Recent Developments in Experimental AIPS

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available from

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INFRASTRUCTURE

Dynamic memory

- offset from standard Fortran array
- allocated by C call to `malloc`
- list kept of memory allocations to avoid leaks
- tailors memory/swap to user's problem

Image & graphics "TV" display

- interface simplified to simple data passing
- data conversion to/from FITS standard done in "Y" routines and in `XAS`
- device description & image catalog in `XAS`
- character & vector generation in `XAS`
- allows CVX to know state of TV from/to anywhere
- connected sets of disk files no longer needed
- device locking handled by new dæmon

developments anticipated soon:

- multiple display servers on one compute server
- Unix rather than Internet sockets (when possible)

PROCESSING OF INTERFEROMETRIC DATA

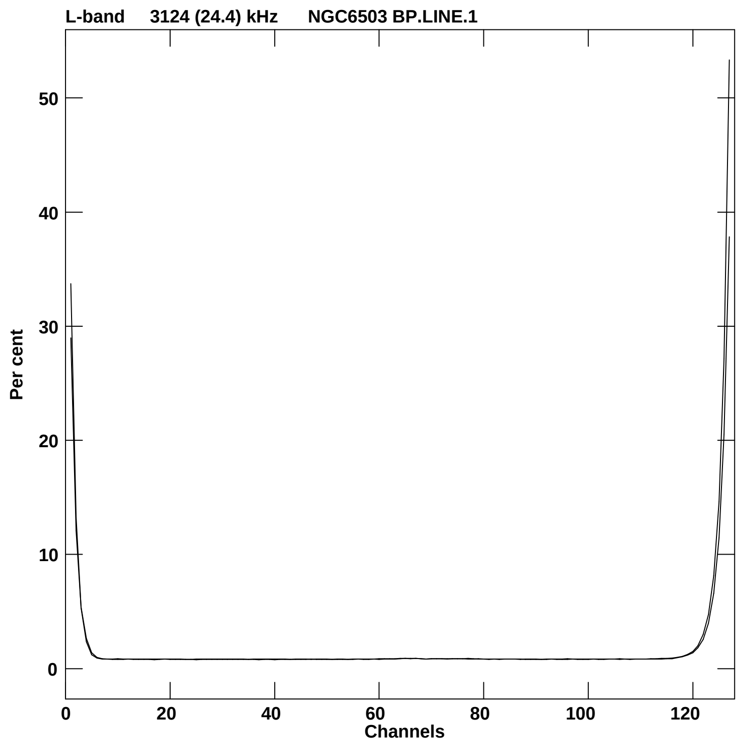
Spectral bandpass calibration

- solutions weighted, weights retained for later use
- new task to smooth and/or fill in solutions over time
- new task for plotting bandpass solutions
- statistical measures of closure failure added
- new task to plot closure failures (see plots)
- dynamic memory used when applying bandpass calibration
- time-interpolated bandpass calibration application available

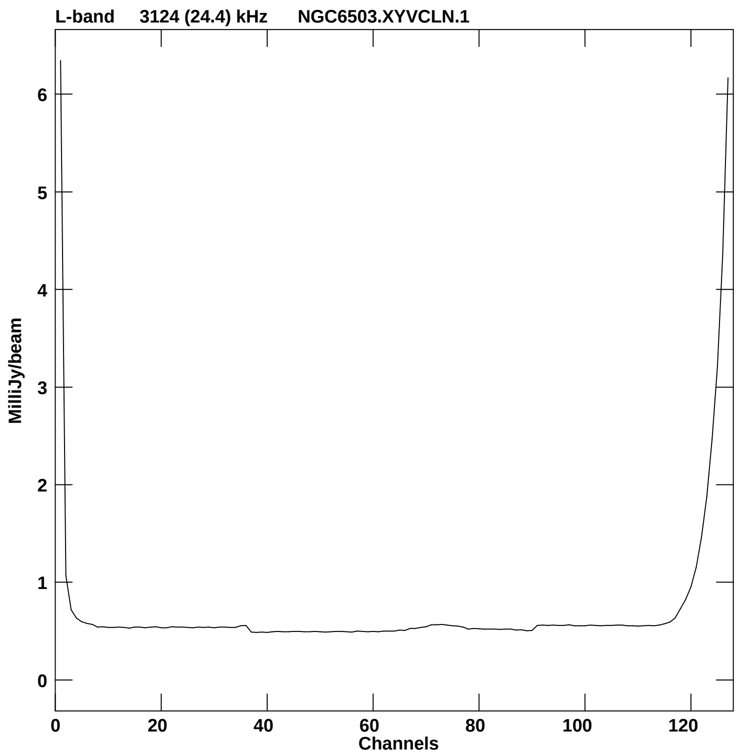
Miscellaneous

- Statistical reporting added for continuum closure failure
- New task to join overlapped spectra in uv data
- New task to difference matching uv data sets
- New task to rotate and scale images
- New task to find sources in large spectral cubes

Bandpass closure failure vs noise in final images



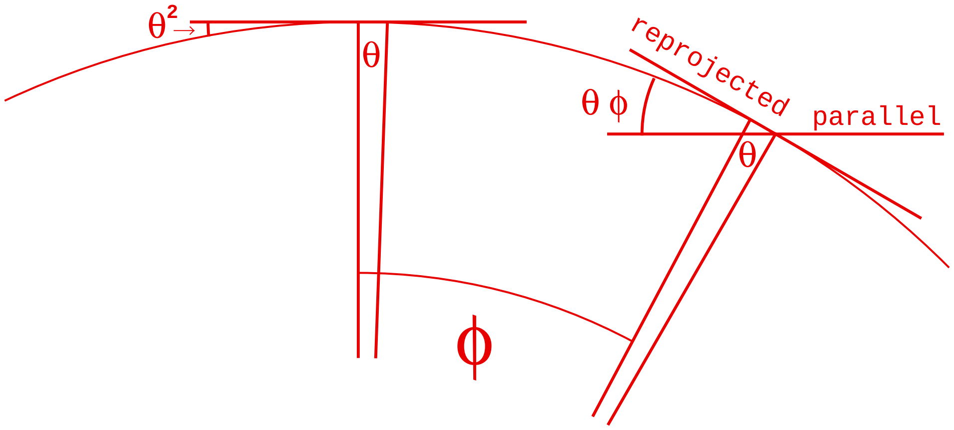
Average amplitude bandpass closure failure



Non-signal rms spectrum of Cleaned image cube

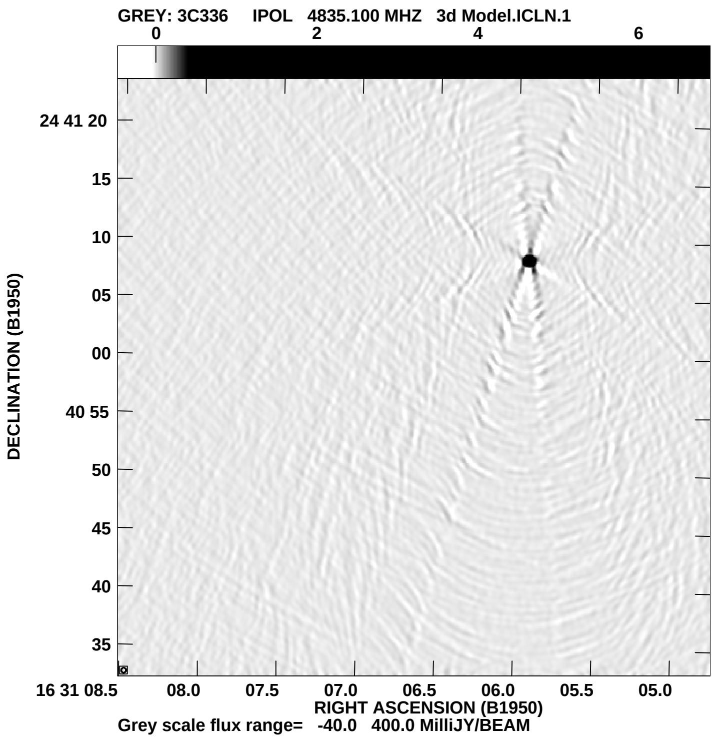
Multi-field imaging

- CVX uses ≤ 64 fields to image primary and interfering sources
- "3d" option to make each field a tangent plane

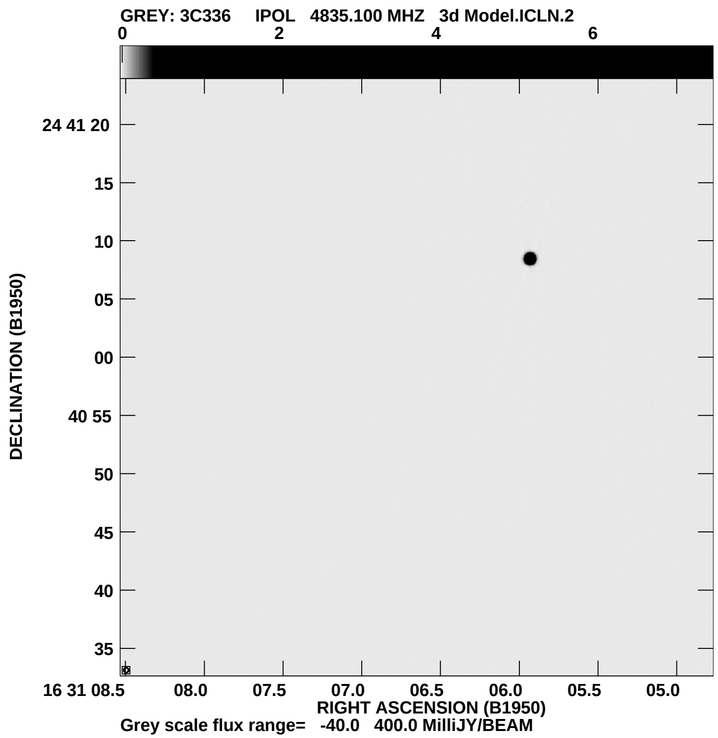


- => increases undistorted field of view in each field
- => requires separate dirty beam for each field
- => requires separate Clean in each major cycle for each field
- => allows special sequencing to handle overlapped Clean search areas, preventing serious instabilities
- CVX can restore Clean components to each field in which they occur, rather than just where they were found
- 3d Clean-component models supported by all CVX tasks namely self-cal, model subtraction, model display, etc.

3d versus non-3d imaging



Cleaned model without 3d-reprojection



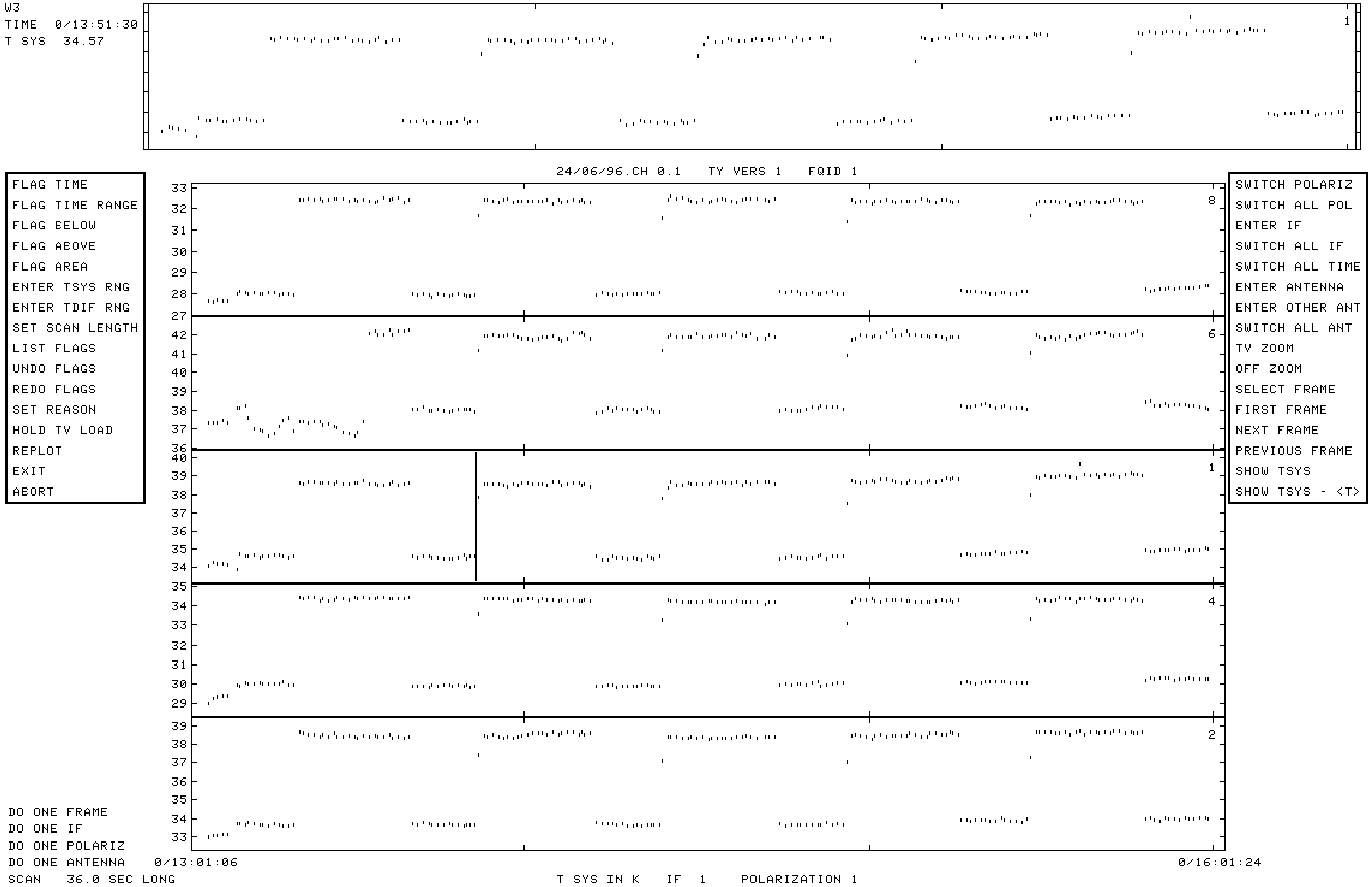
Cleaned model with 3d-reprojection

Gaussian model with some noise located 2° from the phase center and 14.9 arcsec from the image center.

Object-based Fortran and Data editing

- Bill Cotton developed object-based Fortran for AIPS with classes for arrays, vectors, images, *uv* data, tables and for Clean, calibration, image interpolation, printing, coordinates, ...
- I added a TV class with numerous displays as "methods"
- For CVX, an interactive Editor class was developed
  uses *uv* or table data to edit the *uv* data set
  displays data to be edited, 0–9 other antennas for comparison
  uses TV-class graphics for plotting, menu, labeling, marking
  can display second *uv* data set in 2^{nd} color for comparison
- `SCMAP` already combined imaging, Clean, self-calibration and interactive display classes for a *uv* data class
  added Editor option with $+115 - 18$ lines of code
  could add 64 3D overlapping fields simply by adding parameters to the inputs and passing them to the appropriate classes
- Editing based on T_{sys} is found to remove most of the bad data

Data editing with the T_{sys} table



`EDITA` display of T_{sys} showing mis-labeled data in need of deletion

PROCESSING OF SINGLE-DISH DATA

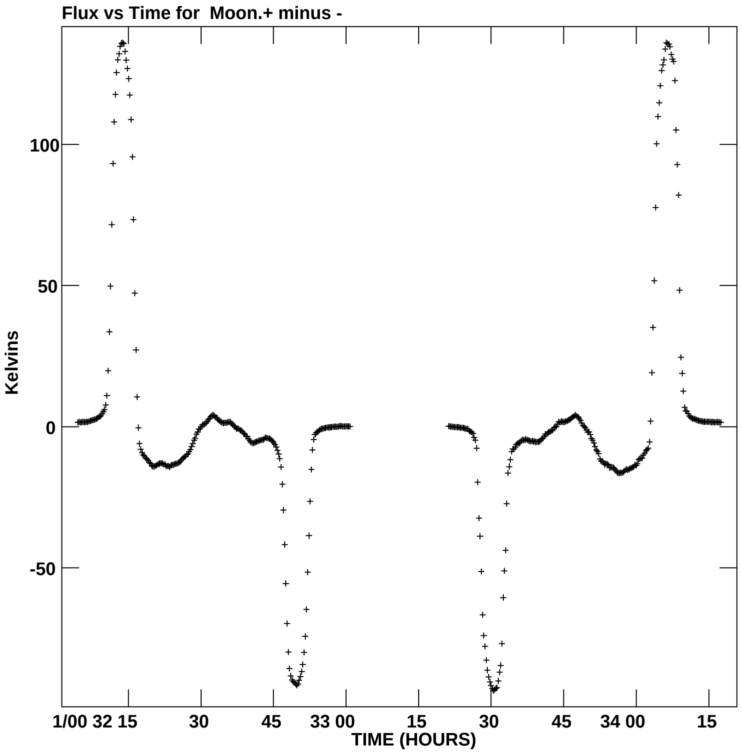
On-the-fly spectral-line imaging

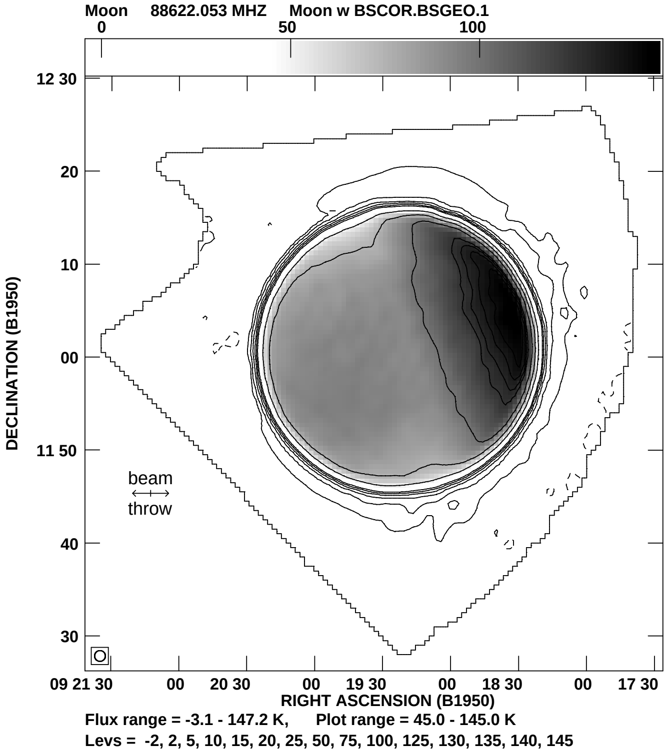
- All 12-m IFs translated to AIPS simultaneously
  gains and offs interpolated in time
- New task to index 12-m data files
- New task to subtract spectral baselines before imaging
- Weighted image averaging allows any number of input images
- Imaging done without large scratch file

On-the-fly beam-switched continuum imaging

- Beam-switched 12m continuum data may be read into CVX
- The 2 data sets may be differenced for editing; see plot.
- They may be imaged and baselined and then
  corrected using Emerson's convolutional methods.
- Instrumental errors in throw length and angle may be corrected.
- Azimuth-elevation images are re-gridded onto celestial coordinates.
- Image quality is limited due to sampling effects (telescope
  wobble) inherent in on-the-fly observing.

On-the-fly beam-switched continuum imaging





Beam-differenced left and right moving central scans

Corrected image of Moon by Jeff Mangum