NRAO's VLBA data calibration pipeline

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SUMMARY

The NRAO VLBA data calibration pipeline is a 'runfile' which executes in AIPS using the VLBAUTIL procedures. The VLBA data calibration pipeline applies basic calibrations to the data and, to evaluate the calibration, produces plots and images. It is not intended to produce final editing, calibration, and high fidelity images. It is available in AIPS releases beginning with 31DEC02.

The NRAO has run the VLBA data calibration pipeline on many suitable experiments since July 2002 with the outputs provided to the observer. The VLBA data calibration pipeline is currently run on continuum and spectral line data sets between 1 and 15 GHz observed with only the VLBA and correlated in Socorro. We expect to extend and improve the capabilities gradually.

WHAT IT NOW DOES

- Calibration for gain, bandpass, parallactic angle, and instrumental polarization, using pulse–cal (continuum) or manual p–cal (spectral line) for frequencies between 1 and 15 GHz (sometimes down to 0.3, and up to 43 GHz).
- Flagging of some bad data
- Application of ionospheric correction with TEC models
- Phase–referencing for up to 15 reference–target pairs
- Calibration for (pseudo–)continuum and spectral line data
- Calibration and imaging of all sources (e.g. surveys) including limited self–calibration of strong sources

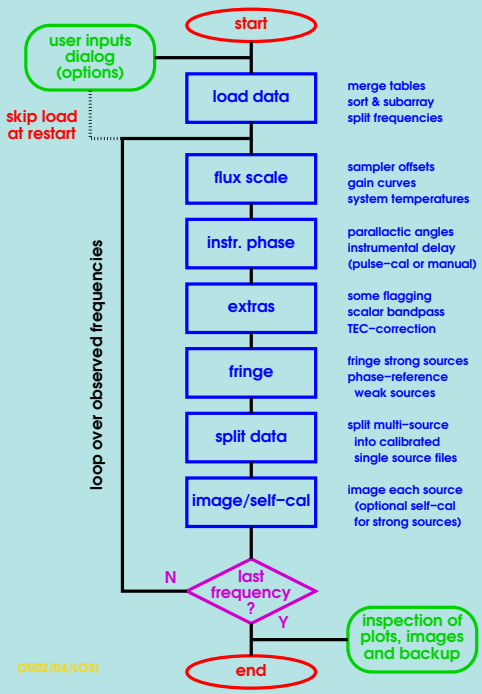
WHAT IT WILL DO LATER

- Improved spectral–line bandpass calibration
- Improved full polarization calibration & imaging
- More robust non–interactive flagging of UV–data
- Manual calibration transfer (from TSM text–files)
- Better low, high frequency calibration (<1 & >15GHz)
- Tropospheric model correction at high–frequency
- Inclusion of VLA (Y1), GBT and Effelsberg telescopes
- Including VLA phased–array (Y27) calibration
- Inclusion of other (non–NRAO) VLBI telescopes

WHAT IT MAY NOT DO

- Correct for "unfortunate" observing conditions, e.g. :
  complex source structure in calibrators
  loss of phase–coherence while phase–referencing
  excessive RFI; radio frequency interference
  using non–optimal observing techniques
- Process data from correlators other than the VLBA
- Flag data with high–fidelity techniques, e.g interactively
- Imaging with advanced algorithms, e.g multiple resolutions
- Self–calibrate data with advanced hybrid mapping, etc.
- Apply Doppler tracking for individual line sources (CVEL)

NRAO'S VLBA DATA CALIBRATION PIPELINE

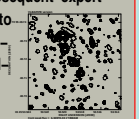


HOW IT WORKS

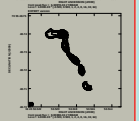
- The VLBAPIPE script uses AIPS VLBAUTIL procedures developed by Chris Flatters and Amy Mioduszewski.
- A schematic flowchart is shown in the central column.
- The images and calibration plots it makes are to assess the quality of this initial calibration. They are rarely suitable as final results. It is advised to run the VLBAPIPE procedure, flag more bad data, and run VLBAPIPE again.
- VLBAPIPE writes single–source, calibrated data sets that are a good starting point for additional editing, self–calibration, and imaging.

HOW IT WORKED

- These figures show a VLBAPIPE and subsequent 'expert' image. The pipeline required 10 minutes to make this phase–referenced, but not self–calibrated, image after loading. Data loading and fringe–fitting take the most time.



- Other example execution times:
  - 8–hour observations, 3 frequencies
    6 x phase–ref: 20 minutes (+ 30 to load)
  - 4–hour observations, 1 frequency
    1 x phase–ref: 3 minutes (+ 2 to load)



HOW TO MAKE IT WORK

- Check "data calibration service" on the proposal and we will do our best calibration for you to FTP to your home
- Send a request to lsjouwerm@nrao.edu and we may be able to calibrate your data and make it available through FTP
- OR DO IT YOURSELF:
  Install the 31DEC03 version of AIPS on your computer, study "explain VLBAPIPE", and then run it on your data. See also http://www.aoc.nrao.edu/~lsjouwer/vlbapipe for further information or request help and hints from Lorant Sjouwerman by sending an email to lsjouwerm@nrao.edu