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:
  \[ 600 \times 2 \text{ pol} \times 7 \text{ beams} \times 4096 \text{ sp. Channels} = 200 \text{ MB} \]
- 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
Haynes, Giovanelli & Roberts 1979

NGC 3628

NGC 3623

NGC 3627

Leo Triplet

Right Ascension

Craig Zwick

cz
Spectral Channel

Galactic HI (clipped)

Time (Right Ascension)

5000 km/s

500 seconds of time

Spectral Channel

500 seconds of time

5000 km/s
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
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