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A newsletter for users of the NRAO
$\mathcal{A}$stronomical $\mathcal{I}$mage $\mathcal{P}$rocessing $\mathcal{S}$ystem

Written by a cast of $\mathcal{AIPS}$

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Sad news

We are sorry to report that Leonia Kogan passed away on November 18 in Mt. Vernon, Washington. He retired from NRAO in 2012 after working for NRAO for nearly 20 years, most of that assisting the $\mathcal{AIPS}$ project. His first CHANGE.DOC entry was May 21, 1993. He was a mathematician by training and temperament and solved many of our most difficult, mathematically-based issues. Most recently he worked on FARS, implementing NRAO's first Faraday Rotation Synthesis algorithm. But he is also well known for UVFIX which computes u, v, w from antenna locations and time with much trusted accuracy and for several correction functions in CLCOR, most notably that for the position of the Earth's pole. He is widely known for his work on array configurations, represented in $\mathcal{AIPS}$ by tasks CONFI (array optimization) and UVCON (array simulation). VLBI data calibration received a lot of his attention through tasks such as FRMAP, PCCOR, PCLOD, ACCOR, COHER, DELZN, and ATMCA as well as work on handling orbiting antennæ. He developed UVRFI to excise RFI from EVLA data and did substantial work on tasks VPLOT, SPLAT, FGPLT, ELINT, and RMSD. Leonia's name appears on very many entries in CHANGE.DOC encompassing a much wider range of matters than the list given above would suggest and reflecting his ready willingness to help wherever he was needed. Leonia is missed.

General developments in $\mathcal{AIPS}$

Reduction of VLB, VLA and ALMA data in $\mathcal{AIPS}$

$\mathcal{AIPS}$ continues to be the main software system for the reduction of VLBI data from the VLBA and other telescopes. Since 2010, there have been numerous improvements to $\mathcal{AIPS}$ that enable full calibration of data from the Karl G. Jansky VLA 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 $\mathcal{AIPS}$. Calibrated uv data may be exported from $\mathcal{AIPS}$ in "UVFITS" format for use in that program. ALMA data may also be reduced in $\mathcal{AIPS}$, although the package is not fully qualified to calibrate data from linearly-polarized feeds. Chapter 4 of the $\mathcal{AIPS}$ Cookbook, available via the $\mathcal{AIPS}$ web site, was revised to describe the new calibration operations.

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 and will be shipped with all distributions of *AIPS*. It will be announced on the bananas and MNJ list servers and, usually, in the NRAO e-News mailing.

Current and future releases

We have formal *AIPS* releases on an annual basis. We recommend a full binary installation method for both the frozen and development versions for MacIntosh OS/X (Intel chips only), and Linux (32- and 64-bit) systems, but all architectures can do a full installation from the source files. There are no longer binary versions available for `31DEC18` for Solaris and Mac PPC chip architectures. If you develop *AIPS* code locally *or have system managers that forbid the use of* `rsync` or `cvs`, you will need to do a source-level installation. The current release is called `31DEC18` 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 2019 to convert your copy of `31DEC18` into the frozen version. However, when patches to `31DEC18` are announced in 2019, you may apply them with the MNJ. This *AIPSLetter* is intended to advise you of corrections and improvements in this release.

We have begun a new version, called `31DEC19`, 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 `31DEC19`, you may update your installation whenever you want by running the MNJ. This uses `cvs`, `rsync`, and/or transaction files to copy all changed text files and then to copy the binary files or to 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 `31DEC19` *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 135-Mbyte `31DEC19.tar.gz` compressed tar file. Binary installations use only `rsync`, while locally compiled versions also use `cvs`. 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 new name for the task or put a copy of the task and its help file in a private disk area instead.

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Installing a new version

If compiling locally, new releases must be installed from the tar ball for that release. `31DEC15` and later versions contain improvements to the code which should make local compilation more reliable. If using the binary installation, a full new installation must also be done with `rsync`. 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 new installation has been verified. 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 `$HOME/.AIPSRC` file may be left in place, but it will need to be edited. The lines giving the `DOWNLOADED` and `UNPACKED` parameters should be cleared and the `CCOMOPT` line should be changed to point to the current release rather than the previous one. If you have made a special version of `do_daily.`*host*, you should preserve it under a new name and restore it after the install. If you have an odd set of *AIPS* versions, the `$AIPS_ROOT/AIPSPATH.*SH` files may need to be edited after the install to set the desired versions. The file `$SYSLOCAL/UPDCONFIG` also needs to be edited to correct your e-mail address(es).

`31DEC09` contains a change in the format of antenna files. Previous releases will not understand the antenna coordinates for arrays that were traditionally left-handed (VLBI primarily). The format change occurs automatically when any `31DEC09` or later antenna-file specific code reads the file, after which older releases will have difficulties. `31DEC15` contains a change in the headers of *uv* data sets which will not be understood by previous versions. Note that the only version which we will patch for major errors is `31DEC18`; even `31DEC17` will no longer be changed.

Improvements of interest to users in `31DEC18`

In the latter half of 2018, new tasks appeared including `PDEDT` to flag the polarization D term table data and visibility data, `PEEK` to solve for updates to VLA pointing parameters, `TGREP` to examine a user's `TGET` files for usage of a specified task, `TVIEW` to display a spectral-line cube interactively in all 3 transpositions, and `SNBLP` to display calibration tables in baseline form, *i.e.*, as they would apply to data. A new verb `SCAT` was added to list all scratch files and a new procedure `OKCOLORS` was added to set colors for `LWPLA` that use less printer ink. New tasks in the first half of 2018 include `TLCAL` to convert VLA telcal files into an initial `SN` table, `XYDIF` to solve for the X minus Y phase difference for linear polarization data, `PLOTC` to display the colors used by various tasks on `DO3COLOR TRUE` with labeling to show which polarization, spectral window, channel, and/or source goes with which color, and `SPFIX` to make a spectral cube from the intensity and spectral index images produced by `SPIXR`.

Normally, bugs which appear in an *AIPS* `TST` version and then are fixed in that same version before its release get little or no discussion in the *AIPSLetter*. Since a rather large number of sites now install the `TST` version of *AIPS* during its development, this is somewhat of an oversight. We urge you to run the "Midnight Job" at least once after `31DEC18` is frozen to bring it up to date and to fix all bugs of this sort. We urge active sites to use the MNJ and, when something odd occurs, to examine `CHANGE.DOC` using the cgi tool available from the *AIPS* documentation web page (`http://www.aips.nrao.edu/aipsdoc.html`). Please do not hesitate to contact us via the NRAO help desk (`https://help.nrao.edu`) or via e-mail `daip@nrao.edu` with any questions or suspicions that there are problems.

VLBI matters: Miscellaneous

FITLD was changed to offer the `DOWEIGHT` option to set data weights to more reasonable values (*i.e.*, scaled by integration time and bandwidth). The maximum number of sources was raised to 10000.

CLCOR was changed to get the `EOPS` option to handle correctly concatenated data sets with messy groups of times in the `CT` table.

DTSIM was changed to enable Nasmyth mount antennas and to handle polarization properly. In both cases, correct code was present in the task but the access to it was flawed. Added the option to correct for parallactic angle or not.

VPLOT was changed to detect good data no matter what its weight and the bandpass routines were changed to ignore the outermost channels even for VLB data.

BSCAN was corrected for inaccuracy in data times and now gets more correct results.

VLBAUTIL procedures for EOPS and TECR were changed to allow the user to download the data files in advance. `VLBARUN` was updated to support these options.

UV data: Miscellaneous

FRING and `RLDLY` were given a new option to allow the user to specify which IFs should have the same delay and rate. This allows the groups to have different numbers of IFs, an option in frequent use on the VLA. `PIPEAIPS` was updated to support this option. `RLDLY` was given the option to average over all times when `SOLINT < 0`.

PDEDT is a new interactive task to edit polarization D-term tables and, optionally, the corresponding *uv* data. Since the PD table does not contain source or time information, the user must specify the sources and time range to be flagged.

BPEDT was changed to allow editing on BP table weights, to allow more colors (*i.e.*, times), to reduce the number of messages and flags generated, to defend the user from excessive FLAG ABOVE and FLAG BELOW commands, and to improve the finding of samples selected by the user.

EDITR was changed to correct an error affecting the last data time. The whole edit class had the improved finding of samples algorithm added.

Table sorting can request very large buffers, so the maximum size of I/O buffers was increased to 256 Mega words.

SETJY was given more synonyms for the new special sources (3C380, Cygnus A, etc.) added to the flux information.

Polarization calibration was corrected to handle failed solutions, flagging appropriate data.

RLDIF was changed to include a modest frequency dependence for the polarization angle of 3C286 and the values for 3C48 and 3C147 were corrected (they used those for 3C138!).

PEEK is a new task to read VLA pointing correction files to determine updates to the VLA pointing parameters. It replaces a stand-alone program having less certain maintenance.

OOSUB was corrected so that it can work with one source read from a multi-source data set.

UVHOL was changed to improve the labeling of plots, to have the option to scale amplitudes by the flux in the source table, and to label the output data columns. HOLOG reads that label and now can handle real/imaginary as well as amplitude/phase.

CQ tables are now provided with *AIPS* data files read in by BDF2AIPS. They are used to correct amplitudes for delay errors when post-correlation frequency averaging is done. The code was changed to correct VLA data as well as VLBI data. This has led to a number of annoying messages when the CQ data are not available when one would like them to be.

BPWAY was given an option to control how input weights are used (or not).

REWAY was given the option to substitute the average cross-hand weight found for all weights. Parallel-hand visibilities can appear noisier than they are due to real source structure.

Imaging and Display: Miscellaneous

IMAGR was corrected to use and output the simple average frequency when the spectral-index option is invoked. A more carefully computed frequency is used otherwise.

TVIEW is a new interactive task to display a spectral-line cube in all 3 transpositions along with an optional reference image. *AIPS* Memo 124, describing its use, was written.

SNBLP is a new task to plot SN and CL table solutions on a baseline basis, *i.e.*, as they would be applied to data. Phases that appear noisy on an antenna basis may not appear noisy on all baselines. This is the basis of the JUMP option in SNFLG.

XYRATIO caused some plot tasks to make plot symbols with different sizes in the two axes. This was corrected.

OKCOLORS is a new built-in procedure designed to make suitable colors for LWPLA but with a white rather than black background.

LISTR can now display azimuth. Previously it could do only elevation and parallactic angle.

PLOTC was enhanced to support BPEDT and PCEDT.

General

CookBook chapters were updated in July and August for various minor updates and a new appendix covering holography and VLA-specific tasks was written.

SCAT is a new verb that lists any scratch files over all disks.

TGREP is a new task which reads TGET files for all users and reports any usage of the specified task including date and time. This is helpful in finding when you last used tasks.

GO and TPUT made an error in communicating parameters to the task data file when the adverbs exactly filled an integer number of disk records. RLDLY caused this error to be found when BPARM was added.

EXTLIST and PLGET were updated to include support for BPEDT, PCEDT, PEEK, and LOCIT.

AIPS Distribution

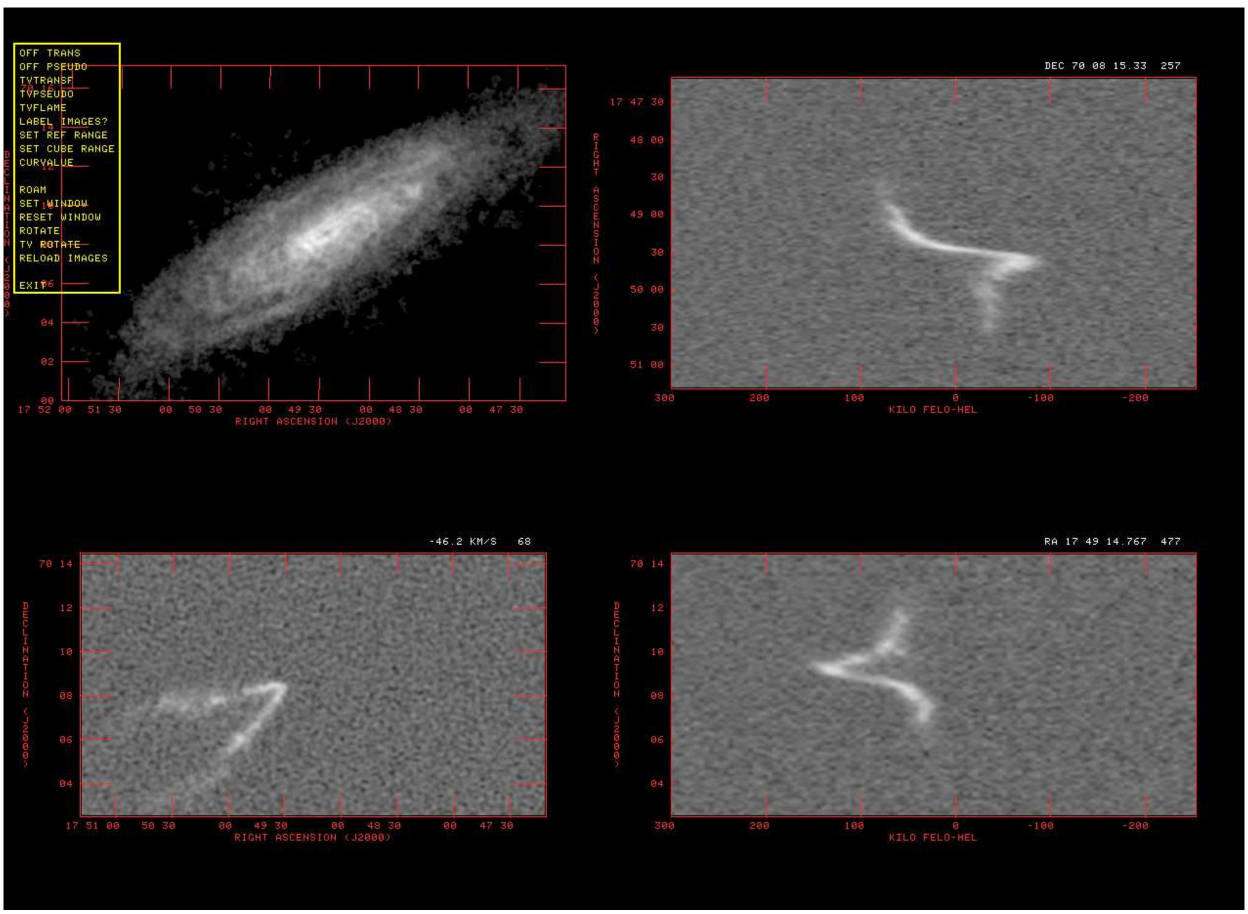
From the NRAO system logs, we count apparent MNJ accesses, downloads of the tar balls, and rsync accesses by unique IP address. Since DSL and some university and other connections may be assigned different IP addresses at different times, this will be a bit of an over-estimate of actual sites. However, 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 2018, a total of 368 different IP addresses downloaded the frozen form of 31DEC17 and 684 IP addresses downloaded 31DEC18 in tarball or binary form. Fully 461 IP addresses accessed the NRAO cvs master. Each of these has at least installed some version of AIPS, but with the change to the MNJ we are unable even to guess how many sites have run the MNJ. The total number of unique IP addresses in these three lists was 1099. The table below shows these numbers as a function of year since we began recording them. The plot of numbers versus time shows that 2017 and 2018 were very similar for the first half of the year but then 2018 fell off the 2017 pace.

year	TST name	NEW name	TST	NEW	TST binary	NEW binary	cvs	Total unique
2004	31DEC04	31DEC03	808	196			797	1276
2005	31DEC05	31DEC04	832	246	299	48	982	1460
2006	31DEC06	31DEC05	806	191	402	94	1050	1398
2007	31DEC07	31DEC06	965	277	669	161	1385	1811
2008	31DEC08	31DEC07	1058	246	986	303	1667	2107
2009	31DEC09	31DEC08	1228	307	1082	478	1855	2399
2010	31DEC10	31DEC09	1228	307	1203	477	1914	2416
2011	31DEC11	31DEC10	1105	270	1064	424	1747	2228
2012	31DEC12	31DEC11	940	284	1028	396	1309	1698
2013	31DEC13	31DEC12	1014	307	990	443	1264	1937
2014	31DEC14	31DEC13	1045	333	848	431	1023	1843
2015	31DEC15	31DEC14	1104	309	1001	350	1070	1817
2016	31DEC16	31DEC15	878	222	788	372	761	1330
2017	31DEC17	31DEC16	874	408	768	386	644	1383
2018	31DEC18	31DEC17	684	368	603	343	461	1099

Recent AIPS Memoranda

All AIPS Memoranda are available from the AIPS home page. AIPS Memo 124 was written to describe the usage of the new spectral-line viewer TVIEW.

124 Further Exploration of Image Cubes in AIPS
Eric W. Greisen, NRAO
November 15, 2018
AIPS has powerful tasks to fit models to the spectral axis of image cubes. Tasks like XGAUS and RMFIT are easier to run if the user is already familiar with the general structure of the data cube. Task TVSPC was written to explore data cubes with emphasis on plots of spectra. Now a new task TVIEW has been written to explore data cubes with displays of position-velocity transpositions of the data cube. This task provides an additional exploration tool within the AIPS environment, rather than requiring users to export their cubes to one or more of the many excellent visualization tools now available. TVIEW offers the option of rotating the image in the celestial axes so that the position-velocity curves may be viewed along axes pertinent to the source, *e.g.*, the major axis.



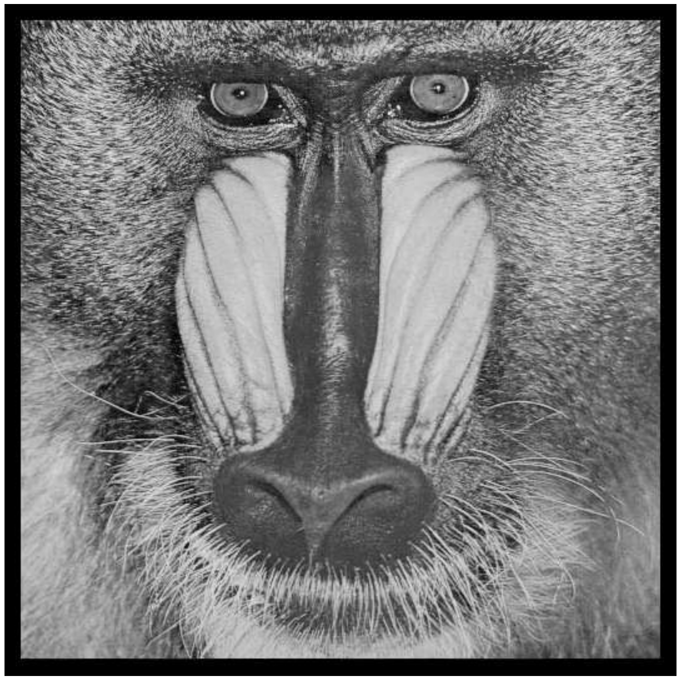
Screen shot from TVIEW: HI moment-zero reference image with image cube in 3 transpositions. The images are labeled, the reference image has been sub-imaged, Y and S planes have been changed by a ROAM in the lower right image.

Patch Distribution for 31DEC17

Because of the extensive use of binary installations, we now patch the master copy of the most recently frozen version. Older versions are not corrected even for egregious errors. Thus, 31DEC17 was patched during 2018 and 31DEC18 will be patched as needed during 2019. Your copy of them may be corrected simply by running a Midnight Job. Information about patches and the code may be found using links from the main *AIPS* web page or by *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. Patches to older releases are kept here as well, but they will require local compilation.

The 31DEC17 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 2018. They are

1. Linear polarization handling applied the parallactic angle twice. *2018-01-09*
2. Batch has not worked for some years. *2018-01-16*
3. CALIB would not use SMODEL on multi-source data sets *2018-01-16*
4. UVSUB did not do OPCODE 'MODL' correctly for multiple facets. *2018-01-20*
5. SETJY printed erroneous error bars with the latest 2017 flux scale. *2018-03-01*
6. UVSUB did not do OPCODE 'MODL' correctly; weights came out zero. *2018-03-14*
7. Large gridded models did not allocate sufficient memory. *2018-04-04*
8. Antenna file reformatting in place failed on files with large numbers of IFs. *2018-04-04*
9. FITLD did not correct duplicate FQ IDs properly. *2018-04-04*
10. DBAPP had an old version of the data pointers and failed to copy modern data properly. *2018-04-09*
11. FQUBE wrote many CG tables when none were input. *2018-04-23*
12. FITLD did not handle antenna files properly when concatenating. *2018-04-24*
13. DOBAND 3 interpolation flagged too much data with failed bandpass solutions. *2018-04-27*, *2018-06-26*
14. Model computation made errors in DFT mode when 4 polarizations were being computed. *2018-06-20*
15. UVSUB did not do MODL correctly with compressed data. *2018-06-20*
16. DOBAND 3 interpolation flagged still too much data when there were failed bandpass solutions and the LNX64 version confused the compiler. *2018-06-26*
17. DOPOL true did not handle magic blanks in the polarization solutions. *2018-07-16*
18. OOSUB did not handle multi-source files correctly. *2018-08-10*
19. AIPS did not do TPUT correctly when there was an exact alignment of the number of adverb values with record boundaries. *2018-08-17*
20. RM could not handle more than 5 or 10 spectral channels due to a very small buffer. *2018-10-03*
21. RLDIF used the wrong position angles for 3C48 and 3C147. *2018-12-18*



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