Processing the Data

- IDL environment
- Noise, bandpass, baseline calibration
- Flagging, visual inspection
- Signal extraction ,phase 1
- Continuum sources
- Gridding, tile cubes
- Signal extraction, phase 2

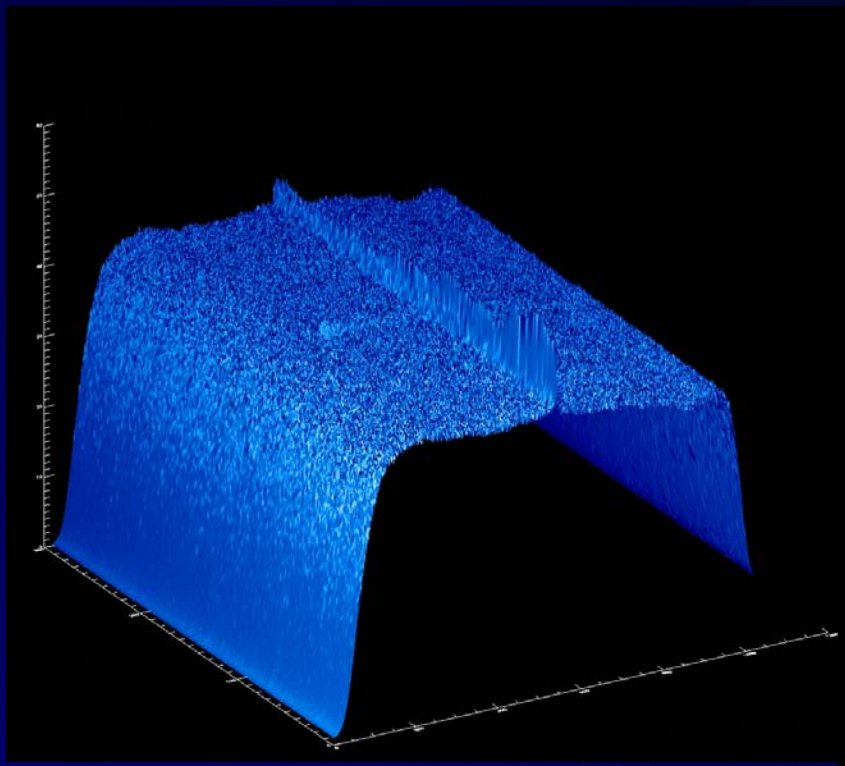
Tasks needed

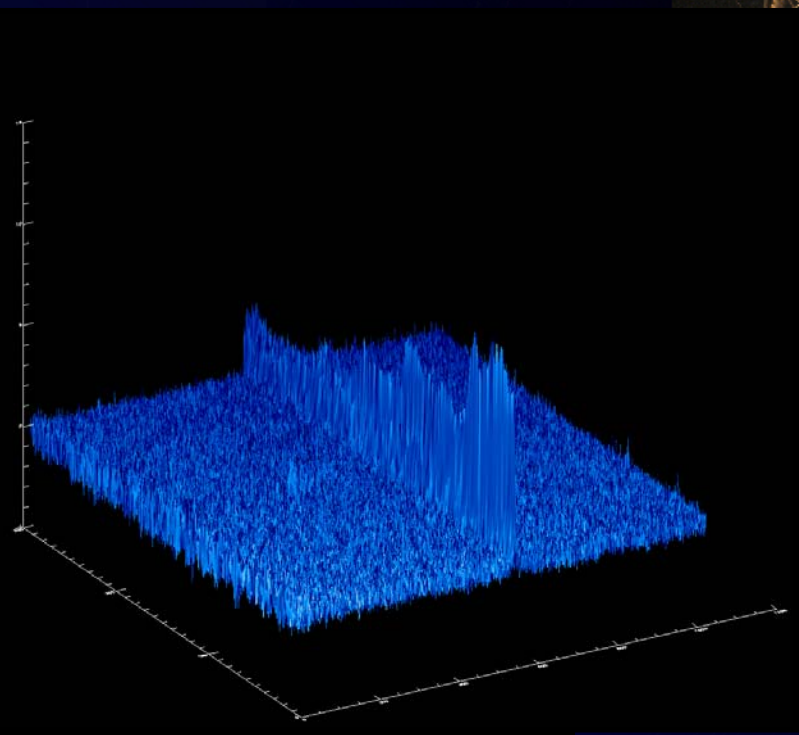
Data Products

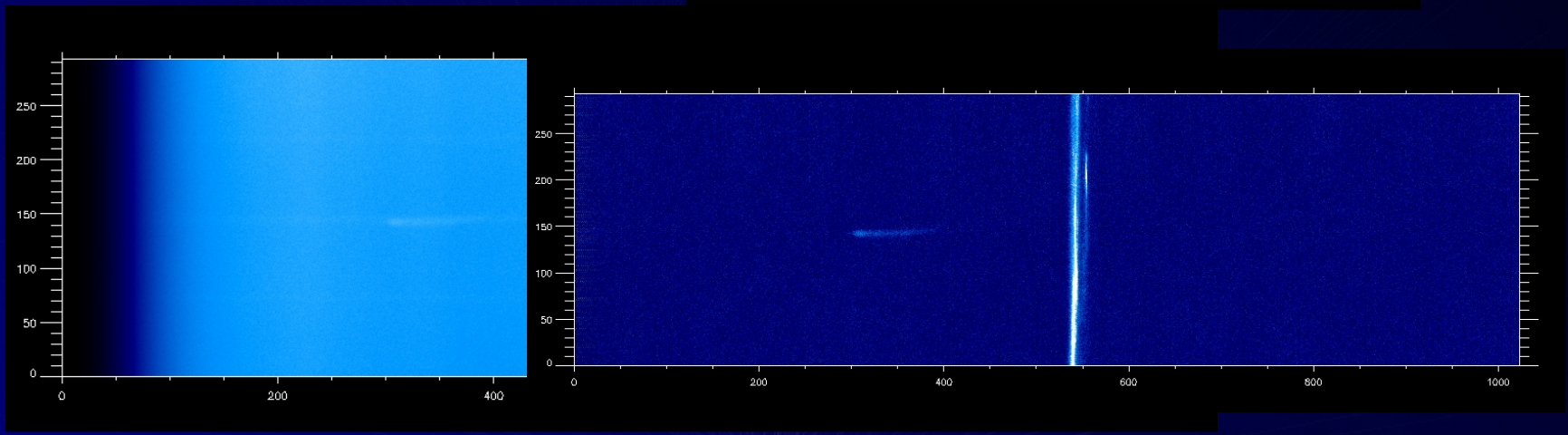
ALFALFA:

- Park telescope at meridian (minimal intrusion); rotate array to 19deg (equal Dec spacing of beams); sky drifts, cover 100 MHz BW centered at 1385 MHz.
- Sample at the rate of 1 record per second, producing drift scans of 600 sec:
  600 x 2 pol x 7 beams x 4096 sp. Channels = 200 MB
- Convert FITS files to IDL structures
- Bandpass subtraction, baselining, calibration, visual inspection within weeks: level I Data Products
- After second pass: gridding, Tile Data Cubes (4x5deg), automated signal extraction: level II Data Products
- Catalogs (level III Products), cross-referencing, web access via NVO

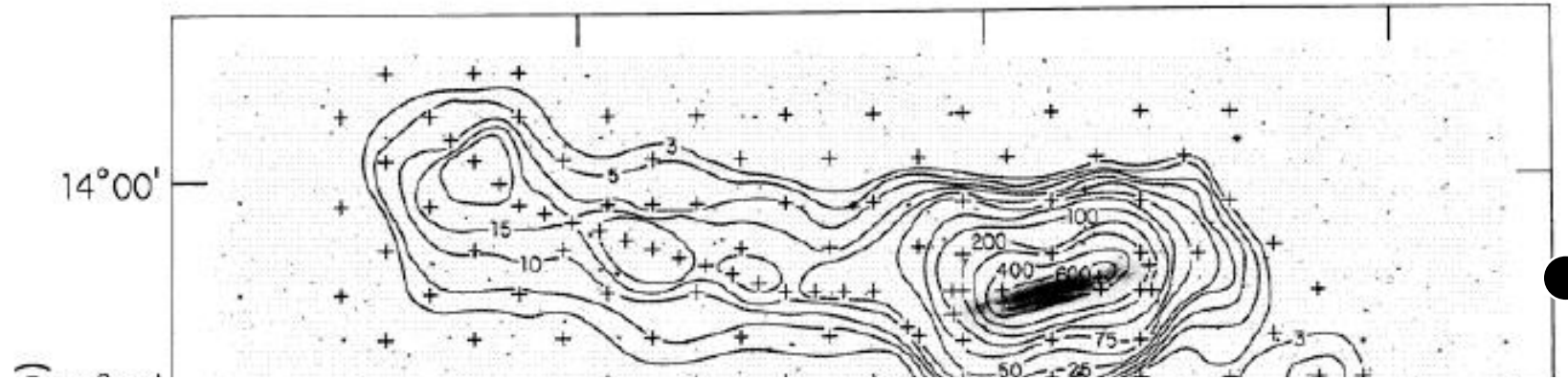
1. At the telescope: convert FITS file to IDL structures and .sav files
2. Within days to weeks: - create calibration structures (ncalib) for observing session (calib1, calib2)
   - run bpdgui, which will use ncalib to noise-calibrate all data in the observing session, obtain a bandpass BP solution and apply it for each drift scan in the session, obtain a continuum map of the drift, create a pos structure, a calsession structure, various masks for continuum, rfi features.
3. First detailed visual inspection of data:
   - run flagbb which "flags bad boxes" in the data, one beam/pol map at a time
4. Run automated signal extraction algorithm: extract and produce source candidate table
5. Within 1 year:
   - run gridder to produce resampled data cubes and ancillary files
   - run extract2 for signal extraction from data cubes



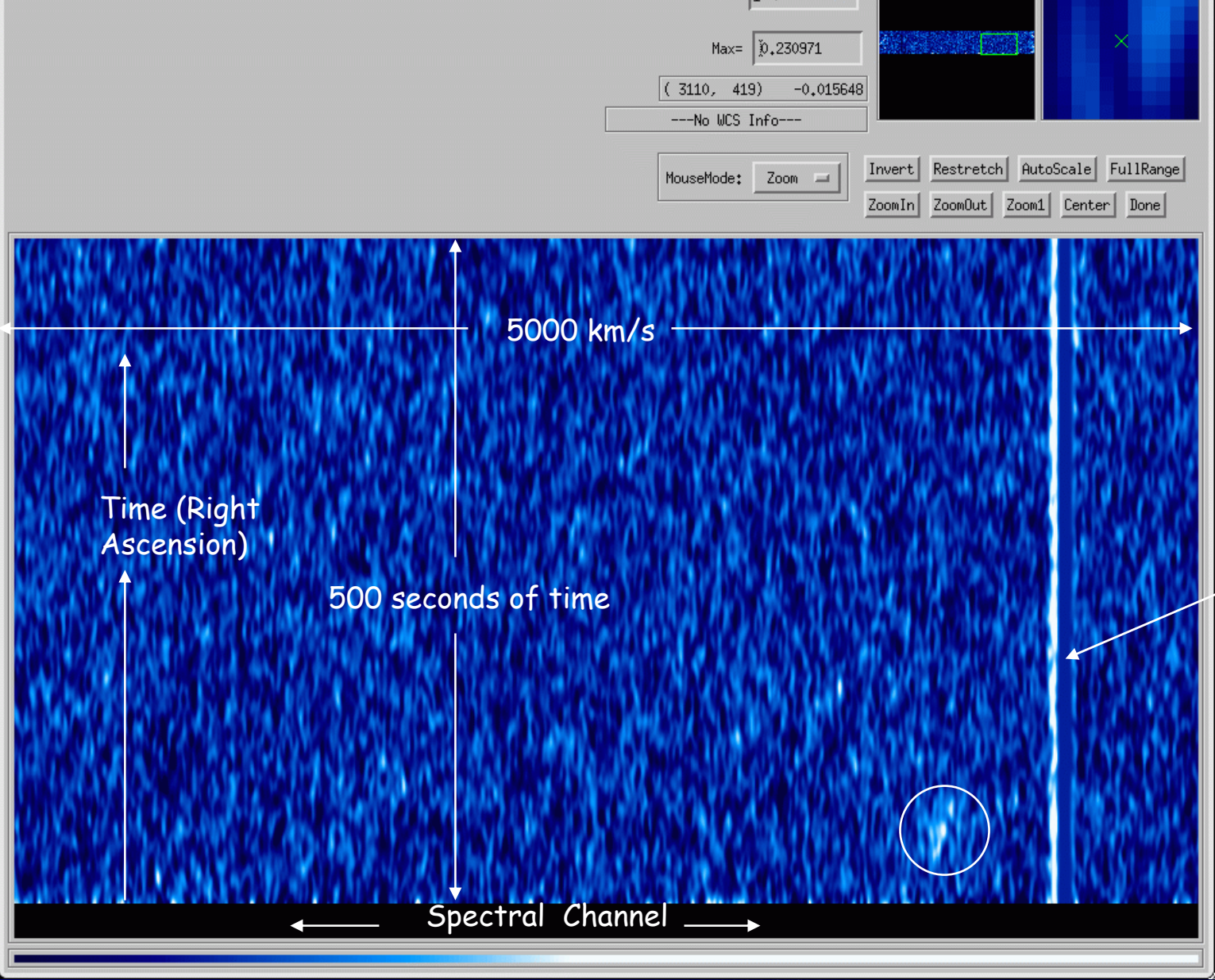



250
200
150
100
50
0
0
200
400
250
200
150
100
50
0
0
200
400
600
800
1000

ALFALFA

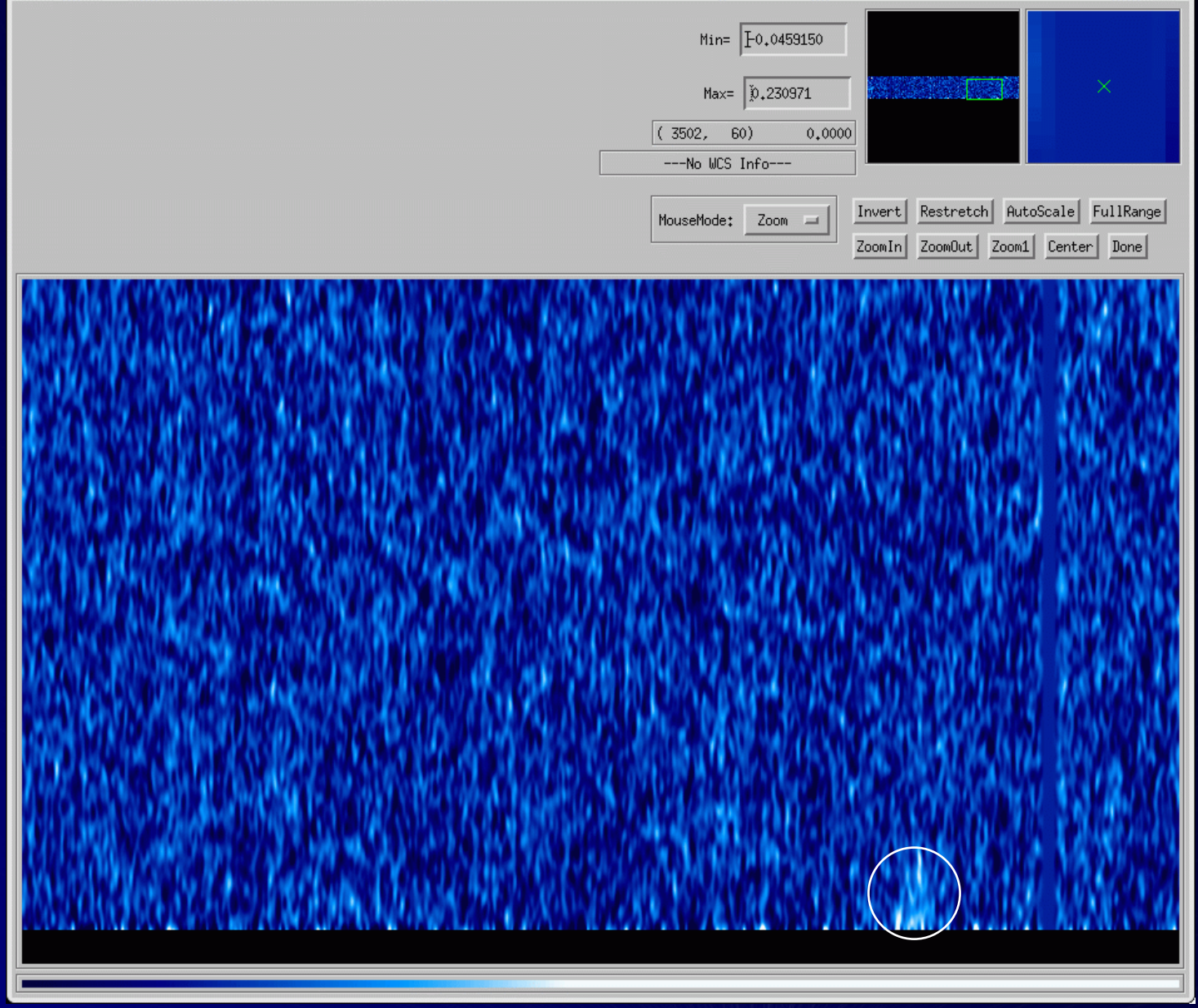


← Right Ascension

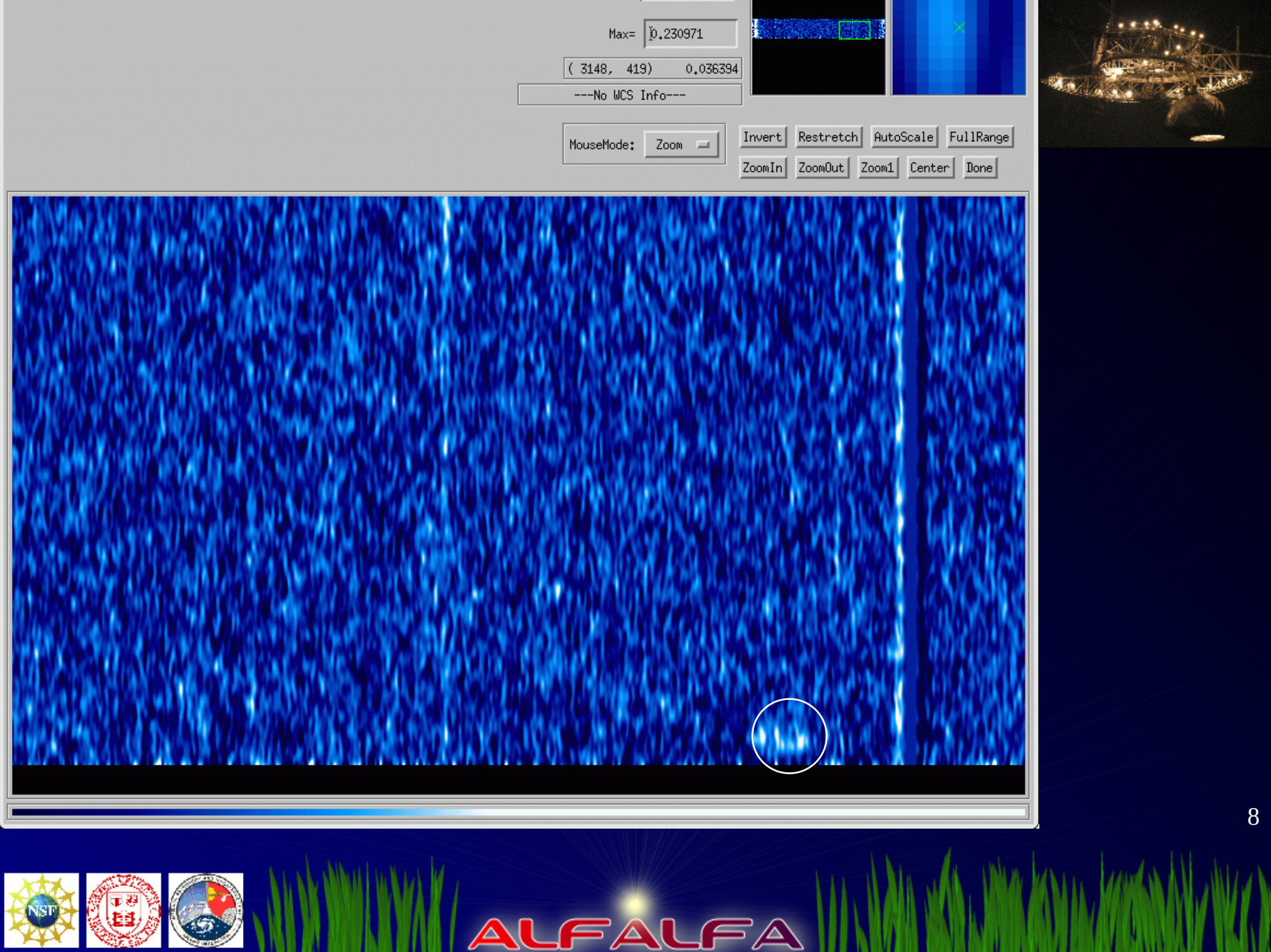


Galactic HI (clipped)

ALFALFA


Min= 0.0459150
Max= 0.230971
(3502, 60) 0.0000
---No WCS Info---
MouseMode: Zoom
Invert
Restretch
AutoScale
FullRange
ZoomIn
ZoomOut
Zoom1
Center
Done

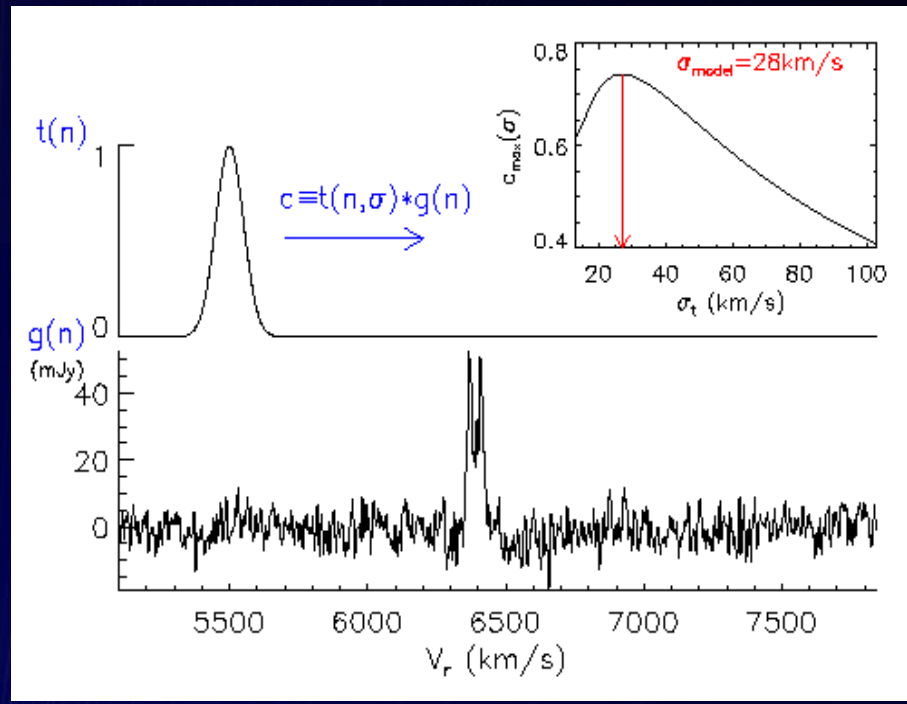
ALFALFA


Max= 0.230971
(3148, 419) 0.036394
---No WCS Info---
MouseMode: Zoom
Invert
Restretch
AutoScale
FullRange
ZoomIn
ZoomOut
Zoom1
Center
Done

ALFALFA

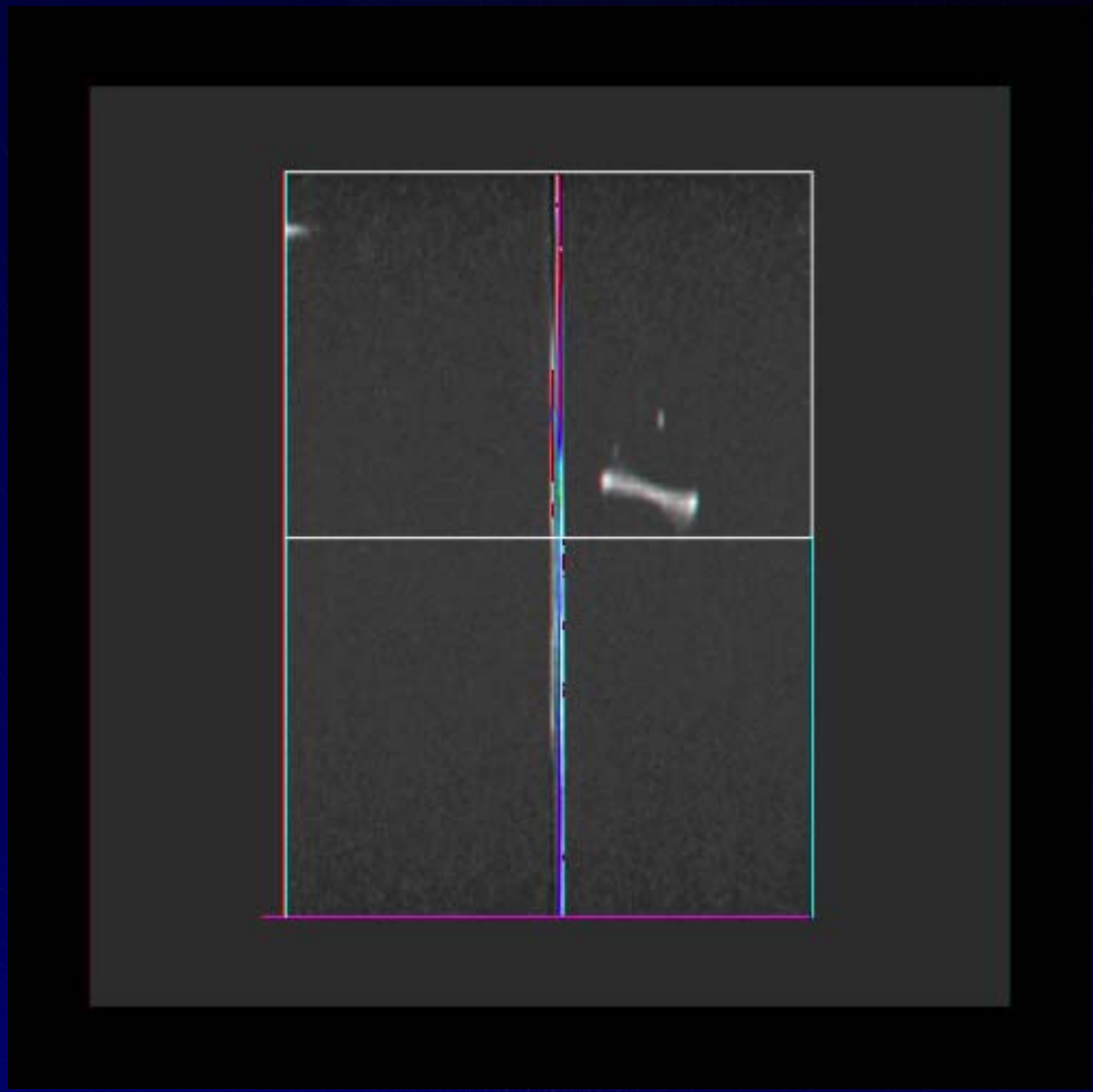
Signal Extractor

- The signals are extracted by cross-correlations of a template with the spectra.
  - More sensitive than peak-finding algorithms.
    - sensitive to total flux, not just peak flux
    - Less vulnerable to baseline instabilities
    - especially important for low mass systems
  - Using FFT's, cross-correlations are fast
  - It's a matched-filter algorithm



Slide: Amelie Saintonge

NGC 2683 & co.



[Data cube visualization in KARMA by B. Kent]

Things to do for ALFALFA - IDL:

- Procedure to process continuum sources in tiled region

- Signal-finding algorithm in 3d tile cubes: peak-finding, matched filter

- Signal-finding algorithm in 2d drift maps: peak-finding

- Map deconvolution of beam characteristics: "take the telescope out of the map"

- Matched-filter photometric/kinematic procedure

- Recovery of flux for large solid angle features, e.g. HVCs
  [Does anybody care about res=5 km/s Galactic HI?]

- Optimization of Destriping algorithms

- Procedures to overlay optical images on IDL/ATV HI maps, etc.

- Procedure to simultaneously fit all sources above given S/N in a tile cube

- Procedure to simultaneously fit all sources above given S/N in a drift map