Obit: Software Environment

- Why develop a new package?
  - AIPS not properly maintained the last 10+ years
  - AIPS architecture difficult to extend
  - No suitable environment for algorithm development
  - Fortran 77 losing compiler support

Obit: What?

- What is Obit?
  - Software environment for algorithm development.
  - Modest requirements on host computer
  - Re engineer AIPS algorithms and data structures
  - Support multiple external data representations (currently AIPS and FITS)
  - Data model and structures compatible with AIPS
  - AIPS and Obit Software inter-operable
  - Modern software environment:
    - Object oriented in c
    - Extensive use of third party packages
    - Python user interface
    - Communication via xmlrpc

Obit: *Components*

- Class libraries in c with glib extensions
  - Simple class hierarchy system
  - Python binding to high level functionality
- Standalone compiled "Tasks"
  - Similar to AIPS tasks
  - Can be run from command line or python shell
- ObitTalk python shell
  - Similar in function to AIPS POPS
  - Derived from ParselTongue (RadioNET)
  - Can run tasks, and
  - Manipulate data using Python interface
  - Executes locally or remotely over network

Obit Tasks

- Similar to AIPS tasks:
  - Can run synchronously or asynchronously
  - Can run locally or remotely
  - Given parameters, operate on datasets and images
- Compiled executables in c
- Can talk to ObitView, interactive image display
- Comparable to or faster than AIPS equivalents
- Inter-operable with AIPS tasks for AIPS data
- Online documentation

ObitTalk Task Window
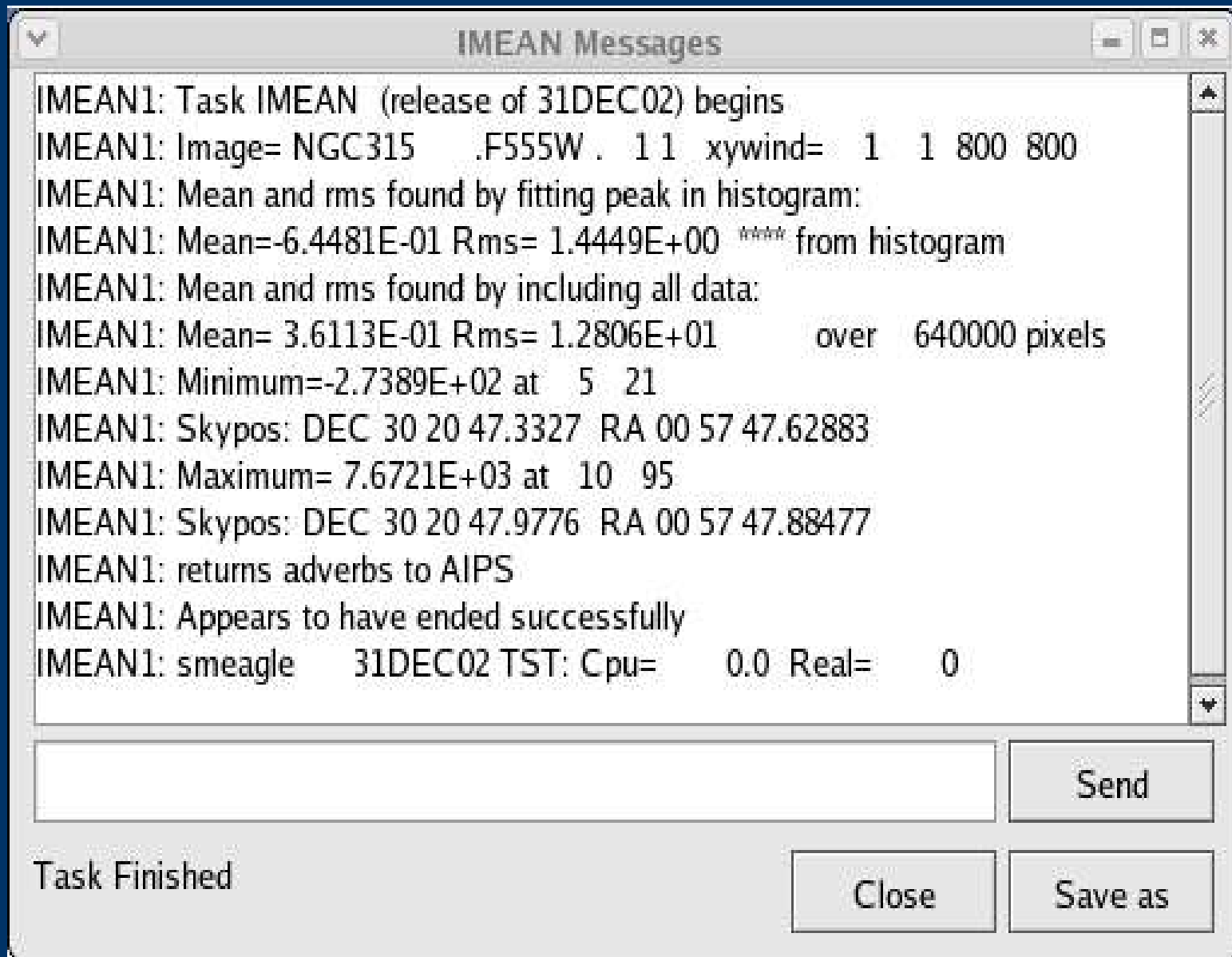
ObitTalk

- Python preloaded with functions
- Can run interactively or on a script
- Can execute tasks locally/remotely, synchronously/asynchronously, Obit/AIPS
- Can execute scripts locally/remotely, synchronously/asynchronously
- Can use ObitView interactive image display
- Data access via python binding
  - Read/write headers, tables, data
  - High level bindings to Obit class libraries allow flexible "toolkit"

ObitView

- Interactive image display
- Communicates via xmlrpc allowing use over networks
- Display AIPS or FITS images
- Standalone image browser

ObitView screen shot
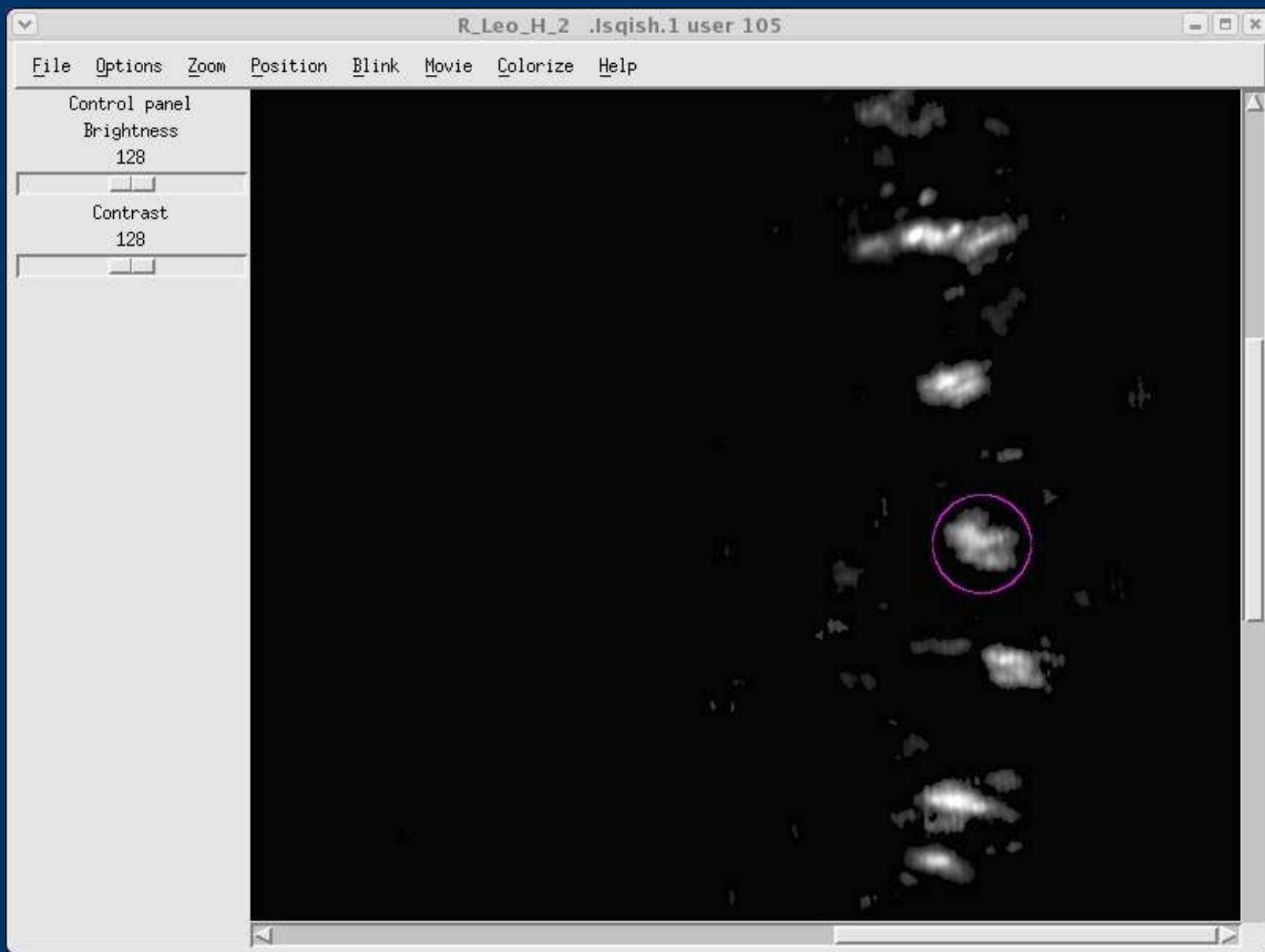
Obit algorithm development and testing

- Most AIPS imaging technology implemented, much of the calibration.
- Use of object-oriented methodology simplifies algorithm development and testing
- Interoperability with AIPS means existing functionality can be used.
- New algorithms can be tested in a production environment.
- Several new algorithms developed.
- autoWindow useful for imaging surveys.

Obit Distribution

- Distributed via anonymous cvs
- Uses GNU GPL license
- Home page:
  http://www.cv.nrao.edu/~bcotton/Obit.html
- configure/make installation
- Minimal support

Documentation

- ObitTalk User documentation: online and
  ftp://ftp.cv.nrao.edu/NRAO-staff/bcotton/Obit/ObitTalk.pdf
- ObitTalk architecture document:
  ftp://ftp.cv.nrao.edu/NRAO-staff/bcotton/Obit/ObitTalkSoft.pdf
- Obit architecture document:
  ftp://ftp.cv.nrao.edu/NRAO-staff/bcotton/Obit/OBITdoc.ps
- Obit software documentation (from doxygen)
  ftp://ftp.cv.nrao.edu/NRAO-staff/bcotton/Obit/doxygen/html/index.html

Why Use Obit for Sky Surveys?

- autoWindow algorithm gives superior imaging
  - based on idea from difmap
  - dynamically determine CLEAN windows
- Only available in Obit for wide-field imaging
- Very import to constrain CLEAN when no. pixels exceeds degrees of freedom in data.
- Reduces "CLEAN" bias – power from real sources redistributed over image.
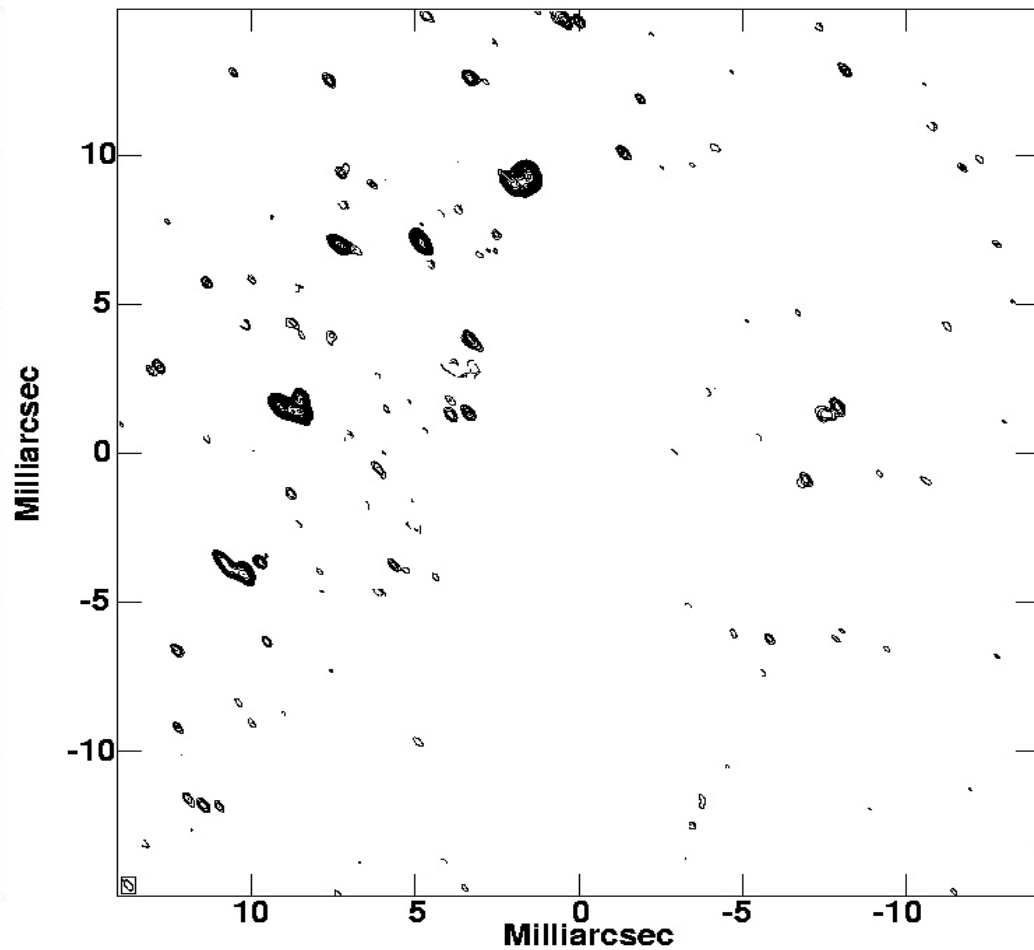
Constraining CLEAN

Example:
SiO masers,
large field of view
VLBA snapshot imaging
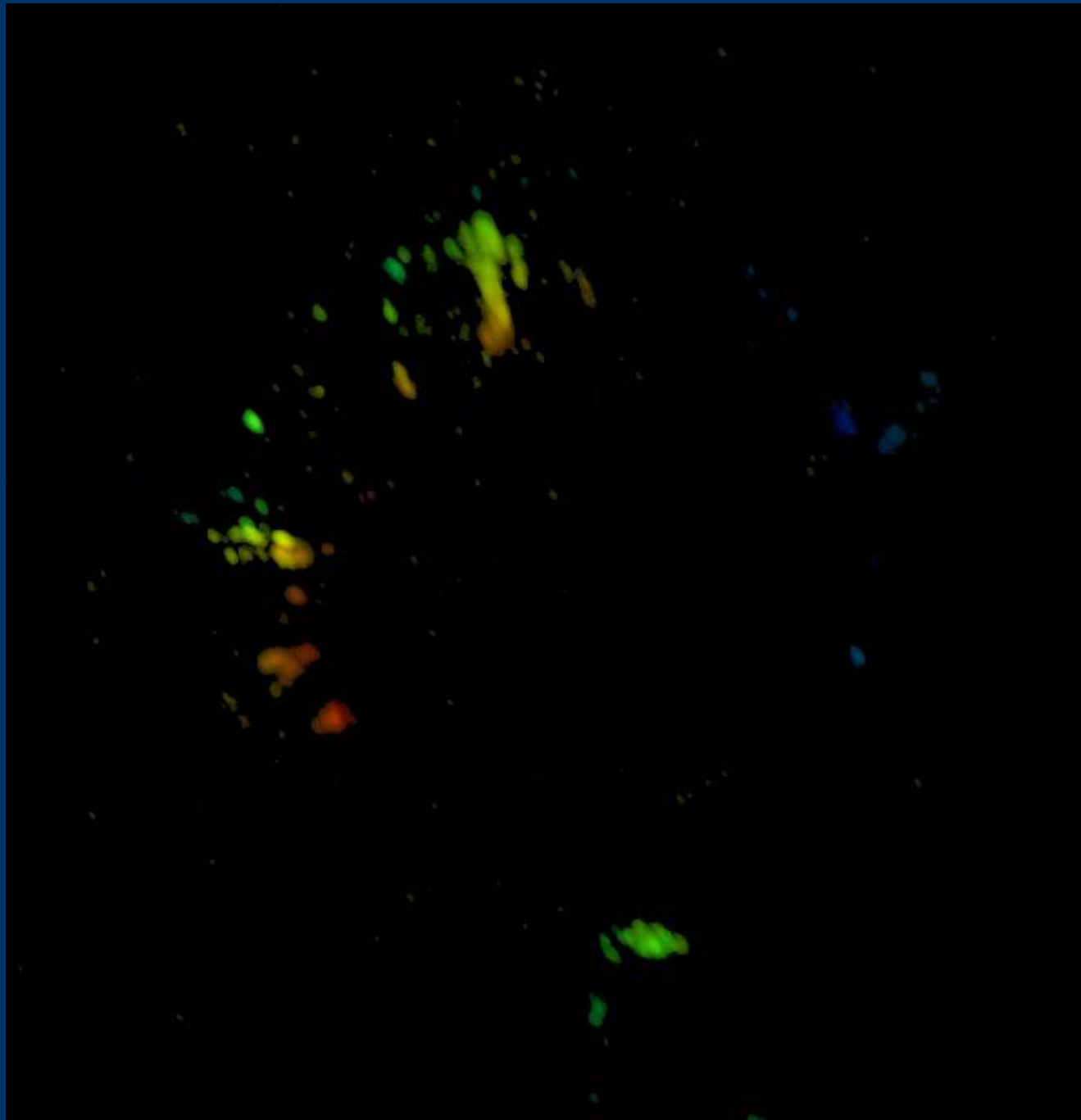
Comparison of autoWindow and unconstrained CLEAN
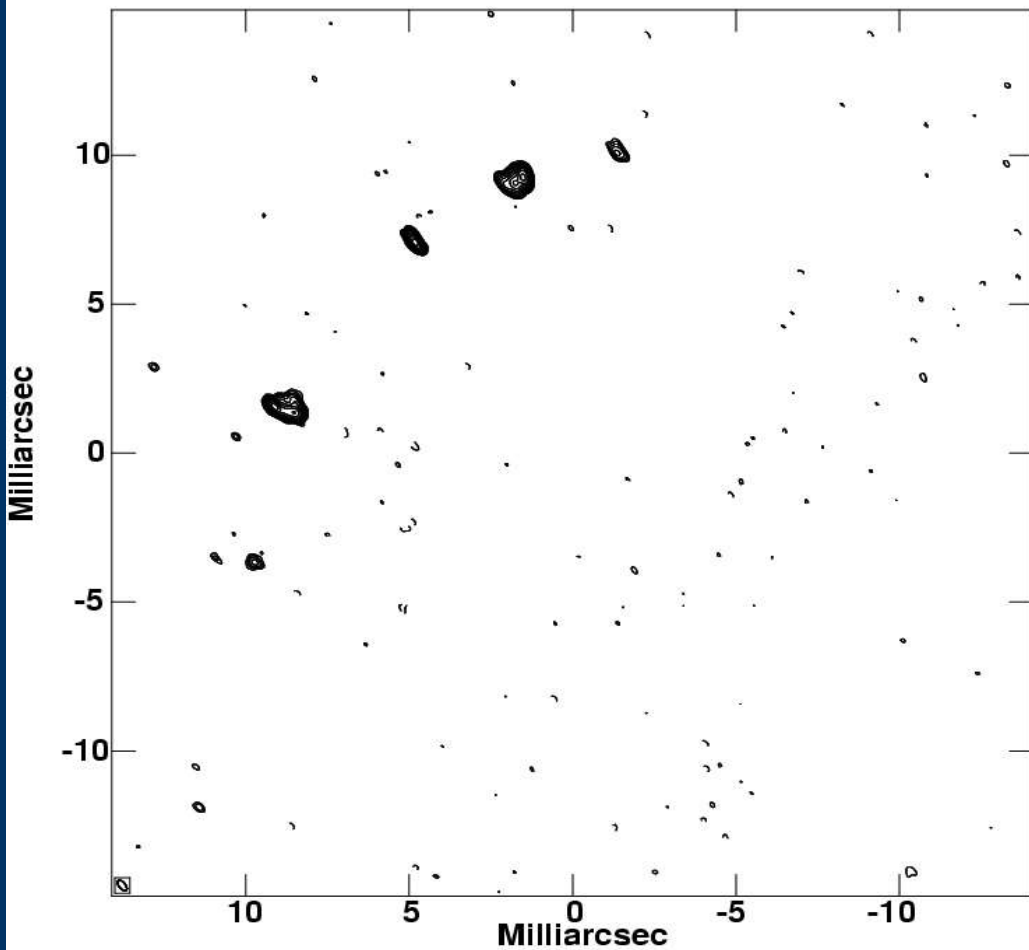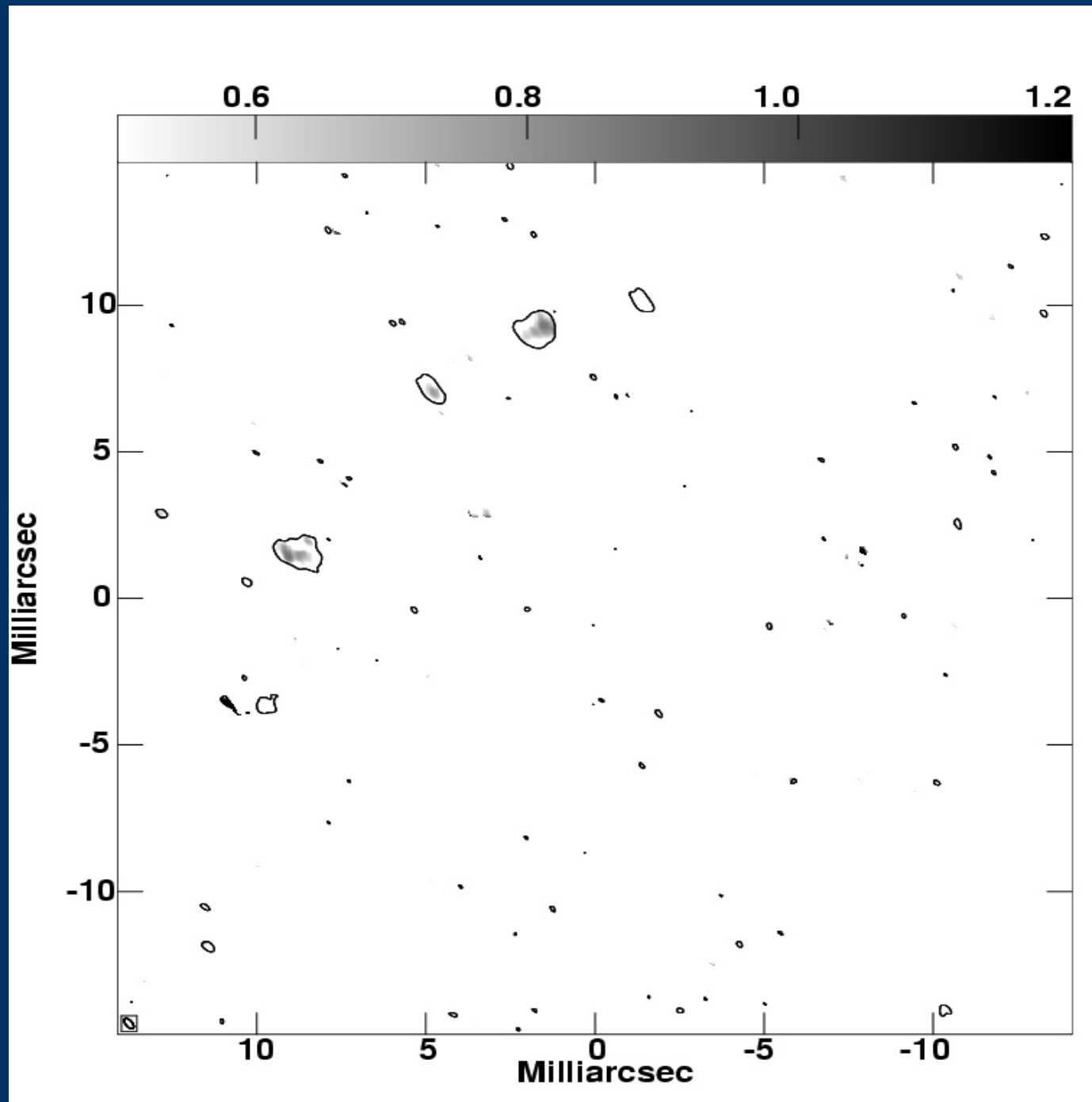

AutoWindow channel image   Full CLEAN window

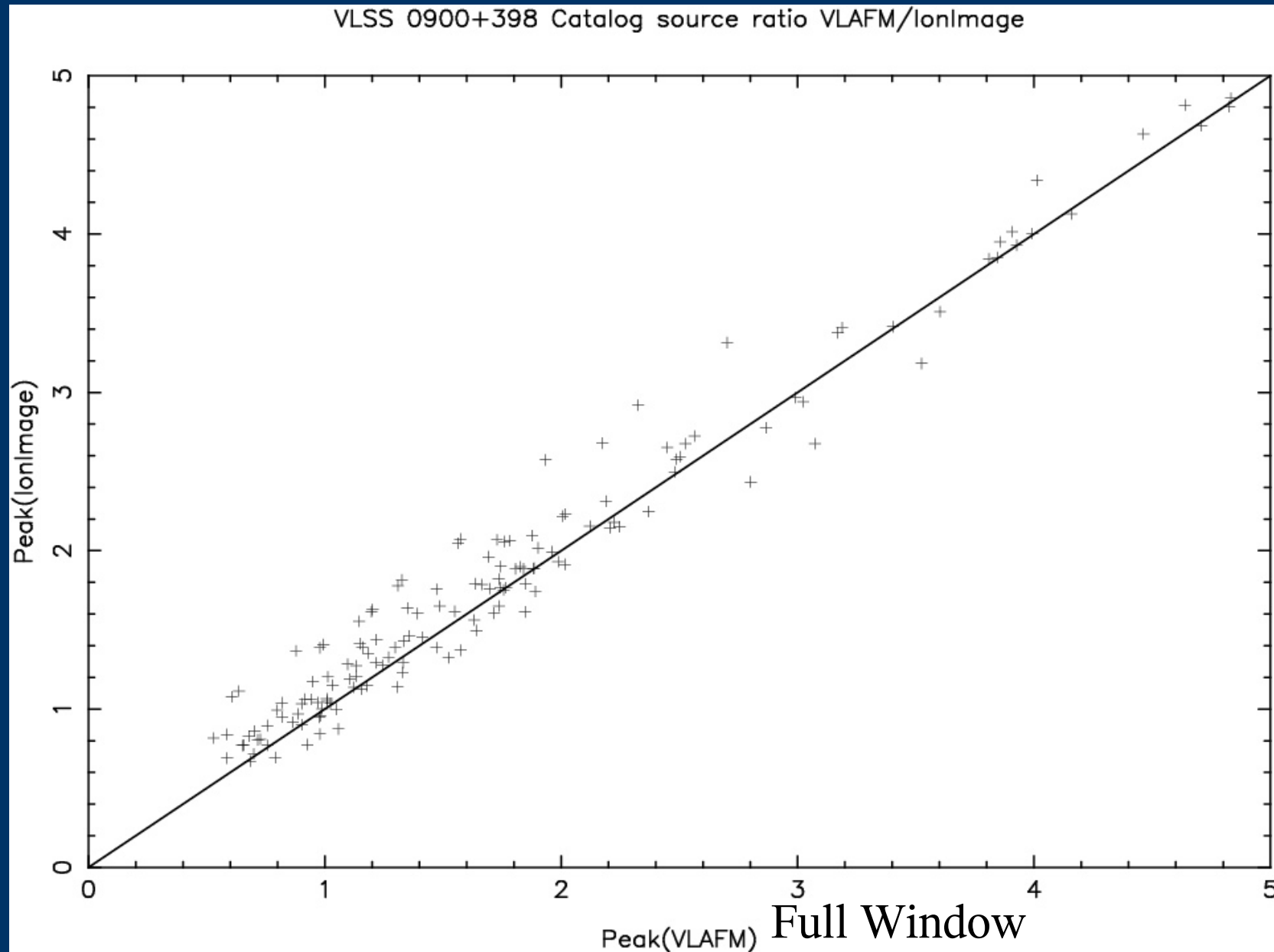Ratio of Full to auto window

Typical values 0.4-0.8

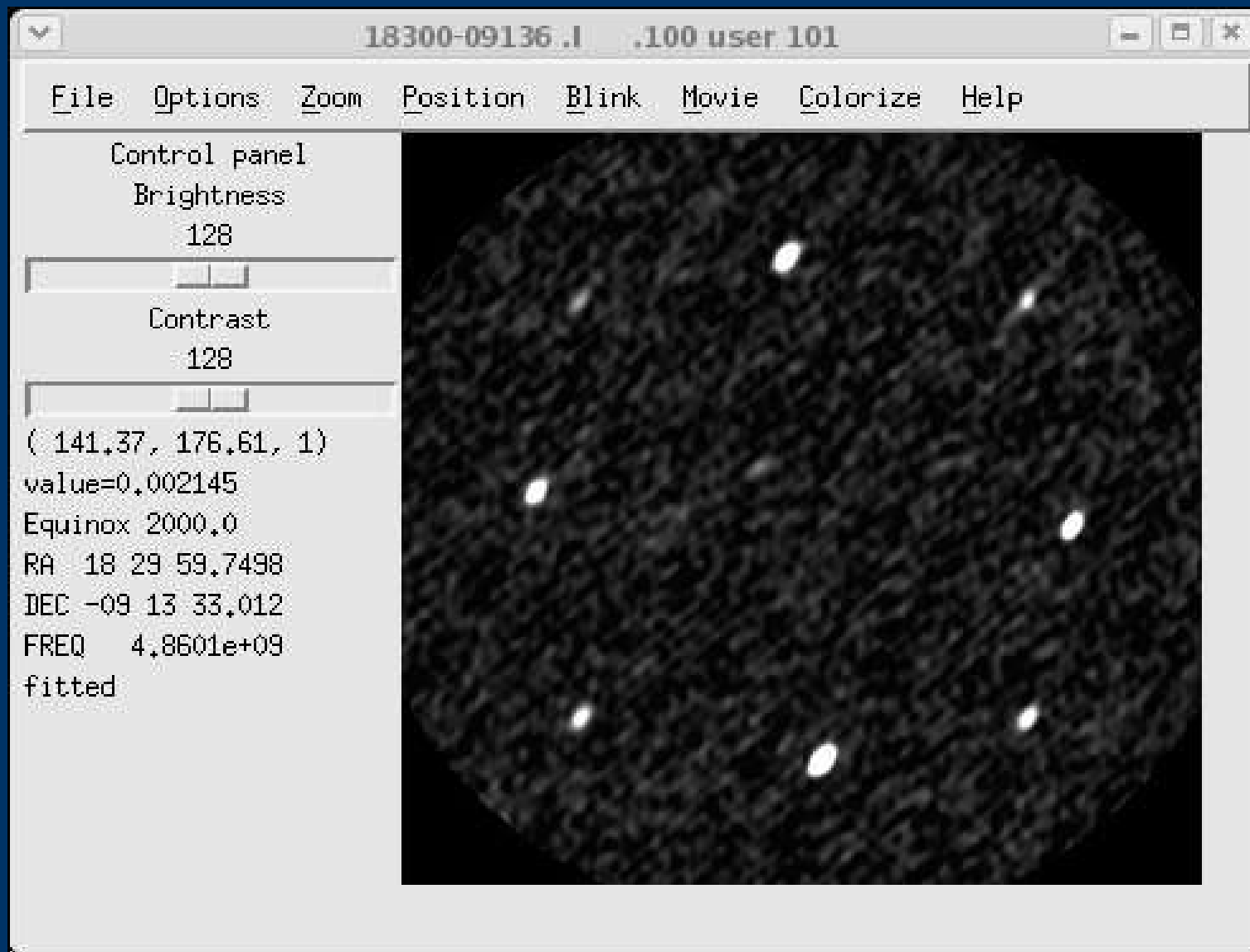Significant reduction of flux density with unconstrained CLEAN

VLSS (74 MHz) Survey image

autoWindow

systematically higher flux density (less CLEAN bias)

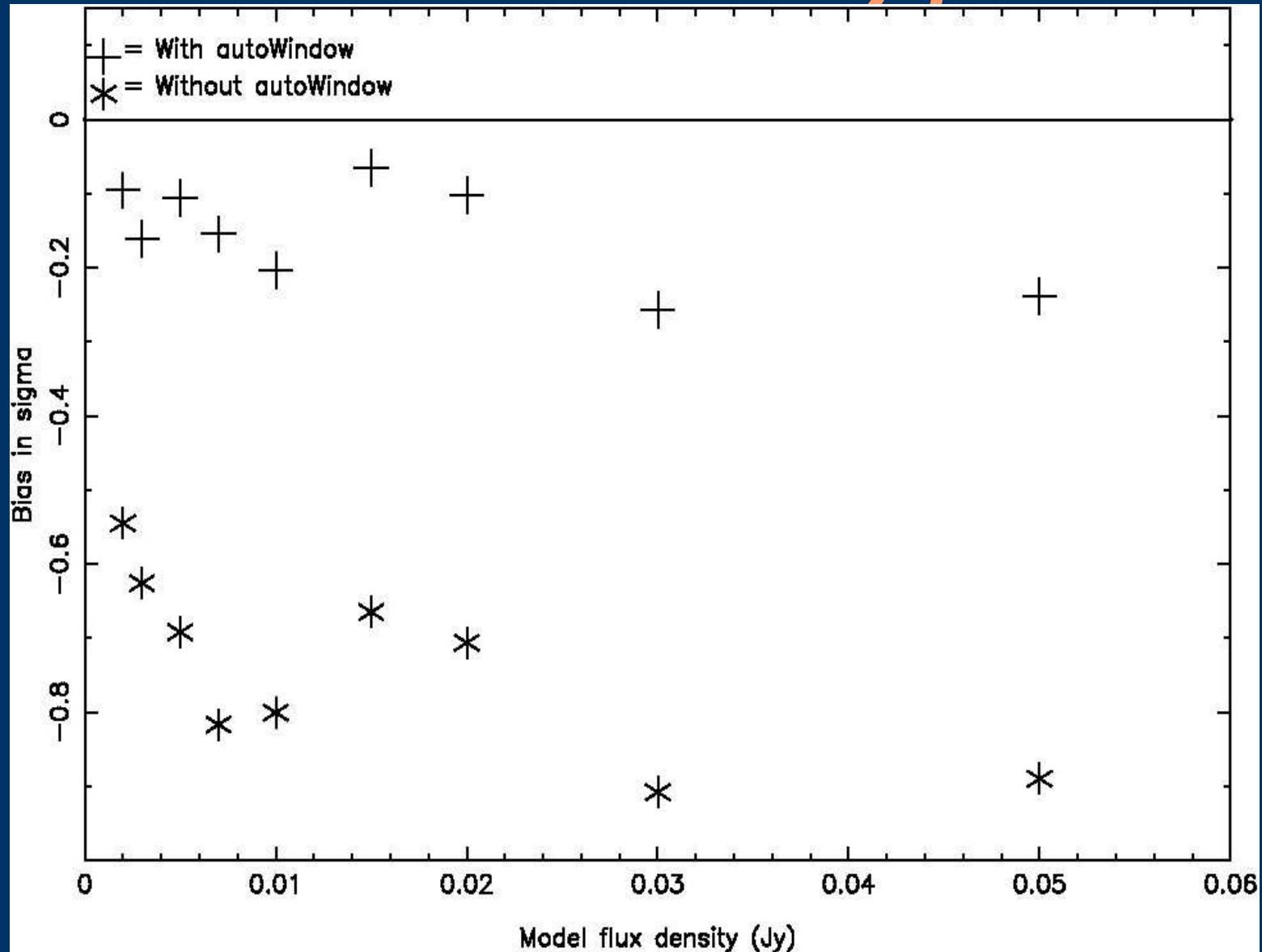VLSS 0900+398 Catalog source ratio VLAFM/IonImage

Bias Reduction in Survey processing

Test for CLEAN bias by adding artificial sources into VLA survey data. Image and deconvolve to see what flux density recovered.

Bias Reduction in Survey processing

Average bias in image RMS with and without autoWindow
for range of artificial source flux densities, 220 test fields

Summary

- Obit is a reasonable environment for algorithm development
- Obit is sufficiently robust and efficient for selected production processing.