration tasks such as CALIB, FRING, and so forth, as well as some modes in IMAGR. The basic routines that compute models in both DFT and gridded forms have been changed so that they can allocate a large "pseudo-AP" memory and compute the models for as many channels and facets as possible for each read through the uv data. This should greatly improve performance in large bandwidth-synthesis imaging problems involving wide fields and/or wide bandwidths. We will continue to look for more ways to reduce the disk traffic.

A new verb has been added to $\mathcal{AIPS}$, named SETMAXAP, to allow the user to specify the maximum amount of memory for an $\mathcal{AIPS}$ task to use. This allows users on small-memory machines, or machines doing many simultaneous operations, to limit the algorithms described above to reasonable memory sizes. If they are not limited, severe paging problems could cause tasks to take nearly infinite times to complete. Most $\mathcal{AIPS}$ tasks have algorithms that adapt to available memory, so a limited allocation will still work and should be faster than a blindly page-faulting version. We have to leave this parameter in the users' hands since we cannot find an operating system service to provide this information. Standard memory allocation will quite happily allow memory sizes in excess of available physical memory and will only fail if they exceed available swap space.

During the testing of the new gridded and DFT subtractions, a number of disturbing things were noticed. It became clear that the order in which facets were subtracted from the uv data mattered, especially in the less than totally accurate (but much faster) gridded subtraction. Steps were taken in the code to retain the original u, v, w values rather than to rotate them for one facet and then rotate them back before starting the next. In single-precision, numerical error could accumulate in this operation and subtle changes in cell position can change how the gridded algorithm does its interpolation for those few points that are almost exactly on cells. A better-known error is seen in imaging with large numbers of samples, either many visibilities or many spectral channels in bandwidth synthesis. The images, including the beams, frequently show large excursions in the corners. This is the result of a random-walk accumulation of numerical error in gridding followed by a very large correction (in the corners) for the Fourier transform of the gridding function.

We have experimented with making the pseudo-AP operate fully in double precision. We did not add options to send in double precision values, but just took advantage of the improved accuracy internally. Indeed, the problems described above were greatly reduced by this. There are two costs in switching the pseudo-AP to double precision. The first is that the number of data words available is halved, which reduces the number of facets and channels which can be handled simultaneously. This will add to the real time in large problems (where the errors are more important). The second is that the cpu and real times increased by a noticeable amount, probably due to double-precision arithmetic being a bit slower and due to cache limitations when twice the memory is required for an operation. It was concluded that one may make a few algorithmic changes to avoid the worst of the errors (*e.g.*, avoiding image corners, caching u, v, w values for re-use) and that the scientific results of the computations will not be enhanced by the greater accuracy. It is important to pay attention, however, to details. If a single-precision number is used to count a very large number of small numbers, then it will reach a maximum beyond which the small numbers will not contribute even if there are still very many of them. Double precision, or smarter algorithms, are the solutions in such cases.

UV data calibration and handling

FILLM

A significant error, mentioned above in the patches listing, was discovered in the task that translates the current VLA data format into $\mathcal{AIPS}$ uv files. FILLM reverses the direction of some baselines in the data to make them consistent when numbered with the actual antenna numbers; they are written by the VLA on-line system in a consistent fashion based on "dcs" address instead. Unfortunately, the nominal sensitivity (T_{sys}) correction factors were not swapped. During the ModComp era (prior to June 27, 2007), this affected only

Solar data and the weights of cross-hand data. The latter is likely to be of almost no significance, but Solar data should have encountered troubles calibrating polarization. The new, post-ModComp system writes the data as correlation coefficients, forcing FILLM to scale the data as well as the weights by the nominal sensitivity. This means that some baselines will have the cross-hand data incorrectly scaled for data taken after June 27, 2007 using versions of FILLM prior to March 6, 2008. Parallel-hand data were correctly scaled and weighted. Solar data since June 27, 2007 should now be correct.

The 31DEC08 version of FILLM also had a number of improvements. The option to average data on input was extended to include correct averaging of the output tables (TY, PO, OF, WX, and OT), to check integration time as well as elapsed time to terminate an average, and to restart an integration if the first time sample(s) had no valid data. A few more holes, in which FILLM could miss changes of mode or the number of spectral channels at file boundaries, were plugged. The task now writes an on-line flagging table in a new, more general and extensive, format. The task was changed to use an improvement in the on-line format which actually tells the reader which receiver was used. For older data, FILLM will split two IFs from the same receiver if they are at frequencies on opposite sides of one of the "official" band boundaries. Messages will now be issued when the task omits (or includes) pointing- and tilt-mode data. The writing of the header keyword CORRCOEF was corrected. It indicates whether the data are correlation coefficients (+1) or visibilities (−1) and is used by the TYAPL task.

Two new tasks were written to do useful things with the on-line flagging table written by FILLM. They are PRTOF which displays the table, interpreting the flag bit patterns into meaningful words, and OFLAG which may be used to apply selectively the information in the OF table. Note that both of these read only the new OF table. FILLM used to write an OF table once in a while, containing almost nothing of any use.

EVLA-EVLA spectral aliasing

At the current time, the VLA is being operated using some antennas with the old VLA electronics and some antennas with the upgraded EVLA electronics, all of which feed the old correlator. Due to the absence of some prohibitively expensive filters, data from below baseband is aliased into the observing band on EVLA-EVLA baselines only. For narrow-band, spectral-line observations, this causes a serious error in the band shape on those baselines only. Extensive study suggests that the form of the data on these baselines is

$$V(n) = A_c e^{2\pi i\phi} + f(n) A_c e^{-2\pi i\phi} + V_l(n)$$

where A_c is the amplitude of the continuum, ϕ is the uncalibrated phase of the continuum, V_l is any spectral-line signal as a function of channel number n, and $f(n)$ is the strength of the aliasing. It appears that, to first order anyway, $f(n)$ is independent of time, direction, IF, polarization, and antenna and is a real function with no phase term.

We have written a new task FIXAL which fits observations of calibrator sources to determine $f(n)$ and then fits that function to line-free channels in the main data set to determine A_c and ϕ to correct the data for the aliasing. A procedure FXALIAS was written to assist in the operation. It runs BPASS using only VLA-VLA and VLA-EVLA baselines, applies the bandpass to all data with SPLAT, separates the bandpass calibrators with UVCOP, and then runs FIXAL. Note that this operation must be done on totally uncalibrated data — if any phase correction has been applied, the above formula will have been rendered incorrect.

Users should note two things. This problem is temporary. When the new WIDAR correlator is used, the problem will disappear. However, the problem will remain with us until then and will remain in the VLA data archive forever. *At present, the new task and procedure should be regarded as experimental.* They appear to work most of the time and to remove most of the problem. There are niggling bits left and there seem to be isolated cases in which they do not work well.

Other *uv*-editing matters

EDITA and EDITR were changed to handle flagged table rows without dying, to "restore area" with the same complex logic used in "flag area", to know which antennas have data and ignore those that don't, to handle phase plot ranges better, to keep track of source name/number even when only one source is included, and to apply the FG table correctly to TY tables before plotting them.

SNFLG now counts the data to determine the required dynamic memory correctly and benefits from the changes to the EDIT class described for EDITA.

TVFLG now supports channel averaging with NCHAVG and CHINC adverbs and allows auto-correlations to have phase (which they do in cross-hands).

WIPER now has interactive options FLAG BASELIN and UNFLAG BASEL to eliminate/restore all points from a user-entered antenna pair. Up to 10 antenna pairs are remembered for each plotted point. Phase plots handle wraps better.

Other *uv*-display matters

LISTR now supports two gain conversions EFST (effective system temperature) and SEFD (system equivalent flux density) and honors the FREQID specification on gain listings.

VPLOT can now average spectral channels under control of adverb AVGCHAN and can plot channels and IFs separately or together under control of the CROWDED adverb. It can now draw connected lines in color when requested and selects better phase ranges for plotting when possible.

UVPLT was improved to plot phases with the least wrap problem, to implement the fixed scale within a fixed range option, to bin phases in a vector fashion rather than scalar, and to scale u, v, w by frequency.

Other *uv*-related matters

FITLD was corrected for an error that caused weather tables to be garbled and for an error in the logic that decided which antennas to include in the next record being written in the CL table. Code was added for the new software "DifX" correlator to read a new keyword and, based on it, to avoid one of the VLBA digital corrections, while making all of the others.

SPLIT and SPLAT now write a new index table automatically. The index table can help CALIB do a better job of averaging within scans even in single-source files and running INDXR is a nuisance.

DELZN was changed to use the antenna name rather than number since the latter can vary between data sets.

CLCOR was changed to offer a moving-source correction option using either fixed rates or an INFILE and to use the new format of the output from DELZN.

Weights in model division should be multiplied by the model amplitude squared. The gridded method was corrected some time ago, but the DFT method was only corrected in March.

TIORD is a modest task intended simply to report all points in a data set at which the data are not in strict time order. INDXR is very fussy about this, but quits at the first such point without supplying any useful information.

Analysis

RMSD was changed to offer the histogram-fitting method of rms determination, to allow control of the number of iterations in the robust method, and to allow circular as well as rectangular apertures for the computations.

CONVL was changed to offer the option of doing a cross-correlation of two images and to find and fit the maximum in the result.

IMEAN and IMSTAT can now do their thing inside or outside the specified window.

MFPRT was upgraded to offer a variety of new output options including full user control of which columns are displayed and more mnemonic column labels.

IRING was changed to offer more plot options including choice and size of symbol, error bars, connecting of points, and a rescale and relabel option for the x axis. This allows conversion to, for example, kpc rather than arcsec. It now also offers a text-file output option (for use with PLOTR or other plot programs) and uses a plot type fully understood by EXTLIST and PLGET.

ISPEC had displays of total flux, sum of plotted points, and number of non-blanked points added. Previously, one had to add up the numbers by hand.

XGAUS had a number of bugs corrected, one of which caused it to go catatonic when a retry was requested. Additional descriptions were added to the help file to clarify what it is attempting to do.

IMFIT and JMFIT reported the major and minor axis sizes in arc seconds after conversion from pixels, but reported the pixel-fit position angle rather than the one the corresponds to CCW from North in coordinate space. SAD reported this position angle correctly.

Miscellaneous matters

TABED had the operations of delete, clip, and unflag added.

PEELR now supports the SOLMODE option.

I/O count is now displayed in megabytes at the end of each task. If one enters SETDEBUG 1, then all following tasks will display separately the total count and size of ZMIO and ZFIO reads and writes from which the total is computed.

CookBook was reviewed thoroughly and numerous upgrades and corrections were made about January 1.
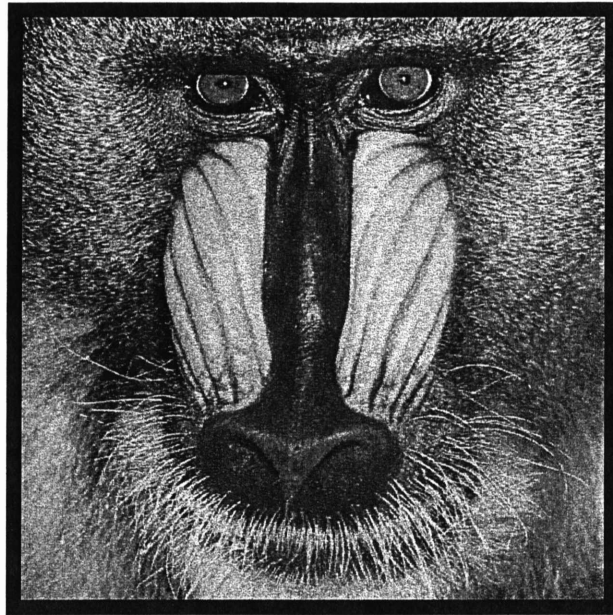
June 30, 2008

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Socorro, NM 87801-0387
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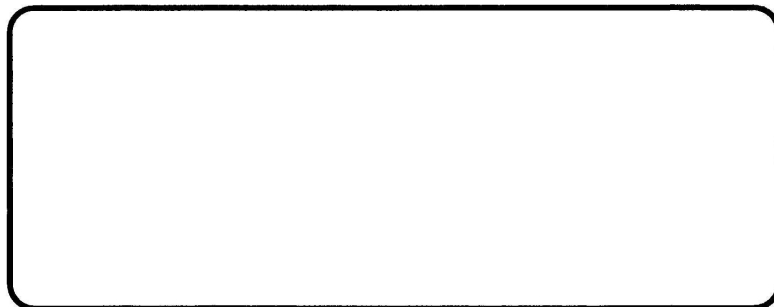
General developments in *AIPS*

Current and future releases

We have formal *AIPS* releases on an annual basis. While we offer a full binary installation method for both the frozen and development versions for MacIntosh OS/X (PPC and Intel chips), Solaris, and Linux systems, all architectures can do a full installation from the source files. The current release is called 31DEC08 and is now "frozen." If you took a development copy of this version at some earlier date, you should use the "Midnight Job" (MNJ) to bring it up to date. You need to run a MNJ only once in 2009 to convert your copy of 31DEC08 into the frozen version. When patches to 31DEC08 are announced, you may apply them with the MNJ. This *AIPS Letter* is intended to advise you of corrections and improvements in this release.

We have begun a new version, called 31DEC09, which is now under development by the *AIPS* Group. You may fetch and install a complete copy of this version at any time. Having fetched 31DEC09, you may update your installation whenever you want by running the MNJ. This uses cvs, rsync, and/or transaction files to copy and compile the code selectively based on the code changes and compilations we have done. We expect users to take their source-only or binary version of 31DEC09 *AIPS* over the Internet (via *anonymous* ftp). Both versions require you to copy the installation procedure install.pl via ftp; the source-only version also requires you to ftp the 90-Mbyte 31DEC09.tar.gz compressed tar file. 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 with previous releases. We have found that cvs works very well, although it has one quirk. If a site modifies a file locally but in an *AIPS*-standard directory, cvs will detect the modification and attempt to reconcile the local version with the NRAO-supplied version. This usually produces a file that will not compile or run as intended.

AIPS is now copyright © 1995 through 2008 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 *AIPS Letter* and is included with every distribution in file $AIPS_ROOT/*release-name*/COPYING.

Installing a new version

If compiling locally, new releases must be installed from the tar ball for that release. If using the binary installation, a full new installation must also be done with `rsync`. The cvs system requires this. When installing a new *AIPS* release in a system that already has a previous release, we recommend that `install.pl` be used and that the previous release be left in place, at least until the installation has been seen to work. If you do this, then you will not have to re-edit the disk, printer, and tape lists and can simply skip all those pages in the `install.pl` menus. The old `$HOME/.AIPSRC` file may be left in place, but it will need to be edited. The lines giving the `DOWNLOADED` and `UNPACKED` parameters should be cleared and the `CCOMOPT` line should be changed to point to the current release rather than the previous one — the `-I` parameter really should be `-I$INC` but it gets its full path name instead. This forces a re-edit with each release. If you have made special versions of `UPDCONFIG` and `do_daily.host`, you should preserve them under new names and restore them after the install. If you have an odd set of *AIPS* versions, the `$AIPS_ROOT/AIPSPATH.*SH` files may need to be edited after the install to set the desired versions.

For Linux, Solaris Ultra, and MacIntosh systems, a binary installation could be available from DVD, supported by `install.pl`. Alternatively, the frozen version may be installed with the binary installation method now present in `install.pl`. The ftp site for downloading files directly has been eliminated.

AIPS Distribution

We are now able to log apparent MNJ accesses, downloads of the tar balls and `rsync` accesses. We count these by unique IP address. Since DSL and some university and other connections may be assigned different IP addresses at different times, this will be a bit of an over-estimate of actual sites. However, a single IP address is often used to provide *AIPS* to a number of computers, so these numbers are at the same time an under-estimate of the number of computers running current versions of *AIPS*. In 2008, a total of 246 different IP addresses downloaded the frozen form of 31DEC07 and 1058 IP addresses downloaded 31DEC08 in tarball or binary form. Fully 1667 IP addresses accessed the NRAO cvs master. Each of these has at least installed 31DEC08 and 429 appear to have run the MNJ at least occasionally. The total number of unique IP addresses in these three lists was 2107. 303 sites accessed 31DEC07 in binary form, while 986 sites used the binary form of 31DEC08. The attached figure shows the cumulative number of unique sites, cvs access sites, tar-ball/binary download sites and binary access sites known to us as a function of week in 2008. These numbers represent substantial increases over those for 2007.

2008 systems shipped and CVS access by site

Since the registration system, always under-utilized, has now been abandoned, we are left with analysis by IP address. The table below lists the IP addresses for 2008 by the final qualifier for shipments of 31DEC08, 31DEC07, and access to the cvs site. The numbers in the cvs column include those sites that install or run a midnight job for these releases. The comments come from what appears to be a semi-official list of Internet codes. Sorting is on the "unique" column, which counts unique IP addresses over the other three columns:

Code	31DEC07	31DEC08	cvs site	unique	Comments
net	14	106	492	543	Network
edu	33	221	296	368	US Educational
uk	7	64	63	85	United Kingdom
de	4	38	63	75	Germany
jp	18	55	58	74	Japan
in	22	29	51	64	India
com	12	31	38	56	US Commercial
es	5	27	45	49	Spain
ca	3	19	26	35	Canada
it	4	27	32	35	Italy
au	3	22	19	34	Australia
org	2	19	27	32	Non-Profit Organization
nl	7	21	20	31	Netherlands
za	7	11	12	24	South Africa
pl	7	6	18	24	Poland
ru	5	13	7	18	Russian Federation
mx	2	11	6	14	Mexico
gov	2	7	8	10	US Government
ar	4	4	6	10	Argentina
fr	1	8	3	9	France
tw	2	6	7	8	Taiwan
br	3	5	4	8	Brazil
mil	0	5	7	8	US Military
hu	4	3	1	7	Hungary
ch	0	5	3	6	Switzerland
se	0	4	4	6	Sweden
ie	1	3	4	5	Ireland
be	2	2	3	5	Belgium
pt	0	2	4	5	Portugal
fi	0	4	3	4	Finland
at	1	3	3	3	Austria
dk	0	2	1	2	Denmark
gr	0	2	1	2	Greece
th	0	2	0	2	Thailand
kr	0	2	1	2	Korea (South)
il	0	1	1	1	Israel
yu	0	1	0	1	Yugoslavia
my	0	1	0	1	Malaysia
bo	0	1	0	1	Bolivia
lt	0	1	0	1	Lithuania
eg	0	1	0	1	Egypt
cx	0	1	0	1	Christmas Island
no	0	1	0	1	Norway
ua	0	1	0	1	Ukraine
cl	0	0	1	1	Chile
None	2	8	6	12	
Unknown	69	252	323	422	
Total	246	1058	1667	2107	

Preview of coming attractions

The 31DEC09 release already contains a few minor changes that we decided were a bit risky or not needed in 31DEC08. TIMDEST has been disabled and RENUMBER can now renumber files to slot numbers higher than any present in the current catalog. TAB characters should be removed on input more fully. The position of the North Pole will be expressed in arc seconds, not meters, a decision enforced by the fundamental routine ANTINI. UVFIX will handle both units properly in 31DEC08.

Improvements of interest to users in 31DEC08

We expect to continue publishing the *AIPS Letter* every six months along with the annual releases. Compared to the first half of this year, there have been only modest changes made to *AIPS* in the second half of the year. New verbs include ASIN, ACOS, and SIZEFILE, the last to assist in controlling the "array-processor" size with SETMAXAP. The last of the basic amplitude calibrator models, 3C147 at C and X bands, have been added to the system. IMAGR was changed to reduce disk I/O where possible, imaging more than one facet for each read through the data. This is a continuation of the major changes in model computation made earlier this year, also in an effort to reduce disk I/O which has become a major bottleneck. During the first half of 2008, the *AIPS* TV was enhanced to support more image planes and a wider dynamic range, use of VLA on-line flag information was enhanced, and procedures to handle the temporary aliasing problem on EVLA-EVLA baselines were introduced.

31DEC08 contains major changes to the display software. Older versions may use the 31DEC08 display (XAS), but 31DEC08 code may not use older versions of XAS. 31DEC04 through 31DEC09 use a new numbering scheme for magnetic tape logical unit numbers that is incompatible with previous versions. Thus all tape tasks and the server TPMON must be from a recent release. Other than these issues, 31DEC08 is compatible in all major ways with the with the 15OCT98 and later releases. There are significant incompatibilities with older versions. Note that the only version which we patch for major errors is 31DEC08; even 31DEC07 is no longer changed.

UV data input/output

FILLM

FILLM, the task that translates VLA on-line data into *AIPS*, was changed quite a bit during the first half of 2008; see the June 30 *AIPS Letter* and the patches list elsewhere in this *AIPS Letter*. FILLM has confused which IF goes with which in applying on-line flags for modes 2BC, 2CD, 4, PA, and PB. This led to some data being flagged that should not have been and other data being left unflagged erroneously. FILLM treated DOUVCOMP = 0 as true, which is very non-standard for *AIPS* logical adverbs; it was changed to be false. A revised on-line format has made the actual receiver ID available to FILLM. This has allowed bands to be defined better, but caused an error in the period September 12 to October 20. During that time, a change of band could cause the last CL table entry for the previous band to have opacity and gain corrections appropriate to the new band. The flagging of data for shadowing has been implemented incorrectly in the on-line system in the post-ModComp (after June 27, 2007) era. The subroutine that computes flagging in FILLM was corrected for a nasty typo and then made the default for shadowing for data from the post-ModComp era. Note that the nasty typo only affected computation of shadowing using a limit other than 25.0 meters, but that the on-line bug affected all recent data. Shadowing is of course only important in the D configuration. FILLM was also changed to determine the configuration for itself, for purposes of writing it in the history file.

FITLD and FITS-IDI

A couple of bugs in the transfer of clock and atmosphere corrections and the geometric delay polynomial from the MC and IM tables to the CL table were found. The first arose when there was more than one *uv* table in a correlator file, a circumstance which seems moderately common. In that case, the update of the CL table was attempted only for the range of times of the last *uv* table of the file. The other arose when IM

and MC tables are the same size from correlator file to correlator file. In that case, the hash tables were not re-initialized and so the desired data of the later files was not found. Both of these bugs were corrected July 28 in 31DEC08 only. These parameters are not widely used in *AIPS*, but they are updated by DELZN and are quite relevant to data sets taken from *AIPS* to astrometric packages. If the first CL table from FITLD has to be replaced by INDXR due to subarray or data ordering conditions, then these bugs are fully corrected.

The FITS-IDI convention layered upon the FITS Format has been widely used for data from VLBI correlators including the VLBA. This convention has been reviewed recently for consideration as an internationally accepted convention. During that review a number of errors and omissions in previous documentation were uncovered and corrected. We wish to encourage all interested parties to review this document and to send any suggestions and corrections to egreisen@nrao.edu. The document may be found at http://www.aoc.nrao.edu/~egreisen/AM113.pdf. FITLD has received several revisions to support these corrections. The new CORRELAT keyword is now used a bit more extensively.

Calibration and editing

VBGLU was corrected for an error in which data that were not in strict TB order could have a wrong baseline's data written into the output. *The error was present starting in August 2006 and all uses of* VBGLU *since then should be re-done.* Errors affecting the gluing of AT and CQ tables were also corrected.

3C147 models at C and X bands have been added to the system. These are available to all releases if one runs a MNJ.

3C48 model at X band has caused high rates of closure error on long baselines. A single data set dominated that model and seems to be the mysterious source of the difficulties. A revised model was released.

UVFLG was changed to make opcode 'UFLG' more restrictive but with "I don't care about this one" values allowed for almost all adverbs. The opcode 'REAS' was reinstated to allow un-flagging based on REASON alone. A new opcode 'WILD' was added to un-flag on REASON with wild-card characters allowed in the adverb.

Modeling with images works well if the images are suitable, *i.e.*, not convolved Clean images. The code was corrected to handle off-set sub-images correctly.

Clean component files may be found with *uv* data sets as well as images. The modeling software as well as PRTCC and VPLOT were corrected for image-centric assumptions.

UVCOP was changed to allow flagging of TY and/or SN tables when a flag table is being applied to the *uv* data.

Nasmyth antenna mounts require some changes to code, primarily in parallactic angle computation. Richard Dodson has provided us with those corrections.

CALIB was corrected to avoid time inaccuracies which caused it to try to read past the end of index tables. The averaging was changed to avoid unfortunate alignments between fixed intervals and the actual data. The setting of the scaling factor in models was corrected to use only facet one and to apply the desired radius to each of the standard amplitude calibration sources.

BPASS now includes the option of an amplitude-only BP function.

FXALIAS and FIXAL were enhanced to allow more control over what is and isn't averaged in solving for and correcting the aliasing of EVLA-EVLA baselines in the old correlator. Defaults were changed to average over very little.

UV2MS was changed to allow full calibration adverbs to be applied to the input data set.

EDITR and EDITA were upgraded to apply a pre-existing FC table to the data prior to the first display, to keep track of source number when only one source is being edited, and to handle AREA flagging more proficiently.

PHSRF was given the full set of calibration and data selection adverbs. This task, which re-references spectral-line data sets, was corrected to work properly for data with more than one IF or polarization.

Imaging and analysis

IMAGR was changed to grid multiple facet images and beams with one read through the uv work file when making the initial images and to re-image several facets with one read when looking for the next strongest in OVERLAP=2 mode. It will now allow a specification in BOXFILE of no Clean boxes for a facet. The option to delete "weak, isolated" Clean components is run when requested as the Cleaning is about to end, but Clean now tries to continue for a while afterward in case the deletion makes a difference in the ending criteria.

SIZEFILE is a new verb to return the size of a file in Mbytes. This information may be of use when running SETMAXAP to control the upper limit to the "array processor" memory size used by *AIPS* tasks.

CCRES was changed to control scaling of the residual image, with the default being to correct to the new beam area. It now uses a careful counting of beam area for smallish beams and supports new opcodes 'ADDP' and 'S+AP' to put the components back as 1-pixel points.

SETFC was made to reduce the allowed phase error when the zenith angle is large or the average $|w|$ is comparable to w_{max}. The default phase error was also reduced — all because it was noted that for southerly fields it was encouraging users to use facets that were way too large. It may now err on the side of smallish facets.

FIXBX now discards all boxes in the input BOXFILE even if the new INFILE has no boxes for the particular facet. The output gets a default inscribed circle if no boxes whatever are found for a facet.

COMB was given the adverb DOHIST to suppress some or all copying of the input history files to the output file.

UVMOD was given the full set of calibration and data selection adverbs.

SHIFT is now always done as arc seconds from the reference position. FRPLT, UVLSF and UVLIN were corrected to do this and to use correct frequencies in the phase shifting. A variety of help files were improved to be more explicit about shifting and to be correct in the usage.

Plotting

UVPLT was corrected to plot log base 10 amplitudes when plotting log and to allow limits on w when plotting the visibility sampling (u and v as the two axes).

POSSM was fixed to handle SOLINT intervals with no data gracefully and to plot log of amplitude under CODETYPEs 'LA&P' and 'LAMP'.

DFTPL was corrected to do phase shifting properly (it was rather seriously wrong) and to fetch the data of the requested channel (it was using only channel 1 data previously).

Miscellaneous

ASIN and ACOS are new verbs that return the arc sine and arc cosine in degrees.

New adverb names have appeared in many tasks to alleviate the overuse of INFILE and OUTFILE. These include DATAIN and DATAOUT for FITS readers and writers plus FILLM. INTEXT and OUTTEXT appear in tasks that write miscellaneous information such as IMEAN and POSSM. CALIN is used to provide input calibration data to APCAL, ANCAL, and FILLM. FITOUT is used for output from fitting tasks such as SAD.

Header keywords are now copied in whole or in part from the input files to the output files. Many tasks ignored these previously.

CookBook files were updated for the new adverb names, UVFLG unflagging options, UVCOP flagging options, new capabilities of XAS, etc.

Sorting   of tables was given a new method to use when the rows are rather long. It sorts in RAM the keys with an input record number and then does a gather read while writing the output table.

Patch Distribution for 31DEC07

As before, important bug fixes and selected improvements in 31DEC07 and 31DEC08 can be downloaded via the Web beginning at:

<div align="center">http://www.aoc.nrao.edu/aips/patch.html</div>

Alternatively one can use *anonymous* ftp to the NRAO server ftp.aoc.nrao.edu. Documentation about patches to a release is placed on this site at pub/software/aips/*release-name* and the code is placed in suitable sub-directories below this. As bugs in 31DEC09 are found, they are simply corrected since 31DEC09 remains under development. Corrections and additions are made with a midnight job rather than with manual patches.

The patch system has changed because we now have binary installations. We now actually patch the master copy of the frozen version. This means that a MNJ run on 31DEC07 after the patches listed below will fetch the corrected code and/or binaries rather than failing. Similarly, patches announced for 31DEC08 during the next year will be available via MNJ as well as ftp. Installations of 31DEC07 and 31DEC08 after the patch date will contain the corrected code.

The 31DEC07 release is no longer available for installation and will no longer receive patches even for egregious errors. It had a number of important patches during 2008. They are

1. REBYTE did not handle tables with long rows (IM and possibly BP) correctly *2008-01-09*

2. FITLD did not translate WX (weather) tables correctly *2008-01-18*

3. DFT model division did not set weights correctly *2008-03-05*

4. FILLM did not scale and weight cross-hand data for some baselines correctly *2008-03-05*

5. VISDFT did not do multi-scale model division and subtraction correctly *2008-04-29*

6. FILLM did not set the CORRCOEF keyword correctly for recent data *2008-06-19*

7. FILLM did not apply on-line flags correctly in modes 4, PA, PB, 2BC, and 2BD *2008-07-08*

8. GO verb limited the usage of GPOS and FPOS to less than some tasks require *2008-08-13*

9. FACSET used the wrong source radius primarily for 3C286, getting the wrong CC flux and model scaling parameter *2008-09-10*

10. The Mac OS/X version "leopard" requires changes to XAS and procedures START_AIPS and START_TVSERVERS *2008-09-26*

11. FILLM did not compute the shadowing test properly *2008-11-18*

Patches for versions older than 31DEC07 remain available from the web site, but only for hand insatllation with local compilation. The binary download site and our working systems contain only 31DEC07 and more recent releases. We are unable to offer significant support for older releases.
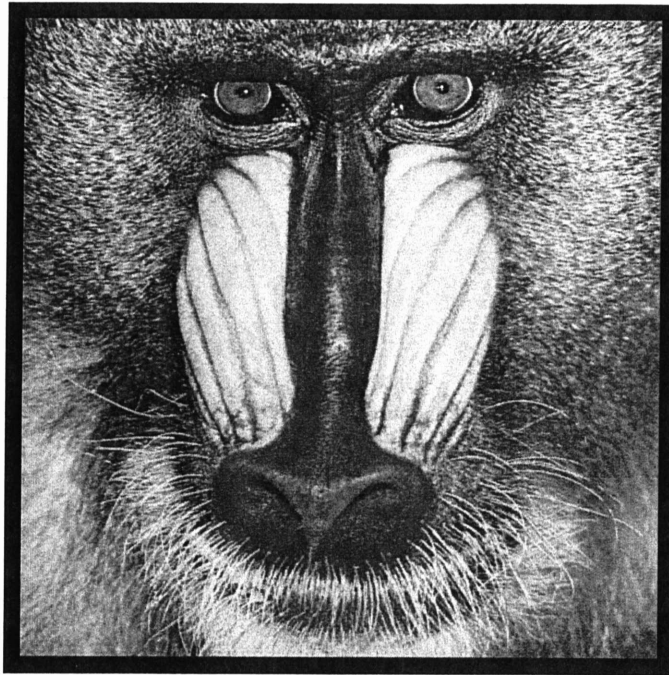
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