A I P S L E T T E R

Volume XXXIII, Number 1: June 30, 2013

A newsletter for users of the NRAO
Astronomical Image Processing System

Written by a cast of *AIPS*

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General developments in *AIPS*

Reduction of JVLA and ALMA data in *AIPS*

This *AIPSLetter* and those from 2010 through 2012 contain numerous improvements to *AIPS* that enable full calibration of modern VLA data and most imaging operations as well. The one exception is the wide-band (bandwidth synthesis) deconvolution algorithm ("MSMFS") being developed in CASA by Urvashi Rao Venkata, for which there is no comparable function in *AIPS*. Calibrated *uv* data may be ported from *AIPS* in "UVFITS" format for use in that program. ALMA data may also be reduced in *AIPS*, although the package is not fully qualified to calibrate data from linearly-polarized feeds. See Appendix E of the *AIPS* Cookbook, available via the *AIPS* web site, for details.

AIPSLetter publication

We have discontinued paper copies of the *AIPSLetter* other than for libraries and NRAO staff. The *AIPSLetter* will be available in PostScript and pdf forms as always from the web site listed above. It will be announced in the NRAO eNews mailing and on the bananas list server.

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 (32- and 64-bit), Solaris, and MacIntosh OS/X (PPC and Intel) systems may install binary versions of recent releases. The last, frozen release is called `31DEC12` while `31DEC13` remains under active development. You may fetch and install a copy of these versions at any time using *anonymous* `ftp` for source-only copies and `rsync` for binary copies. This *AIPSLetter* is intended to advise you of improvements to date in `31DEC13`. Having fetched `31DEC13`, 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. Use a copy of the task and its help file in a private disk area instead.

Improvements of interest in `31DEC13`

We expect to continue publishing the *AIPSLetter* approximately every six months. Henceforth, this publication will be primarily electronic. There have been several significant changes in `31DEC13` in the last six months. Some of these were in the nature of bug fixes which were applied to `31DEC12` before and after it was frozen. If you are running `31DEC12`, be sure that it is up to date; pay attention to the patches and run a MNJ any time a patch releavnt to you appears. New tasks in `31DEC13` include `RMFIT` to fit polarization models to Q/U cubes interactively, `DSKEW` to remove coordinate skew from input (usually optical) images, `FTFLG` to edit *uv* data interactively in a frequency-time display with all baselines averaged, `CLVLB` to apply calibration to correct VLBI data for phase-stopping positions away from the pointing position, `VLAMP` to determine system temperature calibration for the phased VLA in VLBI observations, and `PCVEL` to include planetary velocities when correcting *uv* data spectra to be centered on a line at the source. The interactive Gaussian-fitting task `XGAUS` was overhauled to become a much more usable tool to fit large spectral cubes. The handling of more global coordinate types was expanded and brought up to more modern standards to handle images, primarily optical, now being brought into *AIPS*. A fifth name group (`IN5NAME`, *et al.*) was added with new verbs `GET5NAME`, `M5CAT`, `U5CAT`, `IM5HEAD`, and `Q5HEADER` to support it.

`31DEC09` contains a significant change in the format of the antenna files, which will cause older releases to do wrong things to data touched by `31DEC09` and later releases. `31DEC08` contains major changes to the display software. You are encouraged to use a relatively recent version of *AIPS*, whilst those with VLA data to reduce should get the latest release.

UV-data

Calibration application

Calibration application subroutines, shared by all tasks with `DOCAL` as an adverb, were found to have numerous difficulties. Simple corrections included making various in-memory calibration arrays be structured to include auto-correlations as well as cross-correlations. Prior to that, `DOCAL` on data which included auto-correlations would fail miserably. Then it was found that bandpass calibration was done only for channels `BCHAN` through `ECHAN` even when more channels would be needed to do frequency smoothing after the bandpass was applied (`SMOOTH(1)`> 4).

The `CL` table is supposed to have records at the very start and end of each scan for each subarray as well as at regular intervals in between. If this is in fact the case, then the two `CL` table records to be applied to any datum are easily found and unambiguously correct for the source observed at that time. However, `CL` tables can lose correspondence with the data file in a variety of ways. The most damaging is through the task `CLCAL` which can create a new `CL` table omitting sources, times, antennas, and more. The intention of this omission is to build up a new `CL` table piece-by-piece with different inputs until a new and complete table results. That often fails however. To reduce the frequency of this failure, the default `OPCODE` in `CLCAL` was made `'CALP'` which passes all `CL` table information including that which is not selected for change in the current execution.

The `CL` table contains corrections that are specific to the source for which the record is intended. These include amplitude corrections for antenna elevation gain dependence and atmospheric opacity and phase corrections for antenna and source location, for clock errors, for affects due to the atmosphere and ionosphere, and more. It is therefore an error to use a CL table record from one source for data from another source. Unfortunately, when the CL table was not in pristine condition, the software quite happily did this. It was changed to use only records for the current source, a change that exposed numerous inadequacies in the way the required CL data records are found. It is believed that these have now been found and corrected. However, pathalogical CL tables may still cause difficulties. Be sure to run the midnight job on 31DEC13 regularly — or whenever you encounter difficulties applying calibration.

INDXR was corrected for two ways in which it was able to write more than one CL table record for each antenna at indistinguishable times. Scans consisting of a single record would trigger this as would scans microscopically longer than an integer times the CL table interval.

Polarization calibration also had its issues. Oddly, PCAL had at least 5 separate declarations of the maximum number of calibration sources, with three quite different values. They all now agree on one upper limit (50). DOPOL true with a spectral-channel dependent solution using a polarization model other than the default ('APPR') would run without complaint, but produce nothing but zero for output. The bottom-level routines for these polarization models were all prepared to work correctly for spectral solutions, but a higher level routine refused to call them except for non-spectral solutions. That has been fixed and tested.

VLA Calibration

SETJY has received a variety of significant modifications. It was changed to ignore some of the adverbs on some of the OPTYPEs. Previously, unintended changes could suddenly appear in the source table. A new collection of primary calibration source fluxes was added which includes time dependence for sources 3C48, 3C138, and 3C147. An additional model of source fluxes at low frequencies, due to Anna Scaife and George Heald, was also added. It is the default for data taken at frequencies < 500 MHz. BPASS was also changed to use the new, time-dependent spectral indices for the primary calibration sources.

S-band models at 2141, 2663, 3047, 3463, and 3847 MHz for 3C48, 3C138, 3C147, 3C196, 3C286, and 3C295 were made available. The 3463 MHz ones were made the default S-band ones. Note that these images are based on one A-array data set only and we expect to improve on these models at a later time.

TYAPL was corrected to examine the validity only of the parameters it needs to use. Previously, it would flag post-gain calibrations when the values of Pdif and/or Psum appeared bad. It was given the option to review all the SY data to decide which antennas, polarizations, and IFs have an excessive amount of obviously bad calibration values. With this option, the "bad" correlations are passed through without application of the SY data while those data are applied to all other correlations. CALIB should be able to correct for the omitted SY calibration and it certainly beats deleting the affected data.

SYCOP is used to correct IFs that have bad values in the SY table due to RFI and the like. It was given additional OPTYPEs to control which data are averaged and which replaced.

VLBI Calibration

FRING was changed to run much faster in some cases. The useless division by source fluxes from the SU was dropped. Model division must be done in some cases, but a simple division by flux has no affect on the task other than to waste time. When FRING is told to determine no rates (DPARM(9)>1) and to use no solution sub-intervals (SOLSUB = 0), the data are now averaged on the fly rather than after reading them all separately into memory. This saves a lot of memory in many cases and saves compute time. FRING was corrected to flag multi-band delay when it solves for it, but finds too low a S/N and blanks the individual IF solutions. The routine at the start of FRING that examines the data to find an integration time was improved to return errors and appropriate messages when no data are found or other basic dataset errors arise.

The new task VLAMP was written to use the VLA SY table to write an ANTAB file for the phased VLA. It sums up the system temperatures of the antennas suitably weighted by calibration amplitudes from the CL table to provide the amplitude calibration needed for VLBI arrays which include the phased VLA.

The new task CLVLB was written to correct CL-table amplitudes for any difference in antenna pointing and phase-stopping positions. In VLBI observations, which have minuscule fields of view, this can be done in the *uv* plane, while such corrections must be done in the image plane for interferometers with larger fields of view. The DiFX software correlator is now capable of using numerous phase stopping positions while correlating a VLBI observation. Data from each of these phase-stopping positions are written to separate data files so that software such as *AIPS* will not be confused by multiple sources observed simultaneously. `CLVLB` attempts to model beam squint for each antenna as well as changes in the primary beam size above and beyond those which are simply a linear function of frequency. Initial attempts with this task provided encouraging results, but left a good bit to be desired. As a consequence, debug options have been left in to display solutions in selected ways and to choose two different approaches to the handling of the angles involved (the one we believe to be correct and the one that seems to give better answers).

Editing

`TVFLG` and `SPFLG` received some useful attention over the past six months. The most important change was the addition of a new, large dynamic-memory method to prepare the work files. The old method of writing the same row of multiple output planes at the same time worked well on older disk systems, but does not perform well with modern disk systems. It is now better to read the input file more times if necessary and to write the output file one plane at a time. With large memory usage, it is often possible to reduce the number of passes through the input data while still writing the grid file one plane at a time. Both tasks now have the `DOCENTER` option to control the positioning of the data plot with respect to the menu. This often helps reduce or avoid the overlap of the two. Both tasks also needed the X-axis labeling to be corrected for plots that have so many baselines or spectral channels that only every n'th value can be displayed. `SPFLG` now also has the option to smooth the data in frequency after the grid file has been filled with interactive control over the degree of smoothing.

`FTFLG` is a new task based on `SPFLG`. Like the latter, it displays the data with frequency changing along the horizontal axis and time on the vertical axis. Unlike `SPFLG`, the data from all baselines are averaged together; only the different Stokes are kept separate. Mostly this task in intended as a quick way to examine the data for wide-spread RFI. It does have most of the display and flagging options of `SPFLG`, but, of course, flags all baselines in every flag it generates.

`SNEDT` and `EDITA` were given the ability to edit based on multi-band delay values recorded in `SN` and `CL` tables. Flags generated using multi-band delay, of course, must flag all IFs. `RFLAG` has a new `DOSCALE` option which instructs it to find flux scales for each IF and baseline in an attempt to bring them all up to the same scale. When `RFLAG` is required before `CALIB` can be run, this option provides a near uniform scaling for the cutoff levels.

Miscellaneous *uv*-data matters

FITLD was changed to honor `DIGICOR` for all array names rather than just those labeled VLBA. This requires a `CQ` table in order to apply some of the corrections. Since many files do not have this, `FITLD` was changed to be forgiving about the lack. Handling of `SO` tables was corrected to make a buffer large enough for a significant number of IFs and to fix a bad error message.

TIORD now also checks baseline codes for correctness and has the new `PRTLIMIT` adverb to limit the number of messages printed for the various types of errors in *uv*-data files that it can detect.

SPLAT now honors `OUTNAME` even when writing multiple single-source output files. In that mode, `OUTSEQ` is honored for the first output file and then set to 0 (highest +1) for all others.

UVFIX was given the `INVERS` adverb to control the version of the `CL` or `FO` table read for Doppler offsets. It now checks that file to see if there are any non-zero values and, if not, skips reading the file further. The reading of these files was improved in numerous ways to improve the extraction of the Doppler values.

PCVEL is a new task that reads a text file providing a sequence of planetary velocities. It adds these, with various options, to the corrections for the Earth's motions to shift the visibility spectra so that a selected channel represents a selected velocity with respect to the planet.

SPECR was corrected to avoid losing the data sort order and to handle the fact that the `FQ` table had a format change some time ago.

BPASS was corrected to avoid creating apparent overlaps between scans which could cause very short integrations to be used in bandpass solutions.

Display

UVPRT offers the option to display real and imaginary instead of amplitude and phase and the option to apply an additional scaling to the visibilities. It now prints as many channels as will fit on the line and displays the actual frequency of the first channel being displayed.

SNPLT now offers the option to display multiple data types in separate panels at the same time each with its own plot range. Thus one could set `NPLOTS=3` and plot `PDIF`, `PSUM`, and `PSYS` from the `SY` table with one antenna per page. The task now offers azimuth as an optional horizontal axis.

POSSM now offers the option to smooth the plotted data over frequency after the plot has been averaged. This speeds up frequency smoothing a lot, although it will give somewhat different results than doing it one record at a time when the data have lots of channel-dependent flagging. The task was fixed to recognize Stokes "formal I", to access the calibration data more efficiently, and to handle the upper plot scaling and labeling more correctly.

UVPLT and `WIPER` were given frequency and spectral channel number as additional available axes.

PRTAB was corrected to handle really big numbers in floating-point format and to allow non-integer comparison numbers for integer-valued columns.

Tick mark computation and labeling were corrected for excessive round-offs that led to offsets in the plotted coordinates. Edge issues, especially with difficult coordinate systems (see below), were also addressed.

Imaging

Image coordinates

The IAU FITS Working Group has endorsed a World Coordinate Systems agreement which came along many years after *AIPS* required solutions to the problem[1]. Part I of the agreement[2] is a generalization of the *AIPS* methods which adds the possibility of a skew in the coordinates. While *AIPS* has always allowed a rotation, it still does not support skew generally. However, fits to image coordinates in optical astronomy often find a slight skew which is dutifully recorded by IRAF and other packages in the FITS files which reach *AIPS*. `IMLOD` and `FITLD` report this when they cannot convert the FITS header into something that will be understood fully in *AIPS*. A new task `DSKEW` has now been written to re-grid such images to remove the skew recorded in the `CD`*i_j* FITS keywords saved by `IMLOD` and `FITLD` in the *AIPS* history file. The new task uses much of the machinery of `OHGEO` with only the coordinate translation portion replaced. As such, it will handle blanked pixels congenially.

`AIPS` does not and will not handle the full generality of the IAU agreements. That has been considered carefully and found to be an enormous amount of work for little general benefit. Nonetheless, some of the second part of the agreement on celestial coordinates[3] appears moderately often in images that *AIPS* users need for comparison with their radio data. *AIPS* has been revised to handle some of the more global coordinate systems in a manner incorporating much of the more commonly used generality. Coordinate systems previously known to *AIPS* (Sanson-Flamsteed previously called global-sinusoidal, Mercator, and Hammer-Aitoff) were revised and new ones (Plate-Caree, Molweide, and Parabolic) were added. The old *AIPS* mathematics worked correctly as long as the latitude reference pixel had a value of zero. The big change arises when the latitude reference value is not zero. In the new agreement, the "native" coordinate system of the projection has by definition reference longitude and latitude equal to zero, but the celestial coordinates become oblique when the reference celestial latitude is not zero. This is illustrated in Figure 1.

[1] Greisen, *AIPS* Memos 27 (1983), 46 (1986)
[2] Greisen & Calabretta, 2002, A& A, 395, 1061
[3] Calabreta & Greisen, 2002, A& A, 395, 1076

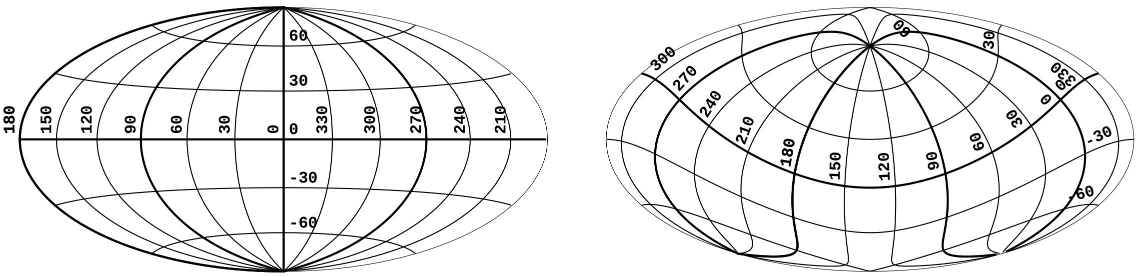


Figure 1: Displays of the celestial sphere in Hammer-Aitoff projection. At left, the reference longitude and latitude are 0, 0 while at right they are 135, 30 degrees.

IMAGR

The main imaging and deconvolution task, IMAGR received a number of bug fixes in this half year, with one new option. That option allows the user to specify in the BOXFILE ranges of facet numbers to be entirely ignored in the cleaning steps. The expected usage is to ignore the more extended scales in the outer facets, but any facet may be so specified. This specification can be absolute or allow a facet to be turned on interactively after it has been ignored in earlier cycles.

Bug fixes include a slight difference in the formulæ for memory requirements between the "planning" stage and the execution stage which was able to cause the task to shoot itself in the foot. The output header values for pointing ("observed") position were sometimes set to zero due to zeros from the data acquisition tasks; the phase stopping coordinate is a better guess in that case. If the BOXFILE defines a facet more than once, an error is now raised. When IMAGR is told to use a specific work file whose contents are not currently good (ALLOKAY ≤ 1.5), the task deletes the file and recreates it to insure that its structure fits current needs. If the user has accidentally specified some file in IN2NAME *et al.*, this may result in unhappiness when a non-work *uv* data set or image gets deleted. IMAGR was changed to try to avoid this, when it can. If the purported work file is in fact an image, a compressed *uv* data set, or a *uv* data set with more than one Stokes value, IMAGR will quit with an error condition. Unfortunately, uncompressed *uv* data with one Stokes looks just like an IMAGR work file and cannot be protected.

Image analysis

XGAUS and RMFIT

XGAUS was substantially overhauled. In the new version, the task starts by building and initializing a table with the fitting results with one row for each pixel within BLC to TRC. It then begins an interactive session trying to fit the Gaussian model to every YINC'th and ZINC'th pixel. Initial guesses are based on the previous fit and, for each new row, the left-most fit in the previous row. If things are going well, the user may turn of interactivity to allow the task to find initial guesses and fits by itself. Interactivity will turn back on automatically if a bad answer is found. After this pass through the data, XGAUS will then go through the data doing interactive fits at very pixel that has not already been fit. The results of the fitting are stored in the table as soon as they are determined. This means that the user may elect at any time to exit the task and resume the fitting at the next convenient time. The task may also be restarted with a higher number of Gaussians to be fit and/or a lower flux cutoff level for the fitting.

After all pixels above specified cutoff levels have been fit, XGAUS goes into a menu-driven "editing" mode. The primary purpose at this stage is to try to improve upon, or flag, the fits at those pixels where the fit appears less than desirable. There are three methods for doing this. The first is to establish the parameter values (S/N in peak, peak residual, center values, width values, and error in widths) which constitute desirable values. There are operations to review all fit pixels to see if they meet these criteria and, if not, to flag the pixel or to try a new interactive fit on that pixel. The second method is to make a list of suspect pixels and then to flag or re-fit those pixels. The pixel numbers may be entered by hand or by pointing at them while

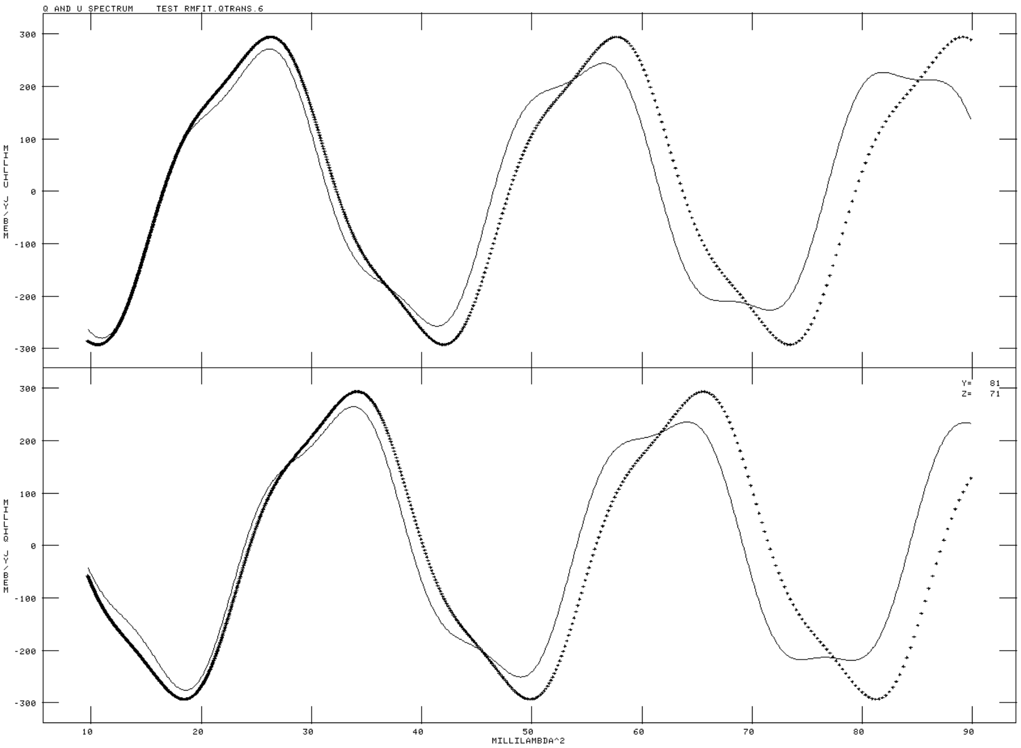


Figure 2: Result of RMFIT at one pixel in a model image with two components. The solid line is the guess based on the FARS output rotation-measures at this pixel; the dots are both the data and the fit, which are indistinguishable at this high S/N.

looking at images of the fit results. The third editing method is a swap of the results between components n and m since the fitting task may confuse which component number goes with those from previous pixels. The swap may be done on the pixel list or on an area marked with a TV blotch function like that used in the AIPS verb TVSTAT. This editing phase will display images of the fit results including the "flux" (integral of the Gaussian in frequency) and their errors. While looking at the image, you may engage in many of the familiar image display functions to adjust the transfer function, color, and zoom as well as examine pixel values with a CURVALUE-like function. It is that last function that allows you to add pixels to the list most easily.

When the user really believes that the results are as good as can be, the task can be told to write out images of the residuals and of each parameter and its uncertainty.

RMFIT is a new task based on the overhauled XGAUS. It follows the sequence of functions described above, but fits the data with the model

$$
\begin{aligned}
Q(i) &= \sum_{j=1}^{n} P_j \cos(2\theta_j + 2\mathrm{RM}_j \lambda^2(i)) \\
U(i) &= \sum_{j=1}^{n} P_j \sin(2\theta_j + 2\mathrm{RM}_j \lambda^2(i)) \,,
\end{aligned}
$$

where i is the spectral channel. RMFIT will attempt to fit n polarization components of total polarization P_j, intrinsic polarization angle θ_j and rotation measure RM_j. The output of the Faraday rotation measure synthesis task FARS is used to provide the data from which initial guesses are found, while the fit is done to transposed image cubes of the Q and U Stokes parameters. During fitting, the FARS results are displayed as amplitude and phase versus rotation measure to allow selecting the initial guess. Then the spectra of Q and U are displayed with the initial guess and the fit in different colors. After the user accepts the result, the task repeats the process on the next pixel.

RMFIT is still in the early development phase. It also differs from XGAUS in that it allows the spectral data to be weighted, with weights provided either by an external text file or by fitting the rms, by robust means, of each spectral channel in the Q and U images. The model may become more complicated. Adding an optional fit for spectral index is one obvious improvement. That will force P_j to be the polarization at some fiducial frequency (1 GHz is widely used in *AIPS*) rather than being the polarization at $\lambda = 0$. More complex models, such as thick polarized emitters, may require more advanced mathematical fitting methods. The fitting code currently used is the modified Levenberg-Marquardt algorithm used by IMFIT and XGAUS, among others, in *AIPS*. It is fast and converges well if the initial guess is not too bad. An example fit to one pixel of a model image is shown in Figure 2.

Other analysis changes

IMFIT, JMFIT, and MAXFIT now return the new adverb FSHIFT which provides a net shift parameter to be used to force the particular component to land exactly on a cell.

FQUBE was given a new option to control whether a fully blanked input image plane is written to the output image. It also checks that each input image plane has a corresponding CG table (Clean Gaussian) entry before allowing it to be written to the output image.

COMB attempts to scale the input images so that they are in units of Jansky per the *same* beam. This caused issues which have been corrected in 'POLC' with noise values in BPARM and with images not in Jansky/beam.

IRING was changed to include column labels and a column of uncertainties in the output text file. It was corrected to use double-precision floats for its counters. Single-precision runs out of sensitivity on large images (*e.g.*, 7000 x 7000).

FARS was corrected to blank the output, computing nothing, for those pixels which were completely blanked on input. Previously it did something with such rows, producing microscopic output values which were almost, but not quite zero.

AFARS was corrected to handle its input headers more carefully; it tried to read more image planes than were present.

General

SETMAXAP was changed to allow the user to request up to 12288 Mega-bytes in 64-bit computers. This is 1536 mega-words in the pseudo-AP since it is now implemented in double precision.

IN5NAME, IN5CLASS, IN5SEQ, and IN5DISK are new adverbs to describe a fifth input data file (required by RMFIT). New verbs GET5NAME, M5CAT, U5CAT, IM5HEAD, and Q5HEADER support this fifth name set.

Patch Distribution for 31DEC12

Important bug fixes and selected improvements in 31DEC12 can be downloaded via the Web beginning at:

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

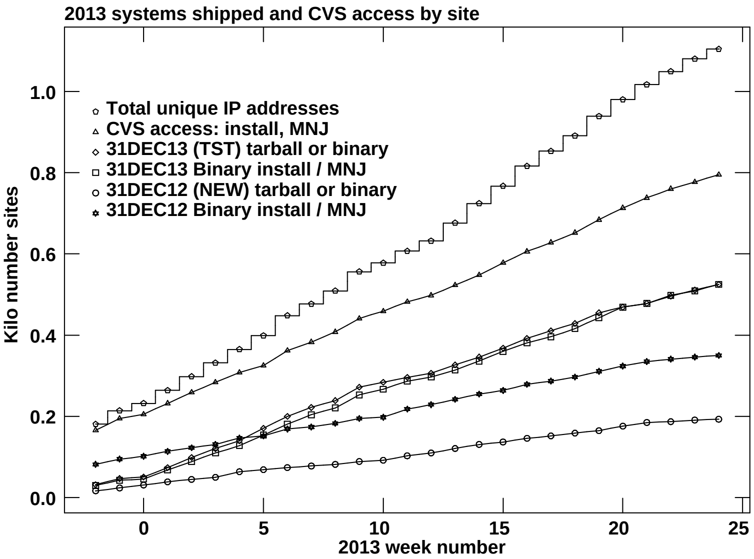
Alternatively one can use *anonymous* ftp to the NRAO server ftp.aoc.nrao.edu. Documentation about patches to a release is placed on this site at pub/software/aips/*release-name* and the code is placed in suitable sub-directories below this. As bugs in 31DEC13 are found, they are simply corrected since 31DEC13 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 31DEC12, which means that a MNJ run on 31DEC12 after the patch will fetch the corrected code and/or binaries rather than failing. Also, installations of 31DEC12 after the patch date will contain the corrected code.

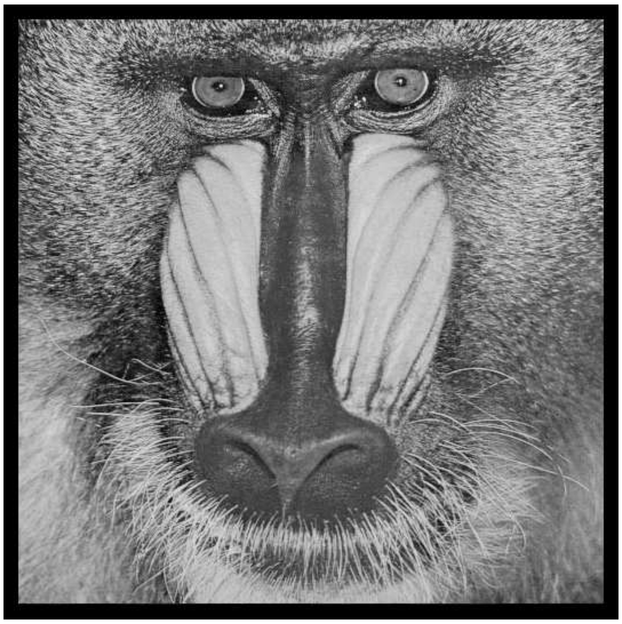
The 31DEC12 release has had a number of important patches:

1. Bandpass calibration was not applied to enough channels to support frequency smoothing afterward. *2013-01-16*
2. Tick increments were computed with an erroneous round-off parameter leading some tick marks to be plotted at offset values. *2013-01-29*
3. `POSSM` had a variety of irritating bugs. *2013-02-05*
4. `FITLD` turned off DIGICOR corrections when the array name was not VLBA. *2013-02-05*
5. `FITLD`, after correction 4, failed if it could not make a `CQ` table. *2013-02-18*
6. `CL2HF` aborted because of an internal name conflict *2013-02-19*
7. `PRTAB` had a format issue with large F formats (NDIG ¡= 0).*2013-03-01*
8. `COMB` did not do `POLC` correctly when using constant noise values *2013-04-04*
9. `AFARS` had a header bug causing it to try to write too much *2013-04-05*
10. `FITLD` could get the `EQUINOX` wrong in the `SU` table with FITS-IDI input *2013-04-11*
11. `COMB` messed up scaling when combining two images with one of them not `JY/BEAM` *2013-05-03*
12. `FITLD` had a bad warning message, causing aborts on some machines. *2013-05-21*
13. `BPASS` rounded times outward for each scan by too much *2013-06-17*
14. `SETJY` used Perley 2010 coefficients but reported Perley 2013 coefficients *2013-06-26*

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 2013, there have been a total of 795 IP addresses so far that have accessed the NRAO cvs master. Each of these has at least installed *AIPS* and 265 appear to have run the MNJ on `31DEC13` at least occasionally. During 2013 more than 193 IP addresses have downloaded the frozen form of `31DEC12`, while more than 525 IP addresses have downloaded `31DEC13`. The binary version was accessed for installation or MNJs by 350 sites in `31DEC12` and 525 sites in `31DEC13`. A total of 1104 different IP addresses have appeared in one of our transaction log files. Some of these numbers are a bit lower than those of 2012 at a comparable date, while the total is noticeably higher.





June 30, 2013

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